Biological Opinions Supporting Incidental Take Permits

Biological Opinion for Permit No. 1391 (2003)

Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION,

UNLISTED SPECIES ANALYSIS,

and

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

for Proposed Issuance of a Section 10 Incidental Take Permit to Public Utility District No. 1 of Douglas County for the Wells Hydroelectric Project (FERC No. 2149) Anadromous Fish Agreement and Habitat Conservation Plan

Action Agency:	NOAA Fisheries
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TERMS AND ABBREVIATIONS

acoustic tag	Tag composed of a small transmitter and battery used in juvenile and adult fish behavior and survival studies
Additional Tools	Tools in addition to those initially proposed - see Tools, below
BA	Biological Assessment
cfs	cubic feet per second
Chelan PUD	Public Utility District No. 1 of Chelan County
Colville Tribe	Confederated Tribes of the Colville Reservation
CAJPS	Combined Adult and Juvenile Project Survival (reservoir, forebay, dam, and tailrace)
conversion rate	Ratio of adult fish detected at a downstream detection site (denominator) and redetected at an upstream detection site (numerator) that may be used as a conservative estimate of adult survival between the two sites
dam	The concrete structure impounding the Columbia River (as defined in the HCP).
Douglas PUD	Public Utility District No. 1 of Douglas County
EA	environmental assessment
Effective Date	Effective Date of the HCP agreement is the later of 1) FERC's license order approving the HCP and modifying the Project license, 2) NOAA Fisheries' issuance of an incidental take statement, or 3) USFWS completion of the necessary consultations under the ESA.
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FEIS	Anadromous Fish Agreements and Habitat Conservation Plans - Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, December 2002
FERC	Federal Energy Regulatory Commission
forebay	The body of water from the dam upstream approximately 500 feet (as defined by the HCP).
GBT	Gas Bubble Trauma
GCFMP	Grand Coulee Fish Maintenance Project
HCP	Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project and supporting documents
HCP Reach	The distance from the tailrace of Chief Joseph Dam to the tailrace of Rock Island Dam, approximately 147.6 km and includes the three HCP projects.
JBS	Juvenile Bypass System
JDPS	Juvenile Dam Passage Survival (forebay, dam, and tailrace)
JPS	Juvenile Project Survival (reservoir, forebay, dam, and tailrace)
ITP	Incidental Take Permit

kcfs	1,000 cubic feet per second
kelt	An adult steelhead that has spawned and is migrating downstream to the ocean, where it will feed before attempting to migrate upstream and spawn again.
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NOAA Fisheries	National Marine Fisheries Service (NMFS)
NNI	No Net Impact
Opinion	This Biological Opinion
Permit Species	UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon
PIT-tag	Passive Integrated Transponder tag commonly used in juvenile and adult fish migration rate and survival studies
Plan Species	Permit Species and reintroduced coho salmon
Project	Wells Hydroelectric Project (FERC No. 2149) - the geographical boundaries of the Project include the reservoir, forebay, dam, and tailrace (as defined in the HCP).
PUD	Public Utility District
QAR	Quantitative Analysis Report
radio-tag	Tag composed of a small transmitter, battery, and whip antenna, commonly used in juvenile and adult fish behavior and survival studies
reservoir	The body of water impounded by the dam extending to the tailrace of the next upstream dam.
RM	river mile
RPA	reasonable and prudent alternative
Signatory Parties	The agencies and tribes which have, to date, conditionally signed the HCP agreement.
tailrace	The body of water from the base of the dam to a point approximately 1,000 feet downstream (as defined in the HCP).
TDG	total dissolved gas
Tools	Any action, structure, facility, or program (on-site only) at the Project (except those prohibited in section 9.7 of the HCP) intended to improve the survival of Permit Species migrating through the Project.
UCR	Upper Columbia River
Umatilla Tribe	Confederated Tribes of the Umatilla Indian Reservation
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
Yakama Tribe	Confederated Tribes and Bands of the Yakama Indian Nation

1. OBJECTIVES

This document constitutes the National Marine Fisheries Service's (NOAA Fisheries) consultation in accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended on the issuance of an Incidental Take Permit (ITP) and unlisted species agreement to Public Utility District No. 1 of Douglas County (Douglas PUD) based upon its Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project (Douglas PUD 2002). This document also analyzes the effects of these actions with respect to fulfilling essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). The MSA requires the inclusions of EFH descriptions in Federal fishery management plans and requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. This document shall hereinafter be referred to as the Opinion.

NOAA Fisheries has proposed and evaluated this ITP and HCP in conjunction with proposed ITPs and HCPs for the Rocky Reach and Rock Island hydroelectric projects (owned by Public Utility District No. 1 of Chelan County [Chelan PUD]) as NOAA Fisheries' preferred alternative in the Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects (NMFS 2002a), hereinafter referred to as the FEIS. For the purpose of formal ESA consultation, the FEIS serves as the agency's biological assessment (BA).

Contemporaneously with this consultation, NOAA Fisheries is conducting ESA Section 7(a)(2) consultations for the Rocky Reach and Rock Island hydroelectric projects, for which NOAA Fisheries will prepare separate biological opinions on the issuance of separate ITPs for each of the HCPs covering each project. Analysis of the proposed action in this Opinion will therefore consider the individual effect of the proposed action for the Wells Hydroelectric Project, hereinafter referred to as the Project. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal actions that have yet to undergo their own ESA consultations (see 50 CFR §402.02, Effect of the Action). However, the cumulative effect of issuing these three ITPs has been considered for the purposes of the National Environmental Policy Act (NEPA) in the FEIS. Also, NOAA Fisheries will consider for the record in this Opinion, as an alternate conclusion in Section 8, whether its ESA Section 7(a)(2) determinations for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

The objective of this Opinion is to 1) determine whether or not issuing the ITP will jeopardize the continued existence of currently listed Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) or UCR spring-run chinook salmon (*O. tshawytscha*) or the presently unlisted UCR summer/fall-run chinook salmon (*O. tshawytscha*) or Okanogan River sockeye

salmon (*O. nerka*) (hereinafter all four species will be referred to as the Permit Species[1]), and 2) determine whether or not the proposed action would adversely affect designated EFH.

Only two species of the anadromous salmonids that are addressed in the HCP are currently listed for protection under the ESA: UCR steelhead and UCR spring-run chinook salmon.[2] For the two other species of anadromous salmonids that are currently unlisted, and thus are neither protected under the ESA nor subject to the provisions of Sections 7 and 10, NOAA Fisheries has agreed, pursuant to the unlisted species provisions of the HCP, to include these species in the ITP as covered species.[3] This document, in addition to being a biological opinion for the proposed action of issuing an ITP for UCR steelhead and UCR spring-run chinook salmon, also provides the rationale and biological basis for making the decision whether to add (to the ITP) the two unlisted species, within the administrative requirements of Sections 7 and 10, and subject to a subsequent determination by NOAA Fisheries according to the HCP (section 10.1.3). Note that all of the anadromous fish were addressed during development of HCP conservation measures as if they were already ESA protected.

NOAA Fisheries has already consulted or is currently consulting on the operations of all artificial production facilities in the middle reach of the Columbia River and its tributaries. These consultations include production of juveniles to mitigate for inundation as well as production of juvenile Permit Species as part of the HCP's Hatchery Compensation Plan. Thus this Opinion will only evaluate the likely effects of the adaptive management process which would govern the
operation of these facilities under the HCP for the term of the ITP and the general effects of hatchery mitigation of up to 7% - which are both integral to the HCP - as part of the proposed action.

Critical habitat had been designated for the two ESA-listed species under consideration in this Opinion. On April 30, 2002, however, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in National Association of Homebuilders, et al. v. Evans, Civil Action No. 00-2799 (CKK)(D.D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species, including the UCR steelhead and UCR spring-run

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[1]Because the Wenatchee River enters the Columbia River downstream of the Rocky Reach and Wells projects, Lake Wenatchee sockeye salmon (*O. nerka*) are not included in the HCPs for these projects. However, Lake Wenatchee sockeye salmon are included as a Permit Species in the Rock Island Hydroelectric Project HCP.

[2]For Pacific salmon, NOAA Fisheries has defined "species" as Evolutionarily Significant Units (ESU). Species and ESUs are thus used interchangeably throughout this rest of this Opinion.

[3]While the HCP includes coho salmon (*O. kisutch*) as a "Plan Species," they are not included as a "Permit Species" since wild coho salmon are extirpated from this reach of the Columbia River and are therefore not protected by the ESA (HCP sections 13.19 and 13.20).

chinook salmon. For this reason, this action will not affect designated critical habitat and thus this Opinion will not determine whether the proposed action is likely to result in the destruction or adverse modification of any critical habitat, a separate substantive standard of ESA Section 7(a)(2).

1.1 Application of ESA Section 7(a)(2) Standards - Analysis Framework

This section reviews the approach used in this Opinion in order to apply the standards for determining jeopardy and destruction or adverse modification of critical habitat as set forth in Section 7(a)(2) of the ESA and as defined by 50 CFR §402.02 (the consultation regulations). Additional guidance for this analysis is provided by the Endangered Species Consultation Handbook, March 1998, issued jointly by NOAA Fisheries and the U.S. Fish and Wildlife Service (USFWS). In conducting analyses of actions under Section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations:

1. Evaluate biological requirements and current status of the species at the ESU level and within the particular action area (Section 4).

2. Evaluate the relevance of the environmental baseline in the action area to action-area biological requirements and the species' current rangewide and action-area status (Section 5).

3. Determine the effects of the proposed or continuing action on the species and on any designated critical habitat (Section 6).

4. Determine and evaluate any cumulative effects within the action area (Section 7).

5. Evaluate whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species, or is likely to destroy or adversely affect their designated critical habitat (Section 8). (See CFR §402.14(g).)

In completing step 5, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species or adversely modify critical habitat. If so, NOAA Fisheries must identify any reasonable and prudent alternatives (RPAs) for the action that avoid jeopardy or adverse modification of critical habitat and meet the other regulatory requirements for RPAs. (See CFR §402.02.)

1.1.1 Evaluate Rangewide Biological Requirements and Current Status

The first step NOAA Fisheries takes when applying ESA Section 7(a)(2) to the listed ESUs considered in this Opinion is to define the species' rangewide biological requirements and evaluate the rangewide status relative to those requirements.

ESU biological requirements are met when a sufficient number and distribution of populations comprising the ESU are meeting their biological requirements. NOAA Fisheries has established Technical Recovery Teams (TRT) to identify the component populations of each ESU, to define viability criteria for each population, and to describe the number and distribution of populations that must be viable before the ESU can be considered viable. The Interior Columbia TRT will provide these guidelines for UCR steelhead and UCR spring-run chinook ESUs, but these guidelines are not yet complete. In the interim, and until superceded by determinations of the Interior Columbia TRT, NOAA Fisheries conservatively assumes that all populations within these ESUs must meet viability criteria in order to conclude that the ESU is meeting its biological requirements. For purposes of this Opinion, NOAA Fisheries applies the same criterion to the two unlisted Permit Species.

Biological requirements of populations may be considered over the entire range of the population or within the action area. Biological requirements within the action area are a subset of the rangewide biological requirements of the populations comprising the ESU. Identification of the rangewide biological requirements provides context for subsequent evaluation of biological requirements within the action area.

Rangewide biological requirements are met when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. McElhany et al. (2000) describe viable salmonid populations as having a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. The attributes associated with viable salmonid populations include adequate abundance, productivity (population growth rate), spatial scale, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle. These factors, in turn, are influenced by the habitat and environmental conditions encountered by individuals within the population.

Consistent with their listing, most populations comprising listed ESUs are not viable. Listed ESUs will be considered recovered when, among other things, factors for decline have been ameliorated and when a sufficient number of populations within the ESU have become viable. For the purpose of assessing the effects of the proposed actions while listed ESUs and their component populations are moving towards recovery, NOAA Fisheries, in its 1995 Federal Columbia River Power System (FCRPS) biological opinion, defined the degree to which species-level biological requirements must be met primarily in terms of abundance:

> "At the species level, NMFS considers that the biological requirements for survival, with an adequate potential for recovery, are met when there is a high likelihood that the species' population will remain above critical escapement thresholds over a sufficiently long period of time. Additionally, the species must have a moderate-to-high likelihood that its population will achieve its recovery level within an adequate period of time. The particular thresholds, recovery levels, and time periods must be selected depending upon the characteristics and circumstances of each salmon species under consultation" (NMFS 1995).

This definition implicitly addresses the productivity criterion for viable populations, because population growth rates must increase to reach critical threshold or recovery abundance levels from current low abundance levels, within an adequate time period. For ESUs with multiple populations, the spatial scale and diversity criteria for viable populations are addressed primarily by specifying the number and distribution of populations that must meet species-level biological requirements, as defined above.

Rangewide status. NOAA Fisheries considers the current status of the listed species, taking into account viability criteria (population size, productivity, population spatial structure, and diversity) and, if available, an assessment of population projections relative to survival and recovery criteria. To assess the current rangewide status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that is relevant to the determination. The listing status, general life history, and population dynamics of each species are described in Section 4.

1.1.2 Evaluate Relevance of the Environmental Baseline in the Action Area to Action-Area Biological Requirements and the Species' Current Rangewide and Action-Area Status

Action area. The action area includes all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area is not delineated by the migratory range of the species affected by the project. The action area for this consultation is defined in Section 3.

Action-area biological requirements are those factors, appropriate to the scale of the action area, that support and are necessary for attainment of the rangewide biological requirements of a population. If the action area is sufficiently large, there is no distinction between the rangewide and action-area biological requirements of a population. However, biological requirements for action areas that encompass a limited portion of the population's range may be expressed in terms such as 1) adequate survival rates through particular life history stages and/or 2) habitat characteristics that are expected to result in adequate survival and distribution of individuals within a population. This consultation includes elements of both approaches.

For the first approach, NOAA Fisheries has considered two methods of defining action-area biological requirements in terms of survival rates. The most basic method defines the biological requirements as the survival rates observed for healthy populations of the same or similar species during the same life history stage(s). Generally, these survival rates will be associated with environmental conditions similar to those under which the species evolved (i.e., relatively "natural" conditions). This approach is used in this Opinion (Sections 5 and 6) to evaluate biological requirements in the mainstem reaches of the action area. A second method, which can be applied only in limited circumstances, such as when the action area includes a substantial portion of the population's range, is to determine a suite of survival rates in every life history stage which, when combined, result in a population growth rate that will meet the rangewide biological requirements of the population. The survival rate(s) in this suite that apply in the action area then define the biological requirements. This second method is not used to define action-area biological requirements in this Opinion.

The second approach defines action-area biological requirements in terms of habitat requirements. As described in NOAA Fisheries (1999, Habitat Approach), there is a strong causal link between habitat modification and the response of salmonid populations. Those links are often difficult to quantify. In many cases, NOAA Fisheries must describe biological requirements in terms of habitat conditions in order to infer the populations' responses to the effects of the action. To survive and recover, a wide-ranging salmonid ESU must have adequate habitat available to support life stage-specific survival rates.

Properly functioning habitat would support adequate survival and distribution of salmon and steelhead throughout their ranges and life history stages. NOAA Fisheries typically considers the status of habitat variables in a matrix of pathways and indicators (NMFS 1996), which was developed to describe properly functioning condition in forested montane watersheds. In this consultation, a more generalized evaluation of habitat characteristics is employed in Sections 5 and 6. This method is primarily used to evaluate biological requirements in tributary portions of the action area. It is also used to qualitatively evaluate biological requirements in mainstem reaches, but, in general, NOAA Fisheries considers reach survival rates the more appropriate characterization of mainstem biological requirements since that measure integrates most of the habitat effects.

Action area status. If relevant and available, detailed and site-specific information regarding the status of the relevant populations comprising the ESU, within the action area, should be described. This information is provided in Section 4 of this Opinion.

Environmental baseline. The environmental baseline includes "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone Section 7 consultation and the impacts of state and private actions that are contemporaneous with the consultation in progress" (50 CFR §402.02).

In step 2 of the analysis, which is included in Section 5, NOAA Fisheries evaluates the relevance of the environmental baseline's continuing and future effects in the action area on the species' biological requirements and current status. In describing the environmental baseline, NOAA Fisheries compares existing habitat conditions and their continuing effects, as well as the effects of qualifying future Federal projects and contemporaneous State and private actions, to the action-area biological requirements described above for the listed salmonid ESUs affected by the proposed action. The extent to which the conditions under the environmental baseline fall short of the species' biological requirements indicates, for the action area, the current status of the species. The species' status is important for the ESA Section 7(a)(2) determinations in step 5 because it is more likely that any additional adverse effects caused by the proposed action will be significant if the species status is poor and the baseline is degraded at the time of the consultation.

1.1.3 Analysis of Effects of the Proposed Action

Effects of the action, which are evaluated in step 3, are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR §402.02). Direct effects occur at a project site and may extend upstream or downstream based on the potential for reducing survival or impairing important habitat elements. Indirect effects are defined in 50 CFR §402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." They include the effects on listed species of future activities that are induced by the proposed action and that occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR §402.02).

Effects of the proposed action are described, with respect to their impact on action-area biological requirements, in Section 6. In this Opinion, two key questions are addressed relative to the NOAA Fisheries action of issuing an ITP for the HCP:

1. If the HCP survival goals are met, what effect will the associated incidental take authorized by the ITP have on action-area biological requirements?

2. Are the specific steps identified by the Applicant likely to result in the achievement of the HCP survival goals?

1.1.4 Cumulative Effects

The cumulative effects analysis in step 4, which is described in Section 7, takes into consideration the effect of future actions on the listed species' ability to survive and recover, as with the effects of the environmental baseline, by focusing on the likely resulting conditions for

the species in the action area relative to the biological requirements. Cumulative effects include effects of future State or private activities, not involving a Federal action, that are reasonably certain to occur within the action area under consideration. Past and present effects of non-Federal actions are part of the environmental baseline. Indicators of actions "reasonably certain to occur" may include, but are not limited to: approval of the action by State, tribal, or local agencies or governments (e.g., permits, grants); indications by State, tribal, or local agencies or governments that granting authority for the action is imminent; a project sponsor's assurance that the action will proceed; obligation of venture capital; or initiation of contracts (USFWS and NMFS 1998). The more State, tribal, or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less reasonable certainty the project will be authorized. Speculative non-Federal actions that may never be implemented are not factored into the "cumulative effects" analysis. At the same time, "reasonably certain to occur" does not require a guarantee the action will occur. There may be economic, administrative, and legal hurdles remaining before the action proceeds.

1.1.5 Conclusion

The conclusion section presents NOAA Fisheries' opinion regarding whether the aggregate effects of the action when added to the effects of the "environmental baseline," and "cumulative effects" in the action area (when viewed against the rangewide status of the species or the status of critical habitat) reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the listed species or would likely result in the destruction or adverse modification of critical habitat. As described above, the biological requirements and current status are the relevant factors indicative of the likelihood of survival and recovery.

If NOAA Fisheries determines that the proposed action is likely to jeopardize listed species or adversely modify critical habitat (the latter is not considered in this Opinion because critical habitat designations have been vacated for UCR steelhead and UCR spring-run chinook salmon), it must identify RPAs for the action that avoid these effects and satisfy the species' biological requirements.

2. BACKGROUND

2.1 Previous Consultations

On June 19, 2000, NOAA Fisheries issued a biological opinion to the Federal Energy Regulatory Commission (FERC) titled "Interim Protection Plan for Operation of the Wells Hydroelectric Project (FERC Project Number 2149)" (NMFS 2000b). The 2000 biological opinion analyzed the effect of the actions at the Project on UCR steelhead, UCR spring-run chinook salmon, and Middle Columbia River steelhead.[4] The 2000 biological opinion concluded that the proposed action, through April 1, 2002, was not likely to jeopardize the continued existence of these species or result in the adverse modification of their critical habitat. The 2000 biological opinion also noted NOAA Fisheries' expectation that the proposed action would be superceded by a habitat conservation plan or the issuance of a new 5-year biological opinion for the Project. On May 17, 2002, NOAA Fisheries informed FERC that the 2000 biological opinion had expired and that NOAA Fisheries was ready to expedite the consultation process so as to provide Douglas PUD continued coverage for the take of ESA-listed species (NMFS 2002b). However, FERC did not respond to this letter and ESA coverage for the Project lapsed.

2.2 HCP Development

The HCP for the Project is the result of over nine years of planning and negotiations between NOAA Fisheries, Douglas PUD, and other participants in the HCP process, including USFWS, Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama Tribe), the Confederated Tribes of the Colville Reservation (Colville Tribe), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla Tribe), American Rivers, and representatives of the major wholesale purchasers of Douglas PUD's electricity.[5] This effort culminated in the completion of three proposed anadromous fish agreements and habitat conservation plans (one each for Wells, Rocky Reach, and Rock Island hydroelectric projects) offered for signing on March 26, 2002.[6] All of the participants, with the exception of the Yakama and Umatilla Tribes and American Rivers, indicated their support of the Wells HCP, pending the outcome of regulatory review, by signing the HCP document in the spring of 2002. In this Opinion, Douglas PUD, NOAA Fisheries, USFWS, WDFW, the Colville Tribe, and Douglas PUD's power purchasers are hereinafter referred to as the Signatory Parties.

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[4]NOAA Fisheries has concluded in this consultation that, because migrating Middle Columbia River steelhead enter and exit at the Columbia River downstream of the action area (as defined in Section 3), the Project likely has no effect or only a negligible effect on this ESU.

[5]The Bureau of Indian Affairs also participated in the HCP negotiations on behalf of the Indian tribes.

[6]The Wells Hydroelectric Project (FERC No. 2149) is owned by Douglas PUD. The Rocky Reach (FERC No. 2145) and Rock Island (FERC No. 943) hydroelectric projects are owned by Chelan PUD.

NOAA Fisheries noticed receiving completed ITP applications and HCPs in the Federal Register on June 25, 2002, (67 FR 42755) and received public comments through July 29, 2002.[7] The Environmental Protection Agency (EPA) noticed NOAA Fisheries' FEIS in the Federal Register on December 27, 2002 (67 FR 79081), initiating a 30-day cooling-off period during which NOAA Fisheries invited comments on or questions about the FEIS. NOAA Fisheries received comments through February 10, 2003.[8] Alternative 3 of the FEIS (Proposed Action - Project HCPs) describes the proposed action (issuing the proposed ITPs to Douglas and Chelan PUDs for a period of up to 50 years) and its likely effects on salmon and steelhead.

2.3 Tribal Consultation

The Colville, Yakama, and Umatilla Tribes actively participated in the preparation of the Wells, Rocky Reach, and Rock Island HCPs and supporting documents. Following over nine years of planning and negotiation, the Colville Tribe indicated its support by signing the HCPs. To date, the Yakama and Umatilla Tribes have chosen to not sign the HCPs.

Because the proposed action would affect Tribal resources, and because NOAA Fisheries wished to ensure that the Yakama and Umatilla Tribes had all the information at their disposal necessary to make an informed decision, NOAA Fisheries technical staff contacted their Tribal counterparts to offer additional discussions pertinent to the HCPs and this Opinion. Umatilla Tribal staff indicated that it was unlikely policy or technical staff would be available for such discussions.

Yakama Tribal staff indicated they would be interested in additional discussions regarding the technical and policy issues related to the HCPs and this Opinion. NOAA Fisheries staff met with Yakama Tribal Fish, Wildlife, and Law Enforcement Committee members and staff on March 27, 2003, and April 15, 2003, and with Yakama Tribal staff via conference call on April 8, 2003. The Colville Tribe was not contacted, as it is a Signatory Party to the HCP.

[7]The Federal Register Notice indicated that comments must be received no later than 5 p.m. on July 25. However, several parties requested a brief extension (2 business days) of the comment period, which was granted.

[8]The initial comment period was through January 27, 2003. However, several parties requested up to a 30-day extension. In response, NOAA Fisheries granted a two-week extension through February 10, 2003.

3. PROPOSED ACTION

The proposed action is 1) NOAA Fisheries' issuance of an ITP to Douglas PUD for the HCP for the operation of the Wells Hydroelectric Project (FERC No. 2149), and the establishment of the Tributary Conservation Plan and the Hatchery Compensation Plan, in accordance with the HCP. NOAA Fisheries is simultaneously writing the ITP and this Opinion. However, with few exceptions, the information that will be incorporated into the ITP is fully described in both the HCP and in section 2.3.4 of the FEIS.

The Hatchery Compensation Plan in the HCP establishes a Hatchery Committee and commits Douglas PUD to fund certain production levels for the term of the HCP. Production levels, including those initially specified in the HCP, will most likely be stable for the next 10 years. Artificial production of Permit Species to mitigate for inundation and for up to 7% of unavoidable project mortality (i.e., the hatchery mitigation component of the HCP) is presently undergoing separate consultation as discussed in Section 1. Current hatchery production levels have been analyzed in ESA Section 7 consultations on the issuance of Section 10(a)(1)(A) permits for UCR steelhead (#1094) and UCR spring-run chinook salmon (#1196) artificial propagation programs. Continued hatchery mitigation activities proposed as part of the HCP will undergo separate ESA Section 7 consultations at 10-year intervals pursuant to which NOAA Fisheries will consider the potential for both beneficial and adverse effects to listed species. However, to the extent that the hatchery mitigation activities are "interrelated" to the proposed action, the programmatic effects of the HCP's hatchery component are considered in Section 6.2.7.

The remainder of this section describes in more detail the HCP (which is the basis for Douglas PUD's application for the ITP that NOAA Fisheries is proposing to issue). Additional details may be found in the HCP and in section 2.3.4 of the FEIS.

3.1 Description of the Action Area

The action area includes all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). Direct effects of the Project on anadromous salmon and steelhead are confined to the reservoir, forebay, dam, and tailrace (approximately 1,000 feet downstream of the dam to 1,000 feet downstream of the next dam upstream), a distance of approximately 29.3 miles. However, water quality impacts (in this case, elevated levels of total dissolved gas (TDG) resulting from either voluntary or involuntary spill at the Project) can indirectly or cumulatively affect Permit Species through interactions with the effects of both upstream and downstream mainstem hydroelectric projects on TDG, and thus may affect migrating and rearing anadromous salmonids far upstream or downstream of the Project.

In addition, habitat protection and enhancement projects resulting from implementation of the HCP's Tributary Enhancement Plan (section 7 of the HCP) and hatchery production resulting

from implementation of the HCP's Hatchery Compensation Plan (section 8 of the HCP) would affect Permit Species in tributary river systems upstream of the Project (as well as in the mainstem migration corridor).

Based on these considerations, the action area is best defined as the mainstem Columbia River between river mile (RM) 544.9 (approximately 1,000 feet downstream of Chief Joseph Dam) and RM 356.0,[9] a distance of nearly 190 miles, as well as the Okanogan and Methow river systems.

3.2 Project Description

The Wells Hydroelectric Project (FERC Project No. 2149) includes the reservoir, forebay, dam, and tailrace. As defined, the Project boundary is approximately 1,000 feet downstream of the Wells Dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir), a distance of approximately 29.3 miles (see FEIS figure 1-2). The 185-foot-high concrete gravity dam was completed in 1967 and is located approximately 12 miles north of Chelan, Washington, on the mainstem Columbia River at RM 515.8 (see FEIS figure 1-1). The reservoir formed by the Project extends upstream to the U.S. Army Corps of Engineers' Chief Joseph Dam (see FEIS figure 1-2), contains 331,200 acre feet of water, and has a surface area of 9,740 acres at the normal pool elevation of 781 feet above mean sea level (msl). Based on a draft limit of 10 feet, usable storage is 98,000 acre-feet. The annual median flow is 109 thousand cubic feet per second (kcfs) (see FEIS table 2-1).

The Project includes a spillway, a powerhouse, earthen embankment sections, a highly efficient juvenile bypass system (JBS), and two adult fishways (see FEIS figure 2-1). The spillway consists of 11 spillway gates with a combined capacity of 1,180 kcfs. The powerhouse has 10 Kaplan turbine units, with a combined hydraulic capacity of 205 kcfs, producing about 840 MW of electricity (see FEIS table 2-2, FEIS section 2.2.1.1, and NMFS 2000b). The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult counting station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the Project. The JBS consists of five evenly spaced surface collector entrances that guide fish into and through the juvenile bypass system and into the tailrace of the dam. A detailed description of these structures and their operation is provided in the FEIS and the 2000 biological opinion (NMFS 2000b).

3.3 Term of the Permit and Species Covered

[9]RM 356.0 is the upper end of the reservoir created by McNary Dam, approximately 21 miles upstream of the confluence of the Yakima and Columbia rivers.

NOAA Fisheries proposes to issue an ITP to Douglas PUD for a term of 50 years, unless the HCP terminates early, for the incidental take of Permit Species resulting from the otherwise lawful operation and maintenance of the Project or tributary enhancement activities, in accordance with the terms and conditions of the HCP. Under certain circumstances, NOAA Fisheries could withdraw from the HCP and/or revoke the ITP according to specific withdrawal and termination provisions. Most notably, any Signatory Party may withdraw from the HCP after March 1, 2018, subject to the following conditions: 1) No Net Impact (NNI) has not been achieved or has been achieved but has not been maintained, or (2) the Project has achieved and maintained NNI, but the Plan Species are not rebuilding and the Project is a significant factor in the failure to rebuild. Withdrawal conditions are fully described in the FEIS (section 2.3.4.2) and in the HCP (sections 1 and 2).

The HCP is designed to minimize to the extent practical project impacts to all Plan Species. Because native populations of coho salmon were extirpated from this reach of the Columbia River, coho salmon in this area are not protected under the ESA nor subject to provisions of ESA Sections 7 or 10. Thus coho salmon are not counted among the Permit Species included in the ITP. Table 1 summarizes the status of each Plan Species.

Table 1. Plan and Permit Species/Evolutionarily Significant Units and status under the ESA and HCP.

Species	Evolutionarily Significant Unit	ESA Status	HCP Status
Steelhead	Upper Columbia River	Endangered (August 1997)	Plan and Permit Species
Spring-Run Chinook Salmon	Upper Columbia River	Endangered (March 1999)	Plan and Permit Species
Summer/Fall-Run Chinook Salmon	Upper Columbia River	Not Warranted (March 1998)	Plan and Permit Species
Sockeye Salmon	Okanogan River	Not Warranted (March 1998)	Plan and Permit Species
Coho Salmon	Not Applicable	Extirpated	Plan Species

Two of the Permit Species are currently listed for protection under the ESA: UCR steelhead and UCR spring-run chinook salmon. Upon the Effective Date of the HCP, the ITP would be immediately effective for these species. For unlisted Permit Species, which are not presently protected under the ESA nor subject to provisions of ESA Sections 7 or 10, the ITP would be effective upon any future listing of these species under the ESA per the unlisted species agreement in the HCP.

3.4 Summary of HCP Actions

As previously noted, the objective of the HCP is to achieve and maintain an NNI standard for each Plan Species at the Project by March 1, 2018. NNI consists of two components: 1) 91% Combined Adult and Juvenile Project Survival (CAJPS) achieved by project improvement measures that are implemented within the geographic area of the Project, and 2) 9% compensation for unavoidable project mortality provided in the form of hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through implementing the Tributary Conservation Plan. However, as noted in Section 1, NOAA Fisheries has already consulted or is currently consulting on the operations of all artificial production facilities in the middle reach of the Columbia River and its tributaries. Thus this Opinion focuses specifically on those aspects of the HCP which relate to project effects (survival) or tributary enhancements activities, adaptive management (committees and study requirements), dispute resolution, and withdrawal/permit revocation provisions.

3.4.1 HCP Survival Standards

The HCP has specific performance standards relating to the survival of juveniles and adults migrating through the Project. The decision-making process for implementation of survival standards is depicted in figure 1 of the HCP (Wells HCP Survival Standard Decision Matrix). The primary survival standard of the HCP is to achieve and maintain the 91% CAJPS standard. This translates to approximately 98% adult survival and approximately 93% juvenile survival (0.98 X 0.93 = 0.91). However, the Signatory Parties agree that adult fish survival cannot be conclusively measured with existing technologies at this time.

Until technology is available to differentiate project-related mortality from natural adult losses, Douglas PUD will implement the adult passage plan (HCP section 4.4) and initiate studies, at the direction of the Coordinating Committee (HCP section 4) to assess juvenile fish survival at the Project. In order of precedence they are 1) measured Juvenile Project Survival (JPS), 93%; 2) measured Juvenile Dam Passage Survival (JDPS), 95%; and 3) calculated JDPS, 95%. The most appropriate standard for each species shall be determined by the Coordinating Committee, per guidelines established in the HCP. (For a brief discussion of the Coordinating Committee, see Section 3.4.3 below.) In the event that the Coordinating Committee determines that no current methodology is available for measuring a juvenile survival standard, the Coordinating Committee will use the best available information to calculate an estimate of JDPS. More detailed descriptions of the survival standards may be found in section 2.3.4.4 of the FEIS and in sections 3 and 4 of the HCP.

3.4.2 HCP Phase Implementation

The measurement of survival and actions implemented at the Project to increase fish survival shall be implemented in three phases (HCP section 4 and figure 1). Under Phase I, Douglas PUD shall implement the juvenile and adult operating plans and criteria to meet the pertinent survival standards identified in the HCP (HCP sections 4.3 and 4.4). Further, a monitoring and evaluation program to determine compliance with the standards will also be implemented. Following the completion of the three-year monitoring and evaluation program in Phase I, the Coordinating Committee will determine whether the pertinent survival standards have been achieved. Depending on the results of this determination, Douglas PUD will either proceed to Phase II (if the applicable survival standard has not been achieved) or Phase III (if the applicable survival standard has been achieved).

The Signatory Parties recognized that Douglas PUD has completed three years of valid JPS studies as documented in appendix B of the HCP agreement. The Signatory Parties further recognized that Douglas PUD has achieved the 93% JPS goal for UCR steelhead and yearling chinook salmon (UCR spring-run chinook salmon) and that following full regulatory approval of the HCP, Douglas PUD will enter Phase III (Standard Achieved) for these Plan Species (UCR steelhead and UCR spring-run chinook salmon).

Phase I studies for the remaining Plan Species will be overseen by the Coordinating Committee, as technology allows, to assess whether or not the most appropriate survival standard is being achieved for each Plan Species. Point estimates of survival measurements from three years of valid studies (meeting critical criteria identified in the HCP, see HCP section 4.1.4) for each species shall be averaged (arithmetic mean). The point estimate of the average will be used to compare against the pertinent survival standard. If the averaged point estimate equals or exceeds the survival standard, then the standard has been achieved. If the average is no more than 0.5% below the survival standard, the Coordinating Committee may decide whether an additional year of study is appropriate. If an additional year of study is undertaken, the study result (if valid) will be included in the calculation of the arithmetic mean.

Phase II will apply in the event that averaged point estimates from Phase I testing studies indicate that the survival standard being evaluated is not being met for a Plan Species. If this occurs, the Wells bypass flow will be increased to 4.4 kcfs per bypass at night (1 hour before sunset to sunrise) for the period during which 80% of the Plan Species not meeting the JDPS Standard pass the Wells Project or for 40 days, whichever is less. Douglas PUD, at the direction of the Coordinating Committee, would conduct survival studies (not to exceed three years) to determine if the appropriate survival standards are being achieved for each Plan Species. If these studies indicate that the appropriate survival standards are still not being achieved, the Coordinating Committee shall decide on Additional Tools (actions, structures, facilities, or programs in addition to those initially proposed) for Douglas PUD to implement in order to achieve the survival standard. Until the survival standard being evaluated is achieved, the Coordinating Committee shall continue to implement Additional Tools for the standard and for each Plan Species that is not meeting the pertinent survival standard, except as set forth in section 2.4 of the HCP. The Coordinating Committee will determine the number of valid studies (not to exceed three years) necessary to make a phase determination following the implementation of Additional Tools.

Phase III will apply in the event that the averaged point estimates from Phase I testing studies (or studies implemented following Phase II) indicate that the survival standard being evaluated has either been achieved or is likely to have been achieved and provides additional or periodic monitoring to ensure that survival of the Plan Species remains in compliance with the survival standards for the term of the HCP.

More detailed descriptions of the phase implementation may be found in the FEIS (section 2.3.4.5) and the HCP (section 4).

3.4.3 HCP Committees

To accomplish these objectives, the Wells HCP proposes to utilize three committees to adaptively manage the major components of the Wells HCP, and one committee to provide policy oversight in the event of disputes among the Signatory Parties. Each committee acts upon

the unanimous vote of those members present. More detailed descriptions of these committees may be found in the FEIS (section 2.3.4.7) and HCP (sections 6, 7.3, 8.2, and 11.1).

The Coordinating Committee would be composed of one voting representative of each Signatory Party, in addition to a non-voting observer representing Douglas PUD's power purchasers. The Coordinating Committee serves as the primary means of consultation and coordination between Douglas PUD and the other Signatory Parties, in connection with the conduct of studies and implementation of the measures set forth in the HCP and for dispute resolution.

The Tributary Committee would be composed of one voting representative of each Signatory Party choosing to appoint a representative to the committee. In addition to non-voting representatives of USFWS and a single non-voting observer representing Douglas PUD's power purchasers, the Tributary Committee may select other expert entities, such as land and water trusts/conservancy groups, to serve as non-voting members of the committee. The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Account for the purposes of implementing the Tributary Plan.

The Hatchery Committee would be composed of one voting representative of each Signatory Party choosing to appoint a representative to the committee and a single non-voting observer representing Douglas PUD's power purchasers. The Hatchery Committee is responsible for developing recommendations and implementing the hatchery elements of the HCP that Douglas PUD is responsible for funding. The Hatchery Committee's responsibilities include overseeing the implementation of improvements, as well as monitoring and evaluation relevant to Douglas PUD's hatchery programs.

The Policy Committee would also be comprised of one designated representative of each Signatory Party. The primary function of the Policy Committee would be to resolve disputes among the Signatory Parties. The Signatory Parties shall choose and Douglas PUD shall fund a neutral third party to act as the chair of each committee, excepting that the chair of the Coordinating Committee shall also serve as the chair of the Policy Committee. The committee chairs would prepare annual lists of understandings based on the results of studies, progress reports, and meeting minutes; facilitate and mediate the meetings; and assist the members of the respective committees in making decisions.

3.4.4 HCP Dispute Resolution

The HCP provides a non-binding dispute resolution process. Disputes which cannot be unanimously resolved within 20 days by the Tributary or Hatchery committees may be raised with the Coordinating Committee. If, at the end of an additional 20 days, the Coordinating Committee is unable to reach unanimous agreement on the dispute, then the chair of the Coordinating Committee or any Party may request that the Policy Committee convene to resolve

the dispute. Upon referral, the Policy Committee would have 30 days to convene and consider the dispute.

If the Policy Committee successfully resolves the dispute, then the Signatory Parties shall implement all aspects of the settlement that can lawfully be implemented without FERC approval, or the approval of another Federal agency. If FERC or other Federal agency approval is needed, all Signatory Parties shall jointly present the resolution of the dispute to FERC or the appropriate Federal agency for approval. If the Policy Committee is unable to unanimously resolve the dispute, then any Signatory Party may pursue any other right they might otherwise have. More detailed descriptions of the dispute resolution process may be found in the FEIS (section 2.3.4.6) and HCP (section 11).

3.4.5 HCP Project Operations and Measures

To achieve the applicable survival standards (see Section 3.4.1 above and figure 1 of the HCP), a combination of measures identified in the juvenile and adult fish passage plans, including predator control measures, would be utilized at the Project. The appropriate mix of measures would vary depending upon the results of survival studies. Initial operations are described below.

Adult Fishway Operations

Douglas PUD has included detailed fishway operating plans (see HCP appendix A). The adult fish passage plan includes requirements to have both fishway facilities in operation from March 1 to December 1 of each year, although for operation and maintenance purposes, the primary fish passage season is considered to be April through November. From May 1 to November 15, the fishway is monitored 24 hours per day via digital recording equipment. Fish counters read the recordings from the previous day and report counts to the U.S. Army Corps of Engineers. The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the Project. Each fishway will be operated to maintain a minimum of 1 to 1.5 feet of hydraulic drop from the entrance pool to the tailwater to attract adult salmonids to the fishway entrances, and transport channels are designed to maintain velocities from 1.5 to 4 feet per second to facilitate adult fish passage. The ladder will be operated such that water depths over weirs in the ladder will be maintained at 1.0 to 1.2 feet. During the migration season, the adult fishway will be inspected once each day. WDFW personnel will inspect the facilities on a monthly basis and provide monthly inspection reports to the Fish Passage Center.

Measures to enhance safe passage of all Plan Species adults will be emphasized in order to give high priority to adult survival in the achievement of 91% CAJPS as described in the FEIS and HCP. The Coordinating Committee may agree to implement additional measures to meet or achieve and maintain the 91% CAJPS standard.

More detailed descriptions may be found in the HCP (section 5.4.2 and appendix A) and in section 2.3.4.8 of the FEIS.

Juvenile Bypass, Spillway, and Turbine Operations

Douglas PUD will operate the JBS each year in order to provide a non-turbine passage route through the dam for 95% of the spring-run and summer-run juvenile Permit Species outmigrations. This system includes five surface bypass entrances that convey fish into five modified spillways. The procedures set forth in the Wells HCP are intended to guide the operating criteria for the Wells JBS. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the JBS. The Coordinating Committee may either approve or amend this document in future years.

More detailed descriptions may be found in section 4.3 and appendix A of the HCP, and in section 2.3.4.8 of the FEIS.

Turbines will be operated at peak efficiency to the extent practicable during the juvenile fish passage season or as otherwise agreed to by the Coordinating Committee to support attainment of HCP objectives.

Predator Control Measures

Douglas PUD, in cooperation with the Coordinating Committee, will refine and implement a comprehensive predator removal and harassment program for the protection of Plan Species. For northern pikeminnows, activities may include, but not be limited to, angling and long-line fisheries and a sport fishing derby in the Project area. For piscivorous birds, including but not limited to Caspian terns, double-crested cormorants, and various gull species, activities may include, but not be limited to, foraging deterrents (e.g., steel wires in the Project tailrace), hazing, and lethal removal of individual birds. These programs will generally occur in the spring and summer, coinciding with the juvenile outmigration.

3.4.6 Tributary Conservation Plan

The Tributary Conservation Plan is detailed in section 7 of the HCP.[10] To implement the Tributary Conservation Plan, Douglas PUD shall provide a Plan Species Account to fund projects for the protection and restoration of Plan Species habitat within the Columbia River watershed (from the Chief Joseph tailrace to the Wells tailrace), and the Okanogan and Methow

[10]The Tributary Conservation Plan is supported by Supporting Document A, "Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds," and Supporting Document D, "Tributary Plan, Project Selection, Implementation and Evaluation." These documents (prepared in 1998) summarize information on aquatic species and their habitats in the four major tributaries to the Mid-Columbia River in Washington State. These documents describe how habitat conditions affect the natural productivity and diversity of aquatic populations native to these watersheds and provide a guidance for Tributary Committee decisions regarding prioritization and funding of tributary habitat protection or restoration projects.

river watersheds, in order to compensate for up to 2% of unavoidable project mortality (the assumed 9% mortality caused by the Project that is compensated through the tributary and hatchery programs). However, if the adult passage survival is determined to be greater than 98% and the juvenile project passage survival is greater than 93% for any one of the Plan Species, contributions to the Plan Species Account would be reduced to reflect the actual survival estimate of that species.

Once the HCP has been approved by FERC, Douglas PUD shall make an initial contribution of $1,982,000 in 1998 dollars to the Plan Species Account. Five years after the initial contribution to the Plan Species Account, Douglas PUD shall do one of the following: 1) make annual payments of $176,178 (2%) in 1998 dollars as long as the HCP is in effect; or 2) provide an upfront payment of $1,761,780 (2% for 10 years) in 1998 dollars, but deducting the actual cost of bond issuance and interest.

The first installment is due within 90 days of the Effective Date of the HCP. The rest of the installments are due by January 31 of each year thereafter. The dollar figures shall be adjusted for inflation on January 1 of each year, based upon the Consumer Price Index for all Urban Consumers for the Seattle/Tacoma area, published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index suitable to the Tributary Committee shall be substituted.

Douglas PUD will provide an additional $200,000 to monitor and evaluate the relative performance of projects approved by the Tributary Committee. It is not the intent of the evaluation to measure whether the Plan Species Account has provided a 2% increase in survival for Plan Species, because any statistical assessment of such small survival improvements would be lost within variation resulting from naturally fluctuating environment conditions. Instead, the evaluation will ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner.

The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Account for purposes of implementing the Tributary Conservation Plan. The Tributary Committee shall also make sure that an appropriate number of projects are chosen upstream of Wells Dam. Whenever feasible, projects selected by the Tributary Committee shall take into consideration and be coordinated with other conservation plans or programs. Whenever feasible, the Tributary Committee shall cost-share with other programs, seek matching funds, and piggyback programs onto other habitat efforts. Habitat protection and restoration projects could include, but are not limited to, the following:

1. Opening fish passage to blocked stream sections or oxbows.
2. Changing the points of origin for problematic irrigation withdrawals to less sensitive site(s).
3. Purchasing, on a willing buyer/seller concept, water shares for the Trust Water Rights

Program or conservation easements on private property.
4. Providing alternative sources of irrigation and domestic water to mitigate impacts of problematic surface water diversions.
5. Removing dams or other passage barriers on the tributaries.
6. Using mechanical means to encourage natural development of riparian areas.
7. Using engineering techniques which increase complexity of permanently altered habitats.

The overarching goal of the Tributary Enhancement Fund is the long-term protection or enhancement of Permit Species' habitats in the tributaries, which in turn should improve the productivity of salmon and steelhead populations in those basins. NOAA Fisheries anticipates that some activities will require additional permitting and ESA consultation. Through these means and through its active participation on the Tributary Committee, NOAA Fisheries would ensure that any negative impacts to Permit Species due to in-water or riparian tributary protection and enhancement activities would be minimized to the extent practical through choice of methodology, seasonal timing of work, and mitigation measures for short-term impacts, and would not jeopardize ESA-listed Permit Species.

More detailed descriptions may be found in section 7 and supporting document D of the HCP and section 2.3.4.8 of the FEIS.

3.4.7 Hatchery Compensation Plan

Douglas PUD will compensate for up to 7% of the unavoidable mortality at the Project for Plan Species originating upstream of Wells Dam through artificial production, or through measures to increase the off-site survival of naturally spawning fish or their progeny. Based upon the results of JPS studies, hatchery compensation for yearling chinook salmon and steelhead will be adjusted to 3.8%, while sockeye salmon and summer/fall-run chinook salmon hatchery compensation will remain at 7%. Douglas PUD shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI in an ESA-compliant manner. Species-specific hatchery program objectives may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species, for changes in the adult-to-smolt survival rate, and for changes to smolt-to-adult survival rate from the hatchery production facilities, considering methodologies described in supporting document B of the HCP (Biological Assessment and Management Plan). The Hatchery Committee will be responsible for determining program adjustments considering the methodology described in the Biological Assessment and Management Plan and for providing

recommended implementation plans to Douglas PUD. Douglas PUD will be responsible for

funding the implementation plan.

The Hatchery Committee shall oversee development of recommendations for implementation of the hatchery elements of the HCP that Douglas PUD is responsible for funding. This includes overseeing the implementation of improvements, monitoring and evaluation relevant to Douglas PUD's hatchery programs (as identified in the Hatchery Compensation Plan, section 8 of the HCP), the Hatchery Permits, and the HCP. Hatchery Committee decisions shall be based upon the likelihood of biological success, the time required to implement, and cost-effectiveness of solutions. The Hatchery Committee shall also coordinate in-season information sharing and shall discuss unresolved issues.

Through its active participation on the Hatchery Committee and through future permits for hatcheries and associated biological opinions, NOAA Fisheries would ensure that the negative hatchery effects (including incidental and direct take as a result of these programs) would be minimized to the extent practical and would not jeopardize ESA-listed Permit Species.

More detailed descriptions may be found in section 8 of the HCP and section 5.3.15 of the FEIS. Proposed hatchery mitigation actions have already been or are now being evaluated by NOAA Fisheries in separate species-specific biological opinions (see Section 1).

4. BIOLOGICAL INFORMATION

As described in Section 1.1, step 1 of the analysis in this Opinion requires an evaluation of the rangewide status of the relevant ESUs, within the context of their rangewide biological requirements. Those biological requirements were described in Section 1.1.1 in relation both to ESUs and their constituent populations. The following sections describe the current status in a manner that is relevant to each species' biological requirements.

4.1 Rangewide Status of the Permit Species

4.1.1 Rangewide Status

Four ESUs representing three species of anadromous salmon and steelhead are included in the HCP as Permit Species: UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon. Two of these ESUs have been listed as endangered under the ESA: UCR steelhead, on August 18, 1997 (62 FR 43937), and UCR spring-run chinook salmon, on March 24, 1999 (64 FR 14308). NOAA Fisheries is currently reassessing the status of these ESUs. NOAA Fisheries determined in March 1998 that listing under the ESA as either threatened or endangered was not warranted for UCR summer/fall-run chinook salmon (63 FR 11482) or Okanogan River sockeye salmon (63 FR 11750). These populations appear to be stable and are in no danger of extinction or of becoming endangered in the foreseeable future.

4.2 Life Histories, Factors for Decline, and Population Trends

The biological requirements, life histories, migration timing, historical abundance, and factors contributing to the decline of Permit Species migrating through the middle reach of the Columbia River have been well documented (Busby et al. 1996; Gustafson et al. 1997; Myers et al. 1998; NMFS 2000a, 2000b, 2002a; West Coast Salmon BRT 2003). The following sections summarize the relevant biological information for UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon contained in these documents. More detailed information is available in the FEIS, in NOAA Fisheries' Status Reviews (Busby et al. 1996; Gustafson et al. 1997; Myers et al. 1998; West Coast Salmon BRT 2003), and on NOAA Fisheries' Northwest Region website: http://www.nwr.noaa.gov.

4.2.1 UCR Steelhead

Geographic Boundaries and Spatial Distribution

The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams adjacent to the mainstem Columbia River upstream of the confluence of the Yakima River to the tailrace of Chief Joseph Dam. NOAA Fisheries has initially identified three important spawning

populations within this ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). Wells Hatchery steelhead stock are also currently part of the listed ESU.

Historical Information

Steelhead are not thought to have occurred in large numbers in British Columbia, Canada, in the upper Columbia River basin. Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam. Runs may already have been depressed, however, by lower Columbia River fisheries and other habitat degradation problems in the natal tributaries. Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Maintenance Project (GCFMP) also influenced the present distribution of the ESU. In 1961, the Chief Joseph Dam also blocked anadromous fish from remaining habitat upstream of RM 545.1.

Life History

Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, smolt age is dominated by 2- and 3-year-olds and some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU (Peven 1990). Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead primarily return after two years in salt water. Similar to other inland Columbia River basin steelhead ESUs, adults typically return to the Columbia River between May and October and are considered summer-run steelhead. Adults may remain in freshwater up to a year before spawning. Unlike chinook salmon or sockeye salmon, a fraction of steelhead adults attempt to migrate back to the ocean. These fish are known as kelts, and those that survive will migrate from the ocean to their natal stream to spawn again.

Population Trends and Risks

NOAA Fisheries determined that UCR steelhead are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on August 18, 1997 (62 FR 43937). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Lohn 2002). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Lohn 2002).

Returns of both hatchery and naturally produced steelhead to the upper Columbia River have increased in recent years. The average 1997-2001 return counted through the Priest Rapids fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was

7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g., hatchery/wild fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 10% of the total adult count, to 2,200 (1997-2001), representing about 17% of the adult count during this period of time (West Coast Salmon BRT 2003).

In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (West Coast Salmon BRT 2003). A 5-year geometric mean (1997-2001) of approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4% per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35% to 29%, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9% per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of wild origin spawners dropped from 19% for the period prior to the 1998 status review to 9% for the 1997 to 2001 returns.

4.2.2 UCR Spring-run Chinook Salmon

Geographic Boundaries and Spatial Distribution

This ESU includes spring-run chinook salmon populations found in Columbia River tributaries between the Rock Island and Chief Joseph dams. NOAA Fisheries has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems. Chinook salmon (and their progeny) from the following stocks that are raised in hatcheries are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek.

Historical Information

The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent GCFMP influenced the present distribution of the ESU. Production of non-listed Carson-origin spring-run chinook salmon has also taken place within the UCR spring-run chinook salmon ESU. Non-listed spring-run chinook
salmon hatchery populations contained within this ESU include Leavenworth, Entiat, and Winthrop national fish hatcheries.

Life History (including Ocean)
UCR spring-run chinook salmon exhibit classic stream-type life-history strategies: emigrating from freshwater as yearling smolts and undertaking extensive offshore ocean migrations. The majority of these fish mature at 4 years of age and return to the Columbia River from March through mid-May.

Population Trends and Risks
NOAA Fisheries determined that UCR spring-run chinook salmon are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on March 24, 1999 (64 FR 14307). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR spring-run chinook salmon, the interim recovery levels are 3,750 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,000 spawners in the Methow River.

All three of the existing UCR spring-run chinook populations have exhibited similar trends and patterns in abundance over the past 40 years. The 1998 status review (Myers et al. 1998) reported that long-term trends in abundance were generally negative, ranging from -5% to +1%. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. Based on redd count data series, spawning escapements for the Wenatchee, Entiat, and Methow rivers have declined an average of 5.6%, 4.8%, and 6.3% per year, respectively, since 1958. In the most recent 5-year geometric mean (1997-2001), spawning escapements were 273 for the Wenatchee population, 65 for the Entiat population, and 282 for the Methow population, only 8% to 15% of the interim abundance recovery targets, although escapement increased substantially in 2000 and 2001 in all three river systems. Based on 1980-2000 returns, the average annual growth rate for this ESU is estimated as 0.85. Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring-run chinook salmon populations are projected to have very high probabilities of 90% decline within 50 years (87% to 100%).

4.2.3 UCR Summer/Fall-run Chinook Salmon

Geographic Boundaries and Spatial Distribution
The ESU includes all naturally spawned populations of summer- and fall-run chinook salmon in the Columbia River and tributaries upstream of the confluence of the Snake and Columbia rivers to Chief Joseph Dam (with the exception of chinook salmon that spawn in the Marion Drain). Historically, this ESU may have extended farther upstream, but spawning habitat has compressed downriver since the construction of Grand Coulee Dam. The populations are genetically and ecologically separate from the spring-run populations in the upper parts of many of the same

river systems. Major river basins currently containing spawning and rearing habitat for this ESU comprise approximately 8,795 square miles in the state of Washington.

Historical Information

Artificial propagation in this ESU began in 1899, when hatcheries were constructed on the Methow and Wenatchee rivers. The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent GCFMP has also influenced the present distribution of the ESU. At least six former populations from this ESU are now extinct.

Life History (including Ocean)

UCR summer/fall-run chinook salmon typically exhibit classic ocean-type life-history strategies: emigrating from freshwater as subyearling smolts and, based on coded wire tag recoveries, undertaking extensive offshore ocean migrations. The majority of the summer-run fish mature at 4 to 5 years of age and return to the Columbia River from May through early August. Adult fall-run chinook salmon return to the Columbia River from mid-August through October. Compared to the summer-run fish, higher proportions of fall-run fish mature as 2-year-old "jacks" and 3-year-old adults.

Population Trends and Risks

On March 9, 1998, NOAA Fisheries concluded that UCR summer/fall-run chinook salmon are not at risk of extinction nor at risk of becoming endangered in the foreseeable future (63 FR 11482). Limited life-cycle modeling has been conducted for this ESU. McClure et al. (in press) have estimated median population growth rates ranging from 1.00 to 1.11 (stable or increasing) for 5 index groups within this ESU. The risk of extinction in 100 years varies between 0% and 5% for these populations. Estimated total adult returns for the ESU averaged about 58,000 adults (geometric mean for 1990-94). This total includes about 51,000 natural spawners in the Hanford Reach of the Columbia River between the McNary Reservoir and Priest Rapids Dam. The remaining 7,000 adults are comprised primarily of natural spawners from the Wenatchee River, and smaller numbers in the Yakima, Methow, Okanogan, and Similkameen rivers. Long-term trends for the three largest populations are positive, while those for the smaller populations are a mix of positive and negative. Recent returns are the largest ever recorded since the 1930s, with over 50,000 naturally produced and hatchery-produced summer-run chinook salmon returning past Rock Island Dam.

4.2.4 Okanogan River Sockeye Salmon

Geographic Boundaries and Spatial Distribution

The ESU includes sockeye salmon that spawn in areas upstream from Lake Osoyoos, in Lake Osoyoos, or in the downstream tributary Similkameen River (below Enloe Dam) in the Okanogan River basin. The spawning and main rearing area for this ESU is in British Columbia,

Canada, while the migration corridor for both juveniles and adults is through the Columbia River in Washington and Oregon.

Historical Information

Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. Between 1939 and 1943, all adult sockeye salmon were trapped at Rock Island Dam on the Columbia River as part of the GCFMP. The mixed-stock progeny of these adults were released into Lake Osoyoos. Between 1940 and 1968, mixed-stock hatchery fish continued to be released into Lake Osoyoos. No hatchery fish were released into Lake Osoyoos between 1989 and 1992. Between 1993 and 2001, the Cassimer Bar sockeye program released hatchery sockeye salmon into Lake Osoyoos that were progeny of adult sockeye salmon trapped at Wells Dam. Since 2002, no hatchery sockeye salmon have been released into the lake.

Life History (including Ocean)

Sockeye salmon from this ESU primarily spawn in the Okanogan River upstream of Lake Osoyoos from late-September through October, although some spawning has occasionally been observed along the shoreline of Lake Osoyoos. Fry typically emerge in early March through May and emigrate to Lake Osoyoos. Juveniles rear in Lake Osoyoos before emigrating in May as yearling smolts down the Okanogan and Columbia rivers to the ocean. Okanogan River sockeye salmon generally spend one to two years in the ocean before returning to spawn, but in some instances a substantial return of 3-year-old adults has been observed. Adult sockeye salmon enter the Columbia River between mid-June and late-July.

Population Trends and Risks

Life-cycle modeling has not been conducted for this ESU as with endangered UCR steelhead and UCR spring-run chinook salmon, or UCR summer/fall-run chinook salmon. No historical abundance estimates specific to this ESU are available prior to the 1930s. Since this time, the abundance of adult Okanogan River sockeye salmon has fluctuated widely, as is the case with many populations of sockeye salmon. Analysis conducted in the 1930s indicated that less than 15% of the total sockeye salmon run in the upper Columbia River went into Lakes Osoyoos and Wenatchee. At that time, the total run at Rock Island Dam averaged about 15,000. Of these, an estimated 2,250 adults escaped downstream fisheries to return to the Okanogan River and the remainder likely spawned in Lake Wenatchee (approximately 12,750 fish, less any pre-spawn losses). Between 1960 and 1990, estimated sockeye salmon escapement to the Okanogan River ranged from approximately 5,000 to 130,000 fish. Although the lowest count at Wells Dam was observed in 1994 (1,662 fish), the 5-year geometric mean of 1992-1996 adult counts at Wells Dam was about 11,000. The 1997 status review (Gustafson et al. 1997) determined that the long-term (1961-1996) trend for this stock has been relatively flat. The most recent 5-year geometric mean (1998 to 2002) is about 19,404 sockeye salmon passing Wells Dam. Thus abundance for the Okanogan River ESU was clearly lower during the 1930s and 1940s than it is presently.

4.3 Significant Factors Influencing Rangewide Status of Each ESU

4.3.1 Harvest

Harvest rates for most ESUs have been substantially reduced as either a direct or indirect result of many species being listed under the ESA during the 1990s. Table 2 provides NOAA Fisheries' best estimates of current total harvest rates for ESA-listed species which are substantially lower than harvest rates occurring prior to ESA listings in the Columbia River basin (NMFS 2001). Because these fisheries are generally mixed-stock fisheries, they should be generally applicable for adults from other ESUs migrating through the Columbia River at the same time. For example, harvest estimates for ESA-listed Snake River spring/summer-run chinook salmon are likely applicable to the summer-run component of unlisted UCR summer/fall-run chinook salmon.

Table 2. NOAA Fisheries' estimates of current total in-river harvest rates (Treaty Indian Fisheries and Non-Indian Fisheries) for ESA-listed species /Evolutionarily Significant Units.

Species / ESUs	Run / Origin	Total Estimated Impact	
		Maximum	Expected
UCR Steelhead	Wild	9.6 %	4.4 %
	Hatchery	11.6 %	7.2 %
UCR Spring-run Chinook Salmon	Spring Migrants	≤ 15.0 %	≤ 15.0 %
UCR Summer/Fall-run Chinook Salmon	Summer Migrants[1]	≤ 6.0 %	1.7 %
	Fall Migrants[2]	31.29 %	<31.29 %
Okanogan River and Lake Wenatchee Sockeye Salmon*	Summer Migrants[3]	≤ 8.0 %	5.0 %

[1]Estimates for Snake River spring/summer-run chinook salmon - summer run component.
[2]Estimates for Snake River fall-run chinook salmon.
[3]Estimates for Snake River sockeye salmon.
*See Footnote 1.
Source: NMFS 2001 and 2002c.

4.3.2 Hatcheries

The following sections briefly summarize the historical impacts of hatcheries on Permit Species that have contributed to the present status of the ESUs.

UCR Steelhead

The upper Columbia River populations were intermixed during the GCFMP (1939 through 1943). The resulting homogenization remains an important feature of the ESU. Chief Joseph Dam blocked anadromous fish from remaining habitat upstream of RM 545.1 in 1961. The naturally spawning population of UCR steelhead has been augmented for a number of years by returning hatchery fish. Replacement ratios for naturally spawning fish (both natural and hatchery-origin fish) are quite low, on the order of 0.3. This very low return rate suggests that either hatchery-origin spawners are largely supporting the population, or that hatchery-origin spawners are not contributing substantially to subsequent adult returns and natural-origin fish are returning at or just below the replacement rate, or some intermediate combination of these factors. Given these uncertainties, efforts are underway to diversify broodstocks used for supplementation, minimizing the differences between natural- and hatchery-origin fish, as well as other concerns associated with supplementation.

Assuming that the hatchery broodstock represents the listed ESU, NOAA Fisheries expects that the early life-history survival advantage of hatchery smolts will help stocks to rebuild. However, there are also substantive concerns about the long-term effect on the fitness of natural-origin populations resulting from an ongoing, long-term infusion of hatchery-influenced spawners (Busby et al. 1996). The hatchery component is relatively abundant and routinely exceeds the needs of the supplementation program by a substantial margin.

UCR Spring-run Chinook Salmon

The upper Columbia River populations were intermixed during the GCFMP (1939 through 1943). The resulting homogenization remains an important feature of the ESU. Chief Joseph Dam blocked anadromous fish from remaining habitat upstream of RM 545.1 in 1961. In addition, spring-run chinook salmon from the Carson National Fish Hatchery (a large composite, non-native stock) were introduced into and have been released from local hatcheries (Leavenworth, Entiat, and Winthrop national fish hatcheries). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally spawning populations. In addition to these national production hatcheries, two supplementation hatcheries are operated by WDFW in this ESU. The Methow Fish Hatchery Complex (operations began in 1992) and the Rock Island Fish Hatchery Complex (operations began in 1989) were both designed to implement supplementation programs for naturally spawning populations on the Methow and Wenatchee rivers, respectively (Chapman et al. 1995).

Risks associated with artificial production programs within the ESU are a concern because of the use of non-native Carson stock for fishery enhancement and hydropower mitigation. However, programs have been initiated to develop locally-adapted broodstocks to supplement the natural populations in the ESU. The Carson stock is being phased out at those facilities where hatchery strays and natural stock interactions are potentially problematic. Captive broodstock programs are underway in the Nason Creek and the White River (the Wenatchee basin) and in the Twisp River (Methow basin), to prevent those populations from going extinct. In some recent years (1996 and 1998), all Methow basin spring-run chinook salmon have been trapped at the Wells

Hydroelectric Project to begin a composite broodstock supplementation program for the Methow basin.

UCR Summer/Fall-run Chinook Salmon
Artificial propagation in this ESU began in 1899, when hatcheries were constructed on the Methow and Wenatchee rivers. Several summer/fall-run chinook salmon hatcheries were operated intermittently from that time through 1931, using both locally derived and imported broodstock. From 1931 to 1939, no chinook salmon hatcheries were in operation above Rock Island Dam. Grand Coulee Dam (completed in 1942), blocked passage to thousands of summer- and fall-run chinook salmon after 1938. In an effort to mitigate for the loss of spawning habitat above the dam, the GCFMP was authorized by the Federal government. The GCFMP sought to relocate all salmonids migrating past Rock Island Dam into three of the remaining accessible tributaries to the Columbia River: the Wenatchee, Entiat, and Methow rivers. Although hatcheries have operated intermittently throughout the previous century, the percentage of non-indigenous stocks incorporated into this ESU has been low (about 3%), and does not appear to have had a significant impact on the integrity of this ESU. However, the resulting homogenization of populations remains an important feature of the ESU.

Okanogan River Sockeye Salmon
Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. Between 1939 and 1943, all adult sockeye salmon were trapped at Rock Island Dam on the Columbia River as part of the GCFMP. Nearly 2 million of these mixed-stock sockeye salmon juveniles were planted into the Okanogan River system. Between 1940 and 1968, mixed-stock hatchery fish continued to be released into Lake Osoyoos. Between 1993 and 2001, only progeny of adult sockeye salmon trapped at Wells Dam were released into the lake. Since 2002, no hatchery fish have been released into the lake.

Several out-of-basin kokanee introductions have occurred in Lake Osoyoos. These releases are not believed to have had large genetic effects on the ESUs.

4.3.3 Hydropower

This section briefly describes how the existence and ongoing operation of the mainstem hydroelectric projects have contributed to the rangewide status of the Permit Species.

The construction of Grand Coulee Dam blocked upstream migration in the Columbia River after 1938. This project not only eliminated populations of anadromous fish upstream of the dam, but the resultant hatchery mitigation plan (the GCFMP) likely influenced all of the Permit Species ESUs; fish from multiple populations were mixed into relatively homogenous groups and redistributed into streams and lakes throughout the region or raised and released from hatcheries (see discussion in Section 4.2.2). Grand Coulee Dam, as well as the large upstream storage projects in Canada, Idaho, and Montana, have affected the quantity and timing of runoff in the

Columbia River. Compared with historical flows, the spring freshet has been greatly reduced, summer flows have been somewhat reduced, and fall and winter flows have been increased (NMFS 2000a).

The five FERC-licensed Mid-Columbia River hydroelectric dams (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) and reservoirs have affected the mainstem migration corridor and reduced the survival of juvenile migrants. Each of these projects has license requirements and settlement agreements that specify operations or processes that govern operations for the purpose of reducing the effects of these projects on anadromous salmonids throughout the remainder of their FERC-issued licenses. For these projects, the best estimates of recent juvenile and adult project survivals contributing to the rangewide status of Permit Species are contained in the FEIS and draft QAR (Cooney 2002).

Four Federally-owned hydroelectric projects in the Lower Columbia River (McNary, John Day, The Dalles, and Bonneville) have also affected the mainstem migration corridor and reduced the survival of juvenile and adult migrants. For these projects, the best estimates of recent juvenile and adult project survivals contributing to the rangewide status of Permit Species are contained in NOAA Fisheries' 2002 Findings Report (NMFS 2002d) and the Federal action agencies' 2002 Progress Report (U.S. Army Corps of Engineers et al. 2003).

4.3.4 Habitat

This section briefly summarizes the historical impacts of human activities on Permit Species in tributary, migration, estuarine, and near-shore ocean environments that have contributed to the present status of the ESUs.

Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River includes conditions that are less conducive to salmon and steelhead survival than in many other parts of the Columbia River basin (Mullan et al. 1992a,1992b). Salmon in this ESU must pass up to nine Federal and non-Federal dams, with Chief Joseph and Grand Coulee dams preventing access to historical spawning grounds farther upstream. Existing degradation of the remaining spawning and rearing habitat continues to be a major concern associated with contemporaneous urbanization, irrigation projects, and livestock grazing along riparian corridors. In addition, development in the vicinity of Lake Osoyoos (Okanogan River sockeye salmon ESU) has increased the likelihood of negative impacts to spawning and rearing sockeye salmon that might not yet be fully reflected in population trends.

More detailed descriptions of tributary habitat conditions in the Methow and Okanogan river basins are available in supporting document B (Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds) of the HCP and in the Upper Columbia Regional Technical Team's report to the Upper Columbia Salmon Recovery Board titled "A biological strategy to protect and restore salmonid habitat in the Upper Columbia Region"

(2003).

The estuary and near-shore ocean environment have also been changed by human activities. Historically, the downstream half of the estuary was a dynamic environment with multiple channels, extensive wetlands, sandbars, and shallow areas. Winter and spring floods, low flows in late summer, large woody debris floating downstream, and a shallow bar at the mouth of the Columbia River kept the environment dynamic. Today, navigation channels have been dredged, deepened, and maintained; jetties and pile-dike fields have been constructed to stabilize and concentrate flow in navigation channels; marsh and riparian habitats have been filled and diked; and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River from 4 miles to 2 miles and increased the depth of the Columbia River channel at the bar from less than 20 feet to more than 55 feet. Sand deposisition at river mouths has extended the Oregon coastline approximately 4 miles seaward and the Washington coastline approximately 2 miles seaward (Thomas 1981).

More than 50% of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses. More than 3,000 acres of this habitat have been converted to other uses since 1948 (Lower Columbia River Estuary Program 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Furthermore, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal pattern and volume of discharge. The peaks of spring/summer floods have been reduced, and the amount of water discharged during winter has increased.

4.4 Species Status with Respect to Species-Level Biological Requirements

The current status of ESA-listed Permit Species, as described above, indicates that the species-level biological requirements of these ESUs are not being met at this time. The abundance of UCR steelhead and UCR spring-run chinook salmon, while increasing in recent years, remains far below historical levels. This information clearly indicates that substantial improvements in survival rates (assessed over the entire life cycle and throughout the range of the ESUs) are necessary to increase abundance to meet species-level biological requirements of the ESA-listed ESUs in the future. Because the effects of this Project and the other HCP projects have been identified as significant factors for decline (Section 4.3.3), it is reasonable to expect that a portion of the needed survival improvement should be reflected in future operations at this Project as well as the other HCP projects.

The estimated median annual growth rate for UCR summer/fall-run chinook salmon ranges from 1.00 to 1.11 for five index groups within the ESU, which indicates that the species-level biological requirements of this species are likely being met at this time. Estimates of abundance (comparison of 5-year geometric means with historical estimates of adult escapement) for the remaining unlisted Permit Species, as described above, similarly indicates that the species-level

biological requirements of these ESUs are likely being met at this time. In each case, these ESUs appear to be stable or slightly increasing. Thus no additional survival improvements are likely necessary at this time to meet the species-level biological requirements of these ESUs.

5. ENVIRONMENTAL BASELINE

5.1 Biological Requirements within the Action Area

As noted in Section 1.1.2, the relevance of the biological requirements of the Permit Species within the action area depends upon the biological requirements of the ESU as a whole and any constituent populations. NOAA Fisheries looks at certain criteria to assess the viability of fish populations that make up an ESU. The criteria that describe a viable salmonid population include 1) the abundance sufficient to withstand periodic environmental downturns, 2) the productivity (return rate) necessary to maintain or increase a population of fish, 3) the distribution throughout a geographic area that is large enough such that ecological disasters would not likely eliminate the entire population, and 4) a genetic diversity approaching the historical diversity of the population. Salmon and steelhead ESUs generally consist of multiple populations. ESUs with fewer populations are more likely to become extinct due to catastrophic events, and have a lower likelihood that the necessary genetic diversity will exist to maintain future viability. ESUs with a limited geographic range are similarly at increased extinction risk due to catastrophic events. ESUs with populations that are geographically distant from each other, or are separated by severely degraded habitat, may lack the connectivity to function as an ESU and are more likely to become extinct. ESUs with limited life-history diversity are more likely to go extinct as the result of environmental catastrophes or change that occurs too rapidly for an evolutionary response. ESUs comprised of a small proportion of component populations meeting or exceeding viability criteria may lack the source populations necessary to sustain the non-viable populations during environmental downturns. ESUs consisting of a single population are especially vulnerable in this regard.

Assessing an ESU's biological requirements involves evaluating the extent to which the current status of an ESU falls short of what would constitute a viable ESU. The fact that the current status of an ESU does not reflect historical abundance, productivity, spatial structure, or diversity does not mean that it is currently non-viable, but it may serve as an informative benchmark against which to weigh viability and the risk of extinction. Whether an ESU is at risk of extinction or endangerment depends on which viability criteria it fails to meet, what the past trend has been, and how far it is below the benchmark.

The biological requirements within the action area are those conditions that support the continued existence of the ESU by addressing the population-level biological requirements. Within the action area, the biological requirements of Permit Species stem from the essential features of juvenile rearing areas and juvenile and adult migration corridors. Therefore, the biological requirements for Permit Species include adequate substrate, adequate water quality (including quantity, temperature and velocity), adequate cover and shelter, adequate riparian vegetation, adequate space, and adequate conditions for safe passage. In addition, an adequate food supply is required in juvenile rearing areas.

Defining a level of adequacy through specific, measurable standards for many of these biological requirements is problematic. In many cases, the absolute relationship between the critical element and species survival is not clearly understood, thus limiting NOAA Fisheries' ability to develop specific, measurable standards. This is the case for the effects of implementing the HCP's Tributary Enhancement Plan in tributary river systems. Thus these components of the proposed action must be evaluated qualitatively.

However, as noted in Section 1.1.2, this is not the case with respect to the effects of the Project itself (including the existence and operation of the Project, which is the primary subject of the HCP). For these facets of the proposed action, various mainstem migration corridor habitat elements relevant to achieving the biological requirements of the Permit Species within the Project area can be captured in a summary reach survival statistic (Section 6.1.1). Therefore, action-area biological requirements in the mainstem portion of the action area can be defined by using specific juvenile and adult survival standards. The HCP proposes that a CAJPS of 91% (which translates to approximately 98% adult project survival and 93% JPS [covering 95% of the juvenile migrations]) would meet the biological requirements of the Permit Species in the mainstem migration corridor. The adequacy of this proposed numeric standard is evaluated in Section 6.

As a reference for determining the adequacy of conditions within the action area, NOAA Fisheries estimated survival levels within the action area that would result if there were no impoundments in existence, i.e., a free-flowing condition. This condition does not necessarily describe the biological requirements for ESA Section 7(a)(2); however, they are relevant to conditions under which the listed species evolved.

5.2 Environmental Baseline Effects

"The past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all the proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" are all included within the environmental baseline (50 CFR §402.02). The environmental baseline encompasses the effects of both human and natural factors leading to the current status of the species, but does not incorporate impacts specific to the proposed actions. Therefore, future impacts resulting from the future operation of the Project (or other hydroelectric projects in the action area) and other activities authorized pursuant to the proposed action are not part of the environmental baseline. Rather, the environmental baseline describes the current status of the species, and the factors currently affecting the species, within the action area. The resulting "snapshot" of the species' health within the action area provides the relevant context for evaluating the anticipated effects of the proposed actions on the ESU's likelihood of survival and recovery relative to its biological requirements.

The past operation and the continuing effect of the existence of the Project is a critical factor influencing survival in the action area; up to 100% of the Permit Species juveniles and adults may be affected by the continuing effects of the human activities that contributed to the existing conditions in the migration corridor. Mortality and sublethal effects (e.g., changes in migration timing or speed) associated with river impoundments, dam passage, and other aspects of the Project within the action area in recent years are summarized in the FEIS (section 2.2.3) and the draft QAR (Cooney 2002), as well as in Appendix A of this Opinion. Douglas PUD has been operating its JBS in a manner consistent with HCP operations since formal ESA consultation was completed in 2000 (NMFS 2000b). NOAA Fisheries determined in the 2000 biological opinion that the operation of the Project would likely achieve the HCP standards for the ESA-listed species. Although Douglas PUD continues to operate the Project consistent with the 2000 biological opinion, that biological opinion expired on April 1, 2002.

Similarly, the past operation and continuing effect of the existence of four other FERC-licensed dams (Rocky Reach, Rock Island, Wanapum, and Priest Rapids) have substantially affected, both directly and indirectly, the environmental baseline in the action area. The past effects of the Rocky Reach and Rock Island hydroelectric projects are summarized in the FEIS (section 2.2.3), the draft QAR (Cooney 2002), and Appendix A of this Opinion. The past effects of the Priest Rapids Hydroelectric Project (Wanapum and Priest Rapids dams and reservoirs) are summarized in the draft QAR (Cooney 2002). In addition, the effects of past operations and the existence of upstream Federal (Grand Coulee and Chief Joseph dams and reservoirs) and Canadian storage and hydroelectric projects have also affected the environmental baseline within the action area by affecting seasonal and daily flows, the thermal regime, and TDG levels in the Mid-Columbia River.

It is clear that the existence and past operation of the other Federally-owned and PUD-owned projects have substantially affected the migration corridor for the Permit Species in the action area and that many of these effects will continue into the future. It is equally clear that the future effect attributable to the discretionary operation of these projects cannot be considered in the environmental baseline of this Opinion because they have not yet undergone ESA Section 7(a)(2) consultation, or their consultation has expired or been remanded.[11] It is not possible to

[11]The 2000 biological opinion for the operation of the FCRPS was remanded but not set aside while NOAA Fisheries considers remedies to address concerns identified by the Court in NWF v. NMFS, CV 01-640-RE (D. Or. Order dated 6/2/03). For the purposes of this consultation, the effects of the RPA recommended by that biological opinion are not considered part of the environmental baseline to the extent they occur beyond June 2, 2004. After that date, by which the remand must be accomplished, NOAA Fisheries anticipates that there will be a new consultation for the FCRPS. This means that the existence effects of the FCRPS, which are part of the environmental baseline, will include the operation effects of the current operation under the 2000 biological opinion RPA until June 2, 2004. While this is the legal effect of the restrictions in the regulatory definition of "effects of the action" 50 CFR 402.02 (no consideration of future Federal actions that have not yet completed Section 7 consultation), as a practical matter this analysis can only qualitatively assume that the level of take caused by the

FCRPS will be significantly reduced in the action area as a result of this consideration. Quantitative estimates of this

quantitatively analyze the effects of a project's existence without considering the operation of that project. However, in Sections 6.2.2 and 6.2.3, NOAA Fisheries compares estimates of juvenile and adult survival through the mainstem portion of the action area with estimates from unimpounded reaches of the Snake and Columbia rivers, or with those from other free-flowing river systems. This comparison provides a valuable reference for assessing the effect of the proposed action compared to the environmental baseline as well as to what may have occurred historically.

Baseline conditions for tributary spawning and rearing habitat are thoroughly described in the FEIS, supporting document D of the HCP, and the Upper Columbia Regional Technical Team's recent report (2003). Primarily, these impacts result from a wide array of past and present land management activities and natural phenomena (wildfires and flood events) in the Okanogan, Methow, Entiat, and Wenatchee basins including, but not limited to, the following:

1. Habitat is eliminated, cut off, or blocked.
2. Habitat is degraded.
3. Reduced or altered flows (water withdrawals or water storage facilities).
4. Reduced channel migration, complexity, and flood-plain function.
5. Altered channel morphology (increased width-to-depth ratios).
6. Reduced gravel recruitment (armoring and/or loss of spawning substrate).
7. Increased fine sediments (increased erosion).
8. Reduced riparian vegetation (amount and quality).
9. Reduced woody debris recruitment into streams.
10. Water quality is degraded.
11. Elevated levels of fecal coliform bacteria.
12. Elevated nutrient loads and reduced dissolved oxygen levels caused by elevated nutrient loading.
13. Elevated late summer and fall temperatures.
14. Chemical runoff from roads and agricultural and urban areas.
15. Water diversions and/or substandard fish screens at diversions kill or injure juvenile fish.

5.3 Ongoing and Future Environmental Baseline Actions in Action Area

Section 7(a)(2) regulations provide that "the anticipated impacts of all the proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation and the impacts of State or private actions which are contemporaneous with the consultation in process" are included within the environmental baseline.

NOAA Fisheries concludes that few Federal actions, and State or private actions with Federal

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reduced take are not possible.

involvement, in this action area have completed Section 7 consultation. To the extent that there are actions with operative biological opinions, NOAA Fisheries knows of none that cover these future activities for more than the first 5 or 10 years of the 50-year term of the HCP under consideration in this ESA consultation.

Similarly, NOAA Fisheries is not aware of particular State or private activities in this action area that are reasonably certain to continue contemporaneous with the 50-year term of this ITP that are reasonably certain to occur, other than the current levels of rural and urban land use that affect the listed species.

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NOAA Fisheries concludes that new Federal actions, such as future timber sales and agricultural water withdrawals, that would be likely to adversely affect listed species, as well as future beneficial Federal actions, such as habitat restoration projects and conservation easements, are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon, against which the effects of this action are considered, are likely to be, in part, improved, and in part, degraded, compared to those reflected by the historical trends resulting under the environmental baseline. It is NOAA Fisheries' judgment, based largely on the description of factors for the decline of these species (see Section 4), that the net effect of the environmental baseline would be an improvement of future abundance and productivity of these species. This improvement cannot be quantified, but NOAA Fisheries does not consider this improvement sufficient to meet all biological requirements within the action area.

5.4 Status of the Species within the Action Area

For UCR steelhead and UCR spring-run chinook salmon, the environmental baseline, as described above, while improving, does not currently meet biological requirements for these species within the action area. Maintenance or further degradation of the existing conditions within the action area would contribute to the long-term declining trend of the ESA-listed Permit Species and thus would continue to increase the high risk of extinction on which the listings were based. Measures must be taken at the Project to avoid or minimize ongoing impacts that have contributed to the trend towards extinction and to aid in establishing improved conditions whereby each species will continue to exist into the future while retaining the potential for recovery. The successful implementation of these measures at the Project will be necessary for the proposed action to avoid jeopardizing listed Permit Species.

For the unlisted Permit Species, as described in Section 4, the environmental baseline appears to meet the species-level biological requirements for these species within the action area at this time. However, further degradation of the existing conditions for currently unlisted Permit Species could result in those ESUs becoming listed under the ESA in the future. Maintenance or

improvement of the existing conditions would likely result in continued stable or increasing populations and would thus reduce the likelihood of these ESUs being listed as threatened or endangered in the future.

6. EFFECTS OF PROPOSED ACTION

In this section, NOAA Fisheries evaluates the effects of the proposed action using the five-part approach for applying the ESA jeopardy standard to Pacific salmon described in Section 1.1. During this step of the analysis, effects of the action are evaluated with respect to action-area biological requirements. Specifically, NOAA Fisheries evaluates whether or not species-level biological requirements (described below) are being sufficiently met within the Project boundary (tailrace, dam, forebay, and reservoir) by qualitatively comparing expected adult and juvenile survival rates through the Project resulting from implementation of the HCP to those that have occurred in the past (baseline), as well as to those that would likely have occurred in a free-flowing river of equal length (i.e., survival that would likely have occurred if the Project did not exist). NOAA Fisheries also qualitatively evaluates any remaining Project-related effects and the effects of interrelated and interdependent actions within the entire action area (including those in the tributaries and downstream of the Project) by comparing the expected effect of the proposed action on the specific species-level biological requirements of these species.

6.1 Methods for Evaluating Action-Area Biological Requirements

As noted in Sections 1.1.2 and 5.2, the primary approach to evaluating the proposed action (issuance of an ITP for a term of 50 years for the operation of the Project according to the HCP) in the action area is to estimate juvenile and adult survival rates through the Project area (reservoir, forebay, dam, and tailrace). These estimates include both direct and indirect (or delayed) mortality related to Project impacts, and include natural mortality. These survival rates should capture the great majority, although not necessarily all, of the impacts of the Project's existence and operation on Permit Species' action-area biological requirements in the mainstem Columbia River. The biological requirements include:

1. Adequate Substrate and Adequate Food Supply for Juveniles: The impoundment of the Project reservoir by the Wells Dam has probably changed the characteristics of substrate above the dam from gravel and cobble to finer sediment size. Gravel/cobble substrate is desired for salmon spawning and incubation. However, with the exception of UCR summer/fall-run chinook salmon, this change in substrate is unlikely to affect adults or early life stages of the other Permit Species, because they are tributary spawners. It is possible that the change in substrate has influenced food production, possibly reducing feeding success and growth of smolts migrating through the impounded reach. However, evidence for this effect is speculative at present (ISG 1996). If such an effect occurs, it is likely to be captured in either the direct survival or indirect mortality rates estimated later in this section. The presence of the dam may also decrease gravel recruitment to downstream reaches. This last effect would be most likely to influence the spawning success of UCR summer/fall-run chinook salmon, but would have little or no effect on other Permit Species.

2. Adequate Water Quality: The primary characteristics of water quality most likely to be affected by operations of the Project are TDG levels, including nitrogen levels harmful to salmonids. This effect would presumably be observable in estimates of adult and juvenile survival rates.

3. Adequate Cover and Shelter: Impoundment of the Project reservoir has modified the physiographic complexity of this reach compared to conditions in a free-flowing river, resulting in a modification of cover and shelter and a potential change in predation on juveniles of listed species. This effect would presumably be observable in estimates of juvenile survival, which are the focus of NOAA Fisheries' approach to evaluating effects (Section 6.2). Additionally, Douglas PUD has proposed a program to remove predators from areas where juveniles are most vulnerable to predation.

4. Adequate Riparian Vegetation: Impoundments may have altered the riparian vegetation within the study reach from pre-impoundment conditions. Regulation of the Project reservoir elevation may influence the distribution and composition of riparian vegetation in the study area. Riparian vegetation is likely to influence cover, food production, temperature, and substrate, so the primary effects are addressed with respect to other factors. Additionally, effects of changes in riparian vegetation resulting from the proposed action are likely to be expressed in the survival rates of juveniles and adults (Section 6.2).

5. Adequate Space and Conditions for Safe Passage: The configuration of the dam and the proposed operation of the Project primarily affect the safe passage of juveniles and adults through the action area (Section 6.2). Safe passage is clearly captured in adult and juvenile survival rates.

The general effects of the proposed tributary protection and enhancement activities and hatchery operations to mitigate for inundation and unavoidable project-related mortalities are evaluated with respect to necessary habitat characteristics rather than survival rates, as explained in Sections 6.2.6, 6.2.7, and 6.2.8. Thus NOAA Fisheries qualitatively evaluates the likely impacts of these facets of the proposed action on the action-area habitat-based biological requirements of the Permit Species.

6.2 Effects on Permit Species

This Opinion analyzes the effects of the proposed action (issuance of the ITP for the HCP) to minimize or mitigate for the effects of the Project on ESA-listed UCR steelhead and UCR spring-run chinook salmon, as well as currently unlisted UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon.

Sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS describe the general effects of hydroelectric projects, as well as the specific effects of the Wells, Rocky Reach, and Rock Island hydroelectric projects and HCP agreements on anadromous salmon and steelhead. Included in these descriptions are summaries of the available project, dam, and route-specific survival estimates for each Permit Species (both juvenile and adult). Appendix A of this Opinion provides NOAA Fisheries' best current estimates of JPS that contributed to the environmental baseline, those that would be expected should the HCP standards merely be met, and actual estimates of survival with HCP operations (where available). Appendix A also compares these survival estimates to the likely survival through a hypothetical free-flowing river reach of equal length to the projects.

6.2.1 General Effects and Considerations

Permit Species from the Methow and Okanogan rivers must pass through the Wells Project as well as four other PUD-owned hydroelectric projects (reservoirs and dams) and four Federally-owned projects in the lower Columbia River during their migrations to and from the Pacific Ocean. Permit Species from the Entiat and Wenatchee rivers do not have to pass through the Wells Project, but some adults may overshoot the Entiat or Wenatchee rivers, pass upstream of the Project, and "fall back" through the Project in order to migrate up the Entiat or Wenatchee rivers.

As discussed in Section 6.1, the primary method for evaluating the effects of the proposed action on the biological requirements of Permit Species as they migrate through the Project is to compare survival estimates obtained from paired releases (the control group downstream and the test group upstream of the Project) of juvenile fish. At the Project, the survival of Permit Species is likely to be most affected by:

1. Project impacts on adult salmonid passage (including the reservoir).
2. Project impacts on juvenile salmonid passage (including the reservoir).
3. Project impacts on water quality (including the reservoir)
4. Predator control programs.

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The effects of tributary enhancement activities resulting from the Tributary Enhancement Fund will also be evaluated qualitatively.

The following information analyzes the specific effects that the proposed action and any interrelated and interdependent actions will likely have on UCR steelhead and UCR spring-run chinook salmon, as well as on the unlisted Permit Species. NOAA Fisheries reviewed the analyses contained in the FEIS and the 2000 Wells biological opinion, and considered additional data where appropriate.

6.2.2 Effects of the Project and Operations on Adult Passage and Survival

General Effects and Considerations

Sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS describe the general and specific effects of the Project on upstream migrating adults. These effects are most likely to include adult delay at Project fishways, reduced passage success through the fishways, and injuries and mortalities resulting from upstream (via fishways) as well as downstream (via turbines, spillways, or juvenile bypass systems) passage through the Project. Each of these effects may contribute to reduced reproductive success (increased pre-spawning mortality or reduced ability to spawn) of adult Permit Species. Because Permit Species must pass through seven to nine projects in order to reach their natal spawning areas, any cumulative passage delays and resultant indirect or delayed effects may further decrease spawning success. Unfortunately, the relationship between each of these effects and overall reproductive success is not clearly understood.

Adult passage information (e.g., time spent immediately downstream of the dam, success at passing into the collection channel and fishway entrances, time taken to traverse the ladder, etc.) is typically evaluated using radiotelemetry techniques. Therefore, project passage information is an assessment of how well radio-tagged fish pass from the tailrace of a specific dam into and through the fish ladders. The underlying assumption is that the behavior of radio-tagged fish is generally similar to untagged fish. Laboratory assessments of tagged and untagged fish and several years of field evaluations support this assumption, although little information is available regarding tagging effects on reproductive success. There has not been a direct relationship established between project passage times and reproductive success, although reducing passage times to the greatest extent possible should reduce energy expenditures and improve the likelihood that adult fish will survive to spawn. Although specific criteria are not available, obvious delays in passage may indicate a need for operational or structural modifications.

Project passage times are only developed for radio-tagged fish that successfully migrate through the fishways at the dam. Although fish that do not pass the dam are of equal or greater concern, it is extremely difficult to determine a causative factor for this behavior. Failure of a radio-tagged fish to ascend a dam may result from poorly designed passage facilities, inadequate attraction water, or complicated flow patterns exacerbated by project operations. Fish that fail to ascend the dam may also be destined for a downstream spawning location or may have been injured prior to reaching the dam (as a result of natural or other effects) or may have been injured or harvested during commercial, ceremonial and subsistence, or recreational fisheries. Tagging effects or loss of tags can also be manifested in the data set and affect these conclusions, none of which are related to operation of the facilities. As a result, the detection rate of radio-tagged fish cannot be used to isolate specific cause and effect relationships between passage and reproductive success. The information can be used, however, to generally assess the success of adult salmonids migrating upstream through the Columbia River corridor and to develop an index that can be used to assess annual improvements in passage conditions.

Obtaining robust estimates of adult salmon and steelhead survival is difficult, especially when attempting to use passage counts at mainstem hydroelectric dams (Dauble and Mueller 2000). The results of radiotelemetry studies are also often used to estimate adult survival through individual or multiple hydroelectric projects or river reaches. However, unknown tag losses (as a result of legal or illegal fisheries, tag loss or failure, or adults spawning in unknown locations or tributaries) or mortalities (as a result of fallback or natural mortality) make it difficult to use the results of adult radiotelemetry studies to provide accurate estimates of project-specific mortality. At present, it is also not possible to differentiate between project-caused mortality and natural mortality (which undoubtedly occurs) with radiotelemetry techniques. Per-project mortality estimates based on available information include both sources. Therefore, mortality rates (based on radiotelemetry) attributable to the effects of hydroelectric projects are undoubtedly lower than those presented, but to an unknown extent. For these reasons, it is most appropriate to consider survival estimates based on radiotelemetry studies as minimum estimates of total adult survival, which includes unknown tag loss as well as project-caused and natural mortality.

Specific Effects

Migration delay and fallback

Excessive delay reported at fishway entrances and fallback over dams are the most pronounced problems that adults experience in their upstream migrations that can be assessed using radiotelemetry techniques. Therefore, past evaluations have focused largely on defining these issues.

The effects of the Project on adults are described in sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS. Table 2-4 of the FEIS summarizes the results of radiotelemetry studies estimating passage times and minimum total survival rates of adults migrating through the Project (see discussion of appropriate use of this information in General Effects, above). Time required for fish to ascend the Project, defined as project passage times, for adult steelhead and spring-run chinook salmon ranged from 12 to 29 hours with the longer passage times recorded during the operation of the brood collection traps. Project passage time for other Permit Species ranged from 5 to 47 hours, depending upon whether or not the brood collection traps were in operation. The majority of the passage delay identified at this Project appears to be associated with adult brood stock collection activities, with lesser delays observed within the fish ladder collection gallery (Stuehrenberg et al. 1995). Table 2-5 of the FEIS compares the migration rates of adult chinook salmon, steelhead, and sockeye salmon through both impounded (dams and reservoirs) and unimpounded reaches of the Snake, Mid-Columbia, and Lower Columbia rivers. In each case, migration rates (miles/day) through the Mid-Columbia River generally exceeded migration rates through unimpounded reaches of the Snake or Columbia rivers and were very similar to those observed in other impounded reaches (13 to 36 miles/day versus 6 to 19 miles/day in unimpounded reaches or 15 to 40 miles/day in other impounded reaches, respectively). This information comports well with 2001 and 2002 steelhead passage rate estimates made by English et al.

(2003). This body of information strongly suggests that small delays at these projects are more than compensated for by faster travel through the reservoir impoundments. In addition, any delays that do occur are more likely to affect species that spawn soon after completing their migration (summer/fall-run chinook salmon or sockeye salmon are more likely to be affected than those that hold in the rivers or streams for considerable periods of time prior to spawning [i.e., steelhead or spring-run chinook salmon]). The effect of delays passing the fishway (hours to a few days) on Permit Species is likely non-existent for currently ESA-listed Permit Species and non-existent to very small for currently unlisted Permit Species. Thus the proposed action should have no effect, or a slight beneficial effect, on upstream migrating adults compared to the migration observed under unimpounded conditions.

Adults' fallbacks at a hydroelectric project can result in substantial mortality. Mortality rates ranging from 14% to 57% have been observed through turbine units and up to 8% through spillways (NMFS 2002a; Ross 1992). Adult survival through state-of-the-art juvenile bypass systems should be similar to or lower than estimates for juvenile mortality (1% to 3%). Table 2-4 of the FEIS indicates that fallback rates at the Project for spring-run or summer-run chinook salmon are 3.6% to 5%. Fallback rates at the Project are 6% to 7% for steelhead and 4% for sockeye salmon. English et al. (2003) found that 12.7% of the hatchery steelhead and 4.3% of the wild steelhead passing Wells Dam fell back (4.4% and 0.0%, respectively, of those fish passing the dam reascended the fishway after falling back).

Due to increased levels and durations of spill (compared to initial operations under the HCP historical operations), non-volitional fallback (presently estimated to be relatively low) could increase slightly. However, the potential negative effect of this action is likely to be more than compensated for by the relatively high survival rates that are expected for adults passing through the dam via the JBS and the spillway. Volitional fallbacks would most likely utilize the JBS and the spillway to move downstream through the Project. Mortalities due to historical fallback at the Project should be included in adult survival estimates (see below). Thus, by slightly decreasing adult mortality as a result of fallback (either volitional or non-volitional) at the Project, the proposed action should somewhat increase adult survival rates compared to those observed in the past.

Adult survival

Because radiotelemetry techniques are unable to differentiate tag loss, tag failure, and fish loss, no accurate estimates of adult survival through the Mid-Columbia River projects are currently available. However, these studies can be used to estimate the minimum survival rates at individual projects or through specific reaches (see discussion in General Effects, above).

Using radiotelemetry techniques, Stuehrenberg et al. (1995) estimated that the maximum mortality of spring-run chinook salmon in the Mid-Columbia River (excluding all fish entering spawning areas) was between 11.1% and 22.2% (depending on the extent to which fish with unknown fates below Priest Rapids Dam were from Ringold Hatchery). The authors estimated

that the maximum mortality of summer-run chinook through the study area was 13.5%. Because fall-run chinook salmon primarily spawn in the mainstem, the authors did not attempt to estimate the maximum mortality of these adults through the study area.

A retrospective analysis of radiotelemetry studies conducted prior to 1996 in the Columbia River upstream of Priest Rapids Dam (e.g., Stuehrenberg et al. 1995) determined that these studies were largely unreliable because of problems associated with the tags, receivers, and software used at the time. For example, Wainwrite et al. (2001) found that Lotek receivers had data gaps ranging from tens to hundreds of hours over the course of the season and a substantial number of false positives (tags being recorded that were already removed from the river, etc.) were being recorded and included in the data set. Thus, while the results of this study are probably less reliable for estimating minimum survival than is typically the case, the behavior of adults in this reach was similar to that of fish migrating through the FCRPS dams on the lower Columbia and Snake rivers.

English et al. (2001 and 2003) conducted radiotelemetry studies of adult steelhead migrating upstream through the Mid-Columbia River in 1999 and again in 2001. In 1999, of the 191 radio-tagged steelhead detected in the vicinity of Wells Dam which were not removed prior to spawning (harvested), 178 or 93.2% were either tracked to known spawning areas or successfully passed and remained above Wells Dam. In 2001, of the 263 radio-tagged steelhead detected in the vicinity of Wells Dam which were not removed prior to spawning (harvested), 252 or 95.8% were either tracked to known spawning areas or successfully passed and remained above Wells Dam.[12]

NOAA Fisheries has summarized the available radiotelemetry studies in order to estimate per-project adult survival for each of the ESA-listed species through the mainstem Snake River and Columbia River Federal hydroelectric projects, dams, and reservoirs that are similar to the Mid-Columbia hydroelectric projects. NOAA Fisheries believes that the estimates made for species at these projects are generally applicable to the FERC-licensed projects on the Mid-Columbia River for both listed and unlisted Permit Species. Estimates of average per-project mortality rates based on this analysis are 3.2% for steelhead, 2.4% for spring-run chinook salmon, 2.4% to 4.2% for summer/fall-run chinook salmon, and 1.9% for sockeye salmon (NMFS 2000a, based on data in NMFS 2000c).

Additional radiotelemetry information from several undammed river systems in British Columbia, Canada, is relevant. Radiotelemetry studies conducted on the Nass River in 1992 and 1993 (Koski et al. 1993; Koski et al. 1996b) documented spring-run chinook salmon survival between 81% and 90%. In 1993, under different flow conditions, survival was 70% (Koski et al. 1994; Koski et al. 1996a). Based on this information, the authors concluded that the total

[12]Note: This is not an actual survival estimate, but is instead an estimate of minimum survival, since the ultimate fate (i.e., the survival or mortality) of several adult steelhead that were radio-tagged is not known.

mortality estimates for spring-run chinook salmon made by Stuehrenberg et al. (1995) through the Mid-Columbia River in 1993 fell within the range of expected natural mortality. Similar pre-dam information is unavailable for the Mid-Columbia River, although one estimate of spring/summer-run chinook salmon survival developed for the period 1962 through 1968 on the lower Snake River averaged 55% with only one dam in place (estimated by relating ladder counts at Ice Harbor Dam with redd counts in Snake River tributaries) (Bjornn et al. 1998).

Adult PIT-tag detectors were installed at Wells Dam in 2001, making possible, for the first time, estimates of adult conversion rates in the Columbia River between McNary Dam (RM 292) and Wells Dam (RM 515), a distance of 223 miles. This reach encompasses five dams and reservoirs, as well as over 50 miles of free-flowing river (the Hanford Reach). In this instance, conversion rates can be estimated for adult returns of fish released as juveniles upstream of Wells Dam and should be viewed as the minimum survival rates between McNary Dam and Wells Dam.[13] Because these fish are of known origin and presumably are attempting to return to their natal streams above Wells Dam to spawn, their conversion rates from McNary Dam to Wells Dam constitute the best available estimates of minimum adult survival through the reach available. By taking the 5th root of the reach conversion rate, an estimate of average per-project survival can be obtained. These estimates are provided in Table 3 and summarized below.

Three groups of juveniles were PIT-tagged and released upstream of Wells Dam in 2000: steelhead were released in the mainstem Columbia River to assess JPS for Wells Dam; spring-run chinook salmon were released in the Methow River, and summer-run chinook salmon were released in the Okanogan River. An additional group of juvenile spring-run chinook salmon was released in the Methow River in 2001.

The estimated conversion rate for returning adult steelhead in 2002 was 85.7% (of the 175 returning adults observed at McNary Dam, 150 were redetected at Wells Dam), translating to an average per-project minimum survival estimate of 97.0%. The estimated conversion rate for returning adult spring-run chinook salmon from the Methow River in 2002 was 80.6% (25 fish at Wells Dam, 31 fish at McNary Dam), translating to an average per-project minimum survival estimate of 95.8%. The estimated conversion rate and per-project survival estimate for returning adult spring-run chinook salmon was 100.0% (22 fish at Wells Dam, 22 fish at McNary Dam) for 2003 returns. Lastly, the estimated conversion rate for adult summer-run chinook salmon returning in 2002 was 87.5% (7 adults at Wells Dam, 8 adults at McNary Dam), translating to an

[13]This methodology assumes that all returning adults will attempt to return to locations at or upstream of the release location (in this instance, above Wells Dam). Fish straying into downstream basins to spawn will also bias the estimated conversion rate low. It also encompasses all forms of tag loss (which may occur for fish close to spawning) or mortality within the reach of interest into the conversion estimate. In addition, there is some potential for adults to be inadvertently diverted around the detectors at Wells Dam as a result of research or broodstock collection activities, which is more likely to occur for chinook salmon than for steelhead. Thus conversion rates should be viewed as conservative estimates of minimum survival between the two points of interest (in this case, McNary and Wells dams).

average per project minimum survival estimate of 97.4%.[14]

Table 3. Detections of known origin adult PIT-tagged steelhead and chinook salmon at McNary Dam in 2002, number of adults redetected at Wells Dam, estimated conversion rate (McNary Dam to Wells Dam), and average per-project (5 dams and reservoirs) conversion rates.

PIT-tag Detection Site	Pateros Steelhead 2002	Winthrop Spring Chinook 2002	Winthrop Spring Chinook 2003	Okanogan Summer Chinook 2002
McNary Dam	175	31	22	8
Wells Dam	150	25	22	7
McNary to Wells Total Conversion Rate	85.7 %	80.6 %	100.0 %	87.5 %
McNary to Wells Average Per Project Conversion Rate*	97.0 %	95.8 %	100.0 %	97.4 %

*Calculated as McNary Dam to Wells Dam Total Conversion Rate to the 5th root (5 dams and 5 pools). Any mortality occurring within the 41 mile free-flowing Hanford Reach of the Columbia River is also incorporated into this estimate and evenly distributed among the 5 dams and reservoirs. Adults detected at Wells Dam that were not also detected at McNary Dam were excluded from the analysis.
Source: Columbia River DART website - July 21, 2003: http://www.cqs.washington.edu/dart/pit_obs_adult_conrate.html.

NOAA Fisheries expects, based on the available information, that these Permit Species require a total (natural and project-related) average annual mortality rate of adults migrating upstream through the Project that does not exceed approximately 2% to 4% of the upstream migrating Permit Species. Furthermore, based on the observed ranges of mortality estimates for unimpounded river systems, which often exceed that observed in impounded reaches of the Columbia River, NOAA Fisheries concludes that there is a high likelihood that mortality as a result of direct, indirect, or delayed effects of passing the Project does not exceed 2% for any Permit Species.

Steelhead kelts

The importance of steelhead kelts (adults that have spawned and are migrating downstream to

[14]These average minimum per-project survival estimates do not include any effects of the reservoir created by the Wells Dam, but they do include reservoir effects of the much larger McNary Dam reservoir as well as one-fifth of any mortality which may occurs in the free-flowing Hanford Reach of the Columbia River (because any mortality in this reach is attributed equally to the five projects.

the ocean) to inland populations of steelhead in the Columbia River basin is receiving greater attention in recent years. The proportion of adults that spawn and apparently attempt to migrate to the ocean as kelts is much higher than previously thought. English et al. (2001 and 2003) estimated that 13% to 75% (in 1999) and 56% to 73% (in 2001) of the adult steelhead migrating upstream of Project were observed moving downstream the following spring. In the Snake River, Evans (2002) estimated that the proportion of wild adult steelhead attempting to outmigrate as kelts in 2001 was at least 25% of the ESA-listed adults migrating past Lower Granite Dam in 2000. The majority of these fish (> 70%) were considered to be in good condition. Most importantly, the ratio of female-to-male kelts appears to be very high; for example, at McNary Dam in 2001 the female-to-male ratio was 11:1 (Worthheimer 2002).

Assuming all steelhead kelts attempt to migrate to the ocean, few are apparently able to survive the migration to the ocean and back to their natal streams. Only 3% (7 of 212) of the kelts radio-tagged at Lower Granite Dam on the Snake River were detected at Bonneville Dam in 2001 (Evans 2002). The reasons for this likely include greatly reduced energy reserves, disease, and hydroelectric project-related mortalities. This translates to an estimated mean per-project mortality of nearly 40%, which is comparable to estimates of adult survival through turbines (see discussion above). In 2001, spill for fish passage at most Columbia River hydroelectric projects was either greatly curtailed or eliminated as a result of a regional power emergency. Thus adults migrating downstream in 2001 were forced to pass mainstem hydroelectric projects via turbines (where mortality rates of up to 41% have been observed) rather than via spillways (where mortality rates of up to 8% have been observed (Ross 1992; Bjornn et al. 1998). Similarly, of the 170 spawners tracked as kelts by English et al. (2003), only 30 (18%) were detected below Coyote Rapids, downstream of Priest Rapids Dam, as they migrated downstream out of the study area. Total mortality rates of kelts from all causes (natural mortality, Project-related mortality, or mortality from other sources) at the Mid-Columbia River projects is likely comparable to that observed at the Snake and lower Columbia river projects; however, kelt mortality due to migration through the Project cannot be estimated at this time.

While the historical importance of adult steelhead spawning multiple times on the UCR steelhead ESU is not well understood, should these fish successfully survive the mainstem Columbia River migration corridor and the ocean environment, they could significantly enhance the reproductive capabilities of the naturally spawning populations of UCR steelhead.[15] In summary, NOAA Fisheries concludes that 1) the biological requirements of steelhead kelts are not well known, 2) the Project will continue to contribute to some extent to the continuing failure to meet their likely biological requirements, and 3) the impact should be substantially less than in the past because of the JBS and HCP spill operations.

[15]However, it should be noted that, based on scale analysis, the proportion of summer-run steelhead in the Columbia River that spawn two or more times is not very high. Long and Griffin (1937) estimated that only 2% of the summer-run fish were repeat spawners, which comports well with the findings of McGregor (1986) in the Thompson River basin.

6.2.3 Effects of the Project and Operations on Juvenile Passage and Survival

General Effects and Considerations

Sections 2.2.3, 3.2.6, and 4.2.3 of the FEIS describe the general and specific effects of the Project on downstream migrating juveniles. These effects most likely include 1) mortality at the dam resulting from predacious birds and fish, direct and indirect effects of passing through turbines,
bypass systems, or spillways; 2) mortality in the reservoir, forebay, or tailrace due to predacious birds and fish; and 3) delayed migration.

Juvenile salmon and steelhead pass dams through various routes including turbines, fish bypass systems, and spillways. The best available route-specific survival estimates at Wells Dam that could be used to calculate JDPS estimates is summarized in table 2-4 of the FEIS. Based upon information collected at other hydroelectric projects, juvenile fish survival is estimated to range from 90% to 93% for turbines, 98% to 99% for bypass systems, and 98% to 99% for spillways. Thus some juvenile mortality is associated with all dam passage routes, although the highest levels of mortality typically occur during passage through turbines. Consequently, an important objective of project operations aimed at improving juvenile survival is to route the highest possible proportion of juveniles past the project in a manner that avoids passage through turbines. Thus the proportion of smolts that pass a project through bypasses or over spillways is an important indicator of the effectiveness of fish passage protection measures.

Unfortunately, currently available technology does not allow the JDPS standard to be measured definitively for any Permit Species, although it can be readily calculated using route-specific passage information and survival information for each species. To address this deficiency, the Signatory Parties to the HCP agreed to adopt a JPS standard of 93% (roughly 95% dam passage survival with an assumed 2% reservoir mortality) covering 95% of the migration for each species, which can be readily measured with PIT-tag studies and potentially acoustic tag studies. Utilizing a paired release methodology to measure JPS (reservoir, forebay, dam, and tailrace) should ensure that all direct, indirect, and delayed Project-related effects (at least to McNary Dam) are included in the survival estimate.

The tagging method employed may also affect the results of survival studies. To assist NOAA Fisheries and the other Signatory Parties to the HCP, NOAA Fisheries' Northwest Fisheries Science Center produced a briefing paper that:

1. Summarized the relevant characteristics of each of the migrating salmonid populations using the Mid-Columbia reach.
2. Briefly described available tagging technologies (PIT-tags, radio-tags, balloon tags, and acoustic tags).
3. Developed recommendations for applying particular monitoring approaches given alternative objectives.

4. Developed and described protocols for evaluating future mark/recapture tools and strategies.

This paper will be used by the Coordinating Committee as guidance to ensure that tag-types and methodologies will be best suited to the objectives of the pertinent survival studies (see HCP, appendix D). At this time, NOAA Fisheries believes that, compared to either radio-tag or acoustic-tag studies, PIT-tag studies provide the most accurate and robust estimate of JPS (including direct, indirect, and delayed effects) through the Mid-Columbia hydroelectric projects (reservoirs and dams).

Specific Effects

As noted above in Section 6.2, NOAA Fisheries considers PIT-tag based estimates of JPS to be the best information available. Paired release PIT-tag studies at the Project rely primarily on subsequent detections at McNary Dam and other lower Columbia River FCRPS projects. In addition, PIT-tag studies are more likely to capture any direct, indirect, or delayed effect of the Project in the survival estimate than radiotelemetry, acoustic tag, or balloon tag studies.

Table 3-5 of the FEIS summarizes JPS estimates available for the Project from studies conducted in 1998, 1999, and 2000 with the JBS in operation. Project survival estimates were 99.7% for yearling chinook salmon and from 94.3% to 94.6% for steelhead. NOAA Fisheries believes that this information is the best currently available for estimating JPS through the Project under current operational conditions. No comparable studies have been conducted to date for the unlisted Permit Species. However, these promising results, along with the Coordinating Committee's adaptive management authorities with respect to future operations, assures a high likelihood that the appropriate studies will be conducted and the HCP survival standards also will be met for the unlisted Permit Species juveniles prior to 2013, as required in the HCP.

Thus NOAA Fisheries concludes at this time that the HCP survival standards for UCR steelhead and UCR spring-run chinook salmon are currently being met. In addition, these PIT-tag studies strongly suggest that the JPS standard will likely be met for the unlisted species as well before the 2013 comprehensive check-in date. The survival of other juvenile Permit Species should also be immediately and substantially improved. The adaptive management authorities of the Coordinating Committee also assure that Project facilities and operations will be sufficient to meet the survival standards for the unlisted Permit Species within this time frame as well.

Appendix A of this Opinion compares the likely effect of Project operations under the HCP on JPS with Project survival estimates that contributed the status of the species (Section 4) under the environmental baseline (Section 5) and survival estimates through a free-flowing river of equal length to the Project. This analysis indicates that meeting the Wells HCP's 93% JPS standard (covering 95% of the juvenile migration) would result in survival levels of approximately 92.7% to 95.8% (see Table A-2 in Appendix A) for the entire steelhead and spring-run chinook salmon migration. Compared to baseline survival estimates, this represents a

survival increase of 1.6% to 4.9% for steelhead and 4.2% to 7.6% for spring-run chinook salmon. The Wells HCP survival estimates are approximately 94% to 97% of those estimated for both juvenile steelhead and spring-run chinook salmon migrating through a free-flowing river of equal length to the Wells Project.

Information with respect to juvenile sockeye salmon is lacking. However, because these fish are migrating at the same time as the ESA-listed species, it is likely that they will exhibit similar increases in survival (approximately 2% to 8%) compared to baseline operations that contributed to the current status of the species. Similarly, it is likely that, compared to a free-flowing river, achieving the 93% JPS standard would result in survival rates of approximately 94% to 97% of those that would be expected in a free-flowing river of equal length.

Similarly, little information is available for juvenile summer/fall-run chinook salmon which migrate as subyearling smolts. However, based on comparisons to fall-run chinook survival in the Snake and Lower Columbia rivers, it is likely that survival levels are much lower than for spring migrating Permit Species. Thus, compared to baseline survival levels which contributed to the current status of these species, achieving the 93% JPS standard should improve survival to a greater extent for UCR summer/fall-run chinook salmon than for the other Permit Species. Achieving this standard would result in survivals equivalent to approximately 95% (0.927/0.977 [Method B]) of the estimated survival that would likely occur in a free-flowing river of equal length.

Recognizing that the cumulative effects of issuing the three ITPs was considered for the purposes of NEPA in the FEIS, and that these three actions may be considered interrelated as defined by 50 CFR §402.02, NOAA Fisheries has determined it is also appropriate to concurrently consider the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs on juvenile survival. This analysis is provided in Appendix A of this Opinion (see especially Tables A-1 and A-2) and summarized below.

For UCR steelhead and UCR spring-run chinook salmon, conservative estimates of the expected juvenile project survivals resulting from implementing the HCPs at the Rocky Reach and Rock Island projects range from 92.7% to 95.2%. Compared to historical conditions contributing to the current status of these ESUs, these survival estimates represent an increase of approximately 6.5%, and 5.6% to 8.4%, for UCR steelhead migrating through the Rocky Reach and Rock Island projects, respectively. Similarly, for UCR spring-run chinook salmon migrating through the Rocky Reach and Rock Island projects, these survival estimates represent an increase of approximately 7.2%, and 6.6% to 9.4%, respectively. NOAA Fisheries further estimates that these survival rates represent approximately 94.9% and 93.8% to 96.3%, for UCR steelhead and 97.7% and 93.7% to 96.2%, for UCR spring-run chinook salmon, of the survival rates that would

be expected to occur in a free-flowing river of equal length to the Rocky Reach and Rock Island projects, respectively.

Survival rates for juvenile UCR steelhead and UCR spring-run chinook salmon migrating through all three projects would likely range from 79.8% to 84.6%. These survival rates would represent an increase in survival of 14.2 % to 21.1%, and 19.1% to 26.3%, for UCR steelhead and UCR spring-run chinook salmon, respectively, compared to historical conditions contributing to the current status of these ESUs. These survival rates would be approximately 83.9% to 88.9%, and 83.5% to 88.5%, for UCR steelhead and UCR spring-run chinook salmon, respectively, compared to the survival rates that would be expected to occur in a free-flowing river of equal length to all three projects.

For unlisted Permit Species, NOAA Fisheries conservatively estimates that the expected juvenile project survival rates resulting from implementing the HCPs at the Rocky Reach and Rock Island projects will be similar to those previously estimated for the ESA-listed species, ranging from approximately 94% to 96%. Historical survival rates of unlisted Permit Species juvenile migrants through the three projects are likely equal to, or less than, those estimated for ESA-listed Permit Species. Thus, compared to historical conditions contributing to the current status of the unlisted ESUs, the HCPs should result in similar (i.e., 6.5% to 7.2% at the Rocky Reach project and 5.6% to 9.4% at the Rock Island project) or greater increases in survival for these species. As was the case for the ESA-listed ESUs, NOAA Fisheries concludes that survival rates of spring migrating Okanogan River sockeye salmon under the HCPs will be approximately 94% to 96% of those likely to be observed in a free-flowing river of equivalent length to the Rocky Reach and Rock Island projects. For UCR summer/fall-run chinook salmon, achieving the minimum HCP survival standards at these projects should result in survival rates of approximately 94% to 96% of those likely to occur in a free-flowing river of equivalent length to each of these projects.

Juvenile survival rates for unlisted Permit Species migrating through all three projects would likely be similar to those estimated for ESA-listed species (i.e., 79.8% and 84.6%). Compared to historical conditions contributing to the current status of the unlisted ESUs, these survival rates would likely represent survival increases similar to (114.2% to 126.3%), or greater than, those estimated for the ESA-listed species. This would represent survival rates of approximately 86% for UCR summer/fall-run chinook salmon and from 83.5% to 88.9% for Okanogan River sockeye salmon compared to the survival rates that would be expected in a free-flowing river of equivalent length to all three projects.

NOAA Fisheries concludes that implementing the HCPs, both individually and collectively, at each of the three projects would substantially increase juvenile survival rates of each Permit Species migrating through the projects compared to the historical conditions contributing to the current status of these ESUs. Furthermore, the resulting survival rates for each Permit Species

would be approximately 84% to 89% of those expected to occur in a free-flowing river of equal length to all three projects (91.7 miles or 147.6 km).

6.2.4 Effects of the Project and Operations on Water Quality, Quantity, and Timing

General Effects and Considerations

Compared to upstream Federal and Canadian storage projects, the Wells Hydroelectric Project, due to its limited storage capacity, has little effect on downstream flows on a daily basis and no effect on a seasonal basis. The Project also has little effect on temperature, but likely eliminates the downstream transport of larger substrate materials and diminishes the transport of sands, silts, and clays. This diminishes turbidity in the river, which is theorized to affect juvenile survival (turbidity helps juveniles evade predators). Any effect of reduced turbidity within the Project's reservoir, forebay, and tailrace on juvenile survival will be captured in the JPS studies required by the HCP. See sections 3.3.1 and 3.3.2 of the FEIS for more detailed discussions regarding water quality and quantity in the Mid-Columbia River and its tributaries.

At the Mid-Columbia River projects, spillways are currently the most benign routes for juvenile salmonids to pass the dams (Chapman et al.1994a, 1994b). Unfortunately, spill may result in supersaturated levels of TDG. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition is called gas bubble trauma (GBT) and can be debilitating or even fatal to aquatic species and to all life-history stages of Permit Species. For these reasons, the Mid-Columbia PUDs limit voluntary spillway discharge levels during the fish passage season to ensure that TDG does not exceed 120% of saturation in Project tailraces or 115% of saturation in Project forebays for more than 12 hours over a 24-hour period, or as otherwise ordered by TDG waivers issued by the Washington Department of Ecology. Due to these operational constraints, spill can be limited under normal operating conditions. Although limited spill can avoid high TDG levels that may be harmful to the Permit Species, spill limitations would also result in higher proportions of migrating juveniles passing through turbine units (rather than juvenile bypass systems or spillways), and consequently, offsetting higher mortality rates for juvenile salmon and steelhead migrants at the dam.

Specific Effects

For UCR steelhead and UCR spring-run chinook salmon smolts, the proven expected effectiveness of the existing juvenile fish bypass system is the most efficient non-turbine passage route for all Plan Species covered by the HCP. However, additional water flow to the JBS could be required to meet HCP survival standards for unlisted Permit Species juveniles. Under current normal operating conditions, the Project does not produce significant increases in TDG (<2%) above those measured in the Project forebay. Survival, therefore, is not expected to be affected as a result of TDG generated at the bypass system under current normal operating conditions. The effect of the Project and its operation on juveniles and adults when river flows do not exceed powerhouse capacity or TDG waivers issued by the Washington Department of Ecology is probably negligible (NMFS 2000a; Backman and Evans 2002a, 2002b).

During high river discharges, elevated levels of TDG may result from involuntary spill, increasing the incidence of mortality related to GBT. However, large flood events are relatively rare due to upstream water storage projects. Therefore, while large flood events may negatively affect spring migrating juvenile and adult Permit Species, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events.

6.2.5 Predator Control Programs

The HCP proposes to continue implementing northern pikeminnow (*Ptychochelus oregonensis*) and avian predator (primarily California, ring-billed, and unidentified gulls; double-crested cormorants; Caspian terns; and common mergansers) control and removal measures to reduce the predation rates on juvenile migrants. Avian control measures consist largely of land based activities that include gull wires installed across project tailraces and pyrotechnics to discourage predation. In addition, some avian predators are killed each year. Although aimed at improving juvenile steelhead and salmon survival, avian control measures do not otherwise affect Permit Species (listed or unlisted) and therefore do not require special permitting by NOAA Fisheries.

Removal of northern pikeminnows, however, may result in the take of small numbers of juvenile and adult Permit Species, depending on the harvest methods used (e.g., hook and line and long-lines). For example, in five years of long-line fishing in the Wells tailrace or reservoir, no anadromous salmonids were encountered. Only 4 rainbow trout and 1 steelhead were encountered over a seven-year period in hook and line fisheries (Jerald 2003). Similarly, over an eight-year period at both Rocky Reach and Rock Island dams, only 13 steelhead have been caught.

Previously, NOAA Fisheries determined these actions resulted in a net benefit to listed populations in the Mid-Columbia River (NMFS 1998). Assuming predator control efforts at the Project remain at current levels or are increased in the future, the removal of predator-sized northern pikeminnows and the hazing or removal of avian predators should result in maintaining or increasing juvenile Permit Species' survival rates compared to present survival estimates. Any survival improvements resulting from predator removal should be reflected in the results of JPS studies for each Permit Species at the Project. Negative impacts to adult Permit Species should be negligible or non-existent for all Permit Species.

6.2.6 Tributary Conservation Plan

A detailed description of the Tributary Conservation Plan, the Plan Species Account, and its allowable uses by the Tributary Committee can be found in section 7 of the HCP and in sections 2.3.4.7 and 2.3.4.8 of the FEIS. The following discussion is a brief summary of this information.

To offset unavoidable project mortality, Douglas PUD will initially contribute $1,982,000 (in 1998 dollars adjusted for inflation) to a Plan Species Account in order to fund projects for the

protection and restoration of Plan Species' habitat within the Columbia River watershed (from Chief Joseph tailrace to the Wells tailrace, and the Okanogan and Methow rivers). Five years after the initial contribution, Douglas PUD could either provide annual payments of $176,178 (in 1998 dollars) throughout the HCP term or provide an upfront payment of $1,761,780 (equivalent to 10 yearly payments in 1998 dollars), deducting the actual costs of bond issuance and interest. After a total of 15 years, the Signatory Parties would determine the contribution method of the remaining funds (at a rate equivalent to $176,178 per year). Tributary protection and conservation projects may include, but not be limited to, 1) providing access to currently blocked stream sections or oxbows, 2) removing dams or other passage barriers on tributary streams, 3) improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period, 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, or 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas.

The Tributary Committee is responsible for selecting projects and approving budgets from the Plan Species Account for the purposes of implementing the Tributary Plan. The HCP directs the Tributary Committee to coordinate with other conservation plans or programs and to cost-share, seek matching funds, and piggyback programs onto other habitat efforts, whenever feasible. No attempt to assess whether or not tributary enhancement projects are increasing the survival of Plan Species by 2% will be made by the Tributary Committee (see Response to Comment 30, 7th paragraph in appendix C of the FEIS for explanation). Instead, Douglas PUD will provide additional money to fund a Tributary Assessment Program which will be used to ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner. The total cost associated with the Tributary Assessment Program may not exceed $200,000 (not subject to inflation adjustment).

The Tributary Committee will be guided by the general strategy outlined in supporting documents A and D to the HCP: protection of existing productive habitat and restoration of high priority habitat by restoring, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. NOAA Fisheries' representative on the Tributary Committee will ensure that take resulting from these activities is minimized to the extent practical.

Based on the certainty of funding, the authorities granted to the Tributary Committee, the Tributary Assessment Program, and NOAA Fisheries' participation, we find that there is an extremely high likelihood that effective protection and restoration measures will be implemented throughout the term of the HCP.

Protection or restoration projects requiring in-water work or physical alterations to adjacent lands (riparian habitat or flood-plain) could have short-term minor negative impacts to spawning,

incubating, and rearing Permit Species by 1) negatively impacting substrate and juvenile food supplies (temporarily elevating sedimentation rates and removing food organisms from aquatic or terrestrial sources); 2) negatively impacting water quality (e.g., increasing turbidity); 3) negatively impacting structures providing cover and shelter to both adults and juveniles; 4) negatively impacting (e.g., removing , replacing, etc.) riparian vegetation; and 5) negatively impacting space and conditions for safe passage (e.g., noise, vibrations, physical presence of people or equipment, etc.) for both adults and juveniles. In the long-term, these actions should have either no effect, or a slight beneficial effect, on one or more of these biological requirements.

NOAA Fisheries concludes that implementing the Tributary Conservation Plan should result in a net benefit to both juveniles and adults of each Permit Species over the long term. In most instances (e.g., leasing riparian lands, leasing or purchasing instream flow water rights, etc.), funded projects are not expected to have any deleterious effects on Permit Species. However, in a few cases (e.g., removal of migration blocks, reconnecting side channels, etc.), some short-term unavoidable negative effects (e.g., some individuals killed or injured, temporarily increased sediment loads and turbidity, etc.) would likely result from funded protection or restoration projects. These projects would require future formal ESA Section 7(a)(2) consultation and authorization of incidental take of ESA-listed Permit Species.

6.2.7 Hatchery Compensation Plan

As discussed in Section 3, current hatchery production levels have been previously analyzed in ESA Section 7 consultations on the issuance of Section 10(a)(1)(A) enhancement permits for UCR steelhead (#1094) and UCR spring-run chinook salmon (#1196) artificial propagation programs. Continued hatchery mitigation activities proposed as part of the HCP will undergo separate ESA Section 7 consultations at 10-year intervals pursuant to which NOAA Fisheries will consider the potential for both beneficial and adverse effects to listed species. This section generally considers the direct and indirect programmatic effects to Permit Species that may result from the HCP's hatchery mitigation actions.

Scientific knowledge regarding the benefits and risks of artificial propagation is incomplete, but improving. Artificial propagation techniques and strategies have proven effective in many cases at alleviating near-term extinction risks, yet the potential long-term benefits of artificial propagation as a recovery tool for depleted salmon populations are unclear. Hatchery-based artificial propagation techniques may provide benefits to fish populations, both ESA-listed and unlisted, by several mechanisms including: reducing the risk that a population on the verge of extirpation will be lost by expeditiously boosting the number of emigrating juveniles in a given brood year, preserving or increasing the abundance of salmonid populations while other factors causing decreased abundances are addressed, accelerating the recovery of populations by increasing abundances in a shorter time frame than may be achievable through natural production, increasing the "nutrient capital" in the freshwater ecosystem supporting natural

salmonid populations by increasing the numbers of decomposing salmonid carcasses in a watershed, establishing a reserve population for use if the natural population suffers a catastrophic loss, seeding vacant habitat by reintroducing populations to streams where indigenous populations have been extirpated while the causes of extirpation are being addressed, and collecting and providing new scientific information regarding the use of supplementation in conserving natural populations.

Potential negative effects of artificial propagation on naturally produced populations include effects on the genetic and ecological health of natural populations, effects of fisheries management, and the potential to mask the status of naturally producing stocks which effects public policy and decision making. Existing and ongoing ESA Section 7 consultations concerning artificial propagation evaluate the risk of 11 generic effects on listed species, which are: 1) operation of hatchery facilities, 2) broodstock collection, 3) genetics, 4) disease, 5) competition/density dependent effects, 6) predation, 7) residualism, 8) fisheries, 9) masking, 10) nutrient cycling, and 11) monitoring and evaluation.

7. CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as "those effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area considered in this biological opinion." Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities, are not considered within the category of cumulative effects for ESA purposes because they require separate consultations pursuant to Section 7 of the ESA after which they are considered part of the environmental baseline. Future State, tribal, local, or private actions within the action area are described for NEPA purposes in the FEIS (sections 3.7, 5.4, 5.5, and 5.6). NOAA Fisheries evaluated these actions to determine whether or not they would meet the requirements of its implementing regulations. Those actions which are most notable include Washington State TMDL (total maximum daily load) development and implementation, Washington State legislation to enhance salmon recovery through tributary enhancement programs, and recent human population trends in the action area. However, after considerable review, NOAA Fisheries has determined that these actions cannot be deemed reasonably likely to occur based on its ESA implementing regulations.

The Endangered Species Consultation Handbook describes this standard as follows:

> "Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."

There are, of course, numerous non-Federal activities that have occurred in the action area in the past, which have contributed to both the adverse and positive effects of the environmental baseline. This step of the analysis for application of the ESA Section 7(a)(2) standards requires the consideration of which of those past activities are "reasonably certain to occur" in the future within the action area.

First of all, any of these actions that involve Federal approval, funding, or other involvement are not considered "cumulative effects" for this analysis (see ESA definition, above). This Federal involvement will trigger ESA Section 7(a)(2) consultation in the future. Once the consultation on those actions is completed the effects may be considered part of the environmental baseline, consistent with the ESA regulatory definition of "effects of the action" (50 CFR §402.02). Thus, for example, state efforts to improve water quality in compliance with the Federal Clean Water Act would not be considered because of the involvement of the EPA, until separate ESA

consultations are completed. Others examples include irrigation water withdrawals involving the

U.S. Forest Service (right-of-way permits for irrigation canals) or agricultural practices that receive Federal funding through the U.S. Department of Agriculture.

Next, actions that do not involve Federal activities must meet the "reasonably certain to occur" test for NOAA Fisheries to consider their effects in this Opinion. Recognizing that this is a narrower standard than used for NEPA purposes, not all of the actions identified in the FEIS may be considered as "cumulative effects" for this ESA Section 7(a)(2) consultation. In reviewing the actions identified in cumulative effects analysis of the FEIS, after eliminating from consideration those with Federal involvement, NOAA Fisheries finds that currently few, if any, of the future adverse or beneficial State, tribal or private actions qualify for consideration in this analysis as "cumulative effects."

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NOAA Fisheries concludes that most of the factors for the decline of these species are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon (as well as currently unlisted Permit Species), against which the effects of this action are considered, are likely to be improved, although to an unknown or possibly minor extent, over those reflected by the historical trends under the environmental baseline.

8. CONCLUSIONS

This section presents NOAA Fisheries' biological opinion regarding whether the aggregate effects of the factors analyzed under the environmental baseline (Section 5), effects of the proposed action (Section 6), and the cumulative effects (Section 7) in the action area, when viewed against the current rangewide status of the species (Section 4), are likely to jeopardize the continued existence of UCR steelhead or UCR spring-run chinook salmon. To "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (CFR §402.02). NOAA Fisheries has also conducted a similar analysis for unlisted Permit Species (UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon) addressed in this HCP as part of its unlisted Permit Species analysis. This analysis is necessary because Douglas PUD requests assurances (i.e., No Surprises) that it will receive a Section 10(a)(1)(B) ITP for the currently unlisted anadromous salmonids that are adequately addressed in the HCP, if they are listed under the ESA and absent relevant new information available at the time these species may be listed.

As determined in Section 4, the status of the listed ESUs is characterized by low abundance and downward population growth rates, despite recent encouraging adult returns. Were NOAA Fisheries to simply project this status forward over the term of this ITP, these population growth rates would need to substantially improve for them to survive with an adequate potential for recovery. As determined in Section 5, however, the effects of the environmental baseline, while responsible for this current status, cannot be assumed to continue over the term of the ITP given the fact that few Federal actions that contributed to the environmental baseline in the past have completed ESA Section 7 consultation for more than the next few years. Thus NOAA Fisheries can assume that the current status will improve, although to an unknown or possibly minor extent, as natural processes (e.g., recovery of riparian vegetation removed as a result of past timber harvest activities) reduce the continuing effects of the environmental baseline. As determined in Section 7, there are few, if any, State or private projects that meet the ESA definition of "reasonably certain to occur" and therefore their effects cannot be assumed for this analysis. This is also true for the unlisted Permit Species, except that their status is characterized as stable or increasing. Thus, for these species, additional survival improvements are likely not necessary for them to survive.

In reaching it conclusions, NOAA Fisheries finds that there will be continuing adverse impacts to species considered under this biological opinion allowed under the HCP. These impacts, as described in Section 6, include continuing mortality of juveniles passing the Project and are related to both the existence and the operation of the Project, which cannot be separated. The level of continuing juvenile mortality relative to the level of juvenile mortality expected in a free-flowing river of equal length (see Section 6.2.3 for discussion of biological requirements necessary for survival and recovery of listed ESUs), does not by itself constitute an appreciable

reduction in the likelihood of survival and recovery. Adult mortality through the Project appears to be similar to that expected in a free-flowing river of equal length. NOAA Fisheries also notes that the levels of juvenile and adult mortality associated with the HCP represent an improvement over the Project-caused mortality that occurred historically and contributed to the current species status under the environmental baseline.

Although some short-term negative impacts may result from HCP tributary enhancement projects, these activities are also likely to benefit, to an as yet unknown extent, all Permit Species, by protecting or enhancing tributary habitat in which these fish spawn and rear throughout the term of the ITP.

Based on these considerations, NOAA Fisheries concludes that its issuance of an ITP under Section 10(a)(1)(B) of the ESA for the lawful operation of the Wells Hydroelectric Project is not likely to jeopardize the continued existence of the ESA-listed Permit Species. NOAA Fisheries also concludes that the proposed action would not jeopardize the continued existence of currently unlisted Permit Species (in the event that they are listed under the ESA in the future).

Although no critical habitat is currently designated for these species, NOAA Fisheries' analysis and no-jeopardy determinations are likely to be highly relevant for the consideration of this ITP's effects on habitat should any be designated as critical for these species during the term of the ITP.

8.1 Conclusions for UCR Steelhead

After reviewing the current status of UCR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of this species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric

Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

NOAA Fisheries has estimated that, based on comparisons of expected juvenile survival rates to baseline survival rates, achieving the HCP survival standards at the Rocky Reach or Rock Island hydroelectric projects would increase juvenile UCR steelhead survival rates through each project by 6.5%, and 5.6% to 8.4%, respectively. Collectively, achieving the HCP survival standards at each of the three projects would increase juvenile survival rates through the three projects by 14.2% and 21.1% for those juveniles migrating through all three projects (i.e., from the Methow River). NOAA Fisheries finds that, based on this information, the three HCPs, both individually and collectively, represent a substantial improvement to juvenile survival over baseline conditions (see Section 6.2.2 and 6.2.3 and Appendix A). NOAA Fisheries estimates that the resulting juvenile project survival rates would be approximately 94% to 97% of that estimated in a hypothetical free-flowing river of equal length to each of the projects individually, and 84% to 89% of that estimated for the projects collectively (see Section 6.2.3 and Appendix A).

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of ESA-listed UCR steelhead, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of this ITP is not likely to jeopardize the continued existence of this species for the term of the HCP.

8.1.1 Adult UCR Steelhead

This conclusion is based, in large part, on recent survival information (Section 6.2.2) and the expected effects on adult migration and survival resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).

- Adult survival and migration speed through the Project appears to be similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).

- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).

- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality

that contributed to the current status for fallbacks or volitional migrants (especially steelhead kelts) compared to turbine passage routes (Section 6.2.2).

- TDG levels resulting from spill operations for juvenile migrants will not exceed expected TDG waivers from the state of Washington and should not affect adult survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.1.2 Juvenile UCR Steelhead

This conclusion is also based on recent project survival estimates (Section 6.2.3) and the expected survival improvements for juvenile migrants resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality is equal to or less than 7%, based upon the results of three years of survival study indicating JPS for steelhead is in excess

of 95%, and the fact that juvenile survival through the Project appears to be at least 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus will benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.2 Conclusions for UCR Spring-run Chinook Salmon

After reviewing the current status of UCR spring-run chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of this species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

NOAA Fisheries has estimated that, based on comparisons of expected juvenile survival rates to baseline survival rates, achieving the HCP survival standards at the Rocky Reach or Rock Island hydroelectric projects would increase juvenile UCR spring-run chinook salmon survival rates through each project by 7.2%, and 6.6% to 9.4%, respectively. Collectively, achieving the HCP survival standards at each of the three projects would increase juvenile survival rates through the three projects by 19.1% and 26.3% for those juveniles migrating through all three projects (i.e., from the Methow River). NOAA Fisheries finds that, based on this information, the three HCPs, both individually and collectively, represent a substantial improvement to juvenile survival over baseline conditions (see Sections 6.2.2 and 6.2.3 and Appendix A). NOAA Fisheries estimates that the resulting juvenile project survival rates would be approximately 94% to 97% of that estimated in a hypothetical free-flowing river of equal length to each of the projects individually, and 84% to 89% of that estimated for the projects collectively (see Section 6.2.3 and Appendix A).

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of ESA-listed UCR spring-run chinook salmon, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of this ITP is not likely to jeopardize the continued existence of this species for the term of the HCP.

8.2.1 Adult UCR Spring-run Chinook Salmon

For adults, this conclusion is based, in large part, on recent survival information (Section 6.2.2) and expected impacts on adult migration and survival resulting from the following elements of the proposed action compared to estimates obtained in free-flowing river systems:

- There is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).

- Adult survival and migration speed through the Project appears to be similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).

- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).

- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality that contributed to the current status for fallbacks or volitional migrants compared to turbine passage routes (Section 6.2.2).

- TDG levels resulting from spill operations for juvenile migrants will not exceed 120% (TDG waivers from the state of Washington) and should not affect adult survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the periodicity of these events (Section 6.2.4).

- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.2.2 Juvenile UCR Spring-run Chinook Salmon

For juveniles, this conclusion is based on recent Project survival estimates (Section 6.2.3) and the expected survival improvements for juvenile migrants resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality is equal to or less than 7%, based upon the results of three years of survival study indicating JPS for spring-run chinook salmon is in excess of 95%, and the fact that juvenile survival through the Project appears to be at least 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should either increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus will benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.3 Conclusions for Currently Unlisted Permit Species

After reviewing the current status of the currently unlisted Permit Species (UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon), the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of these species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

Historical survival rates of unlisted Permit Species juvenile migrants through the three projects are likely equal to, or less than, those estimated for ESA-listed Permit Species. Thus NOAA Fisheries concludes that, compared to baseline survival rates, achieving the HCP survival standards would likely increase the survival of unlisted Permit Species juvenile migrants by at least 6.5% to 7.2%, and 5.6% to 9.4%, at the Rocky Reach and Rock Island hydroelectric projects, respectively. The expected survival levels for juvenile UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon are estimated to be approximately 95% to 96%, and 94% to 96%, respectively, of those estimated for a free-flowing river of equal length to each project. Collectively, achieving the HCP survival standards at each of the three projects would likely increase survival rates by 14.2% to 26.3% for unlisted Permit Species juveniles migrating through all three projects (i.e., from tributaries upstream of Wells Dam). This represents survival levels that are approximately 86% for UCR summer/fall-run chinook salmon and 84% to 89% for Okanogan River sockeye salmon compared to survival rates estimated for a free-flowing river of equal length to the three projects.

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of the unlisted Permit Species, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of the proposed action is not likely to jeopardize the continued existence of these species for the term of the HCP.

8.3.1 Currently Unlisted Permit Species: Adults

For adults, this conclusion is based on expected impacts on adult migration and survival (Section 6.2.2) resulting from the following elements of the proposed action:

- Based on the available information (including that from other species), there is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).

- There is also a high likelihood that adult survival and migration speed through the Project is similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).

- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).

- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality that contributed to the current status for fallbacks or volitional migrants compared to turbine passage routes (Section 6.2.2).

- TDG levels resulting from spill operations for juvenile migrants will not exceed expected TDG waivers from the state of Washington and should not affect adult survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.3.2 Currently Unlisted Permit Species: Juveniles

For juveniles, this conclusion is based on the expectation that survival improvements for currently unlisted juvenile migrants will be similar to those of currently listed juvenile migrants (Section 6.2.3) and the expected impact of the following elements of the proposed action:

- Based on the available information (including that from other species), there is a high likelihood that Project-related mortality is equal to or less than 7% and juvenile survival through the Project appears to be approximately 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should either increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus should benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct." Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of an agency action is not considered to be prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of the incidental take statement.

The measures described in this section are nondiscretionary and must be included in the ITP issued by NOAA Fisheries to Douglas PUD for the operation and maintenance of the Project. NOAA Fisheries has a continuing duty to regulate the Douglas PUD activities covered by this incidental take statement. In the event that the agreed upon measures to increase survival are not implemented or conditions specified in the HCP (subject to the conditions specified in sections 2 and 10 of the HCP) are not met by 2018 or at any time thereafter, the protective coverage of Section 7(a)(2) would lapse prior to the 50-year term per the conditions set forth in Section 10 of this Opinion. To monitor the effect of incidental take, NOAA Fisheries must require Douglas PUD and the HCP committees to report their progress toward implementing the HCP measures and achieving the relevant survival standard for each Permit Species; this information must be given to NOAA Fisheries, as specified in the HCP or in this incidental take statement (50 CFR §402.14(i)(3)).

9.1 Amount or Extent of Take Anticipated

NOAA Fisheries' proposed action (issuance of an ITP for the HCP for a period of up to 50 years from the Effective Date of the HCP) is designed to minimize the incidental take of Permit Species (including currently listed UCR steelhead and UCR spring-run chinook salmon) to the maximum extent practical.

This incidental take statement explicitly excludes any take that might result from projects implemented in tributaries under the Tributary Enhancement Plan component of the HCP. Any projects implemented under this program that are likely to adversely affect listed species and result in incidental take of ESA-listed species will require separate ESA Section 7(a)(2) consultation. Similarly, this ITP explicitly excludes any take (either direct or incidental) that might result from implementing the Hatchery Compensation Plan component of the HCP, which is being considered in separate biological opinions (see Section 1).

9.1.1 Take of Juvenile Permit Species Resulting from Operation of the Project

NOAA Fisheries expects that project-related deaths (i.e., direct, indirect, and delayed mortality resulting from project effects) for juveniles of each Permit Species migrating through the Project will be equal to, or less than, 7% throughout the term of the HCP. However, through 2013, juvenile mortality may slightly exceed 7%, to the extent that initial measures fail to achieve the HCP standards. Assessments of juvenile take (JPS) will adhere to the study requirements of the HCP (see description in Section 3). This shall include any lethal take associated with the predator removal program, or the capture, handling, and transport of naturally produced juveniles for HCP-required research.

9.1.2 Take of Adult Permit Species Resulting from Operation of the Project

NOAA Fisheries further expects, based on the available information, that project-related deaths of adult Permit Species will be equal to or less than 2%. The best available information (presented in Table 3) indicates that total (natural and project-related) mortalities of adults migrating upstream through the Project range from approximately 2% to 4%. Taking into account natural mortality, which undoubtedly occurs, it is likely that the HCP standard of no more than 2% adult mortality resulting from project-related effects is being met at this time for each Permit Species. However, because it is not possible to distinguish between project-caused and natural mortality at this time, nor is it reasonable to determine the combined mortality at an individual project, NOAA Fisheries identifies the extent of allowed incidental lethal take of adult Permit Species to be no more than 4%. Take of adults will be monitored using conversion rates (as utilized in Section 6.2.2 to assess current survival levels) until such time that technologies allow for a reasonable differentiation of these sources of mortality. At that time, allowable project-related lethal take shall not exceed 2% for any Permit Species.

Project-related mortality of downstream migrating UCR steelhead kelts is unknown at this time. Survival of kelts from all tributaries within the action area to below Priest Rapids Dam was estimated at about 18% in 2002. Estimates of "natural" mortality rates for these fish - which have gone many months without feeding while expending considerable energy migrating and spawning - are not available, but are thought to be high. NOAA Fisheries expects that, compared to current survival rates, implementing HCP measures at the Project (the increased operating period of the JBS and spill to achieve the HCP survival standards) will substantially improve steelhead kelt survival through the Project in future years.

9.1.3 Take of Permit Species Resulting from Predator Control Measures

Non-lethal take of juvenile and adult Permit Species (capture and handling) as a result of predator control measures is expected to be rare. Thus NOAA Fisheries limits non-lethal take from these measures to no more than 20 juveniles and 4 adults of any Permit Species each year

and lethal take from these measures to no more than 10 juveniles and 2 adults of any Permit Species each year.

9.2 Effect of Take

Earlier in this Opinion (Sections 8.1, 8.2, and 8.3), NOAA Fisheries determined that the projected levels of survival through the term of the HCP are not likely to result in jeopardy to listed UCR steelhead or UCR spring-run chinook salmon or currently unlisted Permit Species.

9.3 Reasonable and Prudent Measures and Terms and Conditions

NOAA Fisheries believes the following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize the impacts of incidental take associated with the proposed actions at the Project. In order to be exempt from the prohibitions of Section 9 of the ESA, NOAA Fisheries must incorporate into the ITP, and FERC and Douglas PUD must comply with, all of the reasonable and prudent measures and terms and conditions set forth in Section 9.3.1.

9.3.1 HCP Measures, Terms, and Conditions

1. In accordance with the provisions of section 10 of the HCP, the ITP authorizes Douglas PUD to incidentally take Permit Species that are listed under the ESA, to the extent that such incidental take of these species would otherwise be prohibited under Section 9 of the ESA, and its implementing regulations, or pursuant to a rule promulgated under Section 4(d) of the ESA, and to the extent that the take is incidental to Douglas PUD's lawful operation of the Wells Hydroelectric Project, subject to the condition that Douglas PUD must fully comply with all requirements of the HCP and the ITP. The ITP will become immediately effective upon issuance for Permit Species currently listed under the ESA. The ITP will become effective for currently unlisted Permit Species upon any future listing of such species under the ESA as described in section 10.1.3 (Permit Modification) of the HCP, and in accordance with NOAA Fisheries' regulations governing ESA-listed species permits (50 CFR Parts 222.301-222.309).

2. Douglas PUD, in effecting the take authorized by this ITP, is considered to have accepted the terms and conditions of this ITP and to be prepared to comply with the provisions of the HCP, the ITP, the applicable regulations, and the ESA.

3. Douglas PUD must make available a copy of the ITP, including the accompanying HCP and related agreements, to personnel, contractors, or agents of Douglas PUD conducting authorized activities. All applicable provisions of the ITP must be presented and clearly explained to all authorized employees, contractors, or agents of Douglas PUD engaged in these activities.

4. Incidental take of ESA-listed Permit Species resulting from the actions of individual employees, contractors, or agents of Douglas PUD operating under the authority of this ITP in accordance with activities described in the HCP (with the exception of tributary enhancement activities or artificial production activities which are covered under separate permits or biological opinions) shall be included, as appropriate, in the allowable take authorized above in Sections 9.1.1, 9.1.2, and 9.1.3.

5. Upon request by NOAA Fisheries, Douglas PUD must allow NOAA Fisheries, or any other person(s) duly designated by NOAA Fisheries, to inspect Douglas PUD's records and facilities if such records and facilities pertain to (i) activities for which take of listed species is authorized by the ITP, (ii) ESA-listed species covered by this ITP, or (iii) NOAA Fisheries' responsibilities under the ESA.

6. Douglas PUD must provide NOAA Fisheries with copies of the HCP-specified information and reports (e.g., survival studies, committee reports, etc.) within the time frame specified by the HCP or otherwise agreed upon by the Policy, Coordinating, Hatchery, or Tributary committees.

7. Douglas PUD shall report all observations of any adult Permit Species mortality (noting whenever possible whether adult steelhead are kelts or pre-spawning adults). Douglas PUD shall also report exceedences of threshold values for descaling, injury, and mortality of juvenile Permit Species, as described in Section 3.3.5, to NOAA Fisheries, within two days of the incident, and shall include a concise description of the causative event (if known) and a description of any resultant corrective actions taken at the facility.

8. Douglas PUD shall report to NOAA Fisheries (by December 31 of each year) the number of juvenile and adult Permit Species salmon or steelhead caught or killed via implementation of the predator removal programs (noting whenever possible whether adult steelhead are kelts or pre-spawning adults).

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information. NOAA Fisheries has no conservation recommendations to make at this time.

11. REINITIATION OF CONSULTATION

This concludes formal consultation on NOAA Fisheries' proposed issuance of an ITP to Douglas PUD for the proposed Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained. To the extent that discretion has been retained, reinitiation of this consultation is required if: 1) any action is modified in a way that causes an adverse effect on the species that is new or significantly different from those analyzed in connection with the HCP, 2) new information or project monitoring reveals adverse effects of the action in a way not previously considered or that involves additional take not analyzed in connection with the original HCP, or 3) a new species is listed or critical habitat is designated that may be affected by the action.

In this HCP, NOAA Fisheries' discretion is retained subject to the following conditions (or as otherwise described in the HCP): 1) the agreement terminates early (section 1 of the HCP); 2) NOAA Fisheries elects to exercise its ability to withdraw from the HCP and/or revoke the ITP according to the conditions set forth in sections 2 and 10 of the HCP; or 3) no later than 50 years from the Effective Date of the HCP, whichever occurs sooner.

12. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

12.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A)).

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries' EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

- EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR §600.10). "Adverse effect" means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR §600.810).

- EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action as described in Section 3 of this Opinion would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

12.2 Identification of EFH

Pursuant to the MSA, the Pacific Fisheries Management Council has designated EFH for three species of Federally-managed Pacific salmon: chinook salmon (*Oncorhynchus tshawytscha*); coho salmon (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable manmade barriers (as identified by PFMC 1999), and longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

12.3 Proposed Action

The proposed action and action area are detailed in Section 3 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of UCR spring-run chinook salmon and UCR summer/fall-run chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*) (once established).

12.4 Effects of Proposed Action

As described in detail in Section 6 of this Opinion, the continued existence and operation of the Project will continue to result in both short- and long-term adverse effects to a variety of habitat parameters. These adverse effects to chinook salmon and coho salmon (once established) are:

Mainstem Spawning Habitat

- Inundation of mainstem summer/fall-run chinook salmon spawning habitat upstream of the Project.
- Altered mainstem summer/fall-run chinook salmon spawning habitat substrate downstream of the Project (reduced proportion of gravels and cobbles downstream of the Project).

Juvenile Rearing Habitat and Juvenile and Adult Migration Corridor

- Altered flow conditions (ramping) that can modify juvenile and adult fish distribution.
- Altered invertebrate (food) sources and production in the mainstem migration corridor for juvenile chinook salmon and coho salmon.

- Altered water quality, especially TDG resulting from uncontrolled spill at the Project.
- Higher than natural predation rates resulting from the Project enhancing predator habitat or foraging opportunities.
- Altered riparian vegetation which can influence cover, food production, temperature, and substrate.
- Altered juvenile behavior or reduced survival of juveniles migrating through the action area as a result of Project inundation and operations.
- Altered adult behavior or reduced survival or spawning success of adults migrating through the action area as a result of Project operations.

The HCP was developed to mitigate, to the extent practical, these adverse impacts on all Plan Species, including chinook salmon and coho salmon (once established).

12.5 Conclusion

NOAA Fisheries concludes that the continued existence and operation of the Project would continue to adversely affect designated EFH for chinook salmon and coho salmon (once established). These adverse effects would continue, but would be mitigated to the extent practical by NOAA Fisheries' issuance of an ITP to Douglas PUD for the implementation of the HCP.

12.6 EFH Conservation Recommendations

Pursuant to §305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies, including itself, regarding actions which may adversely affect EFH. The applicable conservation measures described in the FEIS and in Section 3 of this Opinion will be implemented by Douglas PUD at the Project and in upstream tributary habitat. These measures, in addition to those terms and conditions outlined in Section 9 of this Opinion, are generally applicable to designated EFH for chinook salmon and coho salmon and, together, should address these adverse effects to the extent practical (e.g., inundation effects). Consequently, NOAA Fisheries recommends that the terms and conditions in Section 9, in addition to those required by the HCP, be adopted as EFH conservation measures.

12.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR §600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the

scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

12.8 Supplemental Consultation

NOAA Fisheries must reinitiate EFH consultation with itself in the event that it elects to withdraw from the HCP and/or revoke the ITP. This action would constitute a substantially revised proposed action that may adversely affect EFH and new information that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR §600.920(k)).

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APPENDIX A

ASSESSMENT OF THE MID-COLUMBIA HABITAT CONSERVATION PLANS' 93% JUVENILE PROJECT SURVIVAL STANDARD COMPARED TO BASELINE SURVIVAL ESTIMATES AND ESTIMATED SURVIVALS IN A HYPOTHETICAL FREE-FLOWING RIVER

The purpose of this appendix is to assess the relative juvenile survival benefit of implementing the proposed anadromous fish agreements and habitat conservation plans (HCP) compared to two useful points of reference: 1) the survival that might be expected in a hypothetical "free-flowing" or undammed river, and 2) the estimated survival of these fish under existing operations (i.e., baseline conditions that contributed to the current rangewide status of the evolutionarily significant units [ESU] prior to the HCP measures being either partially or fully implemented).

Background and Purpose

The Public Utility District No. 1 of Douglas County (Douglas PUD) and the Public Utility District No. 1 of Chelan County (Chelan PUD) have applied for Incidental Take Permits (ITPs) for the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects (Projects) in accordance with three HCPs offered for signing on March 26, 2002. The HCPs are the culmination of over nine years of planning and negotiations between the National Marine Fisheries Service (NOAA Fisheries), Douglas PUD, Chelan PUD, and other participants in the HCP process. Participants included U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla), American Rivers, and representatives of the major wholesale purchasers of electricity from Wells Dam. All of the participants, with the exception of the Yakama and Umatilla Tribes and American Rivers, indicated their support of the Wells HCP, pending the outcome of regulatory review, by signing the HCP document in the spring of 2002. Douglas PUD, NOAA Fisheries, USFWS, WDFW, the Colville Tribe, and Douglas PUD's power purchasers are hereinafter referred to as the Signatory Parties. The species included in the HCPs include both ESA-listed (Upper Columbia River [UCR] steelhead and UCR spring-run chinook salmon) and unlisted (UCR summer/fall-run chinook salmon, Lake Wenatchee sockeye salmon, and Okanogan River sockeye salmon), collectively referred to as Permit Species.[1]

NOAA Fisheries noticed receiving completed ITPs (Nos. 1391, 1392, and 1393) and HCPs in the Federal Register on June 25, 2002 (67 FR 42755) and received public comments through July 29, 2002. The Environmental Protection Agency (EPA) noticed NOAA Fisheries' Final Environmental Impact Statement (FEIS) in the Federal Register on December 27, 2002 (67 FR 79081), initiating a 30-day cooling-off period during which NOAA Fisheries invited comments on, or questions about, the FEIS. NOAA Fisheries received comments through February 10, 2003. Alternative 3 (Proposed Action - Project HCPs) of the FEIS describes the proposed action as well as the likely effect of issuing the proposed ITPs to Douglas and Chelan PUDs for a

[1]Coho salmon are considered extinct in the Mid-Columbia River and its tributaries. However, coho salmon are also included in the agreement, pending their successful reintroduction. They and the other Permit Species are jointly referred to as "Plan Species" in the HCPs.

period of 50 years. At this time, NOAA Fisheries proposes to issue an ITP permit to Douglas PUD for incidental take of ESA-listed and unlisted salmon and steelhead resulting from the continued operation of the Wells Hydroelectric Project, in accordance with the conservation, minimization, and mitigation measures proposed in the HCP. The FEIS thus serves as NOAA Fisheries' biological assessment for the purpose of consulting on its proposed action of issuing the ITPs in accordance with Section 10(a)(2)(B) of the ESA.

As a good-faith gesture, Douglas and Chelan PUDs have been implementing the operational components of the HCPs since the HCPs were offered for signing in 2002. In addition, Chelan PUD has constructed a new juvenile bypass facility at its Rocky Reach project, which became operational in 2003. Thus the operational and structural components of the HCPs are being fully implemented at all three projects for the first time during the 2003 outmigration.

Fish from the Methow and Okanogan rivers must migrate through all three of the HCP projects, Grant County PUD's Wanapum and Priest Rapids dams, the free-flowing Hanford Reach, and four Federally-owned hydroelectric projects (McNary, John Day, The Dalles, and Bonneville dams). Fish from the Entiat River must migrate through only two HCP projects (Rocky Reach and Rock Island dams) and fish from the Wenatchee River must migrate through only the Rock Island Hydroelectric Project, in addition to the other downstream hydroelectric projects.

Estimate of Survival in Free-Flowing River

Estimates of survival have been made for wild spring-run chinook salmon smolts migrating from the Salmon River trap at Whitebird to Lower Granite Dam (1966 through 1968) and for wild spring chinook salmon and steelhead from 1993 through 1998. The estimates for both periods include survival through Lower Granite Reservoir. NOAA Fisheries, after factoring out mortalities resulting from Lower Granite Dam and Reservoir, has estimated that the per/km survival of Snake River steelhead and spring-run chinook salmon would be approximately 0.99966 and 0.99969, respectively, in a free-flowing Snake River.[2]

The distance from the tailrace of Chief Joseph Dam to the tailrace of Rock Island Dam is approximately 147.6 km and includes the three HCP projects - hereinafter referred to as the HCP Reach. Assuming that per/km survival estimates based on information collected in the Snake River can be utilized as reasonable surrogates for likely per/km survival estimates in a hypothetical free-flowing Columbia River yields the estimates of juvenile survival shown in Table A-1. These values are calculated by taking the per/km survival estimate to the X (# of kilometers in the reach) power. For example: 0.99966 to the 147.6th power = 0.951 or 95.1%. The estimated average "natural" survival through a hypothetical free-flowing HCP Reach would

[2] The methodologies used in this analysis are detailed in Appendix A (Annex 1) of the 2000 FCRPS biological opinion.

be 95.1% and 95.5% for juvenile steelhead and spring-run chinook salmon, respectively (Table A-1).

Estimated Survival Through HCP Reach Under Baseline Conditions

Cooney (2002) reviewed the available survival data during the 1980s and early 1990s in the Mid-Columbia Reach. This information was summarized and presented in the draft Quantitative Analytical Report (QAR). The project survival estimates used in the draft QAR for the HCP projects resulting from operations during this period are shown in Table A-2 (baseline). Survival estimates for each project ranged from 87.1% to 91.3% for migrating steelhead, and from 86.5% to 89.0% for spring-run chinook salmon smolts.

Based on these estimates, the estimated survival of migrating steelhead during this period was approximately 69.8% through the HCP Reach, or 73.4% of the "natural" survival estimate through the hypothetical free-flowing river of equal length. The estimated baseline survival of migrating spring chinook salmon was approximately 67.0% through the HCP Reach, or 70.1% of the estimated survival through the hypothetical free-flowing river of equal length. These are the best estimates available of baseline survival through the HCP Reach.

Estimated Survival Through the HCP Reach (93% Juvenile Project Survival Standard Achieved)

The key juvenile survival metric stipulated in the HCPs is the 93% juvenile project survival metric. This metric encompasses survival through the reservoir, forebay, dam, and tailrace of each individual HCP project during HCP operations that are designed to cover at least 95% of the juvenile migration of each Permit Species. It is the minimum standard that would indicate that the HCP survival standards have been achieved.

This scenario assumes that 95% of the juvenile spring-run chinook salmon and steelhead pass the project and survive at the minimum HCP standard survival rate of 93%. It also assumes that only 96% of the remaining migrants (5%) survive the reservoir, and that all of these fish are forced to pass the dam via turbines at an average survival rate of 91.5%.[3] This approach yields an estimated juvenile project survival of 92.7% ([.95 x.93]+[.05 x.96 x.915]) for both species.

Using these assumptions, the survival at each project for either juvenile steelhead or spring-run chinook salmon would be approximately 92.7% (see Table A-2, HCP, 93% Juvenile Project Survival). The minimum survival estimates through the HCP Reach after implementing the HCPs would be 79.8% for both steelhead and spring-run chinook salmon, representing an improvement over the baseline survival through the HCP Reach of 14.2% for steelhead and

[3]91.5% is the middle of the range (90% to 93%) of estimated survival for fish passing through turbines at the three HCP projects - see FEIS, table 2-4.

19.1% for spring-run chinook salmon. At each project, implementing the HCP would result in survival improvements (over baseline) ranging from 1.6% to 6.5% for juvenile steelhead and 4.2% to 7.2% for juvenile spring-run chinook salmon.

Comparing these minimum survival estimates as a fraction of those that would occur in a hypothetical free-flowing river of the same length as the HCP Reach is also indicative of the survival benefits accruing to these species as a result of implementing the HCPs. For steelhead and spring-run chinook salmon, minimum HCP survivals would result in survival levels that are roughly 83.9% and 83.5%, respectively, of estimated survival in the hypothetical free-flowing HCP Reach. Comparisons for individual projects result in survivals of between 93.7% and 94.9% (for each species) of those estimated for hypothetical free-flowing rivers of equal length to the individual projects (Table A-2, HCP, 93% Juvenile Project Survival).

These survival estimates should be viewed as very conservative, especially for spring migrating juveniles like UCR steelhead and UCR spring-run chinook salmon. In reality, project survival is expected to be much higher for the following reasons:

1. Because the HCP applies equally to all Permit Species, the differential timing of the migration of each species during the spring will result in 95% to 100% of an individual species' juvenile migration being covered by HCP measures. This will likely not be the case for summer migrants (primarily UCR summer/fall-run chinook salmon).

2. Similarly, because juveniles of different species will undoubtedly survive at different rates under one suite of operations, the requirement to meet the minimum survival standard of each Permit Species will automatically result in some species surviving at rates substantially exceeding the 93% juvenile project survival metric. For example, 15% spill levels may prove sufficient (in addition to other measures) to achieve the standard for steelhead and spring-run chinook salmon, but spill levels of 25% may be needed to meet the HCP standard for sockeye salmon. The increased spill to meet the HCP standard for sockeye salmon in this example would likely result in survival rates in excess of 93% for the other species.

3. Finally, some measures (e.g., operation of juvenile bypass systems at Wells and Rocky Reach) are relatively inexpensive (compared to providing passage via the spillways) and will be operated to cover 95% of the juvenile migrations - potentially covering virtually the entire migration of all Permit Species.

Estimated Survival Through HCP Reach (Actual Survival Measurements with HCP

Operations)

Only four juvenile survival studies that comply with HCP study requirements have been completed at the individual projects. Three of these studies were conducted at the Wells Project (two using steelhead and one using yearling chinook salmon) and the fourth was conducted at the Rock Island Project using yearling chinook salmon.[4] Under most environmental conditions, steelhead and yearling chinook salmon smolts typically survive at similar rates.[5] Thus the average of these project-specific estimates is used in the remainder of this analysis. Because no HCP compliant survival studies have been conducted to date at the Rocky Reach Project, the survival estimate used in this analysis was simply the minimum HCP survival would be achieved (as analyzed in the previous section).[6] For the reasons noted at the end of the previous section, these estimates (especially that for the Rocky Reach Project) should again be viewed as very conservative.

Using these assumptions, the estimated juvenile project survivals range from 92.7% to 95.8% for both species at the HCP projects for a total HCP Reach survival estimate of 84.6%. Compared to baseline survival estimates for juvenile steelhead, fully implementing the HCPs would increase survival by 4.9% to 8.4% at each project (21.1% for the HCP Reach). Compared to baseline survival estimates for juvenile spring-run chinook salmon, fully implementing the HCPs would increase survival by 7.2% to 9.4% at each project (26.3% for the HCP Reach). These results are summarized in Table A-2 (HCP, Actual Measured).

Compared to the hypothetical free-flowing river, implementing the HCPs for steelhead and spring-run chinook salmon will result in survival estimates that are 94.9% to 97.3%, and 94.7% to 97.2%, respectively, of the "free-flowing" survival estimates for reaches of equal lengths to the projects. Together, survival through the HCP Reach would be 88.9% (steelhead) and 88.5% (spring-run chinook salmon) of that estimated to occur through a free-flowing HCP Reach.

Unlisted Permit Species

[4]The survival of yearling chinook is again being assessed at the Rock Island Project in 2003. Unfortunately, the results of this study were not available for inclusion in this analysis. Additional studies are planned in future years.

[5]In 2001, an extremely low flow year in the Columbia River basin, yearling chinook salmon smolts survived at much higher rates than steelhead smolts.

[6]A new juvenile bypass system was constructed at Rocky Reach Dam and became operational in time for the 2003 migration season. Project operations are being evaluated in 2003 and HCP-compliant survival studies are planned for 2004 through 2006.

Comparisons using the hypothetical free-flowing river cannot be made for unlisted sockeye salmon at this time, as per/km survival estimates for sockeye salmon are unavailable. However, estimates are available for Snake River fall-run chinook salmon, which exhibit an "ocean-type" life history similar to that of UCR summer/fall-run chinook salmon. The 2000 FCRPS biological opinion provided two estimates of juvenile Snake River fall-run chinook salmon survival through a hypothetical free-flowing Snake River. The first (Method A) provided an estimate of .9978 per/ km, and the second (Method B) provided an estimate of .9995 per/km. Using these estimates, survival through a free-flowing river of equal length to each HCP project could range from 86.4% to 98.3%. Survival through the HCP Reach could range from 72.3% to 92.9% using these estimates (see Table A-1). Survival of unlisted sockeye salmon in a free-flowing river would most likely be similar to that of other spring migrants.

For the unlisted Permit Species, implementing the HCPs will probably result in survival levels somewhere between those estimated for the listed Permit Species with the HCP Juvenile Project Survival Standards merely being met and the actual measured survival estimates (i.e., 92.7% to 95.8%) (see Table A-2). Because estimates of juvenile steelhead and spring-run chinook salmon survival through hydroelectric projects are generally equal to or higher than those estimates for summer/fall-run chinook salmon or sockeye salmon, the expected improvement in survival should also be equal to or greater than those indicated in Table A-2 for the ESA-listed species. Thus for those unlisted juveniles migrating through the entire HCP Reach, survival should also improve by approximately 14% to 26% compared to the survival rates that were probably occurring prior to any HCP measures being implemented (baseline).

Implementing the HCPs should increase survival rates of juvenile sockeye salmon to a similar extent (if per/km juvenile sockeye salmon survival rates are similar to or lower than those estimated for ESA-listed steelhead or spring-run chinook salmon) compared to a hypothetical free-flowing HCP Reach (i.e., to somewhere between 83.5% and 88.9%).

Assuming that only the minimum HCP juvenile project survival standard (93% covering 95% of the migration) is achieved for UCR summer/fall-run chinook salmon (92.7% survival for the entire migration), implementing the HCPs would result in HCP Reach survivals of 79.7%. Compared to survival through a free-flowing HCP Reach (72.3% using Method A and 92.9% using Method B), this would equate to a relative survival of 110.2% using Method A and 85.8% using Method B. Using Method A per/km survival estimates appears to generate unreasonable survival estimates (i.e., expected survivals with the HCP would be higher than survival estimates for hypothetical free-flowing river reaches of equal lengths) when compared to the analysis for other species presented earlier in this document. Method B per/km survival estimates appear to generate comparative HCP Reach survival estimates more in line with those estimated for other species: 85.8% of the hypothetical free-flowing river versus 83.9% for steelhead and 83.5% for spring-run chinook salmon. Achieving the HCP project survival standards would thus appear to provide equivalent or higher survival levels (compared to the hypothetical free-flowing river of the same length) for UCR summer/fall-run chinook salmon as for UCR steelhead or UCR spring-

run chinook salmon.

Conclusions

Based on this analysis, for ESA-listed UCR steelhead and UCR spring-run chinook salmon smolts, implementing the HCPs should provide survival levels similar to (or greater than, in the case of the Rocky Reach Project) those actually measured in recent years Table A-2 (HCP, Actual Measured). Thus implementing the HCPs would substantially increase survival rates of juvenile steelhead and spring-run chinook salmon through each project as well as through the HCP Reach (by up to approximately 21% for steelhead and 26% for spring-run chinook salmon) compared to baseline survival estimates. Survival rates with the HCPs should result in juvenile survival rates approaching 90% of those estimated for a hypothetical free-flowing river reach of comparable length for steelhead and spring-run chinook salmon (and for unlisted sockeye salmon) (see Table A-2, HCP, Actual Measured) and 86% or better for summer/fall-run chinook salmon (see Unlisted Species section above).

References

Cooney, T.D. 2002. Upper Columbia River steelhead and spring chinook salmon quantitative analysis report: run reconstructions and preliminary assessment of extinction risks. Final Draft, September 25, 2002. Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 2725 Montlake Boulevard East, Seattle, Washington 98112-2097.

NMFS. 2000. Biological Opinion - reinitiation of consultation on operation of the Federal Columbia River Power System, including the juvenile fish transportation program, and 19 Bureau of Reclamation Projects in the Columbia basin.

Table A-1. Estimated average per/km juvenile survival of steelhead and chinook salmon in a hypothetical free-flowing river through the HCP projects and HCP Reach.

Species	Steelhead	Spring Chinook	Summer/Fall Chinook	
			Method A	Method B
Per/km survival estimate	0.99966	0.99969	0.9978	0.9995

Project	Length (miles)	Length (km)	Est. Surv. Steelhead	Est. Surv. Spring Chinook	Est. Surv. Sum/Fall chinook	
					Method A	Method B
Rock Island	21.1	34.0	0.989	0.990	0.928	0.983
Rocky Reach	41.3	66.5	0.978	0.980	0.864	0.967
Wells	29.3	47.2	0.984	0.985	0.901	0.977
HCP Reach	91.7	147.6	0.951	0.955	0.723	0.929

Source: 2000 FCRPS Opinion, pg. 9-262 and 263.

Table A-2. Estimates of baseline, minimum HCP implementation, and actual estimated survivals of juvenile steelhead and spring-run chinook salmon in the HCP Reach compared to estimated survival in a hypothetical free-flowing river.

Estimated Juvenile Steelhead Survivals								
	Baseline (Draft QAR 2002)		HCP (93% Juvenile Project Survival)[1]			HCP (Actual Measured)[1, 2]		
Project	Project Survival	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing
Rock Island	0.878	88.8 %	0.927	5.6%	93.8%	0.952	8.4%	96.3%
Rocky Reach	0.871	89.1%	0.927	6.5%	94.9%	0.927	6.5%	94.9%
Wells	0.913	92.8%	0.927	1.6%	94.2%	0.958	4.9%	97.3%
HCP Reach Total	0.698	73.4%	0.798	14.2%	83.9%	0.846	21.1%	88.9%
Estimated Juvenile Spring-run Chinook Salmon Survivals								
	Baseline (Draft QAR 2002)		HCP (93% Juvenile Project Survival)[1]			HCP (Actual Measured)[1, 2]		
Project	Project Survival	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing
Rock Island	0.870	87.9%	0.927	6.6%	93.7%	0.952	9.4%	96.2%
Rocky Reach	0.865	88.3%	0.927	7.2%	94.7%	0.927	7.2%	94.7%
Wells	0.890	90.3%	0.927	4.2%	94.1%	0.958	7.6%	97.2%
HCP Reach Total	0.670	70.1%	0.798	19.1%	83.5%	0.846	26.3%	88.5%

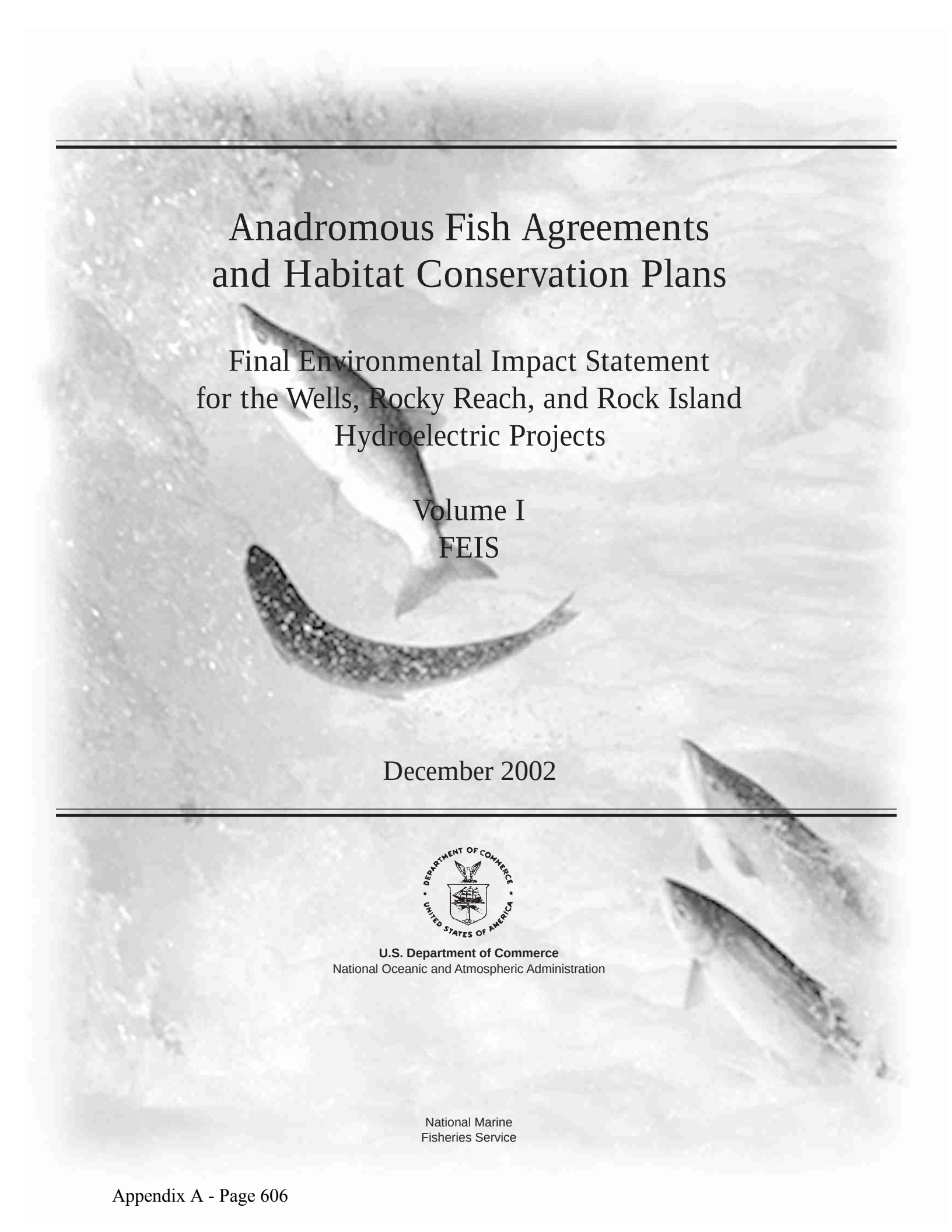
[1]Project Survival standard apples to 95% of the juvenile migration. The remaining 5% is assumed to pass through turbines. These are minimum estimates as some juvenile measures (Wells bypass operations and Rocky Reach bypass operations) will cover nearly 100% of the migration of UCR steelhead and/or spring-run chinook at these projects. Turbine survival estimated at 91.5% (middle of range presented in table 2-4 of FEIS); pool survival estimated at 96.0% (consistent with draft QAR analysis and similar to pool survival estimates in 2000 FCRPS Opinion).

[2]Wells Project survival estimates represent the average of three juvenile survival studies conducted in accordance with the HCP study requirements and with HCP operations being implemented (covering 95% of the juvenile migrants). Individual estimates were: 1998 yearling chinook salmon (99.7%); 1999 steelhead (94.3%); 2000 steelhead (94.6%). Rock Island Project survival estimates represent a single juvenile survival study conducted in accordance with the HCP study requirements (covering 95% of the juvenile migrants) and with HCP operations being implemented. The estimate for 2002 yearling chinook was 95.6%. Rocky Reach had no survival studies conducted which meet HCP study requirements or operations.

Biological Opinions Supporting Incidental Take Permits

Final Environmental Impact Statement for Wells, Rocky Reach and Rock Island Hydroelectric Projects – Permit No. 1391, 1392 and 1393 (2002)

Volume I (Summary and Chapters 1 – 10)



Anadromous Fish Agreements and Habitat Conservation Plans

Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Volume I
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December 2002

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine
Fisheries Service

Public Utility District
No. 1 of Douglas County

National Marine
Fisheries Service

Public Utility District
No. 1 of Chelan County

Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Final Environmental Impact Statement

Submitted pursuant to
the National Environmental Policy Act [42 U.S.C. 4322(2)(c)]

by the

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

in cooperation with

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY
PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY
FEDERAL ENERGY REGULATORY COMMISSION

ACRONYMS

ALCOA	Aluminum Company of America
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BP	before present
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
DDT	dicholoro-diphenyl-tricholoroethane
Ecology	Washington Department of Ecology
EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
HCP	habitat conservation plan
JARPA	Joint Aquatic Resource Permit Application
kcfs	thousand cubic feet per second
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity unit
ODFW	Oregon Department of Fish & Wildlife
PIT	passive integrated transponder
PUD	public utility district
QAR	Quantitative Analysis Report
RCW	Regulatory Code of Washington
ROD	Record of Decision
SEPA	State Environmental Policy Act
TMDL	total maximum daily load
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish & Wildlife
WRIA	Watershed Resource Inventory Area

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Final Environmental Impact Statement

Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

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Abstract: The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) is evaluating the decision to authorize incidental take permits pursuant to Endangered Species Act Section 10(a)(1)(B) for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs [Chelan County PUD and Douglas County PUD]). The HCPs were developed to protect five species of Columbia River steelhead and salmon (spring-run chinook salmon [*Oncorhynchus tshawytscha*], summer/fall-run chinook salmon [*O. tshawytscha*], sockeye salmon [*O. nerka*], steelhead [*O. mykiss*], and coho salmon [*O. kisutch*]), two of which are currently listed as endangered (Upper Columbia River spring-run chinook salmon and steelhead) under the Endangered Species Act. The HCPs' fish protection measures also satisfy the PUDs' regulatory obligations with respect to anadromous salmonid species under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 RCW. The agreements would set a "no net impact" standard for salmon and steelhead protection at three hydropower projects (Wells, Rocky Reach, and Rock Island) operated by the Chelan and Douglas County PUDs, and provide the PUDs with some degree of certainty for the long-term operation of these projects. Plan coverage of the three species not listed as endangered should help prevent the need to list these species in the future. This EIS describes three alternatives. Alternative 1 is the no-action alternative that represents existing conditions under the project licenses, subsequent license amendments, and settlement agreements. Alternative 2 is application of alternative anadromous fish conservation measures considered during the NEPA process that could be implemented under the Federal Power Act or Section 7 of the Endangered Species Act, whereas Alternative 3 represents application of the measures and survival standards defined in the HCP. Under Alternative 3, three HCPs representing Wells, Rocky Reach, and Rock Island hydroelectric projects would be approved and in effect over a 50-year permit term.

The following table summarizes the expected conservation measures associated with each alternative, relative to the components of the no net impact standard established for Alternative 3. This standard consists of meeting 91 percent combined adult and juvenile project passage survival, with compensation for the remaining 9 percent unavoidable

project passage mortality through 7 percent hatchery production and 2 percent funding of tributary habitat enhancement projects.

EXPECTED CONSERVATION MEASURES BY ALTERNATIVE

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
ESA-Listed Anadromous Salmonid Protection	No additional protection for ESA-listed anadromous salmonid species	Additional protection necessary to prevent extinction of the ESA-listed anadromous salmonid species	Additional protection to meet a no net impact standard consisting of 91% combined adult and juvenile survival, habitat improvements, and hatchery production
Non-Listed Anadromous Salmonid Protection	No additional protection	No additional protection	Same as above for ESA-listed anadromous salmonid species
ESA-Listed Species Recovery Potential	Steelhead and spring-run chinook populations continue trending down at a loss rate of 5 to 10% per year	Estimated 22 to 45% survival improvement potential over Alternative 1; additional basin-wide measures needed to meet recovery goals	Similar to Alternative 2, plus up to an additional 6% survival increase due to tributary habitat enhancements; additional measures may be needed to meet recovery goals
Juvenile Survival Standard	Meet existing on-site fish passage efficiency criteria	Increase spill, as needed, to meet unspecified survival rates for ESA-listed species	Meet the juvenile component of the no net impact standard (93% juvenile project passage, or 95% juvenile dam passage survival) for all anadromous salmonids
Adult Survival Standard	Continue existing fish passage protocols	Minimize impacts to ESA-listed species	Meet the adult no net impact standard component (98% project passage survival) for all anadromous salmonids
Tributary Habitat Enhancement	No PUD-funded habitat improvements	Same as Alternative 1	$46.5 million (1998 dollars) PUD funding provided over 50 years
Hatchery Production	Meet existing license and settlement criteria	Same as Alternative 1, although likely reductions to minimize effects on ESA-listed species	Same as Alternative 1 until at least 2013; possible subsequent reductions based on impacts to ESA-listed species
Cost (in millions)	$156 for Wells	$867 for Wells	$188 for Wells
	$392 for Rocky Reach	$1,474 for Rocky Reach	$511 for Rocky Reach
	$170 for Rock Island	$688 for Rock Island	$316 for Rock Island

ESA = Endangered Species Act

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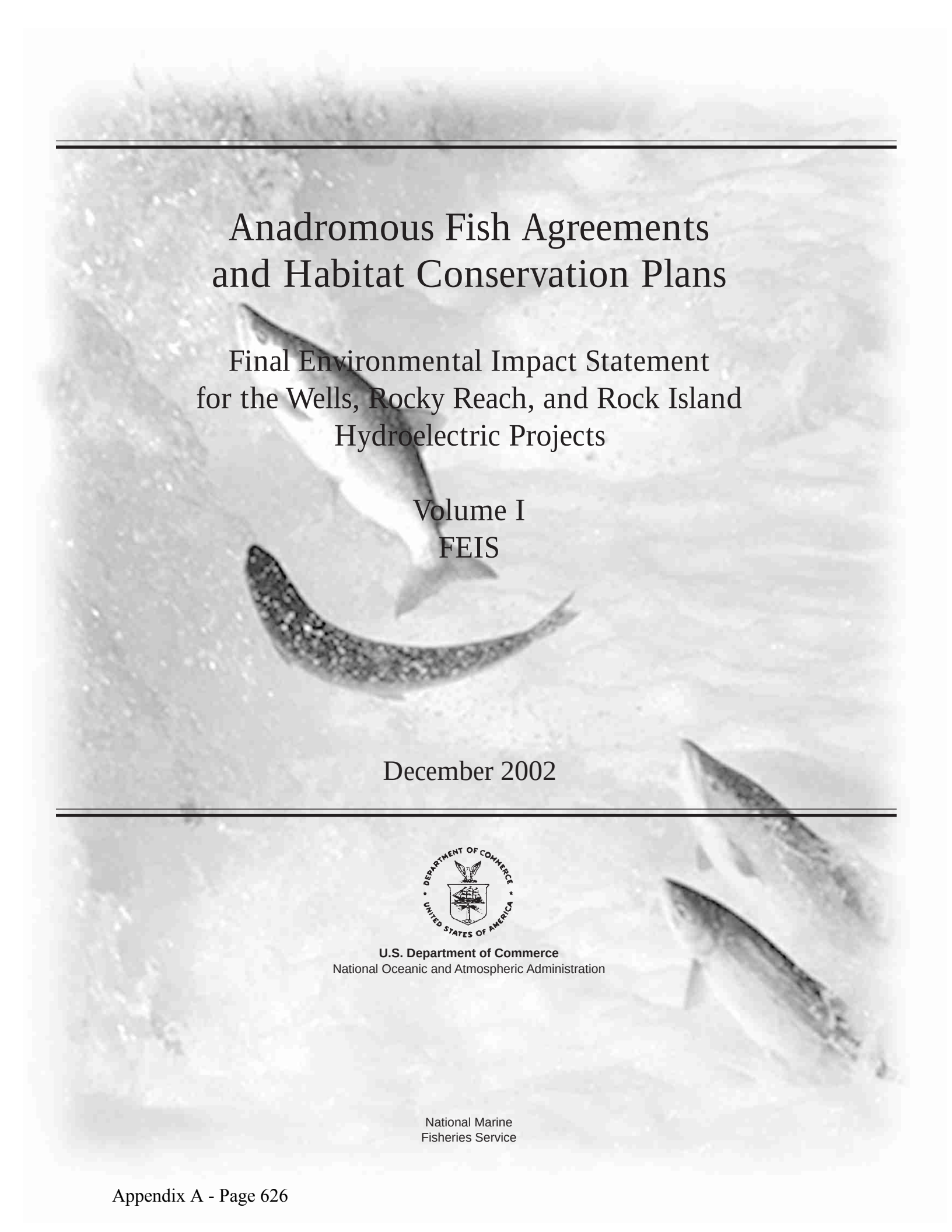

Anadromous Fish Agreements and Habitat Conservation Plans

Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Volume I
FEIS

December 2002

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine
Fisheries Service

Summary

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SUMMARY

S.1 PROPOSED ACTION

The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) is evaluating the decision to authorize incidental take permits, in accordance with Section 10 (a)(1)(B) of the Endangered Species Act of 1973, for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs) for the Wells (Federal Energy Regulatory Commission [FERC] project number 2149), Rocky Reach (FERC project number 2145), and Rock Island (FERC project number 943) hydroelectric projects (67 Federal Register 42755 [June 25, 2002]). The HCPs were developed to protect five species of Columbia River anadromous salmonids (referred to as Plan species), two of which are currently listed as endangered under the Endangered Species Act.

The fish protection measures and methodologies proposed under the HCPs would also represent long-term settlement agreements under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, and Title 77 Regulatory Code of Washington (RCW) for the five species.

The HCPs are consistent with the protocols and provision of the Basinwide Salmon Recovery Strategy "All-H Paper" (Federal Caucus 2000) and the reasonable and prudent alternatives contained in the biological opinion for the Federal Columbia River Power System (NMFS 2000a).

The agreements would set a "no net impact" standard for salmon and steelhead protection at three hydropower projects operated by the Chelan and Douglas County PUDs and provide the PUDs with some degree of certainty for the long-term operation of these projects. Plan coverage of the three species not listed as endangered is expected to reduce the possibility that these species would be listed in the future.

The anadromous fish agreements and HCPs are the result of more than 9 years of planning and negotiations between the interested parties. In addition to NMFS and the PUDs, participants in the HCP development process were the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Colville Reservation (Colville), and the Confederated Tribes of the Umatilla Indian Reservation (Umatilla) (collectively, the Joint Fisheries Parties); American Rivers, Inc.; and the major wholesale purchasers of the PUDs' electricity.

NMFS is the Federal agency responsible for protecting anadromous salmon and steelhead and is the lead agency for this National Environmental Policy Act (NEPA) final environmental impact statement (FEIS). The FERC is a cooperating agency for the purpose of developing the EIS, and the PUDs will coordinate compliance with the State Environmental Policy Act (SEPA).

The PUD No. 1 of Douglas County is applying for a permit covering the Wells Hydroelectric Project, and the PUD No. 1 of Chelan County is applying for permits to cover the Rocky Reach and Rock Island hydroelectric projects. The permit applications are based upon the HCPs and their exhibits and supporting documents.

The incidental take permits would provide coverage for four Permit species:

1. Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*),

2. Upper Columbia River summer/fall chinook salmon (*O. tshawytscha*),

3. Okanogan River and Lake Wenatchee sockeye salmon (*O. nerka*), and

4. Upper Columbia River steelhead (*O. mykiss*).

Currently, Upper Columbia River steelhead and spring-run chinook salmon are listed as endangered under the Endangered Species Act. During the species status evaluations, NMFS and USFWS determined that these Evolutionarily Significant Units represented the last of the remaining genetic resources of fish that migrated into the Upper Columbia River prior to the construction of Grand Coulee Dam. As a result, although these fish spawn in an area typically referred to as the Mid-Columbia River reach, they are designated as Upper Columbia River Evolutionarily Significant Units. For the purpose of this EIS, the Mid-Columbia River Reach is defined as the area of the river between the Chief Joseph Dam tailrace and the confluence of the Yakima River.

Although summer/fall chinook and sockeye salmon have not been listed, the Permits would cover these species as well, according to the June 17, 1999 Federal policy governing the use of HCPs for the conservation of candidate or potential candidate species. The "No Surprises" policy associated with these agreements assures the PUDs that no additional measures would be required by NMFS for the duration of the Permits, for any of the Permit species.

Coho salmon *(O. kisutch),* an extinct species in the Mid-Columbia region, are also included in the HCPs as a Plan species. Recently, attempts have been made to reintroduce coho salmon into the area.

Although a Plan species, coho salmon are not considered a Permit species because an extinct species is not subject to Endangered Species Act jurisdiction. Thus, there are four Permit species and five Plan species covered by the HCP agreements.

The Columbia River bull trout populations were also listed as threatened under the Endangered Species Act in June 1998 (USFWS 1998). Because bull trout are not an anadromous species, this species is under the jurisdiction of the USFWS, rather than NMFS. The HCPs cover anadromous species under the jurisdiction of NMFS. However, bull trout are reviewed in this EIS to ensure that the HCPs' conservation measures do not negatively affect bull trout migration, breeding, cover, and resting areas.

S.2 PROJECT APPLICANTS

The project proponents are the following:

- The Douglas County PUD, a Washington municipal corporation, is sponsoring the Wells Anadromous Fish Agreement and HCP.

- The Chelan County PUD, a Washington municipal corporation, is sponsoring the Rocky Reach and Rock Island Anadromous Fish Agreements and HCPs.

The Chelan and Douglas County PUDs would file applications requesting FERC to amend their existing licenses to include the HCPs. In addition, the PUDs would rely upon the HCPs to fulfill their obligations for anadromous salmonids under new license agreements.

The HCPs would meet the Endangered Species Act requirements for the Permit species through the 50-year HCP terms. The Wells HCP becomes effective on the date that FERC adopts the HCP

terms into the project license. The Rocky Reach and Rock Island HCPs would become effective on the date the last signatory party signs the agreements. If FERC does not relicense the projects, or issues a license inconsistent with the conditions of the Permit and HCP, then NMFS may withdraw from the agreement and the Permit will not take effect. The applicants would then be obligated to meet Endangered Species Act requirements through Section 7 consultations.

S.3 PURPOSE AND NEED

The purpose and need for this project is to develop methods to protect anadromous salmonids in the Mid-Columbia River reach while allowing Chelan and Douglas County PUDs to continue to generate electricity to meet the power demands of the Pacific Northwest. The action alternatives considered in this EIS would result in:

- developing a comprehensive, long-term strategy for protecting and aiding in the recovery of anadromous salmonids in the Mid-Columbia River, two of which are currently listed as endangered under the Endangered Species Act;
- providing a process for managing fish passage issues for relicensing the three projects under the Federal Power Act;
- meeting applicable legislative requirements pertinent to the Endangered Species Act, including ensuring that any incidental take of listed species caused by the projects would not appreciably reduce the likelihood of the survival and recovery of the species it the wild;
- meeting NMFS's responsibilities under the Magnuson-Stevens Fishery Conservation Act to ensure the sustainability of the nation's fisheries resources;
- allowing the Chelan and Douglas County PUDs to plan for long-range operations with a degree of certainty to economically operate their projects and fulfill their long-term bonding and contractual sales obligations; and
- helping to ensure stable power supplies and pricing for the utilities' customers.

The project need is based on the substantial population decline of anadromous salmonids since European settlement of the Columbia River Basin. This decline is due (1) loss, destruction, or degradation of tributary habitat; (2) overharvest, genetic introgression, and competition with hatchery-reared fish; and (3) habitat inundation, blockage, and mortality from construction and operation of dams and reservoirs. Increased survival of all life stages of anadromous fish within the Columbia River Basin is necessary to meet the dual goals of recovering Endangered Species Act-listed anadromous fish and providing self-sustaining, harvestable populations of anadromous salmonids. The Wells, Rocky Reach, and Rock Island hydroelectric projects have affected anadromous salmonid populations through inundation of mainstem spawning and rearing habitat, decreased survival of migrating juveniles as they pass the projects, and possibly by decreasing survival or spawning success of migrating adults.

Since the projects were constructed, the applicants have worked (often in cooperation with other resource managers) to improve fish passage survival through facility and operational improvements and mitigate for project effects by funding hatcheries. Under the current licenses and agreements, each of the three projects has unique mitigation, compensation, and species protection requirements. However, a coordinated, comprehensive approach with similar performance survival standards among the three dams is currently not in place. Because the projects occur in the same geographical area

(whereby the reservoirs of the downstream projects encroach on the tailraces of the upstream projects) and operationally affect each other through changes in water quality parameters, a comprehensive cooperative approach among the projects would help to minimize fish losses and enhance fish passage opportunities in the Mid-Columbia reach.

S.4 PROJECT LOCATION

The Wells, Rocky Reach, and Rock Island hydropower projects are part of an 11-dam system on the mainstem Columbia River within the continental United States. Their location relative to the other projects in the region is shown in Figure S-1. Most of the projects on the mainstem Columbia River are Federally operated, although local PUDs operate five of the projects in the Mid-Columbia River segment. In addition to the three projects operated by the Chelan and Douglas County PUDs, the PUD No. 2 of Grant County operates the Priest Rapids and Wanapum dams (Priest Rapids Project).

The Douglas County PUD operates the Wells Project located at river mile 515.8 on the Columbia River, north of the City of Wenatchee. Wells began commercial operations on August 22, 1967, and is operated under a license issued by FERC, which expires in the year 2012.

Chelan County PUD operates the Rocky Reach and Rock Island hydroelectric projects. Rocky Reach Dam is located about 8 miles upstream from the City of Wenatchee, at river mile 474.5. The Federal Power Commission issued the original operating license for Rocky Reach on July 11, 1957. The license expires in 2006. Rock Island, which was the first hydroelectric project to span the Columbia River, is located about 13 miles downstream from the City of Wenatchee at river mile 453.4. Rock Island began operating in 1933, and its operating license expires in the year 2028.

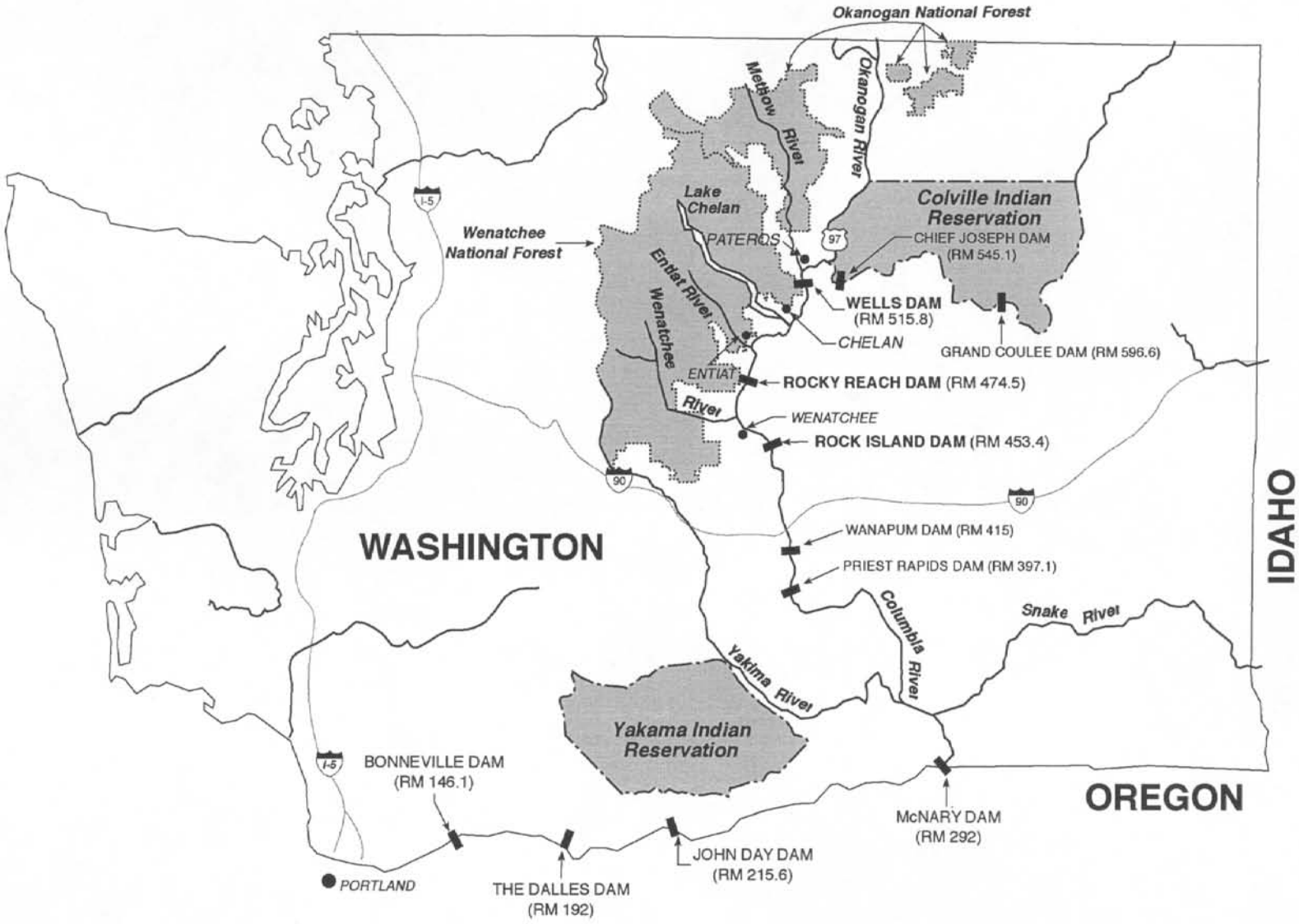
The project boundaries include the forebay (from the dam to approximately 500 feet upstream), tailrace (from the dam to approximately 1,000 feet downstream), and reservoir associated with each dam. The Wells reservoir extends approximately 30 miles upstream of the dam to the Chief Joseph Dam tailrace, the Rocky Reach reservoir extends approximately 41 miles upstream of the dam to the Wells tailrace, and the Rock Island reservoir extends approximately 20 miles upstream of the dam to the Rocky Reach tailrace. Considering all components of the three projects, the entire project area extends from the tailrace of the Rock Island Dam upstream to the tailrace of Chief Joseph Dam (approximately 92 miles). Some project effects, however, continue downstream through the Hanford Reach to the confluence of the Yakima River (inclusively defined as the action area). Project effects that continue downstream include water quality impacts (e.g., total dissolved gas levels) and delayed mortality of fish passing the projects.

All three of the hydroelectric projects discussed in this EIS are "run-of-the-river" facilities, which means that they have limited storage capacity compared to larger reservoir projects, such as Grand Coulee and Chief Joseph dams.

S.5 ALTERNATIVES CONSIDERED IN DETAIL

S.5.1 ALTERNATIVE 1 (NO-ACTION)

Alternative 1 represents baseline conditions, which include the FERC licenses and amendments that govern current operations. These licenses cover all aspects of dam operation, as well as environmental resource protection. Under Alternative 1, analyses in this EIS review how the licenses and the applicable amendments



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SCALE IN MILES 0 34 67

N

Dam
Indian Reservation
National Forest
City
RM River Miles

Figure S-1
General Location of Columbia River Dams

affect the environmental resources within the project area.

Provided below are the protection measures associated with Alternative 1 that are pertinent to anadromous fish for direct comparison to Alternatives 2 and 3. The effects of these fish prescriptive measures on other environmental resources, (including resident fish), are described in Chapter 4 of this EIS.

S.5.1.1 Wells Hydroelectric Project

The original FERC license stipulated that two adult fishladders would be constructed at the Wells Project (adjacent to each embankment), as well as a low bucket spillway design that was approved by the State of Washington Department of Fisheries and Game (FERC 1962a). A subsequent amendment to the license stipulated a general requirement to provide mitigation for project construction, alteration, and operations, and to comply with reasonable requests to modify project structures and operations in the interest of fish and wildlife (FERC 1962b). Project structure revisions were approved in 1970 to comply with fishery agency requirements regarding fish ladder design and operation (FERC 1970). FERC (1982) amended the license to raise the forebay elevation by 2 feet.

In 1990, the Douglas County PUD, the Wells Project power purchasers, resource agencies, and tribes entered into a long-term fisheries settlement agreement regarding the Wells Project (FERC 1991). The 1990 Wells Settlement Agreement established the requirements for the Douglas County PUD to fund, operate, maintain, and evaluate three anadromous fish-related programs through at least March 1, 2004. These programs consist of: (1) juvenile downstream migrant fish passage measures, (2) adult passage measures, and (3) hatchery-based compensation measures for fish loss. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfill Douglas County PUD's obligation to protect anadromous fish and mitigate and compensate for the effects of the Wells Project on anadromous fish. The agreement also stipulates evaluation programs for fishery measures and establishes procedures for coordination among the PUD, its power purchasers, and the Joint Fisheries Parties through the Wells Coordinating Committee.

Section 7 consultation, pursuant to the provisions of the Endangered Species Act, has been completed for the interim protection plan involving the operation of the Wells Project (NMFS 2000b), although this coverage expired as of April 1, 2002. However, Douglas County PUD continues to operate the project in accordance with the 2000 biological opinion in anticipation that its HCP will be approved. Because these provisions have not formally been incorporated into the existing FERC license, they are not considered part of Alternative 1.

Juvenile Fish Passage

The juvenile fish passage program called for the installation and evaluation of a juvenile bypass system to route juvenile anadromous salmonids away from the turbine units. The established program uses controlled spill through modified spill bays to provide an effective non-turbine passage route through the project. The agreement includes specific operation, performance, and evaluation standards, as well as procedural guidelines for modifying the operational components of the system if necessary to meet the performance standards. The performance standards are set to provide fish passage efficiency (the percentage of fish bypassing the project through non-turbine routes divided by the total population of fish passing the project). The established fish passage efficiency standards are at least 80 percent during the juvenile spring migration period and at least 70 percent during the juvenile summer migration period.

Adult Fish Passage

The 1990 Wells Settlement Agreement called for evaluations of adult passage delay and mortality at the project beginning in 1991. If the evaluations identified delays or mortality, the agreement specified that operational modifications would be used to alleviate the problems. If those modifications could not correct the problems, the adult fishways would be modified.

Hatchery-Based Compensation

Under the 1990 Wells Settlement Agreement, the PUD agreed to fund a hatchery program to mitigate for fish passage losses at the Wells Dam. The agreement identifies specific production levels for the anadromous fish species affected by the project that are in addition to the existing mitigation program at Wells Dam. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile losses at the dam. However, production levels based on impacts of project inundation would not be altered. The agreement also establishes specific operational standards for the fish production facilities.

Measures Planned

The existing fish mitigation and compensation measures for the Wells Dam were developed through the 1990 Wells Settlement Agreement and subsequent agreements within the Wells Coordinating Committee. A summary of measures expected to either continue or be implemented under Alternative 1 are:

1. Adult Passage

    a. Continue operation and maintenance of the existing adult fishways.

    b. Investigate entrance and ladder modifications that may be necessary to improve ladder operations and minimize fish passage delay.

    c. Conduct appropriate evaluations to determine the best actions for correcting any significant delay.

    d. Develop solutions and implement corrective actions where adult passage problems are identified.

2. Juvenile Passage

    a. Surface Bypass Operation – Operate at least one spillway bypass, throughout 80 percent of the peak spring and summer juvenile downstream migrations, respectively (Table S-1).

    b. Avian Predator Control – As defined in the Cooperative Service Agreement between Douglas County PUD and the USDA Animal and Plant Health Inspection Service, this program is expected to continue at the Wells Dam and Wells Hatchery. Although it is a voluntary program, it is relatively inexpensive to conduct and effective at increasing juvenile fish survival through the project.

    c. Gas Abatement – Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of fish. At all other times, the criterion is 110 percent of saturation.

TABLE S-1. SUMMARY OF EXISTING JUVENILE FISH BYPASS SYSTEMS AND SPILL OPERATIONS AT WELLS, ROCKY REACH, AND ROCK ISLAND DAMS (ALTERNATIVE 1)

PROJECT	BYPASS SYSTEM	PERIOD OF OPERATION
Bypass Systems/Operations		
Wells	Surface bypass (baffled spill gates with discharge through controlled spill of up to 11% of total river discharge)	The Wells bypass team determines the timing of bypass operations of the bypass to cover at least 80% of the spring and summer juvenile anadromous fish migration timing. Fyke netting and hydroacoustics are used to help the bypass team make operational decisions regarding use of the bypass system.
Rocky Reach	Turbine screens in two units; prototype surface bypass (discharge through conduit to tailrace)	24 hours/day between April and August. Construct a permanent bypass system[1] before the 2003 migration and continue to evaluate and improve the efficiency of the bypass, and provide spill as an interim measure (see below)
Rock Island	Passive gatewell orifice bypass system at Powerhouse 2 (discharges through a conduit to tailrace)	24 hours/day (spill is the primary bypass system used at Rock Island as described below)
Spill Operations		
Wells	See bypass operations (above)	See bypass operations (above)
Rocky Reach	15% of previous daily average flow in spring 10% of previous daily average flow in summer	30 days during spring migration, plus up to 6 extra days if necessary to encompass 90% of the run of Okanogan River sockeye Total of 34 days between June 15 and August 15
Rock Island	Spring and summer spill purchased by joint request of the Fisheries Agencies and Tribes from a Fisheries Conservation Account of $2.05 million (1986 dollars adjusted for inflation) at the market price of energy	The Fisheries Agencies and Tribes decide when and how much spill to purchase based on funds available in the Fisheries Conservation Account

[1] The construction and operation of the permanent bypass system has been consulted on by NMFS and authorized by FERC. However, because this system has been developed as a major component of the HCP, the effect of the new bypass structure is analyzed in the HCP alternative (alternative 3) rather than in the no-action alternative.

3. Hatchery Program

   a. Continue to provide funding and hatchery capabilities to rear and release up to 49,200 pounds of spring-run chinook, 32,000 pounds of yearling summer chinook, 24,200 pounds of subyearling summer chinook, and 80,000 pounds of yearling steelhead, according to provisions in the settlement agreement. Sockeye production has been phased out because it has not lead to a substantial increase in adult returns. Approximately 15,000 pounds of spring-run chinook salmon would be substituted for the sockeye salmon production until 2005. After 2005, sockeye mitigation will be facilitated through the implementation of a set of flow management options that would increase the natural production of sockeye salmon in the Upper Okanogan River Basin.

   b. Under the settlement agreement, hatchery production for unavoidable losses could be reduced if survival studies indicate that fish passage mortality is less than the assumed 14 percent, which was the basis for the current mitigation level. Project survival studies indicate that for yearling

spring-run chinook and steelhead, actual project survival averages 96.2 percent. As a result, hatchery compensation would be reduced under Alternative 1 from the existing 14 percent to about 3.8 percent.

4. Monitoring and Evaluation

   a. Juvenile Run Timing – Utilize hydroacoustic and fyke net monitoring data to determine the timing of bypass system operations.

   b. Survival – Develop and utilize the best techniques to estimate the survival of juvenile salmon and steelhead passing the project. Techniques may include the use of mark recapture methodologies.

   c. Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Although this is a voluntary program, it is a program that is expected to continue given recent court rulings related to compliance with the Clean Water Act.

   d. Fish Counting – Provide adult fish counts on a 24-hour basis.

S.5.1.2 Rocky Reach Hydroelectric Project

The existing fishery protection measures undertaken by the Chelan County PUD for the Rocky Reach Dam are the result of mitigation and compensation requirements in the original project license and subsequent amendments (FERC 1953, 1957a,b, 1968), as well as interim stipulations executed in the Mid-Columbia Proceedings (Docket No. E-9569 [FERC 1987b]). The interim stipulations were temporary agreements between the Chelan County PUD and the Joint Fisheries Parties with respect to juvenile fish passage measures and hatchery compensation levels to mitigate for impacts resulting from project operations.

The first interim stipulation identified compensation and operational requirements that would be in effect from July 1, 1987 through August 31, 1988. Subsequently, the stipulation was extended and revised several times (FERC 1995, 1996a). The latest revision (Fourth Revised Interim Stipulation) was negotiated to include the period September 1, 1995 through December 31, 1997 (FERC 1996a). Although there is no current agreement for Rocky Reach, Chelan County PUD has continued to operate the project in coordination with the Mid-Columbia Coordinating Committee, as it has under the previous stipulations.

The Rocky Reach Dam has Section 7 Endangered Species Act coverage until 2006 through the biological opinion (NMFS 2002a) that was developed by NMFS in consultation with FERC for the construction and continued evaluation of the permanent juvenile fish bypass system.

Although the bypass option is a component of the Rocky Reach HCP, it was independently evaluated as part of a license amendment proceeding and was approved irrespective of future FERC actions on the HCP. Moreover, since construction of the permanent bypass system is not complete, the timing of its construction relates to the HCP, and represents a departure from the no-action condition. The bypass is therefore evaluated in this EIS as an HCP conservation measure under Alternative 3 (see Section 5.3.1 of the Rocky Reach HCP).

Juvenile Fish Passage

The main goal of the Fourth Revised Interim Stipulation was to develop a safe (less than 2 percent mortality) juvenile bypass system capable of bypassing 80 percent of the juvenile salmon and steelhead over 90 percent of the migration period. This agreement led to the development of a prototype surface bypass system that was

installed at Rocky Reach Dam in the fall of 1994. Since that time, the bypass system has been modified based on the results of hydraulic modeling and fish passage evaluations. During development of the surface bypass system, the Fourth Revised Interim Stipulation provided a protection plan for juvenile migrants through the use of spill.

The prototype juvenile bypass system will be removed in the fall of 2002 and replaced with a permanent structure. Pile-driving activities required to construct the permanent bypass structure in the forebay have already begun. Completion of the permanent bypass system is expected to occur by the 2003 spring outmigration period. The regulatory approval to install the system was based on an environmental assessment and biological opinion. Since the bypass was approved, it is included under all the alternatives, but for reasons previously noted, it is evaluated under Alternative 3.

Adult Fish Passage

Under Alternative 1, Chelan County PUD would maintain and operate adult passage systems at the project according to the Detailed Fishway Operating Procedure criteria, or superior criteria developed through the use of specific study results of fish passage. The PUD would also operate the spill and turbine units in a manner that optimizes adult passage, while meeting requirements for juvenile passage. Adult and kelt steelhead fallback rates and kelt protection would be evaluated when implementing juvenile bypass options.

Hatchery-Based Compensation

Through the terms of the Fourth Revised Interim Stipulation, Chelan County PUD provides funding and hatchery capacity to compensate for anadromous fish production losses resulting from the initial inundation of the project. As with other portions of the stipulation, Chelan County PUD is expected to continue providing the same level of compensation under Alternative 1.

Measures Planned

Although the interim stipulation is expired, Chelan County PUD has continued implementation of the associated programs through the Mid-Columbia Coordinating Committee. In addition, NMFS has issued a biological opinion for the operation of the project and the construction of the juvenile bypass system (NMFS 2002a). This biological opinion provides specific measures for the protection of spring-run chinook salmon and steelhead, which were included in the license by amendment. The fish protection measures consistent with the Fourth Revised Interim Stipulation and the biological opinion (NMFS 2002a) include:

1. Passage

    a. Continue operation and maintenance of the adult fishways.

    b. Operate the powerhouse units within 1 percent of peak efficiency for a given head and power output, to the extent possible, and favor units 1 and 2 during the spring juvenile outmigration period.

    c. Construct a permanent juvenile bypass facility capable of bypassing 80 percent of the juvenile migrating salmon and steelhead over 90 percent of the migration period.

2. Gas Abatement

    a. Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation.

3. Predator Control

    a. Continue to refine and implement a northern pikeminnow removal program.

    b. Continue avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service at the Rocky Reach Dam.

4. Hatchery Program

    a. Continue to provide funding and hatchery facilities adequate to rear and release up to 54,400 pounds of fall chinook and 30,000 pounds of steelhead annually.

5. Spill Program

    a. Spill during the spring migration at a level equal to 15 percent of the daily average flow for 36 days, plus a potential additional 6 days spill at this level to provide additional protection for Okanogan River sockeye. During the summer, spill at a level equal to 10 percent of the daily average flow for a total of 34 days between June 15 and August 15 (see Table S-1).

    b. As indicated in the Juvenile Fish Passage section, the spill program at the project is currently being implemented in accordance with the HCP provisions and the biological opinion (NMFS 2002a). If the HCP is not approved, the spill program is expected to follow the guidelines of the Fourth Revised Interim Stipulation for non-listed fish species until the project license expires in 2006. The spill program for the listed species would follow the guidelines in the 2002 biological opinion through 2006. Because these spill measures are considered an integral component of the HCP, for the purpose of comparison, they are analyzed under Alternative 3 (see Section 5.4.1c of the Rocky Reach HCP).

6. Monitoring and Evaluation

    a. Survival – Develop and utilize the best techniques to estimate the survival of juvenile salmon and steelhead passing the project. Techniques may include the use of radio- or acoustic-tags or tag release and recapture methodologies.

    b. Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult anadromous salmonids.

    c. Fish Counting – Provide adult fish counts on a 24-hour basis.

    d. Steelhead Kelt Losses – Assess the feasibility to study steelhead kelt losses through the project.

S.5.1.3 Rock Island Hydroelectric Project

The original FERC license for the Rock Island Dam was issued in 1930, and construction was completed in 1933. In 1987, the Chelan County PUD, Puget Sound Energy (formerly Puget Sound Power & Light), resource agencies, and Tribes entered into a long-term fisheries Settlement Agreement for the Rock Island Hydroelectric Project (FERC 1987a). The provisions in the Rock Island Settlement Agreement were included in the new license for the project in 1989 (FERC 1989a). The Rock Island Settlement Agreement was amended in 1993 to replace the requirement to conduct an adult fish mortality study with the requirement to

conduct an adult fish passage study (FERC 1993a).

The 1987 Rock Island Settlement Agreement established the requirements for the PUD to fund, operate, maintain, and evaluate three anadromous fish-related programs. These programs consist of: (1) juvenile fish passage measures, (2) adult fish passage measures, and (3) hatchery-based compensation measures.

Juvenile Fish Passage

The Rock Island Settlement Agreement called for a bypass development program to study, design, develop, test, and install a mechanical juvenile fish bypass system at the project. The performance standards targeted for the bypass system included achieving at least 80 percent fish passage efficiency during the spring migration period and at least 70 percent fish passage efficiency during the summer migration period. Subsequent efforts to develop an adequate mechanical solution to the juvenile bypass issue were unsuccessful. The PUD is currently evaluating modifications at the spillway to increase the rate of non-turbine passage at the project and utilizing a conservation account to provide spill.

As an alternative to juvenile bypass system development, the agreement established and the Rock Island Coordinating Committee chose to implement a Fisheries Conservation Account. This account (with an annual funding level of $2.05 million in 1986 dollars, which is currently assessed at $3.2 million) could be used by the fishery agencies and the Tribes to purchase spill as a means to increase the non-turbine passage of juvenile fish at the project.

Adult Fish Passage

Under Alternative 1, Chelan County PUD would maintain and operate adult passage systems at the project according to the Detailed Fishway Operating Procedure criteria, or superior criteria developed through the use of specific study results of fish passage. The PUD would also operate the spill and turbine units in a manner that optimizes adult passage, while meeting requirements for juvenile passage. The PUD would evaluate adult and kelt steelhead fallback rates and kelt protection when implementing juvenile bypass or spillway modification options.

Hatchery-Based Compensation

Under the Rock Island Settlement Agreement, the PUD agreed to construct, maintain, and fund a hatchery program to mitigate for fish passage losses at the Rock Island Dam. The agreement identifies the specific construction standards, production levels, and evaluation procedures to be implemented. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile and adult losses at the project, although production levels intended to compensate for project inundation would not be altered. The agreement establishes specific operational standards for the fish production facilities.

Measures Planned

The following fish protection measures were developed in the Rock Island Settlement Agreement and are included in Alternative 1:

- Modify the existing adult fishladders so their operation meets current fishery agency operating criteria.
- Utilize the conservation account to provide spill for spring and summer outmigrants, up to $2.05 million (in 1986 dollars). However, as indicated in Section 2.2.3.1 (Juvenile Passage), the spill program at Rock Island Dam is currently being implemented in accordance with the HCP provisions (see Section 5.4.1a of the Rock Island HCP). If the HCP is not approved, the spill program is

expected to return to following the conservation account provisions contained in the Rock Island Settlement Agreement (see Table S-1).

- Continue to provide funding and hatchery capability to rear and release 250,000 pounds of salmon and 30,000 pounds of steelhead in a manner that is consistent with the maintenance of genetically distinct stocks.

- Evaluate fish guidance efficiency using hydroacoustic and direct capture methods, including assessments of injury and stress. Also review the hatchery programs (including sampling) to determine hatchery versus natural components of steelhead returns to evaluate hatchery production and its inter-relationship with natural production.

- Gas Abatement – Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation.

- Continue to refine and implement a northern pikeminnow removal program.

- Continue avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service, at the Rock Island Dam.

The following measures would apply for monitoring and evaluation:

- Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult anadromous salmonids.

- Juvenile Fish Passage System – Continue to evaluate non-turbine juvenile fish passage options, as agreed to through the Rock Island Coordinating Committee.

- Fish Counting – Provide adult fish counts on a 24-hour basis.

S.5.2 ALTERNATIVE 2 (HYDROPOWER CONSERVATION MEASURES TO PROTECT ANADROMOUS FISH)

Alternative 2 assesses additional anadromous fish conservation measures that could be implemented through the Federal Power Act and the Endangered Species Act while allowing the continued operation of the three projects. Under the Federal Power Act, new or revised conservation measures for anadromous fish could be required during license reopener proceedings or relicensing. Each of the three projects is scheduled for relicensing over the next 30 years with the Rocky Reach Project scheduled for relicensing in 2006, the Wells Project in 2012, and the Rock Island Project in 2028.

The opportunities to change conservation measures through license reopener clauses vary by project. Long-term settlement agreements have been reached for Rock Island and Wells dams that would limit some of the opportunities at these projects in the near term. However, there is no approved long-term agreement for Rocky Reach Dam, and relicensing procedures are currently underway to enhance the conservation measures for anadromous fish at that project.

Actions that would result in changes in conservation measures from existing conditions also include the potential for NMFS to request FERC to begin a proceeding under the reopener clause of the license and prepare a biological assessment on listed species due to a change in project operations, change in species status, identification of a species critical habitat that occurs in the project area, additional information related to project effects.

Due to a recent court decision, NMFS is currently reviewing the critical habitat designations for the Upper Columbia River Endangered Species Act-listed fish species. As a result, an additional consultation process might be required when a final critical habitat determination is made. If other species were listed under the Endangered Species Act in the future, additional consultation processes would also occur.

Under Alternative 2, compliance with the Endangered Species Act for the measures being considered by FERC is through the Section 7(a)(2) formal consultation process. With the assistance of each utility, FERC would provide NMFS with a biological assessment outlining the potential effects of the projects and any additional measures on listed species or their critical habitat (once designated)[1]. A typical biological assessment would include the following information:

- a description of the action being considered;
- a description of the specific area that may be affected by the action;
- a description of any listed species or critical habitat2 that may be affected by the action;
- a description of the manner in which the action may affect any listed species or critical habitat1;
- an analysis of the cumulative effects; relevant reports and analyses prepared on the proposal; and any other relevant studies or information on the action, the affected species, or critical habitat1; and
- an evaluation of how the action might adversely affect Essential Fish Habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act for chinook and coho salmon.

NMFS would then evaluate this information and any other information available to determine whether the proposed action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat[1]. NMFS would then write a biological opinion describing their conclusions regarding the potential impacts of the proposed action on the listed species. At that time, NMFS would also fulfill its obligations under the Magnuson-Stevens Fishery Conservation and Management Act through an evaluation of the potential impacts of the proposed action on the Essential Fish Habitat of chinook and coho salmon.

Depending on their conclusions, NMFS could recommend additional protection measures to ensure that the proposed actions are not likely to jeopardize the continued existence of endangered species or result in the destruction or adverse modification of their critical habitat (once designated). Under this process, FERC would then have the responsibility of ensuring that measures identified in the biological opinion were implemented at the projects. The PUDs may either implement measures required by the biological opinion and FERC, or formally object to the mandatory requirements through litigation.

The protection of non-listed and anadromous species would be provided under the guidance of FERC. Although FERC and NMFS have not determined what, if any, additional measures would be required over the next 50 years to protect these species, it is likely that the agencies would require conservation measures that help to improve fish passage conditions at the projects and that do not result in adverse impacts to their habitat. However, the specific measures, the number of species covered, the proportion of the

[1] A recent court ruling has vacated the critical habitat designations for the listed anadromous salmon. Although consideration of habitat requirements would be assessed during consultation to determine whether the proposed action is likely to jeopardize the species, additional consultation might be required after critical habitat designations are finalized.

migrants covered, and the implementation schedule are substantial uncertainties associated with this alternative.

S.5.2.1 Conservation Measures

Relying on past and recently completed consultations at other mainstem Columbia and Snake River hydroelectric projects, Alternative 2 conservation measures would likely include a combination of the following:

- measures that allow for increased upstream passage of adult fish through fishways and reservoirs and decreased fish injury and pre-spawning mortality (examples include hydraulic and structural fishway improvements—specifically, ladder modifications and improved attraction flow to help move fish more quickly into the ladder systems and past the dams); and

- measures that provide for increased downstream passage of juvenile anadromous salmonids while minimizing fish injury (examples include increased spill programs [in association with operational and structural modifications to reduce total dissolved gas levels], expanded predator control programs (fish and avian), the development of improved fish bypass systems, and potentially, drawdown or dam removal).

These measures may be directed at both listed and unlisted salmonid species and would possibly only occur during specific periods (seasonal) to benefit a particular life stage. The specific measures for listed species may be independent and may not necessarily benefit all salmonid species.

Each measure implemented under Alternative 2 would continue until such time that FERC or NMFS determines that:

- other protective measures would better increase survival,

- the proposed measures are determined to be ineffective or unsuccessful in increasing fish survival, or

- a Federally listed species is delisted and it is determined that previously approved protection measure may safely be relaxed or are no longer warranted.

The decision to apply specific measures at each dam would depend on the benefit of the measures to anadromous salmonids. It is envisioned that each dam would have a combination of juvenile bypass options, including a screened bypass and/or a surface bypass system, a spill program designed to maximize non-turbine passage, fish and avian predator control, and improvements to the adult facilities intended to maximize project and pre-spawning survival.

Initial survival standards for protection of listed species have been developed as a result of preliminary survival information and life-history analyses (draft Quantitative Analysis Report). The results of this life-history analysis is described in Chapter 5 and summarized in Appendix E.

S.5.2.2 Other Options Considered

If listed fish populations continue to decline, additional protection measures may be needed. Most of these additional measures would likely be in-water facility improvements.

Natural river drawdown is a remote possibility, and would have substantial environmental effects to many of the existing natural, physical, and social resources. However, this type of operation would help to mimic the natural river conditions that existed prior to the construction of the hydroelectric facilities, and thereby minimize the impacts caused by the hydropower system.

Although not recommended by a Federal, State, or local agency at this time, the review of natural river drawdown was requested by organizations

during public scoping for this EIS. Consequently, natural river drawdown at the three dams (Wells, Rocky Reach, and Rock Island) has been evaluated for Alternative 2 at a brief summary level to help understand and compare its effect with other conservation measures. Although natural river drawdown is not an option under the existing FERC licenses, it may be considered during relicensing for the projects if requested by interested parties (2006, 2012, and 2028 for the Rocky Reach, Wells, and Rock Island dams, respectively).

It is uncertain whether drawdown to minimum operating pool (seasonal reservoir drawdown), which is an option under the current licenses, would result in an increase in juvenile survival in the Mid-Columbia River. Although smolt migration rates would likely increase, the correlation between migration speed and survival has not been consistently documented (Giorgi et al. 2002). Therefore, it was not evaluated in this EIS.

S.5.2.3 Committees

It is uncertain whether implementation of measures developed through Alternative 2 would be conducted through the existing, or similarly structured, coordinating committees. However, a coordinating committee similar to those currently operating is expected to occur under this alternative. Alternative 2 would therefore include coordinating committees likely consisting of representatives of the Joint Fisheries Parties and the PUDs. Decisions by the committees are expected to continue to be made by consensus.

S.5.2.4 Conservation Measures at the Projects, Including Hatchery Programs

Wells Hydroelectric Project

In 1990, the Douglas County PUD, the Wells Project power purchasers, resource agencies, and Tribes entered into a long-term fisheries settlement agreement for the Wells Project. This agreement established the Douglas County PUD's obligation for the installation and operation of juvenile downstream migrant bypass facilities, hatchery compensation for fish losses, and adult fishway operation. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfil the Douglas County PUD's obligation to protect anadromous fish and mitigate and compensate for the effects of the Wells Project on anadromous fish.

Initial compensation was established at 14 percent until the PUD could implement juvenile survival studies to actually measure project impacts. Recent measures undertaken by Douglas County PUD, consistent with the now expired biological opinion on the Wells Interim Protection Plan (NMFS 2000b), would likely continue to be incorporated into a long-term fish recovery plan. Additional measures may also be sought by NMFS if project operations are likely to jeopardize the continued existence of the listed species or cause the destruction or adverse modification of critical habitat, or if there is not adequate potential for recovery of listed species.

Similar measures may also be implemented for non-listed species, although these measures would be approved through provisions in the Federal Power Act instead of the Endangered Species Act. As a result, there is potentially a lower likelihood of implementing the same measures for species that are not currently threatened or endangered.

Measures currently anticipated to be part of the protection program include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Wells Dam:

    a. Operate the surface bypass system during the upstream adult steelhead and spring-run chinook migration periods and during the downstream kelt passage period to

maximize the survival of fallbacks and downstream migrating adults.

2. Juvenile Passage – In addition to measures described under Alternative 1 for Wells Dam:

    a. Operate within 1 percent of peak turbine power efficiency at all times during the juvenile and adult passage periods, with appropriate reporting and monitoring requirements to ensure compliance.

    b. Operate the surface bypass system 24 hours a day for up to 99 percent of the juvenile migration period.

3. Hatchery Program – The same amount of chinook, sockeye, and steelhead would be produced as described under Alternative 1, although production could be reduced because of the potential negative effects of hatchery fish on naturally spawning populations of Endangered Species Act-listed fish. In addition, Douglas County PUD would fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with the Endangered Species Act recovery goals for listed spring-run chinook salmon and steelhead populations. However, because of the potential effects of hatchery fish on natural populations, and considering that project-related mortality is 3.8 percent rather than the assumed 14 percent, hatchery production would be reduced under Alternative 2. A similar reduction would also apply to yearling summer-run chinook salmon.

4. Monitoring and Evaluation – Measures are the same as described under Alternative 1 for juvenile run timing, survival, total dissolved gas monitoring, and fish counting. The following additional measures are expected to be implemented:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Evaluate adult fishladder passage standards as they relate to spring-run chinook salmon and steelhead, and modify facilities as needed.

    c. Total Dissolved Gas Monitoring – Provide physical monitoring of total dissolved gas levels and temperature within the project area. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult salmon and steelhead.

5. Spill Program

    a. Maximize use of the spill program up to the maximum allowable total dissolved gas levels. At Wells, this would likely include spilling up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species to maximize fish passage efficiencies and survival. The timing of spill would likely range from April through August.

    b. Limit spill to ensure compliance with the Ecology total maximum daily load (TMDL) allotment for total dissolved gas, which is up to 120 percent of saturation for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

Rocky Reach Hydroelectric Project

Long-term protection measures for the Rocky Reach Dam would likely be similar to those described in biological assessments submitted to NMFS and the subsequent biological opinion for the construction and operation of the permanent bypass system (NMFS 2002a). Additional measures might also be necessary if project operations are likely to jeopardize the continued existence of the listed species or cause the destruction or adverse modification of critical habitat (once designated), or if there is not adequate potential for recovery of listed species, based on additional information available to NMFS and as a result of continued monitoring and evaluation.

Similar measures may also be implemented for non-listed species, although these measures would be approved and implemented through provisions in the Federal Power Act instead of the Endangered Species Act. As a result, there is potentially a lower likelihood of implementing the same measures for species that are not currently threatened or endangered.

Measures currently anticipated to be part of the fish protection program include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Rocky Reach:

    a. Enhance the fishway entrance attraction conditions through planned operation of spill gates and turbines.

    b. Investigate ladder modifications to improve operations within specified standards and minimize fish passage delay.

    c. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill).

    d. Conduct modeling or other appropriate evaluations to determine the best actions for correcting passage problems, and implement measures as necessary.

2. Juvenile Passage – Measures in addition to those described in Alternative 1 would include:

    a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of anadromous salmonids (although included in Alternative 1 it is evaluated under Alternative 3).

    b. Operate turbine units within 1 percent of peak turbine power efficiency at all times during the juvenile and adult fish passage periods, with appropriate reporting and monitoring to ensure compliance.

    c. Increase spill as necessary to maximize fish passage efficiencies and survival at the project.

    d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event.

    e. Implement effective fish and avian predator control measures.

    f. Potentially implement additional or alternative juvenile bypass systems, such as a surface bypass sluiceway, to improve fish passage survival.

3. Hatchery Program – The same amount of chinook and steelhead would initially be produced as described under Alternative 1, although production could be reduced at any time because of the potential effects of hatchery fish on natural populations. Hatchery production of non-listed species would not be changed unless the production

levels are determined to affect the listed species. In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Survival – Utilize the best techniques to estimate the survival of salmon and steelhead through the project. Techniques would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

    c. Total Dissolved Gas Monitoring – Conduct physical monitoring of total dissolved gas levels and temperature within the project area. Conduct biological monitoring to determine the incidence of gas bubble disease symptoms in juvenile steelhead and salmon.

    d. Fish Counting – Provide adult fish counts on a 24-hour basis.

    e. Evaluate adult fish passage efficiencies through radio-telemetry studies.

    f. Install adult PIT-tag detection devices in the adult fishways.

5. Spill Program

    a. Maximize use of the spill program for up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species to increase juvenile fish passage survival at the project. The timing of spill may therefore range from April through August.

    b. Limit spill to ensure compliance with the Ecology total maximum daily load allotment for total dissolved gas, which is up to 120 percent of saturation for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

Rock Island Hydroelectric Project

Long-term protection measures for the Rock Island Dam would include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Rock Island:

    a. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill, etc.).

    b. Evaluate passage facilities through hydraulic evaluations and adult passage studies and correct problems when identified.

    c. Investigate ladder modifications to improve operations within specified standards and minimize fish passage delay.

    d. Conduct evaluations on spawning success and fecundity as it relates to passage through a multiple dam system.

2. Juvenile Passage – Measures in addition to those described under Alternative 1 would likely include:

    a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of juvenile salmonids.

    b. Operate turbine units within 1 percent of peak turbine power efficiency at all times during the juvenile and adult passage periods, with appropriate reporting and monitoring to ensure compliance.

    c. Increase spill as necessary to maximize fish passage efficiencies and survival at the project.

    d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event.

    e. Implement effective fish and avian predator control measures.

3. Hatchery Program – The same amount of chinook and steelhead would initially be produced as described under Alternative 1, although production could be reduced because of the potential effects of hatchery fish on natural populations. Hatchery production of non-listed species would not be changed unless these production levels are determined to affect the listed species. In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Survival – Utilize the best techniques to estimate the survival of salmon and steelhead through the project. Techniques would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

    c. Total Dissolved Gas Monitoring – Provide physical monitoring of total dissolved gas levels and temperature within the project area. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in juvenile salmon and steelhead.

    d. Fish Counting – Provide adult fish counts on a 24-hour basis.

    e. Evaluate adult fish passage efficiencies through radio-telemetry studies.

5. Spill Program

    a. Maximize use of the spill program for up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species. The timing of spill may therefore range from April through August.

    b. Limit spill to ensure compliance with total maximum daily load allotment requirements, which is up to 120 percent for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

S.5.2.5 Adaptive Management

Alternative 2 includes an adaptive management component through the Section 7 re-consultation process. Re-consultation would occur if new information becomes available that indicates that the provisions of the initial consultation were not adequate to ensure the continued existence of the listed species. Re-consultations would also occur as a result of relicensing and license amendment processes, where FERC consults with NMFS prior to making a decision on proposed modifications of the project structures or operations or other plans that may affect listed species.

In addition, any actions that would substantially change conservation measures from existing conditions might have the potential for NMFS to request FERC to begin license reopener clause proceedings and prepare a biological assessment on listed species due to a change in project operations. Re-consultation would also occur if there were a change in species status, identification of a species critical habitat that occurs in the project area, or additional information related to project effects.

During re-consultation, NMFS would have the opportunity to adjust conservation measures, thereby providing an adaptive management process. However, there is some uncertainty of how effective this adaptive management process would be, given the potential implementation delays in the consultation process, and the project-by-project and issue-by-issue nature of the consultation process. This adaptive management would also involve just the listed species.

For unlisted species, adaptive management would involve the use of NMFS's Federal Power Act authorities to pursue additional protective measures in future relicensing or license reopener procedures or amendment proceedings. Adaptive management activities would also occur through the existing Mid-Columbia coordinating committees.

S.5.3 ALTERNATIVE 3 (PROPOSED ACTION – PROJECT HCPS)

The proposed action consists of implementing the three HCPs for the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects. The HCPs were developed to conserve and protect listed and non-listed anadromous fish species over the long term, and to support ongoing compliance with the Endangered Species Act, while allowing continued operation of the three projects. The HCP fish protection measures and methodologies proposed to implement these measures would represent comprehensive long-term settlement agreements under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Northwest Power Planning and Coordination Act, and Title 77 RCW. Because the Agreements are comprehensive settlements, they propose a standard and scope greater than that required under the Endangered Species Act. The objective of the HCPs is to achieve percent no net impact for anadromous salmonids affected by the projects. This objective applies not only to the listed spring-run chinook salmon and steelhead, but also to the other anadromous salmonids in the Mid-Columbia River.

Protection for the migrating species is accomplished through a series of performance (survival) standards, which are based upon actual survival of the migrating species, not simply measures to be implemented regardless of their actual benefit to the migrating species. Unavoidable mortality is mitigated though tributary habitat improvements and state of the art hatchery supplementation.

The primary purpose of the HCP agreements is to obtain an incidental take permit from NMFS to comply with the Endangered Species Act for any take of listed anadromous fish as a result of project operations and satisfy the FERC relicensing requirement for the Plan species.

Issuance of an incidental take permit is a Federal action subject to NEPA compliance. The purpose of NEPA is to promote analysis and disclosure of the environmental issues surrounding a proposed Federal action and to reach a decision that reflects NEPA's mandate to strive for harmony between human activity and the natural world. As a cooperating agency, FERC also intends to utilize this EIS for subsequent licensing decisions (which are considered separate Federal actions), and the State agencies intend to use the information to satisfy state environmental requirements (SEPA).

The requirements of Section 10 of the Endangered Species Act provide the guidelines for HCP preparation. The information within each of the HCPs includes the following:

- the environmental setting in the project vicinity,
- structural and operational features of the project,
- existing operations related to anadromous salmonids,
- existing mitigation and monitoring measures and their effectiveness,
- unresolved issues related to anadromous salmonids (note: The 1998 Incidental Take Permit Applications indicated that there were unresolved issues at the time the applications were submitted. Unresolved issues were resolved by the amended applications filed in 2002. The HCPs address changing circumstances and unknown future events through committee processes and adaptive management (see Section 10.4.2 of the Wells HCP and Section 10.3.2 of the Rocky Reach and Rock Island HCPs).
- proposed mitigation and enhancement measures to address unresolved and unknown future issues,
- proposed monitoring,
- costs and funding, and
- alternatives to the proposed measures.

In addition to Section 10 requirements, the issuance of an incidental take permit and amending a FERC license are Federal actions subject to Section 7 of the Endangered Species Act. Although Section 7 and Section 10 are similar, Section 7 introduces several considerations into the HCP process that are not explicitly required by Section 10. These considerations include the assessment of indirect effects, effects on Federally listed plants, and effects on critical habitat. As a result, NMFS and FERC are required to initially consult with the Services (NMFS and USFWS) to ensure that their actions proposed in the HCP are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat.

S.5.3.1 HCP Species

The Plan species addressed in the HCPs are spring-run chinook salmon, summer/fall-run chinook salmon, sockeye salmon, coho salmon, and steelhead inhabiting the Upper Columbia River (Table S-2) (see Section 13.19 of the Wells HCP and Section 13.20 of the Rocky Reach and Rock Island HCPs). In addition, the HCPs also identify Permit species (species covered under the incidental take permit application). The Permit species include all the Plan species except coho salmon. The native coho salmon populations have been extirpated from the Upper Columbia River, are not subject to Endangered Species Act protection, and therefore do not require the issuance of an incidental take permit.

TABLE S-2. PLAN AND PERMIT SPECIES STATUS, RELATIVE TO THE HCPS (ALTERNATIVE 3)

SPECIES	ENDANGERED SPECIES ACT STATUS	EVOLUTIONARILY SIGNIFICANT UNIT	HCP STATUS
Steelhead	Endangered (August 1997)	Upper Columbia River	Plan and Permit Species
Spring-Run Chinook Salmon	Endangered (March 1999)	Upper Columbia River	Plan and Permit Species
Summer/Fall-Run Chinook Salmon	Not Warranted (March 1998)	Upper Columbia River	Plan and Permit Species
Sockeye Salmon	Not Warranted (March 1998)	Okanogan River Lake Wenatchee	Plan and Permit Species
Coho Salmon	Extirpated	Upper Columbia River	Plan Species

S.5.3.2 HCP Term

The terms of the three HCPs and any incidental take permits are to be 50 years from the date the HCPs are executed (in the case of Chelan County PUD), and approved by FERC (in the case of Douglas County PUD) (see Section 1.1 in the Wells, Rocky Reach and Rock Island HCPs). In the event any PUD project is not relicensed to that PUD, the corresponding HCP for that project would terminate. A 50-year term was selected because it corresponds to the maximum length of a FERC license, although the HCP process will not necessarily coincide with the FERC relicensing process at the three projects. A lengthy term is also appropriate because of the length of time and expense involved in negotiating and consulting on each of the HCPs. For example, the negotiation process for the three HCPs considered in this EIS began in 1993.

Although some HCP measures are currently being implemented by the PUDs, the HCPs would not be fully implemented until the agreements are executed by the signatory parties and the regulatory review processes have been completed. As a result, the effective date of the agreements would be the later of when (1) FERC issues a final order approving and incorporating the agreements in the project licenses, (2) NMFS issues an incidental take permit, and (3) the USFWS completes the necessary consultation under the Endangered Species Act. Based on the current schedule, the terms of the HCPs should extend from approximately 2003 through 2053. Payments to the Plan species Account would be initiated 90 days after the effective date of each HCPs and adjusted for inflation from 1998.

The HCPs also have termination provisions if the performance standards are not achieved (see Section 1 of the Wells, Rocky Reach, and Rock Island HCPs). An HCP could be less than 50 years under the following circumstances:

- FERC issues a non-power license for the project,
- FERC orders removal or drawdown of the project, or
- if the no net impact standard has not been achieved or maintained by 2013 (2018 for the Wells Project), or if no net impact has been achieved and maintained but Plan species are not rebuilding and the project is a significant factor in the failure to rebuild,
- if a party fails to comply with the terms of the HCP,
- if the obligations imposed by the HCP are impossible to achieve,

- if NMFS revokes the incidental take permit, or

- if a regulatory entity takes action that materially alters or is contrary to one or more provisions of the HCP.

Any party to the HCP may elect to withdraw from the agreement at any time, based on the non-compliance provisions of the HCP agreements. However, NMFS and USFWS will not exercise their right to withdraw from the HCP until at least 2013 (2018 for the Wells Project) if the PUDs have complied with all aspects of the agreement but have not met the survival standards. If mutual agreement is reached between the PUDs and the two Federal agencies, the Services (NMFS and USFWS) can seek reservoir drawdown, dam removal, and/or non-power operations without withdrawing from the agreement or suspending or revoking the incidental take permit.

During the 50-year HCP term, all three projects would undergo a relicensing process with FERC. It is the intention of the HCPs that mitigation measures agreed to as part of the HCPs be consistent with, and form the basis of, subsequent FERC license articles developed to address impacts on anadromous salmonids. Therefore, unless the parties to the HCPs withdraw from the HCP agreements (following the prescribed withdrawal procedures), they would be supportive of a new license, under which the HCPs would constitute the terms, conditions, and recommendations for Plan species under Section 10(a), Section 10(j), and Section 18 Fishway Prescriptions in the new license (see Section 9.5 of the Wells HCP and Section 9.2 of the Rocky Reach and Rock Island HCPs).

The PUDs have voluntarily implemented some provisions of the HCPs because specific deadlines for reaching the survival standards were established in the HCPs. During this period, the PUDs have had the ultimate authority on pursuit and implementation of specific bypass measures since 1998. However, the existing FERC license articles, settlement agreements, and stipulations remain in effect to address dispute resolution proceedings, spill volumes, and hatchery compensation levels. Components of the HCPs that address each of these issues would not be implemented until the agreements have been ratified. To address ongoing Endangered Species Act issues, FERC issued an order approving the Rocky Reach Bypass System and NMFS issued a Biological Opinion for the Wells Project (which has since expired).

S.5.3.3 HCP Mitigation Objectives

All measures proposed in the HCPs are intended to minimize and mitigate impacts to the Plan species, to the "maximum extent practicable" as required by the Endangered Species Act. The HCPs also address the obligations of the PUDs under the Federal Power Act, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Northwest Power Planning and Coordination Act, and Title 77 RCW (see Section 9.7 of the Wells HCP and Section 9.4 of the Rocky Reach and Rock Island HCPs).

The HCPs would mitigate impacts from dam operations in areas directly affected by those operations (project areas). The project areas extend from approximately 1,000 feet downstream of each dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir). The PUDs would also provide funding for hatchery supplementation and tributary habitat improvement programs to offset losses not directly mitigated at the project.

S.5.3.4 HCP Performance Standards

The HCPs have specific performance standards that relate to the survival of each Plan species (see Section 4 of the Wells HCP and Section 5 of the Rocky Reach and Rock Island HCPs). The overall performance standard is to achieve no net

impact to the Plan species through each dam. This term takes into account the fact that 100 percent equivalent survival cannot be achieved at the projects alone, requiring additional mitigation through off-site measures to increase salmonid productivity (e.g., hatchery supplementation programs and tributary habitat improvements).

The no net impact standard consists of two components:

1. A 91 percent combined adult and juvenile project survival rate achieved within the geographic area of the projects by fish passage improvement measures.

2. Compensation for the 9 percent unavoidable project mortality provided through hatchery and tributary programs, with compensation for 7 percent mortality provided through hatchery programs and compensation for the remaining 2 percent mortality provided through tributary habitat improvement programs.

It is the intention that these no net impact components will contribute to the rebuilding of tributary habitat production capacity and the basic productivity and numerical abundance of the Plan species. Tributary habitat improvement programs would involve the protection and restoration of salmonid habitat within the Columbia River watershed (from the Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat, and Wenatchee River Basins. The hatchery programs would be consistent with the objective of rebuilding naturally reproducing populations in their native habitats, while maintaining genetic and ecological integrity and supporting harvest.

Monitoring of both on-site and hatchery mitigation measures would be conducted, and mitigation measures would be modified, as necessary, to achieve or maintain the no net impact standard. A comprehensive evaluation of the hatchery mitigation program will be conducted to assess the effectiveness for achieving the no net impact standard in 2013, and every 10 years thereafter. Based on the results of these evaluations, adjustments could be made to the program. However, compensation for no more than 7 percent unavoidable project mortality would be provided through hatchery compensation without agreement of the parties that signed the HCPs.

Compensation for up to 2 percent unavoidable project mortality would be through tributary habitat improvements. This compensation level is assumed, and will not be monitored for actual survival contribution during the 50-year term of the HCPs due to the difficulty and uncertainties associated with monitoring and quantifying the effects of tributary habitat improvements. However, a tributary assessment program will be funded to monitor and evaluate the relative performance of tributary improvement projects. The intent of this assessment program is to ensure the most cost effective and efficient use of the tributary improvement funds, but not to quantify the actual survival benefits.

The performance standards for the HCPs are the result of an extensive collaborative process dating back to 1993, and represent the collective wisdom and professional judgment of the scientists and regional policy makers participating in the process. In addition, the standards are generally consistent with the performance standards included in the 2000 Federal Columbia River Power System biological opinion for the Lower Snake and Columbia River projects (NMFS 2000c). In-river survival evaluations will be used to determine whether the survival standards are being achieved.

The no net impact and survival standards are designed to have several layers of requirements to provide the most flexibility in achieving and measuring the goal of recovering and stabilizing the anadromous fish runs in the Mid-Columbia River. In particular, although the 91 percent survival standard combines the adult and juvenile

fish survival through the project, it is recognized that it is not currently possible to conclusively differentiate hydro-related mortality from natural adult fish losses. Therefore, the combined adult and juvenile survival standard will initially be measured through alternative survival measurements relative to juvenile fish passage. These alternative survival measurements assume a 2 percent adult mortality rate, based on the best available data throughout the region, which suggests a 98 to 100 percent survival rate of adults passing each hydroelectric project.

The alternative juvenile survival measurement was established to provide additional flexibility in estimating project impacts on each Plan species, given the species-related limitations of the available assessment techniques. The alternative metrics are for either juvenile project or juvenile dam passage survival. The alternative juvenile project passage survival metric is 93 percent (which is the survival rate over 95 percent of each Plan species migration through a project's reservoir, forebay, dam, and tailrace). This 93 percent survival goal includes direct, indirect, and delayed mortality, as it relates to the project, wherever it occurs and can be measured.

If juvenile project passage survival cannot be accurately measured, juvenile dam passage survival can be used as the next best alternative to determine if the HCP survival standards are met for each Plan species. The juvenile dam passage survival standard is set at 95 percent, and encompasses the survival of 95 percent of the juveniles passing through a project's forebay, dam, and tailrace areas. However, unlike the project survival standard, dam passage survival estimates do not include indirect or delayed mortality as they relate to project operations. Therefore, even if this standard is met, additional evaluations will be needed (as measurement technologies allow) to verify achieving the no net impact standard of the HCPs.

If neither of these alternative juvenile survival rates can be directly measured with the available technology, juvenile dam passage survival would be calculated based on the best available data (including the proportion of fish utilizing specific passage routes and estimated survival rates for each route). This calculation would consider the same elements as the directly measured juvenile dam passage survival technique, although off-site data may be used when project-specific data are not available. This calculation process could be used for Plan species such as sockeye and subyearling chinook because directly measuring dam passage survival for these species is currently not possible with existing technology.

The initial hatchery production levels are based on average adult returns and adult to smolt survival rated during a baseline period, and the need to compensate for up to 7 percent unavoidable project-related mortality. In response to requests from the Tribes, NMFS has agreed to fully permit the initial production levels identified in the HCPs through 2013. During 2013, and every 10 years afterward, the hatchery production levels would be evaluated and adjusted to achieve and maintain no net impact to each Plan species. These assessments would allow adjustments in production based on average adult returns and any changes in adult-to-smolt survival rate or smolt-to-adult survival rates for the hatchery production facilities. However, hatchery production levels established as compensation for original project inundation impacts are not subject to change.

In addition to hatchery program modifications based on the results of survival studies, there are procedures established to allow program reductions if the 7 percent hatchery compensation level is determined by NMFS to be inappropriate for species recovery. Such Endangered Species Act policy adjustments could occur in 2013 and every 10 years afterward, at the time of program reviews. Such policy changes might be required if the interactions of hatchery and wild fish are proven to be delaying the recovery process. These interactions include direct impacts such as

competition for space and food, disease transmission, and predation.

Additional evaluations are expected over the next 10 years to determine the amount of hatchery supplementation that can be allowed without negatively impacting the listed species.

As part of the effort to achieve the performance standards, the PUDs would use their best efforts to evaluate, improve, maintain, and operate adult passage fishways to meet criteria established by the coordinating committees. The criteria currently used for the adult fishways were developed in cooperation with the existing Wells Coordinating Committee, Rock Island Coordinating Committee, and the Mid-Columbia Coordinating Committee. The adult fishway operating criteria for the Wells Dam can be found in the Adult Fish Passage Plan (Appendix A) of the Wells HCP. For Rocky Reach and Rock Island, the adult fishway operating criteria is referred to as the Detailed Fishway Operating Plan (DFOP) (see Appendix A of the Rocky Reach and Rock Island HCPs).

Measures implemented at the projects to meet the performance criteria are referred to as "tools", which include any action, structure, facility, or program (on-site only) intended to improve the survival of Plan species migrating through the project areas.

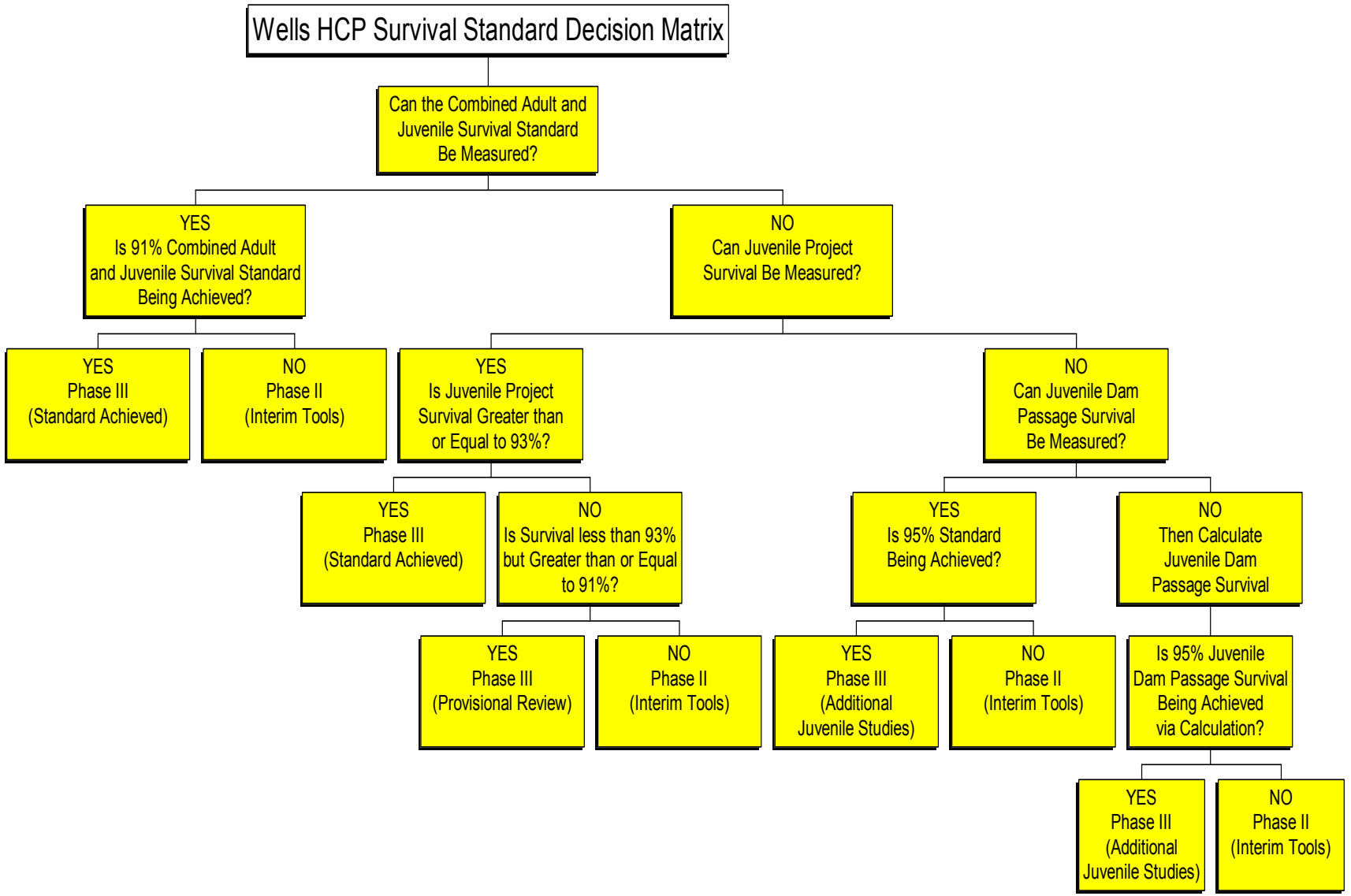
Although there is limited survival information available for all the Plan species at each of the three dams, recent improvements in fish tagging technology (e.g., PIT-tags, miniature radio, acoustic and balloon tags) will provide more detailed and accurate future assessments.

The HCPs set an initial period for the PUDs to achieve the juvenile project or juvenile dam passage survival goals followed by up to 3 years of evaluation (see Section 4.2 of the Wells HCP and Section 5.3 of the Rocky Reach and Rock Island HCPs). The 3-year evaluation period has been completed by Douglas County PUD for yearling chinook and steelhead, while the first year of evaluation at Rocky Reach and Rock Island dams is scheduled to begin in 2004 and 2002, respectively. If the survival levels are not met, the HCP coordinating committees (which include NMFS participation) would then identify additional tools to implement, prior to the next migration period, to achieve the combined adult and juvenile, juvenile project or juvenile dam passage survival goals. Detailed discussions of the evaluation phases are provided below in Section 3.2.2.6, HCP Phases.

S.5.3.5 HCP Phases

The HCP survival standards would be evaluated in three phases (see Section 4.2 of the Wells HCP and Section 5.3 of the Rocky Reach and Rock Island HCPs). During Phase I, the PUDs would evaluate survival rates for those Plan species that can be studied with existing methodologies. Juvenile fish survival studies would be measured at a 95 percent confidence level, with a standard error of no more than plus or minus 2.5 percent. However, if all testing protocols and model assumptions are adhered to, the coordinating committees can (by unanimous approval) accept study results with a standard error of plus or minus 3.5 percent.

Survival studies would be conducted over a 3-year period to determine the survival rates. Study results that meet the precision and testing protocol requirements would be included in the 3-year average. Depending on the results of the 3-year survival studies, the PUDs would proceed to either Phase II or Phase III). The decision-making process for interpreting the survival study results is summarized in a decision matrix of the phase determination process (Figures S-2 and S-3). The juvenile survival studies conducted during Phase I could indicate that the standards were achieved for some species and not others. This would result in different phase designations for the various Plan species. The coordinating committees can also designate a representative or surrogate species for testing if the target species cannot be accurately tested with the existing technology.



..... Figure S-2. Wells HCP Survival Standard Decision Matrix

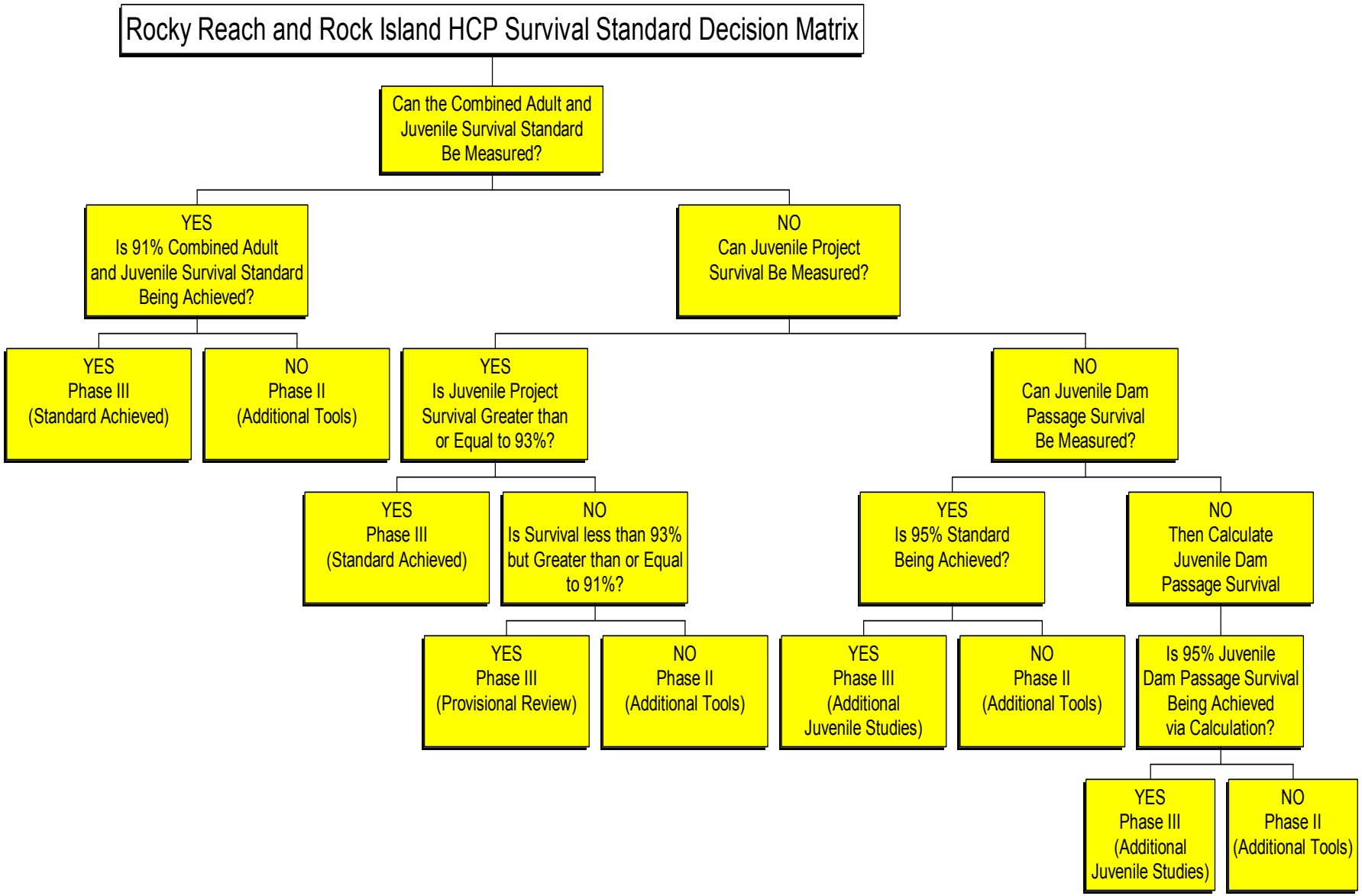


Figure S-3. Rocky Reach and Rock Island HCP Survival Standard Decision Matrix

If the Phase I evaluations conclude that the applicable survival standard has not been achieved, the PUD would enter Phase II (Interim Tools/ Additional Tools). In this phase, the coordinating committee would jointly decide on either interim tools or additional tools for the PUD to implement to achieve the pertinent survival standard. Once implemented, up to 3 years of evaluations would be conducted to verify compliance with the standard and appropriateness of moving into Phase III. Until the survival standard(s) being measured are achieved, the PUDs will continue to implement either interim tools or additional tools to meet the standard(s). However, if it is determined that the standards cannot be met, the parties can withdraw from the HCP agreements. There are several determination levels under Phase III to address uncertainties or gaps in the available information. The coordinating committees would determine if the Phase III level has been achieved, at each project and for each Plan species, as follows:

- Standard Achieved – Verified compliance with the 91 percent combined adult and juvenile survival standard or 93 percent juvenile project survival.

- Provisional Review – Measured juvenile project survival less than 93 percent but greater than or equal to 91 percent.

- Additional Juvenile Studies – Measured or calculated 95 percent juvenile dam passage survival.

Under Phase III (Standard Achieved), the PUDs would reevaluate survival every 10 years. These 1-year reevaluation processes would include one representative species for the spring migration period and another for the summer migration. The resulting survival estimates would be included in the cumulative average for those species. If the standard is no longer being achieved, additional evaluations would occur. If survival levels remain below the standards after 3 years of reevaluation, the PUD would move into Phase II (Additional Tools) for that species, and follow the procedures discussed previously for Phase II. In addition, the coordinating committee would consider reevaluating other Phase III (Standards Achieved) species.

If the reevaluation studies show that the standards are being exceeded, the coordinating committees could make adjustments to the passage measures or the unavoidable mortality mitigation levels to maintain the no net impact standard. At Rock Island or Rocky Reach dams, the spill requirements could be adjusted for the following migration season used by that species, such that the survival standard is achieved but not exceeded. However, the survival standard could be exceeded for a particular species, if measures implemented primarily for another species provide additional survival benefits to both species. At Wells Dam, the coordinating committee could adjust the hatchery supplementation rates from the 7 percent level based on actual project survival, such that the no net impact standard is achieved but not exceeded.

A Phase III (Provisional Review) determination allows the PUD a one-time (Plan species specific) 5-year period to implement additional measures or conduct additional survival studies to achieve or verify the achievement of the pertinent survival standard. If the survival goal is subsequently met, the PUD would follow Phase III (Standard Achieved) or Phase III (Additional Juvenile Studies) procedures. If the pertinent standard cannot be achieved, Phase II (Interim Tools) procedures would be followed for Wells and Phase II (Additional Tools) would be followed for Rocky Reach and Rock Island. However, even if the juvenile dam passage survival rate (calculated or measured) is determined to be 95 percent or greater, Phase III (Additional Juvenile Studies) procedures would apply.

The Phase III (Additional Juvenile Studies) classification is provided because juvenile dam passage survival estimates do not address juvenile mortality in the reservoir. Therefore, even if the

95 percent juvenile dam passage survival (measured or calculated) is met or exceeded, either the 91 percent combined adult and juvenile project survival estimate or the 93 percent juvenile project survival metric would still be measured when appropriate monitoring methods are available.

Based on the survival and the fish passage efficiency studies, the parties to the HCP recognize that the Douglas County PUD has achieved the 93 percent juvenile project survival goal for yearling chinook and steelhead. In addition, the 95 percent juvenile dam passage survival goal is assumed to have been met for sockeye and subyearling chinook, until adequate evaluation methodologies are available to verify survival of these species.

For the Chelan County PUD, the evaluation period (Phase I) began at Rock Island in 2002 and would occur between 2004 and 2006 for Rocky Reach. The coordinating committees would use these evaluation results to make a phase determination for each Plan species.

Whenever Phase I evaluations indicate that the survival standards are not being achieved for a specific species, Phase II (Interim Tools) would be applied for the Wells Project and Phase II (Additional Tools) would be applied to the Rocky Reach and Rock Island projects. Phase II (Interim Tools) for Wells includes a set of project specific actions, that could be implemented at the project, to increase survival above the pertinent survival standard. Following the implementation of Interim Tools, an evaluation of the survival benefit of these actions will take place. For the Rocky Reach and Rock Island projects, the coordinating committees would identify the additional tools or studies that are to be implemented during Phase II. The coordinating committees shall use the following criteria when deciding which interim/additional tools to be implemented during Phase II. These criteria are:

1. likelihood of biological success;
2. time required to implement; and
3. cost-effectiveness of solutions, but only where two or more alternatives are comparable in their biological effectiveness.

The PUD would continue to implement Phase II tools for each Plan species that is not meeting the pertinent survival standard. The coordinating committee would determine the number of valid studies (not to exceed 3 years) necessary to verify the survival rate and make a phase determination, following the implementation of the interim/additional tools.

S.5.3.6 Dispute Resolution

The HCP agreements stipulate a dispute resolution procedure that would apply to all disputes over the implementation and compliance of the agreements (see Section 11 of the Wells, Rocky Reach, and Rock Island HCPs). These procedures rely on unanimous agreement of the pertinent coordinating committee representatives present for the dispute resolution process.

If a unanimous decision cannot be reached within a hatchery or tributary coordinating committees, then the dispute would be decided by the pertinent HCP coordinating committee. If the HCP coordinating committee cannot resolve a dispute elevated from the hatchery or tributary committee (or the HCP coordinating committee cannot resolve a dispute amongst themselves) then the dispute would be decided by a policy committee, comprised of executives of all signatory parties. If a unanimous decision of the attending representatives of the policy committee cannot be reached, each of the HCP parties may pursue any other right they might otherwise have to achieve their objectives. However, the agreement encourages the parties to seek a resolution through an alternative resolution process, including mediation or arbitration.

S.5.3.7 HCP Committees

The three HCPs would be implemented through a group of committees established for each project (see Section 6 of the Wells HCP and Section 4 of the Rocky Reach and Rock Island HCPs). Each project would have a coordinating committee, a tributary committee, and a hatchery committee.

The coordinating committees would oversee HCP monitoring programs, including the selection of the most appropriate survival standard to measure, protocols and methodologies to assess survival, and review of the study results to determine whether or not the survival standards have been achieved. The coordinating committee would also provide input on the choice of measures implemented under Phase I, and periodically evaluate and adjust the protection measures (after Phase I) to assess actual project survival and unavoidable project mortality.

Although adjustments can be made to ensure the no net impact standard, no more than 9 percent unavoidable project mortality shall be made up through hatchery and tributary compensation. If any project, for any species, cannot achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival standard, then the PUDs shall consult with the signatory parties through the coordinating committees to jointly seek a solution. The committee would have the ability to select an independent third party to provide scientific review of any disputed survival study results.

The tributary committees are charged with the task of selecting projects and approving project budgets from the Plan Species Account for purposes of implementing the Tributary Conservation Plan.

The hatchery committees are responsible for evaluating the hatchery programs and ensuring that adequate compensation is being maintained based on the 7 percent compensation goal.

The tributary and hatchery committees would be formed after the HCP is approved by FERC, and would operate simultaneously and independently throughout the HCP terms.

S.5.3.8 HCP Conservation Plan and Compensation Measures

The measures described below are currently considered to be the tools that Chelan and Douglas County PUDs would use to meet 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival.

Wells Dam

Outside of the existing mitigation measures negotiated during the 1990 long-term fisheries settlement agreement for the Wells Project (FERC 1991), no new structural modifications have been identified to date. The combination of the existing juvenile fish bypass system at Wells Dam and the replacement of the turbine units with minimum gap type turbines has produced a three year average project survival of 96.2 percent for yearling chinook and steelhead.

As a result, the HCP signatory parties have determined that Douglas County PUD has achieved the Phase III (Standard Achieved) designation for yearling chinook and steelhead. The HCP parties also believe that the calculated estimate of juvenile dam passage survival for sockeye and subyearling chinook is probably greater than the 95 percent standard and that Douglas County PUD has most likely achieved Phase III (Additional Juvenile Studies) for subyearling chinook and sockeye.

Based on the measured or calculated survival information, the juvenile bypass system would continue to be operated in a manner consistent with that used during the evaluation phase (see Section 4.3 of the Wells HCP). Specific

measures to be implemented include the following:

- Continuously operate the bypass between April 10 and August 15, or longer if necessary to encompass 95 percent of a juvenile migration period.
- Coordinate with the HCP signatory parties and other resource agencies to address total dissolved gas and other water quality issues.
- Maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures.
- Operate and maintain the adult fish passage systems according to procedures outlined and criteria developed through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project.
- Evaluate the biological significance of adult fallback rates and steelhead kelt loss at the project, and implement recommendations of the coordinating committee likely to significantly improve survival.

Rocky Reach Dam

The Chelan County PUD would be undertaking various interim, prototype, and permanent measures at the Rocky Reach Project in an effort to achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival standards. These measures would include interim spill, bypass diversion screen operations, surface collection bypass system construction and evaluation, turbine replacement, and predator control (see Section 5.4 of the Rocky Reach HCP). The appropriate mix of measures would vary as the surface collection system is improved and its efficiency tested and quantified.

Phase I testing at Rocky Reach Dam is expected to begin in 2004 for yearling chinook and steelhead. The surface collection juvenile bypass system is scheduled to be completed by 2003. Chelan County PUD will use the 2003 juvenile outmigration season to conduct studies to identify specific physical or operational modifications prior to the first year of survival testing (2004). Based on the results of these initial studies, spill levels will be adjusted for the Phase I testing period (2004 – 2006). Survival rates for subyearling chinook and sockeye would be measured if technology exists, or calculated based on estimated survival rates for, and the proportion of these species passing, each passage route at the project.

Survival data would determine the number, type, and magnitude of the various protective measures needed to achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project passage survival, or 95 percent juvenile dam passage survival standards. Actions would also be taken to improve survival and ensure timely passage of adult anadromous salmonids through the project. The following measures would be implemented:

- Install a juvenile fish bypass system consisting of a surface collection system with secondary collection from a limited number of turbine intake screens.
- Continuously operate the bypass between April 1 and August 31, or longer if necessary to encompass 95 percent of a juvenile migration period.
- Modify replacement turbine runners to improve survival of juvenile anadromous salmonids as much as possible, given manufacturing, technical, and installation schedule limitations.
- Continue implementing a spill program that provides spill levels to achieve 95 percent survival when used with the surface collector

during a period encompassing 95 percent of migration periods of spring- and summer-migrating Plan species. In addition, provide 25 percent spill during the Okanogan sockeye outmigration period (for up to a maximum of 21 days). Spring spill would begin no later than April 20 and generally end no later than June 15. The summer spill period is between July 1 and August 15.

- Coordinate with the HCP parties and other resource agencies to address total dissolved gas and other water quality issues

- Maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures.

- Operate and maintain the adult fish passage systems according to criteria developed through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project.

- Evaluate the biological significance of adult fallback rates and steelhead kelt loss at the project, and implement recommendations of the coordinating committee likely to significantly improve survival.

- Perform the necessary studies to properly monitor and evaluate on-site mitigation measures.

Rock Island Dam

Similar to the Rocky Reach Project, the Chelan County PUD would undertake various interim, prototype, and permanent measures at Rock Island Dam in an effort to achieve the 91 percent combined adult and juvenile project passage survival, 93 percent juvenile project passage survival, or 95 percent dam passage survival standards for juvenile anadromous salmonids.

The HCP identifies several specific measures to implement at Rock Island Dam to improve fish passage survival (see Section 5.4 of the Rock Island HCP). One measure is to replace the existing Fisheries Conservation Account spill program with a program that provides spill levels of 20 percent of the daily average flow during a period encompassing 95 percent of the migration period for each Plan species. Under this new program, spring spill would begin no later than April 17 and generally end no later than June 15. The summer spill period is between July 1 and August 15. However, spill periods can be extended to encompass 95 percent of the migration period for each Plan species. The fish migration periods will be determined by fish captured in the second powerhouse juvenile fish bypass system.

Another measure outlined in the HCP is to maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures.

The PUD would also operate and maintain the adult fish passage systems according to criteria developed through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project. The HCP also stipulates the evaluations of the biological significance of adult fallback rates and steelhead kelt loss at the project, and implementation of the coordinating committee recommendations likely to significantly improve survival.

Survival data obtained at each step in the process would determine the number, type, and magnitude of the various protective measures needed to achieve the pertinent survival standard. Actions would also be taken to improve survival and ensure timely passage of adult anadromous salmonids through the project to meet the 91 percent combined adult and juvenile project survival standard. Some or all of the following measures would be implemented:

- designing, modeling, prototype testing, and installing spill gate modifications to provide surface spill to increase fish passage efficiency;

- testing and evaluating various spill configurations;

- designing, modeling, prototype testing, and installing a turbine bypass system consisting of a surface bypass collection system, with or without secondary collection from turbine intakes;

- replacement of turbine runners to improve survival of juvenile anadromous salmonids that pass through the units, and limiting use of the Powerhouse 1 turbines;

- testing a forebay guidance curtain to route juvenile anadromous salmonids into surface bypass collectors;

- maintaining effective predator control measures; and

- performing necessary studies to properly monitor and evaluate on-site mitigation measures.

Tributary Conservation Plan

Alternative 3 would create a Plan Species Account, to be used to fund activities for the protection and restoration of Plan species habitat within the Columbia River watershed (from Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat, and Wenatchee River watersheds, to compensate for the unavoidable 2 percent project mortality (see Section 7 of the Wells, Rocky Reach and Rock Island HCPs).

Restoration projects would occur within one of seven categories: (1) habitat protection, (2) floodplain rehabilitation, (3) channel function, (4) instream flow improvements, (5) fish passage improvements, (6) riparian restoration, and (7) water quality improvements. These habitat improvement projects could include, but are not limited to:

- providing access to currently blocked stream sections or oxbows,

- removing dams or other passage barriers on tributary streams,

- improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period,

- improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, and

- purchasing important aquatic habitat shoreline areas for preservation or restoration.

Such tributary habitat conservation and restoration measures are expected to improve the migration and rearing conditions for all anadromous fish species, as well as other resident fish. These measures are also expected to help decrease bank erosion, sedimentation, channel scouring, and water quality problems. The improved conditions would increase the opportunities for successful spawning by facilitating the return of adult anadromous salmonids to their natal spawning areas at the proper time and in good health. The tributary committees would review all habitat restoration projects according to the criteria set forth in the HCP supporting documents provided as appendices to the HCPs.

The funding levels for each project to the Plan Species Account are set in the HCPs. The combined total contributions through the 50-year term of the HCPs will be over $46.5 million in 1998 dollars. For the Wells Project, the Douglas County PUD would fund an initial contribution to the account of $1,982,000 (1998 dollars adjusted

for inflation). Five years after the initial contribution, the PUD could either provide annual payments of $176,178 (1998 dollars) throughout the HCP term or provide an up-front payment of $1,761,781 (equivalent to 10 yearly payments in 1998 dollars), deducting the actual costs of bond issuance and interest. After a total of 15 years, the HCP parties would determine the contribution method of the remaining funds (at a rate equivalent to $176,178 per year).

These funding levels are based on a 2 percent mitigation level for adult mortality. However, if the adult passage survival is determined to be greater than 98 percent and the juvenile project passage survival is greater than 93 percent, for any one of the Permit species, contributions to the Tributary Fund would be reduced to reflect the actual adult survival estimate of that species.

The adult survival estimates for each Permit species would independently determine one quarter of the funding to the Plan Species Account for each project. For example, if adult steelhead and spring-run chinook salmon survival were determined to be 99 percent, the annual contributions to the Plan Species Account would be based on 1 percent mortality for these two species. However, the annual contributions for the other two Permit species would continue to be based on a 2 percent mitigation level. Under this scenario, the annual contributions to the account would be reduced from a full $8/8^{th}$ contribution (2 percent for four species) to a $6/8^{th}$ contribution.

For the Rocky Reach Project, Chelan County PUD would fund the Plan Species Account at $229,800 annually (1998 dollars adjusted annually for inflation) for the term of the HCP. At the request of the tributary committee, advanced contributions would be made during the first 15 years of the agreement.

For the Rock Island Project, the Chelan County PUD would provide $485,200 annually (1998 dollars adjusted annually for inflation) to the Plan Species Account. At the request of the tributary committee, advanced contributions would be made during the first 15 years of the agreement.

The Plan Species Account would be vested with the authority to expend money contributed by the PUDs for activities within the Columbia River watershed (from Chief Joseph Dam tailrace to the Rock Island tailrace), and including the Okanogan, Methow, Entiat, and Wenatchee River watersheds to increase productivity of anadromous salmonids in the Mid-Columbia River area.

The tributary committee would be composed of one representative of each of the signatory parties. The committee may select other expert entities, such as land and water trust/conservancy groups, to serve as additional, non-voting members of the tributary committee. The committee would be charged with the task of selecting projects and approving project budgets for the purposes of implementing the Tributary Conservation Plan.

The tributary habitat improvement projects would be determined on a case-by-case basis by the tributary committee, subject to the guidelines and standards of biological and economic efficiency and the financial resources of the Plan Species Account. The guidelines for tributary projects place the highest priority on maintaining and improving stream channel diversity and floodplain function. The projects would seek to conserve and protect riparian habitat to improve incubation and rearing conditions in tributary streams.

Through the Tributary Assessment Program, the PUDs would provide support for assessing the relative merits of each tributary project funded (see Section 7.5 of the Wells, Rocky Reach, and Rock Island HCPs). Funding for the assessment program is separate from the Plan Species Account, but is set for approximately $200,000 per project (up to $600,000 for all three projects) (not subject to inflation adjustment) during the term of the HCPs.

Hatchery Compensation Plan

Each hatchery committee would consist of one representative of each HCP signatory party. These committees would direct the effort required of each PUD to meet the 7 percent hatchery compensation goal to achieve no net impact for each Plan species. The initial estimated HCP hatchery production capacities for each Plan species was based on the average adult returns of that species for a baseline period, the 7 percent compensation level, and baseline adult/smolt survival rates for existing Mid-Columbia River hatcheries (see Section 8 of the Wells, Rocky Reach, and Rock Island HCPs).

The estimated production capacity shall be adjusted periodically, excepting for original inundation mitigation, to achieve and maintain no net impact to the Plan species. Adjustments to the hatchery compensation level may include reduction of production to conform to actual project mortality, as determined from monitoring and evaluation, or increases in production as the base population level increases in the recovering anadromous fish populations. Hatchery compensation may be increased either by increasing the number of fish produced or by increasing the survival of fish produced at the initial production levels. Such adjustments would be based on the results of juvenile passage survival evaluations at the hydroelectric projects.

Until successfully reproducing coho salmon populations are reestablished, or a long-term coho hatchery program is developed, there are no hatchery compensation programs required in the HCPs for coho salmon.

S.5.3.9 Provisions for Unknown Impacts on Other Aquatic Species

The HCPs do not include mitigation measures for non-Plan species. However, species that actively or passively pass the project (such as bull trout) may benefit from improvements at the dams (through improved fish passage conditions). Bull trout are a threatened species in the Columbia River Basin, and although they occur in the project area, the extent of their occurrence and the project-related impacts are largely unknown. The PUDs and FERC are currently conducting informal consultation with the USFWS to assess the potential effect of project operations on bull trout.

Aquatic species that are expected to benefit from the tributary habitat improvement projects conducted under the HCPs are Pacific lamprey and resident trout species (including bull trout) that occupy the same habitats as the Plan species.

Terrestrial wildlife species that use riparian, wetland, and floodplain habitats are expected to benefit from implementation of aquatic habitat improvements in the tributaries. These improvements should increase their food supply, cover, and overall habitat area.

S.5.3.10 Monitoring and Evaluation

All three HCPs propose monitoring and evaluation of on-site measures to determine if the 95 percent juvenile dam passage survival, the 93 percent juvenile project passage survival, or the 91 percent combined adult and juvenile project passage survival metrics have been achieved (see Section 4 of the Wells, Rocky Reach and Rock Island HCPs). In addition, monitoring and evaluation of tributary habitat improvements funded by the Plan Species Account and the number and effects on other species after release of fish produced by the hatchery program would also be monitored.

S.5.3.11 Project Cumulative Effects

The anadromous salmonid mortality rates associated with passage at the projects contribute to the overall mortality of the Plan species passing other downstream hydroelectric projects. However, the salmonid survival improvements

resulting from the proposed actions would be in addition to other recovery efforts underway in the basin. The primary recovery efforts include the reasonable and prudent measures identified in the FCRPS biological opinion, Water Resource Inventory Area planning efforts, Salmon Recovery Funding Board activities, and the extensive predator control activities underway within the Columbia River Basin.

The PUDs would consider the cumulative impact effects when making land use decisions on project-owned lands to meet the conservation objectives of the HCPs, FERC license requirements, and other applicable laws and regulations. The PUDs would notify and consider comments from the signatory parties regarding land use permit applications on project-owned lands. The PUDs would also notify applicants seeking permits to use or occupy project lands or water that such use or occupancy may result in an incidental take of species listed under the Endangered Species Act, requiring advance authorization from NMFS or USFWS.

The run-of-the-river Mid-Columbia River PUD projects have limited capabilities for storing water, and are therefore unlikely to affect water quantity parameters. However, the cumulative impacts of the projects include water quality issues, particularly the effects on temperature and total dissolved gas. The PUDs would continue to work cooperatively with each other, and other entities in the region, to minimize the cumulative effects of project operations on water quality issues.

Project operations could have an effect on recreation, riparian vegetation, and wildlife species along the mainstem Columbia River, particularly for drawdown options. With the general exception of drawdown options however, project operations are not expected to substantially affect these or the other resources analyzed in this EIS, compared to existing conditions.

Off-site tributary enhancement projects could affect all the resources addressed in the EIS, depending on the location and the extent of the projects. Although such changes are expected to have environmental benefits, the effects to resources other than anadromous fish species would likely be minimal. The tributary habitat improvement projects could affect land ownership, if riparian habitat corridors are purchased or leased as mitigation activities. Other habitat improvement projects are likely to require various permits or environmental reviews.

S.5.3.12 Costs and Funding

Funding of all PUD obligations, including studies necessary to evaluate and monitor the effectiveness of those measures, would be provided directly by the PUDs from power sale revenues. It is anticipated that bonds secured by those revenues would be issued for major capital costs, such as bypass construction. Money for the Plan Species Account and the Tributary Assessment Program would also come from project revenues, with the initial contribution possibly obtained from a bond issue (see Section 7.4 of the Wells HCP and Section 7.5 of the Rocky Reach and Rock Island HCPs).

S.5.3.13 Verification of Standards

To determine if the HCPs' survival standards are being met, specific biological and statistical standards have been established in the HCPs (see Section 4.1.4 of the Wells HCP and Section 5.2.3 of the Rocky Reach and Rock Island HCPs). These standards apply to all of the evaluations to be conducted. The results would be utilized to support decisions made after Phase I of the HCPs. Efforts to determine more direct evidence of compliance with the HCP standards for all Plan species would continue during Phases II and III.

Because the juvenile fish passage survival standards cannot be verified for subyearling chinook (summer/fall chinook) or for sockeye

salmon, and the 91 percent combined juvenile and adult project survival standard cannot be verified for any of the Plan species, compliance with the juvenile dam passage survival standards would be based on calculations.

Survival studies of yearling chinook salmon and steelhead were initiated at the Wells Project in 1998 and were initiated at Rock Island Dam in 2002. Survival studies will be initiated at the Rocky Reach Dam no later than 2004. Initial verification of the 93 percent juvenile project passage or 95 percent juvenile dam passage survival standards is expected to take 3 years.

The HCPs provide a mechanism for future verification of the 91 percent combined juvenile and adult project survival standard for each of the Plan species, as the appropriate technology is developed and supported by the coordinating committees.

Wells Project

Because the Wells Project has an existing bypass system, juvenile survival studies were initiated earlier than at the other projects. Douglas County PUD conducted juvenile survival studies in 1998 using yearling chinook salmon, and in 1999 and 2000 using yearling steelhead. These studies met the biological and statistical standards established in the revised HCPs. Additionally, the Douglas County PUD conducted 3 years of fish passage efficiency evaluations (an estimate of the number of juvenile fish bypassing the project powerhouse through the surface bypass system) for the Wells Project bypass system.

The 3-year average from the yearling chinook and steelhead project survival studies was 96.2 percent. The 3-year average for the fish passage efficiency studies indicates that 92 percent of the spring-run migrants (yearling chinook, steelhead, and sockeye) and 96 percent of the summer-run migrants (summer/fall chinook) use the bypass system. Based on the best estimate of turbine and bypass system survival (90 to 93 percent and 98 to 99 percent, respectively), spring-run migrants are expected to have a juvenile dam passage survival rate of 97 to 98 percent and summer-run migrants are expected to have a 97 to 98 percent juvenile dam passage survival rate.

Throughout the term of the HCP, the 93 percent juvenile project passage survival, the 95 percent juvenile dam passage survival standard, or the 91 percent combined adult and juvenile project survival standard would be reevaluated every 10 years. It is anticipated that survival studies would be conducted for sockeye and subyearling chinook salmon, as well as adult salmon and steelhead, as technology is developed.

Funding for the Wells Tributary Conservation Plan is tied directly to the fish passage survival standard. If it is determined that the Wells adult survival rate for an individual Plan species is equal to or greater than 98 percent and the juvenile project passage survival is greater than 93 percent, the funding of the Tributary Conservation Plan would be reduced to reflect adult survival estimates for that species.

Rocky Reach Project

The Chelan County PUD is developing a surface bypass collector system for the Rocky Reach Project. This system is expected to be installed by the 2003 spring outmigration period, while survival tests would not start until 2004. Chelan County PUD would initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that the 93 percent juvenile project passage survival or the 95 percent juvenile dam passage survival standard is being met. The best available information would be used to determine whether the juvenile passage survival standards have been met for each of the remaining Plan species (e.g., survival information from surrogate species combined with measurements of fish passage through non-turbine routes). Throughout the term of the HCP, the pertinent survival standard would be reevaluated from time to time

as determined necessary by the coordinating committee.

Rock Island Project

Spill is currently the preferred juvenile bypass measure at Rock Island Dam. Beginning in 2002, Chelan County PUD would initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that either the 93 percent juvenile project passage survival or the 95 percent juvenile dam passage survival standard is being met. As is the case with the Wells and Rocky Reach projects, the best available information would be used to determine the juvenile passage survival for each of the remaining Plan species (e.g., survival information deemed sufficient by the HCP coordinating committee could be combined with measurements of fish passage through non-turbine routes to develop interim estimates of dam passage survival). Throughout the term of the HCP, the pertinent survival standard would be reevaluated from time to time as determined necessary by the coordinating committee.

S.5.3.14 Compensation for Unavoidable Project Mortality

During the development of this EIS, certain sections of the HCPs required clarification to allow for accurate analysis of the potential effects of the actions on Endangered Species Act-listed species and on other natural resources. Most of the clarifications related specifically to modification of the standards to ensure no net impact. It should be noted that HCP survival standards are fixed and compensation would not increase if the standards are not being met. For example, hatchery compensation would not be increased to 9 percent if juvenile dam passage survival were measured at only 93 percent for a given species. The 2 percent shortcoming in the juvenile dam passage survival standard would need to be addressed through improvements in dam passage survival. Likewise, if the 7 percent hatchery compensation level is not met due to NMFS Endangered Species Act concerns, neither the dam passage survival standard, the project survival standard, nor the habitat compensation standard would be adjusted. However, failure to meet the standards by 2013 (2018 for the Wells Project) would allow parties to withdraw from the HCP agreements.

Although the compensation levels would not increase as a result of not meeting the survival standards, hatchery compensation for the Wells Project could be reduced if the survival standards are exceeded. However, if the survival standards are exceeded at Rock Island or Rocky Reach dams, Chelan County PUD may reduce the amount of spill to levels which will continue to meet the survival standards of the HCPs, as indicated by an additional series of survival studies.

S.5.3.15 Hatchery Compensation Plan Issue

During the development of the HCPs, NMFS determined that the 7 percent hatchery compensation levels may adversely affect wild salmon populations under certain conditions.

Therefore, until the specific details of the compensation programs were developed (including identification of appropriate broodstock, maximum percentages of the wild populations that can be trapped for broodstock, and the total number of fish produced through artificial means), NMFS could not guarantee that the 7 percent compensation level would satisfy Endangered Species Act requirements.

To address the Tribes' concerns regarding hatchery production levels, subsequent HCP negotiations resulted in an agreement to provide the PUDs with a 7 percent hatchery production guarantee through 2013. In 2013 the parties to the HCP agreements shall have an opportunity to review and make modifications to the hatchery compensation component of the HCP agreements.

Based on the results of the program review in 2013, the program could be changed at that time, or in subsequent reviews scheduled for every 10 years.

To minimize the potential impacts to wild fish from the Hatchery Compensation Plans, the PUDs would implement specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations, and achieving no net impact to the Plan species. Specific objectives may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest objectives.

Due to the increased emphasis on developing hatchery programs that focus on rebuilding natural populations, NMFS believes (pending completion of its review of the HCPs) that the initial hatchery production levels outlined in the HCPs are unlikely to jeopardize the continued existence of the listed species in the near term. However, there is still some uncertainty over the long term. As a result, it was agreed that the initial hatchery production levels necessary to compensate for 7 percent unavoidable mortality at the projects would be maintained until a comprehensive review is conducted in 2013. (Chelan County PUD hatcheries are compensating for a 14 percent juvenile mortality in the period running through 2013.) These production levels are based on adult return rates during the baseline period, the 7 percent compensation requirement, and baseline adult to smolt survival rates for existing Mid-Columbia River hatcheries. In addition to the program review in 2013, additional reviews would occur every 10 years during the term of the HCPs.

S.5.3.16 Other Options Considered

Similar to Alternative 2, Alternative 3 could include project reservoir drawdown after 2013 for the Rocky Reach and Rock Island projects or after 2018 for the Wells Project. Either the USFWS or NMFS could pursue this option under certain circumstances, including if: (1) no net impact has not been achieved or has been achieved but has not been maintained, (2) the Plan species are not rebuilding and the project is a significant factor in the failure to rebuild, or (3) is agreed to by the PUDs.

S.5.3.17 Recent HCP Policy Revisions

On June 1, 2000, USFWS and NMFS published a final addendum to the *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (USFWS and NMFS 2000). This addendum, which is also known as the five-point policy guidance, provides clarifying direction on five issues brought forth from recent HCPs implemented throughout the United States. The following sections describe how the applicant HCPs meet the HCP addendum.

Biological Goals and Objectives

The addendum recommends that biological goals and objectives be incorporated in HCPs. These goals may be either habitat- or species-based. Species-based goals are expressed in terms specific to individuals or populations of that species. The performance standards represent the biological goals and objectives for the HCPs (i.e., the HCP standards). These standards require specific survival goals based on the population passing through each project. In addition, incidental mortality is mitigated through hatchery production and habitat improvements to achieve an overall no net impact standard.

Adaptive Management

The use of an adaptive management strategy is recommended to (1) identify uncertainties related to quantifying the achievement of goals and objectives of the HCPs, as well as the questions that need to be addressed to resolve these uncertainties; (2) develop alternative strategies and determine which experimental strategies to

implement; (3) integrate a monitoring program that is able to detect the necessary information for strategy evaluation; and (4) incorporate feedback loops that link implementation and monitoring to a decision-making process that results in appropriate changes in management. Adaptive management would be incorporated into the HCP monitoring programs that provide the feedback necessary to determine the effectiveness of various approaches being implemented to increase fish survival. Throughout the term of the HCP, what is learned would be used to adjust conservation measures.

Monitoring

HCP handbook guidance on monitoring recommends that the monitoring program reflect the measurable biological goals and objectives. The monitoring programs developed under the Mid-Columbia River HCPs are three-fold: (1) confirm fish survival through the dams (validation monitoring), (2) evaluate the effectiveness of on-site mitigation measures implemented to improve fish survival (effectiveness monitoring), and (3) confirm that the on- and off-site mitigation measures are applied correctly (implementation monitoring).

Permit Duration

Factors to be evaluated when determining permit duration include the time line of the proposed activities and the expected positive and negative effects on covered species associated with the proposed duration. The HCP terms generally compliment the term of a project operating license, but more importantly reflect a desire to provide long-term protection assurances for the Plan species that also account for oceanic condition changes that may occur over a longer period of time.

The HCP handbook addendum recommends a 90-day public comment period for large scale, regional or complex HCPs. The addendum notes that 60 days would be appropriate if the applicant has taken steps to involve the public early in the process. In this process, the public was provided with four months to comment on the draft EIS; interested parties participated directly in developing the revised HCPs over the course of 6 months; and an additional comment period of 30 days was provided on the revised HCP permit applications.

S.6 Actions Common to All Alternatives

Only those project operations that affect fish passage would be altered, if necessary, to assist in increasing the overall salmon and steelhead survival rates. Studies to evaluate and improve fish passage have been ongoing since the dams were constructed. As a result, the key factors influencing fish passage have already been identified. Project operations that are included under all of the alternatives are:

fishways,
fishladders,
fish bypass,
turbine operations,
predator control,
hatcheries, and
spill.

The four tributaries where funds for the Plan Species Account would be directed under the HCP (Wenatchee, Entiat, Methow, and Okanogan) have threatened (bull trout) and endangered (spring-run chinook and steelhead) species. Numerous efforts are being, or will be, implemented to improve fish survival and breeding opportunities in the streams that are unrelated to the operation of the Wells, Rocky Reach, and Rock Island dams or the HCPs. These separate improvement activities (not funded by the PUDs) would continue under all alternatives.

S.7 ALTERNATIVE COMPARISON

Because all three of the alternatives strive to improve fish survival at the dams, this section describes both the environmental differences among the alternatives at the project site and the procedural differences for implementing the alternatives, as shown in Table S-3 and described below.

The most significant differences among the alternatives are the scope of the species covered, the statutory obligations satisfied, the parties that support the alternatives, and the timing and certainty for implementation. For example, under Alternative 1, current FERC license requirements would address all species but may or may not address the additional requirements of the Endangered Species Act. Alternative 2 would result in an additional protection plan for anadromous salmonid species but is primarily concerned with the protection and recovery of Endangered Species Act-listed Upper Columbia River steelhead and spring-run chinook salmon. A new Endangered Species Act consultation would occur at the time each project is relicensed, or when significant new information is available that indicates that existing protection measures are not adequate for the listed fish and a reopener clause proceeding is initiated. This would help in the protection of anadromous salmonids. Finally, Alternative 3 (Proposed Action) represents long-term settlements of the anadromous salmonid issues for each project under the current licenses and at relicensing for all anadromous salmonid species in the project area. Alternative 3 would be effective for a 50-year term, although comprehensive reviews of the programs and species status would occur every 10 years.

S.7.1 AFFECTED SPECIES

S.7.1.1 Alternative 1 (No-Action)

For purposes of comparison only, it is assumed that protection for the listed and non-listed anadromous salmonid species would be limited to existing measures under current FERC licenses and agreements. Existing measures, however, may not prevent the extinction of listed species, nor are they expected to increase the populations of non-listed species above current levels.

S.7.1.2 Alternative 2

Alternative 2 includes the protective measures identified in Alternative 1, as well as additional measures to protect listed anadromous species. Authorities afforded to NMFS under the Endangered Species Act would apply to Upper Columbia River steelhead, Upper Columbia River spring-run chinook salmon, and Mid-Columbia River steelhead. Protection for other Endangered Species Act-listed species (including bull trout) that might be impacted by the Mid-Columbia River hydroelectric projects would be addressed through separate but similar actions to those identified for Alternative 2.

NMFS and FERC also have obligations to protect anadromous species through the Federal Power Act through the relicensing or license reopener procedures. As with the other alternatives, additional protection for non-listed anadromous species is expected through these proceedings. However, the protection measures are not expected to be as comprehensive as those that apply to the listed species.

S.7.1.3 Alternative 3

The HCPs provide the same level of protection for sockeye, summer/fall-run chinook, and coho salmon as they provide to the Endangered Species Act-listed species. Although the wild population of coho salmon has been extirpated from the action area, the HCPs provide measures to protect reintroduced populations. Although the impacts

TABLE S-3. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Endangered Species Act Compliance	Continue with existing measures under current license conditions[1]	Section 7(a)(2) for ESA-listed species for all three projects	Section 10(a)(1) for all Plan species (applies to those species which are currently listed as well as those that could be listed in the future)
Duration of Each Alternative	50 years[2]	Same as Alternative 1[2]	50 years subject to withdrawal and termination provisions
Species Covered	All anadromous salmonid species	Same as Alternative 1, but additional measures would focus primarily on ESA listed species.	Same as Alternative 1
Protection Measures	Limited spill and bypass measures, continued operation of adult fishways	Additional project operational and structural modifications for listed species and potentially additional protection measures for non-listed anadromous fish through the issuance of a new license; determination and implementation of measures would depend on ESA consultations, negotiations, and Federal Power Act authorities.	Following HCP approval, immediate implementation of additional project operational and structural modifications for all Plan species, as well as habitat improvement measures
Implementation Timing	Protection measures currently being implemented	Protection measures to be implemented during relicensing, license amendments or under reopener clause proceedings, but subject to Section 7(a)(2) consultations; implementation would occur following FERC approval of the measures, which typically occurs up to 5 years following commencement of formal ESA consultation	Implemented immediately following HCP approval
Performance Standards	Currently based on fish passage efficiency for specific measures, such as a specified spill level for a fixed period of time or until moneys in the Fish Conservation Account are exhausted (no project or species level standards)	Same as Alternative 1, except for the likely development of appropriate survival standards for listed species through ESA consultations, as well as some potential for developing survival standards for non-listed anadromous salmonid species through the Federal Power Act	No net impact for all Plan species - 91% combined adult and juvenile project (reservoir and dam) passage survival, or 93% juvenile project passage survival, or 95% juvenile dam (forebay, dam, and tailrace) passage survival; compensation to obtain no net impact also includes up to 7% hatchery programs and 2% to tributary programs

TABLE S-3. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Project Lead for Identifying and Implementing Protection Measures	FERC through the existing coordinating committees	Same as Alternative 1 or through new license conditions	HCP coordinating committees
Location of Fish Protection Measures	Project area, including reservoir, dam structures, tailrace, and hatcheries	Same as Alternative 1	Same as Alternative 1 and additionally including Wenatchee, Entiat, Methow, and Okanogan Rivers and tributaries
No Surprises Policy	Not applicable	Not applicable	Applicable, subject to certain circumstances defined in the withdrawal provisions of the HCP agreements
Continued Studies to Assess Survival	Needed to verify fish passage measures at Rock Island and Rocky Reach dams	Same as Alternative 1	At least 3 years of evaluation for each Plan species, and periodic reevaluations every 10 years or as determined by the HCP Coordinating Committees
Monitoring Following Statement/Permit Issuance	Not applicable	As needed to ensure effectiveness of measures and status of salmonid species	Periodic monitoring to verify survival for all Plan species
Future Provisions for Other Aquatic Species	Would occur under relicensing or under existing license reopener clauses	Same as Alternative 1, although Endangered Species Act-listed species would be covered under separate consultations	Same as Alternative 2
Hatchery Compensation	Continued hatchery funding at present level, for inundation compensation levels and ongoing unavoidable losses (hatchery compensation can be adjusted for Wells based on actual losses)	Same as Alternative 1, although production levels may be reduced at any time based on potential effects to listed species	Continued hatchery funding for inundation compensation levels; hatchery funding would be established to mitigate for unavoidable losses; initially, mitigation would be set to achieve a 7 percent compensation level but could be adjusted periodically based upon the results of survival studies; additional survival reevaluations would take place every 10 years

TABLE S-3. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Tributary Improvements	No PUD-funded improvements	Same as Alternative 1	PUD contributions to the Plan Species Account would pay for projects that improve salmon and steelhead habitat in the Wenatchee, Entiat, Methow, and Okanogan River Basins, as well as the Mid-Columbia River mainstem; the combined funding over the 50-year term of the HCPs is over $46.5 million, and is specified and guaranteed in the HCPs
On-Site Protection Measures			
Wells	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, if adult fish passage problems are identified, develop solutions to the problems	Adult Passage: Same as Alternative 1 or as needed to prevent the extinction of listed species; conduct spawning success evaluations, operate surface bypass system during adult steelhead and spring-run chinook migration periods and downstream kelt passage period	Adult Passage: Same as Alternative 1, with the additional requirement to meet the 91% combined adult and juvenile survival standards for all Plan species
	Juvenile Passage: Evaluate and control total dissolved gas, continue, operate surface bypass system to achieve 80% fish passage efficiency for spring and summer migrants	Juvenile Passage: In addition to measures in Alternative 1: operate the turbines as efficiently as possible, operate surface bypass system 24 hours/day for up to 99% of juvenile migration, increase spill as needed to improve survival but limited by dissolved gas	Juvenile Passage: Meet 93% project passage survival or 95% dam passage survival for all Plan species by increasing effectiveness of juvenile bypass system, spill gates, predator control, and turbine usage, or through other measures
Rocky Reach	Adult Passage: Continue to operate and maintain adult fishladders, operate powerhouse units within 1% of peak efficiency	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, conduct modeling and develop solutions for adult fish passage problems, use spillway flow configurations to optimize adult fishway attraction flows, provide safe passage for adult fallbacks and kelts, evaluate biological impacts of adult passage	Adult Passage: Same as for Wells (above)

TABLE S-3. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Juvenile Passage: Operate the turbines as efficiently as possible during the migration seasons, spill 15% of daily river flow for 42 days of the spring migration period and 10% for 34 days during the summer migration; evaluate and construct a permanent bypass system and replace old turbine runners, control total dissolved gas, continue predator control measures, monitor passage and total dissolved gas levels to meet requirements	Juvenile Passage: Same as Alternative 1, except for additional spill to improve juvenile fish passage survival rates to cover up to 99% of the migration period, but limited by dissolved gas levels; consider additional or alternative juvenile bypass options such as a sluiceway	Juvenile Passage: Construct and operate a new juvenile bypass facility and spill 15% of the daily average river flow, over 95% of the migration period of each Plan species (in addition, spill is increased to 25% for three weeks during the spring migration period to further protect sockeye), or as necessary to meet the survival standards listed above for Wells Dam, other operational criteria would be similar to Alternative 1
Rock Island	Adult Passage: Continue to operate and maintain adult fishladders	Adult Passage: Same as for Rocky Reach (above)	Adult Passage: Same as for Wells (above)
	Juvenile Passage: Provide spill as requested by Fishery Agencies and Tribes through the Fish Conservation Account (currently assessed at about $3.2 million), evaluate fish guidance efficiency, control gas abatement, continue predator control measures	Juvenile Passage: Increase spill to improve juvenile fish passage survival rates to cover up to 99% of the migration period, but limited by dissolved gas levels; enhance spillway passage efficiency, preferentially use Powerhouse 2 turbines, and minimize use of Nagler turbines	Juvenile Passage: Spill 20% of the daily average river flow, over 95% of the migration period of each Plan species; also strive to meet the survival standards listed above for Wells
Dispute Resolution	Disputes resolved by Wells, Rock Island, and Mid-Columbia Coordinating Committees or FERC and/or in court	Disputes are resolved by NMFS, FERC, and/or in court	Disputes resolved by coordinating committees or policy committees, if no resolution is reached, procedures would be similar to Alternative 2
Additional Protection Measures	As negotiated during relicensing or license re-opener clauses	Other measures as required by FERC and NMFS to ensure protection of salmonid species and recovery of the listed species	As determined by the HCP coordinating committee to meet the survival standards for all Plan species

[1] Alternative 1 (no-action alternative) represents existing baseline conditions for comparative purposes only. The measures implemented under Alternative 1 may not comply with the Endangered Species Act.

[2] Considered for comparison purposes only.

to Mid-Columbia River steelhead[2] are likely limited to water quality issues, this species is not specifically addressed in the HCP agreements. Protection for bull trout or other Endangered Species Act-listed species would be addressed under separate Section 7 consultations.

S.7.2 PROCEDURAL DIFFERENCES

S.7.2.1 Alternative 1 (No-Action)

Provisions of this alternative would be implemented under existing FERC license conditions, which currently include use of several coordinating committees. The committees consist of members representing fishery agencies, Tribes, and PUDs. The protection measures implemented through this process require unanimous consent of all parties. This has resulted in contested proceedings and legal debates among the parties that have significantly delayed implementation of fish protection measures. This alternative does not contemplate additional protection for listed or unlisted anadromous fish, and may not satisfy Endangered Species Act requirements.

S.7.2.2 Alternative 2

In addition to measures implemented through existing FERC license conditions, NMFS has the legal authority under the Endangered Species Act to recommend additional measures necessary to ensure that any FERC action affecting the projects does not jeopardize the continued existence of listed species. Such actions include relicensing proceedings, license amendments and proceedings under the reopener clauses. NMFS may also identify the most appropriate measures to be taken at each project and modify the measures as needed if species continue to decline. FERC, as the action agency, must include these measures in the license to obtain exemption from the take prohibitions as described under Section 9 of the Endangered Species Act. Under Section 7, NMFS has a legal responsibility to provide the benefit of the doubt to listed species with respect to gaps in the information base.

If FERC or the PUDs disagree with NMFS's decisions under this process, lengthy legal proceedings may ensue. During these proceedings, measures in addition to those already included in the FERC-issued operating licenses and settlement agreements are not likely to be implemented.

Species not listed under the Endangered Species Act would be addressed through NMFS's authorities under the Federal Power Act and the Magnuson-Stevens Fishery Conservation and Management Act, although these species might also benefit from actions implemented for the listed species. In addition, FERC relicensing or license reopener proceedings are expected to result in greater protection measures for all anadromous species.

S.7.2.3 Alternative 3

According to HCP provisions, the primary authority to determine the appropriate protection measures for each Plan species is provided to the coordinating committees (comprised of the PUD responsible for the HCP, NMFS, and each of the signatories to the agreement) for a joint decision on the appropriate measures. In the case of a dispute, if the coordinating committee cannot reach a unanimous agreement within 20 days, the dispute would be referred to the policy committee. If the policy committee cannot reach a unanimous agreement within 30 days, the HCP parties may pursue any other right that they might otherwise have to affect a decision, which would be similar to the dispute resolution options available under Alternatives 1 and 2.

[2] This Evolutionarily Significant Unit includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington; but excluding steelhead from the Snake River.

Because the HCPs establish specific actions, responsibilities, and duties to be carried out by the PUDs, each of the signatories to the agreements agrees not to institute any action under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning Conservation Act, Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, or Title 77 RCW with regard to the Plan species for these three projects (except as noted for the dispute resolution process). NMFS's No Surprises policy (which ensures the PUDs that NMFS would not request additional measures during the term of this agreement) would be in effect. However, the No Surprises policy would not affect the ability of NMFS to withdraw from the HCP agreements under the withdrawal provisions. While the No Surprises policy ensures that the HCP goals remain the same, the measures needed to achieve the goals could change.

S.7.3 TIME FRAME

S.7.3.1 Alternative 1 (No-Action)

Fish protection measures included in this alternative would occur throughout the term of the FERC-issued operating licenses. Project operations would continue as occurs presently regardless of future listings or delisting. FERC license periods are typically 30 to 50 years, and the Wells, Rocky Reach, and Rock Island projects would be relicensed over the next 26 years. It is recognized that additional fish protection measures could be implemented during relicensing and potentially through reopener clause negotiations, as described above. However, the pursuit of additional protective measures through these venues is evaluated in Alternative 2. Thus, for comparative purposes, it is assumed that the time frame evaluated for Alternative 1 is the same as the 50-year HCP term, and that no additional measures are adopted during that time period.

S.7.3.2 Alternative 2

The time frame is the same as Alternative 1.

S.7.3.3 Alternative 3

The HCPs would be in effect for a 50-year period beginning in approximately 2003, the date that the agreements are expected to be adopted by FERC as amendments to the FERC licenses (currently expected to be June 2003 through May 2053), except for defined termination procedures.

S.7.4 GOALS AND OBJECTIVES

S.7.4.1 Alternative 1 (No-Action)

This alternative may not provide specific provisions to ensure the continued existence or recovery of Endangered Species Act-listed fish species. Protection measures would continue to be implemented in accordance with existing FERC license articles and settlement agreements. Goals and objectives tend to be specific for each measure at each dam (i.e., no outcome-based performance standards).

S.7.4.2 Alternative 2

This alternative includes regulatory options under the Federal Power Act and Endangered Species Act. No specific project goals are identified, although the general consensus is to maximize salmonid survivability through the projects. Although outcome-based performance (survival) standards are likely to be established for the listed species, it is uncertain whether similar standards would be set for non-listed species.

S.7.4.3 Alternative 3

The HCPs provide long-term agreements to protect the Endangered Species-listed and non-listed salmon and steelhead, with the goal of having no net impact to all the Plan species. The no net impact standard would be achieved

through project-specific protection measures, hatchery production, and tributary habitat enhancement projects.

S.7.5 IMPLEMENTATION SCHEDULE

The three alternatives have different schedules for the implementation of the conservation measures, based on the mechanism used to establish the measures. The conservation measures included under Alternative 1 represent existing conditions and are therefore currently being implemented for all species, although the operational criteria for Rocky Reach Dam (provided by the Fourth Revised Interim Stipulation) have expired. As a result, additional negotiations would be required to develop new operational criteria for Rocky Reach Dam. However, the biological opinion issued by NMFS for the construction and operation of the permanent bypass system would be the likely starting point.

Additional measures implemented under Alternative 2 during the established 50-year timeline would be accomplished through the procedures available in the Federal Power Act, including relicensing or license reopener procedures. It is unknown when additional conservation measures would be implemented under Alternative 2, except during the established relicensing dates. However, previous negotiations have typically taken a number of years to reach agreement. There is also the potential for requiring legal proceedings to establish the conservation measures.

Additional Endangered Species Act consultations would be needed to establish conservation measures for the listed species. It is uncertain how long it would take to complete the consultation proceedings and the subsequent license amendment processes.

A number of the provisions provided under Alternative 3 have already been voluntarily implemented by the PUDs based on the staggered effective dates of Chelan County PUD's HCPs and Douglas County PUD's expectation that the HCPs will be approved and permitted by the appropriate regulatory agencies. The remaining provisions would be implemented when the HCPs are amended to the FERC licenses. As a result, no additional negotiations or consultations would be required to begin implementation of the conservation measures. In addition, legal challenges between the PUDs and the agencies would be substantially minimized or eliminated.

S.7.6 ADDITIONAL MEASURES

S.7.6.1 Alternative 1 (No-Action)

This alternative does not provide a procedure to require implementation of mitigation measures beyond the project's boundaries (i.e., tributary habitat improvements). Under Alternative 1, hatchery supplementation is addressed through the existing settlement agreements and license articles.

S.7.6.2 Alternative 2

Under Alternative 2, additional protection would likely be provided to the Endangered Species Act-listed fish by NMFS. If NMFS determines that the current hatchery production levels would compromise the genetic integrity of Endangered Species Act-listed fish, the production levels would be reduced. Such a determination could occur at anytime, because it would be considered significant new information warranting reinitiation of consultation. Other measures could also be implemented at any time through consultations based on new information.

Provisions of the Clean Water Act, Federal Power Act, Northwest Power Planning Act, Tribal treaties, and other laws and statutes are available under Alternative 2 to protect and restore Upper Columbia anadromous fish through increased operational and structural measures and supplementation.

S.7.6.3 Alternative 3

The HCPs include a funding process for the protection and restoration of Plan species' habitat within the Columbia River watershed (from the Chief Joseph project tailrace to the Rock Island Project tailrace) and in the Okanogan, Methow, Entiat, and Wenatchee River watersheds. In addition, hatchery compensation plans guarantee funding and capacity to meet the 7 percent compensation level necessary to achieve no net impact. Hatchery compensation levels, with few exceptions, would not change until 2013, and every 10 years thereafter.

Similar to Alternative 2, provisions of other laws, statutes, and Tribal treaties are available under Alternative 3 to protect and restore Mid-Columbia anadromous fish through increased operational and structural measures and supplementation. However, specific provisions in these laws and statutes that are under the jurisdiction of NMFS (and other signatory parties) would be subject to the terms and conditions of the HCPs.

S.7.7 OTHER ENVIRONMENTAL DIFFERENCES

Table S-4 provides a summary comparison of how the alternatives affect other environmental resources in the project area. This information is further described in Chapter 4.

S.8 PREFERRED ALTERNATIVE

The proposed action (Alternative 3) is the preferred alternative of the project proponents (Douglas County and Chelan County PUDs) and NMFS, as well as USFWS, WDFW, and the Colville Tribe. NMFS will describe its preferred alternative and the rationale for selecting it in a ROD issued following review of this FEIS. The review by NMFS is guided by both the Endangered Species Act and NEPA requirements. The major NEPA-related issues that NMFS considered in making its decision were:

- Was the environmental review process adequate?
- Were the impacts adequately discussed and significant adverse impacts mitigated?
- Were all reasonable and appropriate alternatives to the proposed action considered?
- Are there significant unavoidable adverse impacts associated with the preferred alternative?
- What were the values that were considered, and what is the basis for the decision?
- Are there any outstanding unresolved issues?
- Will the preferred alternative result in the irrevocable commitment of Federal resources?
- Does the preferred alternative meet the applicants' purpose and need?
- What are the major differences between the preferred alternative and the proposed action?

In addition to analyzing all human and biological resources potentially affected by the preferred alternative, the major Endangered Species Act issues that NMFS considered were related to the overall protection and recovery of the salmon and steelhead species covered by the incidental take permit. To document its analysis and decision making, NMFS would issue a biological opinion to assist in deciding whether the HCPs satisfy the requirements of Section 10(2)(B) of the Endangered Species Act. The biological opinion analysis by NMFS will involve:

- determining the biological requirements within the proposed action area,
- determining the status of the species within the action area,
- determining the factors affecting the species environment within the action area,
- determining the effects of the proposed action on species-level biological requirements, and
- evaluating the cumulative effects associated with the proposed action.

Prior to amending the project licenses, FERC is expected to consult with USFWS to evaluate any impacts on listed species not included as Permit species (e.g., bull trout). The FERC is also expected to initiate consultation with NMFS at this time to evaluate any impacts on listed anadromous species. However, it is assumed that absent any new information, FERC's proposed license amendments would be identical to the proposed actions already evaluated in the biological opinions on NMFS's issuance of the incidental take permits and the NMFS's findings would be identical.

The ROD for this EIS will certify the adequacy of the HCPs' environmental review process and will incorporate the requirements of the permit, including the mitigation commitments of the applicants.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Land Features, Geology, and Soils			
Project Area Soils	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, portions of the river cross-sectional areas would decrease to the original size of the river. In the short-term, riparian and shoreline areas would be disturbed and eventually mainstem spawning, incubation, and rearing habitat would be increased.	Same as Alternative 2.
Reservoir Erosion and Sedimentation	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, erosion and reservoir turbidity would initially increase over the short term and damage aquatic habitat conditions, with the greatest damage occurring during the first 4 to 7 years. Turbidity would decrease over time, and habitat conditions would improve. However, increased turbidity could also provide cover for juvenile fish from predators. Natural river sediment transport regimes would be restored, which could increase salmonid production through improved spawning and rearing habitat. Increased rates of sediment deposition would take place in the reservoir immediately downstream of the drawn down reservoir.	Same as Alternative 2.
Associated Tributaries	Geologic conditions conducive to fish habitat are expected to improve from independent local and State funded WRIA fish habitat enhancement projects.	Same as Alternative 1. If reservoir drawdown occurs, tributary channel mouths would erode each year. However, additional spawning habitat would likely be provided at the confluence with the mainstem.	Same as Alternative 2, with additional improvements to the geomorphic condition of the stream channel through the PUD-funded tributary habitat enhancement programs.
Columbia River System/Cumulative Effects	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, increased sediment and turbidity over the short-term particularly in the reservoirs immediately downstream of the drawn down project.	Same as Alternative 2.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Fisheries Resources			
Anadromous Salmonids and Other Listed Species (bull trout)			
Juvenile Migration/Survival Standards	Project-specific fish passage standards, no additional specific protection measures for threatened or endangered species. Protection for listed and non-listed species would be provided by laws and statutes other than the ESA.	Same as Alternative 1. Additional measures may be required under FERC licensing or ESA requirements that are likely to include increased use of spill to improve juvenile fish passage survival. Bull trout protection would be provided through consultation with USFWS.	No net impact standard - 91% combined adult and juvenile project passage survival, or 95% juvenile dam passage survival for all Plan species. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs. Bull trout protection would be similar to Alternative 2.
	Wells Dam: Provide a non-turbine passage route (juvenile bypass system) to pass at least 80% of spring-run outmigrants and 70% of summer outmigrants.	**Wells Dam:** Potentially increase the use of spill and extend the operational time frame of the juvenile bypass system to up to 40% of daily average flow through 99% of the juvenile migration periods.	
	Rocky Reach Dam: Provide safe (less than 2 percent mortality) non-turbine passage route (juvenile bypass or spillway passage) for 80% of juvenile migrants over 90% of the migration period.	**Rocky Reach Dam:** Same as Wells Dam above.	
	Rock Island Dam: Fund an account to purchase spill, as requested by fish agencies and the Tribes, to an annual revenue loss of $2.05 million (in 1987 dollars to be adjusted for inflation).	**Rock Island Dam:** Same as Wells Dam above.	
Adult Migration/ Survival Standards	Maintain and operate fishladders according to criteria established in the existing settlement agreements or by the fishery agencies. Project-specific standards, with no specific protection measures for threatened or endangered species. Protection for all species would be provided by laws and statutes other than the ESA.	As required to minimize the impacts to salmonid species. The PUDs would each consult with FERC and NMFS for anadromous salmonids, and with USFWS for bull trout.	No net impact standard - 91% combined adult and juvenile project passage survival, 93 % juvenile project survival, or 95% juvenile dam passage survival for all Plan species. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs. Bull trout protection would be similar to Alternative 2.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Hatchery Production	Hatchery mitigation for initial loss of habitat from dam construction would continue over the long term. Hatchery funding for unavoidable losses from fish passage would follow existing settlement agreements.	Same as Alternative 1. Production could be reduced at any time if significant impacts to listed species are likely to occur. Production could be reduced based on actual fish passage losses. Production would be adjusted at relicensing.	Same as Alternative 1, except the initial production levels would be based on compensating for assumed unavoidable project passage mortality. Production levels would not change until at least 2013. Compensation for unavoidable losses at Wells Dam would be adjusted to 3.8% for yearling chinook and steelhead and 7% for sockeye and subyearling chinook from the currently assumed 14% rate for all species. Exact production levels based upon the actual numbers of returning adults. Hatchery production would not be less than that specified to address initial project inundation.
Independent (Non-PUD Funded) Tributaries Habitat Improvements	Habitat improvements could occur through the implementation of non-PUD funded projects through Federal, State, and local agency funding, specifically WRIA-funded projects.	Same as Alternative 1.	Same as Alternative 1.
PUD-Funded Habitat Improvements	None.	Same as Alternative 1.	$46.5 million (1998 dollars) additional funding provided through the HCPs to compensate for the 2% unavoidable project mortality.
Monitoring	At Wells, run timing, total dissolved gas, and system efficiency monitoring would continue. At Rocky Reach and Rock Island, only monitoring to ensure facility modifications are achieving criteria identified in license articles, settlements, and stipulations.	Same as Alternative 1, with additional survival studies for Endangered Species Act-listed juveniles and adults.	Studies necessary to verify that standards are being met for all Plan species will take place during Phase I, periodic monitoring to verify that standards continue to be met during Phase III, and periodic monitoring in Phase II to evaluate survival improvements.
Drawdown	Drawdown cannot be required under existing licenses.	Drawdown could increase survival rates of migrating juvenile fish over the long term. However, lower water levels could initially increase predator density and predator/prey encounters. Over the short term, drawdown would decrease water quality, fish habitat, and foraging opportunities, and likely affect survival rates. Only an option at relicensing. Also see Land Features, Geology, and Soils section.	Same as Alternative 2, although this is unlikely to occur under the HCPs. However, the Services have the option of withdrawing from the HCPs to pursue drawdown or dam removal options under certain provision of the HCPs.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Bull Trout	No specific measures are identified to protect bull trout.	Protection measures as required to recover the species under the ESA (Section 7 consultation).	Same as Alternative 2.
QAR Analysis	Based on analysis of Upper Columbia River spring-run chinook salmon and steelhead, the return rates for spring-run chinook salmon have been trending down at a loss rate of 5 to 10% per year. Although complicated by the natural spawning of hatchery fish, wild steelhead populations in the Wenatchee and Entiat Rivers are trending down at a similar rate as the chinook populations, while the Methow River population is trending downward at a faster rate	Although maximizing survival at each of the PUD dams will increase the return rates of spring-run chinook salmon and steelhead, populations will continue to decline without reductions in non-hydro system related impacts (including higher ocean survival), although at a slower rate than Alternative 1.	Achieving the project survival and habitat improvement standards identified in the proposed HCPs will increase Mid-Columbia River reach survival by approximately 22 to 35% for steelhead and 27 to 45% for spring-run chinook salmon. Under these survival rates, populations will continue to decline without reductions in non-hydro system related impacts, although at a slower rate than Alternatives 1 or 2, if survival conditions continue as they were for brood years 1980 - 1994. Commitments to habitat productivity, in addition to dam passage survival increases, will increase survival rates by an additional 6 to 10% over Alternative 2. Under the long-term scenario, achieving the survival standards in the HCPs alone would reduce the risk of extinction to acceptable levels. (The effects of long-term supplementation have not been analyzed.)
Other Species of Concern or Importance (lamprey, sturgeons, cutthroat trout, game species, etc.)			
Project Area	No change expected over existing conditions.	Improvements to fish bypass systems or an increase in spill volumes might occur. These measures would likely reduce the turbine entrainment of some resident species. Specific sections of the bypass systems could disproportionately affect some species (e.g., impingement of lamprey on turbine intake screens. Increased spill and resultant elevated levels of TDG may have negative impacts on the reproductive success of sturgeon and may impact the long-term health or food base of aquatic species located within the action area.	Spill requirements could change dependent on efficiency of juvenile bypass systems and/or meeting survival standards. Meeting the survival standards for all the Plan species would likely provide a wider range of protection for other species.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	.	Drawdown would affect habitats of reservoir fish, and access to and from tributary streams for migratory species. Habitat for species adapted to free-flowing river conditions (e.g., cutthroat trout) would increase or improve, while habitat for species better suited for reservoirs (e.g., bass) would diminish.	Same as Alternative 2.
Associated Tributaries	No direct effect. Habitat improvements could occur through the implementation of non-PUD-funded projects through Federal, State, and local agency funding.	Same as Alternative 1.	Habitat improvements funded by the HCP Plan Species Account would likely benefit bull trout, cutthroat trout and have added benefits to the health and productively of all native fish species that occur in the tributary streams.
Columbia River System/Cumulative Effects	No changes expected over existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Water Quantity			
Project Area	No change in flows.	Amount of spill could increase to improve juvenile fish passage survival, particularly for listed species. Drawdown would increase water velocity.	Amount of spill could change dependent on efficiency of juvenile bypass systems and/or meeting the survival standards. However, water quantities would not be substantially altered. Effects from drawdown would be the same as Alternative 2.
Associated Tributaries	No effect. Some non-PUD-funded projects may help to increase water quantity in the tributaries.	Same as Alternative 1.	Additional funding by the PUDs through the Plan Species Account would likely provide for more water conservation projects and more improvements in tributary flows.
Columbia River System/Cumulative Effects	No changes expected over existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Water Quality			
Project Area Total Dissolved Gas	No change expected over existing conditions	Some improvement expected as Ecology imposes TMDL for Clean Water Act compliance and other measures (e.g., spill deflectors) are implemented at relicensing. Spill and total dissolved gas levels could increase if needed to improve anadromous fish passage efficiency or survival rates.	Same as Alternative 1, although spill could increase as needed to meet survival standards, resulting in an increase in total dissolved gas levels. However, spill is limited by Clean Water Act requirements. HCP signors agree to work collectively to address water quality issues.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Associated Tributaries	There is potential for incremental water quality improvements (e.g., higher dissolved oxygen, lower turbidity and sedimentation) as total maximum daily load program and other ongoing watershed restoration efforts proceed, and benefits from improved riparian protections are seen (no change from existing conditions).	Same as Alternative 1.	Same as Alternative 1, although guaranteed PUD funding would provide for more restoration projects and improvements in tributary water quality.
Columbia River System/Cumulative Effects	No change from existing conditions.	Spill programs may increase total dissolved gases in project area and at downstream hydroelectric projects.	Similar to Alternative 1, although the PUDs would work collectively to minimize total dissolved gas levels.
Vegetation			
Project Area	No change from existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, it could impact shoreline and aquatic vegetation. One threatened plant species (giant hellborine) could potentially be affected by a drawdown and may require additional ESA consultation.	Same as Alternative 2 but may also include off-site improvements in the production and carrying capacity of the mainstem Columbia River.
Associated Tributaries	Some local and State fish habitat improvement projects could improve riparian vegetation – no change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, and HCP funding for tributary improvements would potentially benefit vegetation by removing invasive non-native plant species, adding or enhancing soils, and establishing buffer areas along tributary streams.
Columbia River System/Cumulative Effects	No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Wildlife			
Threatened, Endangered, and Sensitive Wildlife Species			
Project Area	No change from existing conditions.	No effect anticipated. If drawdown occurs, bald eagle abundance may decline due to declines in waterfowl prey.	Same as Alternative 2.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Associated Tributaries	Possible short-term disturbance to bald eagles from tributary habitat improvement projects conducted by other agencies. Possible benefits to bald eagles if projects improve riparian habitat and waterfowl prey base. No effects on northern spotted owls, gray wolves, or grizzly bears. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1. HCP funding for tributary improvements could enhance habitat.
Columbia River System/Cumulative Effects	No effect.	Same as Alternative 1.	Same as Alternative 1.
Other Wildlife			
Project Area	Possible decline in avian predator abundance due to continued implementation of predator control programs. No effect to other wildlife. No change from existing conditions.	Same as Alternative 1. If drawdown occurs, declines in abundance of waterfowl, aquatic furbearers, amphibians, and other riparian-associated wildlife may result.	Same as Alternative 2. In addition, HCP funding for tributary improvements could enhance habitat for fish and wildlife.
Associated Tributaries	Possible short-term disturbance to wildlife from tributary habitat improvement projects conducted by other agencies. Possible benefits to waterfowl, aquatic furbearers, and other riparian associated wildlife, if projects improve riparian habitat.	Same as Alternative 1	Same effects from PUD and other agency habitat improvement projects as Alternatives 1 and 2.
Columbia River System/Cumulative Effects	No effect.	Same as Alternative 1.	Same as Alternative 1.
Land Use			
Project Area	No changes from existing conditions.	May be modified if listed species are affected.	The PUD will consider cumulative effects of land use decisions, accept comments on such actions from signatory parties, and notify applicants of potential incidental take restrictions.
Associated Tributaries	Local and State aquatic habitat enhancement projects may alter floodplains and result in land exchanges. Less development would be allowed at river shorelines. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, although more actions are expected under the tributary fund.

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Columbia River System/Cumulative Effects	No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Aesthetics			
Project Area	Projects viewed in rural setting.	Same as Alternative 1. Project conservation measures do not change scenic quality in the area. If drawdown occurs, substantial unvegetated barren earth would be seen in area of drawdown.	Same as Alternative 2.
Associated Tributaries	Tributaries occur in forested (higher elevation) and rural settings (lower elevations).	Same as Alternative 1.	Same as Alternative 1.
Columbia River System Cumulative Effects	Projects appear as man-made modifications to the Columbia River.	Same as Alternative 1. No developments planned in the area change the project scenic quality.	Same as Alternative 2.
Socioeconomics			
Project Area	No changes from existing conditions.	Electricity rates will go up as a result of higher production costs and the need to replace lost energy from more expensive generating plants. The amount of increase is based on the measures imposed on the PUDs. If drawdown is proposed, a detailed socioeconomic analysis would be conducted.	Less that Alternative 2 as the PUDs have the ability to implement the lowest cost measures to achieve defined survival standards.
Associated Tributaries	Short-term local jobs under independent tributary habitat improvements. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, and Plan Species Account will provide some additional jobs and service-related income.
Columbia River System/Cumulative Effects	No changes from existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Economics			
Project Area	No change from existing conditions.		
Associated Tributaries	Not applicable.		
Columbia River System/Cumulative Effects	Not applicable.		

TABLE S-4. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Recreation			
Facility Operation and Maintenance	No changes from existing conditions.	Same as Alternative 1. If drawdown occurs, reduced pool levels would make boat ramps and beaches unusable and substantially impact recreational facilities.	Same as Alternative 2.
Associated Tributaries	Short-term access may be affected as local and State aquatic habitat improvements occur through independent WRIA actions. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, although the additional PUD-funded habitat improvements could affect short-term access.
Columbia River System/Cumulative Effects	No changes from existing conditions.	Same as Alternative 1. If drawdown occurs, increased fishing upstream and downstream of the projects may result.	Same as Alternative 2.
Cultural Resources			
Project Area	No change from existing conditions.	Same as Alternative 1. If drawdown occurs, substantial impacts could occur to cultural resources.	Same as Alternative 2.
Associated Tributaries	Tributary habitat improvements that occur through independent actions could affect some cultural resources unless surveys and mitigation (if needed) are conducted prior to earth moving activities. However, regulatory compliance with applicable laws is expected.	Same as Alternative 1.	Same as Alternative 1, although additional PUD-funded habitat improvements would be expected.
Columbia River System/Cumulative Effects	No change from existing conditions.	No change would occur. If drawdown occurs, impacts could occur to cultural resources at downstream dams.	Same as Alternative 2.

ESA = Endangered Species Act

Purpose and Need for Action

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CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 1

- Changes in Chapter 1 were made to address public comments on the Draft EIS and to describe in greater detail NMFS's NEPA approach and analysis for this project.
- Redundancies within and between Chapters 1 and 2 were eliminated. For example, a description of the proposed alternatives was presented in Chapters 1 and 2 of the DEIS, but is now presented in its entirety in Chapter 2.
- Key Terms includes a definition of the Quantitative Analysis Report (QAR).
- An explanation of why bull trout are addressed in the EIS is included.
- Chapter 1 further describes the goal of the HCPs and incidental take permits for the three hydroelectric projects.
- Chapter 1 provides greater detail of PUD options for complying with the Endangered Species Act.
- Chapter 1 has a description of completed interim Section 7 consultations.
- A new section under Federal Requirements describes requirements of the Magnuson-Stevens Fishery Conservation and Management Act and the definition of Essential Fish Habitat as applied to the Mid-Columbia River reach.
- Chapter 1 clarifies the position of the Tribes regarding 7 percent hatchery compensation levels.
- A description of a recent U.S. District Court decision that vacated the critical habitat designations for 19 Evolutionarily Significant Units for Upper Columbia River steelhead and spring-run chinook salmon is included.
- The energy production levels of the three projects are provided.
- Previous and ongoing management programs in the Plan area are expanded and clarified.
- An overview of the DEIS public review process and negotiated HCP revisions is included.
- Minor word corrections, definitions, and recent references are included where pertinent in Chapter 1.
- The Background Summary section was removed to reduce redundancy within Chapter 1.

Chapter

1 PURPOSE AND NEED FOR ACTION

Key Terms *

Adaptive management – The process of monitoring the implementation of conservation measures, then adjusting future conservation measures according to what was learned. Adaptive management can also include testing of alternative conservation measures, monitoring the results, and then choosing the most effective and efficient measures for long-term implementation.

Biological assessment – A requirement under the Endangered Species Act of 1973 to assess the effects of a Federal action on a Federally listed threatened or endangered species. A biological assessment report is prepared by the project proponent and provides existing and projected conditions that affect a threatened or endangered species and the proposed mitigation measures that minimize or avoid impacts to these species.

Biological opinion – An opinion from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service as to the effects of a Federal action on a Federally listed threatened or endangered species. The biological opinion is a report that reviews and considers the adequacy of the biological assessment that is initially prepared by the project proponent. The biological opinion includes conservation measures recommended by the agency to protect the listed species.

Endangered Species Act – The Endangered Species Act of 1973, 16 USC §§ 1531 through 1543, as amended and its implementing regulations. Federal legislation that provides a means to ensure the continued existence of threatened or endangered species and the protection of critical habitat of such species.

Habitat Conservation Plan (HCP) – Under Section 10(a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application. The HCP process is intended to provide a comprehensive, long-term management plan to protect and facilitate the recovery of threatened and endangered species, and to provide a framework for "creative partnerships" between the public and private sectors in endangered species conservation (H.R. Rep. No. 97-835, 97th Congress, Second Session). The term HCP in this EIS also refers to the "Anadromous Fish Agreement and Habitat Conservation Plans," conditional agreements for each of the three projects to implement an HCP; these HCPs also serve as settlement agreements to be filed with FERC.

Incidental take permit – A permit that exempts a permittee from the take prohibition of Section 9 of the Endangered Species Act provided that a "conservation plan" has been developed that specifies the likely take and steps that the applicant will use to mitigate and minimize the take. An incidental take permit is issued by USFWS or NMFS or both under Section 10 of the Endangered Species Act for non-Federal applicants.

Incidental take statement – An incidental take statement is issued under Section 7 of the Endangered Species Act for projects that involve a Federal action. The statement identifies the extent of the take that would occur as a result of the action, as well as reasonable and prudent measures to minimize the take.

No Surprises policy – A policy of NMFS and USFWS providing regulatory assurances to an HCP incidental take permit holder that no additional land use restrictions or financial compensation would be required with respect to species covered by the applicant's incidental take permit, even if unforeseen circumstances arise after the permit is issued that indicate additional mitigation is needed to protect the species (50 CFR § 222.303[g]).

Quantitative Analysis Report (QAR) – The Upper Columbia QAR process was established to provide decision makers with current assessments of the status of Endangered Species Act-listed spring-run chinook salmon and steelhead runs returning to the Upper Columbia River. Simple population models were developed for Upper Columbia River spring-run chinook salmon (Wenatchee, Entiat, and Methow populations) and summer steelhead (Wenatchee/Entiat and Methow populations). The models are based on reconstructed spawner to spawner return ratios for historical years. Alternative assumptions regarding the effectiveness of hatchery-origin spawners are also considered in the analyses. A range of alternative future survival improvements for Upper Columbia River stocks were modeled, including an analysis of the expected survival improvements that could be expected from implementation of the long-term mitigation measures outlined in the Chelan and Douglas County PUD HCPs.

* *See Chapter 7 for a complete listing of all Key Terms.*

1.1 INTRODUCTION

The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) is evaluating the decision to authorize incidental take permits, in accordance with Section 10 (a)(1)(B) of the Endangered Species Act of 1973, for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs) for the Wells (Federal Energy Regulatory Commission [FERC] project number 2149), Rocky Reach (FERC project number 2145), and Rock Island (FERC project number 943) hydroelectric projects (67 Federal Register 42755 [June 25, 2002]). The HCPs were developed to protect five species of Columbia River anadromous salmonids (referred to as Plan species), two of which are currently listed as endangered under the Endangered Species Act.

The fish protection measures and methodologies proposed under the HCPs would also represent long-term settlement agreements under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, and Title 77 Regulatory Code of Washington (RCW) for the five species.

The HCPs are consistent with the protocols and provision of the Basinwide Salmon Recovery Strategy "All-H Paper" (Federal Caucus 2000) and the reasonable and prudent alternatives contained in the biological opinion for the Federal Columbia River Power System (NMFS 2000a).

The agreements would set a "no net impact" standard for salmon and steelhead protection at three hydropower projects operated by the Chelan and Douglas County PUDs and provide the PUDs with some degree of certainty for the long-term operation of these projects. Plan coverage of the three species not listed as endangered is expected to reduce the possibility that these species would be listed in the future.

The anadromous fish agreements and HCPs are the result of more than 9 years of planning and negotiations between the interested parties. In addition to NMFS and the PUDs, participants in the HCP development process were the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Colville Reservation (Colville), and the Confederated Tribes of the Umatilla Indian Reservation (Umatilla) (collectively, the Joint Fisheries Parties); American Rivers, Inc.; and the major wholesale purchasers of the PUDs' electricity.

NMFS is the Federal agency responsible for protecting anadromous salmon and steelhead and is the lead agency for this National Environmental Policy Act (NEPA) final environmental impact statement (FEIS). The FERC is a cooperating agency for the purpose of developing the EIS, and the PUDs will coordinate compliance with the State Environmental Policy Act (SEPA).

The PUD No. 1 of Douglas County is applying for a permit covering the Wells Hydroelectric Project, and the PUD No. 1 of Chelan County is applying for permits to cover the Rocky Reach and Rock Island hydroelectric projects. The permit applications are based upon the HCPs and their exhibits and supporting documents.

The incidental take permits would provide coverage for four Permit species:

1. Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*),

2. Upper Columbia River summer/fall chinook salmon (*O. tshawytscha*),

3. Okanogan River and Lake Wenatchee sockeye salmon (*O. nerka*), and

4. Upper Columbia River steelhead (*O. mykiss*).

Currently, Upper Columbia River steelhead and spring-run chinook salmon are listed as endangered under the Endangered Species Act. During the species status evaluations, NMFS and USFWS determined that these Evolutionarily Significant Units represented the last of the remaining genetic resources of fish that migrated into the Upper Columbia River prior to the construction of Grand Coulee Dam. As a result, although these fish spawn in an area typically referred to as the Mid-Columbia River reach, they are designated as Upper Columbia River Evolutionarily Significant Units. For the purpose of this EIS, the Mid-Columbia River Reach is defined as the area of the river between the Chief Joseph Dam tailrace and the confluence of the Yakima River.

Although summer/fall chinook and sockeye salmon have not been listed, the Permits would cover these species as well, according to the June 17, 1999 Federal policy governing the use of HCPs for the conservation of candidate or potential candidate species. The "No Surprises" policy associated with these agreements assures the PUDs that no additional measures would be required by NMFS for the duration of the Permits, for any of the Permit species.

Coho salmon *(O. kisutch),* an extinct species in the Mid-Columbia region, are also included in the HCPs as a Plan species. Recently, attempts have been made to reintroduce coho salmon into the area.

Although a Plan species, coho salmon are not considered a Permit species because an extinct species is not subject to Endangered Species Act jurisdiction. Thus, there are four Permit species and five Plan species covered by the HCP agreements.

The Columbia River bull trout populations were also listed as threatened under the Endangered Species Act in June 1998 (USFWS 1998). Because bull trout are not an anadromous species, this species is under the jurisdiction of the USFWS, rather than NMFS. The HCPs cover anadromous species under the jurisdiction of NMFS. However, bull trout are reviewed in this EIS to ensure that the HCPs' conservation measures do not negatively affect bull trout migration, breeding, cover, and resting areas.

1.2 PROJECT APPLICANTS

The project proponents are the following:

- The Douglas County PUD, a Washington municipal corporation, is sponsoring the Wells Anadromous Fish Agreement and HCP.

- The Chelan County PUD, a Washington municipal corporation, is sponsoring the Rocky Reach and Rock Island Anadromous Fish Agreements and HCPs.

The Chelan and Douglas County PUDs would file applications requesting FERC to amend their existing licenses to include the HCPs. In addition, the PUDs would rely upon the HCPs to fulfill their obligations for anadromous salmonids under new license agreements.

The HCPs would meet the Endangered Species Act requirements for the Permit species through the 50-year HCP terms. The Wells HCP becomes effective on the date that FERC adopts the HCP terms into the project license. The Rocky Reach and Rock Island HCPs would become effective

on the date the last signatory party signs the agreements. If FERC does not relicense the projects, or issues a license inconsistent with the conditions of the Permit and HCP, then NMFS may withdraw from the agreement and the Permit will not take effect. The applicants would then be obligated to meet Endangered Species Act requirements through Section 7 consultations.

1.3 PURPOSE AND NEED

The purpose and need for this project is to develop methods to protect anadromous salmonids in the Mid-Columbia River reach while allowing Chelan and Douglas County PUDs to continue to generate electricity to meet the power demands of the Pacific Northwest. The action alternatives considered in this EIS would result in:

- developing a comprehensive, long-term strategy for protecting and aiding in the recovery of anadromous salmonids in the Mid-Columbia River, two of which are currently listed as endangered under the Endangered Species Act;
- providing a process for managing fish passage issues for relicensing the three projects under the Federal Power Act;
- meeting applicable legislative requirements pertinent to the Endangered Species Act, including ensuring that any incidental take of listed species caused by the projects would not appreciably reduce the likelihood of the survival and recovery of the species it the wild;
- meeting NMFS's responsibilities under the Magnuson-Stevens Fishery Conservation Act to ensure the sustainability of the nation's fisheries resources;
- allowing the Chelan and Douglas County PUDs to plan for long-range operations with a degree of certainty to economically operate their projects and fulfill their long-term bonding and contractual sales obligations; and
- helping to ensure stable power supplies and pricing for the utilities' customers.

The project need is based on the substantial population decline of anadromous salmonids since European settlement of the Columbia River Basin. This decline is due (1) loss, destruction, or degradation of tributary habitat; (2) overharvest, genetic introgression, and competition with hatchery-reared fish; and (3) habitat inundation, blockage, and mortality from construction and operation of dams and reservoirs. Increased survival of all life stages of anadromous fish within the Columbia River Basin is necessary to meet the dual goals of recovering Endangered Species Act-listed anadromous fish and providing self-sustaining, harvestable populations of anadromous salmonids. The Wells, Rocky Reach, and Rock Island hydroelectric projects have affected anadromous salmonid populations through inundation of mainstem spawning and rearing habitat, decreased survival of migrating juveniles as they pass the projects, and possibly by decreasing survival or spawning success of migrating adults.

Since the projects were constructed, the applicants have worked (often in cooperation with other resource managers) to improve fish passage survival through facility and operational improvements and mitigate for project effects by funding hatcheries. Under the current licenses and agreements, each of the three projects has unique mitigation, compensation, and species protection requirements. However, a coordinated, comprehensive approach with similar performance survival standards among the three dams is currently not in place. Because the projects occur in the same geographical area (whereby the reservoirs of the downstream

projects encroach on the tailraces of the upstream projects) and operationally affect each other through changes in water quality parameters, a comprehensive cooperative approach among the projects would help to minimize fish losses and enhance fish passage opportunities in the Mid-Columbia reach.

1.4 PROJECT LOCATION

The Wells, Rocky Reach, and Rock Island hydropower projects are part of an 11-dam system on the mainstem Columbia River within the continental United States. Their location relative to the other projects in the region is shown in Figure 1-1. Most of the projects on the mainstem Columbia River are Federally operated, although local PUDs operate five of the projects in the Mid-Columbia River segment. In addition to the three projects operated by the Chelan and Douglas County PUDs, the PUD No. 2 of Grant County operates the Priest Rapids and Wanapum dams (Priest Rapids Project).

The Douglas County PUD operates the Wells Project located at river mile 515.8 on the Columbia River, north of the City of Wenatchee (Figure 1-2). Wells began commercial operations on August 22, 1967, and is operated under a license issued by FERC, which expires in the year 2012.

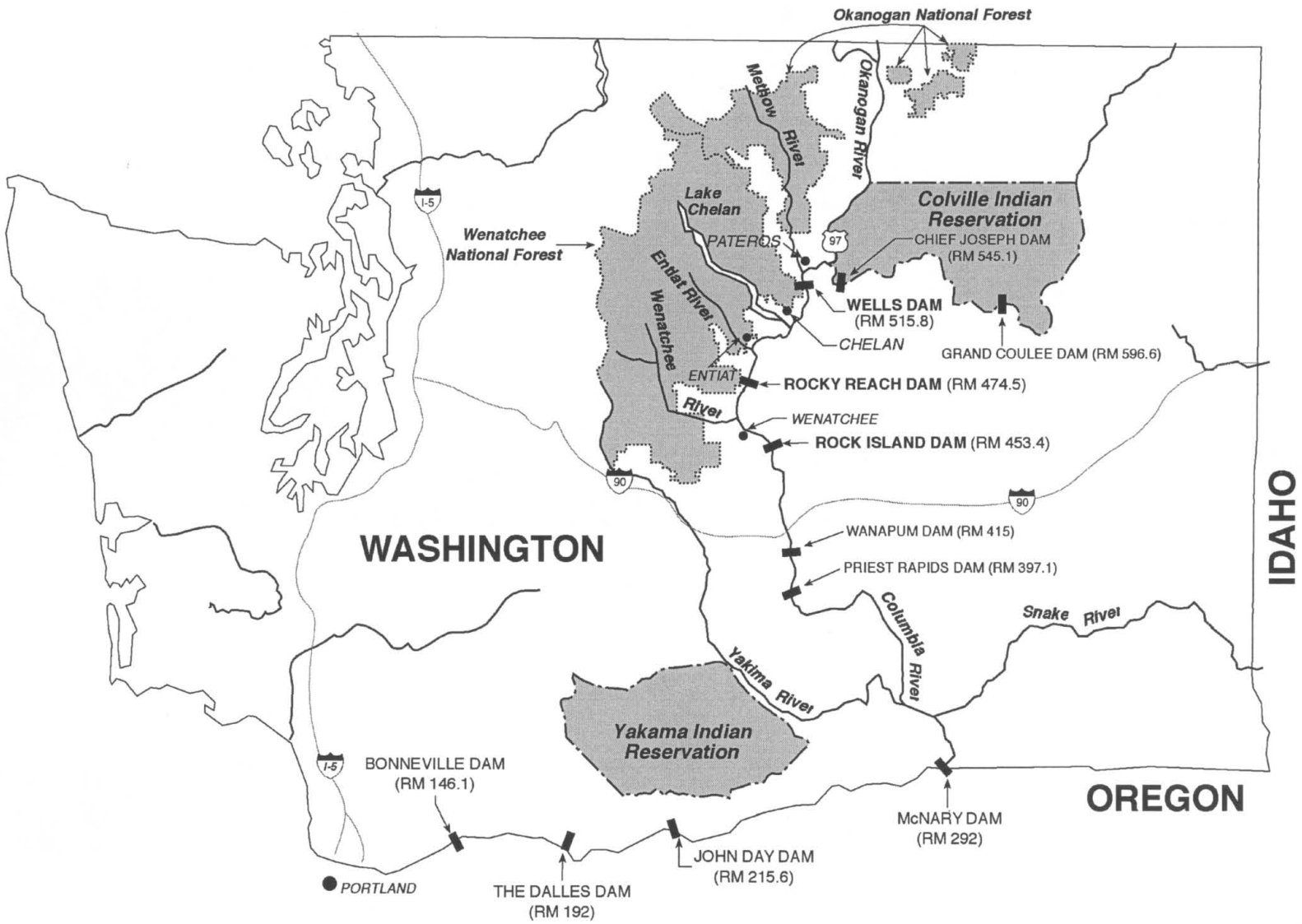
Chelan County PUD operates the Rocky Reach and Rock Island hydroelectric projects. Rocky Reach Dam is located about 7 miles upstream from the City of Wenatchee, at river mile 473.7 (Figure 1-2). The Federal Power Commission issued the original operating license for Rocky Reach on July 11, 1957. The license expires in 2006. Rock Island, which was the first hydroelectric project to span the Columbia River, is located about 13 miles downstream from the City of Wenatchee at river mile 453.4 (Figure 1-2). Rock Island began operating in 1933, and its operating license expires in the year 2028.

The project boundaries include the forebay (from the dam to approximately 500 feet upstream), tailrace (from the dam to approximately 1,000 feet downstream), and reservoir associated with each dam. The Wells reservoir extends approximately 30 miles upstream of the dam to the Chief Joseph Dam tailrace, the Rocky Reach reservoir extends approximately 41 miles upstream of the dam to the Wells tailrace, and the Rock Island reservoir extends approximately 20 miles upstream of the dam to the Rocky Reach tailrace. Considering all components of the three projects, the entire project area extends from the tailrace of the Rock Island Dam upstream to the tailrace of Chief Joseph Dam (approximately 92 miles) (Figure 1-2). Some project effects, however, continue downstream through the Hanford Reach to the confluence of the Yakima River (inclusively defined as the action area). Project effects that continue downstream include water quality impacts (e.g., total dissolved gas levels) and delayed mortality of fish passing the projects.

All three of the hydroelectric projects discussed in this EIS are "run-of-the-river" facilities, which means that they have limited storage capacity compared to larger reservoir projects, such as Grand Coulee and Chief Joseph dams.

1.5 REGULATORY FRAMEWORK

The utilities are acting within a complex regulatory framework, particularly at the Federal level. This EIS has been prepared by NMFS, which is responsible for protecting anadromous fish under the Endangered Species Act, in cooperation with FERC, which is responsible for licensing the hydroelectric projects. The EIS is being made available to the public as required by



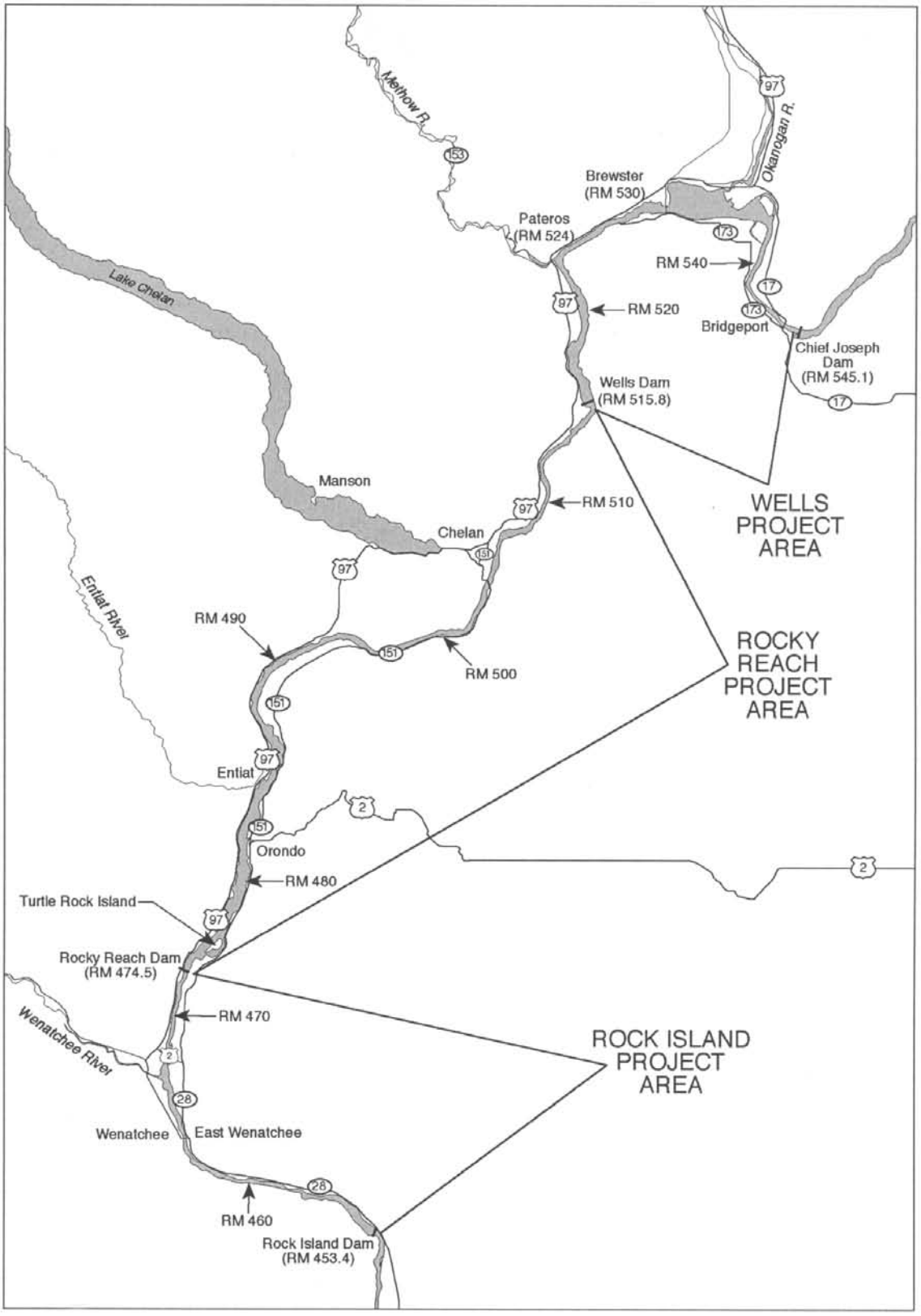
Parametrix, Inc. Mid-Columbia EIS/553-1543-020(10) 8/00 (K)

SCALE IN MILES 0 34 67

N

Dam
Indian Reservation
National Forest
City
RM River Miles

Figure 1-1
General Location of Columbia River Dams



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APPROXIMATE
SCALE IN MILES
0 3.5 7

N

Figure 1-2
Project Area

NEPA, as amended (42 USC 4321 et seq.), NEPA regulations (40 CFR 1500-1508), NMFS policies and procedures for implementing NEPA, and following NOAA's Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act.

1.5.1 Applicant's Regulatory Framework for Compliance with Environmental Laws

The hydroelectric projects included under the HCPs are owned and operated by Chelan and Douglas County PUDs and are licensed by FERC according to the Federal Power Act. Their existing licenses include requirements and restrictions related to how the projects are maintained and operated. The utilities are also required to comply with other State and Federal regulations for environmental protection and for planning and financing their long-range capital improvements.

1.5.2 Overview of Federal Requirements for Species Conservation

The Endangered Species Act of 1973 requires the protection of threatened and endangered species and promotes their recovery. NMFS and USFWS share joint authority under the Endangered Species Act for species protection. USFWS is responsible for terrestrial and freshwater aquatic species, and NMFS is responsible for species in marine environments (mammals, anadromous fish, and other living marine resources). Anadromous salmonids spend the majority of their life cycle in the marine environment. Thus, NMFS is the responsible agency for their protection under the Endangered Species Act.

Section 9 of the Endangered Species Act prohibits the taking of an endangered species. Take is defined under the Endangered Species Act to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect." Harm has been further defined by NMFS to include "significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, feeding, and sheltering." NMFS (or USFWS) may issue permits, under limited circumstances, to allow the take of listed species incidental to otherwise lawful activities. These incidental take permits are issued for non-Federal actions under Section 10(a)(1)(B) of the Endangered Species Act. Similarly, incidental take statements are issued for Federal actions under Section 7(a)(2) of the Endangered Species Act. The NMFS implementing regulations governing threatened and endangered species are detailed in 50 CFR 222.307.

The PUDs have the option of requesting authorization for incidental take of Endangered Species Act-listed species voluntarily through the Section 10 process or relying on FERC (as the licensing entity for the dams) to consult with NMFS regarding project compliance through the Section 7 process. For the latter case, in order for the incidental take associated with the operation of the projects to be authorized by NMFS, FERC would need to adopt the requirements from an incidental take statement issued by NMFS during Section 7 consultation with FERC into the PUD's licenses.

In the former case, the PUDs consult directly with NMFS regarding Section 10 implementation and compliance, although FERC would also be required to consult with NMFS pursuant to Section 7 at the time the licenses are amended to include the HCPs. However, in this instance, NMFS assumes that FERC's proposed action (license amendment) would be identical to NMFS's proposed action (issuance of a Section 10 permit), and that the findings of the subsequent biological opinions would also be identical. The PUDs have the option to pursue the Section 10 permitting process because the dams are owned and operated by the PUDs.

1.5.2.1 Endangered Species Act Requirements for Non-Federal Actions

Under the HCPs, the PUDs (which are non-Federal applicants) would obtain incidental take permits under Section 10(a)(1)(B) of the Endangered Species Act. The HCPs identify the likely impacts of the take and specify the mitigation and minimization steps the applicants would take to protect species that are listed under the Endangered Species Act. For a permit to be issued, Federal regulations specify that an HCP must meet the following requirements:

- The taking will be incidental to an otherwise lawful activity.
- The applicant will, to the maximum extent practicable, minimize and mitigate the impact of such taking.
- The applicant will ensure adequate funding for the plan.
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild.
- The applicant will implement other necessary and appropriate measures to the plan, as determined by NMFS at the time of permitting.

If a conservation plan meets these criteria and is approved, the Permits are valid for a specified term (50 years in these HCPs), as long as the applicant complies with the terms and conditions of the Permit. See Section 2.3.4.2, HCP Term for more detailed information on term conditions and provisions. No additional measures or conditions can be required, except as provided for in the HCPs and the No Surprises policy.

The No Surprises Policy{ XE "Report sections:The No Surprises Policy" }

Endangered Species Act regulations originally allowed NMFS and USFWS to add mitigation measures after a Section 10 permit was issued if "unforeseen circumstances" occurred, such as if the species continued to decline. This provided more flexibility to protect resources, but resulted in uncertainty for the permit holders. To address this uncertainty, President Clinton's administration developed the No Surprises policy in 1994, and the policy became a regulation in 1998 (50 CFR part 222). The No Surprises policy means that, as long as an HCP is being properly implemented, the Section 10 permit is valid, and nothing more can be required. Typically, even if the status of the species protected by an HCP unexpectedly worsens, the permit holder's costs for conservation and mitigation will remain as agreed. However, in the case of these HCPs, in certain circumstances, NMFS may withdraw from the HCP agreement and revoke the Permits to seek additional species conservation measures.

Adaptive Management

The Wells, Rocky Reach, and Rock Island HCPs, like other recently developed HCPs, incorporate an adaptive management approach that helps to assure that additional protection measures can be implemented over time as information is developed. The adaptive management approach is described in HCP Section 10.2 (Endangered Species Act Permit Monitoring) and Section 12.7 (Force Majeure) for the three projects, as well as Section 10.3.2 (Endangered Species Act Permit Modification) in the Rocky Reach and Rock Island HCPs. An HCP must include measurable biological goals and objectives, negotiated during HCP development, that remain in place during the term of the HCP. These goals are described in Section 3 of the HCPs (Survival Standards and Allocation of Responsibility for No Net Impact). The adaptive management approach allows the

applicants, agencies, and other interested parties to work cooperatively during HCP implementation and determine alternative strategies to meet the HCP goals when the initially adopted strategies do not successfully meet the objectives. An adaptive management approach would involve research and monitoring throughout the term of the HCP, and using what is learned to adjust conservation management actions. This adaptive management approach is would be implemented under the guidance of the HCP coordinating committees.

Adaptive management is an essential element of HCPs that cover large areas or regions where a significant degree of biological uncertainty exists. When there are many unknown factors about a species in a Plan area, the risk to the species increases, and a more intensive adaptive management approach is needed. The approach would involve more research and monitoring, with assessment milestones at frequent intervals. The HCPs include progress reporting, reviews, and evaluation to ensure that HCP goals are being achieved (see Wells HCP Sections 6.8 and 6.9 [Coordinating Committee Studies and Reports and Progress Reports] and Rocky Reach and Rock Island HCP Sections 4.8 and 4.9 [Coordinating Committee Studies and Reports and Progress Reports]). The Departments of the Interior and Commerce have recently drafted guidelines on adaptive management to make the approach a standard part of the HCP and incidental take permitting process (64 Fed. Reg. 45 [March 9, 1999]).

1.5.2.2 Endangered Species Act Requirements for Federal Actions

The Endangered Species Act Section 7(a)(2) requires Federal agencies to consult with NMFS (for certain species) to ensure that any agency action is not likely to jeopardize the continued existence of any endangered or threatened species or result in the adverse modification of designated critical habitat of such species. Fish protection measures would be implemented through relicensing and license amendment or license reopener proceedings. In either case, FERC's action on the license would likely trigger an obligation to consult with NMFS and USFWS pursuant to Section 7(a)(2). Whenever FERC is considering an action that may have an adverse effect on a listed species, it must consult with NMFS or the USFWS (FERC was recently involved in this process relative to the PUDs applications for approval of interim protection plans for the listed species).

These consultations were intended to cover the projects' operations until a decision is made on whether to approve the HCPs. Section 7 consultation has been completed for the interim protection plan for the operation of the Wells Project (NMFS 2000b); however, the term of this consultation expired in April 2002, and FERC has given no indication that it intends to reinitiate consultation. Section 7 consultation has also recently been completed for the construction and operation of a juvenile fish bypass system at Rocky Reach Dam, as well as the continued operation of the project through the term of its existing FERC license (2006) (NMFS 2002a).

The terms and conditions under the Section 7 process can be very similar to those under the Section 10 (non-Federal) process. Under Section 7, the Federal agencies must reinitiate their consultations if new information becomes available, and new terms and conditions can be required. The proposed HCPs utilize an adaptive management approach that includes study requirements, performance standards, and a process for determining and implementing additional protective measures (if necessary). The HCPs also allow NMFS to withdraw from the agreement, revoke the Permit, and seek additional protection in certain circumstances. FERC consultation responsibilities are broad under Endangered Species Act Section 7(a)(1), but limited to proposed Federal actions (not licensee actions) in Section 7(a)(2).

1.5.2.3 NMFS Regulatory Requirements

NMFS, as part of its responsibilities under the Endangered Species Act, is responsible for determining whether to list a species as threatened or endangered, designating critical habitat for listed species, determining whether proposed actions will likely jeopardize the continued existence of a listed species or adversely modify their designated critical habitat, authorizing incidental take in certain circumstances, and developing species recovery plans. NMFS is also subject to the requirements of NEPA and to a substantial number of other Federal regulations, policies, and orders.

Section 9 of the Endangered Species Act states that it is unlawful to take a listed species. However, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity, the taking may be permitted through meeting other requirements of the Act, which may include Section 7 (Federal actions) or Section 10 (non-Federal actions).

With the listing of Upper Columbia River spring-run chinook salmon and steelhead as endangered, NMFS is charged with helping to implement recovery plans that (1) assess the factors affecting the species, (2) identify recovery goals, (3) identify actions needed to achieve the goals, and (4) estimate the cost and time to achieve the goals. Currently, NMFS's policy is to allow these plans to be developed through cooperative efforts with local, regional, and State governments, organizations, Tribes, and other parties. However, if a species continues to decline, NMFS has the authority to mandate recovery actions.

Through the development of this EIS, NMFS is fulfilling a key part of its regulatory requirements under NEPA for this proposed action. However, as the responsible agency for protecting anadromous salmonids under the Endangered Species Act, the agency has additional regulatory duties to perform before issuing an incidental take permit.

After the EIS is complete, to assist in determining whether the HCPs satisfy the requirements of Endangered Species Act Section 10(a)(2)(B)(iv), NMFS will prepare a biological opinion specifically to determine whether the taking authorized by the Permits appreciably reduces the likelihood of survival and recovery of the species in the wild. To issue a permit, NMFS must also find that the Permit activity will result in taking that is incidental; that the applicants will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; and that the applicant has ensured that adequate funding for the plan will be provided.

1.5.2.4 FERC Regulatory Requirements

The Federal Power Act provides FERC with the exclusive authority to license non-Federal water power projects on navigable waterways and Federal lands. Sections 4(e) and 10(a)(1) of the Federal Power Act provide guidance to FERC in licensing projects that allow a wide range of uses of the waterways. Section 18 of this act allows the Services to make mandatory fishway prescriptions, and Section 10 (j) allows the Services to make recommendations for protection of fish and wildlife resources. Consequently, the Federal Power Act provides a unique vehicle for achieving fishery management and species recovery goals.

For each project, FERC will decide (1) whether to issue the license to an applicant, and (2) the conditions that should be placed on the license to protect or enhance existing environmental resources; this includes mitigation for adverse environmental impacts that would occur due to the operation and maintenance of the project.

FERC determines whether a hydropower project should be developed, and if developed, under what conditions it should be operated. Before issuing a license, FERC determines if a proposed project is "best adapted to a comprehensive plan for improving or developing a waterway or waterways" for beneficial public uses (16 USC

§ 803[a]). FERC also considers the project's consistency with Federal or State comprehensive plans for improving, developing, or conserving the waterway.

FERC weighs competing interests, including both power and non-power uses, to ensure a proper balance. The FERC licenses include engineering, safety, economic, and environmental requirements that must be met to keep the license in effect. For example, a license can include requirements for water quality monitoring, wildlife habitat creation, a public safety plan, and erosion control plans. As part of its licensing responsibilities, FERC monitors the licensed projects to ensure compliance with its license.

Recently, FERC established an alternative administrative process to allow applicants to modify the timing of some steps of the licensing process (18 CFR parts 4 and 375; FERC, Order No. 5961 [Final Rule], October 29, 1999). The primary change involves pre-filing consultations and environmental review, which can now be combined, and are designed to improve communication and coordination between the applicant, various Federal agencies, and other parties. The alternative process also allows for the NEPA process to begin with the pre-filing stage for license applicants. Under this alternate process, the licensee would ask FERC to incorporate the HCPs as license articles into the new license.

FERC does not operate projects licensed under the Federal Power Act but is responsible for requiring that the licensees comply with their license. Proceedings to reopen existing licenses are subject to notice and hearing, other Federal Power Act protections, the terms of the license, which may reserve FERC's authority to reopen the license, notwithstanding the limitations of Federal Power Act, Section 6. FERC's consultation responsibilities under the Endangered Species Act are described in Sections 7 (a)(1) and (2) of the Endangered Species Act.

The incidental take permits issued by NMFS for the three projects would allow the PUDs to operate the projects following fish protection measures described in the HCPs. These measures would supercede any existing settlement agreements pertaining to the Plan species. If approved by FERC, the HCPs would be added to the existing licenses by amendment. The parties that sign the HCPs would also propose that FERC include the HCP provisions in any new license issued during the 50-year term of the Permits.

The HCPs would address the PUDs' obligation to adequately and equitably conserve and protect Plan species and mitigate any actions that might harm the Plan species pursuant to the Endangered Species Act, Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning and Conservation Act, and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Acts as those Plan species are affected by the projects through the term of the Permits. In addition, WDFW would not request additional protection or mitigation for Plan species under Title 77 RCW. Any modification of the HCPs' terms, approval of less than the entire Plan, or addition of terms by NMFS or FERC as a result of their regulatory reviews of the HCPs shall make the HCPs voidable at the option of any party.

Performance of the PUDs' obligations under the HCPs is contingent on obtaining all necessary regulatory approvals, including applicable Federal, State, and local permits or licenses.

1.5.2.5 Other Federal, State, and Local Requirements

Fish and Wildlife Coordination Act

Whenever the waters or channel of a stream or other body of water are proposed or authorized to be modified by a public or private agency under Federal permit or license, the agency first shall

consult with the USFWS and with NMFS regarding the impoundment, diversion, or other control facility to be constructed, with a view to conserving fish and wildlife. The act's purposes are to recognize the contribution of our fish and wildlife resources to the nation, and their increasing public interest and significance, and to provide that fish and wildlife conservation receives equal consideration and is coordinated with other features of water resource development programs through planning, development, maintenance, and coordination of fish and wildlife conservation and rehabilitation.

Pacific Northwest Coordination Agreement

This agreement was originally executed in 1964, and was revised in 1997 to extend the agreement until 2024. The agreement is an important component of regional plans to maximize the Northwest's hydro resource capability. Maximization also included the development of three storage projects on the Columbia River in Canada, pursuant to the terms of the 1964 Columbia River Treaty between Canada and the United States (Treaty). These storage dams provide regulated streamflows that enable Federal and non-Federal hydroelectric projects downstream in the United States to provide additional power benefits. These agreements coordinate hydro-generation after all non-power requirements (such as fish protection) are satisfied. (Performance of the Pacific Northwest Coordination Agreements will have no effect upon implementation of any alternative in this FEIS, but implementation of any of the alternatives does affect the coordination benefits of the agreements.)

The Treaty requires the United States to deliver to Canada one-half of these downstream power benefits (known as the Canadian Entitlement). The non-Federal utilities of the region have committed to provide a portion of the share of Treaty benefits required to be delivered to Canada. In return, the United States Government agreed to participate in the coordinated operation of the hydroelectric power system. The Federal and non-Federal allocation was the subject of a separate Record of Decision (ROD); the Canadian Entitlement Allocation Extension Agreement (CEAEA) ROD was issued on April 29, 1997 by the Bonneville Power Administration (BPA).

Northwest Power Act

The Northwest Power Act, formally known as the Pacific Northwest Electric Power Planning and Conservation Act, was enacted to address regional environmental and power production coordination and management issues in the Columbia River Basin. FERC must consider the provisions of the Northwest Power Act when licensing, relicensing, or amending the licenses for Douglas and Chelan County PUDs. The major provisions of the Northwest Power Act are to:

(1) Form the Northwest Power Planning Council to help the region develop a strategy to meet its electrical needs at the lowest possible cost.

(2) Make the BPA responsible for system operational planning, and for managing the regional electrical system to achieve fish protection and power system efficiency goals.

(3) Protect and enhance existing Federal laws that provide supply preference and price advantages to co-ops and publicly owned utilities.

(4) Establish a program (through the Northwest Power Planning Council) to protect and enhance the fisheries resources of the Columbia River and to mitigate damage already done to anadromous fish populations, with funding from BPA rate revenue.

(5) Involve the public in planning for electric resources and fish protection. State and local

agencies are to retain control of land use and water rights.

(6) Instruct the Northwest Power Planning Council to provide a method for balancing environmental protection and the energy needs of the region.

(7) Require the Northwest Power Planning Council to seek the recommendations of the region's Tribal, State, and Federal fish and wildlife agencies, and ensure that its measures are consistent with the legal rights of the region's Tribes.

Clean Water Act: 401 Water Quality Certification

Under Section 401(a)(1) of the Clean Water Act, project applicants must have a State certification to verify that their project discharges comply with the applicable provisions of the Clean Water Act, or the applicant must have a waiver of certification from the State. In Washington, the Washington Department of Ecology (Ecology) is responsible for water quality permitting issues. FERC also requires licensing applicants to apply for water quality certifications or waivers before they file their FERC license application.

Magnuson-Stevens Fishery Conservation and Management Act

In 1996, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) was reauthorized and changed by amendments to emphasize the sustainability of the nation's fisheries and establish a new standard by requiring that fisheries be managed at maximum sustainable levels and that new approaches be taken in habitat conservation (Public Law 104-267). These approaches include identifying Essential Fish Habitat that includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting this definition of Essential Fish Habitat, the following definitions apply:

- waters – include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate;
- substrate – includes sediment, hard bottom, structures underlying the waters, and associated biological communities;
- necessary – means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and
- spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (50 CFR 600.10).

The Magnuson-Stevens Act is a national program developed for the conservation and management of the fishery resources of the United States: to prevent overfishing, rebuild overfished stocks, ensure conservation, facilitate long-term protection of Essential Fish Habitat, and realize the full potential of the nation's fish resources.

The Magnuson-Stevens Act requires Federal agencies undertaking permitting or funding activities that may adversely affect Essential Fish Habitat of Federally managed commercial fish species to consult with NMFS. Through these consultations, NMFS is required to provide Essential Fish Habitat conservation and enhancement recommendations to Federal and State agencies for actions that adversely affect Essential Fish Habitat. Adverse effect means any impact that reduces quality and/or quantity of Essential Fish Habitat, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species' reproductive capabilities), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of the actions.

Pursuant to the Magnuson-Stevens Act, the Pacific Fisheries Management Council has designated Essential Fish Habitat for three species of Federally managed Pacific salmon: chinook, coho, and Puget Sound pink salmon (*O. gorbuscha*). Two of these commercial salmon species (chinook and coho salmon) occur or will likely occur in the Mid-Columbia River reach within the term of the Permits. The freshwater Essential Fish Habitat for these species is generally defined as all current or historically accessible streams, lakes, ponds, wetlands, and other water bodies, except for areas upstream of certain impassable barriers. Consultation over the potential effects on the Essential Fish Habitat component for these species will occur under each of the action alternatives for all three of the Mid-Columbia River hydroelectric project considered in this EIS.

Title 77 Revised Code of Washington

This State code recognizes that fish and wildlife resources are the property of the State, and that the State has the obligation of preserving, protecting, and perpetuating wildlife, fish, and their habitat. Conservation, enhancement, and proper utilization of the State's natural resources, including lands, waters, timber, fish, and game, are the responsibilities of the State. While fully respecting private property rights, all resources in the State's domain shall be managed by the State such that conservation, enhancement, and proper utilization are primary considerations.

Washington State Environmental Policy Act

The Washington State Environmental Policy Act (SEPA) provides a process for analyzing the environmental impact of proposed developments or actions by State agencies. The responsible State agency for approving or implementing a project must disclose its likely adverse environmental impacts and identify mitigation measures to minimize or mitigate significant adverse impacts. A variety of documentation approaches can be used to satisfy SEPA requirements, ranging from the preparation of a SEPA checklist to the development of an EIS.

For this project, the NEPA requirements and regulations were designed to meet SEPA requirements, which include development and publication of an EIS. The PUDs are the lead State agencies for this EIS. Other applicable State agencies have been contacted through direct phone contact, meetings, and project mailings. These agencies and State representatives have provided input and comment during development of this EIS. The PUDs currently intend to use the Federal EIS to satisfy SEPA requirements, and plan to formally adopt the NEPA review.

Hydraulic Code

The State Hydraulic Code is intended to protect State aquatic resources from damage by construction and other activities. It applies to construction in all marine and fresh waters in the State. The code is implemented through a permit called the Hydraulic Project Approval (HPA) obtained from WDFW for all construction activities within the high water areas of State waters. Some of the activities involved in the alternatives would require this permit.

Local Government Codes and Policies

A variety of local government codes and policies would apply to the programs or activities included in the alternatives. The requirements of all applicable local codes would be identified prior to implementing any new activities, and all necessary permits and approvals would be obtained to ensure that the project developments are in compliance with local laws.

1.5.2.6 Federal Trust Responsibilities to Indian Tribes

Three Tribes (the Confederated Tribes of the Colville Reservation, the Confederated Tribes and Bands of the Yakama Indian Nation, and the

Confederated Tribes of the Umatilla Indian Reservation) and the Columbia River Inter-Tribal Fish Commission have been active participants and commenters in the development of the three HCPs. The Federal government has a trust and legal responsibility to Native American Indian Tribes, which comes from commitments made by the United States in treaties, executive orders, and agreements. Upholding these Tribal rights specified in these commitments constitutes the Federal government's legal responsibility. The Federal government also has a responsibility to consult with affected Tribes whenever its actions affect the resources upon which Tribal hunting, fishing, gathering, and grazing rights depend. Tribal consultation would occur under any of the alternatives selected.

The rights reserved by the Tribes in treaties, established in executive orders and agreements, or that were not expressly terminated by the Congress or the President in the case of executive orders continue to this day. These governmental rights and authorities extend to any natural resources that are reserved by or protected in treaties, executive orders, and Federal statutes. The courts have developed the Canons of Construction, guiding premises, that treaties and other Federal actions "should, when possible, be read as protection of Indian rights in a manner favorable to Indians" (Cohen 1982).

Several issues raised by the Tribes during the HCP negotiating process and during the initial scoping effort for this EIS have been difficult to adequately reconcile. For example, in an effort to preserve stock structure within the listed populations, NMFS indicated that disproportionately high levels of naturally spawning hatchery fish may affect the continued existence of Endangered Species Act-listed species. As a result, NMFS was reluctant to guarantee the 7 percent supplementation levels negotiated in the HCP development process, for the full 50-year term. Without this guarantee, the supplementation levels critical to the Tribes, and an important component of their support for these agreements, could be modified (i.e., reduced) in certain circumstances.

Without a guarantee from NMFS that the 7 percent compensation levels would be attained under all circumstances, as well as other concerns regarding the mitigation measures set forth in the HCPs, the Yakama and Umatilla Tribes indicated that they would not endorse the HCPs. Certain provisions were added at the request of the Tribes or to otherwise address their concerns. Most notably, NMFS now proposes a series of 10-year hatchery permits for the HCPs' hatchery programs. During implementation of the permits, the full hatchery program will be provided. If NMFS's hatchery policy requires a modification of the hatcheries at the end of the 10-year permits, any party that has signed the HCPs (including the Tribes) has the right to withdraw from the HCPs. In addition, the HCPs now include a number of other legal safeguards for Indian rights.

1.5.3 LISTINGS WITH MAJOR IMPACTS ON APPLICANTS' MANAGEMENT AREAS

NMFS listed Upper Columbia River steelhead and spring-run chinook salmon as endangered under the Endangered Species Act in 1997 and 1999, respectively. Critical habitat for these species was determined to include the mainstem Columbia River and estuary, as well as major Columbia River tributaries known to support these Evolutionarily Significant Units (NMFS 2000c). However, a recent U.S. District Court decision vacated the critical habitat designations for 19 Evolutionarily Significant Units (including the listed Upper Columbia River species). As a result, the critical habitat designations for these species are currently being reevaluated by NMFS.

Although there are currently no critical habitat designations for the Endangered Species Act-listed fish in the Mid-Columbia River region, important spawning and rearing habitat for the Upper Columbia River spring-run chinook salmon includes the Wenatchee, Entiat, and Methow River Basins, as well as the Columbia

River and estuary. In addition to these same areas, important habitat for Upper Columbia River steelhead includes the Okanogan River. The habitat of Upper Columbia River spring-run chinook salmon described above retains its designation as Essential Fish Habitat under the Magnuson-Stevens Act (see above).

USFWS also listed Columbia River bull trout as threatened in 1999. Due to comments on the proposed listing and unresolved issues, USFWS did not make a final rule on critical habitat designations at the time of the listing. In addition, USFWS has not yet made Endangered Species Act Section 4(d) recommendations for the threatened species within the HCPs' management areas. The designation of critical habitat and the 4(d) recommendations are expected within 1 year.

Listed avian and plant species that occur in the project area include the threatened bald eagle and Ute ladies' tresses, respectively. Project effects on these species are evaluated in this EIS.

Over the course of several decades, the PUDs have made physical and operational changes to their hydropower projects to reduce their effects on anadromous salmonids. In addition, the PUDs began to develop the HCPs in the early 1990s as they recognized the likelihood of future listings and the probable effects on their operations.

Other projects in the Columbia River system have been taking similar steps, and the ongoing operations of the overall system are being coordinated to help improve migratory conditions for anadromous salmonids. Hydropower operations throughout the Columbia River Basin have been found to be one reason for the decline of Columbia River salmon and steelhead. Hydropower development has impacted these species through the loss of habitat above the projects (particularly with the large reservoir projects such as Grand Coulee, where fish passage is currently impossible), and it has increased the degree of mortality during migration (NMFS 1996). There is currently only limited data concerning potential impacts of hydropower development to bull trout populations as is described in Chapters 3 and 4 of this EIS.

1.6 BACKGROUND

The development of the Columbia River hydroelectric system began in the 1930s. Over a period of nearly 40 years, 30 multi-purpose projects on the Columbia River and its tributaries were built by the U.S. Army Corps of Engineers and the Bureau of Reclamation (BOR). Investor-owned and publicly owned utilities also built a major system of projects and generating facilities. The projects were designed to meet regional needs of electric power production, land reclamation, flood control, navigation, recreation, and other river uses. During that time, the BPA also built and began to operate transmission lines to deliver the power from these projects, and to market electricity from Federal projects.

As demand for power grew, the United States and Canadian governments negotiated a treaty in the early 1960s for the cooperative use of water storage projects that would be built by both countries in the upper reaches of the Columbia (see Section 1.5.2.5, Other Federal, State, and Local Requirements). Four treaty projects were built, with three on the Columbia River in Canada and a fourth on a major Columbia tributary in Montana. These projects, which were developed in the early 1970s, provide flood control and additional power generation at projects downstream in the United States. The power-generating capability of downstream projects was increased as a result of the treaty storage, including an 18 percent increase at five Mid-Columbia PUD projects.

Over the past several decades, populations of salmon and steelhead throughout the west coast

have declined. Since 1991, NMFS has listed over 20 species of anadromous Pacific salmonids as threatened or endangered. This decline has been particularly notable in the Columbia River system, which includes the Snake River. Before European settlement in the Columbia Basin, between 10 million and 16 million salmon returned to the Columbia each year. By the late 1970s, there were only about 2.5 million salmon, and most of those were of hatchery origin. The NMFS listings noted that the declines were due to many factors, including hydroelectric and irrigation projects; commercial and sport fishing; logging; mining; livestock grazing; water use by farms, cities, and towns; and municipal and industrial pollution. In addition, natural events (such as flooding, landslides, drought, and poor ocean conditions) have impacted fish populations in the Columbia River Basin.

At present, hydropower currently provides about 55 percent of the capacity to meet the Pacific Northwest's energy needs (based on conditions in January 2002). The rapidly increasing human population of the Pacific Northwest will likely result in increased future energy demand in the region. From the most recent data available on Federal energy projections, there would be a deficit of greater than 3,500 average megawatts through the year 2011 (the study years of the analysis), with all months of the year having a deficit. The deficit ranges up to 7,124 average megawatts in year 2011. Because of the region's relatively large reliance upon hydropower, the projected deficits vary substantially dependent on water conditions.

Alternatives to meet future load commitments include (1) purchasing power from new merchant plants operating or under construction in the Pacific Northwest, (2) purchasing power from merchant plants operating outside the Pacific Northwest region, (3) supplementing regional hydro generation using drafting provisions of the Non-Treaty Storage Agreement through June 30, 2003, (4) purchasing off-system storage and exchange agreements that allow for seasonal shaping of regional hydropower with other regions, and (5) a potential for loads to be lower due to economic conditions, conservation, or more efficient technologies through the study horizon. Regional loads and resource development are dependent on regional and local economies, power prices, and aluminum commodity prices (BPA 2000, updated May 2002).

The three hydroelectric projects provide energy directly to local customers and to utilities, which together serve about 7 million customers in the Pacific Northwest. The Wells Project has a peak generation capacity of 840 megawatts of power, enough energy to serve a city about the size of Portland. This dam provides power to its local customers as well as to Puget Sound Energy, Portland General Electric, PacifiCorp, Avista Corporation, and the Okanogan County PUD. The peak capability of the Rocky Reach Project is 1280 megawatts (enough energy to serve a city about the size of Seattle). The Rocky Reach power distribution area includes residents in Chelan County, as well as the regional BPA grid. The peak capability of the Rock Island Project is 624 megawatts, enough energy to serve a city about the size of Vancouver, Washington. The Rock Island power distribution area includes Wenatchee, the upper valley (including Peshastin-Dryden, Cashmere, and Leavenworth), the BPA transmission grid, and the Puget Sound area.

Each of the three Mid-Columbia River hydropower projects addressed in this EIS has a unique development history, but all projects were developed primarily to serve customers in nearby areas. The physical and operational features of each project reflect its location on the river and the engineering and scientific information that was available at the time the projects were developed. Specific facilities and operations of each of the projects are described in Section 2.2, Project Description.

1.6.1 PLAN AREA

The Plan area is located on the middle reach of the Columbia River, at the geographic center of Washington State. The Columbia River system is the fifth largest (by drainage area) in North America. The river and its tributaries drain an area of 260,000 square miles in seven western states and 39,650 square miles in British Columbia. In the United States, most of the basin is in Washington, Oregon, Idaho, and Montana. The Columbia River originates at Columbia Lake in the Rocky Moutain range of British Columbia, and travels over 1,200 miles to the Pacific Ocean through Washington and Oregon.

As stated earlier, the Mid-Columbia River reach is defined here as the area of the river between the Chief Joseph Dam tailrace and the confluence of the Yakima River. It contains the three projects covered by this EIS (Wells, Rocky Reach, and Rock Island), as well as two dams (Priest Rapids and Wanapum) operated by Grant County PUD. It also includes the free-flowing Hanford Reach downstream of the Priest Rapids Project. The major tributaries to the Mid-Columbia River are the Okanogan, Methow, Entiat, and Wenatchee Rivers. Note that NMFS's spring-run chinook salmon and steelhead listing determinations refer to species that spawn in this reach as "Upper Columbia River" species.

The three hydropower projects operate on the mainstem of the Mid-Columbia River (Figure 1-2), with the Wells Project at river mile 515.8, the Rocky Reach Project at river mile 474.5, and the Rock Island Project at river mile 453.4. The geographic scope for the analysis has been defined by the physical limits or boundaries of the project's likely direct effects on the resources. It also considers the extent of the contributing effects of other hydropower activities within the Columbia River Basin. The geographic project scope is separated into three tiers associated with direct facility improvements (at the projects), habitat and hatchery improvements (the mainstem between the Chief Joseph and Rock Island tailraces and the Wenatchee, Entiat, Methow, and Okanogan Rivers), and cumulative effects (including the other projects on the Columbia River).

This EIS evaluates project effects on a tier level, with the first tier representing the major emphasis of the EIS evaluation. The first tier represents the project area described in Section 1.4, Project Location and extends from the tailrace of the Rock Island Dam to the tailrace of the Chief Joseph Dam. The second tier represents the Plan area, which includes the project area and the four tributaries associated with a Tributary Conservation Plan, which addresses improvements to the Wenatchee, Entiat, Methow, and Okanogan River Basins (Figures 1-3 to 1-6). The third tier is associated with *cumulative effects* of the HCPs with other ongoing and proposed fish protection measures being implemented at other projects in the Columbia River. This tier includes the entire Columbia River from the mouth upstream to Chief Joseph Dam, which is the present upstream terminus for anadromous fish in the Columbia River (see Figure 1-1). Cumulative effects are evaluated in Chapter 5.

A quantitative fish assessment was conducted by NMFS and funded by the PUDs, the BPA, the Army Corps of Engineers, and the BOR. This assessment is known as the Quantitative Analysis Report (QAR), and is an analysis of proposed conservation measures to improve survival for listed fish species within the Columbia River and the effect that those improvements have upon the probability of recovery and extinction within specified time frames. A QAR summary is provided in Appendix E. The QAR assesses the likelihood that the combined effects of the proposed long-term measures at the PUD and Federal projects will lead to the survival and recovery of the listed species. The QAR does not evaluate additional benefits that might be provided through the hatchery programs but does

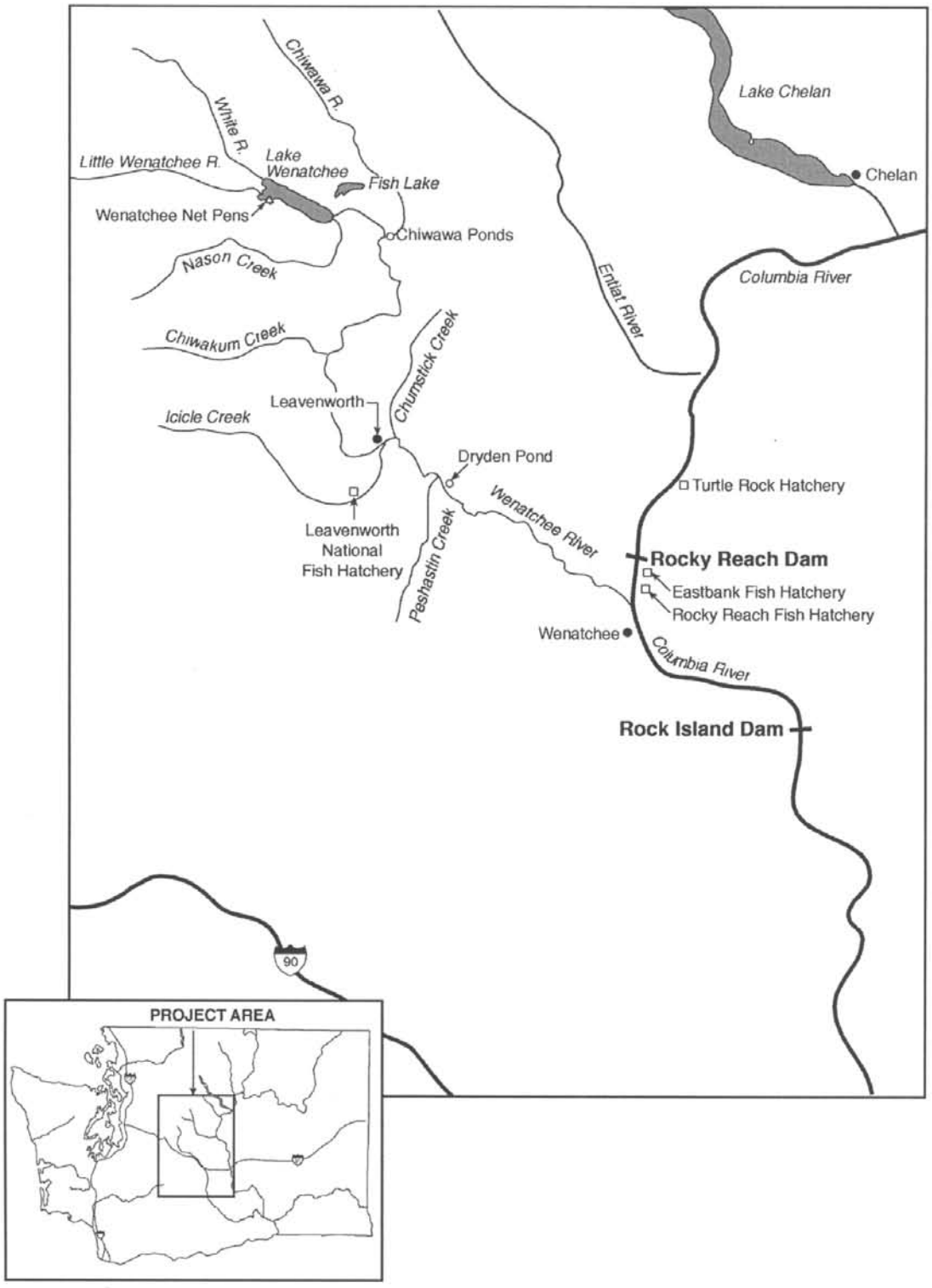
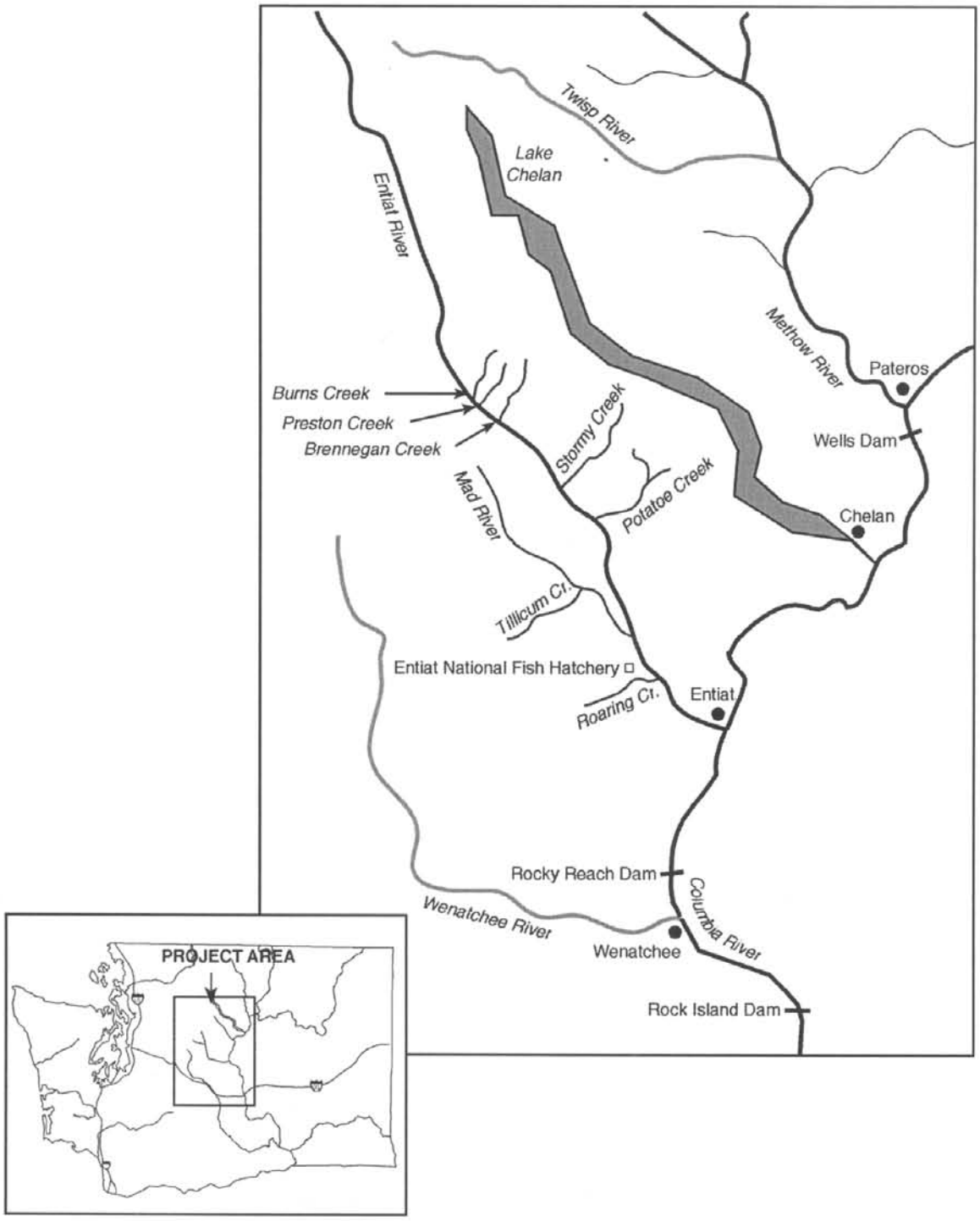


Figure 1-3
Wenatchee River and Associated Creeks and Fish Facilities



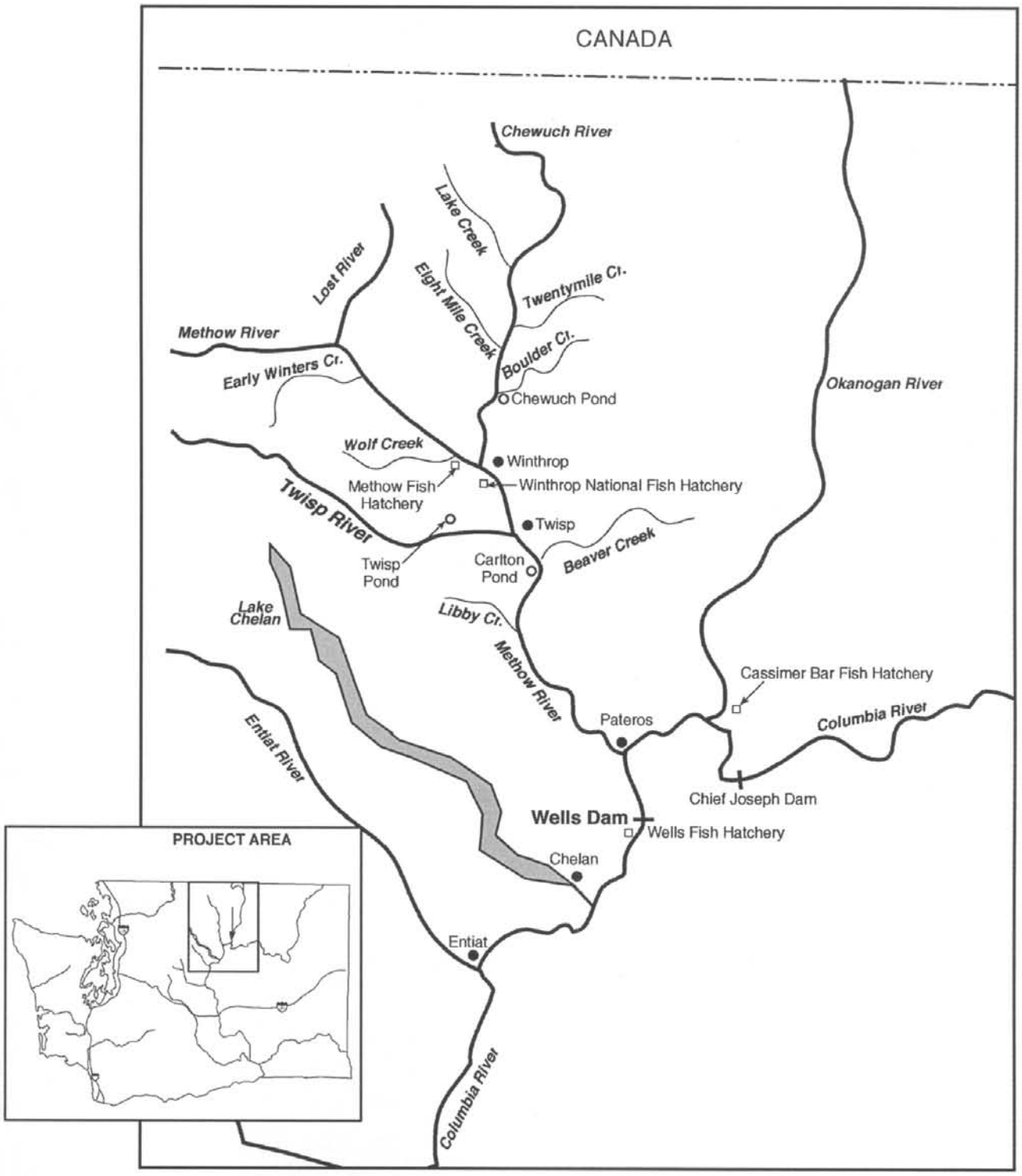
Parametrix, Inc. Mid Columbia/553-1543-020(10) 2/00 (K)

N

NOT TO SCALE

- Dam
- Hatchery
- City

Figure 1-4
Entiat River and Associated Creeks and Fish Facilities



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N

NOT TO SCALE

Dam ● City

□ Hatchery ○ Pond

Figure 1-5
Methow River and Associated Creeks and Fish Facilities

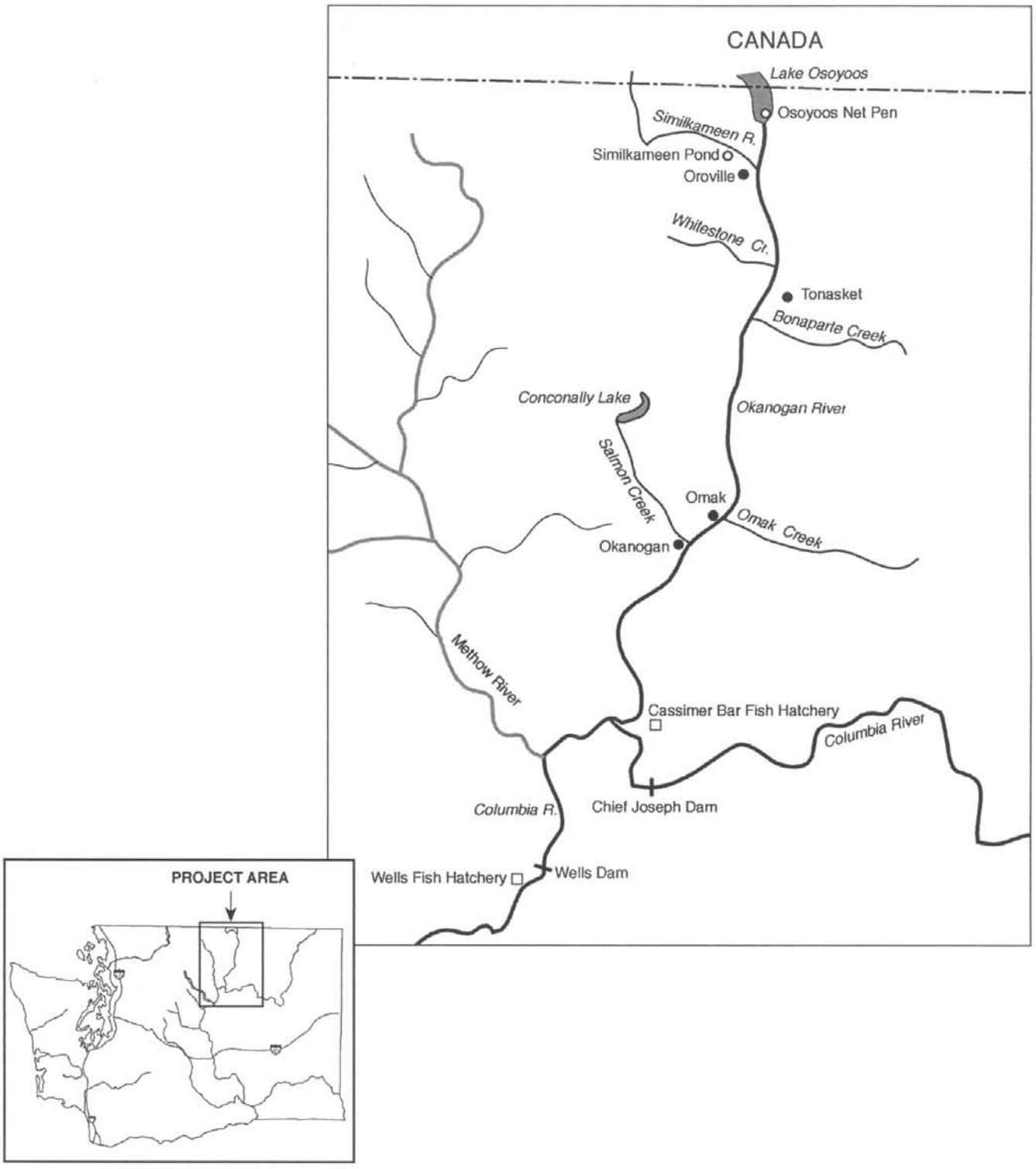

Figure 1-6
Okanogan River and Associated Creeks and Fish Facilities

include the expected survival improvement (2 percent) resulting from implementation of the tributary habitat enhancement programs. The findings of the QAR are presented in Chapter 5 of this FEIS under cumulative effects for fish.

Land use throughout the Plan area varies, but it is primarily rural with the exception of the urbanized areas of Wenatchee, East Wenatchee, Pateros, Brewster, and Bridgeport. The other areas include rangeland, irrigated farmlands, and a mixture of private and Federally owned lands. Sections of the Okanogan and Wenatchee National Forests and some Bureau of Land Management (BLM) lands are also found in the drainages within the Plan area.

The Mid-Columbia River area is served by a regional transportation system consisting primarily of Federal and State highways. On the eastern shoreline of the river from the Wells Project going south, there are no roads until U.S. Highway 97 crosses the river at Chelan Falls. Further south at Orondo, U.S. Highway 2 joins with U.S. Highway 97. North of Wenatchee, U.S. Highways 2 and 97 cross the river heading west, while State Route 28 is initiated and continues on the eastern Columbia River shoreline south past the Rock Island Project. On the western side of the river in the vicinity of the Wells Project are U.S. Highway 97 and Alternate U.S. Highway 97, excepting in the vicinity of the Chelan Butte Wildlife Area, where no highways are present. South of the wildlife area is Alternate U.S. Highway 97 south to Wenatchee. State Route 285 then parallels the Columbia River in the vicinity of Wenatchee, and the Malaga Aluminum Company of America (Alcoa) Highway parallels the western shore of the river south past the Rock Island reservoir.

For all three projects, there are no locks, ports, harbors, or smaller navigational channels that provide commercial boat passage between the three projects. Consequently, motor use on the river in the vicinity of the three projects is restricted to recreational use between projects.

Two railroads parallel portions of the Columbia River in the Plan area. The Burlington Northern Railroad follows the western shoreline, while the Rock Island Railroad and the Burlington Northern Railroad extend along the eastern shoreline.

1.6.2 PREVIOUS AND ONGOING MANAGEMENT PROGRAMS IN THE PLAN AREA

A wide range of Federal, State, Tribal, utility, and environmental parties are active in the management of the Columbia River and its adjacent resources. Literally hundreds of plans and studies have been conducted in the area.

These include long-range operations plans for the hydropower projects at the system and project levels. Also included are detailed scientific studies focusing on issues such as fish passage, fish habitat, water quality, or other physical elements that affect biological requirements for salmon and steelhead. For the Wells, Rocky Reach, and Rock Island projects, FERC licenses and related documents provide an extensive record on the background of the projects and their operating characteristics, including environmental effects.

Other studies in the area include resource and watershed management plans developed at the State and Federal levels to comply with the requirements of the Clean Water Act, to support natural resource management initiatives (including those required by the Endangered Species Act), and to assist in water rights administration. The plans include scenic, land use, and recreational resource management studies. Also included are scientific and engineering studies conducted by NMFS or USFWS and other studies related to recovery planning, permitting, and mitigating project development. Some of these studies are directly within the HCP planning areas, while others involve issues that either affect the Plan area environment or are influenced by the activities of the Mid-Columbia River hydroelectric projects.

Where appropriate, the HCPs and this EIS refer to these documents in the review of scientific information, and in the analysis of the HCPs' compatibility with other plans and programs.

The following is a brief review of the entities that conduct hydropower and river-related management studies in the Plan area. Where appropriate, the major activities or efforts relevant to the PUD projects and the Mid-Columbia HCPs are identified.

1.6.2.1 Federal Energy Regulatory Commission

FERC conducts an ongoing review of State and Federal comprehensive plans for developing or conserving a waterway. This activity is part of FERC efforts to comply with the Electric Consumers Protection Act of 1986, which ordered FERC to consider each proposed project's consistency with relevant comprehensive plans. Table 1-1 is an October 1999 listing by FERC of the comprehensive plans it has identified in and around the Columbia Basin.

TABLE 1-1. COMPREHENSIVE PLANS IN THE PROJECT AREA

PLAN
• Columbia River Basin Fish and Wildlife Program (1984, 1987, 1994), Northwest Power Planning Council
• Columbia River Fish Management Plan Settlement Agreement, U.S. District Court for the District of Oregon in Case No. 68-513
• Hydroelectric project assessment guidelines, WDF
• Inland Native Fish Strategy (U.S. Forest Service)
• Instream Resource Protection Program for the Mainstem Columbia River in Washington State, Ecology
• Northwest Conservation and Electric Power Plan, Northwest Power Planning Council
• Okanogan National Forest Land and Resource Management Plan, U.S. Forest Service
• Protected Areas Amendments and Response to Comments, Northwest Power Planning Council
• Resource Protection Planning Process - Mid-Columbia Study Unit, Department of Community Development. Washington Office of Archaeology and Historic Preservation
• Scenic Rivers Program Report, Washington State Parks and Recreation Commission
• Shorelands and Coastal Zone Management Program, Ecology
• Shorelands and Water Resources Program - State Wetlands Integration Strategy, Ecology
• State of Washington Natural Heritage Plan, Washington Department of Natural Resources
• State Scenic River System Act, Chapter 79.72 RCW
• 1987 Strategies for Washington's Wildlife, Washington Department of Game
• Voices of Washington, Interagency Committee for Outdoor Recreation
• Washington Outdoors: Assessment and Policy Plan, Washington State Interagency Committee for Outdoor Recreation
• Washington State Hydropower Development/Resource Protection Plan, Energy Office
• Washington State Scenic River Assessment, Washington State Parks and Recreation Commission
• Washington's Statewide Comprehensive Outdoor Recreation Plan, Sixth Edition, Interagency Committee for Outdoor Recreation (1985,1995)
• Washington State Wetlands Integration Strategy, Ecology
• Water Resources Management Program - Methow River Basin, Ecology
• Water Resources Management Program - Okanogan River Basin, Ecology
• Water Resources Management Program - Entiat River Basin, Ecology
• Water Resources Management Program - Wenatchee River Basin, Ecology
• Wenatchee National Forest Land and Resource Management Plan, USFS
• Wenatchee River Basin Instream Resources Protection Program, Ecology

Source: FERC (2002)

1.6.2.2 National Marine Fisheries Service

Many of NMFS's past studies, listings, and rules are relevant to the Mid-Columbia hydroelectric projects. Currently, the most significant document, aside from the listings themselves, is the 2000 biological opinion for the reinitiation of consultation on the operation of the Federal Columbia River Power System, including the Juvenile Fish Transportation Project and 19 BOR projects in the Columbia Basin (NMFS 2000a). This biological opinion superseded NMFS's 1995 biological opinion on the operation of the Federal Columbia River Power System (NMFS 1995) and 1998 supplemental biological opinion for steelhead (NMFS 1998a) and evaluated the effects of the operation of Federal Snake and Columbia River storage and run-of-the-river dams on listed anadromous salmonids.

The effects of the Federal Columbia River Power System projects were evaluated in the context of other factors influencing the survival of listed species. NMFS's expectations regarding operation of Mid-Columbia FERC projects were explicitly included in this analysis. Expectations for other Federal activities were documented in the Basinwide Salmon Recovery Strategy (Strategy). The Strategy also includes expectations for the Mid-Columbia FERC-licensed projects. The Strategy describes measures that the Federal dam operators and other Federal agencies committed to implement to improve the likelihood of recovery for listed salmon and steelhead. The 2000 Federal Columbia River Power System biological opinion incorporated and further refined those actions identified in the Strategy as the responsibility of the dam operators as part of an off-site mitigation program to offset effects of the Federal dams on listed anadromous salmonids. These specific off-site mitigation measures, deemed necessary for the survival and recovery of the listed species, are included in the 2000 Federal Columbia River Power System biological opinion's reasonable and prudent alternative.

In addition to the biological opinion for the Federal Columbia River Power System, NMFS has completed biological opinions for the Wells and Rocky Reach projects. The Wells biological opinion (NMFS 2000b) addressed the continued operation of the Wells Project under a proposed interim protection plan through April 2002. Although the timeframe of this consultation has expired, Douglas County PUD continues to operate the Wells Project in accordance with the biological opinion and the interim protection plan, pending the results of the actions proposed in this EIS.

NMFS has also completed the Section 7 consultation for the interim operation of the Rocky Reach Project (through 2006), including the construction and operation of a juvenile fish bypass system. This biological opinion would be superceded by the Rocky Reach HCP, or through the reinitiation of consultation during project relicensing in 2006.

1.6.2.3 Bonneville Power Administration, U.S. Department of Energy

BPA is the sole Federal power-marketing agency in the Northwest and the region's major wholesaler of electricity. Created by Congress in 1937, BPA services the States of Washington, Oregon, Idaho, Montana (west of the Continental Divide), and small adjacent portions of California, Nevada, Utah, and Wyoming. BPA markets and transmits power, coordinates operation of the Federal Columbia River Power System, and manages a large portion of the Pacific Northwest-Pacific Southwest Intertie. Although it lacks authority to build or own dams or power plants, BPA does own and operate, within its service area, the nation's largest network of long-distance, high-voltage transmission lines. BPA is part of the U.S. Department of Energy, but is not funded by tax revenues; the agency recovers the cost of operations and maintenance mainly through its electricity rates.

1.6.2.4 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers owns and operates eight Federal hydropower projects on the Lower Columbia and Snake Rivers. This includes the McNary, John Day, The Dalles, and Bonneville projects on the Lower Columbia. The Army Corps of Engineers also operates Chief Joseph Dam, located immediately upstream of the Wells Dam reservoir. The Army Corps of Engineers is responsible for implementing the Columbia River Fisheries Management Program for its projects. The management program is largely based on measures contained in NMFS's biological opinions on the impacts of the Federal hydropower system operations on Columbia and Snake River salmon and steelhead, including the 2000 biological opinion for the Federal Columbia River Power System (NMFS 2000a). In addition, the Army Corps of Engineers' program considers and implements capital construction measures for mainstem fish passage.

1.6.2.5 Northwest Power Planning Council and the Columbia River Basin Fish and Wildlife Program

The Northwest Power Planning Council is a four-state compact formed under the Northwest Power Act. Through the Council, Idaho, Montana, Oregon, and Washington oversee electric power system planning and fish and wildlife recovery in the Columbia River Basin. The Council has no direct authority over utilities, but it works closely with Northwest utilities and State regulatory commissions. The Council's responsibility is to mitigate the impact of hydropower dams on all fish and wildlife in the Columbia River Basin, including endangered species, through a program of enhancement and protection.

The Northwest Power Act gave the Council three distinct responsibilities: (1) to ensure that the region has an adequate, efficient, economical, and reliable electric power supply; (2) to prepare a program to protect, mitigate actions that might harm, and enhance fish and wildlife populations of the Columbia River Basin that have been affected by the construction and operation of hydropower projects; and (3) to inform the Pacific Northwest public about energy issues and involve the public in decision-making.

Recent studies by the Council include a reliability study of the Northwest power system loads and resources, and a review of Columbia River Basin fish and wildlife decision-making processes. One of the Council's largest ongoing programs is the Columbia River Basin Fish and Wildlife Program.

The Columbia River Basin Fish and Wildlife Program was the first comprehensive strategy for fish and wildlife in the Columbia River Basin. The Council's 2000 Fish and Wildlife Program addresses the activities that affect fish and wildlife in the Columbia River Basin, specifically hydropower, habitat, hatcheries, and harvest. Through its fish and wildlife program, the Council provides guidance and recommendations on hundreds of millions of dollars per year of BPA revenues to mitigate the impact of hydropower on fish and wildlife. That amount is expected to increase in the future as enhancement efforts expand and accelerate.

The Northwest Power Act required the plan to address the following issues: (1) environmental quality, (2) compatibility with the existing regional power system, and (3) protection, mitigation of actions that might harm, and enhancement of fish and wildlife populations and related spawning grounds and habitat (including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish). The four key directives in the Council's fish and wildlife program regarding anadromous fish are to improve migration survival, reduce harvest of wild fish, protect and improve habitat, and improve hatcheries.

1.6.2.6 Fish Passage Center

The Fish Passage Center is an entity established by the Northwest Power Planning Council's Fish and Wildlife Program, with funding provided by BPA. The Fish Passage Center participates in coordinating river flows for fish migration at mainstem Columbia and Snake River hydroelectric projects, both Federal and non-Federal. The Fish Passage Center provides technical support and data for the agencies and Tribal members in planning and implementing operation of the hydroelectric system. It provides extensive data on flow and passage mitigation measures related to the Council's Fish and Wildlife Program and the NMFS biological opinions.

1.6.2.7 Bureau of Indian Affairs, U.S. Department of the Interior

The Bureau of Indian Affairs (BIA) is charged with carrying out the major portion of the trust responsibility of the United States to Native American Indian Tribes. This trust includes the protection and enhancement of Indian lands and natural resources through technical assistance and management and mineral resource management.

1.6.2.8 Bureau of Land Management, U.S. Department of the Interior

BLM is responsible for the management of 281 million acres of public lands located primarily in the western states and Alaska. Resources managed by BLM include timber, hard minerals, oil and gas, geothermal energy, wildlife habitat, endangered plant and animal species, rangeland vegetation, recreation and cultural values, wild and scenic rivers, designated conservation and wilderness areas, and open space. Hanford Reach, the last free-flowing reach in the Lower Columbia River, located downstream of the Priest Rapids hydroelectric project, has been designated a historical monument. Some of the lands adjacent to the Mid-Columbia reach are also Federal public lands managed by BLM.

1.6.2.9 Bureau of Reclamation, U.S. Department of the Interior

BOR administers Federal programs in the 17 western states for water resource management, and owns and operates a number of dams in the Northwest, including Grand Coulee Dam upriver of the Mid-Columbia projects. It also owns and operates several projects on the tributaries of the Columbia River. Grand Coulee Dam is part of the Columbia Basin Project managed by BOR, which provides irrigation water to about 671,000 acres of the Columbia Plateau. This project extends from Grand Coulee Dam, about 125 miles south to near Pasco, Washington. Operations at this project include flood control, storage, generation, irrigation, and salmon flow augmentation. These operations have a significant impact on flows in the Mid-Columbia reach.

1.6.2.10 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (USEPA) is responsible for managing and enforcing water quality regulations in the nation's waters. It also regulates discharge of pollutants into water and air. Under the Clean Water Act, USEPA, the State, Tribal governments, other Federal agencies, and private landowners implement numerous programs throughout the Columbia River Basin to improve water quality in associated watersheds and tributaries. The programs implemented in the Columbia River mainstem and tributaries focus on improving water quality, restoration of habitat, and recovery of Endangered Species Act-listed species. In Washington State, Ecology has been charged by USEPA to implement the provisions of the Clean Water Act. USEPA is also responsible for reviewing this EIS pursuant to Section 309 of the Clean Air Act.

1.6.2.11 Columbia Basin Fish and Wildlife Authority

The Columbia Basin Fish and Wildlife Authority is an association of fish and wildlife agencies from the four states, two Federal agencies, and 12 Indian Tribes in the Columbia River Basin. Its mission is to coordinate planning and implementation of the fish and wildlife management issues in dealings with the Northwest Power Planning Council, BPA, and Army Corps of Engineers. It is a non-regulatory party, and presents only consensus positions of its members.

1.6.2.12 Columbia River Inter-Tribal Fish Commission

This commission represents four Columbia Basin Indian Tribes that signed treaties in 1855 securing to them certain reserved rights to take fish in the Columbia River and its tributaries. The Commission is composed of the fish and wildlife committees of its member Tribes and supplies technical expertise and enforcement resources.

1.6.2.13 Columbia River Treaty Tribes

Four Columbia River Basin Tribes have reserved rights to anadromous fish, provided through an 1855 treaty with the United States. The four treaty Tribes are the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Indian Nation. A fifth tribal organization, the Confederated Tribes of the Colville Reservation, was not specifically named in the 1855 treaty, but the Colville confederation includes part of the Nez Perce Tribe.

From 1905 through the present, a series of Congressional Acts and Federal court rulings have clarified Tribal treaty fishing rights, and determined the various responsibilities of State and Federal agencies to co-manage basin resources with the Tribes and regulate treaty fisheries for conservation purposes. Below, the Tribes are briefly described, based on information provided by the Columbia River Inter-Tribal Fish Commission. Summary information on the Tribes is provided below.

The Nez Perce Tribe

The Nez Perce homeland once covered 12.3 million acres in what is now Idaho, Oregon, and Washington. Today, the reservation consists of 741,300 acres, of which 13 percent is owned by the Tribe. The Nez Perce co-manage and fish in several Columbia River basin tributaries, including the mainstem Columbia. The Tribe has an enrolled membership of about 3,000 and is headquartered in Lapwai, Idaho.

The Confederated Tribes of the Colville Reservation

The reservation of the Confederated Tribes of the Colville Reservation was established by President Grant's Executive Order in 1872. The 12 Tribes located there are the Okanogan, Lakes, Colville, San Poli, Nespelem, Methow, Entiat, Chelan, Wenatchee, Moses-Columbia, Palouse, and Nez Perce. The 1,397,500-acre reservation in the north central section of Washington State is bounded on the east and south by the Columbia River and on the west by the Okanogan River, and includes 4,528 Colville Indians residing on Tribal land.

The Confederated Tribes and Bands of the Yakama Indian Nation

The Yakama Indian Nation includes 14 bands and Tribes, including the Kah-milt-pah, Klickitat, Klinquit, Kow-was-say-ee, Li-ay-was, Oche-chotes, Palouse, Pisquose, Se-ap-cat, Shyiks, Skinpah, Wenatshapam, Wishram, and Yakama. The 1,185,000-acre Yakama Indian Reservation is in south central Washington, and includes

7,411 Yakama Indians residing on Tribal land. The Yakama Indian Nation co-manages the Columbia River, as well as the Wind, White Salmon, Klickitat, Yakima, Wenatchee, Methow, Entiat, and Okanogan Rivers, and fishes in many locations in the greater basin.

The Confederated Tribes of the Umatilla Indian Reservation

The confederation of the Walla Walla, Cayuse, and Umatilla Tribes shared a homeland in what is now northeastern Oregon and southeastern Washington. Today the three-Tribe confederation numbers 1,500, and much of the Tribal reservation (172,882 acres) is in the Umatilla and Grande Ronde River watersheds in Oregon. The Tribe has co-management responsibilities for several Columbia Basin rivers, including the mainstem Columbia. Most of its fishing and conservation activities occur along the Umatilla, Grande Ronde, and Columbia Rivers, below the confluence of the Snake and Columbia Rivers.

The Confederated Tribes of the Warm Springs Reservation of Oregon

The three Tribes in this confederation are the Warm Springs, Wasco, and Paiute headquartered in Warm Springs, Oregon. The reservation is approximately 644,000 acres, with 4,528 Native Indians residing on these lands. The Warm Springs Tribe co-manages the Columbia, Deschutes, Fifteenmile Creek, John Day, and Hood River watersheds, but is typically not an active participant in the management of the Mid-Columbia reach. However, their fishing activities are affected by the health of Mid-Columbia stocks.

1.6.3 OTHER CONTRACTS AND AGREEMENTS

1.6.3.1 Mid-Columbia PUD FERC Agreements

The licenses for the three Mid-Columbia hydroelectric projects include agreements with the Colville, Yakama, Umatilla, and Warm Springs Tribes; State and Federal fisheries agencies; and major wholesale power purchasers. The agreements address issues including juvenile fish passage, hatchery operations, project modifications, and studies related to anadromous fish.

Douglas County PUD entered into the Wells Settlement Agreement for the Wells Project in 1990 (FERC 1990). Although the agreement for the Rocky Reach Project (Fourth Revised Interim Stipulation) has expired, Chelan County PUD continues to operate the project under the interim stipulation in most years (FERC 1995). For the Rock Island Project, Chelan County PUD has entered into the Rock Island Settlement Agreement (FERC 1987a). Chelan and Douglas County PUDs are also parties to the Vernita Bar Settlement Agreement for the protection of the Hanford Reach of the Columbia River.

1.6.3.2 Major Bond and Sales Agreements for the Projects

The projects owned by the Chelan and Douglas County PUDs have different development and financing histories. However, long-term bonds and sales contracts are two major elements affecting their operations. Salmon and steelhead issues affect the PUDs' power costs, energy produced, capacity to generate energy, bond ratings, and their ability to enter future long-term sales contracts. Increasing the predictability of these effects, along with protecting the Plan species, is the major reason why the PUDs are seeking an incidental take permit with a 50-year term.

Through long-term contracts, Chelan County PUD sells about 63 percent of its hydroelectric power at cost to utilities in the Northwest. The PUD finances its hydropower projects through bonds dedicated to each project, and through consolidated bond offerings that also fund its power distribution and water/wastewater systems. The Douglas County PUD sells about 62 percent of its power through long-term contracts. The major financing bonds and sales contracts for the PUDs and their projects are described below.

The Douglas County PUD began developing the Wells Project in 1963, and completed the project in 1967. The development was funded through revenue bonds. In 1975, 1986, 1990, and 1993, additional bonds were issued for various project improvements and to fund programs required under the project's license and other agreements. As of 1999, the PUD had $168.7 million in bonds outstanding.

Through long-term sales contracts that continue to 2018, 100 percent of the power generated by Wells is sold to PacifiCorp, Puget Sound Energy, Portland General Electric Company, Avista Corporation, and the PUD's distribution system. In addition, the PUD has a power sales contract with the PUD No. 1 of Okanogan County, in which the PUD sells 8/38 of its share of the output of the Wells Project to Okanogan PUD and entitles Okanogan PUD to an 8-percent interest in the project after all acquisition and construction debts are repaid. The contracts allow the PUD to recover production costs for the Wells Project.

The Rocky Reach Project was developed and financed by Chelan County PUD through the sale of revenue bonds, which pledged revenues from the project for debt repayment. The original project was financed with $273.1 million of revenue bonds in 1956 and 1957. Additional project improvements for generation, recreation, fish protection, and other features have also been financed by revenue bonds. As of 2001, an estimated $886,076,000 in revenue bonds secured by the Douglas County PUD's consolidated hydrosystem were outstanding.

The repayment of the revenue bonds has been guaranteed through power sales contracts between Chelan County PUD and PacifiCorp, Portland General Electric Company, Puget Sound Energy, Inc. (formerly Puget Sound Power & Light), Avista Corporation (formerly Washington Water Power Company), Alcoa, Douglas County PUD, and the PUD's electric distribution system. Most of the contracts cover a 50-year period that started after the November 1961 date of commercial operation, and they expire in October 2011. The current contracts for Rocky Reach allow the PUD to recover production costs, and the PUD can sell its excess power at market rates (Chelan County PUD 1999a).

The Rock Island Project was first developed by Puget Sound Energy in 1930, and was purchased by Chelan County PUD in 1956. A second powerhouse was added to the project in 1979. All of the power from the project is sold to Puget Sound Energy and to the PUD's distribution system (Chelan County PUD 1999a).

1.7 PUBLIC SCOPING, DEIS REVIEW, AND NMFS'S RESPONSE

Public scoping for the environmental review of the permit applications began with publication of a Notice of Intent in the Federal Register on January 6, 1999 (64 Federal Register 123098E) Subsequently, a scoping brochure was distributed to all parties requesting additional information after the Notice of Intent was published, as well as to individuals, agencies, businesses, or organizations known to have an interest in the hydroelectric projects, the HCPs, or other aspects of the study area. The mailing list included over 285 individuals, agencies, private businesses, and organizations. Both the Notice of Intent and the brochure described the project's public scoping

period, which lasted through February 5, 1999. The brochure included notice of project scoping meetings, and notices of the meetings were also advertised in local newspapers.

Scoping meetings were held on January 20, 1999 in Wenatchee, Washington and on January 21, 1999 in Brewster, Washington. Oral comments were solicited at the meetings, and written comments were received throughout the scoping period. Additional resource agency comments were also received as a result of a scoping and alternatives development meeting held on March 3, 1999. Using results from the scoping meetings, NMFS and the project applicants refined the scope of the projects and alternatives.

The meetings also helped highlight areas of special concern, which included environmental protection, Endangered Species Act compliance, and impacts to society and economic conditions. Comments expressed opinions on alternative preferences, monitoring and measurement, and cultural resources, as well as requests for additional information on the regulatory context and requirements for hydropower project licensing, and implementation and interpretation of the No Surprises policy.

Ten primary issues were identified during public scoping for the DEIS as summarized below:

- **Endangered Species Act Compliance**: *How will Sections 7 and 10 assurances be applied to the action alternatives, including the No Surprises policy?* A detailed description of how the alternatives meet Endangered Species Act compliance is provided in Section 2.6, Alternative Comparison and in Table 2-7, Comparison of Alternatives for Anadromous Salmonid Conservation Measures. The No Surprises policy is discussed in Section 1.5.2.1 Endangered Species Act Requirements for Non-Federal Actions.

- **Anadromous Fish Protection**: *What fish protection and monitoring measures will be applied (including fish screens), what impacts would occur to the Permit species if survival goals are not met, and how would the introduction of coho affect the existing fisheries resources?* The fish protection measures for the action alternatives are described in Section 2.3, Alternatives Considered in Detail. Impacts that would occur to Permit species are described in Section 3.2, Fisheries Resources (including coho salmon).

- **Economic Viability**: *Will HCP funding be achievable, and what is the justification for the proposed funding levels?* Refer to Section 4.8, Economics, for a discussion of the cost differences among the alternatives and how the PUDs will obtain the funding needed. The rationale for establishing the HCP funding levels is addressed in Section 2.3.4.8, HCP Conservation Plan and Compensation Measures.

- **Recreation**: *How would implementation of the HCPs affect the socioeconomic conditions of surrounding communities, especially recreation-related tourism?* Refer to Section 4.7, Socioeconomics for a discussion of the socioeconomic effects of the action alternatives.

- **TribalTreaties/Cultural Resources**: *Will the HCPs satisfy the Federal Trust Responsibility and other Secretarial Orders and Tribal treaties? What are the potential impacts of the action alternatives on cultural resources, especially salmon and lamprey?* Section 4.12.17, Legislation Pertinent to Tribal Governments describes how the alternatives meet Tribal responsibilities. Alternative impacts on salmon and lamprey are described in Section 4.2, Fisheries Resources.

- **Geology and Water**: *How will the HCPs affect flood control, sedimentation, and water use?* Geology, soils, and water resource effects from implementation of the alternatives are described in Section 4.1, Land Features, Geology, and Soils, and Section 4.3 Water Resources.

- **Alternatives**: *Will alternatives be developed that include dam removal, drawdown, and non-power operations? Will any alternative not involve the taking of imperiled salmonids?* The action alternatives include drawdown. Non-power operations (including dam removal) are discussed in Section 2.5, Alternatives Considered But Eliminated from Detailed Consideration. All alternatives involve hydropower operations where the taking of salmonids would occur.

- **Baseline Conditions**: *How will baseline conditions be defined in the analysis?* Alternative 1 represents baseline conditions, and is described in Section 2.3.2, Alternative 1.

- **Regulatory Agency Requests**: *How will compliance with other laws and regulations be addressed in the NEPA process?* Compliance with laws and regulations is described in Section 4.12, Relationship to Laws and Policies, as well as in each of the resource sections in Chapter 4.

- **Cumulative Effects**: *How will cumulative effects be addressed in the EIS?* Chapter 5 describes the cumulative effects by resource.

Where pertinent, the issues identified during public scoping were used to develop alternatives. These include consideration of a fish bypass for an action alternative, dam drawdown, Endangered Species Act compliance, monitoring, the development of survival goals, and demonstration of economic viability. All action alternatives were developed in consideration of Tribal treaty rights, Federal Trust responsibility, Secretarial Orders, and other regulatory compliance requirements.

Following development of the alternatives, a cooperating and participatory agency/organization meeting was held on September 9, 1999 to describe the alternatives and scoping comments received.

The DEIS was published on December 29, 2000 for public review (65 Federal Register 82976). On April 16, 2001, NMFS reopened the comment period on the DEIS in response to requests for extension of the comment period (66 Federal Register 19426). From public comments received on the DEIS, there were questions involving the implementation, regulation, and monitoring components of the HCPs that needed to be further defined prior to publication of the FEIS. Refer to Appendices A (public comments received at DEIS public meetings) and B (written comments received on the DEIS). NMFS responses to public comments are provided in Appendix C. The applicants also commented on the DEIS. Their comments and NMFS's responses are included in Appendix D. In addition, where needed, the FEIS has been changed to include information requested from public comment.

Issues that arose during the DEIS public comment period included 39 specific areas, and some miscellaneous comments (Appendix C). Many comments included the request for more detail and discussion either in the HCPs or the EIS on the expected implementation process. These comments were addressed through HCP and EIS revisions that provided additional detail. Other comments include those already identified above during the scoping process. Unique issues brought forth during the DEIS public comment period that are in addition to requests for clarification are described below:

- **Water Quality**: *How will the action alternatives meet compliance with the Clean Water Act?* The EIS alternatives were primarily developed to meet Endangered

Species Act compliance. However, implementation of any EIS alternative will require compliance with all Federal, State, and local laws and regulations. Clean Water Act compliance is addressed in the HCPs in Section 5, Reservoir as Habitat and Water Quality for the Wells HCP and in Section 6, Reservoir Habitat and Water Quality in the Rocky Reach and Rock Island HCPs.

- **Biological Opinion**: *Will a biological opinion be prepared for this project?* The biological opinion will be available for public review upon issuance of the Record of Decision.

- **Adequacy of the Off-Site Mitigation Plans**: *Is a 2 percent mitigation fund (Plan Species Account) adequate in the HCPs?* The HCPs were revised to include a Tributary Assessment Program as described in Section 7.5, Tributary Assessment Program for the Wells HCP and Section 7.6, Tributary Assessment Program for the Rocky Reach and Rock Island HCPs.

- **Hatchery Plan**: *Will the Tribes be guaranteed hatchery compensation as currently occurs?* Section 8.4.3, Phase I Production Commitment; Section 8.4.5, Adjustment of Hatchery Compensation – Population Dynamics of the Wells HCP; Section 8.4.2, Calculation of Hatchery Levels; and Section 8.7, Program Review in the Rocky Reach and Rock Island HCPs specify the hatchery production levels under the HCP through 2013. The hatchery programs would be evaluated in 2013 and every 10 years thereafter to determine if hatchery program goals and objectives (as defined in the Section 10 Endangered Species Act permits and in the HCP and supporting documents) have been met. Based on this review, production levels would be established for the next 10-year period.

- **Monitoring**: *Will adequate monitoring occur to confirm that HCP no net impact goals are being achieved?* Monitoring for achievement of the survival standard has been revised in the HCPs to ensure that the appropriate studies are conducted and the coordinating committees approve the conclusions. Refer to Section 4 Passage Survival Plan for the Wells HCP and Section 5 Passage Survival Plan for the Rocky Reach and Rock Island HCPs.

- **Attainment of Survival Goals**: *What assurances are there that the HCP survival standards will be met?* The HCPs were revised to ensure that the no net impact standard would be achieved no later than 2013. Refer to HCP Section 3.1 in the Wells, Rocky Reach, and Rock Island HCPs.

- **Other Existing Agreements**: *How will the HCPs affect relicensing and the Mid-Columbia Proceedings?* The FEIS Section 1.5.2 Overview of Federal Requirements for Species Conservation describes how the alternatives affect the current project evaluations by affected parties.

During 2001 and 2002, negotiations were conducted among the interested parties to address the issues identified during public comment on the DEIS. NMFS held over 20 meetings with State and Federal resource agencies, Tribes, and American Rivers. These discussions resulted in revised HCPs for all three Mid-Columbia River projects in March 2002. The PUDs, NMFS, USFWS, WDFW, the Colville Tribe signed these HCPs, and the Wells HCP was also signed by Douglas County PUD's wholesale power purchasers.

NMFS is not obligated under the HCPs to issue the PUDs Section 10 permits unless, after completion of the NEPA process and other environmental analyses, NMFS can make the appropriate Section 10 findings. Implementation of the agreements is contingent upon NMFS's issuance of the Section 10 permit and FERC's

amendment of the project licenses. Notice of the revised applications for incidental take permits and availability for public comment was published by NMFS in the Federal Register (67 Federal Register 42755) on June 25, 2002. NMFS received comments on the Federal Register notice through July 29, 2002. Responses to comments received were reviewed and considered during preparation of this FEIS. NMFS's written response to the comments will be included in the ROD for this project. This FEIS evaluates the revised HCPs.

The revised HCPs provide greater detail regarding the implementation and monitoring procedures, although the fundamental structure of the HCPs remains unchanged as described in the DEIS. The HCPs maintain the primary objective of producing no net impact to the Plan species through a 91 percent combined adult and juvenile project survival standard, and mitigation for the 9 percent unavoidable mortality at each project through hatchery supplementation and tributary enhancement programs.

Although the 91 percent survival standard was maintained, the parties acknowledged the difficulty of measuring adult survival with existing technology. However, instead of abandoning the 91 percent standard, the parties created a measurement surrogate until it becomes possible to adequately measure adult survival. This interim surrogate survival measurement is a 93 percent juvenile project survival goal derived by assuming a 0 to 2 percent adult mortality attributable to each project, which is based on the best available data.

In addition to clearly defining the survival standards, the HCP supporting documents identify the current best available measurement technology and the appropriate uses of the technology to evaluate the standards. The revised HCPs clearly define what constitutes a valid survival estimate. Coordinating committees are identified as the primary means of consultation and coordination between the PUDs and the fisheries parties in connection with conducting studies, implementing the HCP measures, and resolving disputes. The hatchery and tributary committees would operate as described in the DEIS; however, each project would have separate coordinating, hatchery, and tributary committees.

The revised HCPs clarify the PUDs' responsibilities relative to the level of accuracy associated with the measurement of the survival rates. This provides a clear decision-making process for the coordinating committees to determine if the survival standards are met, and actions necessary to achieve or maintain the established protection levels for each Plan species.

Although the 7 percent hatchery supplementation rate also remains unchanged, the revised HCPs provide more details about monitoring and evaluation of the hatchery plan, and better define the types and numbers of fish to be produced, and how the hatchery program will be implemented in relation to changes in NMFS hatchery policies. The 2002 HCPs expressly provide for the production of coho salmon and Okanogan River Basin spring-run chinook salmon.

The tributary enhancement program remains the same in the revised HCPs, although Douglas County PUD agreed to double its initial contribution to the Tributary Fund to $1,982,000 (1998 dollars). The parties also added a Tributary Assessment Program to which each project would contribute up to $200,000 to evaluate the relative merits of individual tributary enhancement projects or an aggregation of several projects.

Other changes in the HCPs included:

- specific provisions for dam operations during the regulatory review process,
- a more detailed description of HCP phase designations,
- the addition of a survival standard decision matrix,

- changes in dispute resolution procedures,
- the agreement that water quality issues will be addressed by all parties,
- the acknowledgement that the Wells Project has already achieved the 93 percent juvenile project survival goal for certain species,
- clarification of the HCP initiation dates for the 50-year time period,
- a more defined description of withdrawal and termination events,
- confirmation that the HCPs will comply with applicable laws, and
- a requirement that the no net impact standard will be achieved no later than 2013.

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CHANGES MADE BETWEEN THE DEIS AND THE FEIS FOR CHAPTER 2

- Changes in Chapter 2 have been made to reflect or address public comments on the Draft EIS, or to otherwise refine the EIS.

- In general, redundancies within and between Chapters 2 and 1 have been eliminated.

- Definitions of kelt, Permit species, and Plan species have been included in the Key Terms.

- Project descriptions and effects were updated and expanded to include new criteria for project operations, the most recent survival studies, and a more comprehensive treatment of the factors affecting fish survival in the project areas. This additional information is also updated in the description of Alternative 1 (no-action).

- Changes were made in Chapter 2 that reflect changes made to the HCPs that resulted from the public and agency DEIS review comments as summarized in Section 1.7, Public Scoping, DEIS Review, and NMFS's Response.

- Section 2.7, Preferred Alternative, was added to identify the preferred alternative and provide a bulleted summary of the major NEPA and Endangered Species Act-related issues that NMFS has considered in its decision.

- Alternative 1 was altered to include the completed Section 7 consultation for Rocky Reach Dam for the construction and operation of a juvenile fish bypass system and the continued operation of the project through relicensing in 2006. However, because the bypass is an integral part of the HCP, it is still evaluated under Alternative 3.

- Alternative 2 was expanded to include more comprehensive conservation measures as requested through public comments on the DEIS.

Chapter

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Key Terms

FERC License – A Federal license for hydroelectric projects that includes requirements and restrictions about how the projects are maintained and operated. The PUD hydroelectric projects are licensed by the Federal Energy Regulatory Commission (FERC), under the Federal Power Act.

Fish Passage Facilities – The features of a dam that enable fish to move around, through, or over a dam. Facilities generally include an upstream fishladder and/or a downstream bypass system. A fishladder is a series of ascending pools constructed to enable salmon or other fish to swim upstream past the dam or barrier. A bypass system is a structure that provides a route for fish to move through or around the dam without going through turbine units..

Kelt – Adult steelhead that have completed spawning and are migrating downstream to return to the ocean.

No Net Impact – An objective of the HCPs is to achieve "no net impact" for each Plan species affected by the Wells, Rocky Reach, and Rock Island hydroelectric projects. The no net impact standard consists of two primary components: 91 percent combined adult and juvenile survival for all anadromous salmonid species migrating through each project, and compensation for the 9 percent unavoidable project mortality. The PUDs would compensate for the 9 percent fish loss at the projects through hatchery compensation programs and funding the tributary habitat programs. Hatcheries would compensate for 7 percent fish mortality at the projects. Habitat improvements in the Mid-Columbia River tributaries would compensate for the remaining 2 percent mortality. This compensation for project mortality would result in a no net impact standard at the three projects.

Permit Species – For the purposes of this EIS, Permit species are all Plan species except coho salmon (*Oncorhynchus kisutch*). Permit species do not include coho salmon since wild coho salmon are extirpated from the Mid-Columbia region and therefore not protected by the Endangered Species Act.

Plan Species – For the purposes of this EIS, Plan species are spring-run and summer/fall-run chinook salmon (*Oncorhynchus tshawytscha),* sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*).

Run-of-the-River Hydroelectric Project – The Wells, Rocky Reach, and Rock Island hydroelectric projects are run-of-the-river projects, which means that they do not store substantial amounts of water in their reservoirs. Run-of-the-river hydroelectric projects produce electric power through use of the gravitational force of falling water, and consist of a powerhouse, spillway, and embankments, as well as fish passage facilities.

Settlement Agreement – Protection plans developed through negotiations with the fishery agencies and the Tribes that specify mitigation and compensation measures for the impacts to anadromous fishery resources as a result of project operations. The fish protection agreements for the Wells, Rocky Reach, and Rock Island projects are documented in the 1990 Wells Long-Term Settlement Agreement, the 1994 Fourth Revised Rocky Reach Interim Stipulation (expired), the 1987 Rock Island Settlement Agreement, and the Vernita Bar Agreement.

* *See Chapter 7 for a complete listing of all Key Terms.*

This chapter summarizes alternatives to address Endangered Species Act requirements for listed species affected by operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects. The three alternatives considered for the projects are discussed and compared on a general level in this chapter, and presented in more detail in Chapter 4, Environmental Consequences. Specifically, this chapter explains:

- how the alternatives were developed,
- the existing hydroelectric projects and related fisheries issues,
- alternatives considered in this EIS,

- the common and the unique features of the alternatives,
- alternatives eliminated from detailed evaluation,
- comparative differences between the alternatives, and
- NMFS's preferred alternative and the process used in selecting this alternative.

2.1 DEVELOPMENT OF ALTERNATIVES

Upper Columbia River steelhead and spring-run chinook salmon were listed as endangered under the Endangered Species Act in 1997 and 1998, respectively. The alternatives examined in this EIS include a no-action alternative and two action alternatives and the effectiveness at minimizing and mitigating to the maximum extent practical, the incidental take of both Endangered Species Act-listed and unlisted anadromous salmon and steelhead at the Wells, Rocky Reach, and Rock Island hydroelectric projects.

Hydroelectric projects have the potential to impact steelhead and spring-run chinook salmon through the direct and indirect effects of project operations, and due to changes in habitat that result from project operations. As a result, an *incidental* take of either of these species may occur. An incidental take of a listed species is any take that results from, but is not the purpose of, an otherwise lawful activity. Take, as defined in Section 9 of the Endangered Species Act, is to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect, or attempt to engage in any such conduct. Under the terms of Section 7(b)(4), Section 7(a)(2), and Section 10(a) of the Endangered Species Act, a take is not prohibited provided that it is in compliance with the terms and conditions of either a biological opinion (Section 7) or an incidental take permit (Section 10).

2.1.1 SECTION 7 PROCESS

Section 7 of the Endangered Species Act requires that Federal agencies consult with USFWS and/or NMFS (the Services) to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any Endangered Species Act-listed species or result in the destruction or adverse modification of their habitat. The result of formal consultation is typically a biological opinion that determines whether an agency action, taken together with cumulative effects, is likely to jeopardize the continued existence of the listed species, or result in the destruction or adverse modification of designated critical habitat. In addition, the Services also provide an incidental take statement for actions not violating the prohibitions set forth in Endangered Species Act Section 7(a)(2). FERC is required to consult with NMFS under Section 7 prior to amending licenses for the Wells, Rocky Reach, and Rock Island hydroelectric projects that could affect listed species.

Under this process, FERC would identify the effects on listed species that may result from the proposed action. The agency would then suggest measures to protect the species to the extent possible and describe how these measures would be implemented. NMFS would then prepare a biological opinion to determine if the proposed action and associated protection measures are sufficient to avoid jeopardizing the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat.

A "no jeopardy" biological opinion would be issued only if NMFS determines that the actions are not likely to jeopardize the continued existence of the listed species or cause the destruction or adverse modification of the habitat on which they rely, and that there is adequate potential for recovery of listed species when the proposed protection measures are implemented.

If NMFS determines that the proposed measures are not adequate to ensure the continued existence of the species, a reasonable and prudent alternative to the proposed action would be developed. The measures developed by NMFS and the terms and conditions or reasonable and prudent alternatives are mandatory requirements of a biological opinion. To be in compliance with the take prohibitions of Section 9, FERC would amend the PUDs' licenses to include the measures identified in the biological opinion. However, modification of a FERC license is subject to appeal by the licensee (the PUDs).

The reasonable and prudent measures or alternatives and the terms and conditions of the biological opinion would remain in effect as long as new information did not indicate that the species' continued existence was in jeopardy. Reinitiation of consultation is required if the amount or extent of taking specified in the incidental take statement is exceeded, new information reveals effects on listed species or critical habitat not previously considered, the action is modified in a way that causes an effect on listed species or critical habitat not previously considered, new species are listed, or critical habitat is designated.

2.1.2 SECTION 10 PROCESS

Non-Federal applicants can apply for a special exemption to the take prohibitions by utilizing the Section 10 permitting process. The Section 10 process requires applicants to develop a conservation plan specifying, among other things, impacts that are likely to result from their proposed actions, and defining the measures that would be taken to minimize and mitigate for these impacts. Conservation plans under the Endangered Species Act are also known as HCPs. A biological opinion from NMFS would still be required under the Section 10 process and reviewed to determine if the incidental take of a species, considering the applicant's HCP measures, would cause jeopardy to the species or destruction or adverse modification to designated critical habitat.

2.1.3 EIS DEVELOPMENT

This EIS examines the Federal and non-Federal alternatives for complying with the Endangered Species Act and impacts of the proposed action and other alternatives on all resources of the human and biological environment. Each alternative (including the no-action alternative) provides some level of protection for all species. However, NMFS's abilities to pursue additional protective measures differ markedly between the two action alternatives. Alternative 1 (no-action alternative) is included and evaluated to assess the impacts of compliance with existing license conditions and settlement agreements, for comparison with additional conservation measures associated with Alternatives 2 and 3.

Alternative 2 sets forth changes to project operations and facilities that could be implemented at the project in future relicensing, license reopener proceedings, or amendment proceedings. The measures analyzed in Alternative 2 include the increased use of spill at all three projects. Alternative 2 also includes the construction and operation of a sluiceway bypass system at Rocky Reach Dam to be used with, or instead of, the bypass system currently being constructed. The procedural mechanism for implementing such measures, and for obtaining Endangered Species Act authorization, differs depending on the status of the species. For Endangered Species Act-listed species, Alternative 2 primarily involves the Section 7 process, where FERC consults with NMFS prior to making a decision on proposed modifications of the project structures or operations or other plans that may affect listed species. For unlisted species, this alternative involves the use of NMFS's Federal Power Act authorities to pursue additional protective measures in future relicensing or license reopener procedures or amendment proceedings.

Alternative 3 includes the project operations and mitigation measures described in the proposed HCP applications. Endangered Species Act authorization for implementation of these measures could be accomplished through the Section 10 process for non-Federal applicants (HCP approach). This alternative would provide incidental take permits to Chelan and Douglas County PUDs for the implementation of protective measures (the HCPs) covering both listed and unlisted species (see Section 13.20 of the Rocky Reach, Rock Island and Wells HCPs.

A 50-year time period, based on the 50-year implementation period of the proposed HCPs (see Section 1.1 of the Wells, Rocky Reach, and Rock Island HCPs), is used in this EIS for comparison among the alternatives. Alternative 1 (no-action alternative) represents existing conditions and assumes that the ongoing conservation measures at each project would continue relatively unchanged over the next 50 years. Over the course of this 50-year period, project relicensing and specific reopener clauses in the existing licenses would be used under Alternative 2 to address the ongoing effects of project operations on anadromous salmonids. Under Alternative 3, the terms and conditions of the HCPs would address the effects of project operations on anadromous salmonids over the 50-year time period.

Over this time period, possible changes to the project area include: (1) more species could be listed; (2) spring-run chinook salmon and/or steelhead could be delisted due to the overall success of the protection measures implemented by the PUDs, State and Federal agencies, and private entities, and/or improved total life-history survival conditions; or (3) listed fish populations could continue to decline or remain at or near existing population levels.

2.2 PROJECT DESCRIPTION

2.2.1 PHYSICAL FEATURES

The Wells, Rocky Reach, and Rock Island hydroelectric projects are run-of-the-river projects, which means that they do not store substantial amounts of water in their reservoirs compared to the larger storage projects like the Chief Joseph or Grand Coulee dams upstream. Each project consists of a powerhouse, spillway, and embankments. The reservoir area immediately upstream of each powerhouse and spillway is called the forebay, while the tailrace is on the downstream side of the project. The upper limit of each reservoir encroaches upon the tailrace of the next project upstream (Table 2-1).

2.2.1.1 Wells Dam

Until the early 1990s, the Wells Dam was the only dam in North America designed as a hydrocombine. While traditional dams have separate powerhouse and spillway structures, the Wells hydrocombine integrates the two by placing the spillway openings in unused space between the generators (Figure 2-1). The dam spans 4,460 feet, with the hydrocombine structure comprising 1,130 feet (Table 2-2). Generating facilities consist of 10 Kaplan turbines, with a generating capacity of 840 megawatts. The project has a hydraulic capacity of about 205,000 cubic feet per second (cfs) through the powerhouse.

The original Kaplan turbine units were replaced with minimum gap type Kaplan turbine runners in the early 1990s. As well as being more efficient, these units are designed to reduce cavitation and decrease the gaps between the runner blades and the hub and the runner blades and the discharge ring, which have been identified as potential sources of fish injury or mortality within the turbine environment. As a result, the new units are expected to have increased juvenile fish passage survival through the powerhouse.

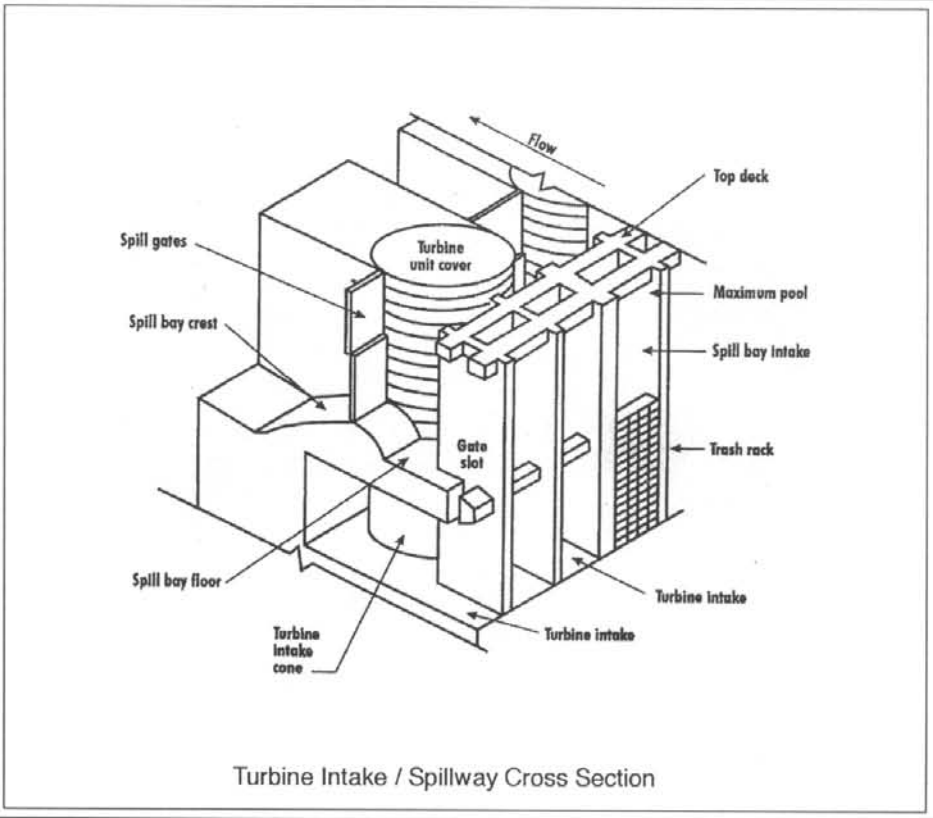
TABLE 2-1. RESERVOIR FEATURES OF THREE MID-COLUMBIA RIVER HYDROPOWER PROJECTS

FEATURE	WELLS	ROCKY REACH	ROCK ISLAND
Reservoir common name	Lake Pateros	Lake Entiat	Rock Island
Owner	Douglas County PUD	Chelan County PUD	Chelan County PUD
Type of operation	Run-of-the-river	Run-of-the-river	Run-of-the-river
Dam location (river mile)	515.8	474.5	453.4
Upper limit of reservoir	Chief Joseph tailrace	Wells tailrace	Rocky Reach tailrace
Length (miles)	30	43	21
Miles of shoreline	100	93	43
Surface area (acres)	9,740	8,235	3,447
Useable storage (thousand acre-feet)	< 98	36.4	< 12.5
Total storage (thousand acre-feet)	331.2	387.5	130.0
Normal full pool elevation (feet)	781	707	613
Normal low pool elevation (feet)	771	703	609
Operating fluctuation (feet)	10	4	4
Maximum pool elevation (feet)	791	710	613
Minimum pool elevation (feet)	767	703	609
Annual median flow (thousand cubic feet per second [kcfs])	109	110.5	115

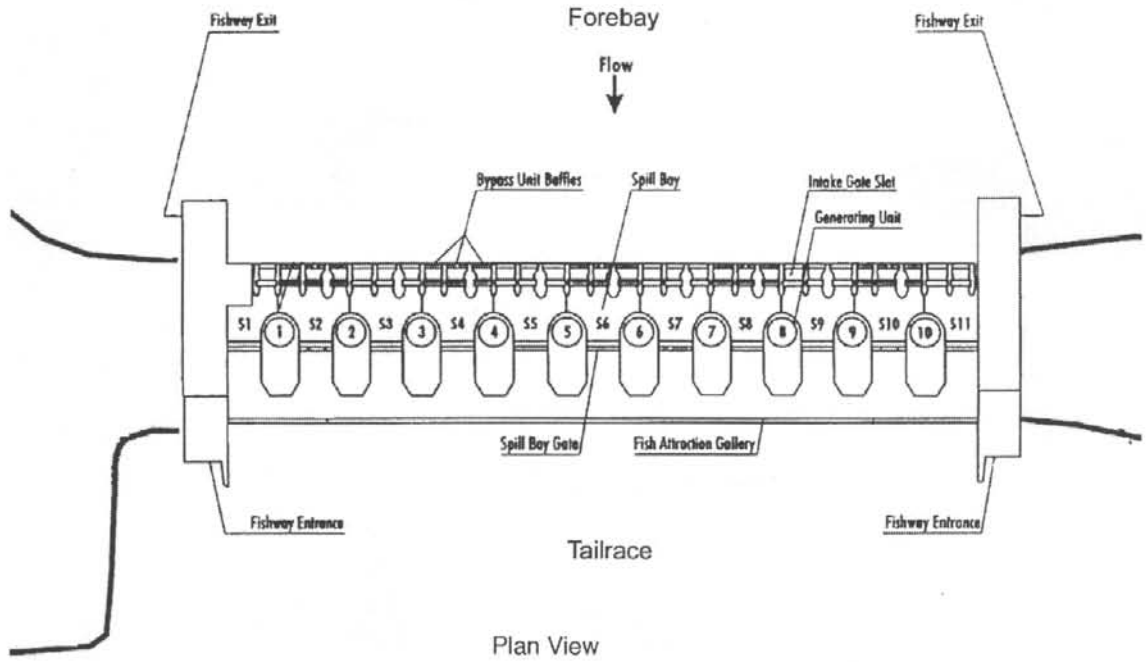
TABLE 2-2. STRUCTURAL FEATURES OF THE THREE MID-COLUMBIA RIVER PUD PROJECTS

FEATURE	WELLS	ROCKY REACH	ROCK ISLAND
Generating Facilities			
Total (peak) generating capacity (megawatts)	840	1,278	624
Dam configuration	Hydrocombine	Conventional	Conventional
Length (feet)			
-Left embankment	1,027	120	590
-Right embankment	2,300	460	-
-Powerhouse 1	1,130	1,088	870
-Powerhouse 2	-	-	470
-Spillway	(see Note 1)	740	1,184
Turbine Quantity	10	11	18
Turbine Type	Kaplan	Kaplan (see Note 2)	Fixed-blade prop. (4) Kaplan (6) Bulb (8)
Spill gate quantity	11	12	31
Spill gate type	Leaf (2 each)	Tainter	Leaf (2 or 3 each gate)
Water depth at spill gate (feet)	75	57	32-57 (see Note 3)
Spillway energy dissipaters	Yes	Yes	No
Sluice gates	2	None	None
Height of sluice freefall (feet)	70	-	-
Fish Passage and Protection Facilities			
Fishladders	2	1	3
Adult collection channel	Yes	Yes	Yes
Adult counting stations	Yes	Yes	Yes
Juvenile bypass facilities	Yes	(see Note 4)	(see Note 5)
Tailrace predator control wiring	Yes	Yes	Yes
Fish Production Facilities			
Associated hatcheries	Wells Methow	Chelan Rocky Reach	Eastbank

Notes:
1. The spillway of Wells' hydrocombine is located vertically above the turbine intakes.
2. Rocky Reach turbines currently in the process of being replaced.
3. Rock Island has a range of spillway crest elevations.
4. Permanent surface collection bypass facility is being installed in 2002.
5. Gatewell orifice and collection channel at Powerhouse 2.



Turbine Intake / Spillway Cross Section



Plan View

Parametrix, Inc. Mid Columbia HCP EIS 553-1543-020/01(09) 9/02 (K)

Figure 2-1
Prominent Features of Wells Dam

The hydrocombine structure contains 11 spill bays. The spillways at Wells are located on top of the turbine intakes and are interspersed between the turbine unit silos. Each spill bay is 46 feet wide and over 70 feet deep. The peak spillway flood capacity at Wells Dam is 1,180,000 cfs. The total hydraulic capacity of Wells Dam is 1,385,000 cfs.

The adult fish passage facilities at Wells Dam consist of identical but mirror-image left and right bank fishway facilities. Each fishway is a conventional pool and weir fishladder.

2.2.1.2 Rocky Reach Dam

The Rocky Reach Dam is a traditional hydroelectric project with separate powerhouse and spillway structures (Figure 2-2). The dam spans 2,460 feet, with the powerhouse comprising 1,088 feet and the spillway comprising 740 feet. There are 11 turbines at Rocky Reach Dam, providing the total nameplate generating capacity of about 1,280 megawatts (encroached) and a total hydraulic capacity of 217,500 cubic feet per second (cfs). Units 1 through 7 are currently vertical shaft Kaplan turbines installed during the original construction in 1962, while fixed-blade propeller turbines were installed at Units 8 through 11 in 1971.

Several of these fixed-blade propeller units have been rehabilitated and replaced with Kaplan turbines, with the rehabilitation of the remaining units expected to be completed in 2003. In addition, all but one of the original Kaplan units have been rehabilitated and replaced with more efficient Kaplan turbines. As well as being more efficient, these units are designed to reduce the gaps between the runner blades and the hub, which have been identified as a potential source of fish injury or mortality within the turbine environment. As a result, these replacement units are expected to increase juvenile fish passage survival through the powerhouse.

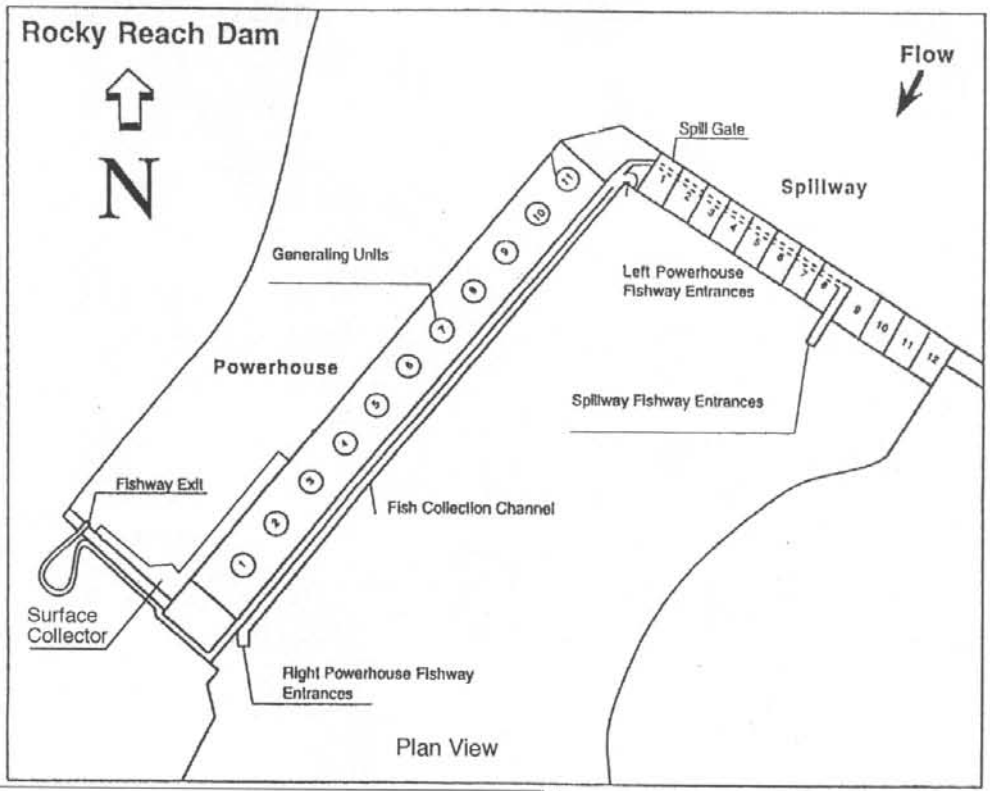
The spillway structure at Rocky Reach Dam contains 12 spill bays. Each spill bay is 50 feet wide. The Rocky Reach Dam is equipped with a single adult fishway system.

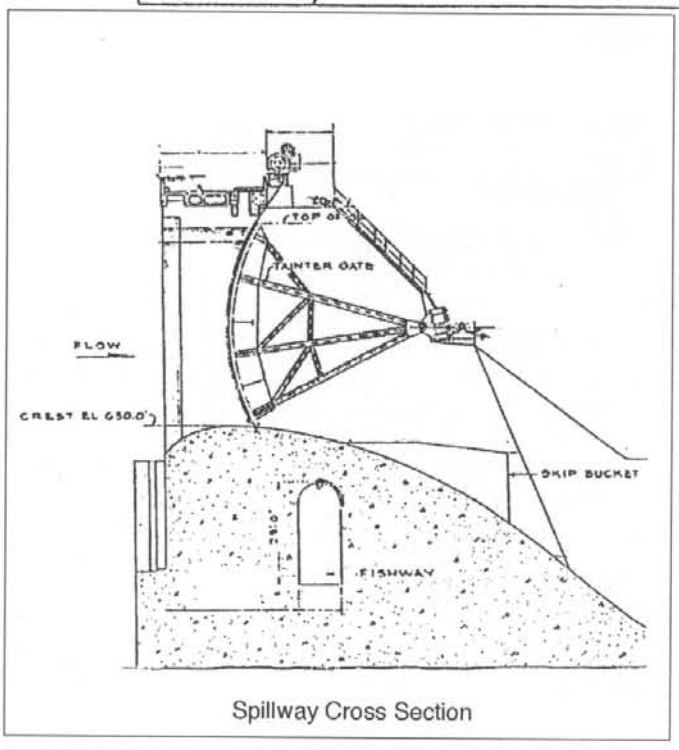
There are four general areas where upstream migrating fish can enter the adult fishway system: at the right end of the powerhouse, at the left end of the powerhouse, at the spillway fishway entrance, and at the powerhouse fish collection channel.

2.2.1.3 Rock Island Dam

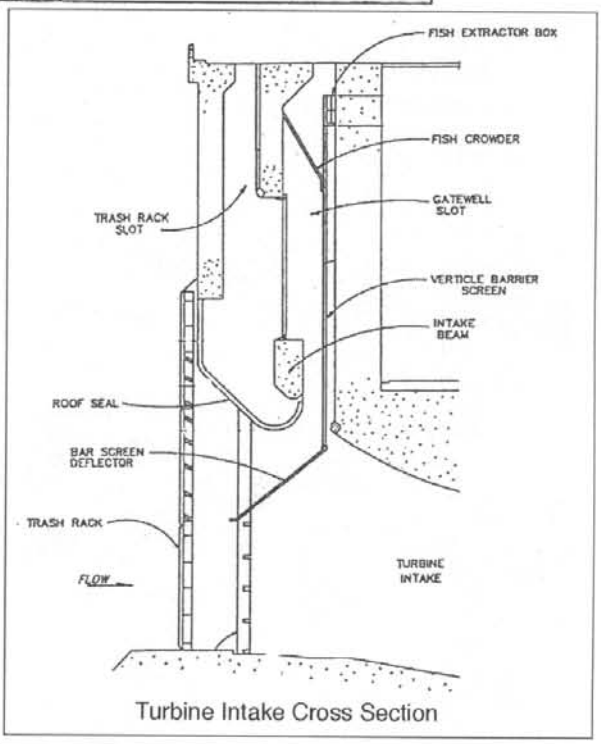
The basic configuration of Rock Island Dam is that of a traditional hydroelectric project with separate powerhouse and spillway structures. However, Rock Island Dam is somewhat atypical in that there are two powerhouses, one each at the left and right banks (Figure 2-3). The dam spans a total of 3,115 feet, with Powerhouse 1 comprising 871 feet, Powerhouse 2 comprising 470 feet, the spillway comprising 1,185 feet, and the left abutment wall comprising 590 feet. The spillways were built to generally follow the existing topography, so spill bays built in deeper sections of the river are taller (deep spill bays), while those in shallower channel section have smaller (shallow) gates (see Figure 2-3).

There are currently 18 turbine units and one station service unit at Rock Island Dam, providing a total nameplate generating capacity of 624 megawatts (encroached) and a total hydraulic capacity of 220,000 cfs. The original construction in the 1930s installed Nagler turbines in Units 1 to 4 of Powerhouse 1. The second class of turbines at Rock Island Dam consists of Kaplan turbines. These units were installed as Units 5 through 10 in Powerhouse 1, coming online during the period from 1952 to 1953. The third class of turbines at Rock Island Dam consists of bulb turbines. Eight bulb turbines were installed as part of the Powerhouse 2 construction project, coming on line in 1979.





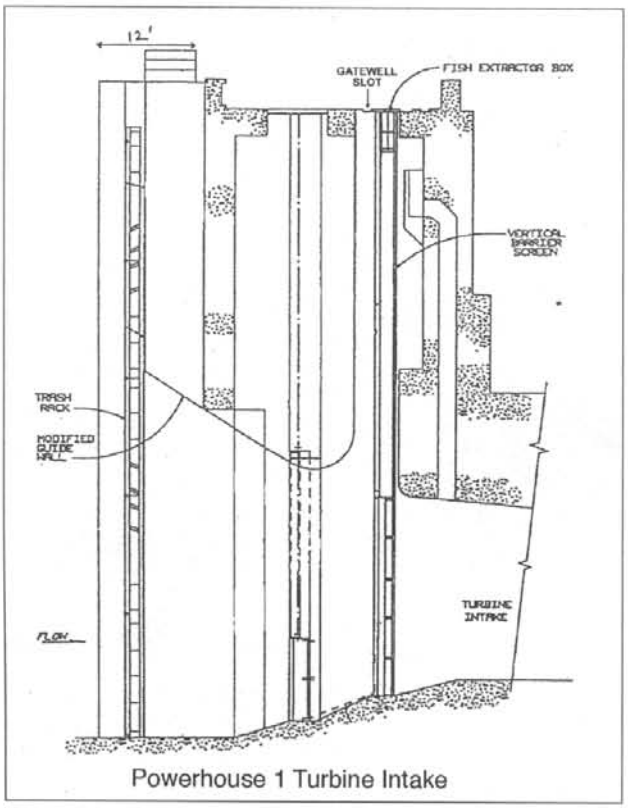
Spillway Cross Section



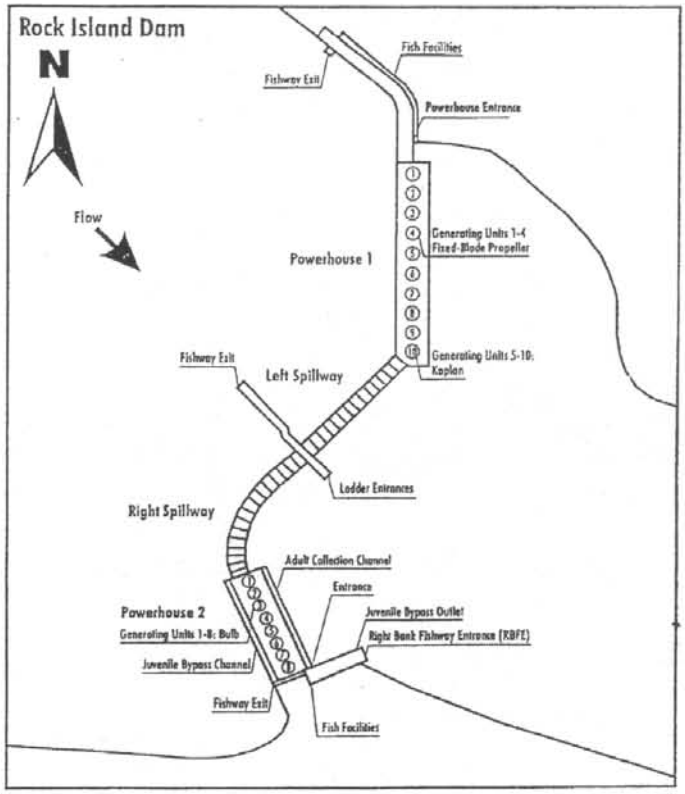
Turbine Intake Cross Section

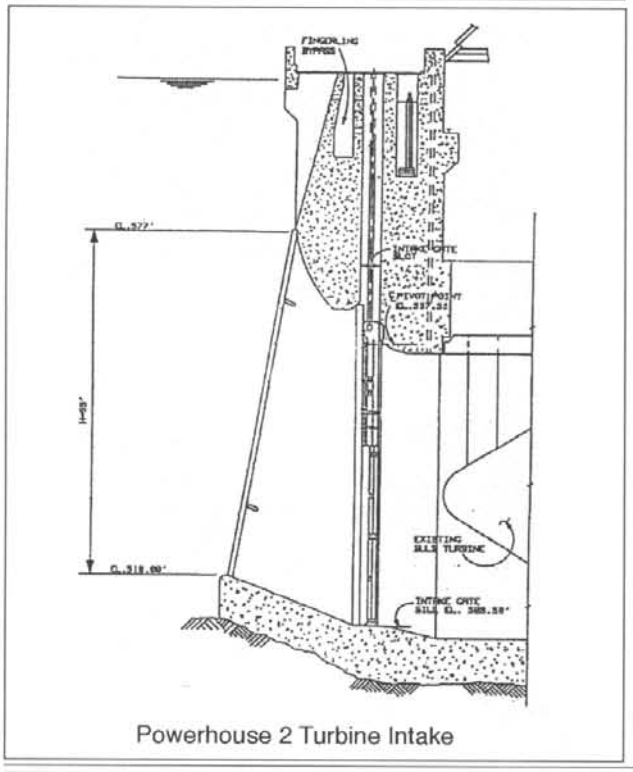
Parametrix, Inc. Mid Columbia HCP EIS 553-1543-020/01(09) 9/02 (K)

Figure 2-2
Prominent Features of Rocky Reach Dam

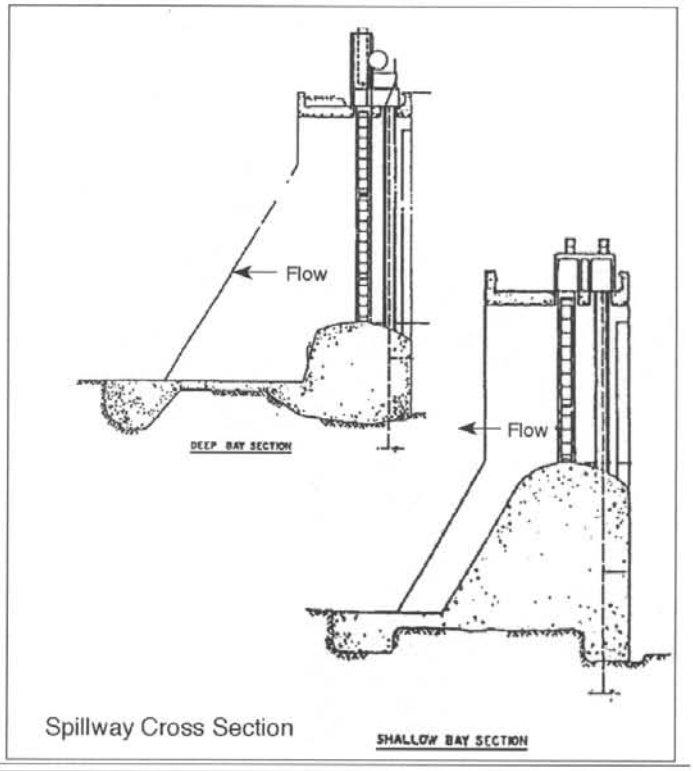


Powerhouse 1 Turbine Intake





Powerhouse 2 Turbine Intake



Spillway Cross Section

Parametrix, Inc. Mid Columbia HCP EIS 553-1543-020/01(09) 9/02 (K)

Figure 2-3
Prominent Features of Rock Island Dam

Upstream passage facilities at Rock Island Dam are composed of three conventional pool and weir fishladders.

2.2.2 DAM AND RESERVOIR OPERATIONS

The three mainstem Mid-Columbia River projects reviewed in this EIS were built to produce power. Collectively, the three dams generate over 14 billion kilowatt-hours annually, or nearly 6 percent of the entire hydropower output in the United States. Operation of these projects, however, must also take into account the diverse interests of a broad spectrum of agencies and river users.

In general, the three dams are operated to meet instantaneous demands for power. The projects produce varying amounts of power throughout a typical 24-hour period, with typical daytime peaks being about 135 percent of the nighttime power production. With lower demands for power, hydropower projects use fewer turbines and discharge less water. When more power is needed, hydropower projects use more turbines and discharge more water.

The number of turbines in use changes the most during the early morning and late evening hours. In most cases, there are more turbines in operation during the day than at night, which means that more water passes the dams during daytime. Since the Mid-Columbia River projects do not store large amounts of water, their ability to generate power depends to a large degree on upstream storage projects. Flow releases from upstream Federal dams (Grande Coulee and Chief Joseph dams) are timed to meet daytime load demands at the downstream dams throughout the day.

The operators of Columbia River hydropower projects coordinate project operations to ensure the best use of the available water and the most efficient generation of power to meet demand. Upstream projects pick up more of the load in the morning, and downstream projects use this pulse of flow to generate electricity in the afternoon and evening. This coordination maximizes generation efficiency at the plants by minimizing reservoir drafting and maintaining efficient "operating heads" for the turbines.

As a general rule, the PUDs operate their turbines at the highest power efficiency possible for a given flow to maximize power generation and revenue for the facility and to maximize the operating life of the turbine units. Operating the units at or near the peak efficiency reduces the turbulence and cavitation of water passing through the unit, resulting in more efficient generation conditions. Reduced turbulence and cavitation improves the flow conditions for fish passing through the turbines, and is expected to result in reduced injury and mortality rates.

Each turbine unit receives approximately the same amount of wear and tear through alternating turbine use. This process is relatively straightforward at Wells Dam, which has 10 turbines of similar type and performance characteristics. Rock Island and Rocky Reach dams use several types of turbines, and the Chelan County PUD decides which turbines to use by considering how much water will be discharged and how efficiently each turbine will meet power demands. Turbine unit priorities may also reflect fish passage needs or other reasons not related to power generation.

Water discharged over spillways, rather than through turbines, is unavailable for power production at that facility. Generally, dam operators prefer to minimize the amount of water they discharge through the spillway. Forced spill is necessary when more water is entering the reservoir than the powerhouses can discharge. Because the dam operators along the Columbia River now coordinate their operations, the amount of forced spill has dropped significantly. When forced spill does occur, it typically is at night when energy demand is lowest, or during a period of high run-off.

At each of the mainstem PUD projects, some or all of the spill gates have dedicated automatic hoists to accommodate sudden storm, flood, or load rejection events in accordance with FERC requirements. The remaining spill gates are opened and closed using gantry cranes that serve more than one spill gate and are used to perform other maintenance duties. It is generally preferred to conduct spill through hoist-equipped gates, so that the gantry cranes remain available for other uses. Ice and floating debris that accumulates in the forebay are usually removed with a crane. In extreme circumstances, floating material can be removed by passing it through sluice gates located at the reservoir surface level. Since the sluice gates at these projects are much smaller than the spill gates, they may also be used during forced spill events when the discharge volumes are small.

2.2.3 HOW THE DAMS AFFECT MIGRATING FISH

The dams on the Columbia River affect migration speed and the timing of both juvenile and adult salmon and steelhead movements. Juveniles can be killed, injured, or disoriented when they pass downstream through dams.

The major juvenile fish passage routes are:

- through a turbine;
- over a spillway or through a sluiceway;
- through a juvenile fish bypass system; or
- through ancillary dam facilities, such as the adult fishway facilities.

Direct or indirect effects to fish can result from any of these project passage routes. Direct effects are a consequence of physical injuries that may be incurred during passage, resulting in immediate or delayed mortality. Indirect effects result from debilitated, disoriented, or stunned fish being exposed to additional sources of mortality, such as predation (Chapman et al. 1994a).

Adults migrating upstream can also be impacted. Although under normal conditions it is likely that few adults are directly killed when they travel upstream past the dams, each dam can potentially delay fish at fishways (fishladders). Delays in fish passage may require fish to expend more energy to pass or increase their exposure to high concentrations of dissolved gases caused by spilling water at the dams. However, adult salmonids typically travel through the reservoirs at a faster rate than through natural river channels. As a result, delays caused by dam passage are likely offset by the faster reservoir travel rates.

The adult salmon and steelhead may also fall back through the dam, resulting in increased delays and potential injury. Additionally, a percentage of adults fail to enter project fishways and pass upstream. Even with the latest fish tagging technologies, in many instances it is still not possible to determine if the failure of fish to pass a project is due to specific problems with the fishladders. This is because some of the tagged fish detected at a project may actually be returning to downstream hatcheries or a natural spawning area.

Over the past several decades, many scientific studies have focused on the effects of the Columbia River system hydropower projects on anadromous fish. Some of the studies have focused specifically on the three Mid-Columbia River projects, while others have focused on the overall system, on other projects, or on particular effects. These studies have helped determine the ways hydropower projects impact fish, and they have shaped the actions needed to reduce impacts. However, the available studies do not always provide definitive assessments of the full range and magnitude of project impacts because different methods, timeframes, and locations were used.

2.2.3.1 Juvenile Passage

Juvenile salmon and steelhead pass the three Mid-Columbia River PUD dams through turbines or

spillways, or through juvenile collection or bypass systems. Juveniles may be killed or harmed by any of these dam passage routes, but the highest levels of mortality typically occur when fish pass through turbines (Whitney et al. 1997). In an effort to increase survival, the project operators use bypass systems and spill during the juvenile migration period.

The three Mid-Columbia River PUD project operators intend that the majority of smolts pass the dams through bypasses or by spill, thereby avoiding passage through turbines. This objective is measured through an assessment of fish passage efficiency, an important indicator of project effects. The proportion of fish passing through spillways and bypasses is an important element in the calculation of dam passage survival for juvenile salmon and steelhead. Current project operations for enhancing juvenile passage are provided in Table 2-3. These are the conditions that define Alternative 1.

TABLE 2-3. SUMMARY OF EXISTING JUVENILE FISH BYPASS SYSTEMS AND SPILL OPERATIONS AT WELLS, ROCKY REACH, AND ROCK ISLAND DAMS (ALTERNATIVE 1)

PROJECT	BYPASS SYSTEM	PERIOD OF OPERATION
Bypass Systems/Operations		
Wells	Surface bypass (baffled spill gates with discharge through controlled spill of up to 11% of total river discharge)	The Wells bypass team determines the timing of bypass operations of the bypass to cover at least 80% of the spring and summer juvenile anadromous fish migration timing. Fyke netting and hydroacoustics are used to help the bypass team make operational decisions regarding use of the bypass system.
Rocky Reach	Turbine screens in two units; prototype surface bypass (discharge through conduit to tailrace	24 hours/day between April and August. Construct a permanent bypass system[1] before the 2003 migration and continue to evaluate and improve the efficiency of the bypass, and provide spill as an interim measure (see below)
Rock Island	Passive gatewell orifice bypass system at Powerhouse 2 (discharges through a conduit to tailrace)	24 hours/day (spill is the primary bypass system used at Rock Island as described below)
Spill Operations		
Wells	See bypass operations (above)	See bypass operations (above)
Rocky Reach	15% of previous daily average flow in spring	30 days during spring migration, plus up to 6 extra days if necessary to encompass 90% of the run of Okanogan River sockeye
	10% of previous daily average flow in summer	Total of 34 days between June 15 and August 15
Rock Island	Spring and summer spill purchased by joint request of the Fisheries Agencies and Tribes from a Fisheries Conservation Account of $2.05 million (1986 dollars adjusted for inflation) at the market price of energy	The Fisheries Agencies and Tribes decide when and how much spill to purchase based on funds available in the Fisheries Conservation Account

[1] The construction and operation of the permanent bypass system has been consulted on by NMFS and authorized by FERC. However, because this system has been developed as a major component of the HCP, the effect of the new bypass structure is analyzed in the HCP alternative (alternative 3) rather than in the no-action alternative.

Juvenile Passage Through Turbines

Juveniles passing through turbines can be killed or injured by mechanical, pressure, or hydraulic-related factors. The turbine blades may strike fish, and fish can be injured passing through gaps between turbine components. Recent advances in turbine design attempt to minimize gaps between

components to reduce the potential injury rates to fish. Fish may be killed by pressure or hydraulic conditions, such as when fish pass through areas of cavitation (vacuums) or hydraulic shear, as well as pressure or velocity changes. It is generally believed that operating turbine units at or near peak power efficiency reduces these potentially injurious hydraulic conditions for fish, although the exact benefits to fish survival are unknown (NMFS 2000d).

Indirect mortality occurs after fish have left the turbine. The principal cause of indirect mortality of juvenile fish is generally believed to be from predation by fish or birds. This most likely occurs in the immediate tailrace area as the juveniles recover from the disorientation and stress of turbine passage (Ledgerwood et al. 1990). Stress may also weaken the resistance to disease and cause subsequent delayed mortality (Ferguson 1994).

There have been many turbine survival studies conducted with juvenile salmon and steelhead at the Snake, Lower Columbia River, and Mid-Columbia River dams. The resulting turbine survival estimates have varied greatly, ranging from 87.7 to 81 percent (Whitney et al. 1997). When survival has been estimated through the recovery of fish immediately after passing through turbines, the survival rates were typically greater than 93 percent (average 94.5 percent). In studies with longer times between turbine passage and recovery, survival levels averaged 89.1 percent (Whitney et al. 1997). This suggests that the higher mortality estimates include delayed mortality and the potential indirect mortality effects of predation on disoriented smolts, as well as direct mortality from turbine passage.

Some recent studies indicate that the highest estimates of direct juvenile survival peak when turbines are operated above 1 percent peak efficiency. Yet others indicate that this operation may result in lower survival estimates. Because of these mixed results, NMFS generally presumes, in the absence of specific data, that the best fish passage conditions occur when turbines are operating within 1 percent of peak efficiency. NMFS passive integrated transponder (PIT)-tag studies of turbine survival over a wide range of turbine operating efficiencies in the Snake River estimated survival at 92.0, 86.5, 92.7, and 93.4 percent in 1993, 1994, 1995, and 1997, respectively (Muir et al. 2001). NMFS's analysis conducted in support of the FCRPS biological opinion indicate that juvenile survival through turbines at Columbia and Snake River main stem hydroelectric projects generally range between 90 and 93 percent.

Wells Dam

The survival estimates developed as a result of the PIT-tag evaluations conducted in 1998, 1999, and 2000 represent the best available information regarding both the direct and indirect effects of the Wells Project on the survival of juvenile Upper Columbia River spring-run chinook salmon and steelhead (Table 2-4). These studies indicate that project survival for yearling chinook is 99.7 percent (1998), and for steelhead studied in 1999 and 2000 survival averaged 94.2 and 94.6 percent, respectively (Bickford et al. 2000a, 2000b, 2001). The three-year average project survival estimate for yearling spring-migrating chinook and steelhead is 96.2 percent.

Approximately 8 percent of the yearling steelhead and spring-run chinook salmon and 4 percent of subyearling chinook salmon outmigrants pass through the turbines at the Wells Dam (Skalski 1993). Based on the information discussed above, the best current estimate of smolt survival for passage through turbines that includes both the direct and indirect components of mortality is 90 to 93 percent. Overall juvenile dam passage survival can be calculated by using this turbine survival estimate and an estimate of spillway survival, along with the proportion of fish that pass the project through these routes. These estimates of dam passage survival do not include indirect and delayed mortality components related to fish passing through the reservoir and the dam.

TABLE 2-4. CURRENT PASSAGE TIMES AND FALLBACK OF ADULT SALMON AND STEELHEAD, AS WELL AS JUVENILE PASSAGE AND SURVIVAL RATES, PASSING THREE MID-COLUMBIA RIVER DAMS[1]

	WELLS	ROCKY REACH	ROCK ISLAND
Adult Passage			
Median Project Passage Time (hours)			
Adult Spring-run Chinook	26.8-28.5	31-37	20-39
Steelhead	12	12.7	4
Summer Chinook	33-47	23-30	15
Fall Chinook	31-46	60	19
Sockeye	5-21	36	17
Fallback (%)			
Adult Spring-run Chinook	3.6	0	2.5
Summer Chinook	5	2-4	2-3
Steelhead	6-7	10.2	7.4
Sockeye	4	14	2-4
Juvenile Dam Passage			
Turbine Passage Rate (%)	4-8	79-88	75-84
Spillway Passage Rate (%)	NA	12-22	17-25
Bypass Passage Rate (%)	92-96	NA[3]	NA
Turbine Survival Rate (%)	90-93	90-93	90-93 (Powerhouse 1) 90-93.5 (Powerhouse 2)
Spillway Survival Rate (%)	98-99	98-99	98-99
Bypass Survival Rate (%)	98-99	97-98	NA
Estimate of Calculated Total Juvenile Dam Passage Survival Rate (%)	96-97	91-94	91-95
Measured Project Survival of Yearling Anadromous Salmonids	94-100	86-97	89-96

[1] Based on the best available data.
[2] NA = Not available.
[3] The bypass that is currently being constructed it is specifically linked to the HCP. Therefore, for comparison purposes the prototype passage results were not included and are therefore not considered as existing conditions.

Sources: Adult Passage: Stuehrenberg et al. 1995; Swan et al. 1994; Alexander et al. 1998; English et al. 1998a, b, 2001
Juvenile Passage: Whitney et al. 1997; Skalski 1993; Bickford et al. 1999, 2000a, 2000b, 2001; Eppard et al. 1998; Stevenson et al. 2000.

Therefore, results from project-specific survival studies represent the best available data.

Rocky Reach Dam

Two studies of direct mortality on juvenile passage through the Kaplan turbines at the Rocky Reach Dam found passage survival to be 94 percent in 1993 (RMC Environmental Services and Skalski 1994), and 95 and 96 percent in 1996 (Normandeau Associates and Skalski 1996). Considering both direct and indirect mortality, turbine survival rates ranging from 90 to 93 percent are also assumed to represent overall turbine passage survival for all species at the Rocky Reach Dam, with peak turbine power efficiency operations. The PUD has begun a multi-year process to install new turbines that are designed to reduce the gap between the blade and runner, which is one cause of direct mortality

from turbines. The new turbines are also more efficient and will allow for greater flexibility in distributing powerhouse load among different turbines.

The survival estimates developed as a result of the passive integrated transponder (PIT)-tag evaluations conducted in 1998, 1999, and 2000 represent the best available information regarding both the direct and indirect effects of the Rocky Reach Hydroelectric Project on the survival of juvenile Upper Columbia River spring-run chinook salmon and steelhead (see Table 2-4). These studies indicate that juvenile spring-run chinook salmon survival was 85.9 percent based on total project survival evaluations conducted on hatchery-reared yearling fall chinook salmon in 1998 (Eppard et al. 1999). The weighted average project passage survival estimates for Upper Columbia River hatchery steelhead in 1999 and 2000 were 95.9 and 96.7 percent, respectively (Bickford et al. 2000a, 2000b, 2001). However, the 1999 and 2000 survival estimates were based on a single release-recapture model, and therefore do not include all of the mortality associated with passage via turbines or the spillway or in the tailrace of Rocky Reach Dam (see discussion in Section 4.2.1.1, Endangered Anadromous Salmonid Species). Thus, survival estimates based on the single release-recapture model are likely biased high compared to estimates made by a paired release survival study.

Rock Island Dam

Rock Island Dam has three different types of generating units. The first powerhouse contains a total of 10 vertical axis turbines that include four Nagler fixed-blade units and six Kaplan-type adjustable blade units. The second powerhouse contains a total of eight horizontal-axis bulb turbines. A study of Rock Island Dam has shown that the bulb and Kaplan turbines have a higher survival rate than the Nagler turbines. Fall chinook salmon passing through the Kaplan units had estimated direct survival rates of 96.1 and 95.7 percent, while fish passing the Nagler units showed a 93.2 percent survival rate (Normandeau Associates and Skalski 1997). However, this estimate does not include indirect and delayed mortality effects. Therefore, as with Wells and Rocky Reach dams, the 90 to 93 percent survival rate that includes both direct and indirect causes of mortality is assumed to represent turbine passage survival for all species at the Rock Island Dam.

The survival estimates developed as a result of the PIT-tag evaluations conducted between 1998 and 2001 represent the best available information regarding both the direct and indirect effects of the Rock Island hydroelectric project on the survival of juvenile chinook salmon and steelhead (see Table 2-4). These studies indicate that juvenile Upper Columbia River spring-run chinook salmon survival is 88.9 percent, based on total project survival evaluations conducted on hatchery-reared yearling fall chinook salmon in 1998 (Eppard et al. 1999), and juvenile Upper Columbia River steelhead survival is 95.8 percent based on total project survival evaluations conducted on hatchery-reared juvenile steelhead in 1999 (Stevenson et al. 2000).

PIT-tag evaluations in 2000 and 2001 using hatchery fall chinook salmon resulted in weighted average project survival estimates of 91.8 percent and 92.2 percent, respectively (Skalski et al. 2000, 2001). Direct juvenile salmonid survival estimates calculated at the spillway and powerhouses, although not conclusive, are consistent with the trends identified in the PIT-tag survival evaluations.

Juvenile Passage Through Bypass Systems

Fish bypass systems can be fairly complex systems that can include turbine intake screens, gatewell orifices, bypass flumes, dewatering screens, sampling facilities (including holding tanks), and bypass outfall conduits. These features vary by project, and all of them affect the survival rate of juvenile salmon and steelhead. Studies of bypass systems at the Snake and

Lower Columbia River projects suggest that mortality of wild steelhead and yearling chinook is generally less than 1 percent (Martinson et al. 1997; Spurgeon et al. 1997; summarized in the 2000 NMFS Federal Columbia River Power System biological opinion [NMFS 2000a]). However, mortality rates vary by species and the size of fish due to factors such as propensity for scale loss and impingement on the screens (NMFS 1995). Therefore, a conservative estimate of mortality (1 to 2 percent) is assumed for the Mid-Columbia River projects.

These figures do not include the level of mortality due to predation at the outfall, which requires further investigation (Ferguson 1994). Predation has been found to increase when outfall sites are poorly located or when juvenile salmon and steelhead are concentrated into a comparatively small volume of water. Juveniles also may be injured in the bypass system and then later succumb to predators.

When most Columbia River system dams were constructed, juvenile fish could pass only over the spillways or through turbines. As the number of mainstem dams on the Columbia and Snake Rivers increased, the cumulative impacts on downstream migrating fish were recognized as a significant fisheries management problem. In the early 1950s, the U.S. Army Corps of Engineers started the Fish Passage Development and Evaluation Program to develop methods of safe juvenile fish passage at the mainstem dams (BPA et al. 1994a). Other entities have cooperated with this program and contributed additional research efforts, including USFWS; NMFS; State, Tribal, and Canadian resource agencies; and many public and private industrial concerns.

Juvenile dam passage is still considered to be the primary cause of salmon and steelhead mortality at hydroelectric projects, and is the primary area in which survival improvements are proposed to occur. The typical bypass system features can be divided into four groups: behavioral barriers, physical barriers, fish-diversion devices, and fish-collection devices.

Behavioral barriers attempt to move fish away from an area of concern by using measures that repel fish but do not physically block them. Examples are electrical screens, air bubbles, lights of various types, and sound barriers. These barriers allow water to pass freely, and avoid the problems of debris accumulation. They do not lower turbine power efficiency, and they do not cause physical injuries to fish. However, there has been limited success with these measures under conditions experienced at large mainstem dams (Stone and Webster 1986).

Physical barriers and diversion devices are the most common bypass measures on the Columbia and Snake River dams. These two measures prevent fish from entering turbine intakes and provide an alternative passage route around the project. To be effective, the system must be designed to allow fish to locate and use the bypass entrance. Although the design parameters for physical barriers are based primarily on the swimming abilities and physical size of the fish, their effectiveness largely depends on fish behavior and conditions at the particular dam, which may vary considerably.

Nearly all physical barriers at mainstem Columbia Basin dams involve a fish screen mechanism. As a result of years of investigative studies and evaluations of full-scale applications, NMFS has developed fish screen criteria to enhance the performance of these facilities (NMFS 1994b). Fish swimming ability is a primary consideration in these criteria. Swimming ability can be estimated according to the species and size of fish, but swimming ability varies according to factors such as the duration of swimming time required, the level of dissolved oxygen, water temperature, light conditions, the physical condition of the fish, and the migrational life stage.

Juvenile screening facilities have been added as a retrofit to turbine intakes at many dams. In many cases, it was not possible to fully screen turbine intakes because of constraints within the existing powerhouse structures, excessive water velocities, and conflicts with intended project operations. Partial screening systems are more common, and they reduce but do not eliminate turbine passage. The fish screens installed at typical projects intercept approximately the upper third of the turbine intake flow (DeHart 1993).

Fish screens for turbines do affect flow conditions, and may result in reduced turbine power efficiency and greater pressure drops across the turbine runners. The presence of fish screens may also move fish to lower portions of the water column. While fish screens should significantly reduce the number of fish passing through turbines, the mortality rate for fish through the turbines may be higher as a result of their altered depth distribution entering the intake (BPA et al. 1994b).

Fish screens can result in substantial mortality or injury to juvenile fish, particularly small fish. Gilbreath et al. (1993) reported a 20 percent direct and indirect mortality of subyearling chinook at the Bonneville Dam second powerhouse screen bypass system. However, subsequent evaluations of the modified system showed mortality rates of 2 percent or less for steelhead and yearling and subyearling fish (Gilbreath and Prentice 1999). Screen bypass systems have also been shown to result in high descaling rates for sockeye and impingement rates for lamprey.

The fish screen barriers at the projects divert fish into gatewells located above the turbine intakes. The gatewells were originally designed for turbine operation and maintenance, but many have been modified for juvenile bypass. The most common approach is to install orifices that lead to a collection channel inside the dam. The orifices provide a route for the bypassed fish to volitionally exit the gatewell to reach the collection channel and bypass route. The collection channel runs the length of the powerhouse, then changes to either a pipeline or open flume that carries fish to the release site below the project.

NMFS has developed bypass facility criteria with the objective of expediting fish passage with minimal injury (NMFS 1994b). Criteria cover aspects of the bypass layout, entrance conditions, conduit design, and outfall conditions. While some of these criteria are based upon the swimming ability of the juvenile fish, others are concerned with juvenile behavioral responses to hydraulic conditions at the barrier and through the bypass facilities. Hydraulic conditions vary considerably from site to site and also change in response to seasonal flows. As a result, the design of bypass facilities is not a generic process and is very much dependent on the collection of site-specific hydraulic and biological data.

Additional research efforts are focusing on surface collector bypass systems owing largely to the success of the Wells Dam bypass system completed in 1989. Since juvenile anadromous fish tend to migrate in the upper portion of a reservoir, surface collector systems attempt to provide attraction flow higher in the water column than the attraction flow being created by the turbines. The Wells Dam system includes vertical baffle slots to create attraction flow into the spillway bypass, while other prototype systems are examining shallow skimmer weirs and orifices similar to the sluiceways at the Ice Harbor and The Dalles dams (BPA et al. 1994b).

Wells Dam

Hydroacoustic studies conducted from 1990 through 1992 at the Wells Dam estimated that 92 percent of the spring migrants, which include both steelhead and spring-run chinook salmon, were guided through the juvenile bypass system (Skalski 1993). These estimates have been supported by similar information collected during concurrent fyke net evaluations (Bickford 1997). A juvenile chinook balloon-tag study that was conducted in 1993 concluded that there was no

measurable direct injury or mortality through the bypass system (RMC Environmental Services 1993). Although this study did not measure the effects of predation in the tailrace, bypassed fish are not concentrated at one location (as in the case of a typical bypass outfall), and the spillway flow only falls an average of 5 feet before becoming mixed back into the turbine discharge. These attributes may reduce the effects of predation in the tailrace. Therefore, the total direct and indirect mortality is likely less than the 2 percent found at the Lower Snake River project screen bypass and collection systems (NMFS 1998a).

The PUD operates the bypass system to provide passage for at least 80 percent of the juvenile spring and summer migrants to pass the Wells Dam. In 1999, the bypass was operated during 98.2 percent of the migration period (Wells Coordinating Committee, unpublished data). The Wells Coordinating Committee bypass team determines the operation dates for the Wells bypass system by utilizing monitoring information from hydroacoustic transducers installed in the forebay of the Wells Dam.

Rocky Reach Dam

A prototype juvenile bypass system was constructed at Rocky Reach Dam in 1994. Modifications and subsequent evaluations of the prototype bypass have been ongoing. Passage efficiency tests indicate that 26 to 39 percent of radio-tagged yearling chinook salmon and 47 to 57 percent of radio-tagged steelhead pass the project through the bypass (English et al. 1998a, 1999, 2000; Lady et al. 2000). Similar results were estimated using PIT-tagged fish, with 22 to 51 percent of yearling chinook salmon and 27 to 61 percent of steelhead passing through the bypass in 1998 through 2000 (Mosey et al. 1999, 2000). The bypass efficiency for sockeye salmon and subyearling chinook tended to be lower, at 27 to 39 percent and 7 to 29 percent, respectively, for PIT-tagged fish (Mosey et al. 1999, 2000; Murphy et al. 2001).

The prototype bypass system has been removed and a new bypass is currently being constructed at Rocky Reach Dam. The new bypass system includes surface collection entrances and intake guidance screens in turbine units 1 and 2. With improved hydraulic conditions at the intake screens, and with a properly sited bypass outfall, survival through the new Rocky Reach bypass system is expected to equal or exceed the 98 percent survival rate estimated for bypass systems at the Lower Snake River dams. Because the juvenile bypass system is considered a major component of the HCP it is not assumed to be an integral part of existing conditions (Alternative 1). The evaluation of the bypass system and additional measures that can be implemented if the system does not achieve HCP survival standards are addressed in Alternative 3. Therefore, the bypass system is evaluated in Alternative 3 rather than Alternative 1 (no-action).

In addition to the juvenile bypass system currently being constructed at the project, Chelan County PUD has investigated the potential for installing a sluiceway at the downstream end of the forebay cul-de-sac. Various configurations of the sluiceway concept have been modeled by Chelan County PUD during their evaluation of fish bypass options at the project. Although the juvenile bypass system was selected over the sluiceway as the preferred option as part of the HCP, the sluiceway concept is one option analyzed under Alternative 2.

Rock Island Dam

Powerhouse 2 is equipped with a passive bypass system (no intake screens for guidance) that allows fish to voluntarily enter turbine unit gatewells and exit via bypass orifices to a collection channel that leads to a fish sorting collection raceway or tailrace. The annual passage of juvenile spring-run chinook salmon through this system has ranged from 8,500 to 33,500 from 1985 to 1996 (Fish Passage Center, Annual Reports 1985 – 1996). Although the percentage of the total population is small, this

facility provides useful monitoring information about downstream juvenile migrants. Currently, Powerhouse 1 has no juvenile fish bypass system. Various turbine intake screens have been investigated at Rock Island in the late 1980s and early 1990s. The Rock Island Coordinating Committee decided not to pursue screened bypasses based on feasibility evaluations, and opted to use spill as the primary means of increasing non-turbine fish passage.

Juvenile Passage Through Spill

Fish passage spill occurs only during the juvenile migration season, generally from April through August. Spring spill (April through June) targets spring migrants (stream-type chinook, sockeye, and steelhead), and summer spill (July through August) targets ocean-type chinook juveniles (Columbia Basin Fish and Wildlife Authority 1995). Spill passage reduces the number of juveniles that pass through the turbines and is an easy and flexible system to implement. However, juveniles passing over the spillway face several risks. First, although rare at the spillway, the juveniles can sustain physical injuries, such as descaling, that may incapacitate or even kill them. Second, increasing spill may result in higher total dissolved gas levels downstream, which in turn, may cause gas bubble disease and reduce the survival rates of juvenile and adult anadromous salmonids. Juveniles that become injured or disoriented while passing over the spillway are also more susceptible to predation.

Based on past studies, juveniles that pass through spill most likely have mortality rates that range from 0 to 2 percent (Anderson et al. 1993). However, local conditions, such as back eddies or other factors, may favor predators and cause higher rates of mortality (Whitney et al. 1997). Relative to other means of passage currently available, spillways are considered the most benign routes for juveniles to pass the Mid-Columbia River projects (Chapman et al. 1994a,b).

Wells Dam

Five of eleven spill bays at the Wells Dam have been modified to function as a juvenile bypass system. This system uses baffles to increase water velocities that attract surface-oriented fish, which are then bypassed through the spillway (see previous section: Juvenile Passage Through Bypass Systems – Wells Dam).

Rocky Reach Dam

According to the Fourth Revised Interim Stipulation Agreement for Rocky Reach Dam, Chelan County PUD provides up to 30 days of spill during the spring outmigrations, at a spill level of 15 percent of the daily average river flow over a 24-hour period, with an additional 6 days of spill if necessary to encompass 90 percent of the Okanogan River sockeye run. Chelan County PUD also provides 34 days of spill during the summer migration period (June 15 to August 15). The spill level during this period is set at 10 percent of the daily average river flow.

Pursuant to the staggered effective date of the HCPs, Chelan County PUD has also voluntarily modified its spill program to benefit other Plan species. Chelan County PUD provides a spill level equivalent to 15 percent of the daily estimated flow during a period coinciding with 95 percent of the spring-run chinook salmon and steelhead spring outmigration season (typically April 20 to June 15). This also includes a 15 percent spill level during the summer migration period of subyearling chinook salmon (typically July 1 to August 15). Spill will be increased to 25 percent of the daily flow during the period coinciding with the peak of the spring outmigration of juvenile Okanogan River sockeye salmon (up to 21 days). However, if the HCP is not approved, the spill program would likely revert to the spill program implemented prior to 2002.

Studies at the dam have shown that between 8 and 19 percent of the spring migrating smolts pass through the spillway at the 15 percent spill level, resulting in spill effectiveness of between

0.5:1 and 1.2:1 (Steig et al. 1997; Chelan County PUD 2000). The estimated spill effectiveness for sockeye, coho, and subyearling chinook salmon ranged between 0.2:1 and 1.5:1 in 1997 and 1998 (Chelan County PUD 2000 unpublished data).

Only one survival evaluation has been conducted at the Rocky Reach spillway. Juvenile coded-wire tagged coho salmon, released at one spill bay in 1980, resulted in an estimated 99 percent survival (Heinle and Olsen 1980).

Rock Island Dam

Spill is the preferred juvenile bypass measure at Rock Island Dam, but its use is limited due to total dissolved gas production.

As outlined in the Rock Island Settlement Agreement, spill at Rock Island Dam was conducted through a Fisheries Conservation Fund, which allowed the fishery regulatory agencies to request spill at their discretion up to a limit of $2,050,000 (1986 dollars and increased for inflation) in lost energy revenue per year. Beginning in 2000, however, spill volumes between 21 and 41 kcfs were voluntarily provided, with the exact levels determined from the results of fish survival studies conducted in 2000 and 2001. In addition, similar to the operations at Rocky Reach Dam, the Chelan County PUD has agreed to implement HCP spill provisions in 2002 with the expectation that the HCP will be approved. As a result, the current spill program provides an equivalent of 20 percent of the daily estimated flow during the period encompassing 95 percent of the spring and summer juvenile migration periods (typically April 15 to June 15 and July 1 to August 15, respectively). If the HCP is not approved, the spill program could revert to the spill program implemented prior to 2000.

The PUD has modified several existing spill gates to allow for more surface-oriented spill and increased fish passage efficiency. During the 1998 spring migration, the Chelan County PUD spilled approximately 25 percent of the total daily river flow and passed about 27 percent of the yearling chinook and 26 percent of juvenile steelhead (Iverson and Birmingham 1998). These estimates are similar to estimates provided by radio-tag evaluations in 1999 and 2000, when about 30 percent of radio-tagged steelhead and 25 percent of radio-tagged chinook salmon passed the project through the spillway (Lady et al. 2000; Skalski et al. 2000).

The total direct survival through the modified bays was estimated at 96.4 percent, compared to a 98.4 percent survival through a standard bay (Normandeau Associates and Skalski 1998). However, the study also concluded that the reduced survival rate for the modified bay was the result of the shallow stilling basin at that location.

A subsequent study indicated that survival rates through modified bays with deeper stilling basins may be near 100 percent, although this has not been verified for all river flow and spillway operational conditions (Normandeau Associates 1999). Lady et al. (2000) also estimated spillway survival at about 100 percent for radio-tagged steelhead. However, a conservative estimate of 98 percent average is the assumed direct survival rate for fish passing through spill at Rock Island Dam for all species, which is consistent with the estimates for other spillways in the Columbia River Basin.

2.2.3.2 Adult Passage

Adult salmon and steelhead pass upstream through the Mid-Columbia River PUD dams via fishways that were typically installed during the original construction of the projects. The fishways consist of an entrance gallery and ladder, a diffuser system that provides additional water at the ladder entrances to attract upstream-migrating adult fish, and a flow control section that maintains ladder flow over varying forebay elevations. Migrating adults can be delayed as they search for fishway entrances, although delays are also likely to occur at the entrances and in the collection galleries. The operation of adult

fishladder traps (such as at Bonneville, Priest Rapids, and Wells dams) can result in additional delays. The delay and stress that adults experience during passage through multiple dams may reduce their spawning success. For example, those adults destined for the Methow River must pass through four Federal dams and five PUD dams before reaching their spawning grounds.

Observed total passage times for adult chinook and sockeye salmon have ranged between 5 and 47 hours at Wells Dam, between 23 and 37 hours at Rocky Reach Dam, and between 15 and 39 hours at Rock Island Dam (see Table 2-4). Passage time for adult steelhead ranged between 4 and 26 hours at the three projects.

Under certain conditions, adult salmon and steelhead may also travel back downstream over a dam. Downstream passage can occur over spillways or through fishladders, turbine units, or juvenile bypass systems. Downstream passage or "fallback" can be either involuntary or voluntary. Voluntary fallback typically occurs when adults have unintentionally passed a specific tributary or hatchery and are moving back downstream in search of these natal areas. In addition, post-spawning steelhead (kelts) pass downstream to return to the ocean. Involuntary fallback occurs when adults are inadvertently entrained in flows through these passage routes, and must reascend the ladder before continuing their migrations to reach their natural spawning grounds or hatchery.

Studies in the Lower Columbia and Snake Rivers have found that direct adult mortality in the fishways is likely small under normal passage conditions. However, adults that fall back over the dam can suffer injury or mortality. Studies of mortality rates for fish that fallback through hydroelectric projects have ranged substantially, from lows of 3 and 5 percent at Bonneville Dam to nearly 25 percent at the Lower Granite Dam. In general, mortality rates tend to be higher for fish falling back through the turbines than through spillways or juvenile bypass facilities (NMFS 2000a).

Studies of the Mid-Columbia River projects have estimated fallback rates similar to those observed at other Columbia River Basin projects, although these studies have not estimated mortality rates due to fallback (see Table 2-4). Fallback rates at the Mid-Columbia River dams (Wells, Rocky Reach, and Rock Island dams) have ranged between 0 and 21 percent for chinook salmon (Stuehrenberg et al. 1994; English et al. 1998a and 2001; and Alexander et al. 1998).

In two separate studies, steelhead fallback estimates (which are different from the downstream migration rates of post-spawning steelhead [kelts]) at Wells Dam ranged between 6 and 7 percent. Alexander et al. (1998) reported that one of 16 radio-tagged steelhead (6.3 percent) detected upstream of Wells fell back through the project. These fish did not reascend the project fishways, and many of them were eventually located in the Wells Fish Hatchery outfall, suggesting a substantial voluntary fallback rate. Similarly, English et al. (2001) reported that 11 of 162 fish (6.8 percent) fell back in 1999. Of these fish, five fish (45 percent) reascended the project ladders.

Estimated steelhead fallback rates at Rock Island and Rocky Reach dams were 3 and 5 percent, respectively, in 1998 (English et al. 1998a), and 7 and 10 percent, respectively, in 1999 (English et al. 2001). Eight of the 22 steelhead (36 percent) that fell back at Rock Island Dam in 1999 reascended the fishladders, while only two of 21 steelhead fallbacks (10 percent) at Rocky Reach Dam reascended the project. Sockeye fallback rates in 1997 were 3.5 percent at Wells Dam (English et al. 1998b), 14 percent at Rocky Reach, and 3.5 percent at Rock Island (English et al. 1998a).

Survival rates of adult salmon and steelhead passing through the Mid-Columbia River have not been estimated due to the inability to differentiate tag loss, tag failure, and fish loss. It is not presently possible to measure adult survival with existing technology. Although radio-

telemetry studies provide information on adult passage and apparent spawning distribution, uncertainties associated with the technology, and the inability to determine the ultimate fate or spawning success of radio-tagged fish, result in insufficient data to accurately estimate survival. In addition to the uncertainties related to the survival estimates developed through radio-telemetry data, it is not possible to differentiate natural mortality from project-related mortality.

English et al. (2001) reported that 81 percent of radio-tagged adult steelhead were tracked to known Mid-Columbia River spawning areas, while the other 19 percent were last tracked in the Columbia River mainstem and various hatchery outfall sites (Wells, Eastbank, and Ringold Springs). Despite the uncertainties associated with radio-telemetry data, such studies can provide estimates of minimum adult survival. The estimated survival rates of Upper Columbia River steelhead and spring-run chinook salmon migrating through the Lower Columbia River dams (from Bonneville to McNary dams) averaged 96.8 and 97.6 percent per project, respectively (NMFS 2000a). However, because of the uncertainties described above, these are minimum estimates of survival.

Recent evidence suggests a substantial number of adult steelhead kelts migrate downstream through the Mid-Columbia River. The overall estimate of radio-tagged adult steelhead outmigrating as kelts in the Mid-Columbia River ranged from 34 to 69 percent (English et al. 2001). The wide range in the estimate was primarily due to uncertainties in the data because juvenile fish with some of the same radio-tag codes were released during the kelting period.

2.2.3.3 Fishladders and Other Passage Protection Facilities

Each of the three dams has at least one fishladder for adult salmon and steelhead to pass upstream. Wells has two fishladders, Rocky Reach has one, and Rock Island has three. These ladders are typically along the banks of the river, although one of Rock Island's ladders is in the center of the dam. The ladders operate continuously, except for brief maintenance periods in winter. The ladders operate under criteria approved by relevant fisheries agencies.

Rocky Reach and Rock Island dams have adult collection channels along the downstream length of the powerhouse. Each of the fishladders at Wells has a separate collection gallery located on either side of the hydrocombine powerhouse. The channels use attraction flows to redirect fish toward the fishladders. All the dams have stations for counting adult fish passage. Adult traps are located within both fishladders at Wells Dam. These traps are used for collection of broodstock and for stock assessment purposes.

Adult Reservoir Passage

Once adult fish migrate upstream past a dam successfully, they must swim through a reach of river that has changed substantially from its historic, free-flowing conditions. The reservoirs have reduced water velocity and increased holding area compared to natural river conditions. These changes could benefit migrating adults by decreasing travel times and adult energy consumption. Hydroelectric and water storage projects have altered the thermal regime of the Mid-Columbia River. Compared to pre-project conditions, the thermal inertia of these projects has resulted in lower maximum summer temperatures, higher minimum winter temperatures, cooler spring temperatures (delayed warming), and warmer fall temperatures (delayed cooling). For some species, these changes may lead to higher pre-spawning mortality. Relative to the large storage projects, run-of-the-river projects (such as the three PUD projects) have limited capacity to affect water temperature because of their relatively short retention times (only a few days) (BPA et al. 1994a). Thus, the Mid-Columbia River projects do not appear to significantly affect water temperatures.

Decreased water velocity in reservoirs does appear to facilitate more rapid upstream migration of adult salmon and steelhead. Prior to dam construction, chinook salmon migrated upstream in the Snake River at rates of 12 to 14 miles per day (Bjornn and Peery 1992). Adult spring/summer chinook migration rates through the free-flowing river sections of the Snake River, upstream of Lower Granite Dam, range from 6 to 19 miles per day, while steelhead migration rates are typically less than 7 miles per day (NMFS 2002a). Steelhead migrated upstream in the unimpounded Lower Columbia River at rates of 7 to 11 miles per day (Chapman et al. 1994a), and sockeye migrated at rates of 17 miles per day (Bjornn and Peery 1992) (Table 2-5).

Spring/summer chinook migration rates through the Snake River reservoirs in 1991 to 1993 ranged from 31 to 65 km/day (Bjornn 1998). The median migration rate for steelhead through the Snake River reservoirs in 1993 was 30 km/day while migration rates through the free flowing sections of the river were generally less than 11 km/day (Bjornn 1998). Bjornn et al. (1999) estimated that the median migration times for spring/summer chinook and steelhead passing through the four Snake River dams and reservoirs was the same or less than without dams present.

Migration rates for these species in the Rock Island and Rocky Reach reservoirs in 1997 ranged from 14 to 58 miles per day (English et al. 1998b, 2001). These data suggest that adult salmon and steelhead that successfully pass through Columbia River reservoirs have decreased travel times when compared to unimpounded systems. When considering passage through the reservoirs and dams, adult anadromous salmonids appear to be capable of migrating at similar rates to fish migrating through unimpounded river sections. English et al. (2001) reported that the median travel speed for steelhead adults migrating from the Priest Rapids Dam tailrace to the upstream fishladder exit at Wells Dam was 13 miles per day, which is within the range of the estimated pre-impoundment travel speeds.

Juvenile Reservoir Passage

Reservoir impoundments can create increased rearing area and provide overwintering habitat for juvenile anadromous salmonids. The slower water velocities can also affect the outmigration of anadromous salmonid juveniles by causing extended travel times and decreased survival rates. The use of the term "extended travel times" refers to slower rates of travel by outmigrating juvenile anadromous salmonids. The extended travel time, low water velocities, and increased water temperatures in the reservoirs, compared to the unimpounded river, results in greater energy expenditures by juvenile migrating fish.

Extended travel times due to passage through reservoirs also increase potential exposure of juvenile outmigrants to predatory fish and reduces migration survival (BPA at al. 1994c). Delays in fish reaching the estuary are also suspected of affecting the survival of juveniles during their smoltification and acclimation to salt water. However, limited estuary survival data is available to determine the extent that arrival time influences survival.

Survival estimates for yearling chinook and steelhead through the Rocky Reach Project ranged between 96 and 97 percent (Eppard et al. 1999; Bickford et al. 2001). However, these estimates were derived from single release-recapture methods that do not include all the potential sources of mortality at the dam but does include all of the mortality experienced from passing through the Rocky Reach reservoir and part of the mortality from passing through Rocky Reach Dam.

2.2.3.4 Fish Production

Hatchery Facilities

The Chelan and Douglas County PUDs own six main hatchery facilities that produce fish as mitigation for project impacts (Table 2-6). Through agreements, five of these facilities are operated by WDFW, and the sixth facility (the experimental Cassimer Bar sockeye hatchery), was operated by the Colville Tribe. However, this facility was relatively unsuccessful and was phased out in favor of a flow management program in the upper Okanogan River Basin to improve the production of naturally spawning sockeye salmon. Each year, the PUDs interact frequently with the operators on issues such as mitigation, compliance, funding, facility maintenance, and special projects.

The Douglas County PUD operation of the Wells Hatchery has previously received a Section 10 permit (#1094, issued to WDFW on February 4, 1998). NMFS has also completed a biological opinion on that permit, although this permit expires in May 2003. A subsequent permit (#1395) will be issued in late 2002. The Methow Fish Hatchery spring-run chinook program was considered in the review of Section 10 permit #1196 to WDFW, and NMFS has completed a biological opinion for that permit (NMFS 2002c).

The Chelan County PUD operations of the Turtle Rock and Chelan Falls hatchery facilities have also previously received a Section 10 permit (#1094 to WDFW, as discussed above). A spring-run chinook salmon program at the Eastbank and Chiwawa facilities was considered in a review of Section 10 permit #1196 to WDFW, and NMFS has completed a biological opinion for that permit (NMFS 2002c).

Reservoir and Tributary Production

The majority of the mainstem spawning habitat for anadromous salmonids in the Mid-Columbia River reach was inundated by the formation of the five PUD reservoirs between Priest Rapids Dam (river mile 397.1) and Chief Joseph Dam (river mile 545.1). The total surface area of the Columbia River between Priest Rapids and Chief Joseph dams doubled from 23,000 acres to 46,000 acres following inundation by the dams (Mullan et al. 1986). Since upstream passage facilities were not provided when the Chief Joseph Dam was constructed, this dam is currently the upstream extent of mainstem anadromous salmonid production.

Current natural anadromous salmonid spawning in the mainstem Mid-Columbia River is limited primarily to the free-flowing Hanford Reach downstream of Priest Rapids Dam, the tailrace of Wells Dam, and to the major tributaries including the Wenatchee, Chelan, Entiat, Methow, and Okanogan River systems. Mainstem spawning also occurs in tailrace areas where streambed hydraulics and substrate conditions are favorable (Carlson and Dell 1989, 1990, 1991, 1992; Dauble et al. 1994; Chapman et al. 1994b). Reservoir production concerns and issues are related to a reduction in fish habitat for spawning and juvenile rearing life-history stages, as well as aquatic productivity and predation (Mullan 1986; Rondorf and Gray 1987). A more detailed description of existing spawning and rearing habitat is provided in Section 3.2, Fisheries Resources.

2.2.3.5 Fish Transportation on the Mid-Columbia River

None of the Mid-Columbia River mainstem projects have navigation locks. Consequently, the transportation of fish potentially collected at the three projects would have to rely on trucking. New systems would need to be developed to collect and transfer fish around each dam or into transportation facilities.

TABLE 2-5. ADULT SALMONID MIGRATION RATES THROUGH IMPOUNDED AND UNIMPOUNDED WATERS OF THE LOWER COLUMBIA, MID-COLUMBIA, AND SNAKE RIVERS (MILES/DAY)

	UNIMPOUNDED		IMPOUNDED		
	SNAKE RIVER	COLUMBIA RIVER	SNAKE RIVER	COLUMBIA RIVER	MID-COLUMBIA RIVER
Chinook	6-19		19-40	15	36
Steelhead	7	7-11	19		13-22
Sockeye	11	17		15	25

Source: Bjornn et al. 1995; Bjornn and Peery 1992; Chapman et al. 1994a,b; Stuehrenberg et al. 1995; Swan et al. 1994; English et al. 1998b; NMFS 2002a; English et al. 2001.

TABLE 2-6. FISH PRODUCTION FACILITIES OWNED BY THREE MID-COLUMBIA RIVER PUDS

FACILITY / SATELLITE	OWNER	OPERATOR	COMPENSATION OBJECTIVE	YEAR CONSTRUCTED	PRODUCTION FACILITIES					TOTAL VOLUME (CF)	WATER SUPPLY (CFS)	
					ADULT HOLDING	INCUBATION	RACEWAYS	PONDS	NET PENS		SURFACE WATER	GROUND WATER
Chelan Hatchery	CCPUD/ WDFW	WDFW	Original Rocky Reach pool inundation and current project mortality	1965	yes	yes	yes	no	no	71,500	0	8
Eastbank Hatchery	CCPUD	WDFW	Original Rock Island pool inundation and current project mortality	1989	yes	yes	yes	yes	no		0	53
Carlton Pond				1989	no	no	no	yes	no	53,400	15	0
Chiwawa Pond				1989	no	no	no	yes	no	150,000	21	0
Dryden Pond				1989	no	no	no	no	no		30	0
Lake Wenatchee Net Pens				1989	yes	no	no	no	yes	59,200	N/A	0
Similkameen Pond				1989	no	no	no	yes	no	92,400	21	0
Methow Hatchery	DCPUD	WDFW	Assumed Wells project mortality for spring-run chinook, sockeye, and summer chinook	1992	yes	yes	yes	yes	no	62,500	18	10
Chewuch Pond				1992	yes	no	no	yes	no	25,000	6	0
Twisp Pond				1992	yes	no	no	yes	no	25,000	6	0
Methow Pond				1992	yes	no	no	yes	no	25,000	6	0
Rocky Reach Hatchery	CCPUD	WDFW	Original Rocky Reach pool inundation and current project mortality	1969	no	yes	yes	no	no	29,000	0	6
Turtle Rock Pond				1974-1984	no	no	no	yes	no	176,200	44	0
Wells Hatchery	DCPUD	WDFW	Original Wells pool inundation and assumed project mortality	1967	yes	yes	yes	yes	no	991,636	171.8	19.8

CCPUD = Chelan County PUD DCPUD = Douglas County PUD

2.2.4 OTHER KNOWN HYDROPOWER EFFECTS

2.2.4.1 Water Quality

Total dissolved gas supersaturation is a condition that occurs in water when atmospheric gases are forced into solution at pressures that exceed the pressure of the over-lying atmosphere. Water containing more than 100 percent total dissolved gas is in a supersaturated condition. Water may become supersaturated through natural or dam-related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River results from spilling water at the Mid-Columbia River projects and at upstream and downstream projects. Fish and other aquatic organisms that are exposed to excessive total dissolved gas supersaturation can develop gas bubble disease, which, in extreme cases, can be fatal to anadromous salmonids and other aquatic organisms.

The occurrence of total dissolved gas supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel 1970; U.S. Army Corps of Engineers 1993; Gray and Haynes 1977). Total dissolved gas supersaturation in the Columbia and Snake Rivers was identified in the 1960s and 1970s as a detriment to salmon and steelhead, and those concerns have reappeared as management agencies have reinstituted spill as a means of aiding fish passage around hydropower facilities (NMFS 1995).

Total dissolved gas supersaturation occurs in the Columbia River during periods of high run-off and spill at hydropower facilities, primarily because spill in deep tailraces can cause significant entrainment of gases. Water passed through turbines does not increase gas saturation to any appreciable degree (BPA et al. 1994a). The majority of the variation in total dissolved gas measured just downstream of spillways is explained by the amount of spill. The second most influential variable is spillway plunge depth as indicated by tailrace elevation and stilling basin depth (BPA et al. 1994a). Total dissolved gas supersaturation varies substantially by season and by dam.

In addition to depth and pressure, gas supersaturation can be affected by water temperature. As water temperature increases, the amount of dissolved gas that can be held in solution decreases, resulting in greater relative percentages of dissolved gas levels. The consideration of temperature effects is important in the Columbia River, where water temperatures vary daily and seasonally during salmon and steelhead migrations, and where temperature regimes have been altered by hydropower projects (Beiningen and Ebel 1970).

Within the Mid-Columbia River, Douglas County PUD has modified the spillways at Wells Dam into an effective and efficient juvenile fish bypass system. This system minimizes the amount of spill needed to efficiently pass juvenile fish at the project, thereby minimizing the effect on total dissolved gas. The spillway at Rocky Reach Dam has been shown to cause only slight increases in total dissolved gas under most conditions and may reduce gas levels under certain conditions (Parametrix 2000a). In addition, the construction of the juvenile fish bypass facility at Rocky Reach will minimize the amount of spill needed to effectively pass fish at the project. Spillway modifications at Rock Island Dam are aimed at increasing the efficiency of the spillway at passing juvenile fish to minimize the spill requirements there. More information on total dissolved gas and other water quality effects on fish is provided in Section 3.3.2, Water Quality.

2.2.4.2 Water Temperature

The thermal regime of the Mid-Columbia River is influenced by releases at Grand Coulee Dam and other upstream storage dams. Run-of-the-river projects, such as the three PUD projects, may have limited capacity to affect water temperature

because they have short retention times (only a few days) (BPA et al. 1994a). For example, temperature evaluations conducted in Rocky Reach reservoir in 2001 suggest that the project appears to influence some warming in July and August and some cooling in September and October. These differences were estimated to be on the order of 0.9° and 0.7° F (0.5° C and 0.4° C), respectively (Parametrix and Thomas R. Payne & Associates 2002). Thus, the Mid-Columbia River projects do affect water temperatures at times. The effect of these changes on anadromous salmonids is equivocal, but likely small.

High water temperature is a key water quality issue for the region, particularly during low-flow conditions. High water temperature can pose a significant problem for salmon and steelhead. Warmer water can increase the incidence of disease; increase the energy demands of migrating fish; alter the timing of adult and juvenile migrations; change incubation, hatching and maturation times; and affect gas supersaturation (BPA et al. 1994a; Chapman et al. 1994b, 1995a; Dauble and Mueller 1993). In addition, given sufficient magnitude and duration of exposure, high water temperatures can be lethal to fish.

Water temperatures exceeding 66° to 70° F (19° to 21° C) have been shown to cause delays in migrating adult anadromous salmonids (Dauble and Mueller 1993). Within the Mid-Columbia River region, no delay of migration has been observed on the mainstem, but warm water flowing out of the Okanogan, Methow and Wenatchee Rivers has caused fish to remain in the mainstem until temperatures decreased (Alexander et al. 1998). Spawning fish have limited energy reserves, and any delay in migration may reduce those energy reserves to the point where the fish may not be able to spawn successfully (BPA et al. 1994a). High temperatures not only reduce energy reserves by extending the period of migration but also by increasing the metabolic rate of the fish.

Lethal water temperatures for juvenile spring-run chinook and sockeye salmon are 77° and 76° F (25.1° C and 24.4° C), respectively (Brett 1952). Adult anadromous salmonids are generally less tolerant of high water temperatures. When exposed to temperatures of 70° F (21° C) or more for greater than 7 days, 50 percent of adult salmon and steelhead populations experience mortality (Dauble and Mueller 1993). Nevertheless, mortality of fish may not be observed even when recorded temperatures exceed known lethal thresholds because fish may avoid high temperatures by ceasing migration or seeking out areas of cooler water (e.g., areas of in-channel groundwater upwelling).

Water temperatures at levels that may not directly kill anadromous salmonids may cause indirect stress-related mortality (Dauble and Mueller 1993). In addition, the rate of pre-spawning mortality can be increased by warm temperatures in combination with other stresses, such as disease through pathogenic agents and total dissolved gas (Dauble and Mueller 1993). Refer to Section 3.3.2.1, Project Area, for more information on stream temperatures.

2.2.4.3 Predation

Construction of hydropower facilities on the Mid-Columbia River has created impoundments with habitat more conducive to predators compared to the pre-impounded free-flowing river. Changes in physical habitat, water quality, and downstream passage conditions have combined to increase the abundance of predators and the risk of juvenile outmigrant mortality due to predation (Mullan et al. 1986; Chapman et al. 1994b).

Dams present an obstacle to the downstream migration of juvenile anadromous salmonids, often causing them to concentrate in forebays before finding a route past the dam. Concentrations of juvenile anadromous salmonids provide a ready food supply for predators that congregate at such sites (Beamesderfer and Rieman 1991). Passage through turbines,

spillways, or bypass facilities may stun, disorient, or injure some juvenile anadromous salmonids, making them less capable of escaping predators.

Sediment that formerly would have been suspended during high spring flows settles out in upstream impoundments, resulting in reduced turbidity in the Mid-Columbia River. Clearer water makes juvenile outmigrants potentially more visible and more susceptible to predation (Reid et al. 1988).

The deep, low-velocity habitat created by impoundments is preferred by northern pikeminnow, the major native predator fish of juvenile anadromous salmonids. Two game fish species, walleye *(Stizostedion vitreum)* and smallmouth bass *(Micropterus dolomieuri)*, were introduced into the Columbia River system in the 1940s to 1950s to provide sport fishing opportunities (Henderson and Foster 1956; Zook 1983). These piscivorous game fish have become established in the Mid-Columbia River reservoirs, and prey on juvenile anadromous salmonids.

In addition to piscivorous fish species, juvenile salmonids are also susceptible to predation by avian predators. High concentrations of avian predators have been observed in the project vicinities during juvenile outmigration periods. Ruggerone (1986) estimated that avian predators consumed an estimated 2 percent of all juvenile salmonids passing Wanapum Dam and may be higher for certain species. Similar estimates are likely for the other Mid-Columbia River projects.

Dams and reservoirs in the Columbia River Basin generally increase the availability of microhabitats preferred by these predator species. As a result of project operations or geometry, juvenile salmonids may also be concentrated into specific areas of the forebay or tailrace, where predator species are also typically found in higher concentrations. Thus, dams are thought to generally increase the susceptibility of juvenile salmonids to predators and the incidence of predation compared to historic levels (NMFS 2000d).

Chelan and Douglas County PUDs have developed predator control programs at each of their projects to minimize the predation risks to juvenile salmon and steelhead. Each project has instituted programs to catch and remove predator northern pikeminnow from areas adjacent to the projects. These are typically hook-and-line fishing programs in the forebay and tailrace areas of the projects. Through 2002, over 52,000 northern pikeminnow were removed from the Wells Project area (Bickford 2002 personal communication). Between 1994 and 2002, nearly 51,000 northern pikeminnow were removed from the Rocky Reach Project area, and between 1995 and 2002, nearly 36,500 northern pikeminnow were removed from the Rock Island Project area (West 2002 personal communication). Through several unique programs (e.g., fishing derbies, long-line fisheries) implemented since 1996, approximately an additional 30,000 northern pikeminnow were removed from the Rock Island and Rocky Reach Project areas (West 2002 personal communication).

Bird predation is also minimized by several activities funded by the PUDs. Avian predator deterrent wires have been installed across portions of the tailraces to reduce piscivorous bird access to these areas, where juvenile fish are highly susceptible to predation. In addition, propane cannons and other pyrotechnic methods have been used to haze gulls and other piscivorous birds further downstream of the projects. As is deemed necessary, lethal shooting of individual birds is also employed. The intent of such shooting is to enhance the efficiency of the propane cannons and pyrotechnics by training birds to anticipate injury when they hear explosions. Birds that learn to fly beneath the avian predator deterrent wires, at certain projects, are shot. These protective measures are similar to programs used throughout the Lower Columbia and Snake Rivers, and effective at reducing predation in the immediate project areas.

2.3 ALTERNATIVES CONSIDERED IN DETAIL

2.3.1 INTRODUCTION

The alternatives developed for this EIS include the practicable project conservation measures that could be implemented to improve fish passage conditions at the three Mid-Columbia River hydroelectric projects. These measures are based on the purpose and need of the proposed action, which is to help protect and recover anadromous salmonids while allowing the PUDs to continue to generate power to meet the Pacific Northwest power demands. However, the PUDs ability to generate power varies considerably between the alternatives considered in this EIS (see figures F-10, F-11, and F-12, in Appendix F).

2.3.1.1 Species Considered

The intent of the conservation measures described within the three alternatives presented in this EIS are for the protection and recovery of anadromous fish species (including endangered spring-run chinook, summer/fall chinook, sockeye, and coho salmon, and endangered steelhead) at the three hydroelectric projects.

2.3.1.2 Timeline

For comparative purposes, the timeline considered under this EIS for all three alternatives is 50 years—the term of the HCP applications for Wells, Rocky Reach, and Rock Island projects. Alternative 1 (no-action alternative) represents existing conditions and assumes that the ongoing conservation measures at each project will continue relatively unchanged over the next 50 years. Alternative 2 includes conservation measures that could be implemented over the next 50 years given the best scientific information available today concerning the expected relative benefit of each measure and resulting likelihood of implementation.

Specific goals, tools, and costs associated with Alternative 2 are the most difficult to project because no specific programs have been established. Those conservation measures that have proven to be ineffective in protecting and recovering anadromous fish at the three project sites considered in this EIS are not included in Alternative 2, but are described as alternatives considered but eliminated from detailed evaluation (Section 2.5, Alternatives Considered But Eliminated from Detailed Study). Alternative 3 provides goals, tools, and costs to implement the passage survival requirements over the 50-year term of the HCPs.

2.3.1.3 Location of Conservation Measures

Conservation measures for Alternatives 1 and 2 would occur at the project sites. Existing licenses typically require either facility improvements to increase the survival of fish passing through a project or mitigation in the form of hatchery production. Under Alternative 3, the PUDs have voluntarily offered to aid in the recovery of anadromous fish species by contributing to off-site habitat improvements in the Mid-Columbia River area, including the four tributaries: Wenatchee, Entiat, Okanogan, and Methow Rivers. Alternatives 1 and 2 are based on federal regulatory laws, which do not mandate off-site conservation measures and therefore do not include tributary habitat improvements.

2.3.1.4 Direction, Guidance, and Coordination

Direction for anadromous fish species protection is through FERC licenses, license amendments, and compliance with the Endangered Species Act. Under Alternative 1, evaluation programs for fishery conservation measures and procedures are conducted through coordinating committees for

the Wells, Rocky Reach, and Rock Island projects. These committees provide for coordination among the PUDs, their power purchasers, and the Joint Fisheries Parties. Decisions made by the coordinating committees are by consensus. While it is unclear whether measures adopted under Alternative 2 would include the use of the existing coordinating committees, the EIS evaluation assumes that a coordinating committee similar to that described for Alternative 1 would be established. The coordinating committees under Alternatives 3 have unique members, procedures, and monitoring and evaluation requirements (see Section 6 of the Wells HCP and Section 4 of the Rocky Reach and Rock Island HCPs). In addition, Alternative 3 would have tributary and hatchery committees for each project. More detailed committee information for Alternative 3 is provided in Section 2.3.4, Alternative 3 (Proposed Action-Project HCPS).

2.3.2 ALTERNATIVE 1 (NO-ACTION)

Alternative 1 represents baseline conditions, which include the FERC licenses and amendments that govern current operations. These licenses cover all aspects of dam operation, as well as environmental resource protection. Under Alternative 1, analyses in this EIS review how the licenses and the applicable amendments affect the environmental resources within the project area.

Provided below are the protection measures associated with Alternative 1 that are pertinent to anadromous fish for direct comparison to Alternatives 2 and 3. The effects of these fish prescriptive measures on other environmental resources, (including resident fish), are described in Chapter 4 of this EIS.

2.3.2.1 Wells Hydroelectric Project

The original FERC license stipulated that two adult fishladders would be constructed at the Wells Project (adjacent to each embankment), as well as a low bucket spillway design that was approved by the State of Washington Department of Fisheries and Game (FERC 1962a). A subsequent amendment to the license stipulated a general requirement to provide mitigation for project construction, alteration, and operations, and to comply with reasonable requests to modify project structures and operations in the interest of fish and wildlife (FERC 1962b). Project structure revisions were approved in 1970 to comply with fishery agency requirements regarding fishladder design and operation (FERC 1970). FERC (1982) amended the license to raise the forebay elevation by 2 feet.

In 1990, the Douglas County PUD, the Wells Project power purchasers, resource agencies, and Tribes entered into a long-term fisheries settlement agreement regarding the Wells Project (FERC 1991). The 1990 Wells Settlement Agreement established the requirements for the Douglas County PUD to fund, operate, maintain, and evaluate three anadromous fish-related programs through at least March 1, 2004. These programs consist of: (1) juvenile downstream migrant fish passage measures, (2) adult passage measures, and (3) hatchery-based compensation measures for fish loss. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfill Douglas County PUD's obligation to protect anadromous fish and mitigate and compensate for the effects of the Wells Project on anadromous fish. The agreement also stipulates evaluation programs for fishery measures and establishes procedures for coordination among the PUD, its power purchasers, and the Joint Fisheries Parties through the Wells Coordinating Committee.

Section 7 consultation, pursuant to the provisions of the Endangered Species Act, has been completed for the interim protection plan involving the operation of the Wells Project (NMFS 2000b), although this coverage expired as of April 1, 2002. However, Douglas County PUD continues to operate the project in

accordance with the 2000 biological opinion in anticipation that its HCP will be approved. Because these provisions have not formally been incorporated into the existing FERC license, they are not considered part of Alternative 1.

Juvenile Fish Passage

The juvenile fish passage program called for the installation and evaluation of a juvenile bypass system to route juvenile anadromous salmonids away from the turbine units. The established program uses controlled spill through modified spill bays to provide an effective non-turbine passage route through the project. The agreement includes specific operation, performance, and evaluation standards, as well as procedural guidelines for modifying the operational components of the system if necessary to meet the performance standards. The performance standards are set to provide fish passage efficiency (the percentage of fish bypassing the project through non-turbine routes divided by the total population of fish passing the project). The established fish passage efficiency standards are at least 80 percent during the juvenile spring migration period and at least 70 percent during the juvenile summer migration period.

Adult Fish Passage

The 1990 Wells Settlement Agreement called for evaluations of adult passage delay and mortality at the project beginning in 1991. If the evaluations identified delays or mortality, the agreement specified that operational modifications would be used to alleviate the problems. If those modifications could not correct the problems, the adult fishways would be modified.

Hatchery-Based Compensation

Under the 1990 Wells Settlement Agreement, the PUD agreed to fund a hatchery program to mitigate for fish passage losses at the Wells Dam. The agreement identifies specific production levels for the anadromous fish species affected by the project that are in addition to the existing mitigation program at Wells Dam. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile losses at the dam. However, production levels based on impacts of project inundation would not be altered. The agreement also establishes specific operational standards for the fish production facilities.

Measures Planned

The existing fish mitigation and compensation measures for the Wells Dam were developed through the 1990 Wells Settlement Agreement and subsequent agreements within the Wells Coordinating Committee. A summary of measures expected to either continue or be implemented under Alternative 1 are:

1. Adult Passage

    a. Continue operation and maintenance of the existing adult fishways.

    b. Investigate entrance and ladder modifications that may be necessary to improve ladder operations and minimize fish passage delay.

    c. Conduct appropriate evaluations to determine the best actions for correcting any significant delay.

    d. Develop solutions and implement corrective actions where adult passage problems are identified. Specifically, improve the efficiency of the existing fishways by maximizing the number of adult migrants that enter the facilities.

2. Juvenile Passage

    a. Surface Bypass Operation – Operate at least one spillway bypass, throughout 80

percent of the peak spring and summer juvenile downstream migrations, respectively.

b. Avian Predator Control – As defined in the Cooperative Service Agreement between Douglas County PUD and the USDA Animal and Plant Health Inspection Service, this program is expected to continue at the Wells Dam and Wells Hatchery. Although it is a voluntary program, it is relatively inexpensive to conduct and effective at increasing juvenile fish survival through the project.

c. Gas Abatement – Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of fish. At all other times, the criterion is 110 percent of saturation.

3. Hatchery Program

a. Continue to provide funding and hatchery capabilities to rear and release up to 49,200 pounds of spring-run chinook, 32,000 pounds of yearling summer chinook, 24,200 pounds of subyearling summer chinook, and 80,000 pounds of yearling steelhead, according to provisions in the settlement agreement. Sockeye production has been phased out because it has not lead to a substantial increase in adult returns. Approximately 15,000 pounds of spring-run chinook salmon would be substituted for the sockeye salmon production until 2005. After 2005, sockeye mitigation will be facilitated through the implementation of a set of flow management options that would increase the natural production of sockeye salmon in the Upper Okanogan River Basin.

b. Under the settlement agreement, hatchery production for unavoidable losses could be reduced if survival studies indicate that fish passage mortality is less than the assumed 14 percent, which was the basis for the current mitigation level. Project survival studies indicate that for yearling spring-run chinook and steelhead, actual project survival averages 96.2 percent. As a result, hatchery compensation would be reduced under Alternative 1 from the existing 14 percent to about 3.8 percent.

4. Monitoring and Evaluation

a. Juvenile Run Timing – Utilize hydroacoustic and fyke net monitoring data to determine the timing of bypass system operations.

b. Survival – Develop and utilize the best techniques to estimate the survival of juvenile salmon and steelhead passing the project. Techniques may include the use of mark recapture methodologies.

c. Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Although this is a voluntary program, it is a program that is expected to continue given recent court rulings related to compliance with the Clean Water Act.

d. Fish Counting – Provide adult fish counts on a 24-hour basis.

2.3.2.2 Rocky Reach Hydroelectric Project

The existing fishery protection measures undertaken by the Chelan County PUD for the Rocky Reach Dam are the result of mitigation

and compensation requirements in the original project license and subsequent amendments (FERC 1953, 1957a,b, 1968), as well as interim stipulations executed in the Mid-Columbia Proceedings (Docket No. E-9569 [FERC 1987b]). The interim stipulations were temporary agreements between the Chelan County PUD and the Joint Fisheries Parties with respect to juvenile fish passage measures and hatchery compensation levels to mitigate for impacts resulting from project operations.

The first interim stipulation identified compensation and operational requirements that would be in effect from July 1, 1987 through August 31, 1988. Subsequently, the stipulation was extended and revised several times (FERC 1995, 1996a). The latest revision (Fourth Revised Interim Stipulation) was negotiated to include the period September 1, 1995 through December 31, 1997 (FERC 1996a). Although there is no current agreement for Rocky Reach, Chelan County PUD has continued to operate the project in coordination with the Mid-Columbia Coordinating Committee, as it has under the previous stipulations.

The Rocky Reach Dam has Section 7 Endangered Species Act coverage until 2006 through the biological opinion (NMFS 2002a) that was developed by NMFS in consultation with FERC for the construction and continued evaluation of the permanent juvenile fish bypass system.

Although the bypass option is a component of the Rocky Reach HCP, it was independently evaluated as part of a license amendment proceeding and was approved irrespective of future FERC actions on the HCP. Moreover, since construction of the permanent bypass system is not complete, the timing of its construction relates to the HCP, and represents a departure from the no-action condition. The bypass is therefore evaluated in this EIS as an HCP conservation measure under Alternative 3 (see Section 5.3.1 of the Rocky Reach HCP).

Juvenile Fish Passage

The main goal of the Fourth Revised Interim Stipulation was to develop a safe (less than 2 percent mortality) juvenile bypass system capable of bypassing 80 percent of the juvenile salmon and steelhead over 90 percent of the migration period. This agreement led to the development of a prototype surface bypass system that was installed at Rocky Reach Dam in the fall of 1994. Since that time, the bypass system has been modified based on the results of hydraulic modeling and fish passage evaluations. During development of the surface bypass system, the Fourth Revised Interim Stipulation provided a protection plan for juvenile migrants through the use of spill.

The prototype juvenile bypass system will be removed in the fall of 2002 and replaced with a permanent structure. Pile-driving activities required to construct the permanent bypass structure in the forebay have already begun. Completion of the permanent bypass system is expected to occur by the 2003 spring outmigration period. The regulatory approval to install the system was based on an environmental assessment and biological opinion. Since the bypass was approved, it is included under all the alternatives, but for reasons previously noted, it is evaluated under Alternative 3.

Chelan County PUD initiated a fish predator reduction program at Rocky Reach Dam in 1994, concentrating primarily on the removal of northern pikeminnow. Pikeminnow are the most significant predator fish in the Columbia River, and ongoing removal programs also occur throughout the lower river.

Between 1994 and 2002, nearly 51,000 northern pikeminnow have been removed from the Rocky Reach Project area (West 2002 personal communication). This program is implemented through the use of anglers, either hired directly or through the USDA Animal and Plant Health Inspection Service. Two additional fisheries

predator removal programs were also conducted in 1996 and 1999. The PUDs partially funded fishing derbies, which removed 13,935 northern pikeminnow. Chelan County PUD also funded a long-line test fishery in the fall of 1999 that removed an additional 6,496 northern pikeminnow. That program continued in 2002.

These predator removal programs appear to be altering the population structure of pikeminnow in the project area. The number of pikeminnow ascending the project ladders has declined over the years, and the catch rates have also declined. These results are consistent with the results of the predator removal programs in the Lower Columbia River (Friesen and Ward 1999).

Avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service, are expected to continue at the Rocky Reach Dam.

Adult Fish Passage

Under Alternative 1, Chelan County PUD would maintain and operate adult passage systems at the project according to the Detailed Fishway Operating Procedure criteria, or superior criteria developed through the use of specific study results of fish passage. The PUD would also operate the spill and turbine units in a manner that optimizes adult passage, while meeting requirements for juvenile passage. Adult and kelt steelhead fallback rates and kelt protection would be evaluated when implementing juvenile bypass options.

Hatchery-Based Compensation

Through the terms of the Fourth Revised Interim Stipulation, Chelan County PUD provides funding and hatchery capacity to compensate for anadromous fish production losses resulting from the initial inundation of the project. As with other portions of the stipulation, Chelan County PUD is expected to continue providing the same level of compensation under Alternative 1.

Measures Planned

Although the interim stipulation is expired, Chelan County PUD has continued implementation of the associated programs through the Mid-Columbia Coordinating Committee. In addition, NMFS has issued a biological opinion for the operation of the project and the construction of the juvenile bypass system (NMFS 2002a). This biological opinion provides specific measures for the protection of spring-run chinook salmon and steelhead, which were included in the license by amendment. The fish protection measures consistent with the Fourth Revised Interim Stipulation and the biological opinion (NMFS 2002a) include:

1. Passage

    a. Continue operation and maintenance of the adult fishways.

    b. Operate the powerhouse units within 1 percent of peak efficiency for a given head and power output, to the extent possible, and favor units 1 and 2 during the spring juvenile outmigration period.

    c. Construct a permanent juvenile bypass facility capable of bypassing 80 percent of the juvenile migrating salmon and steelhead over 90 percent of the migration period.

2. Gas Abatement

    a. Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of

fish. At all other times, the criterion is 110 percent of saturation.

3. Predator Control

    a. Continue to refine and implement a northern pikeminnow removal program.

    b. Continue avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service at the Rocky Reach Dam.

4. Hatchery Program

    a. Continue to provide funding and hatchery facilities adequate to rear and release up to 54,400 pounds of fall chinook and 30,000 pounds of steelhead annually.

5. Spill Program

    a. Spill during the spring migration at a level equal to 15 percent of the daily average flow for 36 days, plus a potential additional 6 days spill at this level to provide additional protection for Okanogan River sockeye. During the summer, spill at a level equal to 10 percent of the daily average flow for a total of 34 days between June 15 and August 15 (see Table 2-3).

    b. As indicated in the Juvenile Fish Passage section, the spill program at the project is currently being implemented in accordance with the HCP provisions and the biological opinion (NMFS 2002a). If the HCP is not approved, the spill program is expected to follow the guidelines of the Fourth Revised Interim Stipulation for non-listed fish species until the project license expires in 2006. The spill program for the listed species would follow the guidelines in the 2002 biological opinion through 2006. Because these spill measures are considered an integral component of the HCP, for the purpose of comparison, they are analyzed under Alternative 3 (see Section 5.4.1c of the Rocky Reach HCP).

6. Monitoring and Evaluation

    a. Survival – Develop and utilize the best techniques to estimate the survival of juvenile salmon and steelhead passing the project. Techniques may include the use of radio- or acoustic-tags or tag release and recapture methodologies.

    b. Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult anadromous salmonids.

    c. Fish Counting – Provide adult fish counts on a 24-hour basis.

    d. Steelhead Kelt Losses – Assess the feasibility to study steelhead kelt losses through the project.

2.3.2.3 Rock Island Hydroelectric Project

The original FERC license for the Rock Island Dam was issued in 1930, and construction was completed in 1933. In 1987, the Chelan County PUD, Puget Sound Energy (formerly Puget Sound Power & Light), resource agencies, and Tribes entered into a long-term fisheries Settlement Agreement for the Rock Island Hydroelectric Project (FERC 1987a). The provisions in the Rock Island Settlement Agreement were included in the new license for the project in 1989 (FERC 1989a). The Rock Island Settlement Agreement was amended in 1993 to replace the requirement to conduct an

adult fish mortality study with the requirement to conduct an adult fish passage study (FERC 1993a).

The 1987 Rock Island Settlement Agreement established the requirements for the PUD to fund, operate, maintain, and evaluate three anadromous fish-related programs. These programs consist of: (1) juvenile fish passage measures, (2) adult fish passage measures, and (3) hatchery-based compensation measures.

Juvenile Fish Passage

The Rock Island Settlement Agreement called for a bypass development program to study, design, develop, test, and install a mechanical juvenile fish bypass system at the project. The performance standards targeted for the bypass system included achieving at least 80 percent fish passage efficiency during the spring migration period and at least 70 percent fish passage efficiency during the summer migration period. Subsequent efforts to develop an adequate mechanical solution to the juvenile bypass issue were unsuccessful. The PUD is currently evaluating modifications at the spillway to increase the rate of non-turbine passage at the project and utilizing a conservation account to provide spill.

As an alternative to juvenile bypass system development, the agreement established and the Rock Island Coordinating Committee chose to implement a Fisheries Conservation Account. This account (with an annual funding level of $2.05 million in 1986 dollars, which is currently assessed at $3.2 million) could be used by the fishery agencies and the Tribes to purchase spill as a means to increase the non-turbine passage of juvenile fish at the project.

Chelan County PUD initiated a northern pikeminnow reduction program at Rock Island Dam in 1995, similar to the program described above for Rocky Reach Dam. Between 1995 and 2002, nearly 36,500 northern pikeminnow have been removed from the Rock Island Project area (West 2002 personal communication). As at the Rocky Reach Project, the number of pikeminnow ascending the project ladders and the fishery catch rates have declined since the start of the program.

Avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service, are expected to continue at the Rock Island Dam.

Adult Fish Passage

The Rock Island Settlement Agreement called for modifications to the adult fishladders at Rock Island Dam to meet fishery agency operating standards, as well as a comprehensive hydraulic evaluation of the right bank ladder to ensure that the design flows were met. Under Alternative 1, Chelan County PUD would maintain and operate adult passage systems at the project according to the Detailed Fishway Operating Procedure criteria, or superior criteria developed through the use of specific study results of fish passage. The PUD would also operate the spill and turbine units in a manner that optimizes adult passage, while meeting requirements for juvenile passage. The PUD would evaluate adult and kelt steelhead fallback rates and kelt protection when implementing juvenile bypass or spillway modification options.

Hatchery-Based Compensation

Under the Rock Island Settlement Agreement, the PUD agreed to construct, maintain, and fund a hatchery program to mitigate for fish passage losses at the Rock Island Dam. The agreement identifies the specific construction standards, production levels, and evaluation procedures to be implemented. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile and adult losses at the project, although production levels intended to

compensate for project inundation would not be altered. The agreement establishes specific operational standards for the fish production facilities.

Measures Planned

The following fish protection measures were developed in the Rock Island Settlement Agreement and are included in Alternative 1:

- Modify the existing adult fishladders so their operation meets current fishery agency operating criteria.
- Utilize the conservation account to provide spill for spring and summer outmigrants, up to $2.05 million (in 1986 dollars). However, as indicated in Section 2.2.3.1 (Juvenile Passage), the spill program at Rock Island Dam is currently being implemented in accordance with the HCP provisions (see Section 5.4.1a of the Rock Island HCP). If the HCP is not approved, the spill program is expected to return to following the conservation account provisions contained in the Rock Island Settlement Agreement.
- Continue to provide funding and hatchery capability to rear and release 250,000 pounds of salmon and 30,000 pounds of steelhead in a manner that is consistent with the maintenance of genetically distinct stocks.
- Evaluate fish guidance efficiency using hydroacoustic and direct capture methods, including assessments of injury and stress. Also review the hatchery programs (including sampling) to determine hatchery versus natural components of steelhead returns to evaluate hatchery production and its inter-relationship with natural production.
- Gas Abatement – Control downstream total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of fish. At all other times, the criterion is 110 percent of saturation.
- Continue to refine and implement a northern pikeminnow removal program.
- Continue avian predator control measures, as defined in the Cooperative Service Agreement between Chelan County PUD and the USDA Animal and Plant Health Inspection Service, at the Rock Island Dam.

The following measures would apply for monitoring and evaluation:

- Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult anadromous salmonids.
- Juvenile Fish Passage System – Continue to evaluate non-turbine juvenile fish passage options, as agreed to through the Rock Island Coordinating Committee.
- Fish Counting – Provide adult fish counts on a 24-hour basis.

2.3.3 Alternative 2 (Hydropower Conservation Measures to Protect Anadromous Fish)

Alternative 2 assesses additional anadromous fish conservation measures that could be implemented through the Federal Power Act and the Endangered Species Act while allowing the continued operation of the three projects. Under the Federal Power Act, new or revised conservation measures for anadromous fish could be required during license reopener proceedings or relicensing. Each of the three projects is

scheduled for relicensing over the next 30 years with the Rocky Reach Project scheduled for relicensing in 2006, the Wells Project in 2012, and the Rock Island Project in 2028.

The opportunities to change conservation measures through license reopener clauses vary by project. Long-term settlement agreements have been reached for Rock Island and Wells dams that would limit some of the opportunities at these projects in the near term. However, there is no approved long-term agreement for Rocky Reach Dam, and relicensing procedures are currently underway to enhance the conservation measures for anadromous fish at that project.

Actions that would result in changes in conservation measures from existing conditions also include the potential for NMFS to request FERC to begin a proceeding under the reopener clause of the license and prepare a biological assessment on listed species due to a change in project operations, change in species status, identification of a species critical habitat that occurs in the project area, additional information related to project effects.

Due to a recent court decision, NMFS is currently reviewing the critical habitat designations for the Upper Columbia River Endangered Species Act-listed fish species. As a result, an additional consultation process might be required when a final critical habitat determination is made. If other species were listed under the Endangered Species Act in the future, additional consultation processes would also occur.

Under Alternative 2, compliance with the Endangered Species Act for the measures being considered by FERC is through the Section 7(a)(2) formal consultation process. With the assistance of each utility, FERC would provide NMFS with a biological assessment outlining the potential effects of the projects and any additional measures on listed species or their critical habitat (once designated)[1]. A typical biological assessment would include the following information:

- a description of the action being considered;
- a description of the specific area that may be affected by the action;
- a description of any listed species or critical habitat[2] that may be affected by the action;
- a description of the manner in which the action may affect any listed species or critical habitat[1];
- an analysis of the cumulative effects; relevant reports and analyses prepared on the proposal; and any other relevant studies or information on the action, the affected species, or critical habitat[1]; and
- an evaluation of how the action might adversely affect Essential Fish Habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act for chinook and coho salmon.

NMFS would then evaluate this information and any other information available to determine whether the proposed action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat[1]. NMFS would then write a biological opinion describing their conclusions regarding the potential impacts of the proposed action on the listed species. At that time, NMFS would also fulfill its obligations under the Magnuson-Stevens Fishery

[1] A recent court ruling has vacated the critical habitat designations for the listed anadromous salmon. Although consideration of habitat requirements would be assessed during consultation to determine whether the proposed action is likely to jeopardize the species, additional consultation might be required after critical habitat designations are finalized.

Conservation and Management Act through an evaluation of the potential impacts of the proposed action on the Essential Fish Habitat of chinook and coho salmon.

Depending on their conclusions, NMFS could recommend additional protection measures to ensure that the proposed actions are not likely to jeopardize the continued existence of endangered species or result in the destruction or adverse modification of their critical habitat (once designated). Under this process, FERC would then have the responsibility of ensuring that measures identified in the biological opinion were implemented at the projects. The PUDs may either implement measures required by the biological opinion and FERC, or formally object to the mandatory requirements through litigation.

The protection of non-listed and anadromous species would be provided under the guidance of FERC. Although FERC and NMFS have not determined what, if any, additional measures would be required over the next 50 years to protect these species, it is likely that the agencies would require conservation measures that help to improve fish passage conditions at the projects and that do not result in adverse impacts to their habitat. However, the specific measures, the number of species covered, the proportion of the migrants covered, and the implementation schedule are substantial uncertainties associated with this alternative.

2.3.3.1 Conservation Measures

Relying on past and recently completed consultations at other mainstem Columbia and Snake River hydroelectric projects, Alternative 2 conservation measures would likely include a combination of the following:

- measures that allow for increased upstream passage of adult fish through fishways and reservoirs and decreased fish injury and pre-spawning mortality (examples include hydraulic and structural fishway improvements—specifically, ladder modifications and improved attraction flow to help move fish more quickly into the ladder systems and past the dams); and

- measures that provide for increased downstream passage of juvenile anadromous salmonids while minimizing fish injury (examples include increased spill programs [in association with operational and structural modifications to reduce total dissolved gas levels], expanded predator control programs (fish and avian), the development of improved fish bypass systems, and potentially, drawdown or dam removal).

These measures may be directed at both listed and unlisted salmonid species and would possibly only occur during specific periods (seasonal) to benefit a particular life stage. The specific measures for listed species may be independent and may not necessarily benefit all salmonid species.

Each measure implemented under Alternative 2 would continue until such time that FERC or NMFS determines that:

- other protective measures would better increase survival,

- the proposed measures are determined to be ineffective or unsuccessful in increasing fish survival, or

- a Federally listed species is delisted and it is determined that previously approved protection measure may safely be relaxed or are no longer warranted.

The decision to apply specific measures at each dam would depend on the benefit of the measures to anadromous salmonids. It is envisioned that each dam would have a combination of juvenile bypass options, including a screened bypass and/or a surface bypass system, a spill program designed to maximize non-turbine passage, fish

and avian predator control, and improvements to the adult facilities intended to maximize project and pre-spawning survival.

Initial survival standards for protection of listed species have been developed as a result of preliminary survival information and life-history analyses (draft Quantitative Analysis Report). The results of this life-history analysis is described in Chapter 5 and summarized in Appendix E.

2.3.3.2 Other Options Considered

If listed fish populations continue to decline, additional protection measures may be needed. Most of these additional measures would likely be in-water facility improvements.

Natural river drawdown is a remote possibility, and would have substantial environmental effects to many of the existing natural, physical, and social resources. However, this type of operation would help to mimic the natural river conditions that existed prior to the construction of the hydroelectric facilities, and thereby minimize the impacts caused by the hydropower system.

Although not recommended by a Federal, State, or local agency at this time, the review of natural river drawdown was requested by organizations during public scoping for this EIS. Consequently, natural river drawdown at the three dams (Wells, Rocky Reach, and Rock Island) has been evaluated for Alternative 2 at a brief summary level to help understand and compare its effect with other conservation measures. Although natural river drawdown is not an option under the existing FERC licenses, it may be considered during relicensing for the projects if requested by interested parties (2006, 2012, and 2028 for the Rocky Reach, Wells, and Rock Island dams, respectively).

It is uncertain whether drawdown to minimum operating pool (seasonal reservoir drawdown), which is an option under the current licenses, would result in an increase in juvenile survival in the Mid-Columbia River. Although smolt migration rates would likely increase, the correlation between migration speed and survival has not been consistently documented (Giorgi et al. 2002). Therefore, it was not evaluated in this EIS.

2.3.3.3 Committees

It is uncertain whether implementation of measures developed through Alternative 2 would be conducted through the existing, or similarly structured, coordinating committees. However, a coordinating committee similar to those currently operating is expected to occur under this alternative. Alternative 2 would therefore include coordinating committees likely consisting of representatives of the Joint Fisheries Parties and the PUDs. Decisions by the committees are expected to continue to be made by consensus.

2.3.3.4 Conservation Measures at the Projects, Including Hatchery Programs

Wells Hydroelectric Project

In 1990, the Douglas County PUD, the Wells Project power purchasers, resource agencies, and Tribes entered into a long-term fisheries settlement agreement for the Wells Project. This agreement established the Douglas County PUD's obligation for the installation and operation of juvenile downstream migrant bypass facilities, hatchery compensation for fish losses, and adult fishway operation. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfil the Douglas County PUD's obligation to protect anadromous fish and mitigate and compensate for the effects of the Wells Project on anadromous fish.

Initial compensation was established at 14 percent until the PUD could implement juvenile survival studies to actually measure project impacts.

Recent measures undertaken by Douglas County PUD, consistent with the now expired biological opinion on the Wells Interim Protection Plan (NMFS 2000b), would likely continue to be incorporated into a long-term fish recovery plan. Additional measures may also be sought by NMFS if project operations are likely to jeopardize the continued existence of the listed species or cause the destruction or adverse modification of critical habitat, or if there is not adequate potential for recovery of listed species.

Similar measures may also be implemented for non-listed species, although these measures would be approved through provisions in the Federal Power Act instead of the Endangered Species Act. As a result, there is potentially a lower likelihood of implementing the same measures for species that are not currently threatened or endangered.

Measures currently anticipated to be part of the protection program include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Wells Dam:

    a. Operate the surface bypass system during the upstream adult steelhead and spring-run chinook migration periods and during the downstream kelt passage period to maximize the survival of fallbacks and downstream migrating adults.

2. Juvenile Passage – In addition to measures described under Alternative 1 for Wells Dam:

    a. Operate within 1 percent of peak turbine power efficiency at all times during the juvenile and adult passage periods, with appropriate reporting and monitoring requirements to ensure compliance.

    b. Operate the surface bypass system 24 hours a day for up to 99 percent of the juvenile migration period.

3. Hatchery Program – The same amount of chinook, sockeye, and steelhead would be produced as described under Alternative 1, although production could be reduced because of the potential negative effects of hatchery fish on naturally spawning populations of Endangered Species Act-listed fish. In addition, Douglas County PUD would fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with the Endangered Species Act recovery goals for listed spring-run chinook salmon and steelhead populations. However, because of the potential effects of hatchery fish on natural populations, and considering that project-related mortality is 3.8 percent rather than the assumed 14 percent, hatchery production would be reduced under Alternative 2. A similar reduction would also apply to yearling summer-run chinook salmon.

4. Monitoring and Evaluation – Measures are the same as described under Alternative 1 for juvenile run timing, survival, total dissolved gas monitoring, and fish counting. The following additional measures are expected to be implemented:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Evaluate adult fishladder passage standards as they relate to spring-run chinook salmon and steelhead, and modify facilities as needed.

    c. Total Dissolved Gas Monitoring – Provide physical monitoring of total dissolved gas levels and temperature within the project area. Provide

biological monitoring to determine the incidence of gas bubble disease symptoms in adult salmon and steelhead.

5. Spill Program

    a. Maximize use of the spill program up to the maximum allowable total dissolved gas levels. At Wells, this would likely include spilling up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species to maximize fish passage efficiencies and survival. The timing of spill would likely range from April through August.

    b. Limit spill to ensure compliance with the Ecology total maximum daily load (TMDL) allotment for total dissolved gas, which is up to 120 percent of saturation for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

Rocky Reach Hydroelectric Project

Long-term protection measures for the Rocky Reach Dam would likely be similar to those described in biological assessments submitted to NMFS and the subsequent biological opinion for the construction and operation of the permanent bypass system (NMFS 2002a). Additional measures might also be necessary if project operations are likely to jeopardize the continued existence of the listed species or cause the destruction or adverse modification of critical habitat (once designated), or if there is not adequate potential for recovery of listed species, based on additional information available to NMFS and as a result of continued monitoring and evaluation.

Similar measures may also be implemented for non-listed species, although these measures would be approved and implemented through provisions in the Federal Power Act instead of the Endangered Species Act. As a result, there is potentially a lower likelihood of implementing the same measures for species that are not currently threatened or endangered.

Measures currently anticipated to be part of the fish protection program include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Rocky Reach:

    a. Enhance the fishway entrance attraction conditions through planned operation of spill gates and turbines.

    b. Investigate ladder modifications to improve operations within specified standards and minimize fish passage delay.

    c. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill).

    d. Conduct modeling or other appropriate evaluations to determine the best actions for correcting passage problems, and implement measures as necessary.

2. Juvenile Passage – Measures in addition to those described in Alternative 1 would include:

    a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of anadromous salmonids (although included in Alternative 1 it is evaluated under Alternative 3).

    b. Operate turbine units within 1 percent of peak turbine power efficiency at all times during the juvenile and adult fish passage

periods, with appropriate reporting and monitoring to ensure compliance.

c. Increase spill as necessary to maximize fish passage efficiencies and survival at the project.

d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of fish. At all other times, the criterion is 110 percent of saturation.

e. Implement effective fish and avian predator control measures.

f. Potentially implement additional or alternative juvenile bypass systems, such as a surface bypass sluiceway, to improve fish passage survival.

3. Hatchery Program – The same amount of chinook and steelhead would initially be produced as described under Alternative 1, although production could be reduced at any time because of the potential effects of hatchery fish on natural populations. Hatchery production of non-listed species would not be changed unless the production levels are determined to affect the listed species. In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

   a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

   b. Survival – Utilize the best techniques to estimate the survival of salmon and steelhead through the project. Techniques would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

   c. Total Dissolved Gas Monitoring – Conduct physical monitoring of total dissolved gas levels and temperature within the project area. Conduct biological monitoring to determine the incidence of gas bubble disease symptoms in juvenile steelhead and salmon.

   d. Fish Counting – Provide adult fish counts on a 24-hour basis.

   e. Evaluate adult fish passage efficiencies through radio-telemetry studies.

   f. Install adult PIT-tag detection devices in the adult fishways.

5. Spill Program

   a. Maximize use of the spill program for up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species to increase juvenile fish passage survival at the project. The timing of spill may therefore range from April through August.

   b. Limit spill to ensure compliance with the Ecology total maximum daily load allotment for total dissolved gas, which is up to 120 percent of saturation for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

Rock Island Hydroelectric Project

Long-term protection measures for the Rock Island Dam would include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Rock Island:

    a. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill, etc.).

    b. Evaluate passage facilities through hydraulic evaluations and adult passage studies and correct problems when identified.

    c. Investigate ladder modifications to improve operations within specified standards and minimize fish passage delay.

    d. Conduct evaluations on spawning success and fecundity as it relates to passage through a multiple dam system.

2. Juvenile Passage – Measures in addition to those described under Alternative 1 would likely include:

    a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of juvenile salmonids.

    b. Operate turbine units within 1 percent of peak turbine power efficiency at all times during the juvenile and adult passage periods, with appropriate reporting and monitoring to ensure compliance.

    c. Increase spill as necessary to maximize fish passage efficiencies and survival at the project.

    d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event. The 120 percent saturation criterion is a special exemption that only applies when the dam is spilling water to aid the downstream migration of fish. At all other times, the criterion is 110 percent of saturation.

    e. Implement effective fish and avian predator control measures.

3. Hatchery Program – The same amount of chinook and steelhead would initially be produced as described under Alternative 1, although production could be reduced because of the potential effects of hatchery fish on natural populations. Hatchery production of non-listed species would not be changed unless these production levels are determined to affect the listed species In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Survival – Utilize the best techniques to estimate the survival of salmon and steelhead through the project. Techniques

would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

c. Total Dissolved Gas Monitoring – Provide physical monitoring of total dissolved gas levels and temperature within the project area. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in juvenile salmon and steelhead.

d. Fish Counting – Provide adult fish counts on a 24-hour basis.

e. Evaluate adult fish passage efficiencies through radio-telemetry studies.

5. Spill Program

a. Maximize use of the spill program for up to 40 percent of the daily average flow for up to 99 percent of the juvenile migration season for each salmonid species. The timing of spill may therefore range from April through August.

b. Limit spill to ensure compliance with total maximum daily load allotment requirements, which is up to 120 percent for the tailrace and 115 percent for the forebay of the project.

FERC and NMFS may require additional measures based on information obtained from monitoring and evaluation. This would include the need to protect any listed species from jeopardy under the Endangered Species Act.

2.3.3.5 Adaptive Management

Alternative 2 includes an adaptive management component through the Section 7 re-consultation process. Re-consultation would occur if new information becomes available that indicates that the provisions of the initial consultation were not adequate to ensure the continued existence of the listed species. Re-consultations would also occur as a result of relicensing and license amendment processes, where FERC consults with NMFS prior to making a decision on proposed modifications of the project structures or operations or other plans that may affect listed species.

In addition, any actions that would substantially change conservation measures from existing conditions might have the potential for NMFS to request FERC to begin license reopener clause proceedings and prepare a biological assessment on listed species due to a change in project operations. Re-consultation would also occur if there were a change in species status, identification of a species critical habitat that occurs in the project area, or additional information related to project effects.

During re-consultation, NMFS would have the opportunity to adjust conservation measures, thereby providing an adaptive management process. However, there is some uncertainty of how effective this adaptive management process would be, given the potential implementation delays in the consultation process, and the project-by-project and issue-by-issue nature of the consultation process. This adaptive management would also involve just the listed species.

For unlisted species, adaptive management would involve the use of NMFS's Federal Power Act authorities to pursue additional protective measures in future relicensing or license reopener procedures or amendment proceedings. Adaptive management activities would also occur through the existing Mid-Columbia coordinating committees.

2.3.4 ALTERNATIVE 3 (PROPOSED ACTION – PROJECT HCPS)

The proposed action consists of implementing the three HCPs for the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects. The HCPs were developed to conserve and

protect listed and non-listed anadromous fish species over the long term, and to support ongoing compliance with the Endangered Species Act, while allowing continued operation of the three projects. The HCP fish protection measures and methodologies proposed to implement these measures would represent comprehensive long-term settlement agreements under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Northwest Power Planning and Coordination Act, and Title 77 RCW. Because the Agreements are comprehensive settlements, they propose a standard and scope greater than that required under the Endangered Species Act. The objective of the HCPs is to achieve percent no net impact for anadromous salmonids affected by the projects. This objective applies not only to the listed spring-run chinook salmon and steelhead, but also to the other anadromous salmonids in the Mid-Columbia River.

Protection for the migrating species is accomplished through a series of performance (survival) standards, which are based upon actual survival of the migrating species, not simply measures to be implemented regardless of their actual benefit to the migrating species. Unavoidable mortality is mitigated though tributary habitat improvements and state of the art hatchery supplementation.

The primary purpose of the HCP agreements is to obtain an incidental take permit from NMFS to comply with the Endangered Species Act for any take of listed anadromous fish as a result of project operations and satisfy the FERC relicensing requirement for the Plan species. Issuance of an incidental take permit is a Federal action subject to NEPA compliance. The purpose of NEPA is to promote analysis and disclosure of the environmental issues surrounding a proposed Federal action and to reach a decision that reflects NEPA's mandate to strive for harmony between human activity and the natural world. As a cooperating agency, FERC also intends to utilize this EIS for subsequent licensing decisions (which are considered separate Federal actions), and the State agencies intend to use the information to satisfy state environmental requirements (SEPA).

The requirements of Section 10 of the Endangered Species Act provide the guidelines for HCP preparation. The information within each of the HCPs includes the following:

- the environmental setting in the project vicinity,
- structural and operational features of the project,
- existing operations related to anadromous salmonids,
- existing mitigation and monitoring measures and their effectiveness,
- unresolved issues related to anadromous salmonids (note: The 1998 Incidental Take Permit Applications indicated that there were unresolved issues at the time the applications were submitted. Unresolved issues were resolved by the amended applications filed in 2002. The HCPs address changing circumstances and unknown future events through committee processes and adaptive management [see Section 10.4.2 of the Wells HCP and Section 10.3.2 of the Rocky Reach and Rock Island HCPs].),
- proposed mitigation and enhancement measures to address unresolved and unknown future issues,
- proposed monitoring,
- costs and funding, and
- alternatives to the proposed measures.

In addition to Section 10 requirements, the issuance of an incidental take permit and amending a FERC license are Federal actions subject to Section 7 of the Endangered Species Act. Although Section 7 and Section 10 are similar, Section 7 introduces several considerations into the HCP process that are not explicitly required by Section 10. These considerations include the assessment of indirect effects, effects on Federally listed plants, and effects on critical habitat. As a result, NMFS and FERC are required to initially consult with the Services (NMFS and USFWS) to ensure that their actions proposed in the HCP are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat.

2.3.4.1 HCP Species

The Plan species addressed in the HCPs are spring-run chinook salmon, summer/fall-run chinook salmon, sockeye salmon, coho salmon, and steelhead inhabiting the Upper Columbia River (Table 2-7) (see Section 13.19 of the Wells HCP and Section 13.20 of the Rocky Reach and Rock Island HCPs). In addition, the HCPs also identify Permit species (species covered under the incidental take permit application). The Permit species include all the Plan species except coho salmon. The native coho salmon populations have been extirpated from the Upper Columbia River, are not subject to Endangered Species Act protection, and therefore do not require the issuance of an incidental take permit.

TABLE 2-7. PLAN AND PERMIT SPECIES STATUS, RELATIVE TO THE HCPS (ALTERNATIVE 3)

SPECIES	ENDANGERED SPECIES ACT STATUS	EVOLUTIONARILY SIGNIFICANT UNIT	HCP STATUS
Steelhead	Endangered (August 1997)	Upper Columbia River	Plan and Permit Species
Spring-Run Chinook Salmon	Endangered (March 1999)	Upper Columbia River	Plan and Permit Species
Summer/Fall-Run Chinook Salmon	Not Warranted (March 1998)	Upper Columbia River	Plan and Permit Species
Sockeye Salmon	Not Warranted (March 1998)	Okanogan River Lake Wenatchee	Plan and Permit Species
Coho Salmon	Extirpated	Upper Columbia River	Plan Species

2.3.4.2 HCP Term

The terms of the three HCPs and any incidental take permits are to be 50 years from the date the HCPs are executed (in the case of Chelan County PUD), and approved by FERC (in the case of Douglas County PUD) (see Section 1.1 in the Wells, Rocky Reach and Rock Island HCPs). In the event any PUD project is not relicensed to that PUD, the corresponding HCP for that project would terminate. A 50-year term was selected because it corresponds to the maximum length of a FERC license, although the HCP process will not necessarily coincide with the FERC relicensing process at the three projects. A lengthy term is also appropriate because of the length of time and expense involved in negotiating and consulting on each of the HCPs. For example, the negotiation process for the three HCPs considered in this EIS began in 1993.

Although some HCP measures are currently being implemented by the PUDs, the HCPs would not be fully implemented until the agreements are executed by the signatory parties and the regulatory review processes have been completed. As a result, the effective date of the

agreements would be the later of when (1) FERC issues a final order approving and incorporating the agreements in the project licenses, (2) NMFS issues an incidental take permit, and (3) the USFWS completes the necessary consultation under the Endangered Species Act. Based on the current schedule, the terms of the HCPs should extend from approximately 2003 through 2053. Payments to the Plan species Account would be initiated 90 days after the effective date of each HCPs and adjusted for inflation from 1998.

The HCPs also have termination provisions if the performance standards are not achieved (see Section 1 of the Wells, Rocky Reach, and Rock Island HCPs). An HCP could be less than 50 years under the following circumstances:

- FERC issues a non-power license for the project,
- FERC orders removal or drawdown of the project, or
- if the no net impact standard has not been achieved or maintained by 2013 (2018 for the Wells Project), or if no net impact has been achieved and maintained but Plan species are not rebuilding and the project is a significant factor in the failure to rebuild,
- if a party fails to comply with the terms of the HCP,
- if the obligations imposed by the HCP are impossible to achieve,
- if NMFS revokes the incidental take permit, or
- if a regulatory entity takes action that materially alters or is contrary to one or more provisions of the HCP.

Any party to the HCP may elect to withdraw from the agreement at any time, based on the non-compliance provisions of the HCP agreements. However, NMFS and USFWS will not exercise their right to withdraw from the HCP until at least 2013 (2018 for the Wells Project) if the PUDs have complied with all aspects of the agreement but have not met the survival standards. If mutual agreement is reached between the PUDs and the two Federal agencies, the Services (NMFS and USFWS) can seek reservoir drawdown, dam removal, and/or non-power operations without withdrawing from the agreement or suspending or revoking the incidental take permit.

During the 50-year HCP term, all three projects would undergo a relicensing process with FERC. It is the intention of the HCPs that mitigation measures agreed to as part of the HCPs be consistent with, and form the basis of, subsequent FERC license articles developed to address impacts on anadromous salmonids. Therefore, unless the parties to the HCPs withdraw from the HCP agreements (following the prescribed withdrawal procedures), they would be supportive of a new license, under which the HCPs would constitute the terms, conditions, and recommendations for Plan species under Section 10(a), Section 10(j), and Section 18 Fishway Prescriptions in the new license (see Section 9.5 of the Wells HCP and Section 9.2 of the Rocky Reach and Rock Island HCPs).

The PUDs have voluntarily implemented some provisions of the HCPs because specific deadlines for reaching the survival standards were established in the HCPs. During this period, the PUDs have had the ultimate authority on pursuit and implementation of specific bypass measures since 1998. However, the existing FERC license articles, settlement agreements, and stipulations remain in effect to address dispute resolution proceedings, spill volumes, and hatchery compensation levels. Components of the HCPs that address each of these issues would not be implemented until the agreements have been ratified. To address ongoing Endangered Species Act issues, FERC issued an order approving the Rocky Reach Bypass System and NMFS issued a Biological Opinion for the Wells Project (which has since expired).

2.3.4.3 HCP Mitigation Objectives

All measures proposed in the HCPs are intended to minimize and mitigate impacts to the Plan species, to the "maximum extent practicable" as required by the Endangered Species Act. The HCPs also address the obligations of the PUDs under the Federal Power Act, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Northwest Power Planning and Coordination Act, and Title 77 RCW (see Section 9.7 of the Wells HCP and Section 9.4 of the Rocky Reach and Rock Island HCPs).

The HCPs would mitigate impacts from dam operations in areas directly affected by those operations (project areas). The project areas extend from approximately 1,000 feet downstream of each dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir). The PUDs would also provide funding for hatchery supplementation and tributary habitat improvement programs to offset losses not directly mitigated at the project.

2.3.4.4 HCP Performance Standards

The HCPs have specific performance standards that relate to the survival of each Plan species (see Section 4 of the Wells HCP and Section 5 of the Rocky Reach and Rock Island HCPs). The overall performance standard is to achieve no net impact to the Plan species through each dam. This term takes into account the fact that 100 percent equivalent survival cannot be achieved at the projects alone, requiring additional mitigation through off-site measures to increase salmonid productivity (e.g., hatchery supplementation programs and tributary habitat improvements).

The no net impact standard consists of two components:

1. A 91 percent combined adult and juvenile project survival rate achieved within the geographic area of the projects by fish passage improvement measures.

2. Compensation for the 9 percent unavoidable project mortality provided through hatchery and tributary programs, with compensation for 7 percent mortality provided through hatchery programs and compensation for the remaining 2 percent mortality provided through tributary habitat improvement programs.

It is the intention that these no net impact components will contribute to the rebuilding of tributary habitat production capacity and the basic productivity and numerical abundance of the Plan species. Tributary habitat improvement programs would involve the protection and restoration of salmonid habitat within the Columbia River watershed (from the Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat, and Wenatchee River Basins. The hatchery programs would be consistent with the objective of rebuilding naturally reproducing populations in their native habitats, while maintaining genetic and ecological integrity and supporting harvest.

Monitoring of both on-site and hatchery mitigation measures would be conducted, and mitigation measures would be modified, as necessary, to achieve or maintain the no net impact standard. A comprehensive evaluation of the hatchery mitigation program will be conducted to assess the effectiveness for achieving the no net impact standard in 2013, and every 10 years thereafter. Based on the results of these evaluations, adjustments could be made to the program. However, compensation for no more than 7 percent unavoidable project mortality would be provided through hatchery compensation without agreement of the parties that signed the HCPs.

Compensation for up to 2 percent unavoidable project mortality would be through tributary habitat improvements. This compensation level

is assumed, and will not be monitored for actual survival contribution during the 50-year term of the HCPs due to the difficulty and uncertainties associated with monitoring and quantifying the effects of tributary habitat improvements. However, a tributary assessment program will be funded to monitor and evaluate the relative performance of tributary improvement projects. The intent of this assessment program is to ensure the most cost effective and efficient use of the tributary improvement funds, but not to quantify the actual survival benefits.

The performance standards for the HCPs are the result of an extensive collaborative process dating back to 1993, and represent the collective wisdom and professional judgment of the scientists and regional policy makers participating in the process. In addition, the standards are generally consistent with the performance standards included in the 2000 Federal Columbia River Power System biological opinion for the Lower Snake and Columbia River projects (NMFS 2000c). In-river survival evaluations will be used to determine whether the survival standards are being achieved.

The no net impact and survival standards are designed to have several layers of requirements to provide the most flexibility in achieving and measuring the goal of recovering and stabilizing the anadromous fish runs in the Mid-Columbia River. In particular, although the 91 percent survival standard combines the adult and juvenile fish survival through the project, it is recognized that it is not currently possible to conclusively differentiate hydro-related mortality from natural adult fish losses. Therefore, the combined adult and juvenile survival standard will initially be measured through alternative survival measurements relative to juvenile fish passage. These alternative survival measurements assume a 2 percent adult mortality rate, based on the best available data throughout the region, which suggests a 98 to 100 percent survival rate of adults passing each hydroelectric project.

The alternative juvenile survival measurement was established to provide additional flexibility in estimating project impacts on each Plan species, given the species-related limitations of the available assessment techniques. The alternative metrics are for either juvenile project or juvenile dam passage survival. The alternative juvenile project passage survival metric is 93 percent (which is the survival rate over 95 percent of each Plan species migration through a project's reservoir, forebay, dam, and tailrace). This 93 percent survival goal includes direct, indirect, and delayed mortality, as it relates to the project, wherever it occurs and can be measured.

If juvenile project passage survival cannot be accurately measured, juvenile dam passage survival can be used as the next best alternative to determine if the HCP survival standards are met for each Plan species. The juvenile dam passage survival standard is set at 95 percent, and encompasses the survival of 95 percent of the juveniles passing through a project's forebay, dam, and tailrace areas. However, unlike the project survival standard, dam passage survival estimates do not include indirect or delayed mortality as they relate to project operations. Therefore, even if this standard is met, additional evaluations will be needed (as measurement technologies allow) to verify achieving the no net impact standard of the HCPs.

If neither of these alternative juvenile survival rates can be directly measured with the available technology, juvenile dam passage survival would be calculated based on the best available data (including the proportion of fish utilizing specific passage routes and estimated survival rates for each route). This calculation would consider the same elements as the directly measured juvenile dam passage survival technique, although off-site data may be used when project-specific data are not available. This calculation process could be used for Plan species such as sockeye and subyearling chinook because directly measuring dam passage survival for these species is currently not possible with existing technology.

The initial hatchery production levels are based on average adult returns and adult to smolt survival rated during a baseline period, and the need to compensate for up to 7 percent unavoidable project-related mortality. In response to requests from the Tribes, NMFS has agreed to fully permit the initial production levels identified in the HCPs through 2013. During 2013, and every 10 years afterward, the hatchery production levels would be evaluated and adjusted to achieve and maintain no net impact to each Plan species. These assessments would allow adjustments in production based on average adult returns and any changes in adult-to-smolt survival rate or smolt-to-adult survival rates for the hatchery production facilities. However, hatchery production levels established as compensation for original project inundation impacts are not subject to change.

In addition to hatchery program modifications based on the results of survival studies, there are procedures established to allow program reductions if the 7 percent hatchery compensation level is determined by NMFS to be inappropriate for species recovery. Such Endangered Species Act policy adjustments could occur in 2013 and every 10 years afterward, at the time of program reviews. Such policy changes might be required if the interactions of hatchery and wild fish are proven to be delaying the recovery process. These interactions include direct impacts such as competition for space and food, disease transmission, and predation.

Additional evaluations are expected over the next 10 years to determine the amount of hatchery supplementation that can be allowed without negatively impacting the listed species.

As part of the effort to achieve the performance standards, the PUDs would use their best efforts to evaluate, improve, maintain, and operate adult passage fishways to meet criteria established by the coordinating committees. The criteria currently used for the adult fishways were developed in cooperation with the existing Wells Coordinating Committee, Rock Island Coordinating Committee, and the Mid-Columbia Coordinating Committee. The adult fishway operating criteria for the Wells Dam can be found in the Adult Fish Passage Plan (Appendix A) of the Wells HCP. For Rocky Reach and Rock Island, the adult fishway operating criteria is referred to as the Detailed Fishway Operating Plan (DFOP) (see Appendix A of the Rocky Reach and Rock Island HCPs). The PUDs will continue to maintain and operate the fishways according to their respective criteria, or a subsequent standard adopted by the HCP coordinating committees.

Measures implemented at the projects to meet the performance criteria are referred to as "tools," which include any action, structure, facility, or program (on-site only) intended to improve the survival of Plan species migrating through the project areas.

Although there is limited survival information available for all the Plan species at each of the three dams, recent improvements in fish tagging technology (e.g., PIT-tags, miniature radio, acoustic and balloon tags) will provide more detailed and accurate future assessments.

The HCPs set an initial period for the PUDs to achieve the juvenile project or juvenile dam passage survival goals followed by up to 3 years of evaluation (see Section 4.2 of the Wells HCP and Section 5.3 of the Rocky Reach and Rock Island HCPs). The 3-year evaluation period has been completed by Douglas County PUD for yearling chinook and steelhead, while the first year of evaluation at Rocky Reach and Rock Island dams is scheduled to begin in 2004 and 2002, respectively. If the survival levels are not met, the HCP coordinating committees (which include NMFS participation) would then identify additional tools to implement, prior to the next migration period, to achieve the combined adult and juvenile, juvenile project or juvenile dam passage survival goals. Detailed discussions of

the evaluation phases are provided below in Section 3.2.2.6, HCP Phases.

2.3.4.5 HCP Phases

The HCP survival standards would be evaluated in three phases (see Section 4.2 of the Wells HCP and Section 5.3 of the Rocky Reach and Rock Island HCPs). During Phase I, the PUDs would evaluate survival rates for those Plan species that can be studied with existing methodologies. Juvenile fish survival studies would be measured at a 95 percent confidence level, with a standard error of no more than plus or minus 2.5 percent. However, if all testing protocols and model assumptions are adhered to, the coordinating committees can (by unanimous approval) accept study results with a standard error of plus or minus 3.5 percent.

Survival studies would be conducted over a 3-year period to determine the survival rates. Study results that meet the precision and testing protocol requirements would be included in the 3-year average. Depending on the results of the 3-year survival studies, the PUDs would proceed to either Phase II or Phase III). The decision-making process for interpreting the survival study results is summarized in a decision matrix of the phase determination process (Figures 2-4 and 2-5). The juvenile survival studies conducted during Phase I could indicate that the standards were achieved for some species and not others. This would result in different phase designations for the various Plan species. The coordinating committees can also designate a representative or surrogate species for testing if the target species cannot be accurately tested with the existing technology.

If the Phase I evaluations conclude that the applicable survival standard has not been achieved, the PUD would enter Phase II (Interim Tools/ Additional Tools). In this phase, the coordinating committee would jointly decide on either interim tools or additional tools for the PUD to implement to achieve the pertinent survival standard. Once implemented, up to 3 years of evaluations would be conducted to verify compliance with the standard and appropriateness of moving into Phase III. Until the survival standard(s) being measured are achieved, the PUDs will continue to implement either interim tools or additional tools to meet the standard(s). However, if it is determined that the standards cannot be met, the parties can withdraw from the HCP agreements. There are several determination levels under Phase III to address uncertainties or gaps in the available information. The coordinating committees would determine if the Phase III level has been achieved, at each project and for each Plan species, as follows:

- Standard Achieved – Verified compliance with the 91 percent combined adult and juvenile survival standard or 93 percent juvenile project survival.
- Provisional Review – Measured juvenile project survival less than 93 percent but greater than or equal to 91 percent.
- Additional Juvenile Studies – Measured or calculated 95 percent juvenile dam passage survival.

Under Phase III (Standard Achieved), the PUDs would reevaluate survival every 10 years. These 1-year reevaluation processes would include one representative species for the spring migration period and another for the summer migration. The resulting survival estimates would be included in the cumulative average for those species. If the standard is no longer being achieved, additional evaluations would occur. If survival levels remain below the standards after 3 years of reevaluation, the PUD would move into

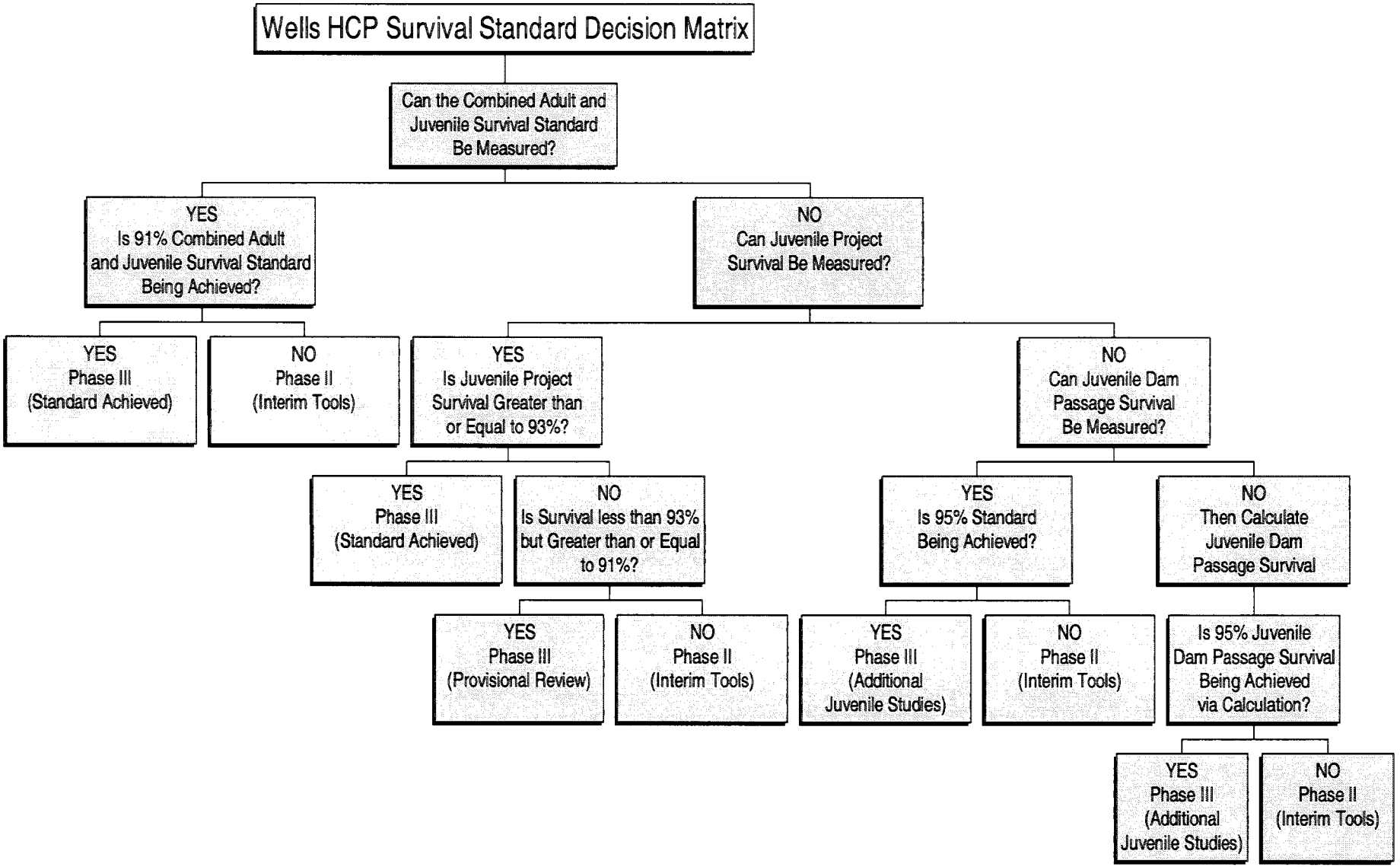


Figure 2-4. Wells HCP Survival Standard Decision Matrix

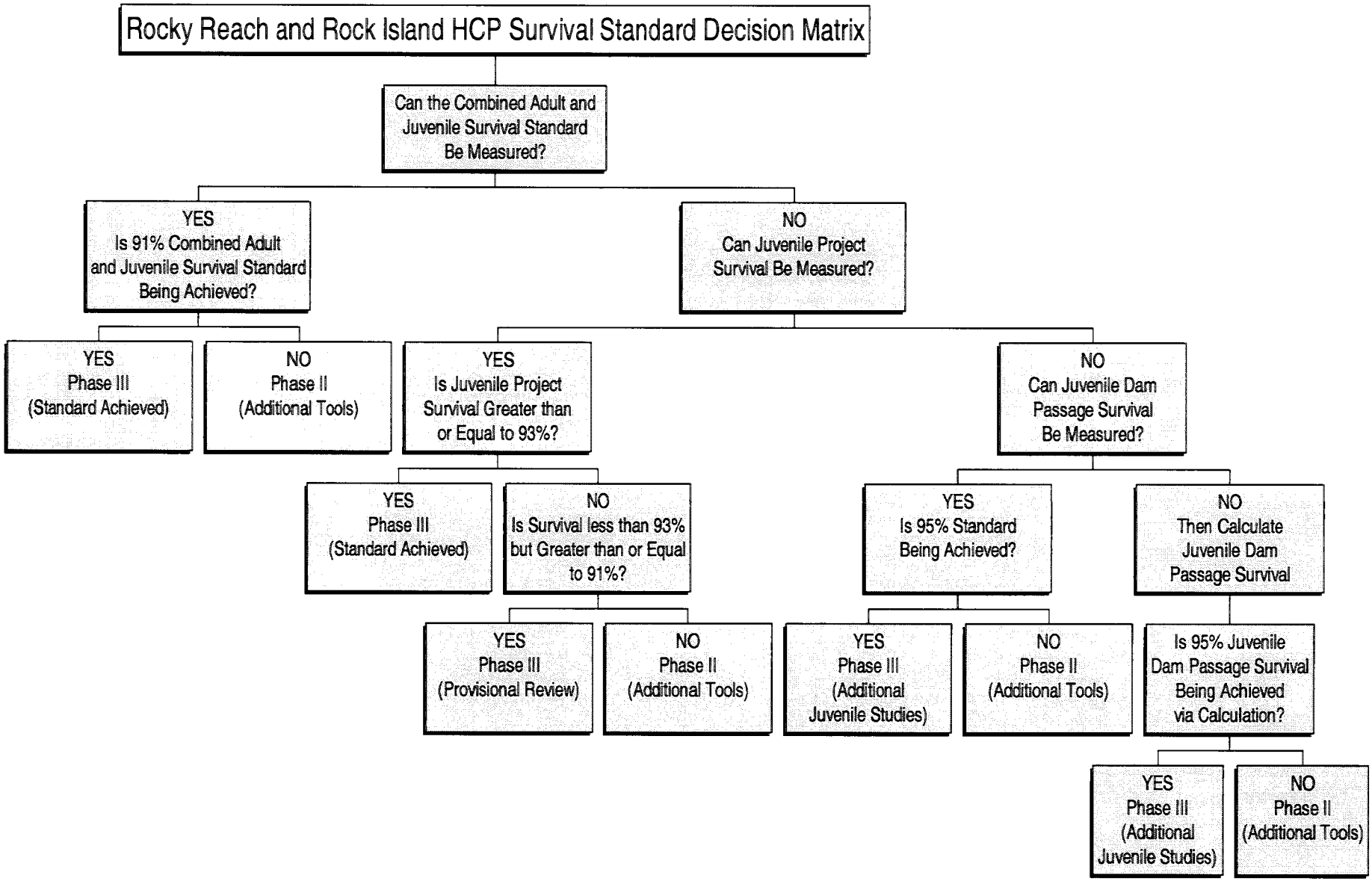


Figure 2-5. Rocky Reach and Rock Island HCP Survival Standard Decision Matrix

Phase II (Additional Tools) for that species, and follow the procedures discussed previously for Phase II. In addition, the coordinating committee would consider reevaluating other Phase III (Standards Achieved) species.

If the reevaluation studies show that the standards are being exceeded, the coordinating committees could make adjustments to the passage measures or the unavoidable mortality mitigation levels to maintain the no net impact standard. At Rock Island or Rocky Reach dams, the spill requirements could be adjusted for the following migration season used by that species, such that the survival standard is achieved but not exceeded. However, the survival standard could be exceeded for a particular species, if measures implemented primarily for another species provide additional survival benefits to both species. At Wells Dam, the coordinating committee could adjust the hatchery supplementation rates from the 7 percent level based on actual project survival, such that the no net impact standard is achieved but not exceeded.

A Phase III (Provisional Review) determination allows the PUD a one-time (Plan species specific) 5-year period to implement additional measures or conduct additional survival studies to achieve or verify the achievement of the pertinent survival standard. If the survival goal is subsequently met, the PUD would follow Phase III (Standard Achieved) or Phase III (Additional Juvenile Studies) procedures. If the pertinent standard cannot be achieved, Phase II (Interim Tools) procedures would be followed for Wells and Phase II (Additional Tools) would be followed for Rocky Reach and Rock Island. However, even if the juvenile dam passage survival rate (calculated or measured) is determined to be 95 percent or greater, Phase III (Additional Juvenile Studies) procedures would apply.

The Phase III (Additional Juvenile Studies) classification is provided because juvenile dam passage survival estimates do not address juvenile mortality in the reservoir. Therefore, even if the 95 percent juvenile dam passage survival (measured or calculated) is met or exceeded, either the 91 percent combined adult and juvenile project survival estimate or the 93 percent juvenile project survival metric would still be measured when appropriate monitoring methods are available.

Based on the survival and the fish passage efficiency studies, the parties to the HCP recognize that the Douglas County PUD has achieved the 93 percent juvenile project survival goal for yearling chinook and steelhead. In addition, the 95 percent juvenile dam passage survival goal is assumed to have been met for sockeye and subyearling chinook, until adequate evaluation methodologies are available to verify survival of these species.

For the Chelan County PUD, the evaluation period (Phase I) began at Rock Island in 2002 and would occur between 2004 and 2006 for Rocky Reach. The coordinating committees would use these evaluation results to make a phase determination for each Plan species.

Whenever Phase I evaluations indicate that the survival standards are not being achieved for a specific species, Phase II (Interim Tools) would be applied for the Wells Project and Phase II (Additional Tools) would be applied to the Rocky Reach and Rock Island projects. Phase II (Interim Tools) for Wells includes a set of project specific actions, that could be implemented at the project, to increase survival above the pertinent survival standard. Following the implementation of Interim Tools, an evaluation of the survival benefit of these actions will take place. For the Rocky Reach and Rock Island projects, the coordinating committees would identify the additional tools or studies that are to be implemented during Phase II. The coordinating committees shall use the following criteria when deciding which interim/additional tools to be implemented during Phase II. These criteria are:

1. likelihood of biological success;

2. time required to implement; and

3. cost-effectiveness of solutions, but only where two or more alternatives are comparable in their biological effectiveness.

The PUD would continue to implement Phase II tools for each Plan species that is not meeting the pertinent survival standard. The coordinating committee would determine the number of valid studies (not to exceed 3 years) necessary to verify the survival rate and make a phase determination, following the implementation of the interim/additional tools.

2.3.4.6 Dispute Resolution

The HCP agreements stipulate a dispute resolution procedure that would apply to all disputes over the implementation and compliance of the agreements (see Section 11 of the Wells, Rocky Reach, and Rock Island HCPs). These procedures rely on unanimous agreement of the pertinent coordinating committee representatives present for the dispute resolution process.

If a unanimous decision cannot be reached within a hatchery or tributary coordinating committees, then the dispute would be decided by the pertinent HCP coordinating committee. If the HCP coordinating committee cannot resolve a dispute elevated from the hatchery or tributary committee (or the HCP coordinating committee cannot resolve a dispute amongst themselves) then the dispute would be decided by a policy committee, comprised of executives of all signatory parties. If a unanimous decision of the attending representatives of the policy committee cannot be reached, each of the HCP parties may pursue any other right they might otherwise have to achieve their objectives. However, the agreement encourages the parties to seek a resolution through an alternative resolution process, including mediation or arbitration.

2.3.4.7 HCP Committees

The three HCPs would be implemented through a group of committees established for each project (see Section 6 of the Wells HCP and Section 4 of the Rocky Reach and Rock Island HCPs). Each project would have a coordinating committee, a tributary committee, and a hatchery committee.

The coordinating committees would oversee HCP monitoring programs, including the selection of the most appropriate survival standard to measure, protocols and methodologies to assess survival, and review of the study results to determine whether or not the survival standards have been achieved. The coordinating committee would also provide input on the choice of measures implemented under Phase I, and periodically evaluate and adjust the protection measures (after Phase I) to assess actual project survival and unavoidable project mortality.

Although adjustments can be made to ensure the no net impact standard, no more than 9 percent unavoidable project mortality shall be made up through hatchery and tributary compensation. If any project, for any species, cannot achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival standard, then the PUDs shall consult with the signatory parties through the coordinating committees to jointly seek a solution. The committee would have the ability to select an independent third party to provide scientific review of any disputed survival study results.

The tributary committees are charged with the task of selecting projects and approving project budgets from the Plan Species Account for purposes of implementing the Tributary Conservation Plan.

The hatchery committees are responsible for evaluating the hatchery programs and ensuring that adequate compensation is being maintained based on the 7 percent compensation goal.

The tributary and hatchery committees would be formed after the HCP is approved by FERC, and would operate simultaneously and independently throughout the HCP terms.

2.3.4.8 HCP Conservation Plan and Compensation Measures

The measures described below are currently considered to be the tools that Chelan and Douglas County PUDs would use to meet 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival.

Wells Dam

Outside of the existing mitigation measures negotiated during the 1990 long-term fisheries settlement agreement for the Wells Project (FERC 1991), no new structural modifications have been identified to date. The combination of the existing juvenile fish bypass system at Wells Dam and the replacement of the turbine units with minimum gap type turbines has produced a 3-year average project survival of 96.2 percent for yearling chinook and steelhead.

As a result, the HCP signatory parties have determined that Douglas County PUD has achieved the Phase III (Standard Achieved) designation for yearling chinook and steelhead. The HCP parties also believe that the calculated estimate of juvenile dam passage survival for sockeye and subyearling chinook is probably greater than the 95 percent standard and that Douglas County PUD has most likely achieved Phase III (Additional Juvenile Studies) for subyearling chinook and sockeye.

Based on the measured or calculated survival information, the juvenile bypass system would continue to be operated in a manner consistent with that used during the evaluation phase (see Section 4.3 of the Wells HCP). Specific measures to be implemented include the following:

- Continuously operate the bypass between April 10 and August 15, or longer if necessary to encompass 95 percent of a juvenile migration period.
- Coordinate with the HCP signatory parties and other resource agencies to address total dissolved gas and other water quality issues.
- Maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures. The northern pikeminnow removal program may include a pikeminnow bounty program, fishing derbies/tournaments, and the use of long-line and fish trapping methods. Piscivorous birds, including Caspian terns, double-crested cormorants, and various gull species, would be hazed. Hazing techniques include elaborate wire arrays in the tailrace to deter foraging, propane cannons, various pyrotechnics, and lethal control when necessary. The program would be implemented during the juvenile fish outmigration periods.
- Operate and maintain the adult fish passage systems according to procedures outlined and criteria developed through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project.
- Evaluate the biological significance of adult fallback rates and steelhead kelt loss at the project, and implement recommendations of the coordinating committee likely to significantly improve survival.

Rocky Reach Dam

The Chelan County PUD would be undertaking various interim, prototype, and permanent measures at the Rocky Reach Project in an effort

to achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project survival, or 95 percent juvenile dam passage survival standards. These measures would include interim spill, bypass diversion screen operations, surface collection bypass system construction and evaluation, turbine replacement, and predator control (see Section 5.4 of the Rocky Reach HCP). The appropriate mix of measures would vary as the surface collection system is improved and its efficiency tested and quantified.

Phase I testing at Rocky Reach Dam is expected to begin in 2004 for yearling chinook and steelhead. The surface collection juvenile bypass system is scheduled to be completed by 2003. Chelan County PUD will use the 2003 juvenile outmigration season to conduct studies to identify specific physical or operational modifications prior to the first year of survival testing (2004). Based on the results of these initial studies, spill levels will be adjusted for the Phase I testing period (2004 – 2006). Survival rates for subyearling chinook and sockeye would be measured if technology exists, or calculated based on estimated survival rates for, and the proportion of these species passing, each passage route at the project.

Survival data would determine the number, type, and magnitude of the various protective measures needed to achieve the 91 percent combined adult and juvenile project survival, or 93 percent juvenile project passage survival, or 95 percent juvenile dam passage survival standards. Actions would also be taken to improve survival and ensure timely passage of adult anadromous salmonids through the project. The following measures would be implemented:

- Install a juvenile fish bypass system consisting of a surface collection system with secondary collection from a limited number of turbine intake screens.
- Continuously operate the bypass between April 1 and August 31, or longer if necessary to encompass 95 percent of a juvenile migration period.
- Modify replacement turbine runners to improve survival of juvenile anadromous salmonids as much as possible, given manufacturing, technical, and installation schedule limitations.
- Continue implementing a spill program that provides spill levels to achieve 95 percent survival when used with the surface collector during a period encompassing 95 percent of migration periods of spring- and summer-migrating Plan species. In addition, provide 25 percent spill during the Okanogan sockeye outmigration period (for up to a maximum of 21 days). Spring spill would begin no later than April 20 and generally end no later than June 15. The summer spill period is between July 1 and August 15.
- Coordinate with the HCP parties and other resource agencies to address total dissolved gas and other water quality issues.
- Maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures. The northern pikeminnow removal program may include a pikeminnow bounty program, fishing derbies/tournaments, and the use of long-line and fish trapping methods. Piscivorous birds, including Caspian terns, double-crested cormorants, and various gull species, will be hazed. Hazing techniques include elaborate wire arrays in the tailrace to deter foraging, propane cannons, various pyrotechnics, and lethal control when necessary. The program would be implemented during the juvenile fish outmigration periods.
- Operate and maintain the adult fish passage systems according to criteria developed

through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project.

- Evaluate the biological significance of adult fallback rates and steelhead kelt loss at the project, and implement recommendations of the coordinating committee likely to significantly improve survival.

- Perform the necessary studies to properly monitor and evaluate on-site mitigation measures.

Rock Island Dam

Similar to the Rocky Reach Project, the Chelan County PUD would undertake various interim, prototype, and permanent measures at Rock Island Dam in an effort to achieve the 91 percent combined adult and juvenile project passage survival, 93 percent juvenile project passage survival, or 95 percent dam passage survival standards for juvenile anadromous salmonids.

The HCP identifies several specific measures to implement at Rock Island Dam to improve fish passage survival (see Section 5.4 of the Rock Island HCP). One measure is to replace the existing Fisheries Conservation Account spill program with a program that provides spill levels of 20 percent of the daily average flow during a period encompassing 95 percent of the migration period for each Plan species. Under this new program, spring spill would begin no later than April 17 and generally end no later than June 15. The summer spill period is between July 1 and August 15. However, spill periods can be extended to encompass 95 percent of the migration period for each Plan species. The fish migration periods will be determined by fish captured in the second powerhouse juvenile fish bypass system.

Another measure outlined in the HCP is to maintain effective predator control measures consisting of northern pikeminnow removal and piscivorous bird harassment and control measures. The northern pikeminnow removal program may include a pikeminnow bounty program, fishing derbies/tournaments, and the use of long-line and fish trapping methods. Piscivorous birds, including Caspian terns, double-crested cormorants, and various gull species, will be hazed. Hazing techniques include elaborate wire arrays in the tailrace to deter foraging, propane cannons, various pyrotechnics, and lethal control when necessary. The program would be implemented during the juvenile fish outmigration periods.

The PUD would also operate and maintain the adult fish passage systems according to criteria developed through the coordinating committee, and use best efforts to eliminate identified sources of adult injury and mortality while passing the project. The HCP also stipulates the evaluations of the biological significance of adult fallback rates and steelhead kelt loss at the project, and implementation of the coordinating committee recommendations likely to significantly improve survival.

Other measures could include a juvenile bypass system, modified spill gates for surface spill, continued or expanded measures for predator control, and possible improvements to turbines. Survival data obtained at each step in the process would determine the number, type, and magnitude of the various protective measures needed to achieve the pertinent survival standard. Actions would also be taken to improve survival and ensure timely passage of adult anadromous salmonids through the project to meet the 91 percent combined adult and juvenile project survival standard. Some or all of the following measures would be implemented:

- designing, modeling, prototype testing, and installing spill gate modifications to provide surface spill to increase fish passage efficiency;

- testing and evaluating various spill configurations;
- designing, modeling, prototype testing, and installing a turbine bypass system consisting of a surface bypass collection system, with or without secondary collection from turbine intakes;
- replacement of turbine runners to improve survival of juvenile anadromous salmonids that pass through the units, and limiting use of the Powerhouse 1 turbines;
- testing a forebay guidance curtain to route juvenile anadromous salmonids into surface bypass collectors;
- maintaining effective predator control measures; and
- performing necessary studies to properly monitor and evaluate on-site mitigation measures.

Tributary Conservation Plan

Alternative 3 would create a Plan Species Account, to be used to fund activities for the protection and restoration of Plan species habitat within the Columbia River watershed (from Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat, and Wenatchee River watersheds, to compensate for the unavoidable 2 percent project mortality (see Section 7 of the Wells, Rocky Reach and Rock Island HCPs).

Restoration projects would occur within one of seven categories: (1) habitat protection, (2) floodplain rehabilitation, (3) channel function, (4) instream flow improvements, (5) fish passage improvements, (6) riparian restoration, and (7) water quality improvements. These habitat improvement projects could include, but are not limited to:

- providing access to currently blocked stream sections or oxbows,
- removing dams or other passage barriers on tributary streams,
- improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period,
- improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, and
- purchasing important aquatic habitat shoreline areas for preservation or restoration.

Such tributary habitat conservation and restoration measures are expected to improve the migration and rearing conditions for all anadromous fish species, as well as other resident fish. These measures are also expected to help decrease bank erosion, sedimentation, channel scouring, and water quality problems. The improved conditions would increase the opportunities for successful spawning by facilitating the return of adult anadromous salmonids to their natal spawning areas at the proper time and in good health. The tributary committees would review all habitat restoration projects according to the criteria set forth in the HCP supporting documents provided as appendices to the HCPs.

The funding levels for each project to the Plan Species Account are set in the HCPs. The combined total contributions through the 50-year term of the HCPs will be over $46.5 million in 1998 dollars. For the Wells Project, the Douglas County PUD would fund an initial contribution to the account of $1,982,000 (1998 dollars adjusted for inflation). Five years after the initial contribution, the PUD could either provide annual payments of $176,178 (1998 dollars) throughout the HCP term or provide an up-front payment of $1,761,781 (equivalent to 10 yearly payments in

1998 dollars), deducting the actual costs of bond issuance and interest. After a total of 15 years, the HCP parties would determine the contribution method of the remaining funds (at a rate equivalent to $176,178 per year).

These funding levels are based on a 2 percent mitigation level for adult mortality. However, if the adult passage survival is determined to be greater than 98 percent and the juvenile project passage survival is greater than 93 percent, for any one of the Permit species, contributions to the Tributary Fund would be reduced to reflect the actual adult survival estimate of that species.

The adult survival estimates for each Permit species would independently determine one quarter of the funding to the Plan Species Account for each project. For example, if adult steelhead and spring-run chinook salmon survival were determined to be 99 percent, the annual contributions to the Plan Species Account would be based on 1 percent mortality for these two species. However, the annual contributions for the other two Permit species would continue to be based on a 2 percent mitigation level. Under this scenario, the annual contributions to the account would be reduced from a full $8/8^{th}$ contribution (2 percent for four species) to a $6/8^{th}$ contribution.

For the Rocky Reach Project, Chelan County PUD would fund the Plan Species Account at $229,800 annually (1998 dollars adjusted annually for inflation) for the term of the HCP. At the request of the tributary committee, advanced contributions would be made during the first 15 years of the agreement.

For the Rock Island Project, the Chelan County PUD would provide $485,200 annually (1998 dollars adjusted annually for inflation) to the Plan Species Account. At the request of the tributary committee, advanced contributions would be made during the first 15 years of the agreement.

The Plan Species Account would be vested with the authority to expend money contributed by the PUDs for activities within the Columbia River watershed (from Chief Joseph Dam tailrace to the Rock Island tailrace), and including the Okanogan, Methow, Entiat, and Wenatchee River watersheds to increase productivity of anadromous salmonids in the Mid-Columbia River area.

The tributary committee would be composed of one representative of each of the signatory parties. The committee may select other expert entities, such as land and water trust/conservancy groups, to serve as additional, non-voting members of the tributary committee. The committee would be charged with the task of selecting projects and approving project budgets for the purposes of implementing the Tributary Conservation Plan.

The tributary habitat improvement projects would be determined on a case-by-case basis by the tributary committee, subject to the guidelines and standards of biological and economic efficiency and the financial resources of the Plan Species Account. The guidelines for tributary projects place the highest priority on maintaining and improving stream channel diversity and floodplain function. The projects would seek to conserve and protect riparian habitat to improve incubation and rearing conditions in tributary streams.

Through the Tributary Assessment Program, the PUDs would provide support for assessing the relative merits of each tributary project funded (see Section 7.5 of the Wells, Rocky Reach, and Rock Island HCPs). Funding for the assessment program is separate from the Plan Species Account, but is set for approximately $200,000 per project (up to $600,000 for all three projects) (not subject to inflation adjustment) during the term of the HCPs.

Hatchery Compensation Plan

Each hatchery committee would consist of one representative of each HCP signatory party.

These committees would direct the effort required of each PUD to meet the 7 percent hatchery compensation goal to achieve no net impact for each Plan species. The initial estimated HCP hatchery production capacities for each Plan species was based on the average adult returns of that species for a baseline period, the 7 percent compensation level, and baseline adult/smolt survival rates for existing Mid-Columbia River hatcheries (see Section 8 of the Wells, Rocky Reach, and Rock Island HCPs).

The estimated production capacity shall be adjusted periodically, excepting for original inundation mitigation, to achieve and maintain no net impact to the Plan species. Adjustments to the hatchery compensation level may include reduction of production to conform to actual project mortality, as determined from monitoring and evaluation, or increases in production as the base population level increases in the recovering anadromous fish populations. Hatchery compensation may be increased either by increasing the number of fish produced or by increasing the survival of fish produced at the initial production levels. Such adjustments would be based on the results of juvenile passage survival evaluations at the hydroelectric projects.

Until successfully reproducing coho salmon populations are reestablished, or a long-term coho hatchery program is developed, there are no hatchery compensation programs required in the HCPs for coho salmon.

2.3.4.9 Provisions for Unknown Impacts on Other Aquatic Species

The HCPs do not include mitigation measures for non-Plan species. However, species that actively or passively pass the project (such as bull trout) may benefit from improvements at the dams (through improved fish passage conditions). Bull trout are a threatened species in the Columbia River Basin, and although they occur in the project area, the extent of their occurrence and the project-related impacts are largely unknown. The PUDs and FERC are currently conducting informal consultation with the USFWS to assess the potential effect of project operations on bull trout.

Aquatic species that are expected to benefit from the tributary habitat improvement projects conducted under the HCPs are Pacific lamprey and resident trout species (including bull trout) that occupy the same habitats as the Plan species.

Terrestrial wildlife species that use riparian, wetland, and floodplain habitats are expected to benefit from implementation of aquatic habitat improvements in the tributaries. These improvements should increase their food supply, cover, and overall habitat area.

2.3.4.10 Monitoring and Evaluation

All three HCPs propose monitoring and evaluation of on-site measures to determine if the 95 percent juvenile dam passage survival, the 93 percent juvenile project passage survival, or the 91 percent combined adult and juvenile project passage survival metrics have been achieved (see Section 4 of the Wells, Rocky Reach and Rock Island HCPs). In addition, monitoring and evaluation of tributary habitat improvements funded by the Plan Species Account and the number and effects on other species after release of fish produced by the hatchery program would also be monitored.

2.3.4.11 Project Cumulative Effects

The anadromous salmonid mortality rates associated with passage at the projects contribute to the overall mortality of the Plan species passing other downstream hydroelectric projects. However, the salmonid survival improvements resulting from the proposed actions would be in addition to other recovery efforts underway in the basin. The primary recovery efforts include the reasonable and prudent measures identified in the

FCRPS biological opinion, Water Resource Inventory Area planning efforts, Salmon Recovery Funding Board activities, and the extensive predator control activities underway within the Columbia River Basin.

The PUDs would consider the cumulative impact effects when making land use decisions on project-owned lands to meet the conservation objectives of the HCPs, FERC license requirements, and other applicable laws and regulations. The PUDs would notify and consider comments from the signatory parties regarding land use permit applications on project-owned lands. The PUDs would also notify applicants seeking permits to use or occupy project lands or water that such use or occupancy may result in an incidental take of species listed under the Endangered Species Act, requiring advance authorization from NMFS or USFWS.

The run-of-the-river Mid-Columbia River PUD projects have limited capabilities for storing water, and are therefore unlikely to affect water quantity parameters. However, the cumulative impacts of the projects include water quality issues, particularly the effects on temperature and total dissolved gas. The PUDs would continue to work cooperatively with each other, and other entities in the region, to minimize the cumulative effects of project operations on water quality issues.

Project operations could have an effect on recreation, riparian vegetation, and wildlife species along the mainstem Columbia River, particularly for drawdown options. With the general exception of drawdown options however, project operations are not expected to substantially affect these or the other resources analyzed in this EIS, compared to existing conditions.

Off-site tributary enhancement projects could affect all the resources addressed in the EIS, depending on the location and the extent of the projects. Although such changes are expected to have environmental benefits, the effects to resources other than anadromous fish species would likely be minimal. The tributary habitat improvement projects could affect land ownership, if riparian habitat corridors are purchased or leased as mitigation activities. Other habitat improvement projects are likely to require various permits or environmental reviews.

2.3.4.12 Costs and Funding

Funding of all PUD obligations, including studies necessary to evaluate and monitor the effectiveness of those measures, would be provided directly by the PUDs from power sale revenues. It is anticipated that bonds secured by those revenues would be issued for major capital costs, such as bypass construction. Money for the Plan Species Account and the Tributary Assessment Program would also come from project revenues, with the initial contribution possibly obtained from a bond issue (see Section 7.4 of the Wells HCP and Section 7.5 of the Rocky Reach and Rock Island HCPs).

2.3.4.13 Verification of Standards

To determine if the HCPs' survival standards are being met, specific biological and statistical standards have been established in the HCPs (see Section 4.1.4 of the Wells HCP and Section 5.2.3 of the Rocky Reach and Rock Island HCPs). These standards apply to all of the evaluations to be conducted. The results would be utilized to support decisions made after Phase I of the HCPs. Efforts to determine more direct evidence of compliance with the HCP standards for all Plan species would continue during Phases II and III.

Because the juvenile fish passage survival standards cannot be verified for subyearling chinook (summer/fall chinook) or for sockeye salmon, and the 91 percent combined juvenile and adult project survival standard cannot be verified for any of the Plan species, compliance

with the juvenile dam passage survival standards would be based on calculations.

Survival studies of yearling chinook salmon and steelhead were initiated at the Wells Project in 1998 and were initiated at Rock Island Dam in 2002. Survival studies will be initiated at the Rocky Reach Dam no later than 2004. Initial verification of the 93 percent juvenile project passage or 95 percent juvenile dam passage survival standards is expected to take 3 years.

The HCPs provide a mechanism for future verification of the 91 percent combined juvenile and adult project survival standard for each of the Plan species, as the appropriate technology is developed and supported by the coordinating committees.

Wells Project

Because the Wells Project has an existing bypass system, juvenile survival studies were initiated earlier than at the other projects. Douglas County PUD conducted juvenile survival studies in 1998 using yearling chinook salmon, and in 1999 and 2000 using yearling steelhead. These studies met the biological and statistical standards established in the revised HCPs. Additionally, the Douglas County PUD conducted 3 years of fish passage efficiency evaluations (an estimate of the number of juvenile fish bypassing the project powerhouse through the surface bypass system) for the Wells Project bypass system.

The 3-year average from the yearling chinook and steelhead project survival studies was 96.2 percent. The 3-year average for the fish passage efficiency studies indicates that 92 percent of the spring-run migrants (yearling chinook, steelhead, and sockeye) and 96 percent of the summer-run migrants (summer/fall chinook) use the bypass system. Based on the best estimate of turbine and bypass system survival (90 to 93 percent and 98 to 99 percent, respectively), spring-run migrants are expected to have a juvenile dam passage survival rate of 97 to 98 percent and summer-run migrants are expected to have a 97 to 98 percent juvenile dam passage survival rate.

Throughout the term of the HCP, the 93 percent juvenile project passage survival, the 95 percent juvenile dam passage survival standard, or the 91 percent combined adult and juvenile project survival standard would be reevaluated every 10 years. It is anticipated that survival studies would be conducted for sockeye and subyearling chinook salmon, as well as adult salmon and steelhead, as technology is developed.

Funding for the Wells Tributary Conservation Plan is tied directly to the fish passage survival standard. If it is determined that the Wells adult survival rate for an individual Plan species is equal to or greater than 98 percent and the juvenile project passage survival is greater than 93 percent, the funding of the Tributary Conservation Plan would be reduced to reflect adult survival estimates for that species.

Rocky Reach Project

The Chelan County PUD is developing a surface bypass collector system for the Rocky Reach Project. This system is expected to be installed by the 2003 spring outmigration period, while survival tests would not start until 2004. Chelan County PUD would initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that the 93 percent juvenile project passage survival or the 95 percent juvenile dam passage survival standard is being met. The best available information would be used to determine whether the juvenile passage survival standards have been met for each of the remaining Plan species (e.g., survival information from surrogate species combined with measurements of fish passage through non-turbine routes). Throughout the term of the HCP, the pertinent survival standard would be reevaluated from time to time as determined necessary by the coordinating committee.

Rock Island Project

Spill is currently the preferred juvenile bypass measure at Rock Island Dam. Beginning in 2002, Chelan County PUD would initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that either the 93 percent juvenile project passage survival or the 95 percent juvenile dam passage survival standard is being met. As is the case with the Wells and Rocky Reach projects, the best available information would be used to determine the juvenile passage survival for each of the remaining Plan species (e.g., survival information deemed sufficient by the HCP coordinating committee could be combined with measurements of fish passage through non-turbine routes to develop interim estimates of dam passage survival). Throughout the term of the HCP, the pertinent survival standard would be reevaluated from time to time as determined necessary by the coordinating committee.

2.3.4.14 Compensation for Unavoidable Project Mortality

During the development of this EIS, certain sections of the HCPs required clarification to allow for accurate analysis of the potential effects of the actions on Endangered Species Act-listed species and on other natural resources. Most of the clarifications related specifically to modification of the standards to ensure no net impact. It should be noted that HCP survival standards are fixed and compensation would not increase if the standards are not being met. For example, hatchery compensation would not be increased to 9 percent if juvenile dam passage survival were measured at only 93 percent for a given species. The 2 percent shortcoming in the juvenile dam passage survival standard would need to be addressed through improvements in dam passage survival. Likewise, if the 7 percent hatchery compensation level is not met due to NMFS Endangered Species Act concerns, neither the dam passage survival standard, the project survival standard, nor the habitat compensation standard would be adjusted. However, failure to meet the standards by 2013 (2018 for the Wells Project) would allow parties to withdraw from the HCP agreements.

Although the compensation levels would not increase as a result of not meeting the survival standards, hatchery compensation for the Wells Project could be reduced if the survival standards are exceeded. However, if the survival standards are exceeded at Rock Island or Rocky Reach dams, Chelan County PUD may reduce the amount of spill to levels which will continue to meet the survival standards of the HCPs, as indicated by an additional series of survival studies.

2.3.4.15 Hatchery Compensation Plan Issue

During the development of the HCPs, NMFS determined that the 7 percent hatchery compensation levels may adversely affect wild salmon populations under certain conditions.

Therefore, until the specific details of the compensation programs were developed (including identification of appropriate broodstock, maximum percentages of the wild populations that can be trapped for broodstock, and the total number of fish produced through artificial means), NMFS could not guarantee that the 7 percent compensation level would satisfy Endangered Species Act requirements.

Although several of the affected Columbia Basin Treaty Tribes made significant comments during the scoping process associated with this EIS, a major concern was NMFS's reluctance to guarantee the 7 percent compensation levels. These levels were a key component of achieving and maintaining no net impact and an important Tribal consideration for maintaining their treaty rights under the conditions of the HCPs. The inability of NMFS to guarantee the 7 percent hatchery compensation levels, under all

circumstances, led to a breakdown in the negotiation process between the parties. Without this guarantee, as well as other assurances concerning Tribal treaty rights, the Yakama and Umatilla Tribes would not endorse the HCPs. To address the Tribes' concerns regarding hatchery production levels, subsequent HCP negotiations resulted in an agreement to provide the PUDs with a 7 percent hatchery production guarantee through 2013. In 2013 the parties to the HCP agreements shall have an opportunity to review and make modifications to the hatchery compensation component of the HCP agreements. Based on the results of the program review in 2013, the program could be changed at that time, or in subsequent reviews scheduled for every 10 years.

To minimize the potential impacts to wild fish from the Hatchery Compensation Plans, the PUDs would implement specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations, and achieving no net impact to the Plan species. Specific objectives may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest objectives.

For example, the Douglas County PUD would alter its sockeye compensation program, which currently raises spring-run chinook as a substitute species. After 2005, sockeye mitigation would be accomplished by implementing a set of options identified in the Sockeye Enhancement Decision Tree (Section 14, Figure 3 of the Wells HCP). The initial focus of this program is funding the implementation of a Canadian Flow Management Program. The flow management program is designed to incorporate current knowledge about biological and physical processes controlling sockeye salmon production into a set of water management models. The models would be used to make "fish friendly" water management decisions in the Canadian portion of the Okanogan River system. The goal of this program is to enhance natural sockeye production, instead of funding artificial production programs.

Due to the increased emphasis on developing hatchery programs that focus on rebuilding natural populations, NMFS believes (pending completion of its review of the HCPs) that the initial hatchery production levels outlined in the HCPs are unlikely to jeopardize the continued existence of the listed species in the near term. However, there is still some uncertainty over the long term. As a result, it was agreed that the initial hatchery production levels necessary to compensate for 7 percent unavoidable mortality at the projects would be maintained until a comprehensive review is conducted in 2013. (Chelan County PUD hatcheries are compensating for a 14 percent juvenile mortality in the period running through 2013.) These production levels are based on adult return rates during the baseline period, the 7 percent compensation requirement, and baseline adult to smolt survival rates for existing Mid-Columbia River hatcheries. In addition to the program review in 2013, additional reviews would occur every 10 years during the term of the HCPs.

2.3.4.16 Other Options Considered

Similar to Alternative 2, Alternative 3 could include project reservoir drawdown after 2013 for the Rocky Reach and Rock Island projects or after 2018 for the Wells Project. Either the USFWS or NMFS could pursue this option under certain circumstances, including if: (1) no net impact has not been achieved or has been achieved but has not been maintained, (2) the Plan species are not rebuilding and the project is a significant factor in the failure to rebuild, or (3) is agreed to by the PUDs.

2.3.4.17 Recent HCP Policy Revisions

On June 1, 2000, USFWS and NMFS published a final addendum to the *Habitat Conservation*

Planning and Incidental Take Permit Processing Handbook (USFWS and NMFS 2000). This addendum, which is also known as the five-point policy guidance, provides clarifying direction on five issues brought forth from recent HCPs implemented throughout the United States. The following sections describe how the applicant HCPs meet the HCP addendum.

Biological Goals and Objectives

The addendum recommends that biological goals and objectives be incorporated in HCPs. These goals may be either habitat- or species-based. Species-based goals are expressed in terms specific to individuals or populations of that species. The performance standards represent the biological goals and objectives for the HCPs (i.e., the HCP standards). These standards require specific survival goals based on the population passing through each project. In addition, incidental mortality is mitigated through hatchery production and habitat improvements to achieve an overall no net impact standard.

Adaptive Management

The use of an adaptive management strategy is recommended to (1) identify uncertainties related to quantifying the achievement of goals and objectives of the HCPs, as well as the questions that need to be addressed to resolve these uncertainties; (2) develop alternative strategies and determine which experimental strategies to implement; (3) integrate a monitoring program that is able to detect the necessary information for strategy evaluation; and (4) incorporate feedback loops that link implementation and monitoring to a decision-making process that results in appropriate changes in management. Adaptive management would be incorporated into the HCP monitoring programs that provide the feedback necessary to determine the effectiveness of various approaches being implemented to increase fish survival. Throughout the term of the HCP, what is learned would be used to adjust conservation measures.

Monitoring

HCP handbook guidance on monitoring recommends that the monitoring program reflect the measurable biological goals and objectives. The monitoring programs developed under the Mid-Columbia River HCPs are three-fold: (1) confirm fish survival through the dams (validation monitoring), (2) evaluate the effectiveness of on-site mitigation measures implemented to improve fish survival (effectiveness monitoring), and (3) confirm that the on- and off-site mitigation measures are applied correctly (implementation monitoring).

Permit Duration

Factors to be evaluated when determining permit duration include the time line of the proposed activities and the expected positive and negative effects on covered species associated with the proposed duration. The HCP terms generally compliment the term of a project operating license, but more importantly reflect a desire to provide long-term protection assurances for the Plan species that also account for oceanic condition changes that may occur over a longer period of time.

The HCP handbook addendum recommends a 90-day public comment period for large scale, regional or complex HCPs. The addendum notes that 60 days would be appropriate if the applicant has taken steps to involve the public early in the process. In this process, the public was provided with four months to comment on the draft EIS; interested parties participated directly in developing the revised HCPs over the course of 6 months; and an additional comment period of 30 days was provided on the revised HCP permit applications.

2.4 ACTIONS COMMON TO ALL ALTERNATIVES

Only those project operations that affect fish passage would be altered, if necessary, to assist in increasing the overall salmon and steelhead survival rates. Studies to evaluate and improve fish passage have been ongoing since the dams were constructed. As a result, the key factors influencing fish passage have already been identified. Project operations that are included under all of the alternatives are:

- fishways,
- fishladders,
- fish bypass,
- turbine operations,
- predator control,
- hatcheries, and
- spill.

The four tributaries where funds for the Plan Species Account would be directed under the HCP (Wenatchee, Entiat, Methow, and Okanogan) have threatened (bull trout) and endangered (spring-run chinook and steelhead) species. Numerous efforts are being, or will be, implemented to improve fish survival and breeding opportunities in the streams that are unrelated to the operation of the Wells, Rocky Reach, and Rock Island dams or the HCPs. These separate improvement activities (not funded by the PUDs) would continue under all alternatives.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

During the scoping process of this EIS, several other *independent* alternatives were considered but eliminated from further analysis for two main reasons: either (1) the alternative in itself did not allow for the continued operation of the hydroelectric projects, or (2) the alternative did not satisfactorily address the entire range of issues affecting Endangered Species Act-listed species. These independent alternatives are described in more detail in the following sections.

Note that all alternatives in this EIS contain several specific measures that may be implemented at each project. By themselves, these measures are unlikely to result in recovery of Endangered Species Act-listed salmonid species or to significantly enhance the number of unlisted anadromous salmonids returning to the basin. Each measure typically affects just one component of a multi-faceted problem and either impacts other areas of the salmonid life cycle or inadequately provides the protection necessary to recover the species to harvestable levels without the concurrent implementation of additional measures. Where appropriate, however, specific components of these measures are included in the two action alternatives. Included below is a discussion of why individual protection measures were not considered as unique alternatives.

2.5.1 DAM REMOVAL

Dam removal would return the Mid-Columbia River to a free-flowing state that would arguably provide the greatest benefits to salmon and steelhead. The dam passage impacts would be eliminated and additional spawning and rearing habitat for some Plan species would be created. Dam removal is extremely controversial, and can only be legally mandated at project relicensing. Over the next 10 years, the removal of Wells and Rocky Reach dams may be considered and addressed under the relicensing efforts for the projects if requested by interested parties. Dam removal for the Rock Island Project would not be

evaluated until 2028, when its license is up for renewal.

Under the shortest possible time frame, it is likely that the decision to remove a dam would require up to 10 years, with an additional number of years needed to develop the procedures and to execute the deconstruction efforts. As an example, in 1995, the U.S. Army Corps of Engineers initiated a Lower Snake River Juvenile Salmon Migration Feasibility Study, which contemplated the removal of the four Lower Snake River dams. This effort was finally completed in 2002 with the issuance of a Record of Decision.

A similar process can be expected for removal of the Mid-Columbia River dams, if initiated during project relicensing. Throughout these studies and discussions, salmon and steelhead would continue to decline, possibly to extinction. Therefore, due to the legal constraints associated with mandating dam removal, the time involved, and the interim impacts to both juvenile and adult anadromous salmonids, dam removal is not considered a reasonable alternative and was not considered in detail. This alternative also does not meet the purpose and need of the project, which is to protect and enhance anadromous fish populations and allow the PUDS to continue to generate electricity.

2.5.2 JUVENILE FISH BYPASS SYSTEMS

Although juvenile fish bypass systems have been included as a part of all alternatives evaluated in detail, they would not provide sufficient protection for the recovery of the species as an independent alternative. Therefore, this alternative was not evaluated in detail. A juvenile fish bypass system provides a passage route around a dam's turbine units. It consists of a collection area that allows fish to enter the system from the project's forebay, a bypass conduit that transports fish around the dam, and an outfall located downstream of the project. Although existing spillway structures and ice and trash sluiceways (conduits designed to pass debris over a dam) can be relatively effective at passing fish, the term juvenile bypass system usually refers to a facility specifically designed and suited to this task.

Bypass systems using standard length turbine intake guidance screens, currently in operation on the Lower Columbia and Snake rivers, typically pass approximately 70 percent of yearling salmonid outmigrants (stream-type chinook, steelhead and sockeye). These systems are less effective for subyearling outmigrants (ocean-type chinook) (approximately 50 percent), and they pose a significant risk of injury to sockeye and juvenile lamprey. Although extended length screens have improved the guidance of these systems to a degree, stress and injury continues to occur, and comparatively extensive operations and maintenance efforts can reduce their overall effectiveness.

Surface-oriented bypass systems typically provide juvenile fish passage without incorporating guidance screens. Entrances to these systems are designed to intercept juvenile salmon and steelhead in the upper part of the water column, before the fish enters the turbine unit intakes. Although preferable to screened bypass systems, only the Wells Dam surface bypass system has been consistently efficient at attracting and passing substantial numbers of juvenile anadromous salmonids. A permanent surface bypass system is being installed at the Rocky Reach dams, but it may be necessary to provide some additional protection and enhancement measures to meet the established survival levels for some species. Therefore, although juvenile bypass system development, construction, and operation are included in each of the alternatives, it is not expected to be an adequate alternative in and of itself for all species.

2.5.3 SPILL

In most cases, spill is an effective means of bypassing salmon and steelhead around a dam. However, spill alone would likely not provide

sufficient protection for listed species without considerable impacts to other natural resources. In studies conducted on the Lower Columbia and Snake Rivers, spill has consistently resulted in higher survival levels for juvenile anadromous salmonids than for any other bypass methodology tested. However, the quantity of spill required to bypass significant numbers of juvenile fish may result in increased total dissolved gas levels and affect other water quality parameters.

When water is discharged over a spillway, air is drawn into the tailwater as flow plunges deep below the water surface. As this air reaches the higher pressures associated with increasing water depths, the air is forced into the water column. Increasing levels of spill draw increasing volumes of air to depth, forcing higher levels of the atmospheric gasses into the water. High concentrations (in excess of 120 percent of saturation) of some of these gasses (e.g., nitrogen) can be deadly to fish and other aquatic organisms. Therefore, the amount of water that can be discharged over a given spillway is limited by the amount of atmospheric gasses that are introduced into the tailwater.

At lower spill levels, the volume of water discharged typically passes proportionately higher numbers of fish. For example, if 20 percent of the total river flow is spilled, up to 40 percent of the juvenile anadromous salmonids may bypass the dam via the spillway. As the spill volume increases, to 60 percent for example, only 60 percent of the juvenile anadromous salmonids might pass the spillway. In many cases, 60 percent spill would produce total dissolved gas levels above the Washington Department of Ecology limit of 120 percent in the tailrace and 115 percent at the next downstream dam. At the Mid-Columbia River projects, the maximum spill level is expected to be closer to 40 percent.

Spill is currently the primary measure to pass juvenile fish at Rock Island Dam, and is the primary measure proposed under Alternatives 2 and 3 for Rock Island. It is also a component of the Wells Dam bypass system. However, it is not as effective at Rocky Reach Dam. Spill is a component of the alternatives considered in detail, and will likely assist in meeting the overall survival requirements. In and of itself, however, spill is not expected to satisfy all of the needs of listed species, and was therefore eliminated as an independent alternative for detailed consideration.

2.5.4 FISH TRANSPORTATION

An alternative method of fish passage is to collect juvenile salmon and steelhead at dams as they migrate downstream and then transport the fish by truck or barge around the downstream dams and reservoirs. Advantages of fish transportation include protection from direct and cumulative turbine passage mortality, from predation in the reservoirs and tailraces, and from gas supersaturation caused by excessive levels of spill. Transportation can also help to minimize delays in migration that are caused by slack water in the reservoirs between dams.

Transportation additionally requires the construction of juvenile collection systems that include dewatering structures and separator facilities to enable barge and truck loading facilities. The transportation program is also limited by the ability of the mechanical bypass collection systems to effectively attract juvenile anadromous salmonids. Under certain conditions, transportation may also result in lower adult returns and may increase the level of straying. Currently, fish are transported in the Lower Snake and Columbia Rivers where bypass and separator facilities have been constructed, although fish transportation has not occurred at the three Mid-Columbia River dams (Wells, Rocky Reach, and Rock Island). Although transportation assessments were conducted for the Wells and Priest Rapids hydroelectric projects, the results were generally inconclusive regarding the benefits of transportation on adult return rates, compared to in-river migration.

Given the requirement to design, construct, and install juvenile collection, separator, and loading facilities, transportation is not a valid option in and of itself. In addition, due to the potential stress, injury, and mortality to juvenile anadromous salmonids associated with these systems, and the expectation that guidance efficiencies will fall short of supporting the required survival levels, this alternative has been eliminated from consideration as a stand alone-option. Also as a result of these factors, and the uncertainties related to the overall benefits of transportation, this measure is not included as a component of the two action alternatives addressed in this EIS.

2.5.5 ARTIFICIAL FISH PRODUCTION

The assumption governing this alternative is that juvenile and adult anadromous salmonids that are killed incidentally to project operations can be replaced by juvenile fish produced in a hatchery. Increases in production would likely occur at most of the existing hatcheries, and the number of juvenile fish produced would be based on the calculated fish passage mortality rate attributed to each dam. The goal of this effort would be to mitigate up to 100 percent of the dam-related passage mortality.

Based on several decades of hatchery mitigation and enhancement activities, it is now clear that this methodology alone will not recover Endangered Species Act-listed species or satisfactorily enhance naturally producing unlisted salmonid populations in the Columbia River Basin.

Hatchery fish can have direct and indirect effects on wild fish populations. Competition between the larger hatchery-reared juvenile salmon and steelhead and the smaller wild juvenile salmon and steelhead for food and space and the predation that is likely to occur between these populations may impact the wild fish. In addition, outplanting non-indigenous hatchery-reared juveniles into local habitats further reduces the integrity of the wild populations by increasing the likelihood of genetic mixing. This results in a dilution of the wild gene pool, which affects the long-term health and viability of the wild populations.

As more and more hatchery fish are produced, wild stocks continue to be diluted in comparison to hatchery stocks, ultimately resulting in fewer and fewer wild fish. This continued decrease in the population of wild fish does not meet the objective of recovering an endangered or threatened species. Although limited artificial supplementation efforts utilizing locally adapted stocks would likely be a component of each action alternative to help prevent the extinction of listed species, and to compensate for a certain level of mortality for unlisted species, additional measures are required to ensure the species' long-term protection and enhancement. Therefore, based on the disadvantages associated with excessive supplementation levels, this alternative was eliminated from detailed consideration.

2.5.6 SEASONAL RESERVOIR DRAWDOWN

Seasonal reservoir drawdown refers to lowering the water level of the reservoir located immediately upstream of a dam during juvenile fish migration periods. This concept was initially developed on the Lower Snake River to reduce the time it takes water (and incidentally, juvenile salmon and steelhead) to travel through the reservoirs. Studies on the Columbia River Basin generally show a correlation between increased flow (water velocity) and increased fish migration rates. From these results, it has been generally inferred that this would result in higher juvenile salmon and steelhead survival. Although there is limited data on actual survival improvements, modeling data suggest that high flow conditions could provide greater survival (BPA et al. 1994a; NMFS 1998). While Giorgi et al. (2002) found little evidence of a flow-survival relationship, steelhead survival during the extreme low-flow conditions in 2001 were dramatically reduced.

Rapidly increasing temperatures and higher rates of residualism among juvenile steelhead were also implicated as a causative factor in this reduced survival.

To decrease water particle travel time, either additional flow must be provided through the reservoir or the cross-sectional area of the reservoir must be reduced. Drawdown reduces the cross-sectional area of project reservoirs.

As the concept of reservoir drawdown was more thoroughly developed on the Lower Snake River, lowering the reservoir to slightly above the spillway crest was evaluated. This level of drawdown was intended to create sections of free-flowing river in the tailrace areas of the next upstream dam, and thus return the river to a more natural state. The Army Corps of Engineers evaluated the effects of seasonal reservoir drawdown that would only be in effect during the juvenile migrating of anadromous salmonids. They found that significant modifications would be necessary to the existing fish passage facilities, and the seasonally fluctuating reservoirs would impact existing wildlife habitat, riparian habitat and salmon and steelhead spawning and rearing habitats. Significant loss of power production would also occur, as would impacts to irrigation, municipalities, and industry.

On the Mid-Columbia River, higher flows have been correlated to improved migration speed for sockeye salmon and steelhead. However, no significant correlation was identified for the other salmonid species, and there was no consistent relationship between flows and survival for most species (NMFS 2000a). Therefore, in and of itself, improving water particle travel time will not significantly improve conditions for all Endangered Species Act-listed or unlisted species. In addition, seasonal spillway crest drawdowns have a considerable number of associated habitat impacts and a significant loss of power production that render this option impractical. It is therefore not considered a realistic alternative and has not been evaluated in this analysis.

2.5.7 CONTINUOUS SPILL PROGRAM

Although spill is included in all action alternatives, it was not considered on a continuous basis to cover 100 percent of the juvenile migration period. A continuous spill program may render the projects uneconomical with minimal increases in juvenile survival. This option was therefore not considered a practicable alternative. However, Alternative 2 includes the option of increasing spill to cover up to 99 percent of the migration periods.

2.5.8 NON-POWER OPERATIONS

Section 15(b) of the Federal Power Act authorizes FERC to issue a license for non-power use when it "finds that, in conformity with a comprehensive plan for improving or developing a waterway or waterways for beneficial public uses, all or part of any licensed project should no longer be used or adapted for use for power purposes." If non-power licenses were granted to any of the Mid-Columbia River dams, power production would presumably cease (except for potential emergency power requirements of the project) and all the flow would pass through the spillways and fishways. No entity has recommended issuance of a non-power license, and this would only occur at the time of relicensing. Note that dam decommissioning and possibly seasonal reservoir drawdown would result in non-power operations.

2.6 ALTERNATIVE COMPARISON

Because all three of the alternatives strive to improve fish survival at the dams, this section describes both the environmental differences among the alternatives at the project site and the

procedural differences for implementing the alternatives, as shown in Table 2-8 and described below.

The most significant differences among the alternatives are the scope of the species covered, the statutory obligations satisfied, the parties that support the alternatives, and the timing and certainty for implementation. For example, under Alternative 1, current FERC license requirements would address all species but may or may not address the additional requirements of the Endangered Species Act. Alternative 2 would result in an additional protection plan for anadromous salmonid species but is primarily concerned with the protection and recovery of Endangered Species Act-listed Upper Columbia River steelhead and spring-run chinook salmon. A new Endangered Species Act consultation would occur at the time each project is relicensed, or when significant new information is available that indicates that existing protection measures are not adequate for the listed fish and a reopener clause proceeding is initiated. This would help in the protection of anadromous salmonids. Finally, Alternative 3 (Proposed Action) represents long-term settlements of the anadromous salmonid issues for each project under the current licenses and at relicensing for all anadromous salmonid species in the project area. Alternative 3 would be effective for a 50-year term, although comprehensive reviews of the programs and species status would occur every 10 years.

2.6.1 AFFECTED SPECIES

2.6.1.1 Alternative 1 (No-Action)

For purposes of comparison only, it is assumed that protection for the listed and non-listed anadromous salmonid species would be limited to existing measures under current FERC licenses and agreements. Existing measures, however, may not prevent the extinction of listed species, nor are they expected to increase the populations of non-listed species above current levels.

2.6.1.2 Alternative 2

Alternative 2 includes the protective measures identified in Alternative 1, as well as additional measures to protect listed anadromous species. Authorities afforded to NMFS under the Endangered Species Act would apply to Upper Columbia River steelhead, Upper Columbia River spring-run chinook salmon, and Mid-Columbia River steelhead. Protection for other Endangered Species Act-listed species (including bull trout) that might be impacted by the Mid-Columbia River hydroelectric projects would be addressed through separate but similar actions to those identified for Alternative 2.

NMFS and FERC also have obligations to protect anadromous species through the Federal Power Act through the relicensing or license reopener procedures. As with the other alternatives, additional protection for non-listed anadromous species is expected through these proceedings. However, the protection measures are not expected to be as comprehensive as those that apply to the listed species.

2.6.1.3 Alternative 3

The HCPs provide the same level of protection for sockeye, summer/fall-run chinook, and coho salmon as they provide to the Endangered Species Act-listed species. Although the wild population of coho salmon has been extirpated from the action area, the HCPs provide measures to protect reintroduced populations. Although the impacts to Mid-Columbia River steelhead[2] are likely limited to water quality issues, this species is not specifically addressed in the HCP agreements. Protection for bull trout or other Endangered Species Act-listed species would be addressed under separate Section 7 consultations.

[2] This Evolutionarily Significant Unit includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington; but excluding steelhead from the Snake River.

TABLE 2-8. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Endangered Species Act Compliance	Continue with existing measures under current license conditions[1]	Section 7(a)(2) for ESA-listed species for all three projects	Section 10(a)(1) for all Plan species (applies to those species which are currently listed as well as those that could be listed in the future)
Duration of Each Alternative	50 years[2]	Same as Alternative 1[2]	50 years subject to withdrawal and termination provisions
Species Covered	All anadromous salmonid species	Same as Alternative 1, but additional measures would focus primarily on ESA listed species.	Same as Alternative 1
Protection Measures	Limited spill and bypass measures, continued operation of adult fishways	Additional project operational and structural modifications for listed species and potentially additional protection measures for non-listed anadromous fish through the issuance of a new license; determination and implementation of measures would depend on ESA consultations, negotiations, and Federal Power Act authorities.	Following HCP approval, immediate implementation of additional project operational and structural modifications for all Plan species, as well as habitat improvement measures
Implementation Timing	Protection measures currently being implemented	Protection measures to be implemented during relicensing, license amendments or under reopener clause proceedings, but subject to Section 7(a)(2) consultations; implementation would occur following FERC approval of the measures, which typically occurs up to 5 years following commencement of formal ESA consultation	Implemented immediately following HCP approval
Performance Standards	Currently based on fish passage efficiency for specific measures, such as a specified spill level for a fixed period of time or until moneys in the Fish Conservation Account are exhausted (no project or species level standards)	Same as Alternative 1, except for the likely development of appropriate survival standards for listed species through ESA consultations, as well as some potential for developing survival standards for non-listed anadromous salmonid species through the Federal Power Act	No net impact for all Plan species - 91% combined adult and juvenile project (reservoir and dam) passage survival, or 93% juvenile project passage survival, or 95% juvenile dam (forebay, dam, and tailrace) passage survival; compensation to obtain no net impact also includes up to 7% hatchery programs and 2% to tributary programs

TABLE 2-8. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Project Lead for Identifying and Implementing Protection Measures	FERC through the existing coordinating committees	Same as Alternative 1 or through new license conditions	HCP coordinating committees
Location of Fish Protection Measures	Project area, including reservoir, dam structures, tailrace, and hatcheries	Same as Alternative 1	Same as Alternative 1 and additionally including Wenatchee, Entiat, Methow, and Okanogan Rivers and tributaries
No Surprises Policy	Not applicable	Not applicable	Applicable, subject to certain circumstances defined in the withdrawal provisions of the HCP agreements
Continued Studies to Assess Survival	Needed to verify fish passage measures at Rock Island and Rocky Reach dams	Same as Alternative 1	At least 3 years of evaluation for each Plan species, and periodic reevaluations every 10 years or as determined by the HCP Coordinating Committees
Monitoring Following Statement/Permit Issuance	Not applicable	As needed to ensure effectiveness of measures and status of salmonid species	Periodic monitoring to verify survival for all Plan species
Future Provisions for Other Aquatic Species	Would occur under relicensing or under existing license reopener clauses	Same as Alternative 1, although Endangered Species Act-listed species would be covered under separate consultations	Same as Alternative 2
Hatchery Compensation	Continued hatchery funding at present level, for inundation compensation levels and ongoing unavoidable losses (hatchery compensation can be adjusted for Wells based on actual losses)	Same as Alternative 1, although production levels may be reduced at any time based on potential effects to listed species	Continued hatchery funding for inundation compensation levels; hatchery funding would be established to mitigate for unavoidable losses; initially, mitigation would be set to achieve a 7 percent compensation level but could be adjusted periodically based upon the results of survival studies; additional survival reevaluations would take place every 10 years

TABLE 2-8. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Tributary Improvements	No PUD-funded improvements	Same as Alternative 1	PUD contributions to the Plan Species Account would pay for projects that improve salmon and steelhead habitat in the Wenatchee, Entiat, Methow, and Okanogan River Basins, as well as the Mid-Columbia River mainstem; the combined funding over the 50-year term of the HCPs is over $46.5 million, and is specified and guaranteed in the HCPs
On-Site Protection Measures			
Wells	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, if adult fish passage problems are identified, develop solutions to the problems	Adult Passage: Same as Alternative 1 or as needed to prevent the extinction of listed species; conduct spawning success evaluations, operate surface bypass system during adult steelhead and spring-run chinook migration periods and downstream kelt passage period	Adult Passage: Same as Alternative 1, with the additional requirement to meet the 91% combined adult and juvenile survival standards for all Plan species
	Juvenile Passage: Evaluate and control total dissolved gas, continue, operate surface bypass system to achieve 80% fish passage efficiency for spring and summer migrants	Juvenile Passage: In addition to measures in Alternative 1: operate the turbines as efficiently as possible, operate surface bypass system 24 hours/day for up to 99% of juvenile migration, increase spill as needed to improve survival but limited by dissolved gas	Juvenile Passage: Meet 93% project passage survival or 95% dam passage survival for all Plan species by increasing effectiveness of juvenile bypass system, spill gates, predator control, and turbine usage, or through other measures
Rocky Reach	Adult Passage: Continue to operate and maintain adult fishladders, operate powerhouse units within 1% of peak efficiency	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, conduct modeling and develop solutions for adult fish passage problems, use spillway flow configurations to optimize adult fishway attraction flows, provide safe passage for adult fallbacks and kelts, evaluate biological impacts of adult passage	Adult Passage: Same as for Wells (above)

TABLE 2-8. COMPARISON OF ALTERNATIVES FOR ANADROMOUS SALMONID CONSERVATION MEASURES (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Juvenile Passage: Operate the turbines as efficiently as possible during the migration seasons, spill 15% of daily river flow for 42 days of the spring migration period and 10% for 34 days during the summer migration; evaluate and construct a permanent bypass system and replace old turbine runners, control total dissolved gas, continue predator control measures, monitor passage and total dissolved gas levels to meet requirements	Juvenile Passage: Same as Alternative 1, except for additional spill to improve juvenile fish passage survival rates to cover up to 99% of the migration period, but limited by dissolved gas levels; consider additional or alternative juvenile bypass options such as a sluiceway	Juvenile Passage: Construct and operate a new juvenile bypass facility and spill 15% of the daily average river flow, over 95% of the migration period of each Plan species (in addition, spill is increased to 25% for three weeks during the spring migration period to further protect sockeye), or as necessary to meet the survival standards listed above for Wells Dam, other operational criteria would be similar to Alternative 1
Rock Island	Adult Passage: Continue to operate and maintain adult fishladders	Adult Passage: Same as for Rocky Reach (above)	Adult Passage: Same as for Wells (above)
	Juvenile Passage: Provide spill as requested by Fishery Agencies and Tribes through the Fish Conservation Account (currently assessed at about $3.2 million), evaluate fish guidance efficiency, control gas abatement, continue predator control measures	Juvenile Passage: Increase spill to improve juvenile fish passage survival rates to cover up to 99% of the migration period, but limited by dissolved gas levels; enhance spillway passage efficiency, preferentially use Powerhouse 2 turbines, and minimize use of Nagler turbines	Juvenile Passage: Spill 20% of the daily average river flow, over 95% of the migration period of each Plan species; also strive to meet the survival standards listed above for Wells
Dispute Resolution	Disputes resolved by Wells, Rock Island, and Mid-Columbia Coordinating Committees or FERC and/or in court	Disputes are resolved by NMFS, FERC, and/or in court	Disputes resolved by coordinating committees or policy committees, if no resolution is reached, procedures would be similar to Alternative 2
Additional Protection Measures	As negotiated during relicensing or license re-opener clauses	Other measures as required by FERC and NMFS to ensure protection of salmonid species and recovery of the listed species	As determined by the HCP coordinating committee to meet the survival standards for all Plan species

[1] Alternative 1 (no-action alternative) represents existing baseline conditions for comparative purposes only. The measures implemented under Alternative 1 may not comply with the Endangered Species Act.

[2] Considered for comparison purposes only.

2.6.2 PROCEDURAL DIFFERENCES

2.6.2.1 Alternative 1 (No-Action)

Provisions of this alternative would be implemented under existing FERC license conditions, which currently include use of several coordinating committees. The committees consist of members representing fishery agencies, Tribes, and PUDs. The protection measures implemented through this process require unanimous consent of all parties. This has resulted in contested proceedings and legal debates among the parties that have significantly delayed implementation of fish protection measures. This alternative does not contemplate additional protection for listed or unlisted anadromous fish, and may not satisfy Endangered Species Act requirements.

2.6.2.2 Alternative 2

In addition to measures implemented through existing FERC license conditions, NMFS has the legal authority under the Endangered Species Act to recommend additional measures necessary to ensure that any FERC action affecting the projects does not jeopardize the continued existence of listed species. Such actions include relicensing proceedings, license amendments and proceedings under the reopener clauses. NMFS may also identify the most appropriate measures to be taken at each project and modify the measures as needed if species continue to decline. FERC, as the action agency, must include these measures in the license to obtain exemption from the take prohibitions as described under Section 9 of the Endangered Species Act. Under Section 7, NMFS has a legal responsibility to provide the benefit of the doubt to listed species with respect to gaps in the information base.

If FERC or the PUDs disagree with NMFS's decisions under this process, lengthy legal proceedings may ensue. During these proceedings, measures in addition to those already included in the FERC-issued operating licenses and settlement agreements are not likely to be implemented.

Species not listed under the Endangered Species Act would be addressed through NMFS's authorities under the Federal Power Act and the Magnuson-Stevens Fishery Conservation and Management Act, although these species might also benefit from actions implemented for the listed species. In addition, FERC relicensing or license reopener proceedings are expected to result in greater protection measures for all anadromous species.

2.6.2.3 Alternative 3

According to HCP provisions, the primary authority to determine the appropriate protection measures for each Plan species is provided to the coordinating committees (comprised of the PUD responsible for the HCP, NMFS, and each of the signatories to the agreement) for a joint decision on the appropriate measures. In the case of a dispute, if the coordinating committee cannot reach a unanimous agreement within 20 days, the dispute would be referred to the policy committee. If the policy committee cannot reach a unanimous agreement within 30 days, the HCP parties may pursue any other right that they might otherwise have to affect a decision, which would be similar to the dispute resolution options available under Alternatives 1 and 2.

Because the HCPs establish specific actions, responsibilities, and duties to be carried out by the PUDs, each of the signatories to the agreements agrees not to institute any action under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning Conservation Act, Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, or Title 77 RCW with regard to the Plan species for these three projects (except as noted for the dispute resolution process). NMFS's No Surprises policy

(which ensures the PUDs that NMFS would not request additional measures during the term of this agreement) would be in effect. However, the No Surprises policy would not affect the ability of NMFS to withdraw from the HCP agreements under the withdrawal provisions. While the No Surprises policy ensures that the HCP goals remain the same, the measures needed to achieve the goals could change.

2.6.3 TIME FRAME

2.6.3.1 Alternative 1 (No-Action)

Fish protection measures included in this alternative would occur throughout the term of the FERC-issued operating licenses. Project operations would continue as occurs presently regardless of future listings or delisting. FERC license periods are typically 30 to 50 years, and the Wells, Rocky Reach, and Rock Island projects would be relicensed over the next 26 years. It is recognized that additional fish protection measures could be implemented during relicensing and potentially through reopener clause negotiations, as described above. However, the pursuit of additional protective measures through these venues is evaluated in Alternative 2. Thus, for comparative purposes, it is assumed that the time frame evaluated for Alternative 1 is the same as the 50-year HCP term, and that no additional measures are adopted during that time period.

2.6.3.2 Alternative 2

The time frame is the same as Alternative 1.

2.6.3.3 Alternative 3

The HCPs would be in effect for a 50-year period beginning in approximately 2003, the date that the agreements are expected to be adopted by FERC as amendments to the FERC licenses (currently expected to be June 2003 through May 2053), except for defined termination procedures.

2.6.4 GOALS AND OBJECTIVES

2.6.4.1 Alternative 1 (No-Action)

This alternative may not provide specific provisions to ensure the continued existence or recovery of Endangered Species Act-listed fish species. Protection measures would continue to be implemented in accordance with existing FERC license articles and settlement agreements. Goals and objectives tend to be specific for each measure at each dam (i.e., no outcome-based performance standards).

2.6.4.2 Alternative 2

This alternative includes regulatory options under the Federal Power Act and Endangered Species Act. No specific project goals are identified, although the general consensus is to maximize salmonid survivability through the projects. Although outcome-based performance (survival) standards are likely to be established for the listed species, it is uncertain whether similar standards would be set for non-listed species.

2.6.4.3 Alternative 3

The HCPs provide long-term agreements to protect the Endangered Species-listed and non-listed salmon and steelhead, with the goal of having no net impact to all the Plan species. The no net impact standard would be achieved through project-specific protection measures, hatchery production, and tributary habitat enhancement projects.

2.6.5 IMPLEMENTATION SCHEDULE

The three alternatives have different schedules for the implementation of the conservation measures, based on the mechanism used to establish the measures. The conservation measures included under Alternative 1 represent existing conditions and are therefore currently being implemented for all species, although the operational criteria for

Rocky Reach Dam (provided by the Fourth Revised Interim Stipulation) have expired. As a result, additional negotiations would be required to develop new operational criteria for Rocky Reach Dam. However, the biological opinion issued by NMFS for the construction and operation of the permanent bypass system would be the likely starting point.

Additional measures implemented under Alternative 2 during the established 50-year timeline would be accomplished through the procedures available in the Federal Power Act, including relicensing or license reopener procedures. It is unknown when additional conservation measures would be implemented under Alternative 2, except during the established relicensing dates. However, previous negotiations have typically taken a number of years to reach agreement. There is also the potential for requiring legal proceedings to establish the conservation measures.

Additional Endangered Species Act consultations would be needed to establish conservation measures for the listed species. It is uncertain how long it would take to complete the consultation proceedings and the subsequent license amendment processes.

A number of the provisions provided under Alternative 3 have already been voluntarily implemented by the PUDs based on the staggered effective dates of Chelan County PUD's HCPs and Douglas County PUD's expectation that the HCPs will be approved and permitted by the appropriate regulatory agencies. The remaining provisions would be implemented when the HCPs are amended to the FERC licenses. As a result, no additional negotiations or consultations would be required to begin implementation of the conservation measures. In addition, legal challenges between the PUDs and the agencies would be substantially minimized or eliminated.

2.6.6 ADDITIONAL MEASURES

2.6.6.1 Alternative 1 (No-Action)

This alternative does not provide a procedure to require implementation of mitigation measures beyond the project's boundaries (i.e., tributary habitat improvements). Under Alternative 1, hatchery supplementation is addressed through the existing settlement agreements and license articles.

2.6.6.2 Alternative 2

Under Alternative 2, additional protection would likely be provided to the Endangered Species Act-listed fish by NMFS. If NMFS determines that the current hatchery production levels would compromise the genetic integrity of Endangered Species Act-listed fish, the production levels would be reduced. Such a determination could occur at anytime, because it would be considered significant new information warranting reinitiation of consultation. Other measures could also be implemented at any time through consultations based on new information.

Provisions of the Clean Water Act, Federal Power Act, Northwest Power Planning Act, Tribal treaties, and other laws and statutes are available under Alternative 2 to protect and restore Upper Columbia anadromous fish through increased operational and structural measures and supplementation.

2.6.6.3 Alternative 3

The HCPs include a funding process for the protection and restoration of Plan species' habitat within the Columbia River watershed (from the Chief Joseph project tailrace to the Rock Island Project tailrace) and in the Okanogan, Methow, Entiat, and Wenatchee River watersheds. In addition, hatchery compensation plans guarantee funding and capacity to meet the 7 percent compensation level necessary to achieve no net

impact. Hatchery compensation levels, with few exceptions, would not change until 2013, and every 10 years thereafter.

Similar to Alternative 2, provisions of other laws, statutes, and Tribal treaties are available under Alternative 3 to protect and restore Mid-Columbia anadromous fish through increased operational and structural measures and supplementation. However, specific provisions in these laws and statutes that are under the jurisdiction of NMFS (and other signatory parties) would be subject to the terms and conditions of the HCPs.

2.6.7 OTHER ENVIRONMENTAL DIFFERENCES

Table 2-9 provides a summary comparison of how the alternatives affect other environmental resources in the project area. This information is further described in Chapter 4.

2.7 PREFERRED ALTERNATIVE

The proposed action (Alternative 3) is the preferred alternative of the project proponents (Douglas County and Chelan County PUDs) and NMFS, as well as USFWS, WDFW, and the Colville Tribe. NMFS will describe its preferred alternative and the rationale for selecting it in a ROD issued following review of this FEIS. The review by NMFS is guided by both the Endangered Species Act and NEPA requirements. The major NEPA-related issues that NMFS considered in making its decision were:

- Was the environmental review process adequate?
- Were the impacts adequately discussed and significant adverse impacts mitigated?
- Were all reasonable and appropriate alternatives to the proposed action considered?
- Are there significant unavoidable adverse impacts associated with the preferred alternative?
- What were the values that were considered, and what is the basis for the decision?
- Are there any outstanding unresolved issues?
- Will the preferred alternative result in the irrevocable commitment of Federal resources?
- Does the preferred alternative meet the applicants' purpose and need?
- What are the major differences between the preferred alternative and the proposed action?

In addition to analyzing all human and biological resources potentially affected by the preferred alternative, the major Endangered Species Act issues that NMFS considered were related to the overall protection and recovery of the salmon and steelhead species covered by the incidental take permit. To document its analysis and decision making, NMFS would issue a biological opinion to assist in deciding whether the HCPs satisfy the requirements of Section 10(2)(B) of the Endangered Species Act. The biological opinion analysis by NMFS will involve:

- determining the biological requirements within the proposed action area,
- determining the status of the species within the action area,
- determining the factors affecting the species environment within the action area,
- determining the effects of the proposed action on species-level biological requirements, and
- evaluating the cumulative effects associated with the proposed action.

Prior to amending the project licenses, FERC is expected to consult with USFWS to evaluate any

impacts on listed species not included as Permit species (e.g., bull trout). The FERC is also expected to initiate consultation with NMFS at this time to evaluate any impacts on listed anadromous species. However, it is assumed that absent any new information, FERC's proposed license amendments would be identical to the proposed actions already evaluated in the biological opinions on NMFS's issuance of the incidental take permits and the NMFS's findings would be identical.

The ROD for this EIS will certify the adequacy of the HCPs' environmental review process and will incorporate the requirements of the permit, including the mitigation commitments of the applicants.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Land Features, Geology, and Soils			
Project Area Soils	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, portions of the river cross-sectional areas would decrease to the original size of the river. In the short-term, riparian and shoreline areas would be disturbed and eventually mainstem spawning, incubation, and rearing habitat would be increased.	Same as Alternative 2.
Reservoir Erosion and Sedimentation	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, erosion and reservoir turbidity would initially increase over the short term and damage aquatic habitat conditions, with the greatest damage occurring during the first 4 to 7 years. Turbidity would decrease over time, and habitat conditions would improve. However, increased turbidity could also provide cover for juvenile fish from predators. Natural river sediment transport regimes would be restored, which could increase salmonid production through improved spawning and rearing habitat. Increased rates of sediment deposition would take place in the reservoir immediately downstream of the drawn down reservoir.	Same as Alternative 2.
Associated Tributaries	Geologic conditions conducive to fish habitat are expected to improve from independent local and State funded WRIA fish habitat enhancement projects.	Same as Alternative 1. If reservoir drawdown occurs, tributary channel mouths would erode each year. However, additional spawning habitat would likely be provided at the confluence with the mainstem.	Same as Alternative 2, with additional improvements to the geomorphic condition of the stream channel through the PUD-funded tributary habitat enhancement programs.
Columbia River System/Cumulative Effects	Same as existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, increased sediment and turbidity over the short-term particularly in the reservoirs immediately downstream of the drawn down project.	Same as Alternative 2.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Fisheries Resources			
Anadromous Salmonids and Other Listed Species (bull trout)			
Juvenile Migration/Survival Standards	Project-specific fish passage standards, no additional specific protection measures for threatened or endangered species. Protection for listed and non-listed species would be provided by laws and statutes other than the ESA.	Same as Alternative 1. Additional measures may be required under FERC licensing or ESA requirements that are likely to include increased use of spill to improve juvenile fish passage survival. Bull trout protection would be provided through consultation with USFWS.	No net impact standard - 91% combined adult and juvenile project passage survival, or 95% juvenile dam passage survival for all Plan species. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs. Bull trout protection would be similar to Alternative 2.
	Wells Dam: Provide a non-turbine passage route (juvenile bypass system) to pass at least 80% of spring-run outmigrants and 70% of summer outmigrants.	**Wells Dam:** Potentially increase the use of spill and extend the operational time frame of the juvenile bypass system to up to 40% of daily average flow through 99% of the juvenile migration periods.	
	Rocky Reach Dam: Provide safe (less than 2 percent mortality) non-turbine passage route (juvenile bypass or spillway passage) for 80% of juvenile migrants over 90% of the migration period.	**Rocky Reach Dam:** Same as Wells Dam above.	
	Rock Island Dam: Fund an account to purchase spill, as requested by fish agencies and the Tribes, to an annual revenue loss of $2.05 million (in 1987 dollars to be adjusted for inflation).	**Rock Island Dam:** Same as Wells Dam above.	

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Adult Migration/ Survival Standards	Maintain and operate fishladders according to criteria established in the existing settlement agreements or by the fishery agencies. Project-specific standards, with no specific protection measures for threatened or endangered species. Protection for all species would be provided by laws and statutes other than the ESA.	As required to minimize the impacts to salmonid species. The PUDs would each consult with FERC and NMFS for anadromous salmonids, and with USFWS for bull trout.	No net impact standard - 91% combined adult and juvenile project passage survival, 93 % juvenile project survival, or 95% juvenile dam passage survival for all Plan species. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs. Bull trout protection would be similar to Alternative 2.
Hatchery Production	Hatchery mitigation for initial loss of habitat from dam construction would continue over the long term. Hatchery funding for unavoidable losses from fish passage would follow existing settlement agreements.	Same as Alternative 1. Production could be reduced at any time if significant impacts to listed species are likely to occur. Production could be reduced based on actual fish passage losses. Production would be adjusted at relicensing.	Same as Alternative 1, except the initial production levels would be based on compensating for assumed unavoidable project passage mortality. Production levels would not change until at least 2013. Compensation for unavoidable losses at Wells Dam would be adjusted to 3.8% for yearling chinook and steelhead and 7% for sockeye and subyearling chinook from the currently assumed 14% rate for all species. Exact production levels based upon the actual numbers of returning adults. Hatchery production would not be less than that specified to address initial project inundation.
Independent (Non-PUD Funded) Tributaries Habitat Improvements	Habitat improvements could occur through the implementation of non-PUD funded projects through Federal, State, and local agency funding, specifically WRIA-funded projects.	Same as Alternative 1.	Same as Alternative 1.
PUD-Funded Habitat Improvements	None.	Same as Alternative 1.	$46.5 million (1998 dollars) additional funding provided through the HCPs to compensate for the 2% unavoidable project mortality.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Monitoring	At Wells, run timing, total dissolved gas, and system efficiency monitoring would continue. At Rocky Reach and Rock Island, only monitoring to ensure facility modifications are achieving criteria identified in license articles, settlements, and stipulations.	Same as Alternative 1, with additional survival studies for Endangered Species Act-listed juveniles and adults.	Studies necessary to verify that standards are being met for all Plan species will take place during Phase I, periodic monitoring to verify that standards continue to be met during Phase III, and periodic monitoring in Phase II to evaluate survival improvements.
Drawdown	Drawdown cannot be required under existing licenses.	Drawdown could increase survival rates of migrating juvenile fish over the long term. However, lower water levels could initially increase predator density and predator/prey encounters. Over the short term, drawdown would decrease water quality, fish habitat, and foraging opportunities, and likely affect survival rates. Only an option at relicensing. Also see Land Features, Geology, and Soils section.	Same as Alternative 2, although this is unlikely to occur under the HCPs. However, the Services have the option of withdrawing from the HCPs to pursue drawdown or dam removal options under certain provision of the HCPs.
Bull Trout	No specific measures are identified to protect bull trout.	Protection measures as required to recover the species under the ESA (Section 7 consultation).	Same as Alternative 2.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
QAR Analysis	Based on analysis of Upper Columbia River spring-run chinook salmon and steelhead, the return rates for spring-run chinook salmon have been trending down at a loss rate of 5 to 10% per year. Although complicated by the natural spawning of hatchery fish, wild steelhead populations in the Wenatchee and Entiat Rivers are trending down at a similar rate as the chinook populations, while the Methow River population is trending downward at a faster rate	Although maximizing survival at each of the PUD dams will increase the return rates of spring-run chinook salmon and steelhead, populations will continue to decline without reductions in non-hydro system related impacts (including higher ocean survival), although at a slower rate than Alternative 1.	Achieving the project survival and habitat improvement standards identified in the proposed HCPs will increase Mid-Columbia River reach survival by approximately 22 to 35% for steelhead and 27 to 45% for spring-run chinook salmon. Under these survival rates, populations will continue to decline without reductions in non-hydro system related impacts, although at a slower rate than Alternatives 1 or 2, if survival conditions continue as they were for brood years 1980 - 1994. Commitments to habitat productivity, in addition to dam passage survival increases, will increase survival rates by an additional 6 to 10% over Alternative 2. Under the long-term scenario, achieving the survival standards in the HCPs alone would reduce the risk of extinction to acceptable levels. (The effects of long-term supplementation have not been analyzed.)
Other Species of Concern or Importance (lamprey, sturgeons, cutthroat trout, game species, etc.)			
Project Area	No change expected over existing conditions.	Improvements to fish bypass systems or an increase in spill volumes might occur. These measures would likely reduce the turbine entrainment of some resident species. Specific sections of the bypass systems could disproportionately affect some species (e.g., impingement of lamprey on turbine intake screens. Increased spill and resultant elevated levels of TDG may have negative impacts on the reproductive success of sturgeon and may impact the long-term health or food base of aquatic species located within the action area.	Spill requirements could change dependent on efficiency of juvenile bypass systems and/or meeting survival standards. Meeting the survival standards for all the Plan species would likely provide a wider range of protection for other species.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
		Drawdown would affect habitats of reservoir fish, and access to and from tributary streams for migratory species. Habitat for species adapted to free-flowing river conditions (e.g., cutthroat trout) would increase or improve, while habitat for species better suited for reservoirs (e.g., bass) would diminish.	Same as Alternative 2.
Associated Tributaries	No direct effect. Habitat improvements could occur through the implementation of non-PUD-funded projects through Federal, State, and local agency funding.	Same as Alternative 1.	Habitat improvements funded by the HCP Plan Species Account would likely benefit bull trout, cutthroat trout and have added benefits to the health and productively of all native fish species that occur in the tributary streams.
Columbia River System/Cumulative Effects	No changes expected over existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Water Quantity			
Project Area	No change in flows.	Amount of spill could increase to improve juvenile fish passage survival, particularly for listed species. Drawdown would increase water velocity.	Amount of spill could change dependent on efficiency of juvenile bypass systems and/or meeting the survival standards. However, water quantities would not be substantially altered. Effects from drawdown would be the same as Alternative 2.
Associated Tributaries	No effect. Some non-PUD-funded projects may help to increase water quantity in the tributaries.	Same as Alternative 1.	Additional funding by the PUDs through the Plan Species Account would likely provide for more water conservation projects and more improvements in tributary flows.
Columbia River System/Cumulative Effects	No changes expected over existing conditions.	Same as Alternative 1.	Same as Alternative 1.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Water Quality			
Project Area Total Dissolved Gas	No change expected over existing conditions	Some improvement expected as Ecology imposes TMDL for Clean Water Act compliance and other measures (e.g., spill deflectors) are implemented at relicensing. Spill and total dissolved gas levels could increase if needed to improve anadromous fish passage efficiency or survival rates.	Same as Alternative 1, although spill could increase as needed to meet survival standards, resulting in an increase in total dissolved gas levels. However, spill is limited by Clean Water Act requirements. HCP signors agree to work collectively to address water quality issues.
Associated Tributaries	There is potential for incremental water quality improvements (e.g., higher dissolved oxygen, lower turbidity and sedimentation) as total maximum daily load program and other ongoing watershed restoration efforts proceed, and benefits from improved riparian protections are seen (no change from existing conditions).	Same as Alternative 1.	Same as Alternative 1, although guaranteed PUD funding would provide for more restoration projects and improvements in tributary water quality.
Columbia River System/Cumulative Effects	No change from existing conditions.	Spill programs may increase total dissolved gases in project area and at downstream hydroelectric projects.	Similar to Alternative 1, although the PUDs would work collectively to minimize total dissolved gas levels.
Vegetation			
Project Area	No change from existing conditions.	Same as Alternative 1. If reservoir drawdown occurs, it could impact shoreline and aquatic vegetation. One threatened plant species (giant hellborine) could potentially be affected by a drawdown and may require additional ESA consultation.	Same as Alternative 2 but may also include off-site improvements in the production and carrying capacity of the mainstem Columbia River.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Associated Tributaries	Some local and State fish habitat improvement projects could improve riparian vegetation – no change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, and HCP funding for tributary improvements would potentially benefit vegetation by removing invasive non-native plant species, adding or enhancing soils, and establishing buffer areas along tributary streams.
Columbia River System/Cumulative Effects	No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1.
Wildlife			
Threatened, Endangered, and Sensitive Wildlife Species			
Project Area	No change from existing conditions.	No effect anticipated. If drawdown occurs, bald eagle abundance may decline due to declines in waterfowl prey.	Same as Alternative 2.
Associated Tributaries	Possible short-term disturbance to bald eagles from tributary habitat improvement projects conducted by other agencies. Possible benefits to bald eagles if projects improve riparian habitat and waterfowl prey base. No effects on northern spotted owls, gray wolves, or grizzly bears. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1. HCP funding for tributary improvements could enhance habitat.
Columbia River System/Cumulative Effects	No effect.	Same as Alternative 1.	Same as Alternative 1.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Other Wildlife			
Project Area	Possible decline in avian predator abundance due to continued implementation of predator control programs. No effect to other wildlife. No change from existing conditions.	Same as Alternative 1. If drawdown occurs, declines in abundance of waterfowl, aquatic furbearers, amphibians, and other riparian-associated wildlife may result.	Same as Alternative 2. In addition, HCP funding for tributary improvements could enhance habitat for fish and wildlife.
Associated Tributaries	Possible short-term disturbance to wildlife from tributary habitat improvement projects conducted by other agencies. Possible benefits to waterfowl, aquatic furbearers, and other riparian associated wildlife, if projects improve riparian habitat.	Same as Alternative 1	Same effects from PUD and other agency habitat improvement projects as Alternatives 1 and 2.
Columbia River System/Cumulative Effects	No effect.	Same as Alternative 1.	Same as Alternative 1.
Land Use			
Project Area	No changes from existing conditions.	May be modified if listed species are affected.	The PUD will consider cumulative effects of land use decisions, accept comments on such actions from signatory parties, and notify applicants of potential incidental take restrictions.
Associated Tributaries	Local and State aquatic habitat enhancement projects may alter floodplains and result in land exchanges. Less development would be allowed at river shorelines. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, although more actions are expected under the tributary fund.
Columbia River System/Cumulative Effects	No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Aesthetics			
Project Area	Projects viewed in rural setting.	Same as Alternative 1. Project conservation measures do not change scenic quality in the area. If drawdown occurs, substantial unvegetated barren earth would be seen in area of drawdown.	Same as Alternative 2.
Associated Tributaries	Tributaries occur in forested (higher elevation) and rural settings (lower elevations).	Same as Alternative 1.	Same as Alternative 1.
Columbia River System Cumulative Effects	Projects appear as man-made modifications to the Columbia River.	Same as Alternative 1. No developments planned in the area change the project scenic quality.	Same as Alternative 2.
Socioeconomics			
Project Area	No changes from existing conditions.	Electricity rates will go up as a result of higher production costs and the need to replace lost energy from more expensive generating plants. The amount of increase is based on the measures imposed on the PUDs. If drawdown is proposed, a detailed socioeconomic analysis would be conducted.	Less that Alternative 2 as the PUDs have the ability to implement the lowest cost measures to achieve defined survival standards.
Associated Tributaries	Short-term local jobs under independent tributary habitat improvements. No change from existing conditions.	Same as Alternative 1.	Same as Alternative 1, and Plan Species Account will provide some additional jobs and service-related income.
Columbia River System/Cumulative Effects	No changes from existing conditions.	Same as Alternative 1.	Same as Alternative 1.

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
Economics						
Cost in Millions ($) (Net Present Value)	Wells	79	Wells	82	Wells	90
	Rocky Reach	237	Rocky Reach	358	Rocky Reach	261
	Rock Island	103	Rock Island	101	Rock Island	95
	Total	419	Total	541	Total	446
Foregone Power Revenues in Millions ($) (Net Present Value)	Wells	77	Wells	785	Wells	98
	Rocky Reach	155	Rocky Reach	1,116	Rocky Reach	250
	Rock Island	67	Rock Island	587	Rock Island	221
	Total	299	Total	2,488	Total	569
Recreation						
Facility Operation and Maintenance	No changes from existing conditions.		Same as Alternative 1. If drawdown occurs, reduced pool levels would make boat ramps and beaches unusable and substantially impact recreational facilities.		Same as Alternative 2.	
Associated Tributaries	Short-term access may be affected as local and State aquatic habitat improvements occur through independent WRIA actions. No change from existing conditions.		Same as Alternative 1.		Same as Alternative 1, although the additional PUD-funded habitat improvements could affect short-term access.	
Columbia River System/Cumulative Effects	No changes from existing conditions.		Same as Alternative 1. If drawdown occurs, increased fishing upstream and downstream of the projects may result.		Same as Alternative 2.	

TABLE 2-9. COMPARISON OF ENVIRONMENTAL CONSEQUENCES (CONTINUED)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Cultural Resources			
Project Area	No change from existing conditions.	Same as Alternative 1. If drawdown occurs, substantial impacts could occur to cultural resources.	Same as Alternative 2.
Associated Tributaries	Tributary habitat improvements that occur through independent actions could affect some cultural resources unless surveys and mitigation (if needed) are conducted prior to earth moving activities. However, regulatory compliance with applicable laws is expected.	Same as Alternative 1.	Same as Alternative 1, although additional PUD-funded habitat improvements would be expected.
Columbia River System/Cumulative Effects	No change from existing conditions.	No change would occur. If drawdown occurs, impacts could occur to cultural resources at downstream dams.	Same as Alternative 2.

ESA = Endangered Species Act

Chapter

3

Affected Environment

3 AFFECTED ENVIRONMENT 3-1

3.1 LAND FEATURES, GEOLOGY, AND SOILS 3-1
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3.10 RECREATION 3-161
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3.12 ENVIRONMENTAL JUSTICE 3-190

CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 3

- New references were added throughout Chapter 3 to update the information provided in the DEIS.
- The Fisheries section was updated to state that critical habitat designations are being reevaluated by NMFS. This section now includes more information on the tributary habitat components of value to salmonids.
- Recent information on salmonid adult returns and fish counts was added.
- The spawning distribution of fall-run chinook salmon was updated.
- A discussion was added on hatchery fish that spawn naturally.
- The subsection on mitigation for unavoidable sockeye salmon losses at Wells Dam was updated.
- Additional information was provided on salmonid passage time rates, fallback rates, and survival improvements.
- Species information was updated for the following fish: bull trout, cutthroat trout, river lamprey, Pacific lamprey, kokanee, pygmy whitefish, white sturgeon, lake chub, smallmouth bass, leopard dace, mountain sucker, walleye, largemouth bass, rainbow trout, and mountain whitefish.
- New WDFW fishing regulations and information on recreational fishing in the project area were added.
- The Water Resources section includes new information on water temperature and total dissolved gas levels at Wells Dam.
- The Vegetation section includes an update on the Federally listed plant Ute ladies' tresses.
- The Wildlife section has a new subsection on piscivorous bird control activities.
- The Socioeconomics section includes new Tribal Demographics and Economics subsections.
- Additional Economics, Aesthetics, and Environmental Justice sections are now included in Chapter 3.

Chapter

3 AFFECTED ENVIRONMENT

This chapter summarizes the environmental resources within the Mid-Columbia River region, including the upland areas adjacent to the mainstem Columbia River and the four major tributaries (Okanogan, Methow, Entiat, and Wenatchee). The purpose of the chapter is to document both the existing conditions and the current effects that Mid-Columbia River hydroelectric project operations have on these resources. This information will be used in Chapter 4 to assess the effects of project operations under the alternatives addressed in this EIS.

The specific resources discussed in this chapter include land features/geology/soils, fisheries resources, water resources (quantity and quality), vegetation, wildlife, land ownership and use, socioeconomics, economics, aesthetics, recreation, cultural resources, and environmental justice.

3.1 LAND FEATURES, GEOLOGY, AND SOILS

Key Terms

Basalt – A fine-grained, igneous rock dominated by dark-colored minerals. Cliffs along the Columbia River Valley are typically formed in basalt.

Channel Structure – Channel structure is formed by river bed roughness elements like bars and bends, in-channel logs or debris jams, bank vegetation, and large rocks. Channel structure is important for channel flow velocities, aquatic habitat, and prevention of channel erosion.

Columbia Plateau – Relatively flat region of eastern Washington and northern Oregon formed by vast accumulations of near horizontal flows of basalt lava.

Fluvial – Related to rivers or produced by river action, e.g., a fluvial plain or river bar.

Geomorphology – Branch of geology that deals with the form of the earth and earth surface and the changes that take place in river and hillside landforms.

Glacial – Related to or formed by a glacier. Extensive glaciers flowed into the Mid-Columbia River area, greatly influencing the river and valley landforms and geologic deposits.

Gneiss – Coarse-grained, metamorphic rock in which bands of differing mineral composition and texture appear.

Graben – An elongate, trench-like structural form bounded by parallel faults, created when the block that forms the valley floor moved downward relative to the blocks that form the sides of the valley wall.

Headwater Elevation – The average or maximum reservoir elevation at the project dam.

Physiographic Regions – Areas with similar landforms, geologic materials, soils, and climate.

River Terrace – Relatively flat areas formed by the rivers. Terraces near the rivers are active floodplains; higher terraces have been abandoned by river down-cutting and are no longer accessed by flood flows. Floodplain terraces are common locations for wetlands and side channels, important areas for storage of floodwaters, and important aquatic and wildlife habitat.

Schist – Medium- or coarse-grained metamorphic rock dominated by subparallel orientation of platy mica minerals.

Sediment – Clay, silt, sand, gravel, and cobbles that are deposited into layers by wind, ice, water, or gravity.

Structural Depression – Valley area formed by geologic faulting.

Tailwater Elevation – The average or minimum water elevation at the toe of the dam.

** See Chapter 7 for a complete listing of all Key Terms.*

3.1.1 LAND FEATURES

3.1.1.1 Project Area

The three project area dams are located in the Columbia River valley between the Columbia Plateau and the Cascade Mountains. Watersheds to the west and north of the project areas include mountain streams flowing from the Wenatchee Mountains, the Chiwaukum and Methow structural depressions, the north Cascade Mountains, and the Okanogan Highlands. The watersheds to the east of the project areas are on the Waterville Plateau, which is the northwest portion of the much larger Columbia Plateau (Figure 3-1).

The associated tributary watersheds contributing to the project area include a broad range of terrain types, geologic materials, and climate regions, from high-elevation mountain peaks with glaciers to flat 3-mile-wide valley bottoms. Conditions vary from desert and steppe conditions in the eastern parts of the project watersheds, with as little as 7 inches of annual precipitation, to the snow-covered north Cascade Mountains to the west, with over 100 inches of precipitation annually.

Wells Dam

The Wells Dam, located at river mile 515.8, is the furthest upstream dam in the project area. The Wells Dam, constructed between 1963 and 1967, is the most recently built hydropower project on the Mid-Columbia River mainstem. The dam has a central reinforced concrete structure 1,130 feet long with earth and rock fill embankments on both sides. The east embankment is 1,030 feet long, and the west embankment is 2,300 feet long, for a total embankment length of 3,320 feet and a total dam length of 4,460 feet. The Wells Dam is the only hydrocombine (combined powerhouse and spillway structure) on the Columbia River.

The valley floor is about 4,000 feet wide at the Wells Dam. The original river channel was about 700 feet wide against the east (left bank) valley wall (Galster 1989a). The east side of the valley (left bank) consists of a series of narrow terraces. The west side (right bank) consists of a terrace at 720 feet elevation that is about 2,000 feet wide, followed by a 2,000-foot-wide terrace going from 750 to 775 feet elevation, where it meets a steep bedrock face that serves as the west abutment for the dam. The valley bottom continues with another glacial-age terrace at an elevation of 880 feet and another at 1,200 feet elevation that meets the bedrock west valley wall.

The Wells reservoir extends from river mile 515.8 to the tailrace of Chief Joseph Dam at about river mile 545.5. The reservoir has an area of 9,740 acres and is between 1,300 and 8,000 feet wide, with an average width of 2,700 feet. The reservoir contains a total storage volume of 331,200 acre-feet with 97,985 acre-feet of usable storage at 10 feet of drawdown. The normal reservoir elevation is 781 feet, with a tailwater elevation of 703 feet. The dam has 10 units operating with a hydraulic head of 67 feet.

Rocky Reach Dam

The Rocky Reach Dam is located at river mile 474.5. The dam and original powerhouse with seven power units were constructed between 1956 and 1961. Four additional power units were added between 1969 and 1971. The Rocky Reach Dam is a Z-shaped structure with a spillway, powerhouse, and service bay. The dam is essentially a gravity structure that rises 218 feet above the lowest bedrock support at 499 feet elevation (Coombs 1989).

The valley bottom is about 5,000 feet wide at the dam site. The site consists of a left bank terrace, 140 feet above the river at low flows, that extends for 3,500 feet from the river to the valley wall cliffs (Coombs 1989). The dam rests on rock of the former channel that was about 1,000 feet wide at high flows. The west (right bank) side of the

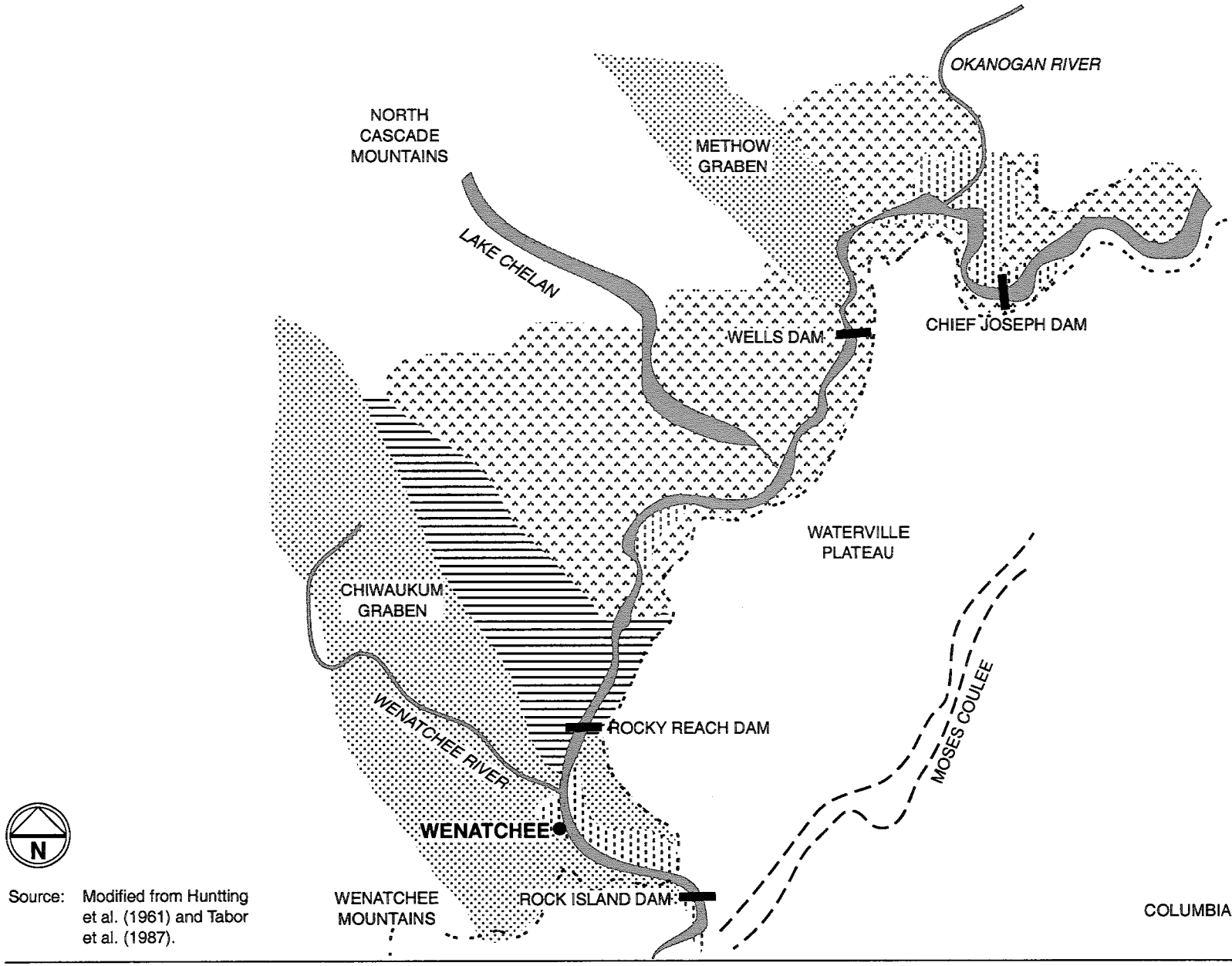


Figure 3-1
Regional Topographic Setting of the Mid-Columbia Projects

dam is against the valley wall, which has shallow soil materials over bedrock.

The Rocky Reach reservoir extends from river mile 474.5 to the Wells Dam tailrace at about river mile 516. The reservoir has an area of 8,235 acres with a width of 1,500 feet to over 5,000 feet. The reservoir contains a total storage volume of 412,000 acre-feet, with 36,400 acre-feet of usable water storage at 4 feet of drawdown. The average project headwater elevation is 706.5 feet, with an average tailwater elevation of 617.5.

Rock Island Dam

The Rock Island Dam, located at river mile 453.4, is the furthest downstream dam in the project area. The dam, powerhouse, and first four turbine units were constructed between 1930 and 1933. The Rock Island Dam was the first dam to be built on the Columbia River mainstem. Additional work continued on the powerhouse and six additional turbine units were constructed between 1951 and 1953. A second powerhouse with eight turbine units was built between 1974 and 1979. Rock Island Dam is a reinforced concrete structure 3,600 feet long with a deck-top elevation of 616 feet and a total hydraulic head of 36 feet.

The valley bottom is about 7,000 feet wide at the dam site. Original selection of the site was based on the availability of shallow bedrock at one of the five major Columbia River rapids: Rock Island rapids (Galster 1989b). The Rock Island rapids were formed by a flat-topped mass of basalt called Rock Island. Part of this island is still visible at the dam site. The rapids were positioned against the east (left bank) side of the valley due to the deposition of a large glacial-age terrace on the west side of the valley. At low flows, the Columbia River channel was originally 200 feet wide on either side of Rock Island; at flood flows, the entire dam site area was underwater.

The Rock Island reservoir extends from river mile 454 upstream to the Rocky Reach tailrace at about river mile 474. The reservoir is 3,300 acres in area, with a typical width of 1,500 feet. The reservoir has a total storage volume of 130,000 acre-feet, with 12,480 acre-feet of usable storage at 4 feet of drawdown. The normal project pool elevation is 612.6 feet, with an average tailwater elevation of 573.2 feet.

3.1.1.2 Associated Tributaries

The main tributary watersheds can be divided into three typical physiographic regions that have a similar range of landforms, geologic materials, soils, and river processes: (1) the mountainous regions of the western and northern tributaries, (2) the valley bottom areas in the lower portions of the tributaries, and (3) the Columbia Plateau region east of the Columbia River valley.

The tributaries originate in the high Cascade Mountains of the U.S. and Canada. Major tributary rivers in this physiographic region include the upper portions of the Wenatchee, Entiat, Methow, and Okanogan Rivers. Climatic conditions range from extreme alpine and subalpine in the upper basins to wet and dry forests in the foothills. Precipitation ranges from 25 inches to over 140 inches per year in the upper Wenatchee Basin, from 35 to 80 inches per year in the upper Entiat Basin, from 15 to 80 inches per year in the Methow Basin, and from 30 to 40 inches per year in the upper Okanogan Basin. Snowmelt and rainfall run-off from this region is a major source of water for hydroelectric power, irrigation, and instream flows. The mountain areas are characterized by steep hillslopes with very high- to moderate-gradient tributary creeks. Limited flat areas occur along the valley bottoms, on ancient and recent river terraces, and in floodways.

The second typical physiographic zone, the valley bottoms, is in the lower portions of the western and northern tributary valleys, where glaciers and the tributary rivers have eroded deep, relatively

wide valleys. Climate, soil, and vegetation conditions include dry forests, grass steppe, and shrub steppe. Precipitation in the lower tributary valleys ranges from 7 to 15 inches per year. This area is characterized by steep, rolling hills along the valley walls, with flat to moderate slopes on ancient terraces and along the valley bottoms. Stream gradients are from high to moderate in the lower valleys.

The third main physiographic zone, the Waterville Plateau, includes the plateau and tributary streams east of the Columbia River valley and the area southwest of Omak Lake. The main tributaries from this region include Omak, Douglas, Foster, and Rock Island Creeks. Climate, soil, and vegetation conditions include grass steppe, shrub steppe, and desert. Average precipitation is 10 inches per year. Tributary flows are considerably less from the Waterville Plateau compared to the run-off from the Cascades.

Wenatchee River Valley

The Wenatchee River enters the Columbia River at river mile 468.2, about 15 miles upstream of the Rock Island Dam and 6 miles downstream of the Rocky Reach Dam (see Figure 1-2). Its watershed covers an area of 1,328 square miles. The river itself begins at Lake Wenatchee in the Cascade Mountains. The Wenatchee Mountains form the southern portion of the watershed, the north Cascade Mountains form the western portion, and the Entiat Mountains form the northern portion of the watershed. Elevations range from 615 feet at the river mouth to just over 8,500 feet at the highest upper watershed peaks.

Entiat River Valley

The Entiat River enters the Columbia River at river mile 484, about 10 miles upstream of the Rocky Reach Dam (see Figure 1-4). With a watershed area of 419 square miles, this is the smallest watershed of the four main tributaries. The south side of the basin is formed by the Entiat Mountains. The Chelan Mountains form the northern portion of the watershed, and the north Cascade Mountains form the western portions. Elevations range from 708 feet at the river mouth to just over 9,000 feet at the highest upper watershed peaks.

Methow River Valley

The Methow River enters the Columbia River at river mile 523.9, about 7 miles upstream of the Wells Dam (see Figure 1-5). The Methow River has a watershed area of 1,791 square miles. Sawtooth Ridge marks the southwest side of the basin. The northern portions are in the Pasayten Wilderness, and the north Cascade Mountains form the western portions of the basin. Elevations range from 780 feet at the river mouth to just under 9,000 feet at the highest upper watershed peaks.

Okanogan River Valley

The Okanogan River begins near Armstrong, British Columbia and flows south through a series of lakes to the Columbia River; it enters the Columbia River at river mile 533.5, about 17 miles upstream of the Wells Dam (see Figure 1-5). The Okanogan watershed covers an area of about 8,200 square miles, 2,342 square miles of which occur in the United States. The northern portion of the watershed is in the Okanogan Highlands of the U.S. and Canada. The southern part of the basin near the river mouth is in the northwest corner of the Columbia Plateau. Elevations range from 780 feet at the river mouth to over 8,400 feet at the highest upper watershed peaks.

3.1.1.3 Columbia River System

The Columbia River has a watershed area of 259,000 square miles, with 39,000 square miles in Canada. The Columbia Basin includes physiographic provinces in both the U.S. and

British Columbia, including parts of the Pacific border, Cascade Range, Columbia Plateau, northern Rocky Mountains, and middle Rocky Mountains (U.S. Geological Survey [USGS] 1994). The overall watershed is bounded by the Rocky Mountains on the east and the Cascade and Coast ranges on the west. The Basin includes 100,000 square miles of the Columbia Plateau. The Columbia River is about 1,243 miles long, with 91 miles located within the project area.

The project dams and the main Mid-Columbia River tributaries are located in the rain shadow of the Cascade Range and have arid to semi-arid climates, low precipitation, dry summers with warm to hot temperatures, and cold winters. Average precipitation in the entire Columbia River Basin is less than 20 inches annually, with much of this occurring in the winter. Some marine influences occur in the alpine zones of the Cascades where as much as 40 to 140 inches of precipitation occurs, mostly as snow. Higher precipitation amounts (40 to 100 inches/year) also occur in the lower river from the Pacific Ocean to the Columbia Gorge because of the marine influence, and in the mountain ranges of Idaho and Montana because of elevation.

Major dams in the Columbia River Basin (with active water storage over 5,000 acre-feet) include 20 in Montana, 48 in Idaho, 33 in Washington, 45 in Oregon, and 16 in Canada (USGS 1994).

3.1.2 GEOLOGY AND GEOMORPHOLOGY

Under the Federal Power Act, hydroelectric projects are reviewed and inspected by FERC staff and contractors to confirm that project structures are stable and safe and determine whether geologic hazards may threaten the facilities or public safety. These inspections are ongoing, and include (when needed) sampling and analysis for seismic hazards, spillway capacity, landslide potential, and erosion issues.

3.1.2.1 Project Area

The Cascade Mountains and Okanogan Highlands to the west and north of the project area include a mix of granitic, volcanic, metamorphic, and sedimentary rocks that have been added onto the North American continent by plate tectonic motions and deposition of material eroded from uplifted areas. Great regional ice sheets and local alpine glaciers modified the mountain areas and tributary valleys. Glacial and alluvial deposits fill the valley with up to several hundred feet of sediment forming extensive terraces along the valley edges. Sediment transported from the mountains and reworked from the valley fills the current floodway and channel deposits along the river valley bottoms.

The project area dams are in a portion of the Mid-Columbia River that can be divided into three basic geologic segments. Between the mouth of the Okanogan River and the Wenatchee River, the Columbia River runs in a deep, steep-walled valley cut into the granitic and gneissic rocks of the northeastern Cascades. Two of the project dams and reservoirs, Rocky Reach and Wells, are within this segment of the Mid-Columbia River. The Okanogan, Methow, and Entiat valleys are also in this geologic region.

The second geologic segment runs for several miles downstream from the Wenatchee River; softer sedimentary rocks of the Chiwaukum graben underlay it. Most of the rocks in the Wenatchee River Basin are in the same sedimentary rock formation, the Chumstick formation.

The third geologic segment along the Mid-Columbia River begins about 5 miles downstream of the Wenatchee River, where the river approaches the north side of the Wenatchee mountain uplift. Here the river is deflected about 10 miles eastward onto the lava plateau underlain by the Columbia River basalts. The river has cut a 600-foot-deep canyon into the Columbia

Plateau basalts. Rock Island Dam is in this portion of the Mid-Columbia River.

Wells Dam

The Wells Dam site was selected because of the presence of bedrock on either side of the valley about midway between the downstream Rocky Reach Project and the upstream Chief Joseph Dam. Prior to construction, the river channel was 700 feet wide located against the east valley wall (Figure 3-2) (Tabor et al. 1982; Galster 1989a). The floodplain west of the river is about 1,000 feet wide.

Additional ancient terraces of glacial, alluvial, and lake deposits occur on the west side of the valley. Bedrock beneath the ancient west bank terraces is about 200 feet lower than the historic river channel. The east side of the valley rises sharply in a series of glacial and fluvial terraces backed by granitic rock slopes that are capped by the basalt beds of the Waterville Plateau, 2,000 feet above the valley floor. The east side of the dam is an embankment 1,000 feet long, with underlying glacial and alluvial sediments on granitic bedrock. The west side of the dam is an embankment 2,300 feet long, with underlying layers of glacial and alluvial sediments as thick as 200 feet to granitic bedrock. The dam (spillway, powerhouse, and fishladders) is built on granitic bedrock cut by north trending basic igneous dikes (Galster 1989a).

The dam site and reservoir valley floor is underlain by a sequence of glacial and fluvial deposits consisting of gravel and sand with local cobble and boulder units, and silty, sandy gravel with lenses of fine sand and silt lake deposits (Galster 1989a). The construction of upstream dams, beginning in 1955 with Chief Joseph Dam, cut off the main supply of upstream bedload sediment into the Wells reservoir. The main source of sediment into the reservoir is now from the tributaries, the majority coming from the Methow and Okanogan Rivers. Sand and gravel deposits occur near the mouths of each tributary, with silt and sand being deposited in the reservoir further away from the tributary inputs.

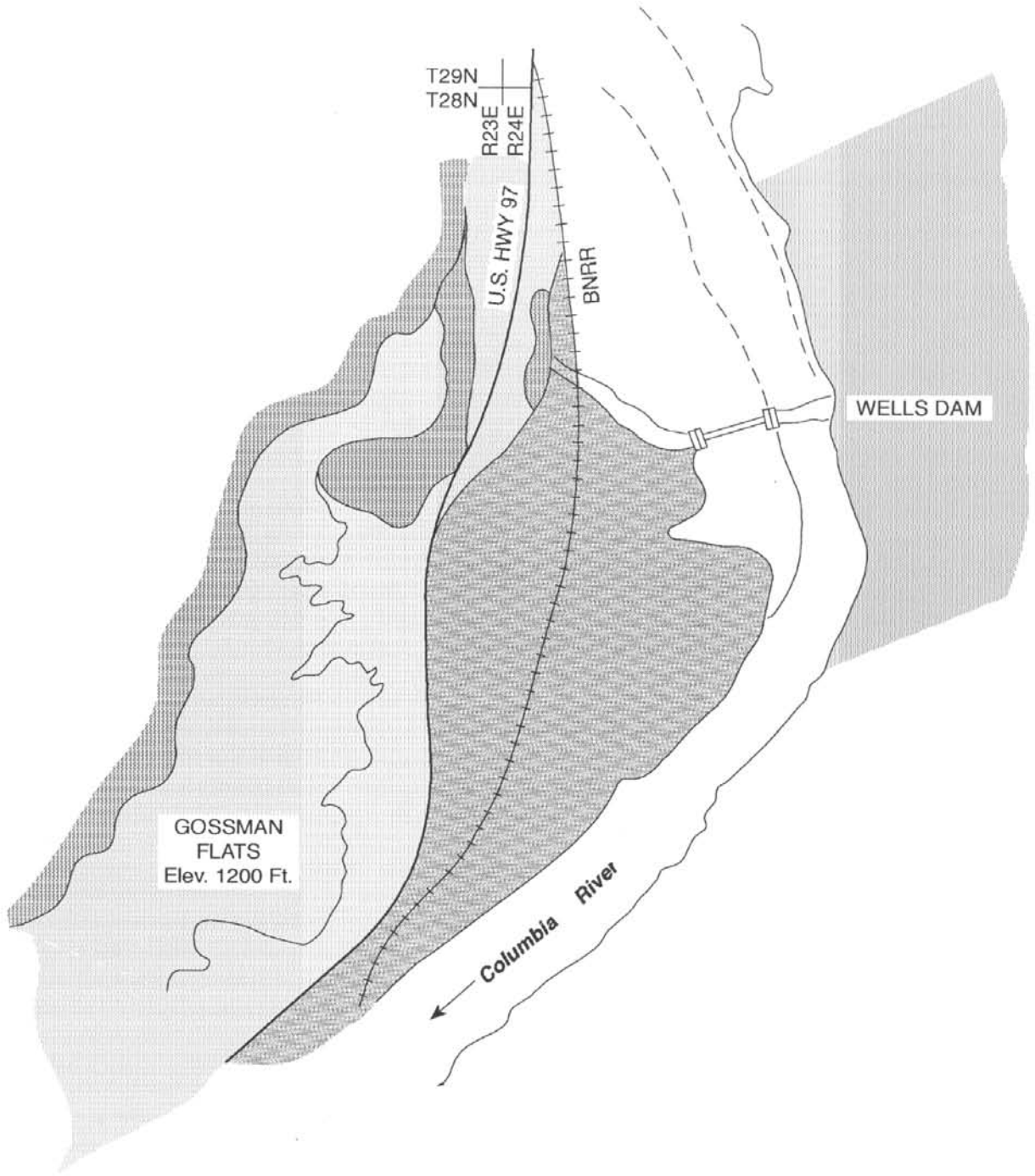
Rocky Reach Dam

The mountains to the north and to the west and the bedrock under the Rocky Reach Dam are all in the Swakane biotite gneiss (Figure 3-3) (Waters 1932; Tabor et al. 1987). On the east bank, the Swakane gneiss forms a cliff 2,000 feet above the river; the cliff is capped by the Columbia River basalts at the western edge of the Columbia Plateau (Coombs 1989). An east bank terrace surface 140 feet above the low-flow river extends 3,500 feet from the river's edge to the valley wall cliff (see Figure 3-3). Exploration during construction revealed a thin layer of sediments over bedrock in the river bottom at the historic river channel location. Beneath the large terrace on the east bank, the bedrock surface is 130 feet lower than the historic channel location. The terrace consists of a layer of coarse gravels from a few feet to more than 100 feet thick, directly overlying the bedrock. Above the gravels is a varved (thin-bedded) lake bottom clay 180 feet thick. In some locations, the clay layer has been eroded away by the river. Above the clay layer are fluvial deposits of sand and gravel.

The supply of upstream bedload sediment into the Rocky Reach reservoir was cut off 5 years after completion of the dam, following the construction of the Wells Dam. The main source of sediment into the reservoir is the Entiat River. Sand and gravel deposits occur near the mouths of the tributary, with silt and sand being deposited in the reservoir further away from the tributary inputs.

Rock Island Dam

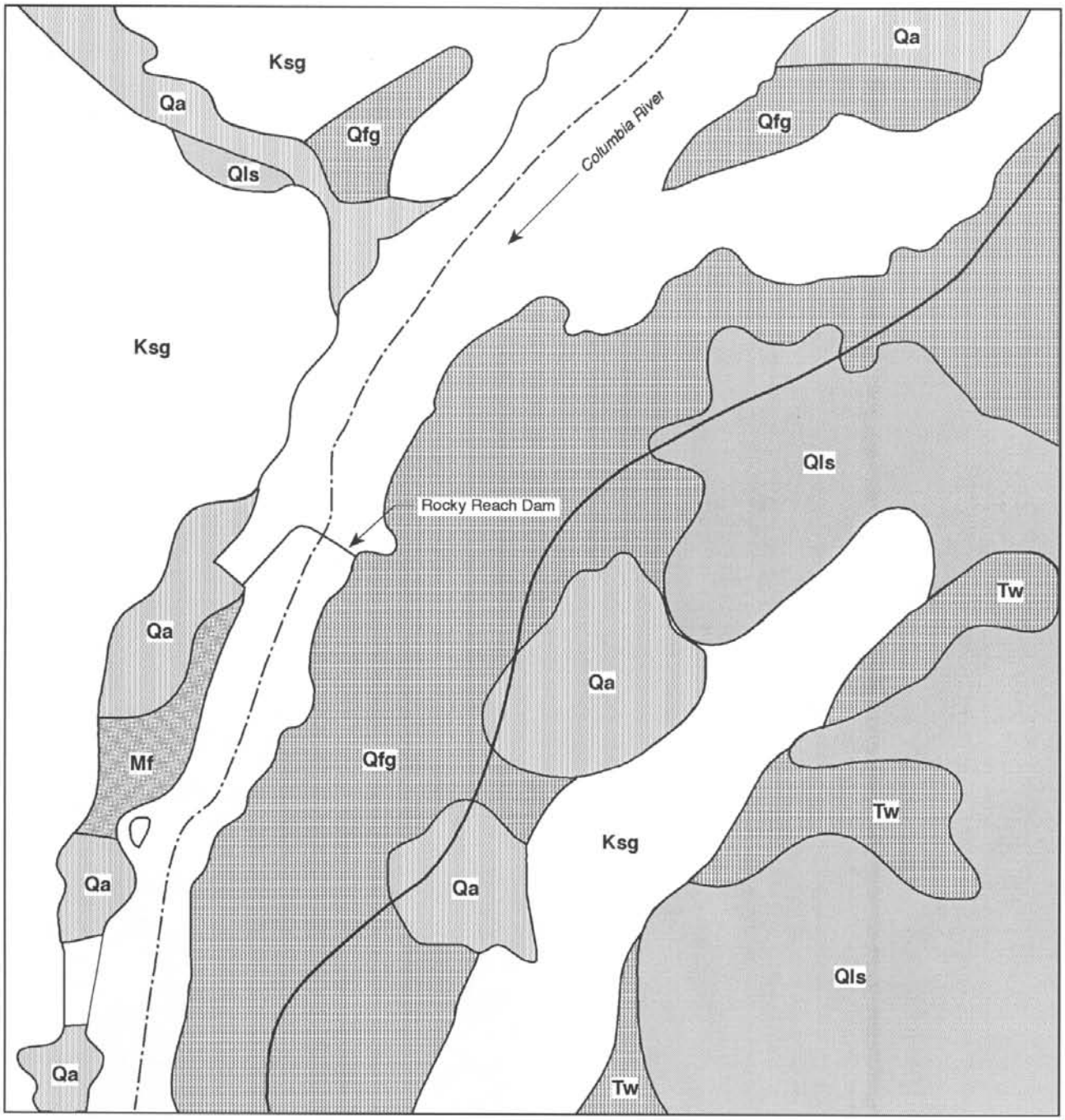
At the site of the Rock Island Dam, anticlinal ridges of the Wenatchee Mountains forced the Columbia River to the east, where it cut into the generally level Columbia River basalts. The original Rock Island rapids and Rock Island are positioned hard against the east side of the



Source: Galster, 1989.

Parametrix, Inc. Mid Columbia/553-1543-020(10) 8/00 (K)

Figure 3-2
Geology of
the Wells Dam A



Source: Galster, 1989.

Parametrix, Inc. Mid Columbia/553-1543-020(10) 6/00 (K)

Figure 3-3
Geology of the
Rocky Reach Dam Area

Columbia River valley due to deposition of extensive glaciofluvial deposits from glacial and great flood events (Galster 1989b) (Figure 3-4). The dam, powerhouse, and spillway are built on basalt and tuffaceous bedrock.

The Columbia River valley was about 6,000 feet wide at the dam site and much wider upstream near Wenatchee prior to being filled with several hundred feet of sand and gravel during the great Missoula floods. This forced the river onto higher bedrock on the east side of the valley, thus creating the Rock Island rapids. The great floods flowing out of Moses Coulee deposited sediment both up- and downstream. The flood deposits form a terrace to the west, upstream, and downstream along the river, consisting primarily of sand and gravel with cobbles, boulders, and thin layers of silt and clay. The bedrock surface is deeper under the terrace than at the dam site. The terrace surface, over 200 feet above the riverbed, has numerous ice-rafted basalt blocks up to 20 feet in diameter.

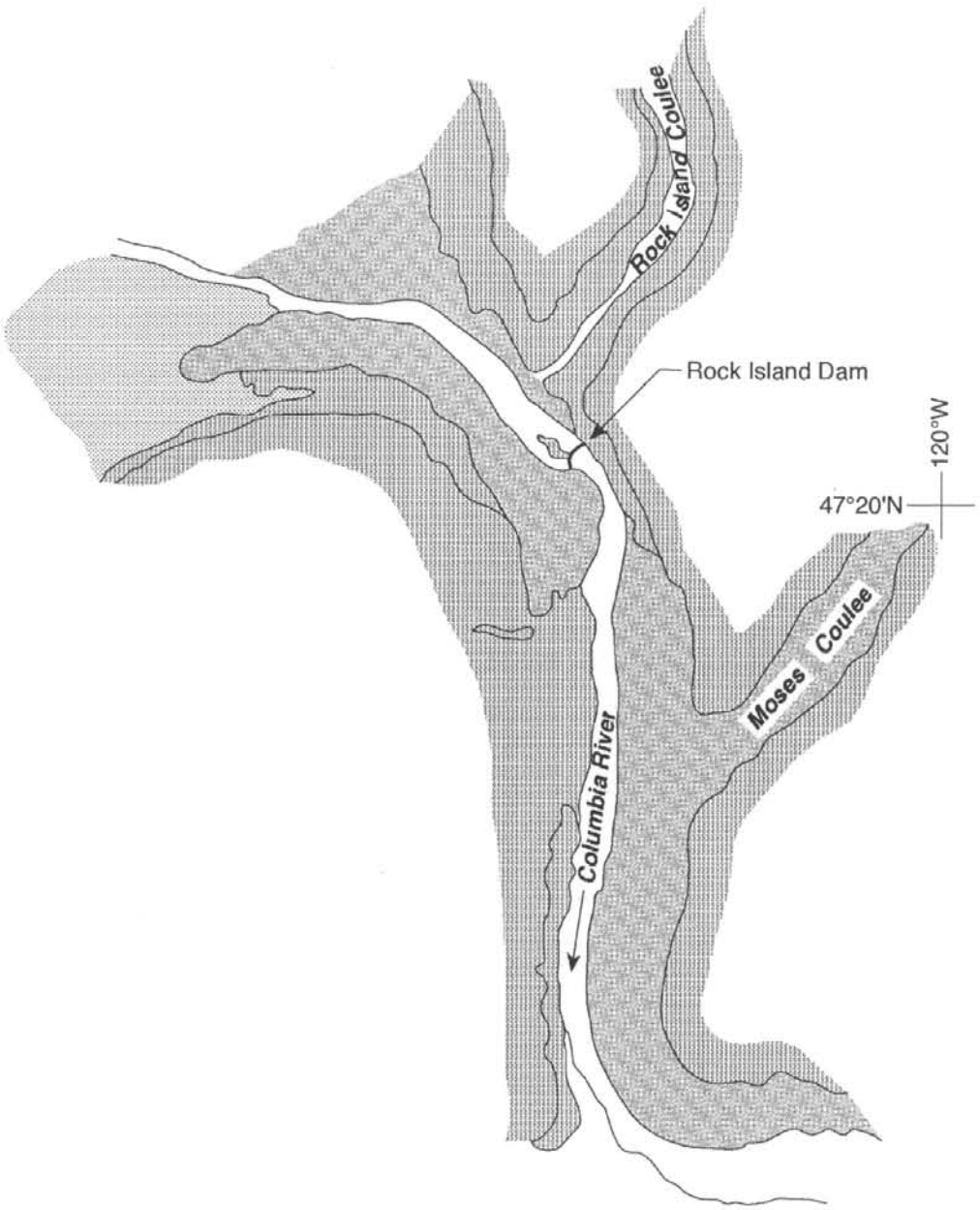
The glacial and great flood deposits underlay the reservoir and form the reservoir and former Columbia channel banks. The river reworked these glacial deposits along the former floodway, forming sand and gravel alluvial deposits. Alluvial sediment, transported by the Columbia River prior to construction of the Rocky Reach Dam (29 years after the Rock Island Dam was constructed), deposited in the upper end of the Rock Island reservoir. Sand and gravel occur in the upstream portions of the reservoir with sand and silt being deposited in the downstream portions. Additional sediment is deposited in the reservoir in the form of a delta where the Wenatchee River enters the reservoir.

Suspended sediment transport in the Mid-Columbia River is relatively low (BPA et al.1994a). Each upstream reservoir allows a portion of the seasonally high suspended sediment loads from the Upper Columbia River to settle out during transit. Direct input of fines from the tributaries is now the main source of silt and fine sand into the Rock Island reservoir. Typical water and suspended sediment travel rates through the Mid-Columbia River are between 1 to 4 feet per second at flows of 100,000 to 380,000 cubic feet per second (cfs) respectively (NMFS et al. 1998a). This allows fine particles in the water column to settle at a higher rate than if natural current velocities occurred. The fine sediment deposits on the bottom where it is often reworked by slumping off the steep reservoir edges and by higher velocities that occur during extreme flood flows. This tends to move the deposited clay, silt, and fine sand into the deeper portions of the reservoir.

3.1.2.2 Associated Tributaries

The range of watershed and river channel conditions is quite similar for all of the main tributary rivers. The river channels in each of the tributaries receive sediment delivered by creeks, mass-wasting, and surface erosion. The steep mountain conditions and presence of glacial deposits result in high sediment delivery rates to the upland creeks. The high gradient mountain streams of the upper watersheds have a large and coarse textured bedload that is deposited onto alluvial fans and channel bars along the main river floodways. Additional channel sediment is eroded from the banks in natural channel migration and erosion of alluvial, glacial, or residual soils along the rivers.

Depending on flow conditions, a portion of the sediment that enters the creeks is transported downstream and a portion is stored along the channel in the channel bars, on the banks, and overbank on the floodplain. Fine sediment is derived from reworking of the glacial and valley bottom deposits by the creeks and from sheet wash erosion of bare areas in the watershed.



Source: Galster, 1989.

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SCALE IN MILES
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Malaga Landslide Deposits
Glacial Flood Deposits
Grande Ronde Basalt

Figure 3-4
Geology of the Rock Island Dam Area

Vegetation (including standing and fallen trees) along with stream banks, brush, forbs, and grasses all play an important function to tributary channel conditions; they protect the banks and provide instream diversity that is important to aquatic and riparian habitat conditions. Depending on the land use and development history, various portions of the tributary creek and river channels have been modified from natural conditions by flood impacts, forest harvest, fires, transportation right-of-ways, and land modifications related to agricultural, residential, and urban development.

Wenatchee River

The Wenatchee River valley is formed in the softer sedimentary rocks of the Chumstick formation preserved in the structural basin referred to as the Chiwaukum graben (Cheney 1994). The Chumstick formation consists of folded shale, sandstone, and conglomerate. The Leavenworth fault zone is on the southeast boundary of the Chiwaukum graben. The metamorphic rocks of the Swakane gneiss are across the Entiat fault on the northeast side of the graben. Glaciation in the northern portion of the basin has resulted in a thick mantle of till overlying lower ridges and valley walls (U.S. Forest Service [USFS] 1999). The entire southern section of the watershed escaped glacial modification.

The Wenatchee River begins at Lake Wenatchee. The Little Wenatchee River and White River flow into the northwest end of the lake. Numerous very high-gradient mountain streams with falls, cascades, and step-pool channels flow from the steep valley walls around the lake. The Lower White and Wenatchee Rivers have a gradient of approximately 1 percent and are slightly entrenched in wide glacial valleys. Large woody debris and channel pool conditions are average. Sediment transport rates are highest in the White River due to the transport of glacial material, including the transport of glacial flock during low-flow conditions. Sediment transport rates in Little Wenatchee River are also high, especially during flood events. Most of the sediment delivered to the lake is deposited in the lake as deltas, alluvial fans, and lake bottom sediments.

Nason Creek and Chiwawa River join the Wenatchee River at the outlet of Lake Wenatchee (river mile 53.6). Nason Creek flows through a glacially formed canyon with a gradient of less than 1 percent in the lower portion. Some side channels have been cut off by Highway 2, and over 5 percent of the lower channel has rip-rapped banks. The Chiwawa River is the largest Wenatchee River tributary. The river channel is dominated by riffle habitat, with pools primarily associated with log jams and meanders. The channel does not meet the USFS standards for large woody debris or pools (USFS 1992).

From the lake to Chiwawa River, the Wenatchee River cuts through a glacial outwash plain with a pool-riffle channel composed mainly of cobble and gravel substrate. Large, deep pools are relatively frequent. From Chiwawa River to the Tumwater Canyon, the Wenatchee River is a pool-riffle and plane-bed channel with further entrenchment, increased gradient, and fewer pools compared to upstream areas. Substrate is also coarser than upstream areas, with more boulders and cobbles as a result of the steeper gradient and confinement of the channel.

Tumwater Canyon is a non-glaciated portion of the valley that the Wenatchee River passes through. Hillslopes are steep igneous and metamorphic rocks forming a deep, narrow, V-shaped valley. The channel is pool-riffle and step-pools with a gradient of less than 2 percent. Long, deep pools alternate with steep riffles. Alluvial and debris fans form along the channel where very high-gradient tributary creeks flow into the canyon. The channel in the canyon has been modified due to railroad, highway, and dam construction. Large bed elements and large woody debris sources were removed for historic log drives down the river, resulting in higher

velocities, fewer pools, and reduced structure to the canyon channel.

Chiwaukum Creek joins the Wenatchee River at river mile 35.9. It is a pool-riffle channel at its mouth, a steep-pool channel in the middle reaches, and is dominated by cascades in the upper reaches. Large log jams and cobble/boulder substrate contribute to a stable channel condition. Loss of riparian vegetation has increased stream bank erosion.

Icicle Creek at river mile 25.6 and Chumstick Creek at river mile 23.5 join the Wenatchee River at the town of Leavenworth. Both creeks are unconfined low-gradient streams. Icicle Creek has extensive bank rip-rap, and a substantial amount of riparian vegetation has been removed (Chapman et al. 1994a). Side channels and oxbows of the original streamway have also been cut off from the main channel. Chumstick Creek has been straightened and realigned along much of the channel. It has a high percentage of silt in the lower 9 miles and is a source of sediment to the Wenatchee River. Several culverts alter the channel conditions, including one that is a fish passage barrier at the river mouth.

In the Upper Wenatchee River watershed, more than 2,500 miles of trails and 4,700 miles of roads provide access to the Wenatchee National Forest. Portions of these roads impact the creek and river channel conditions. Forest practice impacts are minor in Icicle Creek watershed, but are significant in the other tributary watersheds (NMFS et al. 1998a). Forest roads in the Peshastin and Chumstick watersheds are often located in the narrow floodplains of the creeks, encroaching into the streamway, reducing riparian canopy, modifying rain and snowmelt run-off, and increasing fine sediment loads to the creeks, all of which have altered stream channel conditions. Fine sediment levels in the river substrate are above the USFS standard (20 percent) in Mission, Peshastin, and Tronsen Creeks (NMFS et al. 1998a). Many of the timber harvest areas in these watersheds were cut prior to 1988, when no stream riparian buffers were required. At that time, fish-bearing streams had minimal buffers that are now known to be inadequate for the full range of riparian zone functions.

Increased recreation along the White and Chiwawa watershed creeks has resulted in substantial amounts of wood harvest by campers (NMFS et al. 1998a). This causes local bank erosion, loss of large woody debris, and channel sedimentation.

The wide lower-gradient valley of the Wenatchee River begins at Leavenworth. A glacier from the Icicle Creek drainage deposited a moraine across the valley that filled and widened the valley, resulting in a sinuous, unconfined, pool-riffle channel. The channel form would naturally be controlled by overbank flows and channel migration. This has been limited by rip-rapped banks to protect floodplain development. Flows are concentrated in the channel, causing channel incision and bed form changes.

The Lower Wenatchee River was originally unconfined, meandering, and had considerable channel structure with extensive side channel areas. The relatively uniform channel is now moderately entrenched with a moderate, riffle-dominated gradient. The channel conditions have been modified as a result of extensive floodplain development along the lower 12 miles of the river. Orchards, homes, and roads now occupy much of the channel riparian zone.

Peshastin and Mission Creeks are the largest tributaries to the Lower Wenatchee River. Peshastin Creek enters about a mile below the town of Peshastin, and Mission Creek runs through the town of Cashmere. Peshastin Creek has been straightened and realigned along much of the channel due to the construction of Highway 97, and much of the riparian vegetation has been removed and modified in many areas, resulting in poor bank protection and a lack of large woody debris. These changes result in higher water

velocity rates and unstable channel substrate conditions. Peshastin Creek was extensively placer mined between 1860 and 1940, with some mining still occurring today. Historically, this resulted in almost total loss of the stream channel and floodway. Current practices primarily impact the streambed and banks. Because of the potential financial income from small-scale dredging for gold in creeks, the potential for impacts to the creek channels is significant. Small-scale digging and dredging is increasing the instream foot traffic and substrate disturbance in and along the creek channels in areas with known placer deposits such as Peshastin Creek.

Historically, Mission Creek was heavily grazed, and some impacts to run-off and sediment supply continue to occur. Mission Creek is one of the two main sources of sediment to the Lower Wenatchee River (NMFS et al. 1998a). Roads encroach into the streamway of Mission Creek, with similar channel impacts as seen in the upper watershed tributaries.

An inventory of the Wenatchee River from Icicle Creek to the mouth, based on 1991 conditions, indicated a high level of bank disturbance. Of the 57 miles surveyed, 31 percent had no woody vegetation, 35 percent had only a narrow woody buffer zone, 19 percent of the stream banks were armored with rip-rap, and only 16 percent had intact natural woody vegetation (NMFS et al. 1998a). Most of the channel alterations are the result of railroad, highway, and road construction along the Wenatchee River and the Nason, Peshastin, and Chumstick Creeks. Highway encroachment into the streamway and channel migration zone has cut off the side channel areas in the Sleepy Hollow reach of the lower river. Extensive use of rip-rap along the Lower Wenatchee River has decreased the channel sinuosity and reduced the potential for large woody debris recruitment (NMFS et al. 1998a).

Entiat River

The Entiat River valley is formed in the metamorphic rocks of the Swakane gneiss (Cheney 1994). The Entiat fault runs along the southwest side of the valley. A mix of igneous rocks composing the Chelan Mountains forms the northeast side of the valley.

The Upper Entiat River channel begins at the Entiat glacier (river mile 53). The upper river reaches are high-gradient, non-fish-bearing mountain channels. The middle reach begins at about river mile 44. The upper portion of the middle reach (from river mile 44 to river mile 33) has typical channel gradients between 4 and 10 percent. This portion of the river has entrenched, cascading, and step-pool channels. Substrate is cobble and gravel. Steep valley slopes provide abundant sediment and woody debris supply. Sediment transport rates are high because of the high channel gradients.

Channel modifications related to land use and management influences have been relatively minor in the middle reaches of the river. The middle portion of the middle reach (from river mile 33 to river mile 25 near the USFS boundary) has channel gradients between 2 and 4 percent. Here the channel is moderately entrenched and dominated by riffles with infrequently spaced pools. Much of the stream channel below the USFS boundary has been channelized and rip-rapped, with large woody debris and bank vegetation removed. There has been a 30 to 60 percent loss of pool areas in this segment since a survey conducted in the 1930s (USFS 1996).

Historic and current management influences to the channel have been significant, including grazing, fires, roads, recreation, and timber harvest. The lower portion of the middle reach (river mile 25 to river mile 16.5) is a lower-gradient (less than 2 percent) meandering, point bar, and riffle-pool alluvial channel. A terminal glacial moraine at the Potato Creek confluence (river mile 16.5) controls the lower gradient and

channel form in this portion of the river. Because of the lower channel gradient, there is a greater tendency for sediment deposition.

Following major floods in the 1940s and 1970s, nearly all of the lower 22 miles of the river channel were modified by dikes and road fills built to protect properties in the floodplain. This constrains the channel, reduces meandering, increases flow velocity, modifies channel bars and substrate, and reduces channel structure. Woody debris is often removed by landowners concerned about flooding, which further modifies the channel form.

The Lower Entiat River, from the Potato Creek moraine at river mile 16.5 to the river mouth, is an entrenched, meandering, riffle-pool channel with gradients less than 2 percent. Similar to the lower part of the middle reach, this portion of the stream channel has been modified by dikes, road fill, and encroachment. The amount of large woody debris is low and pools have been reduced by 90 percent since the 1930s survey.

Methow River

The Methow River is located in a fault-bounded graben underlain with highly folded sedimentary and volcanic rocks (McGroder and Miller 1989). The area lies between the Gardner mountain fault and the Pasayten fault. The sedimentary rocks weather easily compared to the granites and typically lie beneath thick glacial deposits. Upper valley areas are steep mountains in the Chelan/Colville granitic complex. Pleistocene glaciation has scoured the entire Methow River valley (Soil Conservation Service 1980).

The Upper Methow River begins in very high gradient confined mountain channels in the north Cascade Mountains. The streams in the headwaters of the basin are valley wall creeks that have steep to very steep gradients, are entrenched, cascading, steep/pool channels with bedrock, cobble, and gravel substrates. The headwater channels grade into moderately entrenched, moderate-gradient, riffle-dominated channels with cobble and gravel substrates. The Upper Methow channel, from river mile 83.2 to river mile 74.5, has a typical gradient between 2.6 and 2.8 percent. The channel here is moderately entrenched and riffle-dominated, with infrequent pools. Substrate is cobble and gravel. Steep valley wall slopes provide large woody debris and sediment to the valley bottom alluvial fans. From river mile 74.5 to river mile 63.2, the channel gradient changes from 1.3 to 0.6 percent, and the channel is a meandering and braided alluvial channel with point and transverse bars. The substrate is cobble and gravel.

There is a moderate supply of large woody debris in the Upper Methow channel. Pool frequency is generally low because of the relatively high bedload transport rates and the moderate supply of large woody debris (USFS 1997). The riparian zone is fairly wide and undisturbed (NMFS et al. 1998a). Sediment delivery to the Lower Methow River is not a significant problem. The USFS estimates that sediment delivery to the Methow River from public lands is about 10 percent higher than natural background levels (Okanogan National Forest 1998). The riparian zones in the upper reaches of the Methow Basin are in relatively good condition, with only isolated damage from natural events and limited agriculture, grazing, logging, and roads (NMFS et al. 1998a).

The Mid-Methow River Basin area includes the mainstem from about 5 miles southeast of the town of Mazama to the river mouth. The Methow River is in a U-shaped, unconfined, alluvial valley from Mazama to river mile 32.5. Wolf Creek enters 2 miles upstream of the town of Winthrop, and the Chewuch River enters at Winthrop. The Wolf Creek watershed originates on the south side of Gardner mountain at 8,897 feet elevation, the highest point in Okanogan County. The Methow River is in a U-shaped, moderately confined, alluvial valley from river mile 32.5 to river mile 22.4 near the town of

Carlton. The Chewuch River, the largest Methow River tributary, enters in this segment.

From the confluence of the Chewuch River downstream, the Methow River has an average gradient of 0.37 percent. Past use of private bottom lands by livestock and agriculture has impacted about 60 percent of the Methow River channel by erosion, stream bank sloughing, and bank cutting. About 25 percent of the stream banks have been modified and over 60 percent are eroding (NMFS et al. 1998a). This impacts riparian vegetation, stream bank condition, channel pools, and cover conditions.

Roughly half of the Chewuch River Basin (primarily the upper basin) is relatively undisturbed with natural channel conditions. Along the Chewuch River for 18 miles below the National Forest boundary to Sheep Creek, there is a lack of large woody debris as a result of stream cleanouts for flood control, salvage of instream wood, and extensive logging along the stream riparian zone. Impacts to the channel along portions of the Lower Chewuch River occurred following the 1948 flood, when bank protection was added. Sediment delivery is a significant problem in the Lower Chewuch River. Impacts from forest roads have occurred along the Chewuch River and tributaries (Boulder, Cub, Falls, Twentymile, and Lake Creeks). Boulder Creek watershed has experienced several mass-wasting events, and significant bank erosion presently occurs in the lower 25 miles of the Chewuch River. Reduced large woody debris in the Lower Chewuch River results in reduced pool areas.

The Twisp River enters at river mile 40.2 at the town of Twisp. The Twisp River gradient ranges from 1.7 to 5 percent in the upper reaches and from 0.7 to 1.7 percent in the middle and lower reaches (USFS 1995). Substrate consists of gravel and sand. Forest roads located in the narrow floodplains of the Poorman, Newby, Little Bridge, Buttermilk, Canyon, and Lime Creeks (tributaries of the Twisp River) have impacted channel conditions by direct damage to the riparian zone vegetation and side channel areas and introduction of fines from the road surfaces. The Canyon, Poorman, Little Bridge, Slate, and West Fork Buttermilk Creeks have degraded riparian areas that impact the channel condition by bank erosion and reduce channel structure because of the lack of large woody debris supply.

Surveys of the Twisp River indicate moderate large woody debris conditions. The better aquatic habitat conditions were found in the relatively undisturbed portions of the Twisp River that had good large woody debris and boulder cover. Reduced large woody debris in the Lower Twisp River results in reduced pool areas.

The Lower Methow River Basin area includes the mainstem from the town of Carlton to the river confluence with the Columbia River. The Methow River is in a U-shaped, confined, alluvial valley from near Carlton to river mile 6.5 and in a U-shaped, moderately confined, alluvial valley from river mile 6.5 to the mouth. The substrate quality in the mainstem Methow River is relatively good (Chapman et al. 1994a). Many channel sections are constrained by rip-rap or channel incision, resulting in a narrower deeper flow during flood flows and less room for channel migration. Many of the tributary streams to the lower Methow River, including Beaver, Gold, and Libby Creeks, have water rights that have been overappropriated resulting in dewatering of the streams in the summer and early fall. Vegetation clearing and stream bank rip-rapping has occurred where more homes were constructed along the valley bottoms. Over 86 percent of the channel has eroded and/or excavated banks or is channelized. Stream bank erosion is higher in residential and agricultural areas adjacent to the stream banks (USFS 1998). Construction of valley bottom roads and timber harvest have left small to nonexistent stream buffers that do not provide adequate stream bank protection or provide for current and future large woody debris input to the channels. Similar to the lower portions of the tributaries, reduced large woody

debris in the Lower Methow River has resulted in reduced pool habitat.

Okanogan River

The Okanogan River valley is a part of the Colville complex of granitic and metamorphic rocks. The Omak Lake fault runs up the Okanogan valley. West of the fault is a mix of igneous plutons, gneiss, and metamorphosed deep ocean sediments of the Okanogan trench deposit. These include argillite, phyllite, volcanic rocks, limited carbonate rocks, and greenstone. The valley has a thick deposit of glacial deposits over the bedrock. On the east side of the basin, east of the Omak Lake fault, the rocks are part of the Okanogan metamorphic core complex (Cheney 1994), basically an intrusive granitic dome and surrounding metamorphic gneiss.

Nearly all of the subbasin experienced glaciation and is characterized by moderate slopes and broad, rounded summits. In the lower valleys, the great regional ice sheets, local alpine valley glaciers, and the tributary rivers have eroded deep, relatively wide valleys. This area has steep to rolling hills along the valley walls, with flat to moderate slopes on ancient terraces and along the valley bottoms.

The Okanogan River originates in British Columbia with 29 percent of the watershed area in the United States. The Similkameen River, which enters the Okanogan River from the northwest approximately 75 miles above the mouth, is the main tributary and is located primarily in Canada. The Similkameen River is impassable at Enloe Dam, an abandoned power generation facility, 8.8 miles above the confluence with the Okanogan River.

The Lower Okanogan River runs south from Osoyoos Lake at the Canadian border. From river mile 77.6 at Zosel Dam to river mile 64.6 at Mosquito Creek, the unconfined valley is filled with lake bottom sediments. The channel has a gradient of 0.03 percent, with multiple channels and eroded banks. From Mosquito Creek (river mile 64.6) to Aeneas Creek (river mile 52), the river valley is also unconfined. The channel gradient is 0.04 percent, with multiple channels and eroded banks. From river mile 52 to McAllister rapids at river mile 42 (12 miles upstream of Omak), the channel is in a moderately confined, alluvial valley. The channel gradient is 0.05 percent with multiple channels and eroded banks. From McAllister rapids to the river mouth, the channel flows through a U-shaped, unconfined alluvial valley. The channel gradient is 0.03 percent with straight, multiple, and channelized forms with eroded banks. The last 11 miles are within the backwater of the Wells Dam under average flow conditions in the Columbia and Okanogan Rivers.

The Similkameen River, below Enloe Dam, is in a deep, confined, V-shaped valley from river mile 13.8 to river mile 9.2. The lower reach is in a U-shaped, unconfined valley. The channel consists of straight, multiple, and entrenched segments; over half of the segments have eroded banks.

Several lakes in the Upper Similkameen River and Osoyoos Lake on the Okanogan River trap bedload sediment and a portion of the suspended sediment transported from the upper river basins. Channel substrate in the lower river contains a large proportion of fine sediment because of extensive stream bank erosion, erosion from upland farms and ranches, and basinwide mass-wasting. The riparian habitat of the Okanogan River is the most degraded of the four main Mid-Columbia River tributaries. Lack of riparian vegetation contributes to channel bank instability, sedimentation in the channel, and lack of in-channel pools and cover.

3.1.2.3 Columbia River System

The Columbia Basin is comprised of sedimentary and metamorphic rocks in the north and east, and volcanic and igneous rocks in the west, south, and central parts (USGS 1994). The early geologic history is complex, with terrenes docking against

the ancient North American plate edge in northeast Washington; large and small regions of igneous intrusions; large volcanoes; uplift of the metamorphosed sediments and ocean crust from the edge of the Cascades to the present Pacific coast; volcanic flows across over 100,000 square miles of the Columbia Plateau; great glaciers flowing from the mountains of Canada; extensive valley glaciers; and repeated large glacial outburst floods, draining lakes that covered much of Montana, that flooded the entire Columbia River to the Pacific. The Cascade Mountains grew across the paths of the west-flowing rivers by the late Cenozoic uplift that continues to this day. Only the Columbia and Klamath Rivers were able to erode into the rocks fast enough to continue flowing to the Pacific Ocean.

3.1.3 SOILS

Soil types and the parent materials that they formed in are as varied in the Mid-Columbia River region as are the landform and climate zones of the area. Ancient soils have formed in residual materials that have weathered in place over very long periods. Relatively young soils have formed in the materials left by the continental glaciers that covered the northern portions of the Mid-Columbia River region and the alpine glaciers that flowed down the tributary rivers from the Cascade Mountains. The glaciers deposited outwash from rivers flowing off the ice and glacial tills beneath and just in front of the ice. Along the glacially modified valley walls, soils formed in colluvium, materials that accumulate from hillslope erosion. Common to the valley bottoms and along the narrow mountain river terraces are soils formed in alluvium, materials that are deposited by rivers from the glaciers, glaciofluvial deposits, and recent river deposits. Along the river valleys of the Mid-Columbia River and the main tributaries, well-drained soils have formed in deposits of loess, a mixture of wind-blown silt and fine sand derived from till, outwash, and valley bottom river alluvium. Soils have also formed in volcanic ash deposits and ancient lake bottom sediments.

3.1.3.1 Project Area

Dominant soil types are similar at the Wells, Rocky Reach, and Rock Island Dam sites. They include the Peoh soil series, formed in old alluvium with a surface layer of loess and volcanic ash; and the Cashmont soil series, formed in alluvial and colluvial materials derived from basalt.

The Peoh soils are a gravely, fine, sandy loam with slopes of 3 to 15 percent on the terraces. They have moderately rapid permeability, slow to moderate run-off potential, and a water erosion susceptibility of slight to none.

The Cashmont soils are a sandy loam with slopes of 3 to 8 percent at the edges of the terraces and near the valley walls. They have moderately rapid permeability, slow to medium run-off potential, slight to moderate water erosion susceptibility, and slight to moderate wind erosion potential.

3.1.3.2 Associated Tributaries

Wenatchee River

Most of the soils in the forested mountains of the Wenatchee River Basin are formed in glacial till mixed with volcanic ash and pumice in the surface layers. Some of the upland areas that were not glaciated have residual soils derived from weathered bedrock or wind-blown loess. The most common soils associations are Bjork-Zen and Nard-Stemilt soils (Soil Conservation Service 1973). They are medium-textured, steep to very steep soils underlain by bedrock at 20 to 40 inches depth and are mainly well-drained.

The Bjork-Zen association soils are found on terraces and sideslopes in the hilly uplands. They formed in loess or in material weathered from

sandstone or schist with some loess and volcanic ash in the surface layer. They have moderately slow to moderate permeability, and their run-off potential is medium on low-gradient slopes, rapid to very rapid on steep slopes, and rapid on irrigated soils. Their susceptibility to water erosion is moderate on low-gradient slopes, high on steep slopes, and high on irrigated soils. Bjork-Zen soils occur at elevations from 1,000 to 5,000 feet.

The Nard-Stemilt association soils are found on ridgetops, foothills, sides of terraces, and on mountainous uplands. They formed in glacial till, weathered granodiorite, basalt, gneiss, schist, or sandstone bedrock. Their surface layer contains a mixture of loess and some volcanic ash. They have slow to moderate permeability, and their run-off potential is slow to medium on low-gradient slopes, rapid on steep slopes, and rapid on irrigated soils. Their susceptibility to water erosion is slight to moderate on low-gradient slopes, moderate to high on steep slopes, and high on irrigated soils. Nard-Stemilt soils occur at elevations from 1,000 to 5,000 feet.

The valley bottom soils are nearly all alluvial with some being of glacial origin. River channels have nearly level bars of recent coarse sand and gravelly alluvium. The terraces and valley bottoms have Burch-Cashmont and Brief-Leavenworth associations (Soil Conservation Service 1973). Both of these soil associations are primarily medium- to moderately coarse-textured, nearly level to strongly sloping soils on terraces, alluvial fans, bottom lands, and foot slopes. The soils are mainly well-drained. They have moderate to moderately rapid permeability, and their run-off potential is very slow on low-gradient slopes, slow to medium on steep slopes, and rapid on irrigated soils. Their susceptibility to water erosion is none to slight on low-gradient slopes, moderate on steep slopes, and high on irrigated Brief and Cashmont soils.

The Burch-Cashmont association soils are on terraces and low, recent alluvial fans and foot slopes. The soils formed mainly in valley fill and alluvium, with some loess and volcanic ash in the surface layer. Burch-Cashmont soils occur at elevations from 600 to 1,300 feet.

The Brief-Levenworth association soils are on bottom lands, low terraces, and alluvial fans. They consist mainly of well-drained, moderately coarse- and coarse-textured soils that formed in alluvium but have some loess and volcanic ash in the surface layer. Brief-Levenworth soils occur at elevations from 800 to 2,300 feet.

Mass-wasting, including landslides and debris flows, and surface erosion are the main hillslope processes that transport and deliver sediment to the river channels in the Wenatchee Basin. When located on steep hillsides, the till/volcanic ash mix (common to many of the upland soils) is vulnerable to mass-wasting, erosion, and delivery to the creeks. Areas with extensive logging, road systems, and past grazing in the Mission Creek Basin have accelerated the natural background rates of erosion in the basin. Tractor skidding of logs is still common on private lands and is a significant source of fine sediment to the creeks.

Stream bank erosion and erosion of sediment stored along the stream channels and terraces are the main channel sources of sediment in the stream channels. Bank erosion and transport of channel sediment has been modified in the Wenatchee Basin by altered hydrologic conditions that generate larger and more frequent flood flows; by removal of riparian and stream bank vegetation that modifies the amount of large woody debris, channel structure, and flow velocities; and by rip-rap bank protection, bridge constrictions, dams, and levee structures.

Entiat River

Most of the soils in the forested mountains are formed in glacial till mixed with volcanic ash and pumice in the surface layers. Some of the upland areas that were not glaciated have soils derived from weathered bedrock or loess. The most

common soils are the Entiat-Dinkelman association (Soil Conservation Service 1973). They are predominantly moderately coarse-textured, well-drained, steep to very steep soils underlain by bedrock at a 14- to 60-inch depth.

The Entiat-Dinkelman soils are found on the top and sides of ridges in the foothills and on mountainous uplands. The soils formed in decomposing granodiorite and granite with loess and small amounts of volcanic ash and pumice in the surface layer. They have moderate to moderately rapid permeability, and their run-off potential is slow to rapid on low-gradient slopes, rapid to very rapid on steep slopes, and slight to very rapid on irrigated soils. Their susceptibility to water erosion is none to slight on low-gradient slopes, moderate on steep slopes, and high on irrigated soils. Entiat-Dinkelman soils occur at elevations from 1,000 to 4,000 feet.

The river valley soils are nearly all alluvial, with some being of glacial origin. River channels have nearly level bars of recent coarse sand and gravelly alluvium. The terraces and valley bottoms have Brief-Leavenworth association soils that are the same as described for the Wenatchee Basin valley bottom soils (Soil Conservation Service 1973).

Upland surface erosion from natural and management-related causes has a significant influence on the channel in the lower reaches. Mudflows resulting from high-intensity rainstorms and rain on snow events following extensive fires in the basin are a significant erosion source and cause of siltation in the channel.

Methow River

The upland soils of the Methow watershed are deep to very shallow, mostly grassland soils found on rock outcrop and badlands on dissected upland glacial plains and terraces. Common soil associations include the Newbon-Conconully and Kartar-Dinkelman-Springdale associations (Soil Conservation Service 1980).

The Newbon-Conconully association soils formed in glacial till on glaciated plains in the basin. They are deep, well-drained soils with a moderate infiltration rate. The dissected glacial plains form undulating and rolling uplands and steep hillsides. In these areas, the association soils are shallow and include rock outcrops. Most of the soils are a gravely loam to gravely, sandy loam. They have moderate to moderately rapid permeability, and their run-off potential is slow to medium on low-gradient slopes and rapid on steep slopes. Their susceptibility to water erosion is slight on low-gradient slopes and high to very high on steep slopes. Newbon-Conconully soils occur at elevations from 1,500 to 3,000 feet.

The Kartar-Dinkelman-Springdale association soils formed in glacial till, outwash, and weathered granite, gneiss, and schist. They are deep, somewhat excessively drained or well-drained soils on glacial plains and terraces. The deeply dissected glacial plains form long, narrow to broad, gently rounded ridges, and long, steep side slopes. The terraces are nearly level and their escarpments strongly sloping. They include sandy loam; gravely, sandy loams; and sandy gravels. They have moderately rapid permeability, and their run-off potential is slow to medium on low-gradient slopes and rapid to very rapid on steep slopes. Water erosion susceptibility is slight to moderate on low-gradient slopes and moderate to very high on steep slopes. The Kartar and Dinkelman soils have moderate wind erosion potential. These soils occur at elevations from 1,500 to 3,500 feet.

The river channels have nearly level bars of recent coarse sand and gravelly alluvium. The terraces and valley bottoms have Owhi-Winthrop association soils upriver of the town of Carlton and Pogue-Cashmont-Cashmere soils downstream. The Owhi-Winthrop association soils formed in glacial outwash and alluvium on terraces. They are deep, well-drained or

excessively drained soils found on nearly level to strongly sloping terraces and terrace escarpments. They have moderately rapid to very rapid permeability, and their run-off potential is very slow to slow on low-gradient slopes and medium to rapid on steep slopes. Their susceptibility to water erosion is none to slight on low-gradient slopes and moderate to high on steep slopes. Owhi-Winthrop soils occur at elevations from 1,400 to 3,000 feet.

The Pogue-Cashmont-Cashmere soils formed in glacial till and outwash on terraces. They are deep, somewhat excessively drained or well-drained soils. They have moderately rapid permeability, and their run-off potential is slow on low-gradient slopes and medium to rapid on steep slopes. Water erosion susceptibility is none to slight on low-gradient slopes and moderate to high on steep slopes. The Cashmont and Cashmere soils have a moderate wind erosion potential. These soils occur at elevations from 700 to1,050 feet.

Surface erosion is not considered a major issue in the basin, although some local area conditions can be improved.

Okanogan River

The main upland soils of the Okanogan watershed are Rock Outcrop-Nevin-Donavan association, Rock Outcrop-Donavan association, Molson-Lithic Xerochrepts-Koepke association, and Republic-Mires-Chesaw association (Soil Conservation Service 1981). These are deep to very shallow, mostly forest soils and rock outcrops on mountainous uplands.

The Rock Outcrop-Nevin-Donavan association soils formed on mountain uplands and toe slopes in a mantle of volcanic ash and underlying glacial till. The ridges are gently rounded and the hillsides are steep with deep drainages. The soils are well-drained. They have moderate permeability, and their run-off potential is slow to medium on low-gradient slopes and rapid on steep slopes. Their susceptibility to water erosion is slight to moderate on low-gradient slopes and high to very high on steep slopes. Rock Outcrop-Nevin-Donavan soils occur at elevations from 2,000 to 4,500 feet.

Rock Outcrop-Donavan association soils formed on steep breaks of the deeply dissected glacial plains in volcanic ash over glacial till. Soil properties are similar to the previously described Rock Outcrop-Nevin-Donavan association soils. These soils occur at elevations from 2,000 to 3,500 feet.

Molson-Lithic Xerochrepts-Koepke association soils formed on alluvial fans, outwash terraces, and terrace escarpments in a mantel of volcanic ash, underlying glacial till, and materials weathered from granite. The ridges are gently rounded, and the steep hillsides are cut by deep drainage ways. The soils are well-drained. They have moderate permeability, and their run-off potential is slow to rapid on low-gradient slopes and rapid on steep slopes. Their susceptibility to water erosion is slight to high on low-gradient slopes and high to very high on steep slopes. Molson-Lithic Xerochrepts-Koepke soils occur at elevations from 1,900 to 5,000 feet.

Republic-Mires-Chesaw association soils formed on alluvial fans, outwash terraces, and terrace escarpments in glacial till, reworked glacial till, and outwash. The soils are well-drained to excessively drained. They have dominantly moderate to very rapid permeability, and their run-off potential is slow to rapid on low-gradient slopes and rapid to very rapid on steep slopes. Their susceptibility to water erosion is slight to high on low-gradient slopes and moderate to very high on steep slopes. Republic-Mires-Chesaw soils occur at elevations from 2,800 to 4,500 feet.

On the terraces, ridges, hillsides, and glacial till plains, the common Okanogan Basin soils include the Nighthawk-Conconully-Lithic Xerochrepts and Disanutel-Conconully-Nespelem associations. These are deep to very shallow,

mostly grassland soils, rock outcrop, and badlands on dissected upland plains and terraces.

The Nighthawk-Conconully-Lithic Xerochrepts association soils formed on glacial till plains in glacial till and materials weathered from granite. Most of the association soils are on ridges and hillsides. The ridges are gently rounded and the hillsides are steep. They have moderate to moderately rapid permeability, and their run-off potential is slow to rapid on low-gradient slopes and rapid to very rapid on steep slopes. Their susceptibility to water erosion is slight to high on low-gradient slopes and high to very high on steep slopes. Nighthawk-Conconully-Lithic Xerochrepts soils occur at elevations from 700 to 3,000 feet.

The Disanutel-Conconully-Nespelem association soils formed on plains and terraces in glacial till and lake bottom sediments. The upland plains are undulating and rolling, and the terraces and their escarpments are nearly level and strongly sloping. They have moderately slow to moderately rapid permeability, and their run-off potential is slow on low-gradient slopes and rapid to very rapid on steep slopes. There susceptibility to water erosion is slight on low-gradient slopes and high to very high on steep slopes. Disanutel-Conconully-Nespelem soils occur at elevations from 1,500 to 3,000 feet.

Common soil associations along the valley bottoms of the Okanogan River and tributaries include the Pogue-Cashmont-Cashmere and Colville-Okanogan associations. These are deep, mostly grassland and meadow soils on terraces and floodplains.

The river channels have nearly level bars of recent sand and gravelly sand alluvium. The terraces along the valleys consist of Pogue-Cashmont-Cashmere association soils as described for the Methow Basin valley bottom soils. The Colville-Okanogan association soils are found along the valley bottom floodplains that are subject to flooding. They are deep, somewhat poorly drained or well-drained soils formed in alluvium. They have moderately slow to moderate permeability, and their run-off potential is very slow. Their susceptibility to water erosion is none to slight. These soils occur at elevations from 700 to 2,000 feet.

Much of the floodplain on the Okanogan is used for crops and winter livestock; during the summer, livestock graze the uplands. Some of the tributaries support year-round ranching. High run-off and erosion rates deliver sediment to ditches and creeks during rainstorms and rapid snowmelt periods.

Surface erosion on bottom lands and mass-wasting on adjacent hillslopes were serious problems in the 1970s, when clean cultivation and rill irrigation were common in the basin. This erosion source has been reduced somewhat by a switch to alfalfa and seed production and by adoption of Best Management Practices (BMPs).

Degraded riparian vegetation, eroding banks, and sediment delivery to the river channel from upland forest, agricultural, and urban areas contribute to the very poor stream substrate conditions in the Okanogan Basin.

3.1.3.3 Columbia River System

A broad range of soil types has formed in the Columbia River Basin as a result of the wide range of climate zones and the various types and ages of surface geologic materials. The numerous, high mountain alpine regions of the basin contain young soils because of recent alpine glaciers and constant erosion of the surface. They formed in cold climate conditions with seasonal moisture in the spring; brief, warm but dry summer conditions; and dry, cool fall conditions. Much of the Columbia Basin soils formed in dry to moderately dry conditions with cold winters, short moist, spring weather and dry, hot summer, dry, cool fall, and cold winter conditions. From the Mid-Columbia River to the Pacific, the climate varies from dry interior to wet temperate

conditions, changing the way the Columbia gorge and lower Columbia surface materials are weathered into soils compared to the mid- and upper-river basin areas.

The great continental glaciers, and resulting lakes and river flood deposits covered the northern portions and main valley of the Columbia resulting in relatively young soils, less than 9,000 years old. Since the 1880s, extensive dry land farming and ranching, and since the 1940s, irrigated farming have modified a large portion of the valley bottom, terrace, and foothill soils in the Columbia Basin. During the late 1920s, most of the dry land farms sustained moderate to severe wind erosion of the soils (Social Conservation Service 1973, 1980, 1981). By the mid-1930s, this soil erosion had been reduced as a result of increased rainfall and better cultivation methods.

3.2 FISHERIES RESOURCES

Key Terms

Anadromous – Describes the life-history characteristic of a fish species that reproduces in freshwater, migrates to the ocean for some portion of its rearing stage, and returns to freshwater as an adult.

Biological Productivity – Capacity of an ecological system to produce or support a particular population size of an animal (fish) or plant species.

Broodstock – Group of fish that are used to provide eggs and sperm to produce a hatchery stock to supplement or replace reproduction in a natural environment.

Critical Habitat – Specific areas occupied by a species that contain physical and biological features essential to the conservation of the species, and which may require special management considerations for protection. These areas might provide space for individual or population growth, nutritional or physiological requirements, breeding and rearing habitat, shelter or cover for protection, and/or represent the historical or geographical distribution of the species.

Evolutionarily Significant Unit (ESU) – A reproductively isolated animal or fish population that represents an important component in the ecological/genetic diversity evolution of the species. The unit typically has a relatively confined historical or geographical distribution.

Juvenile Bypass – Facility that is used to collect, divert or guide juvenile fish around a dam and that provides a safer passage route than through the turbine units.

PIT-Tag – A Passive Integrated Transponder tag (about the size of a grain of rice) transmits a digital code unique to an individual fish when the tagged animal passes through an electromagnetic field of the proper frequency. The tag uses the power emitted by the detection system to transmit the signal, thus it has no batteries (making it functional for years). The tag is typically used on juvenile fish to assess passage survival, as well as survival at the adult stage.

Radio-Telemetry – Methodology consisting of attaching or implanting a radio frequency emitting tag in a fish or animal to track its movements or to detect its presence in specific areas. The radio signal emitted by the tag is monitored with a radio receiver and antenna.

Resident – Describes the life-history characteristic of a fish species that spends its entire life in freshwater.

* *See Chapter 7 for a complete listing of all Key Terms.*

The affected fisheries resources that occur in the project area include anadromous and resident fish species, benthic macroinvertebrates, and aquatic vegetation communities. The anadromous fish species include: chinook salmon, coho salmon, sockeye salmon, steelhead, Pacific lamprey (*Entosphenus tridentatus*), and the semi-anadromous white sturgeon (*Acipenser transmontanus*). Some 46 other resident fish species also occur in the Mid-Columbia River Basin. The salmonid species found primarily in the tributary or non-mainstem areas include

kokanee (landlocked sockeye salmon), bull trout (*Salvelinus confluentus*), rainbow trout (resident form of steelhead), westslope cutthroat trout (*O. clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), and pygmy whitefish (*P. coulteri*). These salmonid species occupy some of the same habitats as the Plan species, and are therefore most likely to be affected by the proposed action.

License articles, amendments, and settlement agreements pertinent to fishery resources are described in Chapter 2 of this EIS. These include project facilities, operations, and hatcheries that were developed to avoid and minimize fish injury or losses as a result of passing through the dams.

3.2.1 THE LISTINGS UNDER THE ENDANGERED SPECIES ACT

On August 18, 1997, the NMFS published notice in the Federal Register, listing the Upper Columbia River Evolutionarily Significant Unit of steelhead as an endangered species under the Endangered Species Act (NMFS 1997). In response to this listing, Chelan and Douglas County PUDs filed interim protection plans with FERC for the Wells, Rocky Reach, and Rock Island Projects. The interim protection plans proposed a program to provide short-term compliance with the Endangered Species Act until the Anadromous Fish Agreements and HCPs could be approved. In accordance with the applications filed by the PUDs, FERC initiated informal consultation with NMFS under Section 7 of the Endangered Species Act. Also included in the consultation is the Upper Columbia River Evolutionarily Significant Unit of spring-run chinook salmon (which was listed as an endangered species on March 24, 1999 [NMFS 1999a]) and the Evolutionarily Significant Unit of Mid-Columbia River steelhead (which was listed as a threatened species on March 25, 1999 [NMFS 1999b]). The consultation for Upper Columbia River spring-run chinook salmon and Upper Columbia River summer-run steelhead was concluded when, in June of 2000, NMFS issued Douglas County PUD a biological opinion on the proposed interim protection plan for Wells Dam. Although the time frame for the 2000 Wells biological opinion has expired and FERC has provided no indication that it intends to reinitiate consultation, Douglas County PUD has continued to operate the project and implement those actions identified in the 2000 biological opinion. Consultations were not completed for Rock Island and Rocky Reach Projects, and the time frame for the corresponding interim protection plans has also expired.

On February 16, 2000, NMFS published notice of the critical habitat designation for the two endangered species (NMFS 2000c). This designated the major river basins known to support the Evolutionarily Significant Units, including the Wenatchee, Entiat, and Methow Rivers, as well as the Columbia River and estuary for spring-run chinook salmon. These same areas were designated as critical habitat for the steelhead Evolutionarily Significant Unit, as well as the Okanogan River Basin. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing critical habitat designations for 19 Evolutionarily Significant Units (ESUs) of salmon and steelhead (including the three Endangered Species Act-listed species found in the Mid-Columbia River). The critical habitat designations are currently being reevaluated by NMFS.

The Columbia River bull trout populations were also listed as threatened under the Endangered Species Act in June 1998 (USFWS 1998). Because the Mid-Columbia River bull trout populations are not considered anadromous, their protection was not included in the HCPs. However, bull trout are occasionally observed passing through the adult and juvenile passage facilities at the Mid-Columbia River dams. Currently, no biological assessments have been written for bull trout at the projects; however, informal Section 7 consultations between the

PUDs, FERC, and the USFWS have been initiated.

3.2.2 ANADROMOUS FISH RESOURCES

Four species of anadromous Pacific salmonids occur in the Columbia River Basin upstream of Bonneville Dam: chinook, coho (hatchery origin), and sockeye salmon and steelhead. The HCPs apply to all four of these species (Plan species). The incidental take portion of the agreements does not apply to coho salmon, as native populations in the Mid-Columbia River region are now extinct (Nehlsen et al. 1991). However, hatchery coho salmon have been planted in the Mid-Columbia River region in recent years in an attempt to reestablish the runs. The remaining species, which are included in the incidental take portion of the agreements, are referred to as Permit species.

General life-history descriptions and current and historic run size information for these species in the Columbia River system and the Mid-Columbia River reach are provided below.

3.2.2.1 Life History

The timing of adult migration, spawning, incubation, hatching, emergence, juvenile rearing, smolt outmigration, and ocean residence periods differ between species and some of these differences have been used to separate several species into different races/demes. This differentiation is applied to chinook salmon and steelhead because these species exhibit substantial variation in life-history characteristics.

There are three races/demes of chinook salmon in the Columbia River Basin: spring, summer, and fall; and two races of steelhead: summer and winter. These race designations are based on the time that returning adults typically enter the river. However, in recent years the comparison of overall life-history characteristics and genetic assessments has shown that these designations are not always accurate (Chapman et al. 1994a).

A more consistent differentiation scheme, that characterizes the stocks as either ocean-type or stream-type fish, is based on their overall life-history characteristics. Ocean-type juveniles migrate to sea as subyearlings, spend most of their ocean life in coastal waters, and return to freshwater as adults, a few months prior to spawning. Stream-type fish migrate to sea as yearlings, exhibit extensive offshore migrations, and return to freshwater many months before spawning (Healey 1991). Within the Columbia River Basin, the production of stream-type fish typically occurs higher in the watersheds than ocean-type fish which typically spawn in mainstem areas and lower tributaries (Waknitz et al. 1995). Mid-Columbia River chinook salmon populations exhibit both types of life-history characteristics.

Mid-Columbia River spring-run chinook salmon enter the lower river in the spring and are categorized as stream-type fish because they typically rear in freshwater for more than 1 year before migrating to the ocean as yearlings. They also tend to spawn in the upper reaches of tributary streams. Although summer/fall-run chinook salmon enter the lower river at different times, and usually spawn in different areas (summer-run chinook salmon tend to spawn higher in the system than fall-run chinook salmon), they both exhibit ocean-type life-history characteristics (spend less than 1 year in freshwater). In addition, there is considerable genetic homogeneity between these two groups. As a result, they are considered part of the same Evolutionarily Significant Unit and are usually called summer/fall-run chinook salmon in the Mid-Columbia River (Waknitz et al. 1995).

For the purposes of the HCPs, summer- and fall-run (ocean-type) chinook salmon are treated as indistinguishable races/demes. However, when spawning is discussed, summer- and fall-run chinook salmon are separately identified and

discussed. The fall-run chinook salmon component are defined as those races/demes that spawn in the mainstem Columbia and Snake Rivers, and in the extreme lower reaches of primary tributaries to the mainstem Columbia. The summer-run chinook salmon component are those stocks that do not spawn in the aforementioned areas but do outmigrate as subyearling juveniles (age 0+), the same as fall-run chinook salmon.

Spring-Run Chinook Salmon

The Upper Columbia River Evolutionarily Significant Unit of spring-run chinook salmon was listed as endangered under the Endangered Species Act in March 1999 (NMFS 1999a). These stream-type chinook salmon exhibit substantially more diverse life-history strategies than ocean-type salmonids, probably as a result of differences in the environmental conditions found in the various tributary streams where these fish spend their first year and a half of life. Spring-run chinook salmon are found in all of the major watersheds in the Mid-Columbia River except the Okanogan River drainage. Three independent populations of spring-run chinook salmon are identified for the Evolutionarily Significant Unit, including those that spawn in the Wenatchee, Entiat, and Methow Basins (Ford et al. 1999). Adult spring-run chinook salmon return to Mid-Columbia River tributaries from late March through June, after spending 2 to 3 years in the ocean (Chapman et al. 1995a). This species experiences very little ocean harvest.

Chinook salmon passing the Rock Island Dam before June 23 are considered spring-run chinook salmon (Peven 1992). After entering the tributaries, the adults hold in the deeper pools and under cover until the onset of spawning. They may spawn near their holding areas or move upstream into smaller tributaries. Spawning generally occurs from late July through September and typically peaks in late August, although the peaks vary among tributaries (Chapman et al. 1995a; Peven 1992).

Spring-run chinook salmon eggs hatch in late winter and the fry emerge from the gravel in April and May (Peven 1992). Most of these juveniles rear in freshwater for 1 year before migrating to the ocean, passing the Mid-Columbia River dams between mid-April and mid-June (Mullan 1987). The outmigration of naturally produced spring-run chinook salmon juveniles typically occurs over a longer period than hatchery fish. In addition, naturally produced juveniles are generally smaller than hatchery fish.

Habitat

The extended time spent in freshwater (as adults and juveniles) makes spring-run chinook salmon more susceptible to impacts from habitat alterations than the ocean-type chinook salmon (summer/fall-run chinook salmon). Water withdrawal in some areas has a deleterious effect upon stream-type salmonid spawning distribution, incubation survival, and late summer rearing habitat quality (Chapman et al. 1995a).

Although critical habitat designations for this Evolutionarily Significant Unit are currently being reviewed by NMFS, habitat components important to spring-run chinook salmon and other salmonid species in the Mid-Columbia River include:

- juvenile rearing areas,
- juvenile migration corridors,
- areas for growth and development to adulthood,
- adult migration corridors, and
- spawning habitat.

Within these habitat types, essential features include adequate:

- substrate,

- water quality,
- water quantity,
- water temperature,
- water velocity,
- cover/shelter,
- food,
- riparian vegetation,
- space, and
- safe passage conditions (NMFS 2000c).

Riparian habitat features are also important because they provide shade, sediment transport, nutrient or chemical regulation, stream bank stability, and input (large woody debris or organic matter).

Summer/Fall-Run Chinook Salmon

Most adult summer/fall-run chinook salmon enter the Columbia River from late May to early July and pass the Mid-Columbia River dams from late June through October, after spending 3 or 4 years in the ocean (Peven 1992). Although these two groups of fish are considered part of the same Evolutionarily Significant Unit, and are characterized as ocean-type fish, they spawn in different areas of the basin (Waknitz et al. 1995). Summer-run chinook salmon spawn in the lower portions of the Similkameen River below Enloe Dam, the Okanogan River upstream and downstream of Osoyoos Lake, the lower 50 miles of the Methow River, the Wenatchee River downstream of Lake Wenatchee, and in the Lower Chelan River (Chapman et al. 1994b). Spawning typically occurs during late September through November, peaking in October (Peven 1992).

About 70 percent of the Mid-Columbia River fall-run chinook salmon spawning occurs from Vernita Bar (about 4 miles downstream of Priest Rapids Dam) downstream through the Hanford Reach to the upper reaches of McNary pool (Carlson and Dell 1990). Peak spawning at Vernita Bar occurs in November (Carlson and Dell 1989, 1990, 1991, 1992). Fall-run chinook salmon are also known to spawn in the tailraces of Priest Rapids, Wanapum, Chelan Falls, Wells, and Chief Joseph dams (Chapman et al. 1994a), and possibly below Rocky Reach and Rock Island dams (Dauble et al. 1994). Fall-run chinook salmon spawning also occurs in the Priest Rapids reservoir (Carlson and Dell 1989, 1990, 1991, 1992), Rock Island reservoir (Chelan County PUD 1991), Rocky Reach reservoir (Giorgi 1992; Rensel Associates 2000), and upstream of Wells Dam (Hillman and Miller 1994; Chapman et al. 1994a; Swan et al. 1994; Bickford 1994), where suitable water velocities and substrate conditions occur. However, the extent and magnitude of this spawning activity is unknown.

Juveniles emerge in April and May and move downstream within a few days to a few weeks (Chapman et al. 1994a). Ocean-type fish (summer- and fall-run chinook salmon) generally migrate to the ocean as age-0 subyearlings in late summer and early fall months, passing the Mid-Columbia River dams between June and August (Mullan 1987; Peven 1992; Chapman et al. 1994a). Based on limited snorkel observations, summer-run chinook salmon leave the Wenatchee River in summer as expected for ocean-type fish, but some may rear in the mainstem Columbia River for extended periods (Chapman Consultants 1988). This phenomenon probably occurs on other tributaries to the Mid-Columbia River, and suggests that mainstem reservoirs largely influence the success of ocean-type salmonids.

Habitat

Important habitat components for summer/fall-run chinook salmon are similar to those described above for spring-run chinook salmon, although not necessarily in the same areas or time of year. Summer/fall-run chinook salmon tend to spawn in the mainstem Columbia or lower reaches of tributary streams, and are therefore dependent on

available habitat in those areas for early rearing. Relative to other populations, ocean-type salmonids spend the shortest amount of their life in the tributaries. An important factor that separates this group from others is that juvenile fish have exited the subbasin prior to the lowest flows in fall and are not subject to harsh conditions in winter.

Sockeye Salmon

The life history of sockeye salmon is perhaps the most complex of any Pacific salmon. Although they share the same general life cycle as chinook salmon, other life-history forms of the species are common and play important roles in its long-term survival. Kokanee, a resident form of sockeye salmon, occasionally migrate to sea and return as adults, however there is limited evidence that these fish contribute substantially to sockeye salmon production (NMFS 1994). A third form, known as residual sockeye salmon, often occur together with sockeye salmon. Residuals are believed to be the progeny of sockeye salmon, but are generally non-anadromous themselves.

The distribution of sockeye salmon in the Mid-Columbia River region is limited to the Wenatchee and Osoyoos Lakes, in the Wenatchee and Okanogan watersheds, respectively. Limited numbers of adults and juveniles are periodically detected however, in the Methow and Entiat Rivers (Carie 1996), Icicle Creek, and in isolated areas of the Mid-Columbia River (Chapman et al. 1995b). Despite the considerable mixing of the Wenatchee and Okanogan sockeye salmon stocks during the Grand Coulee Fish Maintenance Project (Fish and Hanavan 1948), the two populations have a high level of genetic distinction in allele frequencies (Winans et al. 1995; Biological Review Team 1996).

The Grand Coulee Fish Maintenance Project (see Section 3.2.4, Hatchery Programs) was a program to preserve the Upper Columbia River anadromous fish runs after the construction of Grand Coulee Dam. The project trapped all adult fish at Rock Island Dam, and transported them to tributary spawning areas for natural production or to hatcheries for artificial production. The hatchery fish were then released into tributary streams downstream of Grand Coulee Dam. This was the beginning of the Leavenworth National Fish Hatchery complex.

Adult sockeye salmon begin entering the Columbia River in May and pass the Mid-Columbia River dams between late May and mid-August (BPA et al. 1994a). Adults reach natural lakes in the Okanogan and Wenatchee watersheds during July through September and spawn during September and October (Mullan 1987; Chapman et al. 1995b). Sockeye salmon fry emerge in March and April and move into freshwater lakes to rear for 1 to 3 years before migrating to the ocean. Sockeye salmon smolts typically pass the Mid-Columbia River dams between mid-April and late May during their outmigration (Chapman et al. 1995b; Columbia Basin Fish and Wildlife Authority 1990).

Habitat

Similar to spring-run chinook salmon and steelhead, sockeye salmon spend substantial time rearing in freshwater areas. They are particularly dependent on the lake environments for juvenile rearing. As a result, these areas represent very important habitat for these fish. They typically rely on mainstem areas as a migratory corridor, although some rearing also occurs during their outmigration.

Steelhead

Although both summer- and winter-run steelhead occur in the Columbia River Basin, winter steelhead typically occur in tributary streams downstream of John Day Dam. Although steelhead exhibit an extremely complex array of life-history characteristics (Peven et al. 1994), NMFS considers all steelhead returning to tributary streams upstream of the confluence of the Yakima River as belonging to the same Evolutionarily Significant Unit (61 Federal

Register, 960730210-6210-01). This Evolutionarily Significant Unit includes steelhead spawning in the Wenatchee, Entiat, Methow, and Okanogan watersheds, and smaller tributaries to the Mid-Columbia River. Only anadromous forms of steelhead are listed due to uncertainties regarding the status of resident forms (rainbow trout), and interactions between the two life-history forms. The steelhead produced at the Wells Fish Hatchery are included in the Evolutionarily Significant Unit because NMFS considers them essential to the recovery of natural populations.

Adult steelhead enter the Columbia River during March through October, after spending 1 or 2 years in the ocean. Returning adults typically pass the Mid-Columbia River dams from June through late September. Not only is the adult migration protracted over a long period, spawning does not occur until the following March through July (Columbia Basin Fish and Wildlife Authority 1990; Peven 1992). Unlike other anadromous salmonids, some steelhead adults (kelts) return to the ocean after spawning and may spawn more than once during their lifetime (Peven 1992). However, repeat spawning in the Mid-Columbia River region is typically 2.1 percent or less (Brown 1995).

Steelhead eggs incubate from late March through June, and fry emerge in late spring to August. Fry and smolts disperse downstream in late summer and fall. Their use of tributaries for rearing is variable, depending upon population size, and both weather and flow conditions at any given time. Smolts typically leave the Wenatchee River in March to early June, after spending 1 to 7 years in freshwater, but most leave after 2 to 3 years (Peven et al. 1994). Some steelhead are thought to residualize and live their entire lives in freshwater.

As a result of their varied length of freshwater residence, their variable ocean residence, and their spatial and temporal spawning distribution within a watershed, steelhead exhibit an extremely complex mosaic of life-history types (Peven et al. 1994). Such life-history diversity is an effective strategy for ensuring the long-term viability of the populations. Steelhead populations in the Mid-Columbia River were depressed by overfishing in the period before the 1950s and continued through the 1970s (Chapman et al. 1994a). However, spawner/recruitment curves constructed by Mullan et al. (1992) indicate that factors outside the tributary watersheds (primarily mainstem passage mortalities) have significant impacts to wild steelhead. Hatchery practices in the past have also contributed to the stock declines, including the practice of planting catchable trout, which have caused an increase in the incidental catch of steelhead (Chapman et al. 1994a).

Habitat

The habitat features important to these stream-type fish are similar to those discussed for spring-run chinook salmon (above in Section 3.2.2.1, Life History). However, juvenile steelhead can spend considerably longer periods of time in freshwater rearing as juveniles. As with spring-run chinook salmon, the tributary habitat appears to be more important for rearing than the mainstem reservoir areas.

Coho Salmon

Historically, coho salmon were present in both the Columbia and Snake River Basins. Major Columbia River tributaries that supported coho salmon include the Wenatchee, Entiat, and Methow Rivers. Mid-Columbia River coho salmon were decimated in the early 1900s by impassable tributary dams, unscreened irrigation diversions, and extensive harvest. Irrigation, livestock grazing, and mining were major contributors to salmon and steelhead habitat destruction before 1910. Later, timber harvest, fire management, and irrigation impacts were of the most importance. Construction of dams in the tributaries also degraded habitat and blocked access to large portions of the Upper Columbia

River (BPA 1999b). Indigenous coho salmon no longer occur in the Mid-Columbia River region.

Because the historical stocks of coho salmon were decimated near the turn of the century, most life-history information is derived from affidavits from older residents. These accounts support the belief that coho salmon probably returned to the Mid-Columbia River tributaries in September, October, and November. This is also similar to the adult passage timing at the Mid-Columbia River dams in recent years, with the reintroduced stock (Fish Passage Center 2002a). In the Lower Columbia River tributaries, coho salmon spawn from October to mid-December. Juveniles typically spend 1 year in freshwater before outmigrating as yearling smolts in April and May. Coho salmon typically spend about 18 months at sea before returning to spawn (BPA 1999b).

Habitat

The important habitat areas for coho salmon are similar to those discussed for spring-run chinook salmon (above in Section 3.2.2.1, Life History). As with spring-run chinook salmon, the tributary habitat appears to be more important as coho salmon rearing habitat than the mainstem reservoir areas. The mainstem areas function primarily as a migration corridor for coho salmon.

3.2.2.2 Abundance

The best available historical data on the Columbia River salmon runs are the records from the commercial fishing industry. The historical peak catch of Columbia River chinook salmon occurred in 1883, when almost 43,000,000 pounds were taken. This also corresponded to the peak number of canneries operated on the Columbia River (39). At that time, most of the commercial catch consisted of chinook salmon, primarily the high-quality spring-run chinook salmon. Sockeye salmon and steelhead first entered the official catch records in 1889. Large fluctuations in the chinook catch occurred between 1889 and 1920, although the general trend was at a level of about 28,000,000 pounds. Between 1920 and 1935, the catch declined to a mean of about 18,000,000 pounds (Bell 1937).

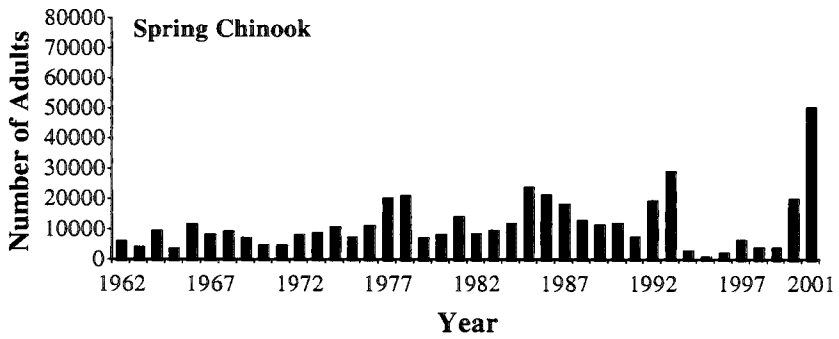
Based on commercial harvest data around the turn of the century, spring-run chinook salmon are thought to constitute between 11 and 15 percent of the estimated 3.8 to 4.3 million chinook salmon entering the river (Chapman 1986). However, prior to the extensive commercial harvest in the lower river before the turn of the century, the separation in run-timing between the different races/demes of chinook salmon was believed to have been much less defined and resulted in greater temporal and spatial overlap between the groups (Mullan 1987). Thompson (1951) showed that, historically, Columbia River chinook salmon exhibited a continuous, bell-shaped run-timing distribution, entering the river mouth from February through late November, peaking in mid-June.

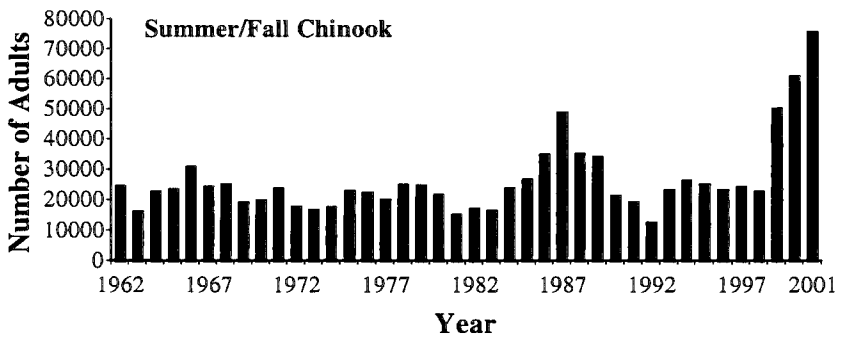
The fishing regulations before and after the turn of the century resulted in a greater exploitation of the spring- and summer-run fish, and as this portion of the run declined, the fishing seasons were extended to include earlier and later portions of the overall chinook salmon run. Fulton (1968) reports that the spring- and summer-runs dominated the catch until about 1928, when the fall-run catch became larger. This exploitation pattern has resulted in greater separation between the three races of chinook salmon (spring-, summer-, and fall-run) and less mixing between groups on the spawning grounds.

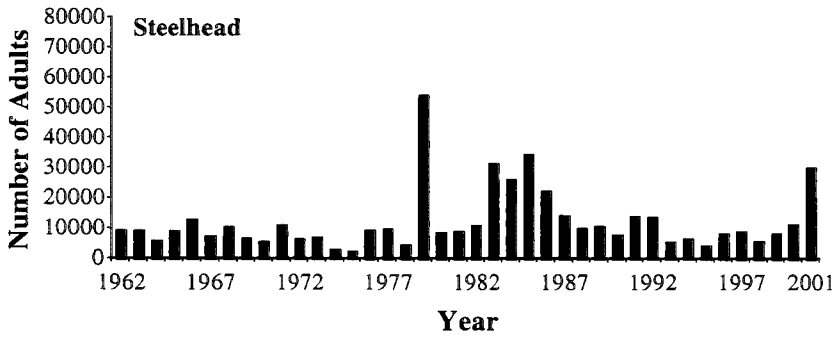
The bell-shaped historical run-timing distribution resulted in some uncertainties regarding the partitioning of the lower river harvest. This has led to considerable confusion regarding the ancestral relationships among chinook salmon populations in the basin (Waknitz et al. 1995).

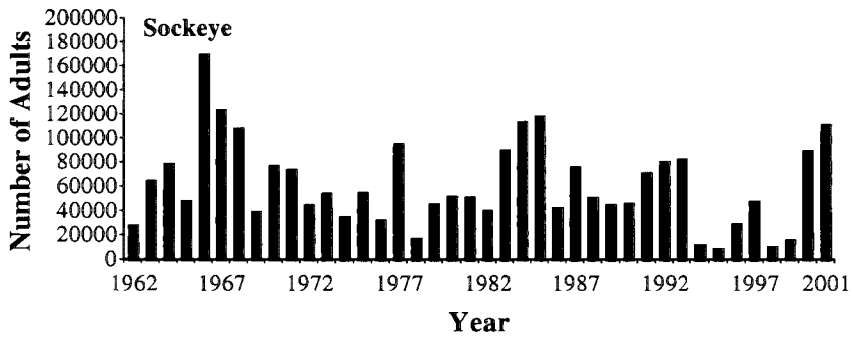
Spring-Run Chinook Salmon

Counting of spring-run chinook salmon began at Rock Island Dam in 1933, with numbers less than 3,000 fish between 1935 and 1938 (Chapman et









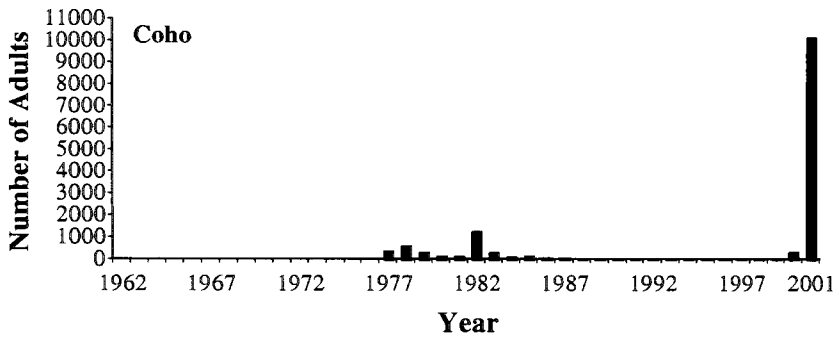


Figure 3-5. Adult returns of steelhead and spring-run chinook[1], summer/fall-run chinook[1], sockeye, and coho salmon at Priest Rapids Dam (1962 to 2001).

[1] Spring- and summer/fall-run chinook salmon numbers represent adult returns from April 16 to June 13, and June 14 to November 15, respectively.

TABLE 3-1. AVERAGE COUNTS OF ANADROMOUS SALMONIDS AT PRIEST RAPIDS DAM (1962 THROUGH 2001), SUMMARIZED BY DECADE

YEARS	SPRING- RUN CHINOOK	SUMMER/FALL-RUN CHINOOK	STEELHEAD	SOCKEYE	COHO
1962 – 1969[1]	7,698	23,595	8,898	82,809	0
1970 – 1979	10,645	21,389	11,330	53,303	427
1980 – 1989	14,249	27,690	17,758	68,235	234
1990 – 1999	9,043	25,136	8,358	40,750	16
2000 – 2001[1]	35,616	68,510	20,634	100,434	5,240

[1] Average based on less than 10 years.

Source: Fish Passage Center (2002b)

al. 1995a). The average number of spring-run chinook salmon passing Priest Rapids Dam increased about 7,698 to 14,300 fish between the 1960's and 1980's (Table 3-1, Figure 3-5). The average decreased in the 1990's to about 9,000 fish, although the counts in 2000 and 2001 were about 20,000 and 51,000 fish, respectively (Fish Passage Center 2002b).

Summer/Fall-Run Chinook Salmon

Summer/fall-run chinook salmon counts at Rock Island Dam averaged about 5,700 fish (adults and jacks) between 1933 and 1942; they remained less than 9,000 fish until 1951 and ranged between about 12,700 fish and 38,600 fish through 1998 (Chapman et al. 1994b; Fish Passage Center 2002b). At Priest Rapids Dam, the summer/fall-run chinook salmon counts have been relatively steady in each of the decades since that project was completed in 1962 (Fish Passage Center 2002b). The averages observed through the last 4 decades ranged from 21,389 to 27,690 fish. As with the spring-run chinook salmon, however, the summer/fall-run chinook salmon counts were substantially greater in the last 2 years (about 61,100 fish in 2000 and 75,900 fish in 2001).

Steelhead

Between 1933 and 1959, adult steelhead counts at Rock Island Dam ranged from 2,600 to 3,700 fish. In the 1960s, with the beginning of hatchery releases, the Priest Rapids counts ranged from about 6,600 to 13,000 fish (average 8,898 fish) (see Figure 3-5). Similar counts occurred in the 1970s, except for 1979, when the Priest Rapids Dam counts exceeded 54,000 fish (averaging about 11,330 fish). The counts generally increased in the 1980s to between about 8,500 and 34,500 fish, for an average of about 17,758 fish (Chapman et al. 1994b). Although the counts declined to an average of 8,358 fish between 1990 and 1999, substantially higher counts (11,313 and 29,936 fish) were recorded in 2000 and 2001, respectively (Fish Passage Center 2002a).

Sockeye Salmon

Sockeye salmon counts at Rock Island have shown substantial variation since 1933 (ranging between about 950 and 170,100 fish). The counts were generally low between 1933 and 1949, averaging about 25,000 fish (range: 950 to 84,627) (Chapman et al. 1995b). The counts increased to an average of about 99,900 fish in the 1950s (range: 50,100 to 155,800). Counts at

Priest Rapids Dam showed substantial variation between 1962 and 1999, ranging from about 170,100 fish (1966) to 6,700 fish (1994) (Fish Passage Center 2002a). The 1990s had the lowest average count of the 4 decades, ranging from 40,200 to 82,800 fish. As with the other anadromous salmonids returning to the Mid-Columbia River, however, increased escapements were observed in 2000 and 2001 (89,500 and 108,700 fish, respectively).

Coho Salmon

Indigenous natural coho salmon no longer occupy the Mid-Columbia River Basin (BPA 1999b). Coho salmon ladder counts at Rock Island totaled only 475 fish between 1933 and 1943 (Mullan 1984; Mullan et al. 1992). That is an average of less than 48 fish per year, indicating that few coho salmon existed prior to completion of the Grand Coulee and Rock Island dams. After completion of the last Mid-Columbia River mainstem dam (Wells Dam) in 1967, and prior to the recent releases of hatchery coho salmon by the Yakama Indian Nation, peak escapement estimates never exceeded 2,000 coho salmon (Figure 3-5). However, the majority of these returns were likely the result of the hatchery releases. About 46,000,000 fry, fingerlings, and smolts were released from Federal hatcheries between 1942 and 1975 (BPA 1999b). In addition, millions of coho salmon were released from the Chelan County PUD-funded Turtle Rock Hatchery through the mid-1980s. Recently, starting in 1996, the Yakama Tribe has been releasing coho salmon smolts into the Wenatchee and Methow Rivers. Between 1988 and 1999, adult counts at Priest Rapids Dam have averaged only 16 coho salmon, probably a result of strays from Lower Columbia River Hatchery programs and returns from the Yakama hatchery programs.

Self-sustaining populations of coho salmon have not been reestablished in the Mid-Columbia River, despite extensive hatchery plantings. As with other salmonid species, however, coho salmon counts were substantially higher in 2000 and 2001 (1,624 and 10,465 fish, respectively) (Fish Passage Center 2002a).

3.2.2.3 Spawner Distribution

Fulton (1968) reported that spring-run chinook salmon generally spawn in small- and medium-sized tributaries of the Mid-Columbia River, while summer-run chinook salmon generally spawn in intermediate and large tributaries and in the middle reaches of the mainstem. French and Wahle (1960, 1965) observed spring- and summer-run chinook salmon spawning in the same areas of the Wenatchee and Methow Rivers, although summer-run fish were more abundant in the lower reaches and spring-run fish more abundant in the upper reaches of these systems. Fulton (1968) also reported that spring-run chinook salmon typically spawn from late July to late September; summer-run between mid-August and mid-November; and fall-run between September and December.

Spawning distribution in the Mid-Columbia River Basin is somewhat confounded by the fact that spring- and summer-run chinook salmon spawning information was combined in older reports, and summer- and fall-run spawning information was combined in more recent reports. The following distributions (Table 3-2) are based primarily on Fulton (1968) who combined spring- and summer-run chinook salmon.

3.2.3 TRIBUTARY AND MAINSTEM DEVELOPMENT

The congressional authorization of Grand Coulee dam during the early 1930s was the beginning of a period of intense dam construction in the Columbia River Basin. The construction of Grand Coulee Dam in 1934 blocked over 1,000 miles of habitat in the Columbia River Basin to anadromous fish because no adult fishways were built as part of the project (see Figure 1-1 for general location of Columbia River dams).

TABLE 3-2. PRIMARY SPAWNING DISTRIBUTIONS OF ANADROMOUS FISH SPECIES IN THE MID-COLUMBIA RIVER WATERSHEDS

SPECIES	WATERSHED	TRIBUTARIES
Spring-run Chinook Salmon (Fulton 1968; Chapman et al. 1995a)		
	Wenatchee River	Peshastin, Icicle and Nason Creeks; Chiwawa, Little Wenatchee, Wenatchee, and White Rivers
	Entiat River	Most of mainstem and Mad River
	Methow River	Mainstem Methow River, lower mainstem Twisp River, and Lower Chewuch River
Summer- and Fall-run Chinook Salmon (Fulton 1968; Chapman et al. 1994a; NMFS et al. 1998a; LGL 2001)		
	Columbia River	Tailrace of mainstem dams
	Methow River	Lower Mainstem Methow River.
	Okanogan River	Mainstem Similkameen and Okanogan Rivers
	Wenatchee River	Most of the Wenatchee River
Steelhead (Fulton 1968; Chapman et al. 1994b)		
	Wenatchee River	Peshastin, Icicle, and Nason Creeks; Chiwawa, Little Wenatchee, Wenatchee, and White Rivers
	Entiat River	Entiat and Mad Rivers
	Methow River	Methow mainstem; Gold, Libby Wolf, and Early Winters Creeks; Twisp, Chewuch, and Lost Rivers
	Okanogan River	Lower Similkameen River
Sockeye Salmon (Fulton 1970; Chapman et al. 1995b)		
	Wenatchee River	Little Wenatchee, Nepeequa, and White Rivers
	Okanogan River	Mainstem Okanogan above Osoyoos Lake

Another 52 miles of habitat were blocked in 1961 with the completion of Chief Joseph Dam. The completion of the Hells Canyon complex in 1961 blocked about 350 miles of mainstem Snake River habitat to anadromous fish. Dworshak Dam is the upstream limit of salmon and steelhead migration on the North Fork of the Clearwater River (BPA et al. 1994a). All mainstem Columbia and Snake River dams downstream of these projects are equipped with facilities to allow passage of adult anadromous fish.

Construction began on the Rock Island Dam in 1929 and was completed before the beginning of the 1932 fish migrations. Fish returning to upstream spawning areas were counted as they passed through the fishladders at the dam. Evaluations showed that sockeye salmon had little difficulty finding and ascending these ladders, although this was not the case for chinook salmon. Chinook salmon were observed jumping at the dam, and those collected and examined from the fishladders showed about a 20 percent injury rate, most of which were in the head and snout region, apparently due to the fish jumping at the rocks below the dam (Bell 1937).

In addition to the injury rate observed on the chinook salmon adults passing Rock Island, substantial delays in their migration were also apparent. Prior to the completion of Rock Island Dam, the peak catch in the Tribal fisheries at Kettle Falls occurred on about August 1. However, in the years immediately following the completion and operation of the dam, the chinook salmon were delayed 20 to 25 days (Bell 1937). Although the number of fish caught in this fishery also declined after completion of the dam, there is no direct evidence that this was related to passage

problems at the dam. As a result of these apparent deficiencies, a third ladder was constructed prior to the 1936 migration period that provided substantial improvements.

Between 1946 and 1991, the estimated minimum number of upriver spring-run chinook salmon entering the Columbia River followed a generally declining trend, while the number of fish passing Rock Island Dam generally increased. The increasing trend in fish passage at Rock Island is likely due to the curtailment of harvest in the lower river, and the effects of the hatchery programs associated with the Grand Coulee Fish Maintenance Program. In addition to Grand Coulee, Rock Island and Chief Joseph dams, four other mainstem dams were constructed in the Mid-Columbia River between 1959 and 1967. These run-of-the-river projects are: Priest Rapids (1959) and Wanapum (1963) that are owned and operated by Grant County PUD, Rocky Reach (1961), and Wells Dam (1967).

3.2.4 HATCHERY PROGRAMS

The first fish hatchery in the Columbia River Basin was built in 1877 on the Clackamas River, a tributary of the Willamette River in Oregon. This was the first of several hatcheries constructed through the turn of the century to support commercial fisheries, including the Grand Coulee Fish Maintenance Program hatcheries beginning in 1939 and those of the Federal Bureau of Fisheries. A second phase of major hatchery construction occurred in the basin in the 1950s when the Mitchell Act passed in the U.S. Congress in 1938.

Today, there are approximately 90 fish production facilities in the Columbia Basin that support important Indian treaty, sport, and commercial fisheries. The annual catch from Mitchell Act facilities alone averaged 2 million adult anadromous salmonids per year between 1960 and 1985. It is estimated that hatchery fish currently account for 70 percent of spring-run chinook salmon, 80 percent of summer-run chinook salmon, 50 percent of fall-run chinook salmon, and 70 percent of steelhead returning to the Columbia River Basin (BPA et al. 1994a). In addition, nearly all of the coho salmon returning to the Columbia River are of hatchery origin.

The Grand Coulee Fish Maintenance Program included the first modern hatchery program in the Mid-Columbia River region (Peven 1992). Under this program adult steelhead, chinook, sockeye, and coho salmon were to be trapped in the Rock Island Dam fishways and transferred to a planned hatchery facility on Icicle Creek, a tributary of the Wenatchee River. Fish would be held and spawned at this facility to provide a supply of eggs to substations on the Entiat, Methow, and Okanogan Rivers. However, these hatchery facilities were not constructed before the start of the 1939 anadromous fish runs. Thus, fish trapped at Rock Island Dam were transferred to holding areas established in the three Mid-Columbia River watersheds to allow natural spawning as a means to propagate the stocks.

Holding areas were established in Nason Creek, a tributary of the Wenatchee River, for spring-run chinook salmon and steelhead. The mainstem Wenatchee and Entiat River holding areas were used to propagate summer- and fall-run chinook salmon and steelhead, and Lake Wenatchee and Osoyoos Lake were used to propagate sockeye salmon. The original success of this natural spawning program led to the inclusion of a natural spawning component in the Grand Coulee Fish Maintenance Program in subsequent years. The Leavenworth National Fish Hatchery and satellite facilities were completed and operational in 1940 to continue the Grand Coulee Fish Maintenance Program. The trapping program at Rock Island Dam ended in late fall 1943, while the hatchery component of the Grand Coulee Fish Maintenance Program continues to the present day.

The Leavenworth National Fish Hatchery on Icicle Creek was completed and operational in 1940. Over the years, varying numbers of eyed

eggs were shipped from this facility to the Entiat and Winthrop substations for hatching, rearing, and release. Fingerlings were also released directly into the Wenatchee system from the Leavenworth Hatchery. The Grand Coulee Fish Maintenance Program used all adult anadromous salmonids captured at Rock Island Dam between the years 1939 and 1943, after which, portions of the adult runs were allowed to pass Rock Island to migrate and spawn naturally.

The Grand Coulee Fish Maintenance Program had a profound impact on the genetic integrity of the various native fish runs in the Mid-Columbia River region. The mixing of stocks, as a result of this program, eliminated the genetic uniqueness of the individual Mid-Columbia River runs and produced homogenized stocks that were used in subsequent years to seed the entire region. Exacerbation of these impacts occurred in subsequent years with the extensive mixing of hatchery progeny with progeny from wild spawning adults, and the inclusion of non-native broodstock in the hatcheries.

Despite the extensive introduction of hatchery fish in the Columbia River, the proportion of hatchery fish that spawn naturally is generally low, although it varies by species and spawning location. Murdoch and Petersen (2000) estimated that hatchery summer-run chinook salmon escapements to the Wenatchee River varied between 2 and 12 percent in 1991 through 1998. Hatchery escapements to the Methow and Okanogan Rivers ranged from 0 to 45 percent, and 0 to 59 percent, respectively. Hatchery contributions of fall-run chinook salmon in the area are estimated to be between 20 and 30 percent. While there is little evidence that Mid-Columbia River hatchery spring-run chinook salmon stray to natural spawning areas within the Wenatchee River, the steelhead spawning escapements are dominated by hatchery-produced fish (NMFS 2000c).

3.2.4.1 Hatchery Compensation for Mid-Columbia Habitat Inundation

Further expansion of the Mid-Columbia River hatchery system occurred between 1961 and 1967, with the construction of four hatchery facilities as compensation for lost fish production from inundation of the mainstem Columbia River by Priest Rapids, Wanapum, Rocky Reach, and Wells dams. The Priest Rapids, Turtle Rock, and Wells hatchery facilities were originally designed as spawning channels to allow natural spawning activity. However, the limited success of these channels led to the construction of conventional fish production hatcheries in the early 1970s. The fourth mainstem compensation facility, the Chelan Hatchery, is also a conventional hatchery.

3.2.4.2 Hatchery Compensation for Mid-Columbia Mainstem Passage Losses

The third phase in the development of the Mid-Columbia River hatchery program began in 1989 with the construction of several facilities to enhance tributary production. These facilities include the Eastbank Hatchery and five satellite locations. In 1992, the Methow Hatchery and two satellite acclimation ponds were completed as well as the experimental facilities at the Cassimer Bar Hatchery. These facilities were the result of long-term settlement agreements for the Wells and Rock Island Projects to compensate for ongoing fish passage losses at the projects. With the exception of the Cassimer Bar facility, which is operated by the Colville Tribe, the PUD hatchery facilities are operated by WDFW.

3.2.4.3 Current Hatchery Production

Between 1980 and 1998, summer-run chinook salmon releases in the Mid-Columbia River region averaged about 2.22 million fish and ranged between 0.27 and 3.89 million fish. Spring-run chinook salmon releases ranged

between 1.33 and 6.46 million fish, and averaged about 4.59 million fish for these same years. An average of about 1.46 million juvenile steelhead were also released in the Methow, Entiat, and Wenatchee River systems, as well in the mainstem Columbia River between 1980 and 1998.

Hatchery releases in 1998 included about 340,000 coho salmon in the Methow River, about 285,000 yearling sockeye salmon from net pens in Lake Wenatchee in 1998, and about 80,500 subyearling sockeye salmon near the mouth of the Okanogan River (Table 3-3).

However, after 9 years of funding the experimental Cassimer Bar Sockeye Hatchery program, the program was eliminated in 2001 because it failed to produce meaningful numbers of adult returns. As a result, the mitigation for unavoidable sockeye salmon losses at Wells Dam will consist of rearing an additional 225,000 spring-run chinook salmon smolts through spring 2005, and through the Okanogan Flow Management Plan after 2005 (Douglas County PUD et al. 2002). This plan is currently being implemented by the Canadian Fisheries Agencies and Tribes. These groups estimate that the flow management plan should result in a 15 percent increase in the production of Osoyoos Lake sockeye.

TABLE 3-3. HATCHERY FACILITIES OWNED OR FUNDED BY THE MID-COLUMBIA RIVER PUDS IN COMPENSATION FOR PROJECT IMPACTS TO ANADROMOUS FISH SPECIES

COMPENSATION OBJECTIVE/FACILITY	OPERATOR	YEAR	SPECIES	PRODUCTION LEVELS
Assumed 14% Wells Project Mortality				
Cassimer Bar Hatchery	Colville Tribe	1992	Sockeye	200,000[1]
Osoyoos Lake Net Pens		1993	Sockeye	200,000[1]
Wells Hatchery	WDFW	1992	Summer-run steelhead	180,000
Methow Hatchery	WDFW	1992	Spring-run chinook	250,000
Chewuch Pond		1992	Spring-run chinook	250,000
Twisp Pond		1992	Spring-run chinook	250,000
Original Wells Pool Inundation				
Wells Hatchery	WDFW	1967	Summer-run chinook	800,000
			Summer-run steelhead	300,000
Original Rocky Reach Pool Inundation				
Chelan and Turtle Rock Facilities	WDFW	1995	Summer-run steelhead	200,000
Rocky Reach Hatchery and Turtle Rock Pond (combined)	WDFW	1969	Summer-run chinook	1,600,000
			Fall-run chinook	200,000
Ongoing Rock Island Inundation/Project Mortality				
Eastbank Hatchery	WDFW	1989	Summer-run steelhead	200,000
Carlton Pond		1989	Summer-run chinook	400,000
Dryden Pond		1989	Summer-run chinook	864,000
Similkameen Pond		1989	Summer-run chinook	576,000
Chiwawa Pond		1989	Spring-run chinook	672,000
Lake Wenatchee Net Pens		1989	Sockeye	200,000

[1] This was an experimental program. No sockeye broodstock were collected after 2000 because this artificial production program is being phased out.

3.2.4.4 Interaction Between Hatchery Stocks and Wild Stocks

Hatchery fish can directly impact wild stocks through increased competition, disease transmission, and loss of distinct genetic characteristics. They can also have indirect impacts by increasing the susceptibility of wild stocks to predation.

Competition

Competition for food and space between hatchery and wild juvenile salmonids is greatest at hatchery release sites, where small numbers of wild fish must compete for available resources with large numbers of hatchery fish. Although, this competition at the release site is expected to diminish as hatchery fish disperse, the initial competition might force wild fish from preferred habitats and increase their susceptibility to predation (BPA et al. 1994c).

Disease

Pathogens that cause disease in salmon and steelhead are present in both wild/natural and hatchery populations, although the hatchery environment encourages the spread of pathogens due to relatively high fish densities. However, there is little information on the impacts of infectious diseases on natural production, and no direct evidence of increased incidence or prevalence of disease in wild/natural populations downstream of hatcheries. Although horizontal (fish to fish) transmission of some pathogens might occur when diseased and healthy fish are held in close proximity, there is little information that suggests similar transmissions in the free-flowing river environment (BPA et al. 1994c).

Genetics

Hatchery management activities can affect the genetic integrity of wild/natural populations in several ways. The release of large numbers of hatchery fish tends to increase the hatchery component in the total adult population. Subsequent harvest regulations based on a proportion of the total run can result in greater impacts to wild/natural fish populations than the hatchery stock. Large hatchery populations can withstand higher harvest levels than a small natural population because it takes fewer adult spawners to fully stock a hatchery program compared to a natural system where natural mortality rates are substantially greater. Selective hatchery breeding protocols, the straying of hatchery fish to natural spawning areas, and the use of non-indigenous hatchery stocks tend to deplete the native genetic characteristics of the wild population (BPA et al. 1994c).

The use of natural broodstocks can also reduce the number of natural spawners. Early broodstock collections in the Columbia River Basin may have led to depletion of wild races/demes. Recent broodstock collection activities have been modified to lower the risk of depleting wild donor races/demes. However, captive-broodstock programs are currently being implemented to reestablish natural populations without needing to remove natural spawners from the system each year. The advantage of including a natural broodstock component to a hatchery program or establishing a captive-broodstock program is that they increase the number of returning adults, without overwhelming or replacing the natural gene pool.

Inadvertent artificial selection (domestication) can occur from a variety of hatchery practices that cause nonrandom mortality and selection, and where rearing and release strategies differ substantially from natural life-history patterns. Inadvertent selection can be avoided through implementation of strict mating and fertilization protocols, and by ensuring that hatchery fish are, qualitatively, as similar to naturally produced fish as possible (BPA et al. 1994a).

A number of hatchery practices can lead to loss of within-population variability. Broodstock

selected for particular traits can lead to loss of traits that may have benefit to the wild gene pool. Examples of this include marked shifts in population run timing over several generations when broodstock is selected from one segment of the natural run cycle (Steward and Bjornn 1990). Loss of within-population variability can also occur where a disproportionate ratio of males are mated to females or the mating population is small. Current hatchery practices minimize these types of selections.

Loss of between-population variability can occur when broodstock is collected from locations that are remote to the targeted watersheds. In the past, non-indigenous stocks and hatchery-derived stocks were commonly mixed. For genetic and fish health reasons, that practice has been discontinued and race/deme transfers are limited. Crossing of unrelated races/demes can also occur with high straying rates of hatchery fish into non-targeted streams (BPA et al. 1994c).

The majority of the above mentioned concerns regarding anadromous salmonid production operations are common to hatcheries throughout the Pacific Northwest. Significant improvements in hatchery practices have been instituted in PUD-funded facilities. On-going efforts by the State and PUDs also strive to minimize the deleterious effects of hatchery practices on wild populations and yet ensure a harvestable surplus of anadromous salmonids.

Predation

There is little available data to quantify direct predation of hatchery fish on wild fish, although as the size difference between hatchery and smaller wild fish increases, the predation potential is expected to increase. Salmonid predators are generally thought to prey on fish approximately one-third or less of their length (BPA et al. 1994c). Therefore, the predation of wild fish is expected to be greatest at the fry stage compared to smolts (USFWS 1994). This suggests that the greatest predation potential is expected to be from resident fish on the small wild fish that are displaced or drawn out of their natural rearing areas by the behavior and interactions with hatchery fish.

The large number of hatchery fish in the system tends to support a correspondingly large population of predators. These predators are attracted to fish bypass outfalls or dam tailraces, where juvenile fish are more concentrated, and the resident predators might prey more heavily on the smaller wild fish (USFWS 1994).

3.2.5 ADULT SURVIVAL AT PROJECTS

3.2.5.1 Upstream Migration of Adults

Prior to dam construction, upstream migrating fish encountered rapids, chutes, and falls which were common in the Mid-Columbia River reach. The mainstem projects replaced the numerous natural gradient breaks with larger gradient breaks (i.e., the dams), interspersed with large pools (i.e., reservoirs). To pass fish over the dams, fishways were built at these dams. Although most salmon and steelhead successfully pass upstream over the projects, the PUDs continue to modify adult passage facilities to improve upstream passage conditions. Other fish species (e.g., sturgeon) do not pass through the fishladders as effectively (Hanson et al. 1992; BPA et al. 1994c).

Dam Passage

Three specific components of the adult migrations through the Mid-Columbia River corridor may affect anadromous fish species: delay at project fishways, passage success at project structures, and injuries and mortalities resulting from upstream and downstream passage through project facilities. Each of these components has the potential to increase pre-spawning mortality. For fish that do reach spawning areas, indirect effects associated with passage through multiple dams may reduce fecundity and reproductive

success. Unfortunately, the relationship between each of these passage measures and reproductive success is not clearly understood.

Adult salmon and steelhead pass upstream through the Mid-Columbia River PUD dams via fishways installed at the projects. The fishways typically consist of an entrance gallery and ladder, a diffuser system that provides additional water at the ladder entrances (to attract fish from the tailrace), and a flow control section at the ladder exit that maintains ladder flow over varying forebay elevations. Observation areas have been established in each ladder to monitor upstream progress and the Wells and Priest Rapids dams have ladder traps for broodstock collection and stock assessment purposes. Migrational delays are most likely to occur at fishladder entrances, in the collection galleries, and during operation of the traps. Injury related to fish passage facilities is usually minimal; however, system failures (especially at diffuser gratings in the entrance pools) can result in injury and mortality.

Assessments of the magnitude and effects of migratory delays at fishway facilities is complicated by the lack of information on the time required for adult anadromous fish to migrate through the unimpounded, natural reaches of the Mid-Columbia River. In addition, there are other environmental factors that influence migration in the Mid-Columbia River including hydrology, water temperature (in mainstem and tributaries), dissolved gas supersaturation, and turbidity (Dauble and Mueller 1993).

Of these environmental factors, water temperature undoubtedly has the greatest influence of upstream migration. However, the Mid-Columbia River projects have limited influence on water temperature. Project operations also have little influence on turbidity. However, spilling operations directly affect total dissolved gas saturation levels downstream of the projects. Backman and Evans (2002) found a very low incidence of gas bubble trauma (less than 1 percent) in adult steelhead and chinook and sockeye salmon, despite sampling large numbers of fish from water exceeding 120 percent total dissolved gas saturation. Ecology grants a water quality standard waiver in the spring and summer on the Columbia River (allowing up to 120 percent total dissolved gas saturation in the hydroelectric project tailraces) to allow spill levels that will aid downstream migrating juvenile salmonids. In addition, there is no information that adult fish react to changes in total dissolved gas levels. Project operations (such as turbine and spill schedules) may also directly affect passage at these mainstem dams by increasing or decreasing the attraction of adults to the ladder entrances.

The impacts of delay vary by species, race/deme, and according to hydrologic and water quality conditions. Species such as spring-run (stream-type) chinook salmon, summer-run (ocean-type) chinook salmon and steelhead that hold in the river for considerable periods prior to spawning are less likely to be negatively affected by slight to moderate delays at fishways (Meekin 1969). Late migrating species such as fall-run (ocean-type) chinook salmon have a much shorter migratory "window" and may be more susceptible to the effects of delayed migration on pre-spawning mortality or spawning success (Meekin 1969).

Adult migration and passage rates, as well as tributary escapement estimates, have historically been evaluated by comparing fish counts at each of the Columbia River dam fishladders. Similarly, pre-spawn mortality rates were estimated by comparing spawning ground survey data with the estimated escapements. More recently, this information has been supplemented with radio-telemetry studies. However, these methods only provide information on how well radio-tagged fish pass from the tailrace of a specific dam into and through the fishway and beyond. The underlying assumption is that the behavior of radio-tagged fish is generally similar

to untagged fish. Laboratory assessments of tagged and untagged fish and several years of field evaluations support this assumption, although little information is available regarding tagging effects on migrating fish in a riverine environment, or their reproductive success.

Radio-tagging studies are often unable to account for all the tagged fish, so their ultimate fate cannot always be determined.

Although there is no direct relationship between project passage times and reproductive success, reducing passage time is generally believed to reduce energy expenditures and improve the likelihood of adult fish surviving to spawn. Over the entire adult freshwater migration phase, passage time at each of the projects is typically slower than in an unobstructed river reach. However, passage time through the reservoirs is typically faster, and energy expenditures are less than for fish migrating through a normal river setting. The median migration rate through the Mid-Columbia River (Priest Rapids tailrace to Wells forebay) was 12.5 miles/day, which exceeds the rates observed in free-flowing reaches of the Skeena River (7.9 to 11.1 miles/day) and the Fraser River (5.3 miles/day) (English et al. 2001).

Issues currently identified for adult salmon and steelhead that may affect injury and delay include entrance into the fishladders from the tailrace, passage in the junction pool between the fishway entrances and the ladder, large tailwater fluctuations that impact fishway operations, and fallback. Although the delay at one dam may not be significant, the cumulative delays (should they exist) at the nine passable dams on the Columbia River may decrease spawning success. However, due to various factors (such as unknown losses caused by fisheries, tag loss or failure, fallback and tributary turnoff, and natural mortality rates) it is difficult to use the results of adult radio telemetry studies to estimate project specific mortality.

The radio-telemetry evaluations can provide valuable information about specific areas within the fish collection and passage facility that appear to causing passage delays. However, only limited information can be obtained from fish that do not enter the system. Although the time it takes for fish to locate and enter the facilities can be quantified, it is extremely difficult to determine the causes of the delays. The delays may be the result of poorly designed passage facilities or factors related to either the operation of the passage facilities or the project as a whole. In addition, fish that fail to pass a dam may be destined for a downstream spawning location or hatchery, or may have been affected by passage at downstream dams. The effects of the tagging process, as well as tag losses, can also affect the apparent conclusions of passage evaluations or the connection to reproductive success. The information can be used however, to assess the success of adult migrating upstream through the project area and to develop an index that can be used to assess improvements in passage conditions.

Stuehrenberg et al. (1995) conducted a Mid-Columbia River evaluation that attempted to track radio-tagged chinook salmon from the Priest Rapids Dam tailrace to their spawning grounds or hatcheries. In that study, the researchers estimated that the minimum survival rate of spring-run chinook salmon from Priest Rapids Dam to the spawning grounds (or hatcheries) was 77.8 percent. If all of the spring-run chinook salmon with unknown fates detected downstream of Priest Rapids Dam (N = 38) were fish from the Ringold Facility (i.e., not destined for areas upstream of Priest Rapids Dam), the survival estimate would increase to 88.9 percent. A similar evaluation in 1999 with radio-tagged steelhead indicated that 81 percent of the fish released downstream of Priest Rapids Dam were tracked to tributary spawning areas (English et al. 2001).

Chapman et al. (1994a,b, 1995a) assumed average total mortality rates for all the Mid-

Columbia River adult summer/fall-run chinook salmon at 5 percent, 4 percent for adult steelhead, and 2 to 6 percent for adult spring-run chinook salmon. NMFS (1998a) assessed various radio-telemetry studies and concluded that the average per-project mortality rates for Upper Columbia River adult spring-run chinook salmon and adult steelhead passing the four Lower Columbia River dams were 3.0 and 1.2 percent, respectively. NMFS again assessed the available information in 2000 and estimated that per project mortality rates for spring-run chinook salmon and steelhead were 2.4 and 3.2 percent, respectively (NMFS 2000a). In 2002, NMFS conducted preliminary analysis of PIT-tag information to corroborate radio telemetry study estimates. This analysis confirmed that in 2001, a year characterized by very low flows in both the Snake and Columbia Rivers and substantially reduced or eliminated juvenile spill programs at the Federal projects, the estimated per project survival of adult Snake River spring-run chinook salmon was approximately 99 percent (NMFS 2002d). Adult fishways at the PUD-owned Mid-Columbia hydroelectric projects and the Federally owned Lower Columbia River projects are of similar design, and operated in a similar manner. For these reasons, the mortality estimates derived from the Lower Columbia River projects should be generally applicable to the Mid-Columbia River projects.

At present, it is not possible to differentiate between hydrosystem caused mortality and natural mortality (which undoubtedly occurs) with the technologies available. Per-project mortality estimates based on available information include both sources. Therefore, mortality rates attributable to the effects of hydroelectric projects are undoubtedly lower than those presented, but to an unknown extent.

Wells Dam

The median project passage time for adult spring-, summer-, and fall-run chinook salmon at the Wells Dam was 28.5, 46.9, and 45.7 hours, respectively, during a 1993 evaluation (Stuehrenberg et al. 1995). This study also noted that fish successfully passing the project moved directly into the collection channel from the tailrace with minimal delay. As a result, the majority of the passage delay was associated with the collection channel itself. Of the 28.5 hour median project passage time for spring-run chinook salmon, over 90 percent, or 26.8 hours was spent attempting to negotiate the collection channel.

Modifications to project operations and fish ladder trapping protocols, to reduce the apparent adult fish passage problems at Wells Dam, were successfully tested in 1997, 1998 and 1999 and implemented in 2000 following agreement of the Wells Coordinating Committee.

In 1997, median passage times from the Wells Dam tailrace to the fish ladder exits for summer-run chinook salmon, steelhead, and sockeye salmon were about 41, 10, and 21 hours, respectively (Alexander et al. 1998). Nass et al. (2000) reported an average passage time of 39 hours for summer-run chinook salmon in 1998. Similar project passage rates have been observed at other Mid-Columbia, Lower Columbia, and Snake River dams (see Table 2-4). However, Swan et al. (1994) reported a substantially faster passage rate for sockeye salmon at Wells Dam (5 hours).

Median passage time for steelhead was about 17 hours in 1999, even through the east and west fishladder traps were operated throughout most of the monitoring period. English et al. (2001) report that adult steelhead passage rates were 2 to 5 times longer when the Wells Dam ladder traps are operated than during non-trapping periods.

These studies also estimated fallback rates at Wells Dam (see Table 2-4). The 1993 telemetry evaluation estimated a 3.6 percent (2 of 56 fish) fallback rate at Wells Dam for spring-run chinook salmon. However, both of these fish were later detected in the Entiat River, suggesting that they may have inadvertently passed the project

originally and the apparent fallback was a voluntary action. Summer-run chinook salmon fallback rate surpassed 15 percent in 1997 and 1998 (English et al. 1998b; Nass et al. 2000), although the location of the summer-run chinook salmon hatchery and the known summer/fall-run chinook salmon spawning areas downstream of Wells Dam suggest that most of the apparent fallback was voluntary. Sockeye salmon fallback was estimated at 3.5 percent in 1997, although 63 percent of these fish reascended the dam and were tracked to spawning grounds (English et al. 1998b).

Alexander et al. (1998) also provided information on steelhead. Of the 20 radio-tagged steelhead that were detected at the Wells Dam, 16 fish (80 percent) successfully passed and remained above the dam during the study period. Of the 4 fish last located below the dam, 2 fish were last detected in the broodstock held at the Wells Hatchery and 2 fish were last detected at the Wells Hatchery outfall. A more extensive study in 1999 found that 162 of 174 steelhead (93 percent) detected at the dam passed upstream of the project (Alexander et al. 2001).

Alexander et al. (1998) reported that, for steelhead successfully negotiating the dam, the median project passage time was about 10 hours. Once upstream of the dam, the median migration rate to the Methow River 15.8 miles per day but only 4.5 miles per day to the Okanogan River.

Alexander et al. (1998) reported 1 of 20 steelhead (5 percent) fell back below Wells Dam, and English et al. (2001) reported a 6.8 percent fallback rate for steelhead at Wells Dam in 1999. Of the 11 fish that fell back, 4 reascended the ladder, 6 were found in spawning areas downstream of Wells Dam with only 1 fish classified as an involuntary fall back.

These fallback rates are consistent with the other Mid-Columbia River dams (range: 7 to 12 percent). English et al. (2001) also found that 94 percent of the fallback fish were of hatchery origin. In addition, 70 percent of the hatchery fish and 100 percent of the wild steelhead that passed the dam were last detected either upstream of the dam or at known spawning areas. Most of the hatchery fish that remained below Wells Dam overwintering in the Wells Hatchery outfall.

English et al. (2001) estimated a 34 to 69 percent range in kelting rate for the Mid-Columbia River steelhead stocks, although the survival rates were not assessed. Although direct information is not available, it is reasonable to assume that adult survival during fallback and kelt (post-spawning steelhead) passage is much higher passing through the juvenile bypass system than through turbines.

Rocky Reach Dam

Median project passage times at the Rocky Reach Dam were estimated at about 37 hours for adult spring-run chinook salmon, 23 hours for summer-run chinook salmon, and 60 hours for fall-run chinook salmon (Stuehrenberg et al. 1995) (see Table 2-4). English et al. (1998c) estimated a median passage time of 26 hours for the 22 radio-tagged steelhead that successfully passed the project in 1997. However, the evaluation of 229 steelhead passing Rocky Reach Dam in 1999 indicated a substantially faster median passage time (about 13 hours) (English et al. 2001). The overall range of these median passage times encompasses those recorded for sockeye and summer-run chinook salmon (36 and 30 hours, respectively), which were based on between 103 and 249 fish detected at Rocky Reach (English et al. 1998c). The observed adult fish passage times at Rocky Reach are similar to those at other Mid-Columbia River dams (see Table 2-4). English et al. (2001) report a fallback rate of about 10 percent for steelhead in 1999, although 95 percent of these fish were of hatchery origin. As a result, they estimated that only 1 percent of the radio-tagged steelhead that passed Rocky Reach Dam fell back involuntarily.

English et al. (1998c) observed fallback rates for summer-run chinook and sockeye salmon of 2

and 14 percent, respectively. It is unclear if the fish fell back through the powerhouse or over the spillway. Spill at the Rocky Reach Dam was higher in 1997 than during the 1993 radio-telemetry evaluation, but the number of summer-run chinook salmon that fell back over the dam were comparable between years.

As discussed above, the various uncertainties related to radio-telemetry data make it difficult to estimate project-specific mortality. The level of uncertainty associated with these data is substantial; documented fallback, delay, and unaccounted loss below the project indicates that adult passage problems may be occurring at Rocky Reach Dam. It is also not possible to differentiate natural effects from system-related effects at this time.

Approximately 236 steelhead kelts were observed in the juvenile bypass system in 1998. Although direct information is not available, it is reasonable to assume that adult survival during fallback and kelt passage is higher passing through the juvenile bypass system than through turbines. Although the bypass is not specifically operated throughout the entire adult and kelt passage seasons, it provides some protection to these fish when it is operated. Adult passage through the spillway is also assumed to be safer than turbine passage.

Rock Island Dam

Median project passage times at the Rock Island Dam were 20 hours for adult spring-run chinook salmon, 15 hours for summer-run chinook salmon, and 19 hours for fall-run chinook salmon in radio-telemetry evaluations conducted in 1993 (Stuehrenberg et al. 1995). Median passage times observed in 1997 were 17 hours for sockeye salmon, 15 hours for summer-run chinook salmon, 39 hours for spring-run chinook salmon, and 4 hours for steelhead (English et al. 1998c). However, some of the 1997 results were based on very small sample sizes. Of the 680 spring-run and 975 steelhead tagged at the Bonneville Dam in 1997, only 12 and 25 were detected at the Rock Island Dam, respectively. During the 1999 steelhead study, fish were tagged at Priest Rapids Dam. Of the 398 fish radio-tagged steelhead released, 309 were detected at Rock Island Dam in 1999. The median passage time for these fish was about 4 hours.

The sample sizes obtained in 1997 for sockeye and summer-run chinook salmon were large enough to identify potential problem areas in the adult fishways. Although the data are not absolutely clear, delay locating the fishway entrances and delays at the junction pool areas below the ladders account for the largest percentage of the passage times. Median passage times for summer-run chinook and sockeye salmon in 1997 were 15 and 17 hours, respectively (see Table 2-4).

English et al. (1998c) noted that no spring-run chinook salmon, 3 summer-run chinook salmon (2 percent), 12 sockeye salmon (4 percent) and 1 steelhead (4 percent) fell back over the Rock Island Dam in 1997 (see Table 2-4). It is unclear if the fish fell back through the powerhouse or over the spillway, although spill was occurring at the time.

English et al. (2001) reported about a 7 percent fallback rate for steelhead in 1999, although 86 percent of these were hatchery fish. More than twice as many of these fallback fish (59 percent) originally passed the project through the right-bank fishladder, compared to 18 and 23 percent through the left-bank and center fishways, respectively. The authors estimate that less than 2 percent of the radio-tagged steelhead that passed Rock Island Dam fell back involuntarily.

As noted above, because of uncertainties with the radio-tagging study results, it is not possible to accurately determine mortality rates, nor is it possible to differentiate natural effects from project effects.

3.2.6 JUVENILE SURVIVAL AT THE PROJECTS

Dam structures form a physical barrier in the path of fish migrating downstream. Mechanisms that allow fish to pass from the upstream to the downstream side of any dam are:

- passage through a turbine;
- passage over a spillway or through a sluiceway;
- passage through a juvenile bypass system;
- passage in a downstream direction through ancillary dam facilities, such as the adult fishway facilities; or
- collection of fish on the upstream side of the structure followed by transport and release on the downstream side.

Potential impacts resulting from any project passage route can be categorized as either a direct or indirect effect. Direct effects are a consequence of physical injuries that may be incurred during passage through spillway, sluiceway, or turbine structures. Direct effects may result in immediate or delayed mortality (Chapman et al. 1994a). Indirect effects result from debilitated, disoriented, or stunned juvenile fish being exposed to additional sources of mortality such as predation (Chapman et al. 1994a).

Over the last decade or more, substantial effort has been directed at improving juvenile fish passage conditions throughout the basin as a response to declining anadromous fish populations. NMFS (2000d) reports that during the 1960s, direct survival of yearling migrants through the entire Federal hydropower system (Lower Snake and Columbia Rivers) was 32 to 56 percent. This represents a period before the four Lower Snake River projects were built (1968 to 1975). Estimates of survival during the 1970s declined to a typical range of 10 to 30 percent, and less than 3 percent for the 1973 and 1977 drought years. However, between 1995 and 1999, survival of yearling Snake River spring/summer-run chinook salmon ranged between 42 and 59 percent. These recent survival improvements are substantially higher than during the 1970s and are believed to be similar to those estimated for the 1960s. These improvements are likely the result of good flow conditions, the implementation of project operation and fish passage improvements, and substantial reductions in predator fish populations. Despite these survival improvements, salmonid populations throughout the basin continued to decline or remained relatively flat until the last few years (see Section 3.2.2.2, Abundance). The increases observed in recent years are believed to be due primarily to improved ocean rearing conditions.

3.2.6.1 Turbine Passage

Direct mortality occurs within the confines of a turbine. Based on inferential data and knowledge of turbine conditions, it is assumed that direct mortality can originate from mechanical, pressure or hydraulic-related factors. Mortality due to mechanical factors may result from fish striking the blades or passing through gaps between turbine components. Pressure or hydraulic-related mortality probably occurs as fish pass through areas of cavitation, hydraulic shear, or other areas where pressure or velocity change may cause injury or death (Normandeau Associates and Skalski 1997).

Indirect mortality occurs after fish, particularly juvenile fish, have left the turbine. The principal cause of indirect mortality of juvenile fish is likely predation by fish or birds (Poe and Rieman 1988). This most likely occurs in the tailrace as the juveniles recover from the disorientation and stress of turbine passage (Ledgerwood et al. 1990). Passage may also create harmful levels of physical or behavioral stress, leading to a weakened resistance to disease and subsequent delayed mortality (Ferguson 1994).

Estimates of turbine survival in other Columbia River Basin projects vary from 98 to 81percent (Whitney et al. 1997). The average survival rate reported from direct recapture studies is 94.5 percent. In tests that included some level of indirect mortality (including predation on disoriented fish), the survival levels averaged about 89 percent (Whitney et al. 1997). However, these average estimates include some data collected prior to the implementation of predator abatement programs, as well as for older (less efficient) turbine units. More recent evaluations, conducted under turbine operations presumed to provide the best passage conditions for fish (i.e., within 1 percent of peak power efficiency), indicate greater survival rates. Turbine survival studies in the Snake River between 1993 and 1997 indicate an average turbine survival rate of about 91 percent (Muir et al. 2001; NMFS 2000a). This estimate represents the best available information, but was not derived from the Mid-Columbia River projects, and therefore may not be directly comparable. Based on available information, turbine passage survival, considering both direct and indirect components of mortality, is likely between 90 and 93 percent.

Wells Dam

Approximately 8 percent of the juvenile salmon and steelhead migrants pass through the Kaplan turbines at the Wells Dam (Skalski 1993). However, no specific estimates of turbine passage survival exist at the Wells Dam following improvements made to the Kaplan turbine units in the early 1990s, or after implementing predator abatement programs. Therefore, a range of 90 to 93 percent average survival levels observed in recent studies on the Snake River is expected to best represent the current passage conditions through turbine units at the Wells Dam (NMFS 2000b). However, this estimated survival range does not include delayed mortality rates. Survival evaluations conducted between 1998 and 2000 provide overall project passage survival rates at Wells Dam, and are discussed below under Total Project Survival – Juvenile Migrants (Section 3.2.6.4).

Rocky Reach Dam

The direct survival of chinook salmon smolts passing through the Kaplan turbines at the Rocky Reach Dam was assessed during two balloon-tag studies, in 1993 and 1996. The 1993 study estimated passage survival at 94 percent (RMC Environmental Services and Skalski 1994). The 1996 tests measured survival rates of 95 percent for a new turbine unit (Unit 6) and 96 percent for an original Kaplan turbine (Unit 5) (Normandeau Associates and Skalski 1996).

The PUD has begun a multi-year process to install new turbines across the powerhouse. These replacement turbines are designed to reduce the gap between the blade and runner that is considered to be one cause of direct turbine mortality. Also, the new turbines have a higher efficiency rating than the original turbines. Fish passage survival is generally considered higher for more efficient turbines and operations at peak turbine power efficiency (Bell 1981). There are no comparatively unique features at the Rocky Reach Dam that would indicate significantly different levels of indirect mortality compared to other facilities. Therefore, the 90 to 93 percent survival rate range discussed above likely represents turbine passage survival for all species at the Rocky Reach Dam.

Based on juvenile radio-telemetry evaluations conducted in 1998, approximately 35 percent of the steelhead and 53 percent[1] of the spring-run chinook salmon passed the project via the

[1] Radio-tagged fall-run chinook salmon obtained from the East Bank Hatchery had considerably higher powerhouse passage rates in 1998 (approximately 81 percent powerhouse passage [English et al. 1998a]). It is unclear at this time why the *naïve* hatchery fish passed the project via the powerhouse at substantially higher rates than the *experienced* fish trapped at the surface bypass system and then released back upstream of the project.

powerhouse (English et al. 1998a). In 1999, Lady et al. (2000) estimated that approximately 27 percent of the radio-tagged steelhead passed the project via the powerhouse and English et al. (1999) estimated that 58 and 40 percent of the radio-tagged spring-run chinook salmon and steelhead passed the project via the powerhouse, respectively. A similar study in 2000 reported 54 percent of spring-run chinook salmon and 32 percent of steelhead passing through the Rocky Reach Dam powerhouse (English et al. 2000). An acoustic-tag evaluation in 2000 found about 48 percent of the chinook salmon and 41 percent of the steelhead passed through the powerhouse (Steig et al. 2001).

Sockeye salmon appear to have a higher turbine passage rate than either chinook salmon or steelhead. Similar powerhouse passage estimates for sockeye salmon (67 and 68 percent) were observed in 1998 and 2000 (English et al. 1998a; 2000). A slightly higher percentage (74 percent) of sockeye salmon passed the project through the powerhouse in 1999 (English et al. 1999).

Normandeau Associates and Skalski (1996) estimated average direct survival of balloon-tagged fall-run chinook salmon passing through the old Kaplan units at 96 percent, and 95 percent for the newly rebuilt Kaplan units. Average survival through the fixed blade units for balloon-tagged hatchery reared fall-run chinook salmon was estimated at 94 percent (RMC Environmental Services and Skalski 1994).

The most significant difference between the balloon-tag evaluations conducted in 1993 and 1996 had to do with operation of the test units. In 1993, the units had no restrictions and were operated as needed to meet load. In 1996, load was kept constant throughout the test. This may help explain the variability seen in the results between the two years, and may better indicate the range of possible survival levels during normal turbine unit operations. Although neither evaluation was able to discern the indirect effects associated with powerhouse passage, the pilot level survival evaluation conducted using radio-tagged steelhead in 1999 estimated the combined direct and indirect survival at about 90 percent (Lady et al. 2000), suggesting that the indirect effects associated with turbine passage are more significant than those seen at the bypass system or spillway. However, the validity of using radio-telemetry data to assess juvenile fish passage survival has not been determined. Such studies are affected by many of the same uncertainties identified for adult survival studies using radio-telemetry methods.

Rock Island Dam

Between approximately 70 and 75 percent of the juvenile Upper Columbia River spring-run chinook salmon and steelhead pass through the turbines at the Rock Island Dam (Iverson and Birmingham 1998; Lady et al. 2000). Normandeau Associates and Skalski (1997) estimated the direct survival of fall-run chinook salmon passing through the Nagler turbines at Powerhouse 1 at about 93 percent. They estimated direct survival through the bulb turbines and Kaplan-type turbines at Powerhouse 2 at about 96 percent. Powerhouse 2 has unique features which are likely to result in higher survival rates relative to most powerhouses in the basin. For example, the relatively long draft tubes (100 feet) likely result in decreased indirect mortality through the turbines compared to turbines at other projects. This is likely for two reasons. First, the point of egress is relatively far away from the dam itself, making juveniles less vulnerable to predacious fishes. Second, the flows exiting the long draft tubes are relatively less turbulent, which would reduce the vulnerability of juveniles to avian predators.

Unfortunately, none of these route-specific estimates account for indirect survival, which has yet to be evaluated with proven technologies at Rock Island Dam. Although using radio telemetry techniques to assess survival has yet to be independently verified, as discussed earlier,

the results do support these initial conclusions that turbine passage survival is likely between 90 and 93 percent at Powerhouse 1 and between 90 and 93.5 percent at the Powerhouse 2.

3.2.6.2 Spill Passage

Survival of fish passing through spillways of Columbia River dams has been generally estimated at between 98 and 100 percent (Anderson et al. 1993; Whitney et al. 1997, NMFS 2000a, Muir et al. 2001). In the absence of project specific data, these estimates are considered the best available estimates of spill passage survival.

Wells Dam

Five of eleven spill bays at the Wells Dam have been modified to function as a juvenile bypass system. These modifications increase water velocities to attract surface oriented fish, which are then bypassed through the spillway. Detailed discussions of the Wells Dam bypass are provided in Section 3.2.6.3 (Juvenile Bypass Systems). In lieu of additional specific information, however, a 98 to 99 percent average survival rate is assumed for the anadromous salmonids passing through Wells Dam via the spillway.

Rocky Reach Dam

Pursuant to the Fourth Revised Interim Stipulation for the Rocky Reach Dam (now expired), Chelan County PUD is obligated to provide up to 30 days of spill during the spring migration period, with an additional 6 days of spill (if necessary) to cover the middle 90 percent of the Okanogan sockeye salmon outmigration. Spill is provided at a level of 15 percent of the previous day's average flow, distributed over a 24-hour period. Information acquired in recent years indicates that the middle 95 percent of the spring-run chinook salmon and steelhead outmigrations range from 30 to 48 days at the Rocky Reach Dam, averaging 42 days for steelhead and 41 days for spring-run chinook salmon. During the summer, the Chelan County PUD spills 10 percent of the previous day's average flow for a total of 34 days between June 15 and August 15.

Chelan County PUD has also voluntarily modified the Rocky Reach spill program to provide the 15 percent spill level during a period coinciding with 95 percent of the outmigration of spring-run chinook salmon and steelhead (typically April 20 to June 15). As well as a 15 percent spill level during the summer migration period of subyearling chinook salmon (typically July 1 to August 15). The voluntary program also provides a 25 percent spill level (for up to 21 days) to aid the outmigration of Okanogan River sockeye salmon.

Hydroacoustic studies conducted over several years at the Rocky Reach Dam have shown that an average of 8 percent of the spring migrating smolts pass through the spillway in 15 percent spill (Steig and Adeniyi 1997). However, similar spill levels in 1998 through 2000 resulted in an average passage rate of about 14 percent for spring-run chinook salmon, 12 percent for steelhead, and 21 percent for sockeye salmon (English et al. 1998a, 1999, 2000).

Only one estimate of spillway survival exists for the Rocky Reach Dam, and that was estimated with coho salmon through a single spill bay in 1980 (Heinle and Olson 1980). The results of this evaluation indicated that survival may be comparatively high, approximately 99 percent. Whitney et al. (1997) also reviewed several spillway survival studies in the Columbia River Basin and concluded that spillway survival is typically at least 98 percent. This estimate is supported by the 99 percent spillway survival estimate for coho salmon at the Rocky Reach Project. In lieu of additional specific information however, a 98 to 99 percent average survival rate is assumed for the anadromous salmonids bypassing the Rocky Reach spillway.

Rock Island Dam

As established in the 1987 Rock Island Settlement Agreement, spill at Rock Island Dam is accomplished through a Fisheries Conservation Account, which allows the fishery regulatory agencies to request spill at their discretion up to an annual limit of $2.05 million in lost energy revenue (based on 1986 dollars adjusted for inflation). Although the preferred method for increasing juvenile passage survival at the Rock Island Dam is through the use of spill, discharge has been limited due to total dissolved gas production. In an effort to increase spill efficiency, the PUD has modified 9 of the 33 spill gates to allow for more surface oriented spill. The modified surface spill gates, or notched gates, utilize a maximum of about 2,000 cfs per spill bay and have been found under certain conditions to pass comparatively more fish per volume of water than the existing spill bays (Ransom and Steig 1995).

Similar to the operations at Rocky Reach Dam, Chelan County PUD currently voluntarily provides spill levels equivalent to 20 percent of the daily flow during the period encompassing about 95 percent of the spring and summer juvenile migration periods (typically April 15 to June 15 and July 15 to August 15, respectively). During the 1998 spring migration, the Chelan County PUD spilled approximately 25 percent of the total river flow for fish passage on a 24-hour basis. At this spill level, both the modified surface spill gates and several of the unmodified spill bays were utilized. Hydroacoustic studies estimated that approximately 27 percent of the yearling chinook salmon and 26 percent of the juvenile steelhead passed through the spillway in 1998 (Iverson and Birmingham 1998). Radio telemetry evaluations in 1999 and 2000 estimated that 30 percent of steelhead smolts (Lady et al. 2000) and 25 percent of chinook salmon (Skalski et al. 2000) passed the project through the spillway.

Direct survival estimates through particular spill bays for hatchery-reared chinook salmon were calculated in 1997 by Normandeau Associates and Skalski (1998). The direct survival through the notched weirs was estimated at about 95 percent and the direct survival through the unmodified spill bays was estimated at approximately 98 percent.

Normandeau Associates and Skalski (1998) concluded that the reduced survival levels calculated through the notched weirs may have resulted from the associated shallow stilling basin at spillbay 21 and the reduction in discharge through the notched weirs. They also noted that the 1,000 cfs of water discharged through the notched weirs had a much more pronounced plunge than the shallower, downstream projection of the 10,000 cfs discharged through the unmodified spill bay. A subsequent survival study estimated survival through both modified and unmodified spillways at between 99.5 and 100 percent (Normandeau Associates 1999). Lady et al. (2000) also estimated spillway survival at about 100 percent for radio-tagged steelhead.

Given the configuration of the Rock Island spillway (i.e., no downstream ogee, plunging flow), it is probable that some level of indirect mortality occurs in the tailrace, but there is not adequate data for accurate estimates. Therefore, a spill passage survival rate of 98 to 99 percent likely represents a conservative estimate of survival, including direct and indirect mortality sources.

3.2.6.3 Juvenile Bypass Systems

Estimates of the direct survival rate of juvenile salmon and steelhead through bypass systems includes mortality rates associated with turbine intake screens, gatewells, orifices, bypass flumes, dewatering screens, sampling facilities (including holding tanks), and bypass outfall conduits. Estimates of direct bypass mortality found at sampling facilities for the bypass systems at the

Federal hydroelectric projects on the Snake and Lower Columbia Rivers suggest that the direct mortality of both wild yearling steelhead and chinook salmon is generally less than 1 percent (Martinson et al. 1997; Spurgeon et al. 1997; summarized in NMFS 2000a), although some level of stress or injury may result in mortality later in the life cycle. Bypass survival may also be indirectly affected by predation at poorly located outfall sites or by delayed mortality associated with injury caused by the bypass system. Bypass system outfalls that concentrate juvenile salmon and steelhead into a comparatively small volume of water may cause high levels of predation related mortality. Muir et al. (2001) estimated direct and indirect survival estimates of between 95.4 and 99.4 percent for yearling chinook salmon passing through bypass systems on the Snake River. Survival estimates for steelhead were slightly lower, ranging from 92.9 to 98.3 percent.

Additional research efforts are focusing on surface collector bypass systems owing largely to the success of the Wells Dam bypass system completed in 1989. Since juvenile anadromous fish tend to migrate in the upper portion of a reservoir, surface collector systems attempt to provide attraction flow higher in the water column than the attraction flow being created by the turbines. The Wells Dam system includes vertical baffle slots to create attraction flow into the spillway bypass, while other prototype systems are examining shallow skimmer weirs and orifices similar to the sluiceways at the Ice Harbor and The Dalles dams (BPA et al. 1994b).

Wells Dam

Hydroacoustic studies conducted from 1990 through 1992 at Wells Dam estimated that 92 percent of the spring outmigrants (which include steelhead, spring-run chinook, and sockeye salmon) were guided through the juvenile bypass system (Skalski 1993). These estimates have been supported by similar information collected during concurrent fyke net evaluations (Bickford 1997). A juvenile chinook salmon balloon-tag study that was conducted in 1993 concluded that there was no measurable direct injury or mortality through the bypass system (RMC Environmental Services, Inc. 1993).

Although this study did not measure the effect of predation in the tailrace on juveniles disoriented or stressed from passage through the bypass system, juveniles are not concentrated in reduced flow in a particular area of the tailrace. Therefore, predation of bypassed smolts in the tailrace may be lower than other bypass systems that have concentrated outfall locations that tend to attract predators. In addition to the potentially reduced predation rates, the limited spill volumes required by the bypass system minimizes the total dissolved gas levels downstream. However, in the absence of specific evaluations of indirect mortality rates at the Wells Dam, the total direct and indirect mortality is likely less than the 2 percent found at the Lower Snake River project bypass systems (NMFS 2000c).

The PUD is required by the Wells Settlement Agreement of 1990 to operate the bypass system to provide a non-turbine passage route for at least 80 percent of the juvenile spring and summer migrants passing Wells Dam. Since 1998, Douglas County PUD has voluntarily operated the bypass system to provide passage over at least 95 percent of the juvenile spring and summer migrations, consistent with the terms of the 1998 HCP Implementation Agreement. In 1999, the bypass was operated during 98.2 percent of the migration period (Wells Coordinating Committee, unpublished data). The coordinating committee bypass team determines the operation dates for the Wells bypass system by utilizing monitoring information from hydroacoustic transducers installed in the forebay of the Wells Dam. Given that the Wells bypass is a modification of the Wells spillways, bypass survival is expected to be similar to spillway survival which is estimated to range from 98 to 99 percent.

Rocky Reach Dam

The new juvenile bypass system, being constructed to replace the prototype system at the Rocky Reach Dam, includes one surface collection entrance and intake guidance screens in turbine units 1 and 2. Passage efficiency evaluations in the mid-1990s to early 2000s indicate generally lower bypass efficiency for juvenile sockeye and chinook salmon than for steelhead. Passage efficiency tests conducted in 1998 showed that approximately 39 percent of the radio-tagged yearling chinook salmon, 10 percent of sockeye, and 51 percent of the steelhead passed the project via the juvenile bypass (English et al. 1998a). Similar radio telemetry studies in 1999 and 2000 reported chinook salmon passage rates of 26 and 28 percent, respectively; sockeye salmon passage rates were 11 and 6 percent, respectively (English et al. 1999, 2000). Bypass rates for steelhead were 49 and 57 percent in 1999 (English et al. 1999; Lady et al. 2000), and 57 percent in 1999 (English et al. 2000).

Several other tagging methods have also been used to assess fish passage efficiencies of the Rocky Reach juvenile bypass system, with generally similar results. PIT-tag studies conducted in 1999 and 2000 indicated that 22 to 51 percent of the yearling chinook salmon used the bypass (Mosey et al. 1999, 2000; Murphy et al. 2001). These same studies also estimated steelhead passage at 27 to 61 percent. Studies conducted in 2000 using acoustic-tagged fish found that 38 percent of the chinook salmon and 50 percent of the steelhead passed through the bypass (Steig et al. 2001). PIT-tag evaluations of sockeye and subyearling chinook salmon, showed bypass efficiencies of 7 to 29 percent and 27 to 39 percent, respectively (Peven and Mosey 1998; Mosey et al. 1999, 2000; Murphy et al. 2001).

The fish passage efficiency of the bypass is influenced by the proportion of fish that pass the project through the spillway before they reach the area of influence of the bypass. The combined spillway and bypass efficiencies (total fish passage efficiency) using the 1998 through 2000 radio- and acoustic-tag data (cited above) ranged from 42 to 52 percent for chinook salmon, and from 59 to 73 percent for steelhead. Similarly, radio-telemetry assessments with sockeye salmon in 1998 through 2000 found total fish passage efficiencies of 26 to 33 percent (English et al. 1998a, 1999, 2000).

In the 1998 evaluations, however, there were significant differences noted between passage efficiency rates of *naïve* hatchery chinook salmon (chinook salmon previously unexposed to the bypass system) and run-of-the-river chinook salmon captured in the bypass system then tagged and released back upstream for evaluation. In 1998, the bypass efficiency for naïve hatchery chinook salmon was substantially lower (19 percent) than those that had previously entered the bypass system (40 percent) (English et al. 1998a). The primary reason for this difference is the higher proportion of the hatchery fish that were first detected at the turbine gatewells or passed the project via the spillway. As a result, a high proportion of the hatchery fish were not available to be guided by the bypass system. It is unknown at this time which population more accurately represents the run at large. Therefore, both estimates are considered in the efficiency estimates.

To determine the rate of injury that may be caused by the bypass system at Rocky Reach, samples of yearling chinook salmon, selected to preclude prior injury, have been released into the surface collector and turbine intake systems and subsequently captured and reexamined for injury. These tests have shown descaling and injury rates attributable to passage through the downstream collection entrance were generally less than 2 percent (Peven et al. 1995, 1996; Peven and Mosey 1998). In 1998, however, 4.4 percent of yearling chinook salmon released into the upstream collector entrance had evidence of scale loss or injury (Mosey et al. 1999). In 1999, by improving hydraulic conditions in turbine intakes

and at the fish diversion screens of units 1 and 2, the PUD improved fish passage conditions, and thereby reduced the scale loss and injury rates.

No measurements of indirect mortality are available to determine the survival of smolts after they pass through the bypass outfall pipe. Studies of subyearling chinook salmon bypass mortality at Bonneville Powerhouse 1 and Powerhouse 2 (Ledgerwood et al. 1990, 1994; Dawley et al. 1996) indicate that high bypass mortality may be associated with predation that occurs at a poorly sited bypass outfall. The temporary bypass outfall site, located in front of the turbine unit three upwelling, was not situated using the current knowledge of predator behavior (e.g., Loch et al. 1994; Mesa and Olson 1993). Therefore, predation mortality may be significant at the temporary site.

However, the PUD has implemented measures to reduce indirect mortality caused by predation in the tailrace. Avian predator hazing by propane cannons and bird exclusion wires across the tailrace reduces bird predation on smolts. Also, the PUD will continue the northern pikeminnow removal program that has removed more than 5,500 predators annually from the tailrace since 1994 (West 2002 personal communication). With improved hydraulic conditions at the intake screens, and with a properly sited bypass outfall, survival through the Rocky Reach bypass system is expected to equal the 97 to 98 percent survival rate estimated for bypass systems throughout the basin (see Table 2-4).

Rock Island Dam

Powerhouse 2 is equipped with a passive bypass system (no intake screens for guidance) that allows fish to volitionally enter turbine unit gatewells and exit them via bypass orifices to a collection channel that leads to a fish sorting collection raceway. The annual passage of juvenile spring-run chinook salmon through this system has ranged from 8,500 to 33,500 from 1985 to 1996 (Fish Passage Center 1985 - 1996). Although the percentage of the total population is small, this facility provides useful monitoring information for Upper Columbia River fish stocks. Due to the small numbers of fish using this system, survival rates are not known. However, it is reasonable to assume that survival is similar to other bypass systems in the basin at 97 to 98 percent (see Table 2-4).

3.2.6.4 Total Project Survival – Juvenile Migrants

Total project survival for juvenile migrants is defined as the percentage of each Plan species that survives through the reservoir, forebay, dam, and tailrace of an individual project, including direct, indirect, and delayed mortality wherever it may occur and can be measured given the available technology. The preferred technology is the use of passive integrated transponder tags (PIT-tags) in paired-release mark and recapture studies that compare the survival of a test group of fish released at the head of the reservoir with a control group of fish released in the project tailrace.

In contrast, single release-recapture models can only measure project effects from the point of release to the point of mixing downstream of the PIT-tag detector (which is typically located within a juvenile bypass channel or fish handling facility). Thus, not all of the mortality associated with passage via turbines or the spillway or in the tailrace of the project is included in these survival estimates. Therefore, these survival estimates are likely somewhat higher than would have been measured if the paired release-recapture model had been utilized.

Unfortunately, methodologies do not currently exist to measure total project survival for all Plan species. The number of fish available; the size, health, and fragility of the fish during their outmigrations; and the detectability of certain species at downstream collector sites all affect the feasibility of utilizing mark and recapture techniques. As an alternative, survival estimates

measured for certain species through a particular passage route can be combined with estimates of fish passage efficiency to calculate an estimate of dam passage survival (i.e., a calculated survival estimate). Although these estimates do not include tailrace or reservoir survival, or estimates of indirect mortality, they can be used to generally identify expected dam passage survival if other specific survival information is unavailable.

This section discusses the results of estimating total project survival for juvenile salmon and steelhead using both the mark-recapture and the passage route calculation techniques, at each of the projects, in an attempt to determine the overall range of expected survival. Because of the specific assumptions required for each methodology, varying environmental conditions, and the annual and behavioral differences in each of the species, these estimates tend to vary by year, by species, and by estimation technique. In addition, the majority of the available information was developed specifically for yearling spring-run chinook salmon and steelhead. This information is generally assumed to represent other salmon species where specific information is unavailable, pending additional studies specific to those fish.

The cumulative effects (i.e., the effects of multiple dam passage on juvenile fish) are not clearly accounted for with either methodology.

Wells Dam

Juvenile survival through Wells Dam is considered to be high when compared to other dams on the Columbia and Snake Rivers. This is due to its highly effective bypass system (passing about 92.4 percent of the juvenile spring migrants and about 96.4 percent of the summer migrants through non-turbine routes). The survival rate through the bypass system is assumed to be 98 to 99 percent. Multiplying the estimated spring-run passage rate (92.4 percent) of the bypass system by the estimated survival rate and the proportion of the run (80% of the spring and summer migrations)[2] covered by the bypass operation period under the Wells Settlement Agreement, indicates that approximately 72.4 to 76.4 percent of the spring migrants and 75.6 to 76.4 percent of the summer migrants would utilize bypass route of passage and survive (Table 3-4). The remaining 7.6 percent of the spring migrants and 3.6 of the summer migrants, that do not pass through the bypass during the bypass operation period and 100 percent of the fish passing the project when the bypass is not operating, are assumed to pass through the turbines. The turbine survival rate is estimated at 90 to 93 percent survival rate (based on data collected throughout the basin). Thus, an estimated 23.5 to 24.3 percent of spring migrants and 20.6 to 21.3 percent of summer migrants utilize the turbine route of passage and survive. Adding these route passage survival estimates results in a calculated total dam passage survival rate ranging from 95.9 to 97.4 percent for spring migrants and 96.2 to 97.6 percent for summer migrants.

Because, species-specific passage rates are not available for the Wells Project, these calculated survival estimates are assumed to be the same for all the spring migrating anadromous salmonid species that pass the dam. The summer migrant estimates of bypass efficiency were collected during the subyearling chinook salmon migration (summer migration) and reflect their guidance rate through the bypass system. However, survival rates are expected to vary to a degree by species and by year (due to differences in river flow and fish conditions etc).

In addition to these calculated dam passage survival estimates, survival studies have been conducted to assess total project passage survival.

[2] This assumes that the bypass system operates for 80% of the run as presented in Alternative 1 as the minimum requirement under the Wells Settlement Agreement. However, Douglas County PUD has operated the bypass system in recent years in accordance with the 1998 HCP agreement to encompass at least 95% of the outmigration.

TABLE 3-4. CALCULATED JUVENILE FISH PASSAGE SURVIVAL ESTIMATES BY PASSAGE ROUTE (ALTERNATIVE1)

SPECIES	CALCULATED SURVIVAL ESTIMATES THROUGH INDIVIDUAL PASSAGE ROUTES DURING THE SPILL AND BYPASS OPERATION PERIODS[1]						TURBINE SURVIVAL FOR NON-SPILL OR NON-BYPASS PERIOD (90-93%)	ALL ROUTES COMBINED – TOTAL SURVIVAL (%)[1]
	SPILLWAY PASSAGE (%)	SPILLWAY SURVIVAL (98-99%)	BYPASS PASSAGE (%)	BYPASS SURVIVAL[2]	TURBINE PASSAGE (%)	TURBINE SURVIVAL (90-93%)		
Wells Dam								
Subyearling Chinook	NA	NA	96.4	75.6 – 76.4	3.6	2.6 – 2.7	18.0 – 18.6	96.2 – 97.6
Yearling Chinook	NA	NA	92.4	72.4 – 73.2	7.6	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Sockeye	NA	NA	92.4	72.4 – 73.2	7.6	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Coho	NA	NA	92.4	72.4 – 73.2	7.6	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Steelhead	NA	NA	92.4	72.4 – 73.2	7.6	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Rocky Reach Dam[3]								
Subyearling Chinook	12.0	9.9 – 10.0	NA	NA	88.0	66.9 –69.2	14.0 –1 4.4	90.8 – 93.6
Yearling Chinook	13.8	11.4 – 11.5	NA	NA	86.2	65.6 – 67.7	14.0 –1 4.4	90.9 – 93.7
Sockeye	21.5	17.8 – 18.0	NA	NA	78.5	59.7 – 61.7	14.0 –1 4.4	91.5 – 94.1
Coho	13.8	11.4 – 11.5	NA	NA	86.2	65.6 – 67.7	14.0 –1 4.4	90.9 – 93.7
Steelhead	12.5	10.4 – 10.5	NA	NA	87.5	66.5 – 68.8	14.0 –1 4.4	90.8 – 93.6
Rock Island Dam[4]								
Subyearling Chinook	16.5	12.9 – 13.1	NA	NA	83.5[6]	60.2 – 62.5[5]	18.0 – 18.6	91.1 – 94.2
Yearling Chinook	23.7	18.6 – 18.8	NA	NA	76.3[6]	54.9 – 57.0[5]	18.0 – 18.6	91.5 – 94.5
Sockeye	24.0	18.8 – 19.0	NA	NA	76.0[6]	54.8 – 56.8[5]	18.0 – 18.6	91.5 – 94.5
Coho	23.7	18.6 – 18.8	NA	NA	76.3[6]	54.9 – 57.0[5]	18.0 – 18.6	91.5 – 94.5
Steelhead	24.6	19.3 – 19.5	NA	NA	75.4[6]	54.3 – 56.4[5]	18.0 – 18.6	91.6 – 94.6

[1] Dam passage survival calculations are based on assumed survival and passage rates for available routes. Although the Rocky Reach survival ranged from 93.3% to 96.7% with the prototype bypass system operating, the bypass is excluded from Alternative 1 for comparative purposes (as it is an integral part of Alternative 3).
[2] Assumes 98 to 99% survival for the Wells bypass and 97% to 98% at Rocky Reach, although Alternative 1 assumes no bypass operations at Rocky Reach Dam.
[3] Assumes 15% spill flow during 84% of the spring and summer migrations.
[4] Assumes 16% and 11% spillway flow during 80% of the spring and summer migration periods, respectively.
[5] Upper range at Rock Island Dam is based on an assumed 93.5% survival through Powerhouse 2; low range assumes 93.0% survival through both powerhouses.
[6] Combined Powerhouses 1 and 2.
NA = Not available.

Project passage survival includes direct, indirect, and delayed mortality related to passing the project, and also the direct and indirect mortality associated with passage through the reservoir. Bickford et al. (1999) report a project passage survival rate of 99.7 percent for PIT-tagged chinook salmon from the Methow River to below the dam when the bypass was operating (Table 3-5). Similar studies with steelhead in 1999 and 2000 estimated project passage survival rates of 94.3 percent and 94.6 percent, respectively (Bickford et al. 2000a,b). The juvenile project passage survival rate estimates are greater than the 93 percent juvenile project passage survival goal established in the HCP, although additional survival estimates would be needed to assess survival rates for sockeye and subyearling chinook salmon.

Rocky Reach Dam

Based on the available information for various species, between 12 to 22 percent of juvenile fish pass through the spillway with a 15 percent spill level and between 19 and 63 percent of the juvenile fish pass the dam through the prototype bypass system (see Table 3-4). Approximately 24 to 60 percent of juvenile fish (again, varying by species) pass the project via the turbines. However, for comparative purposes Alternative 1 does not include the bypass. Without the bypass system operating, about 78.5 to 88 percent of the juvenile fish would pass through the powerhouse.

TABLE 3-5. SUMMARY OF JUVENILE PROJECT SURVIVAL STUDIES FOR WELLS, ROCKY REACH, AND ROCK ISLAND DAMS, 1998 THROUGH 2002

YEAR	STOCK[1]	TAGGING METHOD	STATISTICAL MODEL[2]	SURVIVAL ESTIMATE (%)	STANDARD ERROR (%)	REFERENCE
Wells						
1998	Chinook (H)	PIT-tag	PRR	99.7	1.5	Bickford et al. 1999
1999	Steelhead (H)	PIT-tag	PRR	94.3	1.6	Bickford et al. 2000a
2000	Steelhead (H)	PIT-tag	PRR	94.6	1.5	Bickford et al. 2001
Rocky Reach						
1998	Chinook (H)	PIT-tag	PRR	0.859	4.2	Eppard et al. 1999
1998	Chinook (H)	PIT-tag	SRR	0.939	4.2	Bickford et al. 1999
1999	Steelhead (H)	PIT-tag	SRR	0.959	1.0	Bickford et al. 2000b
1999	Steelhead (ROR)	Radio-tag	PRR	0.966	3.8	Stevenson et al. 2000
2000	Steelhead (H)	PIT-tag	SRR	0.967	0.8	Bickford et al. 2001
Rock Island						
1998	Chinook (H)	PIT-tag	PRR	0.889	3.9	Eppard et al. 1999
2000	Chinook (H)	PIT-tag	PRR	0.918	3.4	Stevenson et al. 2000
2000	Chinook (H)	Radio-tag	PRR	0.947	1.9	Stevenson et al. 2000
2000	Chinook (ROR)	Radio-tag	PRR	0.939	1.6	Stevenson et al. 2000
2001	Chinook (H)	PIT-tag	PRR	0.922	1.0	Skalski et al. 2001
2002	Chinook (H)	PIT-tag	PRR	0.956	2.5	Skalski et al. 2002
2002	Chinook (H)	Acoustic Tag	PRR	0.952	2.6	Skalski et al. 2002
1999	Steelhead (H)	PIT-tag	PRR	0.958	1.4	Stevenson et al. 2000
1999	Steelhead (H)	Radio-tag	PRR	0.998	4.7	Stevenson et al. 2000
2000	Steelhead (ROR)	Radio-tag	PRR	0.920	1.7	Skalski et al. 2001

[1] H = hatchery, ROR = run-of-the-river
[2] PRR = paired release-recapture, SRR = single release-recapture

Multiplying the 12 to 22 percent spill passage rate (this assumes that none of the fish that would have used the prototype use spill to pass the dam) by the 98 to 99 percent spill survival rate (estimated from other projects) and the proportion of the migration period covered by spill indicates that about 9.9 to 18.0 percent of the juvenile migrants are passing via the spillway and surviving (see Table 3-4). Multiplying the turbine passage rates (including the period when spill is not provided) by the 90 to 93 percent turbine survival rate results in about 73.7 to 83.6 percent of smolts are passing the project via the powerhouse and surviving. Adding the survival estimates for the two passage routes indicates an overall dam passage survival ranging from about 90.8 to 94.1 percent (see Table 3-4). Although the Rocky Reach bypass is not included in Alternative 1 (for comparison purposes), if the bypass were operated according to the HCP agreements, the overalls survival rates at Rocky Reach Dam would range from 93.3 to 96.7 percent (assuming the new bypass has the same efficiency as the prototype).

In addition to these calculated dam passage survival estimates, some information relating to project survival (dam and reservoir) is available (see Table 3-5). Although the various methodologies are not directly comparable (they differ with respect to the elements of direct, indirect, and delayed mortality incorporated into the estimates—for example, see discussion at Section 3.2.6.4 [Total Project Survival – Juvenile Migrants] regarding paired- versus single-release recapture models), each method includes at least some, if not most, of the direct, indirect, and delayed mortality factors associated with the project. The PIT-tag and radio-tag survival studies conducted in 1998 with hatchery reared yearling fall-run chinook salmon suggest project passage survival rates (reservoir and dam passage) are in the range of 86 to 94 percent (Bickford et al. 1999; Eppard et al. 1999; see Table 3-5). However, the higher survival estimate was derived from a single-release evaluation that does not include all of the indirect and delayed mortality factors. The 1999 and 2000 PIT-tag survival evaluations estimated project passage survival at 96 and 97 percent for hatchery steelhead, although these evaluations also consisted of a single-release protocol (Bickford et al. 2000b; Bickford et al. 2001). A radio-telemetry evaluation in 1999 estimated project passage survival rate to be about 97 percent for run-of-the-river steelhead (Stevenson et al. 2000). Although this radio-telemetry study included paired releases, and therefore includes most indirect and delayed mortality factors, the accuracy of radio-telemetry data for assessing juvenile survival has not been fully evaluated, and the results could be (for several technical reasons) biased high, although they were virtually identical with the single-release estimates (see Table 3-5).

Rock Island Dam

Based on available information, approximately 75 to 84 percent of the juvenile outmigrants will pass the Rock Island Dam via the powerhouses and about 17 to 25 percent pass via the spillway (see Table 3-4). Under the current operating conditions, the estimated spillway survival rate is about 98 to 99 percent. Multiplying the spillway passage rate by the spillway survival rate and the proportion of the migration period covered by spill operations (80 percent), results in about 13 to 20 percent of all smolts pass the project via the spillway and survive. The estimated smolt survival rate through the Rock Island turbines is between 90 and 93 percent at Powerhouse 1 and between 90 and 93.5 percent at Powerhouse 2. Multiplying the turbine passage rate (including the period when no spill is provided) by the estimated turbine survival rates indicates that about 72 to 81percent of the fish pass the project via the turbines at both powerhouses and survive. Adding spill and powerhouse survival results in approximately 91 to 95 percent survival through Rock Island Dam (see Table 3-4). This overall range of calculated survival rates is within the range of estimates obtained through tagging studies (89 to 99 percent), which include reservoir

and dam passage (see Table 3-5). All of these evaluations were pair-released studies, although some were based on radio-telemetry or acoustic tag technology, which have not been full evaluated (see Table 3-5 and previous discussion for Rocky Reach Dam).

3.2.7 OVERALL FISH PASSAGE SURVIVAL

The HCPs establish an overall survival rate goal of 91 percent for adult and juvenile passing the Mid-Columbia River projects. However, obtaining robust estimates of adult salmon and steelhead survival is difficult, and none of the technologies currently available can differentiate between natural mortality, which undoubtedly occurs, and project-related mortality. For example, adult survival estimates in several unimpounded rivers in British Columbia, Canada ranged between 70 and 90 percent for spring-run chinook salmon and between 31 and 83 percent for summer-run steelhead and was dependent upon environmental factors like flow (Koski et al. 1993, 1994, 1995, 1996a,b).

At this time, there is little information related to the survival of adult anadromous salmonids passing the Mid-Columbia River projects. Stuehrenburg et al. (1995) provided minimum survival estimates of 77.8 to 88.9 percent for spring-run chinook salmon migrating to spawning areas in the Columbia River upstream of Priest Rapids Dam, approximately corresponding to a range of per-project survival estimates of 95.1 to 97.7 percent. However, these data are unreliable because of problems associated with the tags, receivers, and software used at the time (Wainwrite et al. 2001). In addition, many of the tagged fish were likely fish from Ringold Hatchery straying upstream of Priest Rapids Dam. Because many of these fish would eventually fall back through the dams in order to reach the hatchery, their behavior also biases the study. For these reasons, the minimum survival estimates from this study are likely biased low i.e., the actual survival was likely higher than the numbers reported).

Analysis conducted as part of the 2000 Federal Columbia River Power System biological opinion estimated total (natural and project-related) per project survival rates (current and under the reasonable and prudent alternatives outlined in the biological opinion) was about 98 percent for adult Upper Columbia River spring-run chinook salmon and 97 percent for adult Upper Columbia River steelhead. NMFS believes these are the best available estimates and are generally applicable to the FERC-licensed projects on the Columbia River.

As previously noted, it is currently not possible to determine what fraction of the observed mortality rates is attributable to the affects of the hydroelectric projects, and what fraction can be attributed to natural causes. The species characteristics that define the Columbia River salmon and steelhead make comparisons with other river systems problematic and unreliable. In addition, the cumulative effects of dam passage on spawning success are unknown.

As a result of these uncertainties, it is not possible to estimate the overall fish passage survival rates at the present time. However, taking into account natural mortality, which undoubtedly occurs, NMFS has determined that the current adult mortality resulting from project-related effects in the Mid-Columbia is likely no more than 2 percent for listed species.

3.2.8 SPECIES OF CONCERN

In addition to some of the Plan species, bull trout are also listed under the Endangered Species Act as threatened. Two other species (westslope cutthroat trout and river lamprey) are identified as Federal species of concern (WDFW 2002a). Other fish species expected to occur in the project are also listed as priority species or species of concern by the State of Washington (Table 3-6) (WDFW 2002a,b). Priority species classification indicates that the species requires protective measures and/or management guidelines to

TABLE 3-6. FISH SPECIES OF CONCERN AND PRIORITY SPECIES OCCURRING OR POTENTIALLY OCCURRING IN THE MID-COLUMBIA PROJECT AREA AND ASSOCIATED TRIBUTARIES

	FEDERAL STATUS[1]	STATE STATUS[2]	OCCURRENCE				
			PROJECT AREA	WENATCHEE	ENTIAT	METHOW	OKANOGAN
Upper Columbia Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*)	E	C	Yes	Yes	Yes	Yes	No
Upper Columbia Steelhead (*Oncorhynchus mykiss*)	E	C	Yes	Yes	Yes	Yes	Yes
Bull Trout (*Salvelinus confluentus*)	T	C	Yes	Yes	Yes	Yes	Yes
Dolly Varden (*Salvelinus malma*)	None	C	Yes	Yes	Yes	Yes	Yes
Coho Salmon (*Oncorhynchus kisutch*)	None	M	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]
Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*)	SC	None	Yes	Yes	Yes	Yes	Yes
Kokanee (*Oncorhynchus nerka*)	None	M	Yes	Yes	No	No	Yes
White Sturgeon (*Acipenser transmontanus*)	None	M	Yes	No	No	No	Yes
Pacific Lamprey (*Entosphenus tridentatus*)	None	C	Yes	Yes	Yes	Yes	Yes
River Lamprey (*Lampetra ayresi*)	SC	C	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]
Lake Chub (*Couesius plumbeus*)	None	C	Yes	Yes	Yes	Yes	Yes
Leopard Dace (*Rhinichthys falcatus*)	None	C	Yes	No	No	No	No
Mountain Sucker (*Catostomus platyrhynchus*)	None	C	Yes	Yes	Yes	Yes	Yes
Pigmy Whitefish (*Prosopium coulteri*)	None	S	Yes	Yes	Yes	Yes	Yes
Channel Catfish (*Ictalurus punctatus*)	None	M	Yes	No	No	No	Yes
Largemouth Bass (*Micropterus salmoides*)	None	M	Yes	No	No	No	Yes
Smallmouth Bass (*Micropterus dolomieui*)	None	M	Yes	No	No	No	Yes
Walleye (*Stizostedion vitreum*)	None	M	Yes	No	No	No	Yes

[1] Federal status: E= Federally listed as endangered, T = Federally listed as threatened, SC = species of concern.

[2] State status: S = State listed as sensitive, C = candidate for State listing,
M = State listed as priority species with recreational, commercial, and/or Tribal importance.

[3] Native species, although there is no evidence of self-sustaining populations occurring in the basin.

ensure their perpetuation. They are of concern due to their population status and sensitivity to habitat alterations.

3.2.8.1 Life Histories

Bull Trout/Dolly Varden

Although Dolly Varden (*Salvelinus malma*) is currently distinguished as a distinctly separate species from bull trout (*Salvelinus confluentus*), they were considered to be the same species until the late 1970s. The Columbia River bull trout populations were listed as threatened under the Endangered Species Act in June 1998 (USFWS 1998), while Dolly Varden populations were not included in this listing. Bull trout are also a candidate species for listing as threatened or endangered in Washington State (WDFW 2002a). These closely related char species are difficult to distinguish in the field and have similar if not identical life histories (Mongillo 1993). Therefore, the following discussion of bull trout is generally applicable to Dolly Varden.

Eight potential bull trout subpopulations have been identified in the Wenatchee, Entiat, and Methow Rivers, while they are thought to be extirpated from the Okanogan River. However, bull trout were likely never abundant in the mainstem Columbia River (Mongillo 1993). Factors identified in the decline of bull trout populations in the area include dams, forest management practices, livestock grazing, agricultural water diversions, roads, and mining (Beschta et al. 1987). In addition, poaching and the presence of non-native fish species are adversely impacting bull trout populations (Mongillo 1993). Brook trout may have completely replaced bull trout in South Fork Beaver Creek, a tributary of the Methow River.

Four general forms of bull trout are recognized (anadromous, lacustrine, fluvial, and resident), each exhibiting a specific behavioral or life-history strategy (Brown 1992a; Pratt 1992).

Anadromous bull trout are typically found in coastal and Puget Sound river drainages, yet are extinct in the Mid-Columbia River region (Nehlsen et al. 1991). The lacustrine (adfluvial) form matures in lakes or reservoirs and spawns in tributaries, where the young reside for 1 to 3 years. Fluvial bull trout have a similar life history, except that they move between the Columbia River mainstem and smaller tributaries.

The lacustrine and fluvial bull trout are of the most concern in the Mid-Columbia River tributaries (Brown 1992a), as their habitat has been degraded more than that for resident forms. The stream resident bull trout spend their entire lives in smaller, high-elevation streams, apparently moving very little, and seldom reaching a size larger than about 12 inches (Brown 1994). Resident trout may have extensive seasonal movements or change life-history strategies (from resident to lacustrine) depending upon the current environmental conditions. This phenomenon may occur commonly for populations near Lake Wenatchee, where resident bull trout may migrate to the lake when stream flows (and attendant water temperatures) become intolerable. Habitat alterations that disrupt this capability to transmute may limit the population's stability.

Approximately 60 percent of the bull trout spawning and rearing habitat in the Methow River has been lost due to irrigation water withdrawals (USFWS 1998). Habitat degradation in the mainstem Entiat River from development and forest fires has severely depressed the densities of bull trout populations. Physical habitat problems are the most common detriment to bull trout populations, followed by flow and water quality problems. Bull trout are known for their need for cold pristine headwater areas during critical spawning and early life-history stages (Mongillo 1993). Thus, project operations do not affect spawning success, although the role of the projects on isolating populations and their genetic fitness is unknown.

Bull trout are occasionally observed in the adult and juvenile fish passage facilities of the Mid-Columbia River dams, although the information is limited. Although bull trout have been enumerated by fish counters stationed at the viewing windows of the fishladders during the adult salmon passage periods, counts prior to 1998 typically did not differentiate them from other trout. A total of 83 bull trout were counted passing Rocky Reach Dam between May 3 and July 31, 1998 (Chelan County PUD 2002 unpublished data). In 1999, 2000, and 2001, bull trout counts between May and July were 93, 183, and 176 fish at Rocky Reach Dam, respectively. In these years, the majority of the bull trout passed the project in May and June (75 to 90 percent). Although the extent of bull trout passage at other times of the year is generally unknown, some fish have been observed to pass Rocky Reach Dam in October and November.

Fewer bull trout were counted at Rock Island Dam than at Rocky Reach Dam in 1998, 1999, and 2000. Between 56 and 83 bull trout were counted passing Rock Island Dam in these years (Chelan County PUD 2002 unpublished data). In addition, the passage timing appears to be less compressed than at Rocky Reach Dam, with only 55 to 70 percent of the counts occurring in May and June.

Bull trout passage through the Wells Dam fishladders was recorded primarily during spring-run chinook salmon broodstock trapping operations in 1998 and 1999. In 1998, trapping occurred one day a week between May 9 and July 1, resulting in 16 bull trout encounters (Douglas County 2002 unpublished data). Thirteen (81 percent) of these encounters occurred in June. In 1999, trapping occurred continuously between April 28 and June 9, and resulted in 47 bull trout encounters. Two additional bull trout were encountered during the two other days of trapping in 1999. Despite the limited number of trapping events in June (10 days), 65 percent of the bull trout encounters occurred during that month. Daily counts are available at Wells Dam in 2000 and 2001. These data indicated that at least 95 percent of the bull trout passed the project in May and June.

To gather additional information on bull trout migratory behavior in the Mid-Columbia River region, a 2-year radio-tagging study began in 2001 (BioAnalysts, Inc. 2002). A total of 39 bull trout were tagged in 2001 (7 fish at Rock Island, 22 fish at Rocky Reach, and 10 fish at Wells). Three of the bull trout tagged at Rock Island were released downstream of the dam and the other four fish were released upstream. At the other two projects, half of the fish were released upstream of the dam and the other half were released downstream. With the exception of one fish that died in the Rock Island pool, all of the tagged fish migrated to the Wenatchee, Entiat, or Methow Rivers for fall or fall/winter residence.

Of the seven fish released at Rock Island Dam, two entered the Wenatchee River, two migrated upstream to the Entiat River, two to the Methow River, and one died. None of these fish fell back below the dam.

Six of the fish tagged and released downstream of Rocky Reach Dam migrated downstream and entered the Wenatchee River, where they resided throughout the fall and winter. The other five bull trout migrated upstream, with four fish entering the Entiat River and one entering the Methow River. Similarly, 8 of the 11 bull trout released above Rocky Reach entered the Entiat system, and 3 migrated past Wells Dam to the Methow River. None of the fish that passed Rocky Reach Dam fell back below the project.

Nine of the ten fish released at Wells Dam migrated upstream to the Methow River, while one of the trout released downstream of the dam migrated downstream and entered the Entiat River. As with the other projects, none of the fish that passed Wells Dam fell back below the project.

Although bull trout tended to spend greater time passing each of the Mid-Columbia River hydroelectric projects, travel time through the reservoirs was similar to anadromous salmonids (English et al. 1998c, 1999). Although the fish spent time residing in the tailraces and fish ladders, once the fish began to migrate, they did so rather rapidly and all of the tagged fish appeared to enter tributary streams in time to spawn. As a result, there are no indications that dam operations negatively affected the survival of these fish.

Overall, the radio-tagged bull trout exhibited a wide range of behavior, relative to reservoir and tributary residence. Five of the eight trout that entered the Wenatchee River entered by the end of June, while the other two fish remained in the Columbia River for nearly 2 and 3 months longer. Four of the fish remained in the Wenatchee mainstem, while the others moved into smaller tributaries. Five of the tagged fish remained in the Wenatchee River watershed throughout the fall and winter, while the other three fish moved back to the Columbia River between November and December.

In contrast to the Wenatchee River fish, all 15 of the fish that entered the Entiat River did so by mid-July. Seven of these fish remained in the Entiat River mainstem, while the others moved up into the Mad River drainage. The fish that resided in the mainstem exited the Entiat River by mid-November, while the others remained in the Mad River throughout the fall and winter.

All 15 of the Methow River fish entered the river by mid-June, with four residing in the mainstem and the others moving upstream into the Twisp River drainage. Unlike the fish that entered the Entiat River, those that resided in the mainstem remained there through the winter, while four of the fish that entered the Twisp River left the Methow River Basin by mid-December.

As of May 2002, of the 15 fish that returned to the Columbia River, two fish were located downstream of Rock Island Dam, seven fish between Rock Island and Rocky Reach dams, three fish between Rocky Reach and Wells dams, and three fish above Wells Dam.

These data indicate that some bull trout spend considerable periods of time rearing in the mainstem reservoirs and pass upstream through the adult fishladders to enter tributary areas, and some pass back downstream through the dams after exiting the tributary areas. Although it is not known how these downstream migrants pass the projects, there is no evidence of mortality based on the data to date. As a result, bull trout are subject to impacts from the operation of the projects, although little evidence is available to estimate the magnitude or nature of these impacts. Additional radio-tagging studies are being conducted to evaluate bull trout migration and rearing behavior in the project area.

The second year of this evaluation will provide additional information concerning the behavior of these fish, as well as additional fish tagged in 2002. The preliminary data indicate that some bull trout reside in the mainstem Columbia River for considerable periods of time, and undergo relatively lengthy migrations. However, it is unknown how the low water conditions in 2001 may have influenced their behavior.

Westslope Cutthroat Trout

Westslope cutthroat trout (*O. clarki lewisi*) is a priority species (WDFW 2002b). They are allopatric with rainbow trout and have similar life histories. They are chiefly distributed in upper reaches of east slope Cascade range tributaries (including the Wenatchee, Entiat, and Methow Rivers) and typically do not occur in the mainstem reservoirs. Many of these cutthroat trout show some degree of hybridization with rainbow trout. Westslope cutthroat trout exhibit adfluvial and fluvial life-history strategies. Their habitat requirements are similar to those of both rainbow trout and bull trout (Behnke 1992). Cutthroat and rainbow trout spawn at the same

time and place, and considerable hybridization results when hatchery-produced rainbow trout are stocked in streams with natural cutthroat trout (Simpson and Wallace 1982).

River Lamprey

River lamprey (*Lampetra ayresi*) is a Federal species of concern and a candidate species for listing by the State of Washington (WDFW 2002a). It is one of three species of lamprey that occur in the Columbia River Basin. The other two species are Pacific lamprey and western brook lamprey. River lamprey and Pacific lamprey exhibit parasitic life cycles, while the western brook lamprey completes its life cycle in freshwater and is nonparasitic (Close et al. 1995). River lamprey occur in coastal streams from northern California to northern British Columbia. Little is known about the biological or life-history characteristics of this species, although they are expected to be similar to those described for Pacific lamprey. Differentiation between these two species typically does not appear in historical information about the basin, with most observations and occurrences attributed to Pacific lamprey (BioAnalysts 2000a).

Pacific Lamprey

Pacific lamprey (*Entosphenus tridentata)* is a Federal species of concern (WDFW 2002a) that occurs in most tributaries to the Columbia River and in the mainstem Columbia River during their migration stages. They have cultural, utilitarian, and ecological significance in the basin since Indian Tribes have historically harvested them for subsistence, ceremonial, and medicinal purposes (BioAnalysts 2000a; Close et al. 2002). As an anadromous species, they also contribute marine-derived nutrients to the basin.

Little specific information is known, however, on the life history or status of lamprey in the Mid-Columbia River watersheds. They are known to occur in the Wenatchee, Entiat, and Methow Rivers, although there are no indications that they currently use the Okanogan system (BioAnalysts 2000a).

In general, the adults are parasitic on fish in the Pacific Ocean, while the ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 1979). Adults generally spawn in low-gradient stream reaches in the tail areas of pools and in riffles, over gravel substrate (Jackson et al. 1996). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis, between 3 and 7 years after hatching, and migrate from their parent streams to the ocean from March to July, peaking in April. It is not known how long Pacific lamprey live in freshwater prior to migration, but it is assumed to be 5 to 6 years (Wydoski and Whitney 1979).

Due to the lack of information on lamprey habitat requirements, population sizes, and community structures, relatively little is known about the status of Pacific lamprey stocks in the Columbia River. However, estimates of adult Pacific lamprey passing Rock Island Dam in 1996 and 1997 totaled 2,121 and 2,321 fish, respectively (Jackson et al. 1996, 1997). Passage estimates at Rocky Reach were 593 and 1,405 fish in those same years, while at Wells Dam the estimates were 979 and 773 fish, respectively. However, these counts, as well as the comparison counts between the dams, are problematic because of sampling inconsistencies; the behavior of lamprey allows them to pass by certain types of counting stations without being counted (BioAnalysts 2000a). Peak passage in those years occurred between August and September.

Kokanee

Kokanee (*O. nerka*) is a Washington State priority species (WDFW 2002b) that occurs in Lake Wenatchee and Osoyoos Lake and

throughout the mainstem Columbia River. They are a landlocked or resident component of sockeye salmon. As a result, they have a similar life history (see Section 3.2.2.1, Life History), except that the adults remain in freshwater throughout their life cycle (Wydoski and Whitney 1979).

Pygmy Whitefish

Pygmy whitefish (*Prosopium coulteri*) is listed as a Washington State sensitive species, indicating that they are vulnerable or declining and likely to become endangered or threatened without cooperative management or removal of threats (WDFW 2002a). Pygmy whitefish are a native species, currently found in relic populations in western North America. The only known population in the project area is in Lake Chelan (Hallock and Mongillo 1998). This species inhabits lakes, typically staying deeper than 18 feet. They also reside in streams, preferring habitats with moderate to swift current. Little is known about the pygmy whitefish populations in the Mid-Columbia River region.

White Sturgeon

White sturgeon (*Acipenser transmontanus*) is a Washington State priority species with recreational, commercial, and/or Tribal importance (WDFW 2002b). They are a long-lived, primitive fish species that forage primarily along the river bottom of large river systems in the Pacific Northwest. Prior to hydroelectric development in the Columbia River, the native anadromous white sturgeon could distribute downstream to feed in the rich estuary or marine areas before migrating back upstream to spawn. This anadromous life history is currently restricted in the upper river because they do not readily pass through the Columbia River fishladders. They are currently found throughout the basin and are thought to be successfully reproducing in some of the impoundments (Setter and Brannon 1992). Commercial and sport harvest has resulted in depressing the population in the river, and their recovery is substantially limited by the isolation of segment populations by the hydroelectric dams.

Male sturgeon may mature at 10 to 12 years of age, while females may not mature until 15 to 32 years of age. Spawning occurs between February and July, depending on water temperature; most spawning occurs when water temperatures are 50° to 63° F (10° to 17° C) (Pacific States Marine Fisheries Commission 1992). Sturgeon spawn in swift currents (2 to 9 feet per second over cobble, boulder, and bedrock substrates) (Parsley and Beckman 1994), similar to those occurring in the tailrace areas throughout the Mid-Columbia River. Eggs and sperm are broadcast in fast-moving water, allowing the adhesive eggs to disperse before settling to the bottom. The eggs remain adhesive for less than 3 hours to allow additional time for fertilization.

Incubation occurs in 7 to 14 days, depending on water temperature. The hatched larvae are planktonic and drift downstream. Sturgeon are opportunistic feeders that prey on benthic organisms as juveniles, and a variety of benthic-oriented prey as adults (including lamprey and fish).

DeVore et al. (1999) reported that white sturgeon are currently not abundant in the Mid-Columbia River. They captured only four sturgeon in 95 overnight longline sets in Rock Island reservoir. Sampling in Rocky Reach reservoir yielded 4.3 fish in 1,000 longline fishing hours (Chelan County PUD 2000).

Lake Chub

Lake chub (*Couesius plumbeus*) is a native species to the Columbia River and a candidate for listing as threatened or endangered by WDFW (WDFW 2002a). They inhabit a variety of habitats in both lakes and streams, with lake populations reported to migrate into tributary

streams to spawn (Wydoski and Whitney 1979). There is little information about lake chub in the project area, although they are infrequently captured in the mainstem reservoirs (Parametrix and University of Idaho 2000; BioAnalysts 2000b).

Leopard Dace

Leopard dace (*Rhinichthys falcatus*) is a native species to the Columbia River and a candidate for listing as threatened or endangered by WDFW (WDFW 2002a). They usually occur near or on the bottom in relatively shallow (typically less than 3 feet) and slow-moving habitats (less than 1.5 feet per second). Although they inhabit both lake and streams habitats, they are believed to spawn in tributary streams similar to other dace (Wydoski and Whitney 1979). There is little information about leopard dace in the project area, although they are infrequently captured in the mainstem reservoirs (Parametrix and University of Idaho 2000).

Mountain Sucker

Mountain sucker (*Catostomus platyrhynchus*) is a native species to the Columbia River and a candidate for listing as threatened or endangered by WDFW (WDFW 2002a). They occur in the Upper Columbia River and its tributaries, and prefer clear, cold-water streams with sand, gravel, and boulder substrate (Wydoski and Whitney 1979). There is little information about mountain sucker in the project area, although they are infrequently captured in the mainstem reservoirs (Parametrix and University of Idaho 2000).

Smallmouth Bass

Smallmouth bass (*Micropterus dolomieui*) are a non-native game fish that have inhabited the Mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002a). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the Mid-Columbia River are most abundant around the deltas of warmer tributary rivers. They are also abundant areas upstream of the Mid-Columbia River reach. The optimal temperature range for this species is from 70° to 81° F (21° to 27° C) (Wydoski and Whitney 1979), which is higher than the temperatures typically observed in the Mid-Columbia River reservoirs.

Ideal spawning temperatures for this species range from 60° to 65° F (15.5° to 18.5° C). Although such temperatures do not occur consistently in the Mid-Columbia River reservoirs until late summer, these temperatures are present in the Okanogan River and Lake Osoyoos. Smallmouth bass build and defend nests in sloughs and littoral areas with sand and gravel substrates. Such areas are generally lacking in the Mid-Columbia River system. It is believed that primary natural reproduction of smallmouth bass in the Mid-Columbia River occurs only in the free-flowing Hanford Reach below Priest Rapids Dam and in the Okanogan River.

Smallmouth bass were the second most abundant predator species captured in the Mid-Columbia River region during predator assessment sampling conducted in 1994, most frequently captured from forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in the Mid-Columbia River reservoir areas (Beak and Rensel Associates 1999; Parametrix and University of Idaho 2000; Duke 2001). They are a significant fish predator species in the Columbia River, and prey on juvenile salmonids. In the 1994 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the prey fish.

Walleye

Walleye (*Stizostedion vitreum*) are a cool-water, piscivorous game fish believed to have moved downstream into the Mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). However, they were the least abundant predator species captured in the Mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002a).

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the Mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook 1983). Recruitment of walleye into the Mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

Largemouth Bass

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington in the late 1800s (Wydoski and Whitney 1979). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002a). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney 1979). Little is known about the populations in the project area, although they are infrequently captured (Beak and Rensel 1999; Duke 2001; Parametrix and University of Idaho 2000; Burley and Poe 1994).

Channel Catfish

Channel catfish (*Ictalurus punctatus*) is a non-native species that is found most often in clear lakes, reservoirs, and streams. In streams, this species is usually found in moderate to swift currents over sand, gravel, and rubble substrate. However, little is known about the species' habitat preferences in lakes and reservoirs (Wydoski and Whitney 1979). Channel catfish are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002a). Little is known about the populations in the project area, although they are infrequently captured (Duke 2001; Parametrix and University of Idaho 2000; Burley and Poe 1994). No catfish were captured in sampling conducted in the Wells Dam reservoir in 1999 (Beak and Rensel 1999).

3.2.9 Other Resident Fish Resources

Resident fish resources in the Mid-Columbia River have not been studied extensively, but some information on species composition and abundance is available (Table 3-7). Dell et al. (1975) report the most abundant resident fish species were northern pikeminnow (*Ptychocheilus oregonensis*), stickleback (*Gasterosteus aculeatus*), and suckers (*Catostomus* sp.). They also determined that whitefish and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than 2 percent of the total 32,289 fish sampled.

Beak and Rensel (1999) reported suckers (*Catostomus* sp.) as the most abundant resident fish, captured in beach seining sampling, in the Wells Dam forebay (Lake Pateros). This species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey counts in 1998. Other abundant species in the beach seine catch were bluegill (*L. microchirus*) (32 percent), northern pikeminnow (10 percent), peamouth (6 percent), and carp (*Cyprinus carpio*)

TABLE 3-7. OTHER FISH SPECIES THAT MAY OCCUR IN THE COLUMBIA RIVER SYSTEM

SCIENTIFIC NAME	COMMON NAME	PRESENCE IN PLAN AREA	STATUS	REFERENCE
Entosphenus tridentata	Pacific lamprey	A, B, C	native, common	Wydoski and Whitney 1979
Lampetra ayresi	river lamprey	A, B, C	native, unknown	Wydoski and Whitney 1979
Acipenser transmontanus	white sturgeon	A, B, C	native, common	BPA et al. 1994b
Prosopium williamsoni	mountain whitefish	A, B, C	native, common	Dell et al. 1975; U.S. Army Corps of Engineers 1994
Prosopium coulteri	pygmy whitefish	A, B, C	native, rare	BPA et al. 1994b
Prosopium spp.	lake whitefish	A, B, C	native, uncommon	Wydoski and Whitney 1979
Salmo trutta	brown trout	A, B, C	introduced, rare	Wydoski and Whitney 1979
Oncorhynchus clarki	cutthroat trout	A, B, C	native, common	Wydoski and Whitney 1979
Oncorhynchus nerka	kokanee	A, B, C	native, common	Dell et al. 1975
Oncorhynchus mykiss	rainbow trout	A, B, C	native, common	Wydoski and Whitney 1979
Salvelinus fontinalis	eastern brook trout	A, B, C	introduced, rare	Wydoski and Whitney 1979
Salvelinus confluentus	bull trout	A, B, C	native, uncommon	Dell et al. 1975; Wydoski and Whitney 1979
Salvelinus namaycush	lake trout	A, C	introduced, rare	Wydoski and Whitney 1979
Cyprinus carpio	carp	A, C	introduced, common	Dell et al. 1975; Wydoski and Whitney 1979
Tinca tinca	tench	A, C	introduced, uncommon	Dell et al. 1975; Wydoski and Whitney 1979
Acrochelius alutaceus	chiselmouth	A, B, C	native, abundant	Dell et al. 1975
Richardsonius balteatus	redside shiner	A, B, C	native, abundant	Dell et al. 1975; BPA et al. 1994b
Rhinichthys cataractae	longnose dace	B	native, common	Wydoski and Whitney 1979
Rhinichthys falcatus	leopard dace	A, C	native, common	Wydoski and Whitney 1979
Rhinichthys osculus	speckled dace	B	native, common	Wydoski and Whitney 1979
Ptychocheilus oregonesis	northern pikeminnow	A, B, C	native, abundant	Burley and Poe 1994
Mylocheilus caurinus	peamouth	A, B, C	native, common	Dell et al. 1975
Couesius plumbeus	lake chub	A, B, C	native, abundant	Wydoski and Whitney 1979
Catostomus catostomus	longnose sucker	A, B, C	native, common	Wydoski and Whitney 1979
Catostomus macrocheilus	largescale sucker	A, B, C	native, abundant	Wydoski and Whitney 1979
Catostomus platyrhynchus	mountain sucker	A, B, C	native, common	Wydoski and Whitney 1979
Catostomus columbianus	bridgelip sucker	A, B, C	native, abundant	Wydoski and Whitney 1979
Ictalurus punctatus	channel catfish	A, B, C	introduced, uncommon	Wydoski and Whitney 1979

TABLE 3-7. OTHER FISH SPECIES THAT MAY OCCUR IN THE COLUMBIA RIVER SYSTEM (CONTINUED)

SCIENTIFIC NAME	COMMON NAME	PRESENCE IN PLAN AREA	STATUS	REFERENCE
Amiurus nebulosus	brown bullhead	A, B, C	introduced, uncommon	Wydoski and Whitney 1979
Amiurus melas	black bullhead	A, B, C	introduced, uncommon	Dell et al. 1975; BPA et al. 1994b
Lota lota	burbot	A, C	native, uncommon	Wydoski and Whitney 1979
Gasterosteus aculeatus	three-spine stickleback	A, C	native, common	BPA et al. 1994b; Wydoski and Whitney 1979
Percopsis transmontana	sandroller	A, C	native, rare	Wydoski and Whitney 1979
Micrtopterus salmoides	largemouth bass	A, C	introduced, uncommon	Dell et al. 1975; Wydoski and Whitney 1979
Micrtopterus dolomieui	smallmouth bass	A, C	introduced, common	Wydoski and Whitney 1979
Pomoxis nigromaclatus	black crappie	A, C	introduced, common	Dell et al. 1975; BPA et al. 1994b
Pomoxis annularis	white crappie	A, C	introduced, common	Wydoski and Whitney 1979
Lepomis macrochirus	bluegill	A, C	introduced, common	Beak and Rensel, 1999.
Lepomis gibbosus	pumpkinseed	A, C	introduced, uncommon	Dell et al. 1975; BPA et al. 1994b
Stizostedion vitreum	walleye	A, C	introduced, common	Dell et al. 1975; Wydoski and Whitney 1979
Perca flavescens	yellow perch	A, C	introduced, common	Dell et al. 1975; Wydoski and Whitney 1979
Cottus confusus	shorthead sculpin	A, B, C	native, common	Wydoski and Whitney 1979
Cottus beldingi	Piute sculpin	A, B, C	native, common	Wydoski and Whitney 1979
Cottus rhotheus	torrent sculpin	A, B, C	native, common	Wydoski and Whitney 1979
Cottus cognatus	slimy sculpin	A, B, C	native, common	Wydoski and Whitney 1979
Cottus asper	prickly sculpin	A, B, C	native, rare	Wydoski and Whitney 1979
Cottus bairdi	mottled sculpin	A, B, C	native, common	Wydoski and Whitney 1979

A = Project Area B = Tributaries C = Columbia River System

(5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish.

Based on fishladder observations, Mullan et al. (1986) found that resident salmonids and white sturgeon were scarce, and that the fish community was dominated by stickleback, minnow (*Cyprinidae*), and suckers. Known life-history characteristics of the resident fish species in the Mid-Columbia River Basin are provided below. Little is known about the other mainstem Columbia River resident fish, and they are not expected to have substantial interactions with Plan species in the project area. These species include yellow perch (*Perca flavescens*), black crappie (*Pomoxis nigromaculatus*), bluegill, brown bullhead (*Ictalurus nebulosus*), black bullhead (*I. melas*), carp, goldfish (*Carassius auratus*), chiselmouth (*Acrochelius alutaceus*), sandroller (*Percosis transmontanus*), tench (*Tinca tinca*), various sucker species, speckled dace (*Rhinichthys osculus*), longnose dace (*R. cataractae*), redside shiner (*Richardsonius balteatus*), peamouth chub (*Mylocheilus caurinus*), and sculpin (*Cottus* sp.) (Wydoski and Whitney 1979).

Rainbow Trout

Rainbow trout is an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The Mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. The ability of the species to alternate life-history strategies is an adaptive mechanism to variable environmental conditions.

Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Wenatchee, Entiat, Methow, and Okanogan Rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 1979). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs, and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish historically spawned in lower reaches of some tributaries, but the mainstem hydroelectric dams inundated these habitats.

Northern Pikeminnow

Northern pikeminnow (formerly northern squawfish) are a slow-growing, long-lived predator. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate.

Northern pikeminnow are the most abundant predator species in the Columbia River system, and accounts for over 75 percent of the total catch of predator fish in the Mid-Columbia River (Loch et al. 1994). They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes.

They are also expected to occur in tributary streams where slow-moving water occurs.

Between 1994 and 2002, the predator abatement programs resulted in the removal of 52,611 northern pikeminnow at Wells Dam, 33,110 pikeminnow at Rock Island Dam, and 44,882 pikeminnow at Rocky Reach Dam (Douglas County PUD 1999; Chelan County PUD 1999c; Bickford 2002 personal communication). In addition, over 7,700 northern pikeminnow were removed during fishing derbies conducted between Rock Island and Chief Joseph dams from 1998 through 2001 (West 2002).

3.2.10 AQUATIC HABITAT

The mainstem hydroelectric projects throughout the Columbia River system have directly and indirectly resulted in substantial changes to the aquatic habitats. The most obvious direct effect was the change from a free-flowing river system to a series of reservoirs. This change resulted in the inundation of salmonid spawning and rearing habitat and the creation of habitat better suited to cool and warm-water fish species. These reservoir impoundments not only change the aquatic habitat in the immediate vicinity of the dams, but also change the seasonal flow and water temperature variations throughout the basin.

3.2.10.1 Reservoir Habitat

Reservoirs have increased water depth, surface area, and retention time, and decreased water-mixing processes compared to free-flowing rivers. These factors combine to increase overall water temperatures, as well as to promote temperature stratification in the deep reservoir areas. As a result, reservoir releases are typically cooler in the spring and summer and warmer in the fall and winter, compared to natural conditions. However, these factors are largely influenced by the large storage reservoirs upstream of the Mid-Columbia River projects.

The Mid-Columbia River projects are run-of-the-river facilities that have limited water storage or flow regulation capabilities (see Water Quality, Section 3.3.2).

The natural variation in seasonal flow is also highly modified in the Mid-Columbia River by the large upstream storage reservoirs associated with Chief Joseph, Grand Coulee, and other storage dams located in Canada that capture the spring run-off and release that water over an extended period. These yearly and seasonal changes to the natural aquatic environment have resulted in substantial changes to the aquatic ecosystem. The aquatic ecosystem consists of a sophisticated and delicate network of interrelationships between a wide range of biological organisms and habitats. Small changes in an ecosystem can have noticeable effects, although they might be isolated to a small number of organisms or habitat types.

One part of the aquatic ecosystem that is often particularly sensitive to changes in water quality is the benthic community. This community consists of a diverse assortment of plants and animals that grow or live on the bottom of lakes and rivers. Many of these organisms are sedentary or have limited mobility, so they are highly susceptible to environmental changes, such as fluctuations in water level or temperature. Benthic organisms are an essential part of the food chain on which resident and anadromous fish species depend. Other important food chain components include phytoplankton and zooplankton, which are tiny floating plants and animals.

Studies in the Lower Columbia River have shown that juvenile chinook salmon (both ocean- and stream-type) actively feed during their outmigration. These fish feed on aquatic insects in the spring, switch to zooplankton during July and September and back to aquatic insects in the fall (Craddock et al. 1976). Stream-type chinook salmon in the Lower Granite reservoir were found to feed primarily on Chironomidae, as well as

minor amounts of Cladocera, Ephemeroptera, Trichoptera, Plecoptera, and terrestrial insects (Chandler 1995 personal communication). Due to limited reach-specific data, it is assumed that feeding habits of juvenile fish are consistent with those observed elsewhere in the system.

Juvenile Passage Through Reservoirs

Reservoir impoundments can create increased rearing area and provide overwintering habitat for juvenile anadromous salmonids. It can also affect the outmigration of anadromous salmonid juveniles by causing extended travel times and decreased survival rates. The use of the term "extended travel times" refers to slower rates of travel by outmigrating juvenile anadromous salmonids. Juveniles, when exposed to extended travel times and increased water temperatures, can residualize (become residents) and fail to migrate to the ocean (NMFS et al. 1998a). Juvenile fall-run chinook salmon now migrate up to 4 weeks later than they did before the development of the Hells Canyon Complex and the four Lower Snake River projects. This is suspected to be caused by increased incubation time and slower growth rates during the early rearing life stage due to cooler than historic water temperature, as well as potential delays in adult spawning due to warmer water temperatures during that period (NMFS 2000d).

Raymond (1968, 1969, 1979) and Bently and Raymond (1976) estimated that juvenile anadromous salmonids move through the Snake River and Lower Columbia River impoundments one-half to one-third slower than they would through free-flowing river sections of the same length. According to Raymond (1979), juvenile steelhead and chinook salmon migrate through free-flowing stretches of river at 14 miles per day, while they move through impounded waters at 5 miles per day. Fielder and Peven (1986) found similar rates (3 to 6 miles per day) for stream- and ocean-type chinook salmon and steelhead juveniles in the Mid-Columbia River reservoirs. Giorgi et al. (1997) reported the migration rates of PIT-tagged chinook salmon and steelhead smolts at 13.4 and 18.9 miles per day, respectively between Rock Island Dam and McNary Dam. This area includes the free-flowing Hanford Reach. By comparison, travel rates estimates for these same species (chinook salmon and steelhead) in the Snake River (with limited free-flowing reaches) were 4.6 and 8 miles per day (Rondorf and Banach 1996).

Increased migration times can affect the size and survival rate of juveniles, timing of ocean transition and thermal imprinting. Increased migration times can cause migrating juveniles, especially steelhead, to revert to parr (residualize). Laboratory evidence suggests that water temperatures in excess of 68° F (20° C) for about 20 days, or delaying migration beyond the end of June, may cause steelhead smolts to revert to parr (Chapman et al. 1994b; Adams et al. 1975; Wagner 1974; Zaugg 1981). Some reverted parr residualize and are lost to anadromous production.

Extended travel times due to passage through reservoirs also increase potential exposure of juvenile outmigrants to predatory fish and reduce migration survival. In addition to the increased exposure to predatory fish, Vigg and Burley (1991) reported that forage rates of piscivorous fish increase with increases in water temperature.

Sims and Ossiander (1981) reported stream-type chinook salmon and steelhead juvenile survival improved with increasing flow. While increasing flow may increase migration speed and associated reservoir survival through the Lower Columbia and Snake River impoundments, there is little evidence to suggest that increased flows will increase survival of spring-run chinook salmon in the Mid-Columbia River reach. However, there are some indications that survival of steelhead might be affected by flow (NMFS 1998; Chapman et al. 1994a).

Under existing conditions, water velocities in the Mid-Columbia River reach are typically greater than in the Snake and Lower Columbia River system. The increased water velocities also result in faster juvenile migrations through the Mid-Columbia River reach. However, the faster travel in the Mid-Columbia River reach does not appear to improve overall survival, thus, it is uncertain if increasing the travel rate by increasing flows will substantially change survival rates in the Mid-Columbia River (NMFS 1998). In view of the uncertain benefit of increases in travel rates, improving juvenile outmigrant survival in the Mid-Columbia River reach may best be achieved by predator control and improved dam passage conditions.

Adult Passage Through Reservoirs

There is little evidence to suggest that significant impacts on adult migration and pre-spawning mortality occur in the Mid-Columbia River project reservoirs. Bjornn and Peery (1992) included information from Mid-Columbia River and other run-of-the-river reservoirs in their comprehensive review of the effects of reservoirs on adult salmon and steelhead. Based on the available information, they concluded that run-of-the-river reservoirs had minimal effect on migrating adults. Adult salmonids generally pass through these reservoirs at similar or faster rates than they do in the naturally flowing river. There is little evidence of disorientation, wandering, straying, or mortality associated with reservoir conditions.

Reservoir Habitat Use

Mainstem spawning and rearing habitat for anadromous salmonids in the Mid-Columbia River reach was inundated by the formation of five PUD reservoirs beginning at the Priest Rapids Dam and extending to the Chief Joseph Dam. The total surface area of the Columbia River between Priest Rapids and Chief Joseph dams doubled from 23,000 to 46,000 acres following inundation by the dams (Mullan et al. 1986). Since upstream passage facilities were not provided when Chief Joseph Dam was constructed, Chief Joseph Dam is the upstream extent of mainstem anadromous salmonid production. Natural anadromous salmonid spawning in the mainstem Mid-Columbia River presently is limited primarily to the free-flowing Hanford Reach downstream of Priest Rapids Dam, and to the major tributaries including the Wenatchee, Chelan, Entiat, Methow, and Okanogan River systems. Some limited mainstem spawning also occurs in the upstream portions of the reservoirs in project tailrace areas where streambed hydraulics and substrate conditions allow (Carlson and Dell 1989, 1990, 1991, 1992; Dauble et al. 1994; Chapman et al. 1994a).

Whitefish, trout, and char were important resident species prior to reservoir inundation. The change from a free-flowing environment undoubtedly eliminated much of the spawning and rearing habitat of these resident salmonid fish populations. However, recent bull trout radio-tagging studies indicate the some bull trout rear for considerable periods of time in the reservoirs (BioAnalysts, Inc. 2002). Under present conditions, few salmonids reside in the reservoir and their numbers probably represent less than 1 percent of the total fish numbers (Dell et al. 1975; Zook 1983; Mullan et al. 1986). Habitat alteration created a subsequent shift in species composition toward dominance by cool water non-game species. Non-game fish such as sucker, chub, pikeminnow, and shiners, comprise the majority of the reservoir resident fish population (BPA et al. 1994a,b).

Reservoir production concerns and issues are related to a reduction in fish habitat for spawning and juvenile rearing life-history stages. The factors affecting reservoir habitat for these life stages are discussed in the following sections.

Spawning Habitat

Existing mitigation for losses of mainstream spawning habitat due to inundation by the reservoirs is set forth in the existing FERC licenses for the projects. Additional concerns related to reservoir effects on the existing spawning sites include deposition of fine sediments that may reduce incubation and spawning success; scour and relocation of gravel near the tailrace of each dam.

Sediment Deposition and Gravel Scouring

Smoothing of the hydrograph and lack of significant flow velocities as a result of Columbia Basin hydroelectric development has increased the amount of fine sediment present in mainstem cobble substrate, especially in the lower portions of reservoirs (Falter et al. 1991). The Mid-Columbia River is not a navigational shipping corridor, so dredging is not required in the reservoirs. In addition, the turbine intakes at the dams extend to the bottom of the reservoirs, minimizing the sedimentation immediately behind the dams, and thereby eliminating the need for maintenance dredging.

Mainstem anadromous salmonid spawning is concentrated in dam tailrace areas, where conditions are most like a free-flowing river. River hydraulics in these areas are sufficient to maintain well-sorted substrates, relatively free of fine sediment, and velocities that meet spawning preferences of salmonids.

Columbia River mainstem tributaries have the potential to deposit bedload material into reservoirs, forming alluvial fans at the confluences. If the accumulation of fine sediment is not excessive, then bedload material could provide a good source of spawning substrate, as long as local water velocities are appropriate for spawning and they are sufficient to keep excessive levels of fine sediment from accumulating throughout the incubation stage. Fine sediment loading in the Okanogan Basin is considered high, while the Methow and Wenatchee river systems transport a moderate level of fine sediment (Rensel Associates 1993).

To date, mainstem spawning in the tailrace areas has probably been increasing since the 1980s (Mullan 1987; Chelan County PUD 1991), although this apparent increase may be an artifact of researchers spending more time and effort looking for mainstem spawning. Such data indirectly suggest any gravel relocation in the tailraces has not adversely reduced spawning opportunities. Thus, tailrace hydraulic effects may be maintaining spawning opportunities in the reservoirs, particularly for summer- and fall-run chinook salmon (Chapman et al. 1994a).

Fluctuation of Pool Elevations

Maximum pool fluctuations in Mid-Columbia River reservoirs are generally less than 10 feet, although they occur primarily in winter (Zook 1983; Chapman et al. 1994a) during the period when chinook salmon embryos and alevins are incubating in the substrate. Water level fluctuations can have an adverse effect on embryos depending upon the degree and duration of the fluctuation and embryo development stage. Studies indicate prolonged periods of dewatering, up to 12 days, do not reduce embryo survival (Becker et al. 1983; Neitzel et al. 1983). After hatching, alevins can withstand only brief periods (1 to 2 hours) of dewatering without reductions in survival.

Reservoir spawning is suspected to occur in relatively deep mainstem waters near the upstream portions of the reservoirs. Giorgi (1992) and Rensel Associates (2000) observed chinook salmon spawning in the upper reaches of Rocky Reach reservoir and the Wells Dam tailrace at depths between 8 and 23 feet, with most redds constructed at depths greater than 20 feet. Because of the depth of these redds, they are not expected to be affected by water level fluctuations as a result of project operations. The Rocky Reach Dam has a 4-foot reservoir elevation operating range.

Spawning Locations

The importance of mainstem Columbia River reservoir spawning habitats varies by species and race/deme. There is no evidence of substantial mainstem spawning for spring-run chinook salmon, steelhead, sockeye, or bull trout in the Mid-Columbia River reservoirs. The following species-specific accounts focus on mainstem spawning conditions in the Mid-Columbia River Basin.

Ocean-Type Chinook Salmon

Summer/fall-run chinook salmon are known to spawn in the upstream portions of reservoirs, or tailrace areas, where stream velocities, substrate and inter-gravel flows are sufficient to support redd development and embryo incubation (Chapman et al. 1994a). However, the most significant fall-run chinook salmon spawning area in the Mid-Columbia River occurs downstream of Priest Rapids Dam in the free-flowing Hanford Reach (Carlson and Dell 1989; Chapman et al. 1994a). Currently, naturally spawning ocean-type summer-run chinook salmon are also found in the Wenatchee, Okanogan, and Methow Rivers (Waknitz et al. 1995). Summer-run chinook salmon are also reported to spawn in the Lower Entiat and Chelan Rivers, in addition to below mainstem Columbia River dams (Marshall et al. 1995); however, it has not been determined whether or not these are self-sustaining populations.

Stream-Type Chinook Salmon

Stream-type (spring) chinook salmon spawning has not been observed in the reservoir areas, except at the mouths of tributary streams that are inundated by reservoir water. However, some potential spawning could occur in areas of substantial groundwater upwelling.

Sockeye Salmon

Sockeye salmon spawning in the Okanogan and Wenatchee Rivers has been documented during September to October (Mullan 1986). Limited spawning may occur in the Methow and Entiat Rivers maintaining remnant sockeye salmon populations from previous introductions (Mullan 1986). Because of the necessity for juvenile lake rearing, sockeye salmon are not regarded as a mainstem spawner.

Steelhead

Summer-run steelhead spawning has not been observed in the reservoirs but some potential spawning could occur in areas of substantial groundwater upwelling. Past decisions regarding mitigation for steelhead spawning habitat have assumed that steelhead used the reservoirs (Chelan County PUD 1991). As a result, the effects of reservoir inundation on steelhead spawning production may be expected to be similar to that for summer/fall-run chinook salmon.

3.2.10.2 Project Area Rearing

Factors with the potential to affect the rearing capacity of reservoirs include habitat condition, flushing rate, aquatic productivity, level of submerged macrophyte growth, and water quality conditions. The potential effects of these factors on rearing habitat are discussed below.

Habitat Conditions

The Mid-Columbia River hydroelectric projects are operated as run-of-the-river facilities with reservoirs that have relatively rapid flushing rates and limited thermal stratification during summer. Most shorelines are steep with relatively little littoral area in comparison to their size. Rapid water exchange and relatively featureless shorelines limit juvenile anadromous salmonid rearing habitat. The majority of reservoir margins are undeveloped, and riparian habitat adjacent to the reservoir is sparse, characteristic of the dry land climate.

Reservoir Flushing and Turnover Rate

Water retention, or flushing rate, of reservoirs is a function of the total reservoir volume divided by inflow over a given period of time. The mean

annual flushing rate of Mid-Columbia River reservoirs ranges between 0.6 and 5.6 days. Beak Consultants, Inc. and Rensel Associates (1999) reported mean flushing rates of 1.5 days in the Wells Dam reservoir and 1.8 days in the Rocky Reach reservoir. Such rapid flushing rates are primarily related to the shallow depths of the reservoirs. Average water velocity through the Mid-Columbia River reach is estimated to be 0.9 to 3.1 feet per second at river flows between 79,000 to 270,000 cfs (Chapman et al. 1994b). Reservoir flushing rate is an important consideration for aquatic productivity as discussed below.

Aquatic Productivity

Aquatic productivity is typically high in free-flowing sections of mainstem rivers. Dauble et al. (1980) found a diverse aquatic macroinvertebrate and zooplankton community in the Hanford Reach below Priest Rapids Dam. Reservoir inundation typically decreases productivity and diversity of benthic and limnetic organisms (Mullan 1986). The invertebrate community is dominated by chironomids, oligochaetes, and zooplankton (Falter et al. 1991). Thus, juvenile salmonids (which prefer large, high energy content food items [such as Trichoptera]) switch first to chironomids, then to zooplankton as abundance of the preferred food items decline (Rondorf and Gray 1987). Therefore, productivity may limit the feeding efficiency of juvenile anadromous salmonids, who must expend more energy to capture lower energy content prey in the reservoirs as compared to free-flowing reaches.

Most of the primary and secondary production potential in the Mid-Columbia River region is generated from upstream sources. Lake Roosevelt (upstream of Grand Coulee Dam) is the single most important factor influencing aquatic productivity in the downstream PUD reservoirs due to the slow turnover rate, large storage capacity and source of nutrients (Rensel Associates 1993). The thermal regime of the Mid-Columbia River is also influenced by releases from Grand Coulee Dam. Lake Roosevelt exhibits strong thermal stratification during summer months. Since Grand Coulee Dam is not equipped with selective depth-withdrawal facilities, downstream water temperatures are heavily dependent on the depth of the Lake Roosevelt thermocline.

The flow-through characteristics of the Mid-Columbia River Dam reservoirs result in primary productivity being largely dependent on detritus, sessile (attached) algae, and macrophytes (Mullan 1986). The turnover time of water in the pool is too short in summer to permit development of extensive and diverse zooplankton communities.

Submerged Macrophytes

Submergent aquatic plants are increasing in some of the Mid-Columbia River reservoirs. The benthic community in these submerged macrophyte beds is similarly increasing as riverine macrophytes effectively create substrate by velocity reduction and subsequent particle trapping, encouraging settling of organic-rich soils (Falter et al. 1991). Macrophyte beds eventually increase the production of benthic food organisms, as well as providing additional surface area for algae and invertebrates. They may also provide cover for rearing juvenile anadromous salmonids and other fish species.

The dominant species within the aquatic plant communities in the Mid-Columbia PUD reservoirs (Truscott 1991) is non-native Eurasian water milfoil (*Myriophyllum spicatum*), which forms large, dense monotypic beds with a relatively low volume to edge ratio. These conditions may not provide as much cover and rearing opportunities as native plants, but they still offer substantial shallow water rearing habitat. Only under very dense conditions, would milfoil act to reduce the productive capacity of aquatic habitats.

Given the steep bathymetry of the reservoirs, it is not likely that the density of submerged macrophytes would become a problem for fish

rearing. Therefore, it is reasonable to conclude that continued development of macrophyte beds in the reservoirs should improve aquatic productivity in the reservoir and benefit shallow water fish rearing.

Fish Stranding Potential

Many small fish, including chinook salmon fry, use shallow water habitat and embayments along the reservoir shoreline. Trenches or depressions in the river bottom can form isolated pools at low reservoir levels. Juvenile fish trapped in such pools can perish from desiccation, if the pool drains as water moves through the substrate, or from increased predation. However, Mid-Columbia River reservoirs generally consist of steep morphologies along the river margins and have very little backwater or shallow areas (Zook 1983) thereby reducing the potential for stranding juvenile fish.

Coordination within the Mid-Columbia River hydroelectric system strives to hold all reservoirs as close to full as possible to optimize gross head and total generation (Mid-Columbia Hourly Coordination Agreement). Flow reductions following evening peaking may create rapid decreases immediately downstream of the projects. However, Mid-Columbia River reservoirs typically encroach on the tailraces of upstream dams, which moderates elevation fluctuations in the tailrace and reduces the potential to strand juvenile fish.

Water Quality

Water quality in the Mid-Columbia River reach is influenced by the operation of Grand Coulee Dam; the Mid-Columbia PUD projects have limited capability for flow regulation. Dissolved oxygen is adequate in all reaches, with exception of some extreme backwaters where aquatic weed growth restricts water flow. Turbidity is generally very low in the reservoirs (Rensel Associates 1993). However, spilling water at the projects increases the total dissolved gas levels that can cause gas bubble disease in fish and other aquatic organisms. Additional information regarding water quality in the Mid-Columbia River reach is found in Section 3.3.2, Water Quality.

Project Area Rearing

The importance of mainstem Columbia River reservoir habitat for rearing juvenile anadromous salmonids varies by species and race/deme. Stream-type (spring) chinook salmon, steelhead and sockeye salmon do not appear to use the shoreline habitats of the mainstem Columbia River, but outmigrate in the mid-channel areas of reservoirs (Burley and Poe 1994; Dauble et al. 1989). The river is regarded as a migration corridor in which food may be encountered. Limnetic zooplankton and drift may be a primary food source of yearling outmigrants (Burley and Poe 1994). Ocean-type chinook salmon spend relatively long periods of time feeding and rearing in the mainstem Columbia River reservoirs (Chapman et al. 1994a).

Spring-Run Chinook Salmon

Spring-run chinook salmon utilize the mainstem Columbia River primarily as a migration corridor. As a result, they spend little time rearing in the Mid-Columbia River reservoirs (Chapman et al. 1995a).

Ocean-type (Summer/Fall-Run) Chinook Salmon

Ocean-type (summer/fall) chinook salmon juveniles use the mainstem reservoirs for rearing in late spring and early summer (Chapman et al. 1994a; Burley and Poe 1994). Recently emerged ocean-type chinook salmon juveniles rear throughout the shallow, low-velocity areas of the reservoirs in April and May. After reaching approximately 2 inches in size, they move slightly offshore into faster flowing water (Chapman et al. 1994a). Chinook salmon might feed on limnetic species when available, but prefer benthic macroinvertebrates in the drift when rearing (Chapman et al. 1994a). Based on these criteria, it appears that most suitable chinook salmon rearing habitat is found in the upstream portions

of the reservoirs, where river velocities are greater and the substrates are coarser (less fine sediment) than downstream in the reservoirs. However, no surveys have been done in the Mid-Columbia River reservoirs to verify habitat preferences and rearing areas of ocean-type chinook salmon.

Summer-Run Steelhead

Ninety percent of the steelhead production upstream of the Priest Rapids project occurs in hatcheries (Chapman et al. 1994b). The balance of the production occurs in the tributaries, although some minor amount of reservoir rearing may occur during overwintering periods. Although steelhead feed in the reservoirs during their seaward migration, the reservoirs serve primarily as migration corridors rather than as rearing habitat (Chapman et al. 1994b).

Sockeye Salmon

Although sockeye salmon could conceivably rear in the reservoirs, the rapid flushing rate, low primary productivity and lack of abundant zooplankton limit production potential. The Wells Dam reservoir may be a source of rearing habitat for the small but sustained run of Methow River sockeye salmon (Bickford 1994; Chapman et al. 1995b), and the Rocky Reach pool for the remnant run of Entiat River sockeye salmon (Mullan 1986; Chapman et al. 1995b).

Predation

Construction of hydropower facilities on the Mid-Columbia River has created impoundments with habitat more conducive to predators compared to the pre-impounded free flowing river. Changes in physical habitat, water quality, and downstream passage conditions have combined to increase the risk of juvenile outmigrant mortality due to predation (Mullan et al. 1986; Chapman et al. 1994b). Dams present an obstacle to the downstream migration of juvenile anadromous salmonids, often causing them to concentrate in forebays before finding a route past the dam. Concentrations of juvenile anadromous salmonids provide a ready food supply for predators that congregate at such sites (Beamesderfer and Rieman 1991). Passage through turbines, spillways, or bypass facilities may stun, disorient, or injure some juvenile anadromous salmonids, making them less capable of escaping predators. Sediment that formerly would have been suspended during high spring flows settles out in upstream impoundments, resulting in reduced turbidity in the Mid-Columbia River. Clearer water makes juvenile outmigrants potentially more visible and more susceptible to predation.

In addition to juvenile outmigrants being more susceptible to predators (fish and avian) while migrating past the dams, the number of predators is presumed to have increased to levels greater than pre-impoundment conditions in the Mid-Columbia River reach. The following sections provide a general background description of predation (fish and avian) in the Mid-Columbia River reach, and they identify potential methods for reducing predation on juvenile anadromous salmonids.

Piscivorous Fish

The deep, low velocity habitat created by impoundments is preferred by northern pikeminnow, the major native predator fish of juvenile anadromous salmonids. Two other game fish species, walleye and smallmouth bass, were introduced into the Columbia River system in the 1940s to 1950s to provide sport-fishing opportunities (Zook 1983). These piscivorous game fish have become established in the Mid-Columbia River reservoirs, and prey on juvenile anadromous salmonid outmigrants.

In the Columbia River Basin, a predator indexing approach is used to estimate the magnitude of predation on juvenile salmonids by piscivorous fish (Vigg and Burley 1990). Modeling results indicate that piscivorous fish consume up to 19 percent of all juvenile salmonids migrating through the John Day reservoir, and up to 61 percent of ocean-type chinook salmon (Riemen et

al. 1991). Because of their abundance and high consumption indices, northern pikeminnow are the most significant predator, accounting for approximately 78 percent of juvenile salmonids lost to predation by fish. Introduced predator species, such as smallmouth bass and walleye, accounted for the remainder of the losses.

NMFS (2000e) summarized the best available scientific information regarding predation on anadromous salmonids as it relates to the existence and current operation of the Federal hydroelectric projects on the lower Snake and Columbia Rivers. NMFS believes that this information is also generally applicable to the Mid-Columbia River projects.

Northern Pikeminnow

The northern pikeminnow is a slow-growing, long-lived predator. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Northern pikeminnow pose the greatest predation threat to migrating juvenile anadromous salmonids in the Columbia River system because of their number and distribution. Northern pikeminnow accounted for over 75 percent of the total catch of predator fish in the Mid-Columbia River (Loch et al. 1994).

Juvenile salmonids are not a major prey species for northern pikeminnow in riverine environments under natural conditions because they prefer slack water habitat that is limited in the unimpounded areas of the Mid-Columbia River region (Brown and Moyle 1981). A study in the free-flowing portion of the Willamette River found that only 2 percent of the northern pikeminnow stomachs sampled contained juvenile salmonids, despite the fact that sampling took place during the peak juvenile salmonid outmigration (Buchanan et al. 1981).

Because of the concentrations of prey and favorable hydraulic conditions, areas adjacent to and downstream of tailraces have become preferred feeding habitat of northern pikeminnow. The gut contents of northern pikeminnow collected from the tailrace sampling areas at all of the Mid-Columbia River projects contain a higher proportion of juvenile salmonids than pikeminnow collected in the forebays or mid-reservoirs of the same projects (Sauter et al. 1994). In a study conducted in the John Day reservoir from 1983 to 1986, juvenile salmonids accounted for 21 percent of the diet of northern pikeminnow less than 12 inches in length and 83 percent of the diet of larger pikeminnow (Poe et al. 1991). The length of juvenile salmonids consumed by northern pikeminnow also increases progressively with the length of the pikeminnow.

Predation by northern pikeminnow results in substantial losses of juvenile salmonids in the Columbia River system each year. Estimated losses of between 1.9 and 3.3 million juvenile salmonids were estimated in the John Day reservoir alone between 1983 and 1986 (NMFS 2000e). At that time, the estimated northern pikeminnow population in the reservoir was about 85,000 fish. However, the reduction in overall predation, as a result of the removal of northern pikeminnow through predator control programs throughout the system is estimated at between 13 and 15 percent (NMFS 2000e).

Smallmouth Bass

Smallmouth bass are a game fish that have inhabited the Mid-Columbia River reach since at least the 1940s. Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the Mid-Columbia River are most abundant around the deltas of warmer tributary rivers.

In a 1993 survey of the Mid-Columbia River system conducted by the National Biological Survey and the WDFW, smallmouth bass were the second most abundant predator species captured, but accounted for only 9 percent of the total catch (Sauter et al. 1994). The majority of the bass were taken from the reservoir forebays, and the fewest from the tailraces (Burley and Poe

1994). The overall abundance of smallmouth bass in the Mid-Columbia River system appears to be low (Duke 2001; Parametrix and University of Idaho 2000). In addition, smallmouth bass tend to have a low predation rate on salmonids (NMFS 2000e).

The preference of smallmouth bass for low velocity shoreline areas in the Mid-Columbia River reservoirs may reduce their predation on some juvenile salmonid outmigrants. While juvenile stream-type salmonid outmigrants move through the mid-reservoir areas and may avoid substantial interactions with smallmouth bass, juvenile ocean-type salmonid migrants use the shoreline areas and may be an important prey item for smallmouth bass (Poe et al. 1991).

Walleye

Walleye are a cool water, piscivorous game fish believed to have moved downstream into the Mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). Although suitable spawning habitat appears to be plentiful in the Mid-Columbia River, evidence of successful reproduction has not been observed (Zook 1983). Recruitment of walleye into the Mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

Walleye were the least abundant predator encountered in the 1993 National Biological Survey investigation in the Mid-Columbia River, accounting for only 4 percent of all predators caught (Burley and Poe 1994). Of the walleye captured during this survey, 89 percent were caught from dam tailraces, while the remaining 11 percent were caught in mid-reservoir and forebays (Loch et al. 1994). The relatively high numbers of walleye caught in dam tailraces during the spring suggest that walleye may be attracted to the concentrations of juvenile salmonids there. However, investigations of walleye food habits on the Lower Columbia River suggest that walleye in the tailraces are not responding to concentrations of juvenile salmonids. Juvenile salmonids accounted consistently for only 18 to 24 percent of the walleye's diet (Sauter et al. 1994), even when large concentrations of juvenile salmonids were available.

Because of the relatively low level of juvenile salmonid consumption and relative scarcity of walleye in the Mid-Columbia River reservoirs, they are not considered to have a major impact on juvenile salmonid survival migration at this time.

Piscivorous Birds

Juvenile anadromous salmonids near tailraces of the Mid-Columbia River projects are also susceptible to predation by birds. Ring-billed gulls are the most prevalent avian predator in the Mid-Columbia River reach. In addition to gulls, other piscivorous birds known to prey on juvenile salmonids include cormorants, herons, terns, mergansers, and diving ducks (Mace 1983; Wood 1987; Schreck et al. 1997; Schreck and Stahl 1998; Collis et al. 1999, 2001). The birds primarily forage below dams where turbulent currents from the spillways and turbines disorient young juvenile salmonids and carry them near the surface. Ruggerone (1986) estimated that ring-billed gulls consumed 2 percent of the salmon and steelhead passing Wanapum Dam in 1982. Since that time, avian predator control measures (including wires strung across dam tailraces, hazing programs, and lethal shooting in some instances) have hindered bird access to vulnerable juvenile salmonids and are believed to have substantially reduced predation losses. Chelan County PUD in conjunction with the University of Washington, WDFW, and NMFS are currently assessing the impacts of piscivorous birds on juvenile migrating salmonids (see Section 3.5.5, Piscivorous Bird Control Activities).

3.2.10.3 Tributary Spawning and Rearing Habitat

There are four major tributaries in the project area: Wenatchee, Entiat, Methow, and Okanogan Rivers. By the turn of the century, logging, irrigation, and mining activities combined to severely impact the tributary habitats throughout the Columbia River Basin, including the Mid-Columbia River region. However, current conditions have improved because of the removal of small dams on some tributaries, screening of irrigation diversions, increased protection of riparian corridors from logging practices, and reduced mining activities. In addition, some habitat restoration or protection activities (such as improving fish passage conditions at culvert crossings, establishing minimum instream flow criteria, and restricting live stock access to stream bank and riparian areas) have improved the tributary habitat. Despite these improvements, tributary habitat quality and quantity is still a limiting factor in the recovery of anadromous fish stocks in the Mid-Columbia River region.

As a result of the long history of impacts to salmonid populations and their habitats in the Mid-Columbia River region, it is reasonable to assume a substantial reduction in the life-history diversity among these stocks. Decreased diversity is due, in part, to the simplification of the available habitat through riparian and stream-channel modifications, reduced instream flows, and the existence of fish migration barriers. Large-scale introductions of hatchery fish have also contributed to the reduction of life-history diversity within the stocks. Species that adopt several life-history patterns can maximize the use of diverse habitats, occupy vacant niches, and are more robust to periodic dramatic environmental upheavals in a watershed. As a greater percentage of the fish populations become reliant on a single habitat, the impacts resulting from a disturbance or elimination of that habitat also increase.

Habitat needs of anadromous salmonids in the Mid-Columbia River tributaries vary by season and life stage. Upstream adult migration, spawning, incubation of the eggs, juvenile rearing, and seaward migration of smolts are the major life stages for most anadromous salmonids.

Adult salmonids returning to their natal streams must arrive at the proper time and in good health if spawning is to be successful. Unfavorable flow, temperature, turbidity, or water quality conditions could delay or prevent fish from completing their migration. Man-made barriers (such as impassible drops, improperly installed culverts, diversion dams, impoundments, and excessive velocities) may also impede migrating fish.

Hiding and resting cover habitat, clean substrate of appropriate size and composition, and water quality and quantity are important habitat requirements for anadromous salmonids before and during spawning. Cover for fish can be provided by overhanging vegetation, undercut banks, submerged vegetation, woody debris, water depth, and turbulence.

Some anadromous fish (chinook salmon and steelhead, for example) enter the tributaries months before they spawn, so cover is essential for them during this holding period. The suitability of a particular size gravel substrate for spawning depends mostly on fish size, but all require gravel substrate, relatively free of silt.

The timing of hatching and fry emergence of salmon and steelhead varies among the different stocks and spawning areas. These differences are primarily due to variations in temperature during the incubation period. After hatching, alevins (yolk-sac larvae) remain in the gravel for an extended period of time. As their yolk-sacs are absorbed, alevins emerge from the gravel and disperse into a wide variety of habitats. Flow, water velocity, and depth determine the amount of suitable rearing habitat. Other important

features of suitable rearing habitat are substrate composition and cover habitat.

The highest production of invertebrates occurs in shallow water habitats with gravel and cobble substrate, and decreases with larger or smaller substrate material (NMFS et al. 1998a). The amount, type, and location of cover are important during the juvenile rearing phase because it provides food, shade (for temperature stability), and protection from predators.

Wenatchee Watershed

Wenatchee River has about 163 miles of stream accessible to anadromous salmonids. The Federal Government is the largest landowner in the watershed. Private ownership is limited to less than 25 percent of the total watershed area, but encompasses nearly two thirds of the lineal area of the anadromous streams (NMFS et al. 1998a). Most of these lands are irrigated orchard areas located in the lower watershed. Although the large diversions are equipped with modern fish screens, many unauthorized smaller intakes may be operating without screens (NMFS et al. 1998a).

Fish Resources

The Wenatchee River supports several populations of economically and culturally important fish species. The watershed currently supports anadromous runs of chinook salmon, sockeye salmon, and steelhead. Native coho salmon were once present in the Wenatchee watershed (Mullan et al. 1992), but are now extinct (Nehlsen et al. 1991). Other abundant resident species include mountain whitefish, kokanee (landlocked sockeye salmon), bull trout, rainbow trout (a resident form of steelhead), and westslope cutthroat trout. A discussion of the three major evolutionary life-history strategies (ocean-type, stream-type, and resident) exhibited by these fish populations is provided below.

Spring-Run Chinook Salmon

Spring-run chinook salmon return to the Wenatchee River from late April through June. Spawning begins in early August in the upstream reaches of the tributaries, and continues downstream through September. Juveniles emerge from the gravel from late March through early May, generally spend their first summer in the subbasin, and leave in late fall through the following spring. The peak of spring migration is late April through May. The average estimated natural escapement to the Wenatchee River (based upon redd count expansions) is 2,929 fish for the period 1960 to 1969, 2,354 fish for the period 1970 to 1979 (NMFS et al. 1998b), 2,482 fish for the period 1980 to 1989, and 473 fish for the period 1990 to 1999 (NMFS 2001a). Estimated escapement (based on unexpanded redd counts) for 2000 and 2001 were approximately 1,600 and 12,000, respectively (Peven 2002 personal communication).

The primary spawning areas are the Chiwawa River between Grouse and Phelps Creeks, Nason Creek between Kahler and Whitepine Creeks, the Little Wenatchee River between river mile 0.6 and 7, the White River between Sears Creek and White River Falls, and the mainstem Wenatchee River between Chiwaukum Creek and Lake Wenatchee (Peven and Truscott 1995). Spawning is observed annually in Icicle Creek as well, but it is likely that most of these fish are of hatchery origin (Washington Department of Fish [WDF] et al. 1993). A limited amount of spawning has also been reported in Peshastin, Chumstick, and Mission Creeks (USFS 1994a).

Summer/Fall-Run Chinook Salmon

Summer/fall-run chinook salmon return to the Wenatchee River primarily in July and August. They spawn in the mainstem between the outlet of Lake Wenatchee downstream to the confluence with the Columbia River (about 54 miles). Juveniles generally immigrate to the ocean as subyearling fry, leaving the Wenatchee River from 1 to 4 months after emerging from the gravel in April. However, it is likely that some

cohorts also rear in the mainstem, Lake Wenatchee, or tributaries through winter when conditions are favorable to this strategy. Summer/fall-run chinook salmon are most dependent on habitat in the mainstem Wenatchee River downstream of Plain. From 1960 to 1994, the average escapement of ocean-type chinook salmon was 8,826 fish (based on differences in adult and jack counts at Rock Island and Rocky Reach dams), with a range from 3,394 to 13,625 fish. However, estimated escapements in 2000 and 2001 were approximately 19,000 and 23,000 adults, respectively (Peven 2002 personal communication).

Sockeye Salmon

Columbia River sockeye salmon adults generally begin entering the river in April and May. Peak passage at Bonneville Dam typically occurs around the third week in June, and about 1 month later at Rock Island (Chapman et al. 1995b). However, the Wenatchee sockeye salmon population migrates upstream earlier than the Okanogan stock. The principle spawning areas for Wenatchee River sockeye salmon are river mile 0 to 5 on the Little Wenatchee River, from river mile 6 to 10 on the White River, and the lower reaches of Nepeequa River (WDF et al. 1993). In addition, some fish may spawn along the shoreline at the upper end of Lake Wenatchee. As such, sockeye salmon are vulnerable to bulkhead construction because of mechanical damage to redds, altered gravel composition, and reduced nutrient input.

Unauthorized filling and disruption of springs and groundwater seeps, and removal of riparian vegetation also would affect these spawners and decrease fry production. Spawning occurs from mid-September to mid-October. Juveniles move downstream from the rivers to Lake Wenatchee immediately after they emerge from the gravel (March through May). Most of the juveniles (about 82 percent) reside in Lake Wenatchee for 1 year prior to emigration, while some reside 2 years in the lake. A small percentage of sockeye salmon remain in Lake Wenatchee their entire life as kokanee.

Steelhead

In general, adult steelhead migrate into the Mid-Columbia River tributaries in both fall and early spring. Spawning occurs primarily in late March, but may extend longer in some years. Steelhead use the mainstem Wenatchee River and eight of its tributaries: Lower Mission, Sand, Brender, Peshastin, Chumstick, Icicle, Chiwaukum, and Nason Creeks, and the Chiwawa, Little Wenatchee, and White Rivers. Fry emerge in late spring to August and they disperse downstream in late summer and fall. Some fry and parr rear in the mainstem Wenatchee all year. They exhibit a wide range of life-history characteristics, including highly variable, freshwater residence periods, and a broader range of spawning areas (extending higher in the tributaries than stream-type chinook salmon).

Those individuals using upper reaches of tributary habitats (Peshastin and Mission Creeks), have probably been more heavily impacted by forest practices, improper grazing practices, stream channel alterations, and unauthorized water withdrawals than have stream-type chinook salmon. Again, riparian and shoreline impacts are a major problem. Smolts typically leave the Wenatchee River in March to early June, after residing 1 to 7 years in freshwater. Although most leave after 2 or 3 years, some remain in freshwater their entire lives (Peven et al. 1994).

Resident Salmonids

Resident rainbow trout, bull trout, and westslope cutthroat trout use the Wenatchee River and tributary habitat for most or all their life. Although little is known about their specific population dynamics or demographics, they are presumed to exhibit a wide range of life-history patterns.

Bull Trout. The principal spawning areas for bull trout in the Wenatchee River are in Panther Creek (tributary to White River), and the

Chiwawa River and other selected tributaries (Rock, Chikamin, Phelps, Alpine, James, and Buck Creeks) (Brown 1992b). Other lesser populations are known to occur in Nason, Chiwaukum, Eightmile, French, and Ingalls Creeks. Recent radio-telemetry evaluations report that four of eight tagged bull trout moved into tributary streams, while the others remained in mainstem areas (BioAnalysts, Inc. 2002). Bull trout occur throughout the mainstem Wenatchee River from the Columbia River to Lake Wenatchee, although their numbers appear to be low in most areas upstream of Tumwater. The lacustrine form principally spawns in the White River drainage, whereas those bull trout that spawn in the Chiwawa drainage exhibit more of a fluvial life-history strategy (Brown 1992b).

Fishing pressure is a major factor in the decline of bull trout in the Wenatchee watershed (Brown 1992b). In 1992, however, harvest of bull trout was prohibited in the Columbia River and most tributaries of Washington State, including the Wenatchee watershed. With the exception of high levels of sediment in some spawning areas, the new USFS prescriptions for managing stream corridors and riparian habitat are considered adequate for protection of bull trout on public lands (Brown 1992b). However, the consequences of past activities continue to affect bull trout and their habitat (USFWS 1998).

Westslope Cutthroat Trout. Several genetically "pure" and "essentially pure" cutthroat populations occur in the Wenatchee watershed. These populations include: Chiwawa River (Phelps, Rock, Buck Creeks, and the mainstem headwaters), Little Wenatchee River (Rainy, Lake, and Snowy Creeks, and the mainstem headwaters), White River (Napeequa River and mainstem headwaters), Nason Creek (Smith Brook and Gill Creek, and the mainstem headwaters), Icicle Creek (Jack and French Creeks, and mainstem headwaters), and Negro Creek in the Peshastin drainage. Other creeks may have genetically pure or essentially pure stocks, but these populations have not been sampled.

Habitat Conditions

Forest practices can result in multiple habitat impacts, including reduced riparian canopy, increased fine sediment loads, reduced pool habitat, lost off-channel habitats, and increased run-off. Prior to 1988, timber harvests in the watershed left no stream-side buffers along the channels. However, subsequent harvests have incorporated minimum riparian buffers on fish-bearing streams that do not necessarily provide adequate shade or large woody debris recruitment.

Water quality is generally good in the Wenatchee River but water temperatures are above those preferred by salmonids in July, August, and September, particularly during low flow years. The agrarian and historical logging land use practices have increased summer water temperatures above what they would be under natural conditions, and conversely, have probably decreased winter temperatures.

Although fish habitat protection is of primary concern to fishery managers, they have only limited jurisdiction over land and water uses that impact habitat. The Peshastin Creek channel is largely defined by Highway 97. Chumstick and Mission Creeks have been straightened and realigned along much of the historical anadromous zone. While the portion of Icicle Creek still accessible to anadromous fish remains highly sinuous, its banks have been rip-rapped along much of this reach, and its historical maze of side channels and oxbows have been filled in, or cut off from the main channel.

Riparian and Stream Channel Condition

Flood control dikes, gravel mining, and channel straightening associated with rail lines and roads have dramatically simplified habitat in the lower mainstem Wenatchee River. Wood removal, and the loss of wood recruitment resulting from these and other actions have exacerbated conditions.

Today, the lower mainstem is almost entirely devoid of large woody debris, and there is virtually no remaining riparian vegetation. These practices, in combination, constitute the greatest impact to salmonid habitat in the mainstem Wenatchee downstream of Leavenworth.

In general, the lower mainstem river channel would be described as a moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools and stable banks. The upper mainstem Wenatchee River (from Chiwaukum confluence upstream) is a low-gradient, meandering, point bar, riffle/pool, alluvial channel with broad, well-defined floodplains.

The Upper Wenatchee River between the Lake Wenatchee and Leavenworth is impacted less than the reach downstream of Leavenworth. Some rip-rap and general bank protection projects exist in the Plain area along with riparian clearing near some homes along the river. Downstream from Leavenworth, orchards and homes now occupy much of the river's riparian area.

White River

The Lower White River is the principal spawning area for sockeye salmon and adfluvial bull trout. It has an average slope of 1 percent and has shallow entrenchment within a wide, flat-floored, glacial valley. The stream is about 65 feet wide (wetted width), with a relatively even distribution of pool, glide, and riffle habitat. Stream canopy cover is also relatively good.

Nason Creek

Nason Creek flows through a sedimentary glacial canyon, and is relatively unconfined. There are some areas of excessive scour from both natural events and human alterations, and other areas are altered by rip-rap placement. Some side channels and oxbows have been cut off from the main channel by construction of U.S. Highway 2.

Chiwawa River

The Chiwawa River is the largest tributary to the Wenatchee River. Private homes and property are adjacent to Chiwawa River for the first 5 miles, near the confluence of Chikamin Creek and in several other tributary sections. In general, the habitat is riffle dominated, with pools associated with log jams and meanders, although the river has limited large woody debris or pools per unit stream length. No known fish passage barriers occur in the stream. There are numerous roads throughout the watershed. A water diversion is located at river mile 4.4, and has a capacity of diverting 30 cfs that may reduce downstream rearing habitat in late summer. A satellite to the Rock Island Fish Hatchery Complex is located at river mile 0.6.

Icicle Creek

Lower Icicle Creek is an unconfined alluvial stream, with a relatively low gradient. An unquantified but substantial amount of stream bank has been altered by riparian vegetation removal or rip-rap placement. The barrier dam at Leavenworth National Fish Hatchery is reported to block access to more than 19 miles of historical habitat. However, there is some indication that a natural barrier about 3 miles upstream from the hatchery might be the historic upstream extent of anadromous fish access (Clubb 2001 personal communication). Viable populations of rainbow trout, bull trout, cutthroat trout, and brook trout occur upstream of this barrier.

Chumstick Creek

Chumstick Creek is a substantial source of sediment to the Wenatchee River due to riparian habitat degradation along the creek. Although there is some potential for steelhead and stream-type chinook salmon production, this system appears primarily suited for coho salmon. A large culvert under the North Peshastin Road (near the mouth of Chumstick Creek) is a passage barrier for adult salmonids, and several smaller upstream culverts are suspected to hinder upstream passage of salmonids at certain times. Summer flows, at least in drier years, appear to be

low enough to prevent adult salmonid staging and spawning. Juvenile salmonids have been observed in Lower Chumstick Creek, closely associated with the patchy riparian cover.

Peshastin Creek

Stream-type chinook salmon still use this system. Historically, steelhead and coho salmon probably spawned in this system. Irrigation diversions are suspected of blocking adult migrations; however, small numbers of chinook salmon have spawned in Peshastin Creek in some recent years (Peven 2002 personal communication). The effects of water diversions on juvenile rearing are not known.

Riparian vegetation along the mainstem, where it has not been totally cleared, is primarily deciduous trees and shrubs. As a result, the mainstem channel receives a very limited supply of the large woody debris. Currently, in-channel conditions appear to limit stream-type chinook salmon overwintering above the U.S. Highway 2 crossing. Below the crossing, the gradient flattens considerably, but the lack of riparian vegetation also makes for poor rearing and overwintering habitat. The stream channel in Peshastin Creek has been altered and straightened by construction of U.S. Highway 97 from the mouth to Scotty Creek. As a result, water velocities (and resultant bedload) are very high, making this stream virtually unusable by salmonids at all life stages.

Mission Creek

Mission Creek is a substantial source of sediment to the Wenatchee River. Adult stream-type chinook salmon cannot get above the irrigation diversions (steelhead can in wet years), and the spawning conditions in the lower creek are generally unsuitable. High sediment loads, peak flows, and pre-spawning water temperatures, along with limited adult resting habitat, are all problems for stream-type chinook salmon in this watershed. Juvenile chinook salmon and rainbow/steelhead overwinter in Lower Mission and Brender Creeks, however.

Lake Wenatchee

Lake Wenatchee is the only nursery lake for sockeye salmon in the Wenatchee watershed. It is a typical oligotrophic lake, being relatively clear with low productivity. Mullan (1986) classified Lake Wenatchee as classic sockeye salmon rearing habitat: cold, clear well-oxygenated, but infertile water. The White and Little Wenatchee Rivers deliver most of the inflow, as the basin is relatively small, and the Wenatchee River is the outflow.

Lake Wenatchee is highly susceptible to housing development. The amount of shoreline development that has occurred along the lake has increased in recent years. Many bank hardening and dock construction permits have also been issued. Such activities disrupt sediment dynamics and decrease the productivity of littoral zones. The construction of bulkheads, removal of riparian vegetation, and shoreline clearing on Lake Wenatchee is a departure from natural conditions. This practice reduces wood and nutrient recruitment to the lake and downstream habitats.

The Relationship of Existing Aquatic Habitat Conditions to Biological Productivity

Ocean-Type Chinook Salmon

These fish encounter habitat that has been heavily impacted by development in the valley bottomlands. It is believed that summer-run chinook salmon spawning in the Lower Wenatchee River (downstream of Mission Creek confluence) do not enter the river until shortly before they spawn. Thus, they avoid warm water conditions and usually encounter higher flows than earlier spawners encounter. Flows during the second half of October are on average 25 percent higher than those in the latter half of September. However, in drier years, later migrating fish may have difficulty accessing the area upstream of Leavenworth. Sedimentation, gravel scour and anchor ice are potential sources of pre-emergence mortality.

The early rearing environment for chinook salmon is relatively poor. The combination of natural and artificial channel confinement severely limits the availability of suitable early rearing habitat. Velocity refugia are primarily associated with rip-rap and afford little cover from predators. Habitat limitations include velocity refugia and cover. Late rearing habitat quality is also limited by a lack of in-channel diversity. The lack of cover, particularly as flows drop in the summer and fall, may be limiting the success of this group of fish.

Overwinter habitat quality was also severely reduced by the actions described above. Winter water temperatures often hover near freezing, so ice can occupy most of the substrate in this reach in a cold winter with low flows.

Stream-Type Salmonids

Based on stream survey information (from USFS, WDFW, and Chelan County PUD) and the observations of fish biologists familiar with the basin, most Wenatchee River stream-type anadromous fish spawn higher in the watershed than ocean-type fish, in habitats least modified by land use practices. Early rearing also occurs in more pristine areas (Hillman and Miller 1994). A portion of the juvenile population may move downstream gradually during summer and fall for over-winter rearing. Here they encounter increasingly altered conditions where recruitment of shelter habitat (primarily large woody debris) and food supply is reduced because of the loss of forested riparian areas. Conditions in the Upper Chiwawa and White Rivers are considered particularly good, whereas Nason Creek has been straightened and contains limited large woody debris in most of the anadromous zone. Similarly, the mainstem Wenatchee River in and around Plain and the Lower Chiwawa River have lost considerable large woody debris and in-channel diversity as a result of shoreline development.

Forest practice impacts to stream-type salmonids are expected to improve if the riparian buffers required by the USFS remain in effect, and if forest road construction techniques and maintenance standards continue to improve. The Little Wenatchee River and Nason Creek each experience very low flows during the late summer, but it is not known whether this phenomenon results from forest management. The current forest hydrology models that have been applied to these watersheds indicate only slight exacerbation of peak and summer low flows. No data regarding spawning gravel condition are available. The upper mainstem Wenatchee River still shows the scouring effects of historical in-channel log drives.

Shoreline development is the greatest in-basin habitat problem and probably the greatest threat to this salmonid life-history type, especially in the lower river rearing and overwintering zones. The areas most threatened by additional development are the White River below the Nepeequa River, the Chiwawa River below Deep Creek, most of the anadromous portion of Nason Creek, and the Wenatchee River mainstem between Lake Wenatchee and Tumwater Canyon.

Stream-type anadromous salmonids that spawn or rear in the middle and lower sections of main tributaries encounter conditions different from those that existed before development. Water withdrawals are significant problems in all of the lower river tributaries. Portions of Peshastin and Mission Creeks may be completely dewatered, during the late summer, by irrigation withdrawals. Icicle and Chumstick Creeks may also be diverted.

Sockeye salmon spawning habitat is limited to the lower gradient riffles within the accessible portions of the White, Little Wenatchee, and Nepeequa Rivers. Suitable spawning areas exist primarily where the rivers and their floodplains are unconfined. About half of the spawning habitat in the White River is bordered by private property. Development reduces the riparian vegetation, and stream banks begin to erode. If

this situation continues on the White River, sockeye salmon production will likely decline.

Large woody material and higher flows provide cover to protect fish from poaching, harassment, and predation for mature stream-type anadromous salmonids in the summer and fall. Importance of shelter habitat increases as forest road construction provides easier fishing access and vulnerability to legal and illegal harvest.

Resident Fish

Many of the key habitat factors that apply to anadromous salmonids also apply to resident fish. Resident salmonids are found with anadromous fish in many areas but usually reside in smaller order streams with higher gradients. They occur primarily in more forested drainages away from many of the habitat problems associated with bottomland development (bank protection, channelization, water withdrawal). Key habitat conditions for resident fish (in particular, rainbow trout, westslope cutthroat trout, and bull trout) revolve around minimizing sedimentation and gravel scouring and providing the necessary cool water temperatures and adequate cover.

Entiat Watershed

The Entiat watershed is the smallest of the four considered in this assessment, and probably also the simplest ecosystem. About 90 percent of the watershed is publicly owned. Less than 25,000 acres is privately owned, although more than 75 percent of the riparian habitat for anadromous salmonids in the mainstem Entiat River is privately owned. Most of the upper drainage is considered a Federal key watershed for bull trout, salmon, and steelhead. The Entiat Basin suffered four major burns within the last 25 years: the Entiat Fire in 1970 (burned 22 percent of the watershed), the Crum Canyon Fire in 1976 (4 percent), the Dinkleman Fire in 1988 (20 percent), and the Tyee Fire in 1994 (36 percent).

Fish Resources

The Entiat River supports several populations of economically and culturally important fish species. The watershed currently supports anadromous runs of chinook salmon and steelhead. Coho salmon were once present in the Entiat watershed (Mullan et al. 1992), but are now considered extinct (Nehlsen et al. 1991). Passage barriers on the Entiat River at the turn of the century probably contributed to their extinction. Important inland species include mountain whitefish, bull trout, westslope cutthroat trout, and rainbow trout. A recreational fishery exists for resident rainbow and brook trout. No sport fishing for bull trout, salmon or steelhead is allowed on the Entiat River. The spring- and summer-run chinook salmon and steelhead populations were listed as depressed (WDF et al. 1993).

In general, spawning and rearing habitat for salmon and steelhead are considered to be in very good condition in the Upper Entiat River (from Potato Creek confluence to Entiat Falls) and poor in the Lower Entiat River (USFS 1996).

Spring-Run Chinook Salmon

Stream-type (spring) chinook salmon return to Entiat River from late May through July. The primary spawning areas are the mainstem river upstream of the terminal moraine (river mile 16) to Fox Creek confluence (river mile 28). Spawning begins in early August in the upstream reaches, and continues downstream through August and September. The average escapement estimate, based on dam counts (turnoff estimates), has decreased from about 3,229 redds for the period 1960 to 1969, to about 1,056 redds for the period 1990 to 1995. However, some of these escapement values are not corroborated by redd count expansions, done recently by USFWS (Carie 1996).

Juveniles emerge from the gravel from late March through early May, generally spend their first summer in the subbasin, and leave in late fall through the following spring. The peak of the

spring migration is late April through May, but downstream movement from the tributaries may be continuous, and not always associated with parr/smolt transformation.

Summer/Fall-Run Chinook Salmon

It is suspected that ocean-type summer/fall-run chinook salmon were not a dominant life-history strategy in the Entiat River system (Craig and Suomela 1941). Ocean-type chinook salmon return to the Entiat River primarily in July and August, but may enter the river as late as early October. They spawn in the mainstem Entiat River from the Preston Creek confluence downstream to its confluence with the Columbia River (23 miles). Spawning begins in late September in upstream reaches, peaks mid-October, and ends in early November in the lower river (Peven 1992). Juveniles probably immigrate to the ocean as subyearlings, leaving the Entiat River from 1 to 4 months after emerging from the gravel in April.

Based upon redd counts, the ocean-type chinook salmon escapement to the watershed averaged 37 for the period 1957 to 1966, 55 redds for the period 1967 to 1976, 9 redds for the period 1977 to 1986, and 11 redds for the period 1987 to 1991. In 1995, 40 ocean-type chinook salmon redds were observed in the mainstem Entiat River downstream of river mile 20. No summer-run chinook salmon spawn in the tributaries of Entiat River. Juveniles may rear from a few months to a year before migrating downstream. Two general life-history types are presumed for ocean-type anadromous fish in the basin: (1) spawn in the mainstem and leave the system in late spring/summer as subyearlings, and (2) spawn in the mainstem and leave the system in fall as subyearlings. However, some cohorts rear in the Entiat River through winter when conditions are favorable to this strategy.

Sockeye Salmon

Sockeye salmon are not indigenous to the Entiat River (Craig and Suomela 1941). After they were propagated at Entiat National Fish Hatchery between 1941 and 1969, small numbers of sockeye salmon adults are occasionally observed in the Entiat River during spawning ground surveys for chinook salmon (Carie 1996). These fish are either strays from the Wenatchee and Okanogan stocks, or they may be artifacts of the Entiat National Fish Hatchery releases (Mullan 1986). Little is known about the life-history of Entiat sockeye salmon; they are assumed to rear primarily in the impounded lower reach of the Entiat River and the mainstem Columbia River (Chapman et al. 1995b). Spawning occurs from mid-September to mid-October. It is assumed that juveniles move downstream from the Entiat River to the Columbia River reservoir immediately after they emerge from the gravel (March through May).

Steelhead

Steelhead spawn in the Upper Entiat River and some tributaries from mid-March through late May. Most steelhead spend 1 to 2 years rearing in the mainstem or its tributaries, although an almost continuous outmigration from the river occurs during this period. Movements are complex and not fully explainable. Hatchery steelhead are no longer released in the Entiat River.

Natural steelhead stock/recruitment relationships from several reports show little or no replacement. For at least the last 20 years, natural spawning populations in the system are predominantly of hatchery origin. Steelhead exhibit a wide variety of life-history strategies. Again, riparian and shoreline impacts are a major in-basin problem for steelhead.

Resident Salmonids

Resident rainbow trout, bull trout, and westslope cutthroat trout use the Entiat River and tributary habitat most or all their life. Although little is known about their specific population dynamics or demographics, they are presumed to exhibit a wide range of life-history patterns. However, recent radio-telemetry data indicates that bull trout migrate between the Entiat River and the

mainstem Columbia River, although the overall extent of these migrations is not currently known (BioAnalysts, Inc. 2002).

Many of the key habitat factors that apply to anadromous salmonids also apply to resident fish. Resident salmonids are found with anadromous fish in many areas but usually reside in smaller order streams with higher gradients. They occur primarily in more forested drainages away from many of the habitat problems associated with bottomland development (bank protection, channelization, water withdrawal). Key habitat conditions for resident fish (in particular rainbow trout, westslope cutthroat trout, and bull trout) revolve around minimizing sedimentation and gravel scouring, and providing cover.

Habitat Conditions

Forest practices impacts are minor in the Roaring Creek drainage, but they are significant in some smaller tributaries (Burns, Preston, Brenegan, and McCree Creeks). Forest roads in the Potato, Mud, and Crum watersheds are typically located in the narrow floodplains of the mainstems and their tributaries. This road location practice can result in multiple habitat impacts including reduced riparian canopy, increased fine sediment loads, reduced pool habitat, and lost off-channel habitats. Such roads also directly reduce watershed storage capacity by rapidly routing run-off into stream channels and by compacting floodplain soils, and also indirectly by discouraging beaver pond construction. Recently, there have been extensive road obliteration and reconstruction projects in the Wenatchee National Forest—primarily for riparian restoration. Timber harvests have left buffers on fish-bearing streams, but the minimum requirements do not always result in adequate shade or large woody debris recruitment.

Upland erosion is a chronic problem in the Entiat watershed, yet substantial restoration efforts are underway in the Wenatchee National Forest to address this problem. Several stream bank stabilization projects are proposed for the erosive banks on the mainstem Entiat River. Using properly applied bioengineering methods, these projects can provide instream habitat for adult and juvenile salmonids.

However, such remedies are not an adequate substitute for natural stream channel/floodplain conditions. Road closures and obliteration, extensive reforestation, culvert upgrades and other efforts are currently proposed for the forest, and will help to improve fish habitat. There are highly erosive areas along Fox, McCree, Brenegan, Preston, and Mud Creeks, Crum Canyon, and the mainstem Entiat between Fox and Stormy Creeks. Relative to hazards from forest land erosion and fluvial sedimentation, stream bank erosion is not a significant problem on the Entiat River-mostly because the riparian vegetation in the upper reach is adequate for avoiding erosion, and the Army Corps of Engineers has provided extensive channeling and rip-rap armoring in the lower reach.

To protect stream-type chinook salmon, WDFW recently imposed selective resident fishery regulations throughout much of the anadromous fish zone that should significantly reduce juvenile hooking mortality. Portions of the zone however, remain open to bait fishing. The recently abandoned practice of planting catchable hatchery rainbow trout in this portion of the subbasin probably had some impact on chinook salmon smolt production. Large woody material and higher flows provide cover habitat to protect mature stream-type anadromous salmonids from poaching, harassment, and predation. Importance of cover habitat increases as forest road construction provides easier fishing access and vulnerability to legal and illegal harvest.

Water temperatures are not a serious problem in the Lower Entiat River; maximum temperatures are typically less than 15° C, which is tolerable for rearing juveniles. In winter, anchor ice is a problem in the Entiat below Ardenvoir and in the Mad River. Sediment levels, especially fine sediments, are impacting beneficial uses,

primarily aquatic habitat and irrigation. These sediments are derived from both natural and human-caused (accelerated) sources.

Riparian and Stream Channel Condition

Based upon the 1995 stream channel inventory and work presented in Mullan et al. (1992), habitat diversity in Lower Entiat River is remarkably low (riffle:run:pool ratio is 0.72:0.25:0.03). In contrast, the upper reach has 28 percent pools, which the USFS rates as good. The distribution of large woody debris is similar, with a low incidence in the lower river and appreciably better in the upper reaches. These two factors (lack of pools and woody debris), are the primary limitations to natural production of salmon and steelhead on Lower Entiat River. Much of this can be attributed to the flood-control projects undertaken by the Army Corps of Engineers under the 1946 Federal Flood Control Act.

Most habitat upstream of Entiat Falls is rated as fair to excellent, with fewer than 25 percent of the surveyed reaches in the upper river not meeting the USFS standard for pool habitat (USFS 1996). The habitat quality between McCrea Creek and Entiat Falls is rated as fair to excellent, and habitat quality downstream of McCrea Creek is rated as fair to poor (USFS 1996). Spawning and rearing habitat in Mad River is poor to fair up to Young Creek, which is well beyond the reach of anadromous salmonids.

The Entiat valley was impacted by major flood events in the 1940s and 1970s. As a result, virtually all of the lower 22 miles of the Entiat River has been channeled—a dike on one side, and the Entiat River road on the other. Stream sinuosity is low, with very few point bars for gravel accumulation. The lower 12.5 miles of the mainstem Entiat River is highly channeled, resulting in a trapezoidal stream channel for the bankfull width. Instream habitat diversity is very low, with few pools, glides, or pocket water. As a result, there are very few resting areas for both adult and juvenile salmon.

The lower mainstem is almost entirely devoid of large woody debris, and there are some areas with no remaining riparian vegetation. These conditions constitute the greatest impact to salmonid habitat in the mainstem Entiat downstream of Mad River. Sedimentation, gravel scour and anchor ice are potential sources of pre-emergence mortality. The early rearing environment is fairly hostile; the combination of natural and artificial channel confinement severely limits the availability of suitable early rearing habitat.

Velocity refugia are primarily associated with rip-rap and afford little cover from predators. Late rearing habitat quality also lacks in-channel diversity. The lack of cover, particularly as flows drop in the summer and fall, may also be limiting the salmonid productivity. Overwinter habitat is also limited in the lower river due to ice often occupying most of the substrate in a cold winter following a dry summer.

Methow River Watershed

Methow watershed has five subwatersheds, and a total drainage area of 1,146,800 acres. Of the four watersheds in the Mid-Columbia River region, the Methow watershed has the most land in public ownership (94 percent), yet it ranks low in annual flows (about 1,600 cfs, measured at Pateros). Methow watershed has an average run-off (cfs) per square mile of drainage area of 1.1 cfs, compared to 1.9 cfs and 2.6 cfs for the Entiat and Wenatchee watersheds, respectively (Mullan et al. 1992). Most of the riparian bottomlands in the reach accessible to anadromous salmonids are privately owned. Very little of the watershed is irrigated agriculture. Only 12,800 acres of the private land in the basin are irrigated cropland (orchard, pasture, and hay); the majority of the watershed is National Forest land.

Fish Resources

The Methow River supports several populations of economically and culturally important fish species. The watershed currently supports

anadromous runs of chinook salmon and steelhead. Sockeye salmon are occasionally observed (Chapman et al. 1995b). Important inland species include mountain whitefish, bull trout, rainbow trout, and westslope cutthroat trout. Currently, there is a catch and release sport fishery for rainbow and cutthroat trout between Gold Creek and Weiman Bridge on the Methow River and a limited catch and release fishery for rainbow and cutthroat trout on the Twisp and Chewuch Rivers. Bull trout, rainbow trout, and cutthroat trout continue to be legally harvested from the Lost River, a tributary to the Upper Methow River. Wild spring- and summer-run chinook salmon and steelhead populations were listed as depressed (WDF et al. 1993). Fish passage into the Methow River was significantly impeded from 1912 until the 1930s by a hydroelectric dam built across the river at Pateros.

Spring-Run Chinook Salmon

Stream-type spring-run chinook salmon return to Methow River from late May through July. The primary spawning areas are the mainstem Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch, and Lost Rivers, as well as Thirtymile and Lake Creeks. Spawning is observed occasionally in Foghorn Ditch as well, but it is likely that the fish spawning here are of hatchery origin (WDF et al. 1993). A very limited amount of spawning has also been reported in Early Winters, Wolf, and Gold Creeks (USFS 1994b).

Spawning begins in early August in the upstream reaches of the tributaries, and continues downstream through August and September. The average estimated natural escapement to Methow River (which includes wild and hatchery fish, and is based upon redd count expansions) is 3,429 for the period 1960 to 1969, 2,471 for the period 1970 to 1979, 1,061 for the period 1980 to 1989, and 772 for the period 1990 to 1995. The escapement to Methow River (as measured at Wells Dam) for the period 1996 to 2002 ranged from a low of 126 in 1995 to a high of 11,157 fish in 2001.

Juveniles emerge from the gravel from late March through early May, generally spend their first summer in the subbasin, and leave in late fall through the following spring. The peak of the spring migration begins around the end of April and continues through May, but downstream movement from the tributaries may be continuous, and not always associated with parr/smolt transformation.

Summer/Fall-Run Chinook Salmon

Ocean-type summer/fall-run chinook salmon return to the Methow River primarily in July and August, but may enter the river into early October. No summer-run chinook salmon spawn in the tributaries of the Methow, and virtually all summer-run chinook salmon spawn downstream of the Chewuch River confluence, a total of about 42 miles of spawning habitat. That section consists of four valley bottom types. Spawning begins in late September in the upstream reaches and ends in early November in the lower river. Emergence timing is probably January through April. Juveniles may rear from a few months to a year before migrating downstream. Juveniles generally immigrate to the ocean as subyearling fry, leaving the Methow River from 1 to 4 months after emerging from the gravel in April.

Ocean-type salmonids are most dependent on habitat in the mainstem Methow River. From 1967 to 1991, the average redd deposition of ocean-type chinook salmon to the Methow River was 464 redds (based on adjusted aerial survey estimates), with a range from 93 to 1,055 redds.

Sockeye Salmon

Sockeye salmon adults are observed nearly every year in Methow River during spawning ground surveys for chinook salmon. The 1990 to 1994 average number of sockeye salmon observed in the Methow River was 53 (range: 13 to 90) (Chapman et al. 1995b). These fish are either strays from the Wenatchee and Okanogan stocks, or they may be artifacts of the Winthrop National Fish Hatchery releases between 1945 and 1958 (Mullan 1986). Genetically and demographically,

these salmon appear to be more similar to the Wenatchee stock than the Okanogan stock (Chapman et al. 1995b).

Little is known about the life history of Methow sockeye salmon; they are assumed to rear primarily in the impounded lower reach of the Methow River and the Columbia River mainstem (Chapman et al. 1995b). Although not generally referred to as such, sockeye salmon are "stream-type" in that they reside in freshwater (nursery lake) for more than a year. Spawning occurs from mid-September to mid-October. It is assumed that juveniles move downstream from the river to the reservoir immediately after they emerge from the gravel (March through May).

Steelhead

Steelhead use the mainstem Methow River and eleven of its tributaries: Black Canyon, Gold, Libby, Benson, Beaver, Early Winters, and Wolf Creeks; and the West Fork Methow, Chewuch, Twisp, and Lost Rivers (NMFS et al. 1998a). In general, steelhead adults migrate into the Methow River in both fall and spring after spending 1 to 3 years in the ocean (Wydoski and Whitney 1979). Spawning is initiated as early as late March, and can extend into July. Their eggs incubate from late March through June, and fry emerge in late spring to August.

Steelhead exhibit a wide range of life-history strategies throughout the basin. Fry and smolts disperse downstream in late summer and fall. Some fry and parr rear in the mainstem Methow River all year. Their use of tributaries for rearing is variable, depending upon population size, and both weather and flow conditions. Most smolts leave the Methow River in March to early June, after spending 1 to 7 years in freshwater, but most leave after 2 to 3 years (Peven et al. 1994). However, some steelhead residualize and spend their entire lives in freshwater. Thus, some naturally produced steelhead are outmigrating from the river throughout much of the year.

After nearly 14 months of rearing in a hatchery (primarily Wells fish hatchery, but recently also at Winthrop National Fish Hatchery), the smolts are planted into the mainstem Methow River from 20 April until 20 May. Almost 10 percent of these hatchery fish stay an additional year in freshwater prior to emigration. Most steelhead smolts leave the system at age 2 or 3, depending upon stream temperatures, and spend 2 years at sea. Currently, and for at least the last 20 years, steelhead spawning in the watershed are predominantly hatchery descendants.

The average hatchery steelhead run size from 1983 to 1992 was 15,015 fish, with an average sport catch of 7,804 fish and Tribal catch of 388 fish, thus leaving 6,623 fish to escape to spawn in the Methow watershed. Natural steelhead comprise about 10 percent of the total steelhead run in the Methow River system. Depending upon assumptions of hatchery fish viability, the stock recruitment relationships for Methow River natural steelhead are either at replacement or markedly below replacement (Appendix E).

Resident Fish

Resident rainbow trout, bull trout, and westslope cutthroat trout use Methow River and tributary habitat most or all their life. Although little is known about their specific population dynamics or demographics, they are presumed to exhibit a wide range of life-history patterns in the basin.

The status of rainbow trout in the Methow River is not known. It is assumed that the Methow system contains a mixture of full time resident rainbow and ocean migrating steelhead. Mullan et al. (1992) detected rainbow trout/steelhead in the mainstem Methow from the mouth to river mile 76.5, and in selected reaches of the following tributaries: Gold, Lake, Wolf, Early Winters, Foggy Dew, Crater, Beaver, Bridge, War, Eightmile, Twentymile, Goat, and Trout Creeks; the Twisp, Chewuch, and Lost Rivers.

Bull trout have been sampled or observed in selected reaches of: Buttermilk, Goat, Wolf, Early

Winters, Lake, Reynolds, South, and Monument Creeks; Lost and Twisp Rivers, and the West Fork and mainstem Methow River (Mullan et al. 1992). Recent radio-telemetry data indicated that 15 of the 39 tagged bull trout released at Wells, Rocky Reach, and Rock Island dams migrated into the Methow River prior to the spawning period in 2001 (BioAnalysts, Inc. 2002). Eleven of these fish migrated into the Twisp River drainage, and one repeatedly moved between the mainstem Methow River and Libby Creek. The others were only detected in mainstem areas of the Methow River.

Brook trout have been widely stocked into the Chewuch and Twisp Rivers since the 1920s. These fish are prolific in some tributaries to these rivers and pose a substantial risk to bull trout because these two species hybridize, and produce sterile offspring (Platts et al. 1993).

Habitat Conditions

Water withdrawal is a major factor in the overall management of the Methow watershed, but is practiced on only 1 percent of the drainage. Of the four Mid-Columbia River tributaries, the effect of irrigation on instream flows is most acute in the Methow (Chapman et al. 1995a). Instream flows limit salmonid production at virtually all stages of the freshwater life cycle. Mullan et al. (1992) assert that a strong hydraulic continuity exists between the Methow River and the groundwater aquifer from river mile 27.5 to 50, and that dewatering of the stream channel between river mile 62 and 74 may be a natural event that is independent of irrigation diversion. They suggest that some irrigation water diverted in summer may return to the river in winter low flow periods through groundwater recharge.

In some areas, forest roads increase fine sediment loading, reduce pool habitat, and reduce access to off-channel habitats. Such roads also directly reduce watershed storage capacity by rapidly routing run-off into stream channels and by compacting floodplain soils, and also indirectly by discouraging beaver pond construction. Timber harvests have left buffers on fish-bearing streams, but the minimum requirements have not always resulted in adequate shade or large woody debris recruitment.

To protect stream-type chinook salmon, WDFW recently imposed selective resident fishery regulations throughout much of the anadromous fish zone that should significantly reduce incidental juvenile hooking mortality. The recently abandoned practice of planting catchable hatchery rainbow trout in selected areas has probably reduced incidental harvest of chinook salmon and steelhead smolts.

Riparian and Stream Channel Condition

Many channel sections of the Methow River are constrained by rip-rap or channel incision, so that low velocity areas for deposition of fines are limited. Although the effects of surface erosion on salmonid production are not a major concern in the Methow, various actions are currently being considered to mitigate those impacts that do occur. In the Twisp watershed, for example, road obliteration projects are proposed by the Okanogan National Forest for about twenty roads and more spur roads. Similar actions are proposed for the Chewuch watershed.

Boulder Creek watershed, the largest drainage in the Chewuch system, has had several mass-wasting events in recent history. Significant bank erosion presently occurs in the lower 25 miles of the Chewuch River. Channel downcutting is evident in many parts of this reach, lowering the water table and disconnecting the channel from its floodplain and riparian area.

The peak flow typically occurs from late April to early June and is caused by low elevation snow melt. Low flows occur from September and October, but often the winter flows are lower than that of summer. Up to 90 percent of the water withdrawn from instream flow is used for agricultural irrigation. A total of about 248 cfs is diverted from the Methow River and its tributaries for irrigation, although these values

vary considerably, depending upon total stream flow, time of year, and other factors.

Eggs, yearling salmon and steelhead, and all age classes of trout and char are impacted in low-flow years. Ironically, the areas most susceptible to dewatering by low-flow events are often where the highest densities of spring-run chinook salmon redds and rearing juveniles are found (Hubble and Sexauer 1994). This dewatering appears to be a natural phenomenon, exacerbated by water use for irrigation. The reaches that go dry during low flow years in the Methow watershed expand in length during extreme drought years. In 1992, Ecology completed an instream flow study that identified the following areas as most prone to dewatering:

- between Weeman Bridge and Mazama Bridge, about 1.6 miles;
- between the Early Winters Creek confluence and the Lost River confluence, about 5.5 miles;
- from the Lost River confluence to the Robinson Creek confluence, about 0.9 mile; and
- Libby and Gold Creeks.

Ecology has established instream flow requirements for the Methow watershed (Chapters 173-548 Washington Administrative Code [WAC]). These flows are used to condition new water rights, but do not affect water rights acquired prior to adoption of the instream flow rules.

Mainstem Methow River. In the subbasin plan, the Washington Department of Wildlife (WDW) et al. (1989) state that the upper reaches of the Methow River have a riparian zone that is fairly wide and undisturbed. It has isolated damage from natural events, limited agricultural developments, grazing, logging, and road construction. The middle and lower reaches appear to have some damage from livestock grazing and agricultural development. However, the quality of substrate in the mainstem Methow is in relatively good condition (Chapman et al. 1994a). Gradient, discharge, and substrate combine to keep accumulations of sediment from occurring in the mainstem (Chapman et al. 1994a). From the confluence of the Chewuch River downstream, the Methow River is in a moderately confined alluvial valley with an average gradient of 0.4 percent.

Chewuch River. While there are some areas in the Chewuch River where habitat is in poor condition, a large portion of the drainage is in very good condition. Stream width-to-depth ratios are relatively high in some reaches. Roughly half the drainage, covering the portions of the watershed north and east of Lake Creek, is relatively undisturbed and functionally intact. However, some areas are deficient in large woody material, mostly due to stream cleanouts for flood control, salvage of instream wood, and extensive stream-channel harvest of potential recruitment trees. Portions of the Lower Chewuch River have been channelized as a result of bank protection efforts after the 1948 flood.

Twisp River. Large woody debris is limited in some sections of the Twisp River, thereby reducing salmonid production. Pool-to-riffle ratios in the Twisp River also indicate a lack of instream cover.

The Relationship of Existing Habitat Conditions to Biological Productivity

Ocean-type Salmonids

It is unclear why the summer-run chinook salmon population in the Methow River is not as robust as those in the Wenatchee and Okanogan Rivers. In general, the condition of spawning gravels in the Lower Methow is considered excellent, as is water quality during the majority of their residence. Mullan et al. (1992) maintain that, historically, the Methow River had smaller runs of summer/fall-run chinook salmon than the

Wentachee and Okanogan Rivers. There is evidence that some subyearlings remain in the Methow River throughout the summer, and emigrate in fall (Chapman et al. 1994a). If a large component of the population remains through summer, they may be impacted somewhat by irrigation water withdrawals. These withdrawals may also reduce adult migration, holding, and spawning habitat (Chapman et al. 1994a), and effectively increase summer water temperatures.

Stream-type Salmonids

The mainstem Methow River and tributaries can be a limiting environment for salmonids during the late summer, when flows are low, and in winter. Stream channel confinement provides adequate depth and cover for salmonids, yet temperature and flow extremes during both summer and winter may cause significant mortality. Based upon analyses of aerial photographs, Chapman et al. (1995a) observed that 6.4 percent of the mainstem Methow River from the Chewuch River confluence downstream to the mouth has extensive placements of rip-rap and 4.1 percent has no riparian vegetation. This lack of riparian coverage would allow significant loss of thermal insulation to the river.

Much of the spawning and early rearing habitat for spring-run chinook salmon lies upstream from irrigation diversions and return flows and is in a permeable glacial deposit. Although not directly influenced by irrigation, some reaches of the Upper Methow and Twisp Rivers are alternately watered and dewatered. Irrigation is known to dewater portions of Gold, Benson, and Beaver Creeks. Flow is much reduced by irrigation in the Lower Twisp River and in Wolf, Goat, and Early Winters Creeks (Chapman et al. 1995a). The effects of irrigation water diversions can be especially severe in drought years. Pre-spawning mortality may also be a significant factor for spring-run chinook salmon in the Methow (Chapman et al. 1995a). Among a myriad of potential causes could be the lack of appropriate cover habitat associated with large woody debris. Loss of woody debris in the Lower Chewuch and Lower Twisp Rivers may exacerbate the movement of juvenile chinook salmon out of those tributaries in the fall, and into areas that may be less suitable for overwinter holding. Chapman et al. (1995a) believe that fry habitat in the Methow River may be limited, because the river has large segments with unvegetated banks (both eroded and laid-back banks) that would not provide suitable habitat for fry at high flows. Juvenile stream-type salmonids have been documented in lower reaches of smaller tributaries that often go dry in late summer (examples are: Gold, Libby, Beaver, and Wolf Creeks).

Resident Fish

Many of the key habitat factors that apply to anadromous salmonids in the Methow watershed also apply to resident fish. Resident salmonids are found with anadromous fish in many areas but usually reside in smaller order streams with higher gradients. They occur primarily in more forested drainages away from many of the habitat problems associated with bottomland development (bank protection, channelization, water withdrawal). Key habitat conditions for resident fish (in particular rainbow trout, westslope cutthroat trout, and bull trout) revolve around minimizing sedimentation and gravel scouring.

Okanogan Watershed

The Okanogan River originates in British Columbia and flows through several large lake systems before reaching the United States. Most of the following discussion is on that portion within the United States. Migration barriers are an important issue in Okanogan watershed. The Okanogan/Similkameen watershed is the biggest and most complex ecosystem of the four Mid-Columbia River tributaries, and has the largest portion in private ownership. Land use is about equally dominated by forest and rangelands. Despite the extensive private lands, the largest

landowners in the U.S. portion of the basin are USFS and the Colville Tribe. This diverse ownership is a significant factor complicating the management of the resource base in the watershed.

Fish Resources

Warm water and low velocities in the Okanogan River favor non-salmonid fishes. However, the Okanogan River (within the United States) currently supports anadromous runs of chinook salmon, sockeye salmon, and smaller runs of steelhead. Important inland species include mountain whitefish, rainbow trout, and westslope cutthroat trout. The three major evolutionary life-history strategies exhibited by salmonids in the watershed are: ocean-type, stream-type, and resident.

Spring-Run Chinook Salmon

There are no indications that spring (stream-type) chinook salmon currently use the Okanogan drainage, but historical records indicate use of three systems: (1) Salmon Creek, prior to construction of the irrigation diversion dam (Craig and Suomela 1941), (2) tributaries upstream of Osoyoos Lake (Chapman et al. 1995a), and (3) possibly Omak Creek (Fulton 1968). There were probably several life-history strategies that historically existed in the Similkameen watershed, prior to construction of Enloe Dam in 1920, although there is no clear evidence that chinook salmon passed the natural falls on the Lower Similkameen River.

Summer/Fall-Run Chinook Salmon

In general, the run strength of summer-run (ocean-type) chinook salmon declined slightly in the Okanogan River over a 20-year period (through the early 1990s) and increased slightly in the Similkameen River, its largest tributary, during this period (Chapman et al. 1994a). Adults enter the Okanogan River from July through late September, with the duration of spawning from late September through early November, peaking in mid-October. The spatial distribution of spawners in the watershed is fairly discontinuous. Summer-run chinook salmon spawn in limited areas between Zosel Dam and the town of Malott, a distance of about 64 miles. On the Similkameen River, summer-run chinook salmon spawn in the 9-mile span from Enloe Dam to Driscoll Island.

Emergence timing is probably January through April. Juveniles may rear from a few months to a year before migrating downstream. Juveniles generally immigrate to the ocean as subyearling fry, leaving the Okanogan River from 1 to 4 months after emerging from the gravel in April. There is evidence that some fish undergo an extended residence period, with protracted downstream movement. Many subyearlings rear in the Mid-Columbia River reservoirs.

Sockeye Salmon

The run strength of sockeye salmon to Okanogan River is highly variable; escapement has ranged from a low of 1,662 in 1994 to a high of 113,232 in 1967 (estimated from ladder counts after completion of Wells Dam). The 1986 to 1995 average run size is 28,460 fish. Osoyoos Lake is the primary rearing area for sockeye salmon in the Okanogan watershed. The lake is eutrophic and has an abundant food supply, thereby producing relatively large sockeye salmon smolts. Sockeye salmon spawn in the mainstem Okanogan River upstream of Osoyoos Lake, between Lyons Park and McIntyre Dam, a distance of 5 miles, although some may spawn in the reach downstream of Lyons Park and in Vaseaux Creek (Hagen and Grette 1994).

Spawning occurs from early October through early November, with the peak in mid-October. Adult passage through Lower Okanogan River (downstream of Osoyoos Lake) may be blocked, in certain years, by warm water conditions during late July and early August (Pratt et al. 1991). Reconstruction of Zosel Dam in 1987 improved passage conditions into the lake. Sockeye salmon probably exhibited three general historical life-history strategies (anadromous sockeye, residual sockeye, and resident kokanee). All three groups

appear to be closely related genetically and some hybridization likely occurs between the groups. However, the mechanism for the expression of these different life-history strategies is not well understood.

Steelhead

Very few wild steelhead currently use the Okanogan River. The historical record for steelhead in the Okanogan watershed is not complete, yet Mullan et al. (1992) assert that very few steelhead historically used Okanogan River. Salmon and Omak Creeks probably had small runs of steelhead, but passage barriers have restricted access to each stream. Steelhead may have historically used some tributaries upstream of Osoyoos Lake (Chapman et al. 1994b). Current habitat conditions in the migration corridor are poor for most, if not all, steelhead life-history types.

Resident Salmonids

Rainbow trout appear to have one life-history pattern; to spawn and rear in the upper tributaries, including the Upper Toats Coulee, and the Salmon, Omak, Sinlahekin, Bonaparte, and Tonaset Creeks. The population size and distribution of rainbow trout in these streams are not known.

The status of bull trout in the Okanogan watershed is unknown, but they are believed to be extinct downstream of Enloe and Zosel dams. Salmon and Loup Loup Creeks supported bull trout populations; however, hybridization with introduced brook trout may have caused a functional extinction of these populations. In a recent radio-tagged study, none of the 39 tagged bull trout entered the Okanogan River (BioAnalysts, Inc. 2002).

The status of cutthroat trout in the Okanogan watershed is relatively unknown. Cutthroat have been detected in the upper reaches of North Fork Salmon Creek, however it is not known whether these fish are native westslope cutthroat trout or an introduced subspecies. Historical records indicate the presence of cutthroat in the Middle Fork Toats Coulee. It is speculated that the existing cutthroat trout are not native to the Okanogan watershed; those currently present in Toats Coulee (and possibly Salmon Creek) may have been planted.

Habitat Conditions

The average annual flow for Okanogan River, measured at Ellisforde, is about 3,200 cfs, which is highest of the four watersheds considered in this assessment. About 75 percent of the flow comes from its largest tributary, the Similkameen River, which lies mostly in Canada. Upstream of the Similkameen confluence, the Okanogan flows through six large lakes—five of which are inaccessible to anadromous salmonids and are entirely in Canada. Osoyoos Lake lies both in Canada and the United States and is used by sockeye salmon. The Wells Project boundary includes the lower 11 miles of the Okanogan River.

Stream habitat conditions are fair to good in the Okanogan National Forest, and sediment delivery from this forest to lower reaches is not a significant problem. However, the lack of overhead cover, woody debris recruitment, invertebrate drift, undercut banks, and stream bank stability are common in the Lower Okanogan River because of limited riparian vegetation in the lower river.

In the mainstem Okanogan River in British Columbia, there are 13 vertical drop structures between Osoyoos Lake and Vaseaux Lake. These structures regulate water flow for flood control and irrigation purposes, and are spaced at roughly 0.6-mile intervals. McIntyre Dam is 4.85 miles upstream of the furthest upstream structure (Vertical Drop Structure 13), and is a barrier to adult sockeye salmon migration, although some adults have been known to pass the dam in high water years. These structures limit the spawning distribution of sockeye salmon. Flow regulation emanating from Skaha Dam and Okanogan Falls Dam are partially responsible for dewatering

sockeye salmon redds in the Upper Okanogan Basin. The reach between Vertical Drop Structure 13 and McIntyre Dam is where the majority of sockeye salmon spawn. Some sockeye salmon also spawn in Vaseaux Creek (0.9 mile below McIntyre Dam) and in the mainstem Okanogan River between Vertical Drop Structure 13 and Vertical Drop Structure 3 (6.4 miles). In low water years, passage into Vaseaux Creek may be blocked (Hansen 1993).

Zosel Dam (river mile 78) controls the level of Osoyoos Lake. Releases of water from Zosel Dam and others in the British Columbia reaches of the Okanogan River affect passage of salmonids and water quality conditions in the Lower Okanogan River. Enloe Dam, located at river mile 9.5 on the Similkameen River, blocks anadromous fish passage. However, there is evidence from historical records (FERC 1980) and affidavits by the Upper Similkameen Indian Band that anadromous salmonids were blocked from upstream passage by a falls on the Lower Similkameen River, which is now inundated by Enloe Dam. These records suggest that anadromous salmonids were not native to the Upper Similkameen watershed.

Flows in Lower Okanogan River are regulated by the series of dams in British Columbia and Zosel Dam. Water releases to meet fishery needs are negotiated yearly by a consortium of fisheries and irrigation managers from both Canada and United States. During sockeye salmon spawning, water flow from the Upper Okanogan River into Osoyoos Lake is generally between 250 and 380 cfs. However, extreme flow fluctuations have occurred in the river during and after completion of spawning, resulting in both redd scouring and dewatering. Douglas County PUD (in cooperation with British Columbian fish, Tribal and water management agencies) is pursuing an aggressive set of flow monitoring, prediction and control measures that will reduce the amount of scour and dewatering that affects the sockeye salmon populations in the upper reaches of the Okanogan River Basin. In 1976 Ecology established base flows for Okanogan River (WAC 173-549; Table 19), and ruled that no further appropriation of surface water shall be made from Okanogan River and tributaries which would conflict with these base flows. Ecology has established instream flow requirements for the Okanogan watershed (Chapters 173-549 WAC). These flows are used to condition new water rights, but do not affect water rights acquired prior to adoption of the instream flow rules.

Water temperatures often exceed lethal tolerance levels for salmonids in the Lower Okanogan River. These temperature exceedances are partly a result of natural phenomena (low gradient and solar radiation on the upstream lakes). However, the condition is exacerbated by the thermal absorption of the surface waters in the six lakes in this drainage, the lack of functional riparian zones along large segments of the lower river, the presence of excessive amounts of sediment originating from the Similkameen River and low summer flows caused by upstream dam operations and irrigation. High water temperatures in late summer and fall effectively exclude juvenile salmonids from rearing in most of the basin, except the first few weeks after emergence. However, some limited summer rearing may occur in the Similkameen River where ground water enters the stream. At times, high water temperatures in the Lower Okanogan River have blocked adult anadromous salmonid passage.

Omak Creek

The Colville Tribe collaborated with Natural Resources Conservation Service to develop a watershed plan and environmental assessment for Omak Creek (watershed size is 90,700 acres). This stream is significant to the Colville Tribe, as it is the only watershed that lies solely within the reservation. The goals of the plan are to restore over 37 miles of steelhead habitat by improving water quality, reducing soil erosion, reducing water temperatures, and eliminating man-made barriers. This last task, removal of a "velocity

barrier" through a large culvert under the Omak Wood Products mill at the mouth of the creek, is the single most important means to restore natural production in Omak Creek.

Low flows (at times less than 1 cfs at the mouth) also appear to limit the production capabilities in Omak Creek. However, flows could be increased substantially if some of the water diversions are addressed. Likewise, there would be other benefits to sensitive species, and the potential for increased flows when some of the upland rehabilitation practices are implemented.

Salmon Creek

In 1916, a diversion dam was built on Salmon Creek for irrigation of about 3,000 acres of orchard and crop land. The dam, located at river mile 3, diverts all water into a 7.5 mile long ditch, which provides gravity fed irrigation water to about 300 users. The lower 3 miles of Salmon Creek is dewatered, except when excess water overflows the diversion dam during spring freshets. At other times, some groundwater surfaces into reaches of the dewatered channel, but not enough to support most aquatic biota.

The Okanogan Irrigation District manages the water supply to the irrigation ditch through controlled releases from two reservoirs: Conconully Lake and Conconully reservoir. The former feeds the latter, and both systems regulate the flows into Lower Salmon Creek. From Lower Conconully reservoir, Salmon Creek flows through about 12.5 miles of public and private lands before it is diverted into the irrigation channel. There is no upstream passage structure on either dam or the diversion structure. Kokanee and resident rainbow trout naturally reproduce in the two reservoirs, and support a local sports fishery.

Omak Fish Hatchery (managed by WDFW) plants catchable-size rainbow trout in these lakes. Historical records indicate bull trout were present in the North Fork Salmon Creek. In years of poor water supply from the reservoirs, the Okanogan Irrigation District pumps up to 30 cfs of water from Okanogan River near Omak to supplement the irrigation channel. This measure is done only in extreme situations, because the electrical power costs are high. Likewise, maintenance costs for the impellers are high, because of the high silt load in the Okanogan River. The life span of impellers under normal load is 1 year.

Upstream of the irrigation diversion dam (river mile 3), the average flow in Salmon Creek is 49 cfs, which could provide substantial habitat for salmon and steelhead. Habitat and water conditions upstream of the irrigation diversion dam are in fair to very good condition, depending upon the reach. Water temperatures are suitable for all stages of salmonid life history. There are numerous affidavits from early settlers of salmon and steelhead in this stream prior to dam construction. Currently, adult steelhead have been observed in the lower reach of Salmon Creek when water flows to the Okanogan River confluence.

Some entities have proposed to renovate the diversion dam to provide water to Lower Salmon Creek. This would require installation of a passage structure at the diversion dam and substantial changes to the irrigation system. Additionally, if sockeye salmon were to be introduced to the system, a passage structure at the landfill dam on Conconully reservoir would be required. The Okanogan Irrigation District is evaluating modifications to the current system to provide additional water to the lower reach of Salmon Creek.

Mainstem Okanogan River

The riparian habitat in the Okanogan is the most degraded of the four primary watersheds in the Mid-Columbia River (Chapman et al. 1994b). This lack of riparian vegetation contributes to the two major limiting factors, high water temperatures and sedimentation. Likewise, the instream habitat has the most limitations to salmonid production. Establishment of riparian and instream habitat would have limited benefits

after mid-summer, because of high water temperatures emanating from the six storage lakes in this system. Spawning gravels are severely limited in the mainstem Okanogan River because of sedimentation. Heavy silt loads from mass failures have caused fine sediment to infiltrate redds and smother habitat for invertebrates in the Similkameen and Lower Okanogan Rivers. High turbidity in these reaches also reduces the feeding efficiency of juveniles.

Similkameen River

Historically, the Similkameen River was estimated to contain about 4,300 acre-feet of spawning substrate, 80 percent of the total for the Okanogan watershed (Chapman et al. 1994b). Half of this habitat was estimated to lie between Palmer Creek and Keremeos, BC (USFWS 1985). Only the lowest 9 miles of the Similkameen River is currently available to salmonids because of Enloe Dam. However, there is some evidence that this was the upstream extent of historical anadromous fish habitat due to a reportedly impassible falls that was inundated by the dam. Some of the highest densities of summer-run chinook salmon redds in the Mid-Columbia River region have been documented in this reach of the Similkameen River (Hillman and Ross 1992).

The Similkameen River provides 75 percent of the average flows to the Okanogan Basin. Like the Upper Okanogan River, the Similkameen has high summer temperatures, often up to 72° F (22° C) (Chapman et al. 1994b). As such, the Lower Similkameen cannot support summer rearing by juvenile salmonids.

Osoyoos Lake

Osoyoos Lake is 8 miles long and relatively shallow. Although the maximum depth is about 200 feet, much of the lake is less than 100 feet deep. It is very warm in the summer months, highly polluted, and appears to be in the transitory state leading to complete eutrophication (Allen and Meekin 1980). Unlike Lake Wenatchee (the other principle sockeye salmon rearing area in the Mid-Columbia River region), Osoyoos Lake is characteristic of eutrophic lakes (Mullan 1986) with shallow, warm water enriched by agricultural influences (Allen and Meekin 1980).

Osoyoos Lake is the primary rearing area for juvenile sockeye salmon in the Okanogan River system. Osoyoos Lake has a relatively abundant food source, consequently producing relatively large sockeye salmon smolts (Mullan 1986). Predators, warm water temperatures, and anoxic hypolimnetic areas may limit sockeye salmon production in the lake (Pratt et al. 1991). Eighteen species of fish inhabit the lake, and many are potential sockeye salmon predators (Chapman et al. 1995b). Water temperatures rise early in the year, reaching 64° F (18° C) at the surface of the lake as early as May. In August, surface temperatures reach 77° F (25° C) (Allen and Meekin 1980).

Other Lakes

There are several lakes (over 25 acres in size) in the Okanogan watershed that are currently, or were historically, blocked to anadromous fish passage. Omak Lake is a large, oligotrophic, deep alkaline lake with a high concentration of dissolved substances typical of the hard-water lakes of eastern Washington. Conductivity is generally high, and the water has high clarity and high dissolved oxygen levels. Conconully, Palmer, and Spectacle Lakes generally have good water quality, although algae blooms have occasionally been observed (Ecology 1976).

The Relationship of Existing Habitat Conditions to Biological Productivity

Water temperatures pose the most difficult problem for increasing survival of both ocean-type and stream-type salmonids. Chapman et al. (1994a) plotted water temperature in the Okanogan River at Oroville and Tonasket, showing that mean daily temperatures were frequently well over 70° F (21° C) in 1986 and 1987 in mid-summer when sockeye salmon could be expected to migrate upstream. Hansen (1993) plotted mean daily temperatures near Zosel Dam

at 70° F or higher for at least 50 days in 1992, and higher than 77° F (25° C) for periods of up to 10 days. He also documented that temperatures upstream from Osoyoos Lake remained higher than 70° F for many days in July and August. Hansen (1993) speculated that the alteration of flow regimes by upstream structures have possibly changed retention times in Osoyoos Lake that exacerbate the problem.

Ocean-type Salmonids

The high temperatures in the Lower Okanogan River could force ocean-type chinook salmon subyearlings to remain well upstream in cooler areas or leave the Okanogan watershed for the Columbia River before the high temperatures begin to develop. Spawning habitat for ocean-type chinook salmon is highly degraded, but still supports a viable population. Progeny of chinook salmon spawners in the Similkameen River must emigrate as subyearlings to maintain viability.

Stream-type Salmonids

Sockeye salmon production is limited by spawning habitat (Allen and Meekin 1980; Mullan 1986; Chapman et al. 1995b), and flow conditions in the Lower Okanogan River (downstream of Osoyoos Lake) as well as related elevated temperatures in the lake and river have been shown to adversely affect adult survival. The estimated carrying capacity is about 4 million smolts, substantially higher than the current production (from 0.5 million to 2.0 million) (Pratt et al. 1991).

Predators, warm water temperatures, and anoxic hypolimnetic areas may limit sockeye salmon production in Osoyoos Lake (Pratt et al. 1991). Recent dissolved oxygen and temperature profiles of Osoyoos Lake (Rector 1993) indicate the formation of a strong thermocline in summer months that persists until fall turnover. Thermoclines of this magnitude result in large portions of the lake not being conducive for rearing of sockeye salmon fry and limit its rearing capacity (Pratt et al. 1991).

Correcting fish passage problems in Salmon and Omak Creeks would substantially increase the production capabilities of the system for spring-run chinook salmon and steelhead compared to existing conditions.

3.3 WATER RESOURCES (QUANTITY AND QUALITY)

Key Terms

303(d) List – A list of water bodies that Ecology has identified as having impaired water quality based on evidence that specific water quality standards have not been met. Section 303(d) of the Federal Clean Water Act requires that states prepare and periodically update these lists and develop controls to bring the water bodies into compliance with standards and protect beneficial water uses (e.g., water supply, cold-water fisheries). Hundreds of creeks and river segments in Washington are currently on the 303(d) list.

Base Flow – The normal low flow that occurs seasonally in a river or creek. During a period of run-off from rain or snowmelt, streams rise above base flow levels and then recede to base flows sometime after the run-off event has passed. Base flows are sustained by groundwater discharges that may vary seasonally (e.g., higher base flow in the spring and lower in the summer).

Dissolved Oxygen – The amount of oxygen that is in solution. Compared to warm-water fish (e.g., largemouth bass or catfish), cold-water fish (e.g., salmon and trout) require relatively high levels of oxygen for respiration. Water quality standards for dissolved oxygen are minimum concentrations to protect cold-water fisheries.

Flow (or Discharge) – A measurable quantity of water passing through a dam or a reach of river over a given period of time. Flows for rivers in the United States are commonly reported in cfs.

Instream Flow – The amount of water in a river or creek required to sustain fisheries and water quality needs. Fisheries biologists and hydrologists have developed a model called the "instream flow incremental methodology," which is applied to streams to determine the optimum flows needed for fish habitat.

Key Terms (continued)

Run-of-the-River Hydroelectric Project – The Wells, Rocky Reach, and Rock Island hydroelectric projects are run-of-the river projects, which means that they do not store substantial amounts of water in their reservoirs. Run-of-the-river hydroelectric projects produce electric power through use of the gravitational force of falling water; they consist of a powerhouse, spillway, and embankments, and may also include fish passage facilities.

Total Dissolved Gas – Total dissolved gas is the amount of all gases that are in solution (e.g., nitrogen, carbon dioxide, oxygen). "Supersaturation" occurs when water is aerated to the degree that dissolved gases in the water exceed equilibrium conditions for saturation. High levels of supersaturation are harmful to fish; therefore, water quality standards for total dissolved gas are maximum concentrations.

Tributaries – Smaller streams or rivers that enter larger water bodies. For example, the Wenatchee River is a tributary of the Columbia River, and Icicle Creek is a tributary of the Wenatchee River.

Turbidity – A measure of the cloudiness or opaqueness of water. In other words, muddy water has high turbidity and clear water has low turbidity. Turbidity is measured by an instrument that passes a beam of light through a water sample and measures the degree to which the light is scattered by suspended particles.

Water Quality Standards – These standards define the minimum requirements to protect beneficial uses of rivers, creeks, lakes, and other water bodies and are required by the Federal Clean Water Act for all states to establish and enforce. The current Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A of the Washington Administrative Code) designate water bodies as "Class AA" (extraordinary), "Class A" (excellent), or other classes. Each class has numerical and narrative standards to protect general beneficial uses, with Class AA having the most stringent standards. In the future, the standards will be changed to identify specific beneficial uses for each water body. Similar to State standards, Tribes administer water quality standards on their lands.

Water Rights – Water rights permits are required from Ecology to withdraw water from rivers, creeks, lakes, or groundwater resources. These permits specify where, when, and how much water may be withdrawn. In many areas of the State, water rights have been over-allocated to the point that there is not enough water to both meet the demands of water rights applicants and sustain water quality and fisheries needs.

** See Chapter 7 for a complete listing of all Key Terms.*

3.3.1 WATER QUANTITY

Water quantities in the Mid-Columbia River and its tributaries are important to fish, wildlife, and people. The salmonid life cycles are closely tied to the annual water cycle, with juvenile outmigration occurring during spring high flows. High flows help the young fish reach the Pacific Ocean quickly, thereby minimizing predation and other causes of mortality in the river. Maintaining adequate summer low flows is also critical to the success of salmon and steelhead spawning and rearing in small tributary channels.

3.3.1.1 Project Area

The Columbia River is primarily fed by snowmelt. Snow accumulates in the higher elevations from fall through early spring, then melts producing run-off during late spring and summer. High run-off occurs when the snow is melting during May and June, with streamflows typically reaching their peaks in early June. These high flows are critical to the efficient outmigration of juvenile salmonids. In late summer and fall, the river flows recede and generally remain low through April. Rainfall occasionally increases the run-off, and rain-on-snow events have caused some of the largest floods in the Mid-Columbia River.

Columbia River Basin hydropower projects fall into two major categories: storage and run-of-the-river. Storage projects such as Grand Coulee Dam have a large operating range between minimum and maximum pool elevations, store large volumes of run-off water and shape downstream flows by gradually releasing the stored water.

The releases from Grand Coulee Dam and regulation by Chief Joseph Dam fundamentally affect the magnitude and timing of flows at downstream run-of-the-river dams. Since Grand Coulee Dam is not equipped with selective depth-withdrawal facilities, downstream water temperatures depend on the depth of the Lake Roosevelt thermocline.

Operating plans for the storage facilities are implemented by Federal agencies according to the Columbia River Treaty with Canada. Grand Coulee releases water from August through December to meet energy demands, draws down the reservoir from January through mid-April for flood control and power production, and refills the reservoir from mid-April through June. Beginning in 1983, water was also released in the spring to aid downstream migration of juvenile anadromous salmonids.

The Mid-Columbia River dams and other run-of-the-river projects have a small operating range, little storage capacity, and must pass inflow through the reservoirs most of the time. The utility districts record daily measurements of the water quantity or flow passing each of these dams.

Wells Dam

Douglas County PUD records daily measurements of flow through turbines plus spillway flow, when present, at Wells Dam. Average flows between 1980 and 1997 ranged from 75,151 cfs in September to 138,946 cfs in June (Figure 3-6) (Ecology 2000). A maximum discharge of 402,000 cfs was reported for June 15, 1972.

Wells Dam has a somewhat broader range of normal pool elevations ranging from 771 to 781 feet than the other Mid-Columbia River projects. The existing FERC license allows a minimum elevation of 767 feet, if requested by the Army Corps of Engineers for flood control, and a maximum pool elevation of 791 feet during a "flood of record" spill event (Beak Consultants, Inc. 1996). The most recent license settlement agreement includes criteria for spill bypass operations to enhance juvenile fish passage (FERC 1991).

Rocky Reach Dam

Similar to Rock Island Dam, Chelan County PUD records daily measurements of flow through the turbines plus spillway flow, when present (Wiggins et al. 1997). These measurements have been recorded continuously since October 1960. Average flows between 1980 and 1997 ranged from 76,821 cfs in September to 157,553 cfs in June (Figure 3-7) (Ecology 2000). A maximum discharge of about 535,000 cfs was reported for June 10, 1961. These measurements are a requirement of the original FERC license for Rocky Reach (FERC 1957a).

Similar to Rock Island, Rocky Reach Dam normally fluctuates the forebay elevation only 4 feet (i.e., 703 to 707 feet elevation) with a maximum range from 703 to 710 feet (FERC 1957a).

Rock Island Dam

Since June 1961, Columbia River discharge has been measured daily by Chelan County PUD at Rock Island Dam as the flow through turbines plus spillway flow, when present (Wiggins et al. 1997). Previous measurements were limited to water level records. Average flows between 1980 and 1997 ranged from 76,478 cfs for September to 162,228 cfs for June (Figure 3-8) (Ecology 2000). A maximum discharge of 692,600 cfs was recorded for June 12, 1948 (Wiggins et al. 1997). From flood marks at Wenatchee, Washington, the flood of June 7, 1894, was estimated to have reached a peak discharge of 740,000 cfs. The minimum recorded flow is 4,120 cfs from February 10, 1932 (FERC 1988).

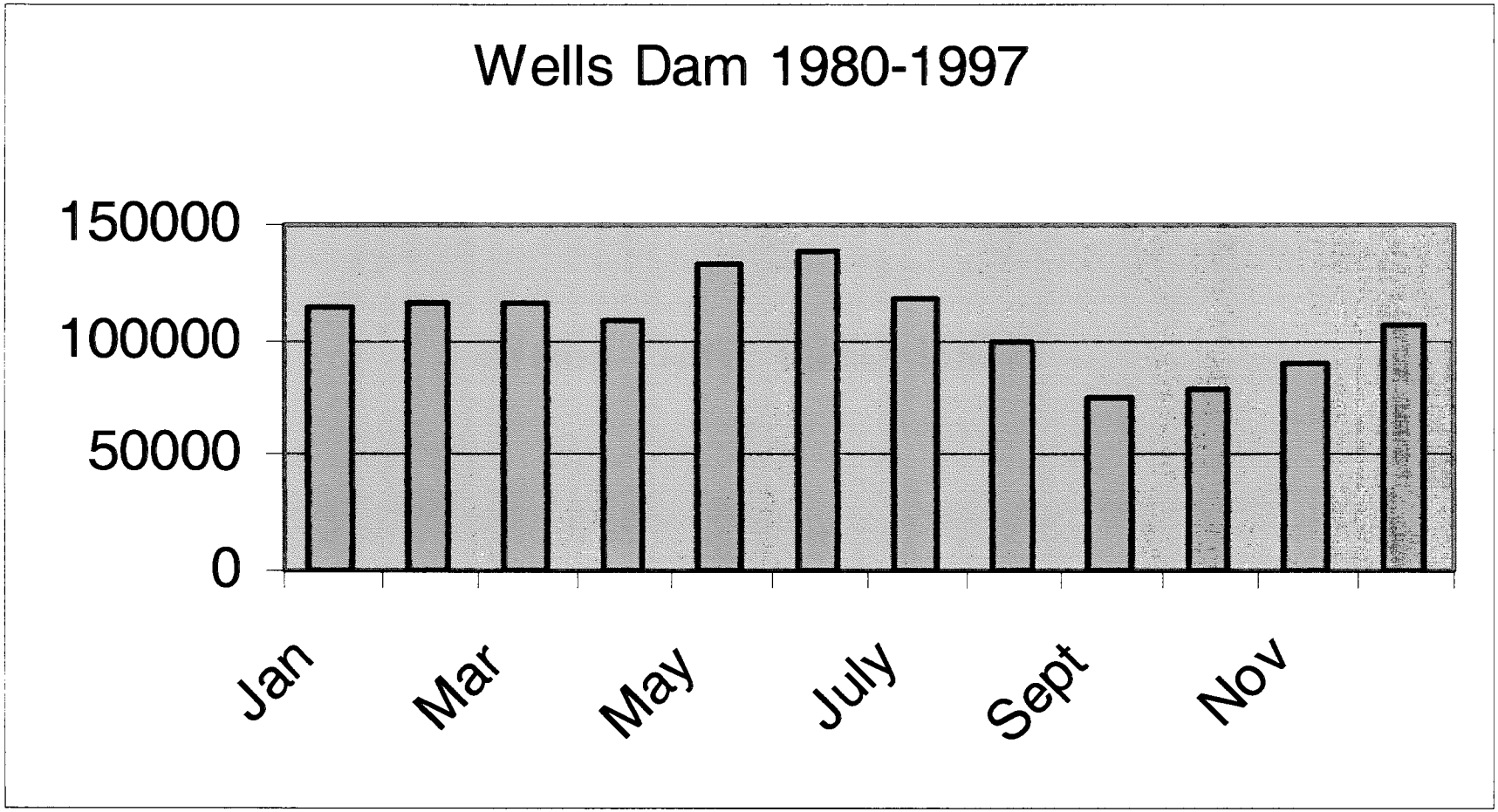


Figure 3-6
Average Monthly Flow (cfs) in the Mid-Columbia River at Wells Dam

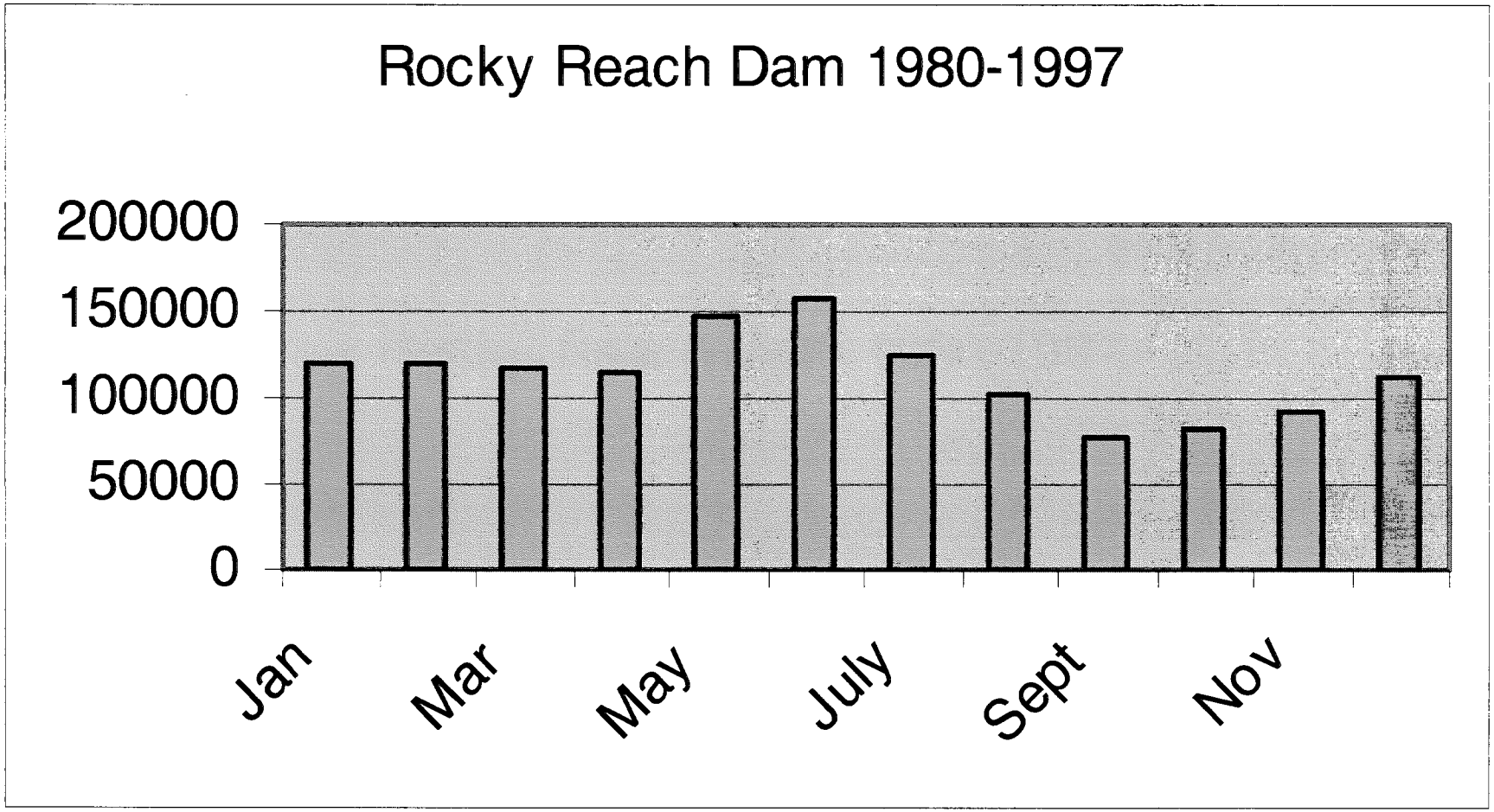


Figure 3-7
Average Monthly Flow (cfs) in the Mid-Columbia River at Rocky Reach Dam

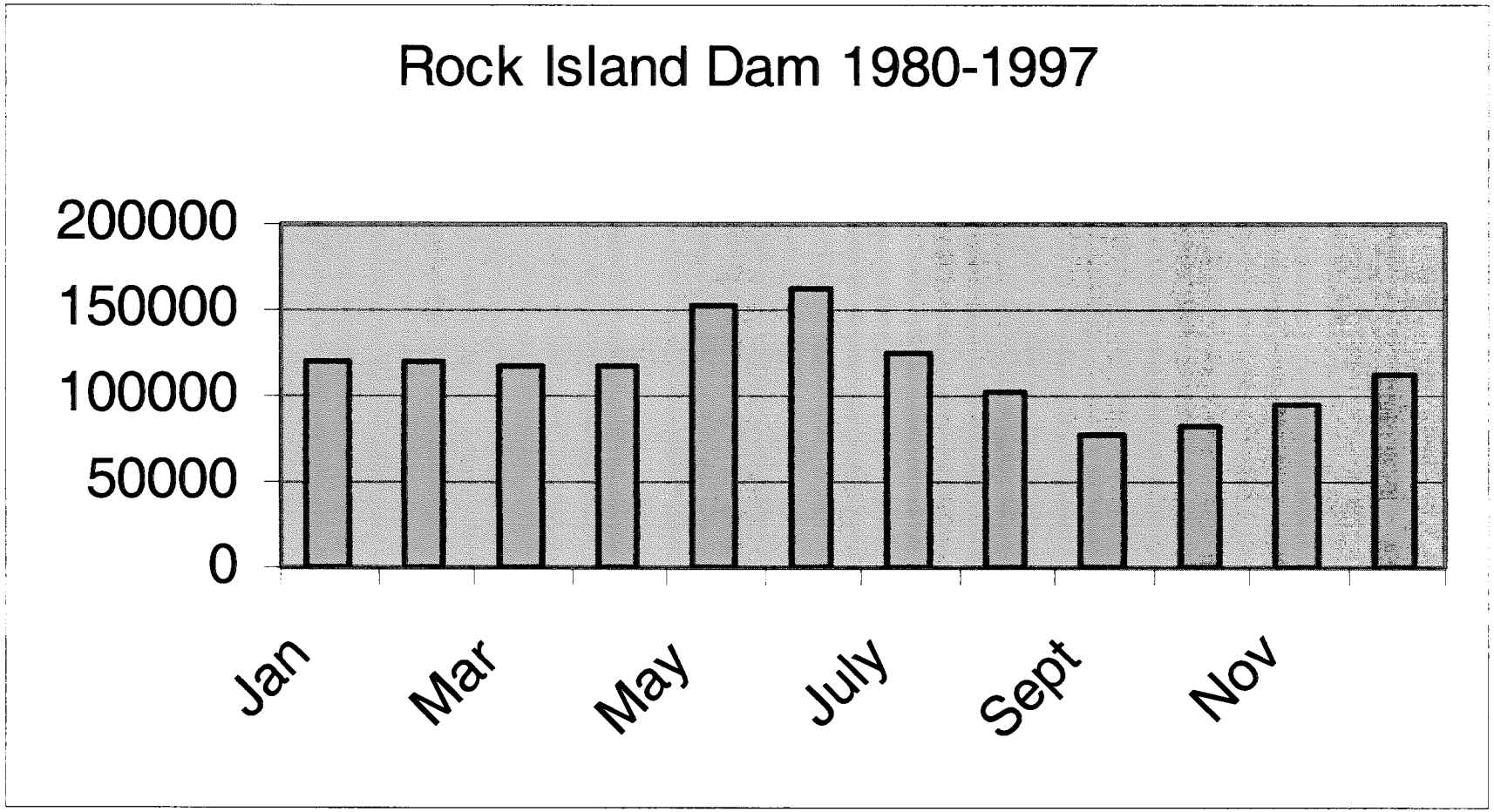


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Figure 3-8
Average Monthly Flow (cfs) in the Mid-Columbia River at Rock Island Dam

As a run-of-the-river project, the Rock Island Dam has very limited capabilities for raising and lowering reservoir water levels. Forebay water levels generally fluctuate between 609 and 614.1 feet elevation, with a maximum range of 602.9 to 619.5 feet (FERC 1989a). The normal operating range is only exceeded during unusual circumstances (e.g., if spill requirements exceeded reservoir inflows for an extended time period).

3.3.1.2 Associated Tributaries

The USGS operates stream-gauging stations on the Wenatchee, Entiat, Methow, and Okanogan Rivers and some of their tributaries. The relatively arid conditions in watersheds on the east side of the Cascade range, combined with the demand for water supplies for irrigation and other uses, result in low flows that affect fish in many of these streams.

Using instream flow incremental methods and data from other hydrologic studies, Ecology has determined that beneficial uses (i.e., fisheries) of many Mid-Columbia River tributaries are impaired due to insufficient instream flows.

To comply with Section 303(d) of the Clean Water Act, Ecology has placed these tributaries on a list of impaired water bodies (i.e., the 303[d] list) and is developing controls to restore beneficial uses (Ecology 1998a). The latest 303(d) list for the State of Washington was updated by Ecology in 1998 and submitted to the USEPA for approval. As part of the response to critical low flows in Mid-Columbia River tributaries, Ecology is not permitting new water rights to withdraw water from several of the Mid-Columbia River tributaries.

Fish hatcheries and other artificial propagation facilities associated with the Mid-Columbia River and its tributaries withdraw water from the rivers primarily for non-consumptive uses. The water is returned close to the point of withdrawal so these facilities have a negligible effect on instream flows.

Wenatchee River

The Wenatchee River flows from the east slope of the Cascade Mountains in Chelan County and enters the Columbia River approximately 6 miles downstream from the Rocky Reach Dam (see Figure 1-3). The Wenatchee River watershed drains 1,328 square miles with 231 miles of major streams (NMFS et al. 1998b). Major tributaries include the Little Wenatchee, White, and Chiwawa Rivers; and Nason, Icicle, Chumstick, and Peshastin Creeks.

Although the Wenatchee River watershed is only the third largest of the four major Mid-Columbia River tributaries, it produces the greatest average annual discharge (2.3 million acre-feet [NMFS et al. 1998b]). Average monthly flows range from less than 836 cfs in September to more than 9,043 cfs in June (Figure 3-9) (Wiggins et al. 1997). Snowmelt is the primary source of the high flows seen in late spring and early summer. However, the maximum recorded discharge for the Wenatchee River (47,500 cfs) occurred on November 30, 1995, in response to a rain-on-snow event (Williams and Pearson 1985). Effects of the large forest fires of 1994, including reduced evapotranspiration and soil absorption capacity, likely contributed to this high peak flow, and may continue to increase total river discharge for an undetermined time (Wenatchee River Watershed Steering Committee/Technical Advisory Committee 1996). In dry years, September flows have averaged as low as 346 cfs.

Of the 420 cfs total water rights established in the Wenatchee River watershed, irrigation districts own about 68 percent (NMFS et al. 1998b). Other water uses are domestic (10 percent), commercial and industrial (8 percent), municipal (6 percent), fish hatcheries (3 percent), and others (4 percent). There are four major irrigation districts in the Wenatchee River watershed: (1) Wenatchee Reclamation District, (2) Icicle and

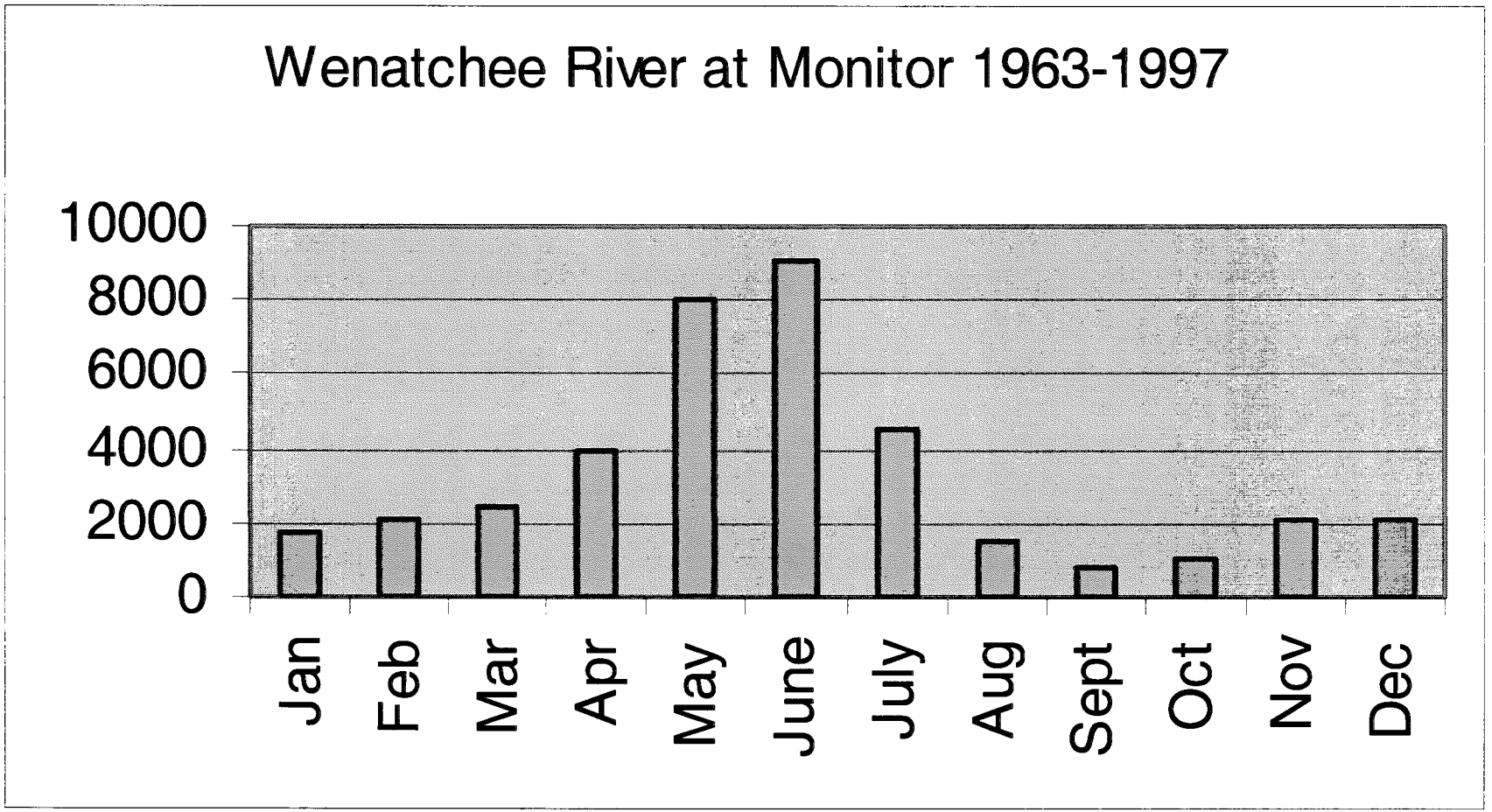

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Figure 3-9
Average Monthly Flow in the Wenatchee River at Monitor, Washington

Peshastin Irrigation Districts, (3) Cascade Irrigation District, and (4) Chiwawa Irrigation District, together with two smaller irrigation groups (Jones-Shotwell and Pioneer-Gunn). Wenatchee Reclamation District, the largest user, diverts up to 200 cfs from the Wenatchee River at Dryden.

Ecology established minimum instream flows for the Wenatchee River and some of its tributaries, to protect and preserve instream values, such as fish and wildlife habitats (NMFS et al. 1998b). These flows are used to condition new water rights issued by Ecology. Because data indicate that minimum instream flow requirements (e.g., 1,200 cfs at Peshastin and 2,000 cfs at Monitor) are not met 90 percent of the time from August to October, Ecology placed the Wenatchee River on its 303(d) list as impaired due to inadequate instream flows (Ecology 1998a). In years of low snowpack, water withdrawals for irrigation and other uses may affect salmonid spawning and rearing habitat.

Several tributaries of the Wenatchee River have also been placed on the 303(d) list as impaired due to inadequate instream flows (Ecology 1998a). Icicle Creek instream flow requirements are not met for an average of 66 days from August to October due to water withdrawals for irrigation, the Leavenworth Fish Hatchery, and the town of Leavenworth. Measurements of essentially zero flow in Chumstick Creek were attributed to large irrigation diversions. Existing water right users, such as the Peshastin Irrigation District, divert enough water to dry up Peshastin Creek in late summer and early fall. Similarly, diversions from Mission Creek were deemed responsible for the lack of flows in Mission Creek. Ecology is responsible for developing controls that restore habitat for spring-run chinook salmon and steelhead in these streams.

Entiat River

The Entiat River flows between the Entiat and Chelan Mountains on the east slope of the Cascade Range in Chelan County, and joins the Columbia River 10 miles upstream from Rocky Reach Dam. The Entiat River watershed drains 419 square miles (Williams and Pearson 1985). Approximately one-fourth of this area is the Mad River watershed, the only major tributary of the Entiat River.

The Entiat River watershed is the smallest of the four major Mid-Columbia River tributaries addressed in the HCP. Average monthly flows in the lower river near Entiat River, are 115 cfs in September and more than 1,430 cfs in June (Figure 3-10) (Wiggins et al. 1997). Snowmelt is the primary source of the high flows seen in late spring and early summer. A maximum discharge of 6,430 cfs was recorded at the Upper Entiat River gauging station on June 10, 1972 (Williams and Pearson 1985), and the maximum flow in the lower river likely exceeded 8,000 cfs at that time.[3] In dry years, monthly flows have averaged as low as 60 cfs (Wiggins et al. 1997).

Methow River

The Methow River originates in the Okanogan National Forest and Pasayten Wilderness on the east slope of the Cascade Range in Okanogan County, and flows southeast to the Columbia River at Pateros, Washington (see Figure 1-5). The Methow River watershed drains 1,792 square miles. Two major tributary watersheds, the 245-square-mile Twisp River watershed and the 525-square-mile Chewuch River (formerly named the Chewack River) watershed (Wiggins et al. 1997) encompass more than 40 percent of this area.

Average monthly flows in the Methow River near Pateros, Washington are 453 cfs in September and 5,963 cfs in June (Figure 3-11) (Wiggins et al. 1997). Similar to the other major Mid-Columbia River tributaries, snowmelt is the

[3] Flow gauging in the lower Entiat River was discontinued between 1958 and 1996; thus, the maximum flow during the 1972 peak was estimated. Average monthly flows for the lower Entiat River are based on the records for 23 years between 1911 and 1958.

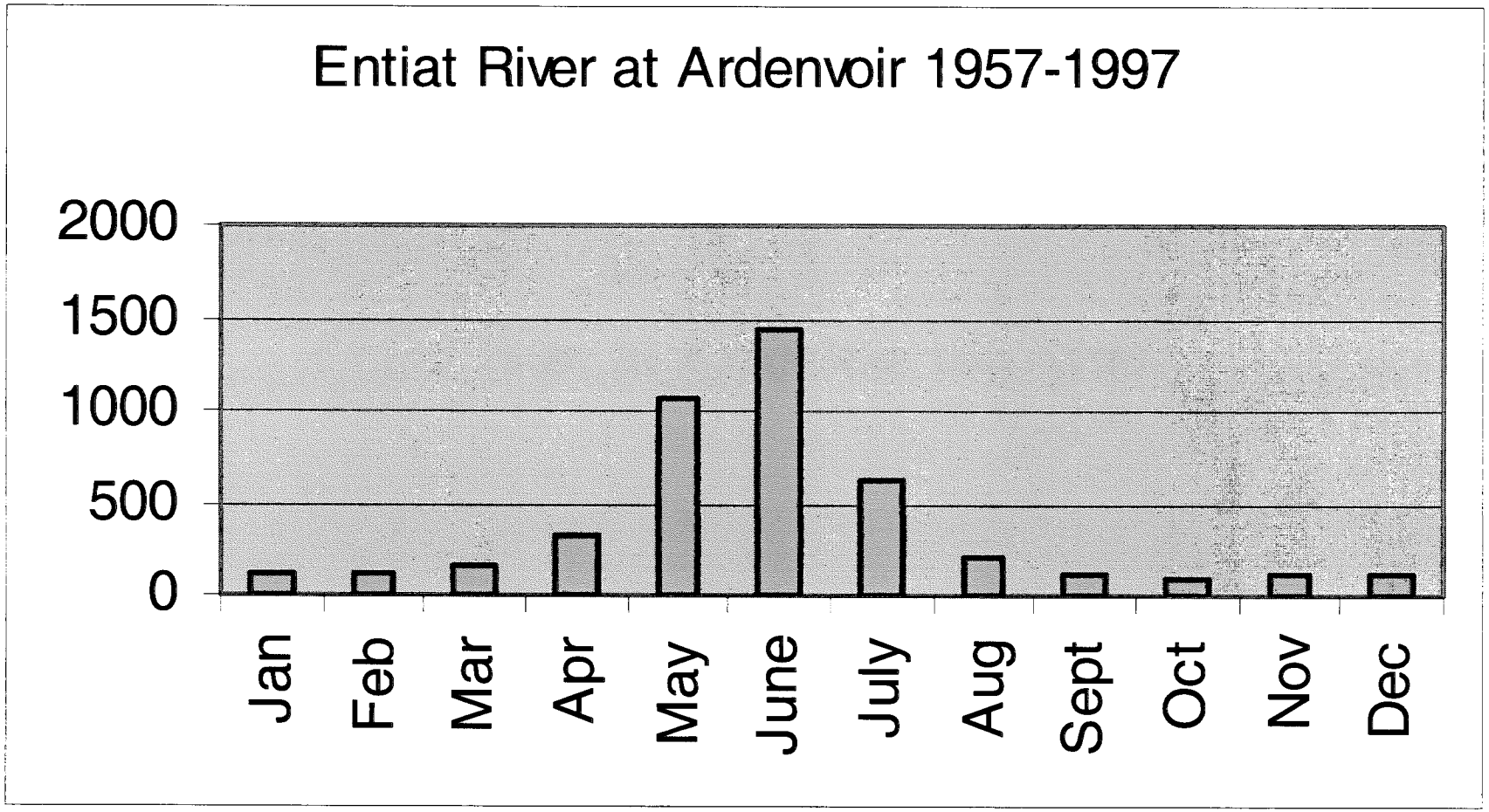

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Figure 3-10
Average Monthly Flow in the
Entiat River at Entiat, Washington

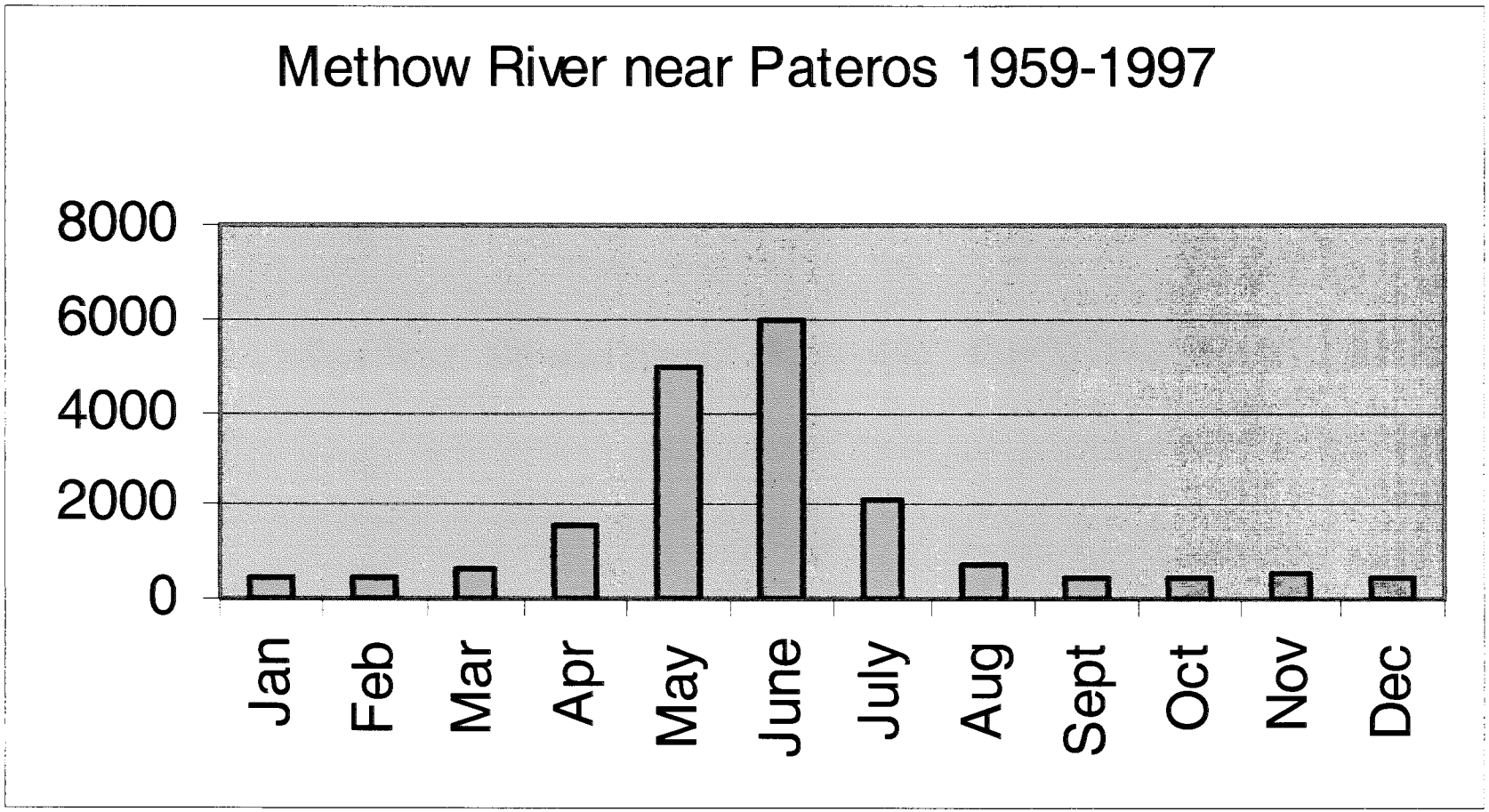

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Figure 3-11
Average Monthly Flow in the Methow River at Pateros, Washington

primary source of the high flows seen in late spring and early summer. The maximum measured discharge was 28,800 cfs in May 31, 1972; however, a peak discharge of 46,700 cfs was estimated for May 29, 1948 (Williams and Pearson 1985). In dry years, monthly flows have averaged as low as 237 cfs (Wiggins et al. 1997).

Ecology found that instream flows limit salmonid production in the Methow River and its tributaries at virtually all freshwater stages of their life cycle (Caldwell and Catterson 1992). Therefore, Ecology placed four reaches of the Methow, Twisp, and Chewuch Rivers, and Beaver, Early Winters, and Wolf Creeks on the 303(d) list of water quality limited streams because of low instream flows. Ecology also established instream flow requirements for the Methow River watershed to limit any new water rights (NMFS et al. 1998b).

Although only 6 percent of the Methow River watershed is private property, including 12,800 acres of irrigated cropland (NMFS et al. 1998b), the effect of irrigation on instream flows is considered more acute than in other Mid-Columbia River tributaries (Methow Valley Water Pilot Planning Project Committee 1994). Up to 90 percent of instream flow withdrawals (248.2 cfs) are used for agricultural irrigation (NMFS et al. 1998b). Ecology estimated that ditches remove about 50 percent of the river flow from the Methow River and most of the flow from some tributaries, in late summer and fall. In summary, hydrologic studies suggest that irrigation diversions exacerbate the problem of critically low flows that occurs naturally in the Methow River watershed.

Okanogan River

The Okanogan River originates in British Columbia, flows through several large lakes, and enters the Columbia River approximately 11 miles downstream from Chief Joseph Dam (see Figure 1-5). The largest of the Mid-Columbia River tributaries, the Okanogan River drains a watershed of approximately 8,080 square miles (Wiggins et al. 1997). Approximately one-half of this area lies within the Similkameen River watershed, an international river system that joins the Okanogan about 5 miles downstream from Osoyoos Lake and supplies approximately 75 percent of the Okanogan River flow below the confluence.

Flows in the Lower Okanogan River are partly regulated by water releases from Zosel Dam and other dams in British Columbia. These releases are negotiated yearly by an international consortium of fisheries and irrigation managers (NMFS et al. 1998b). Although water flows from the Upper Okanogan River into Osoyoos Lake are generally maintained between 250 and 380 cfs during sockeye salmon spawning, extreme flow fluctuations after spawning have resulted in both redd scouring and dewatering.

Average monthly flows in the Lower Okanogan River at Malott, Washington, are 1,203 cfs in September and 10,330 cfs in June (Figure 3-12) (Wiggins et al. 1997). Snowmelt is the primary source of the high flows seen in late spring and early summer. The maximum discharge was 45,600 cfs on June 3, 1972. In dry years, monthly flows at Malott have averaged as low as 372 cfs in September (Wiggins et al. 1997).

In 1976, Ecology established base flows for the Okanogan River, and ruled that no further appropriation of surface water from the river and its tributaries shall be made which would conflict with these base flows (NMFS et al. 1998a). They further determined that, except for livestock watering and domestic uses, no additional appropriations of water from lakes would be granted. Lower Okanogan River flows drop below the minimum base flows established for late August and September (i.e., 800 cfs), during dry years.

Salmon Creek, a tributary that enters the river at Okanogan, Washington, was placed on the 303(d) list as impaired due to inadequate instream flows.

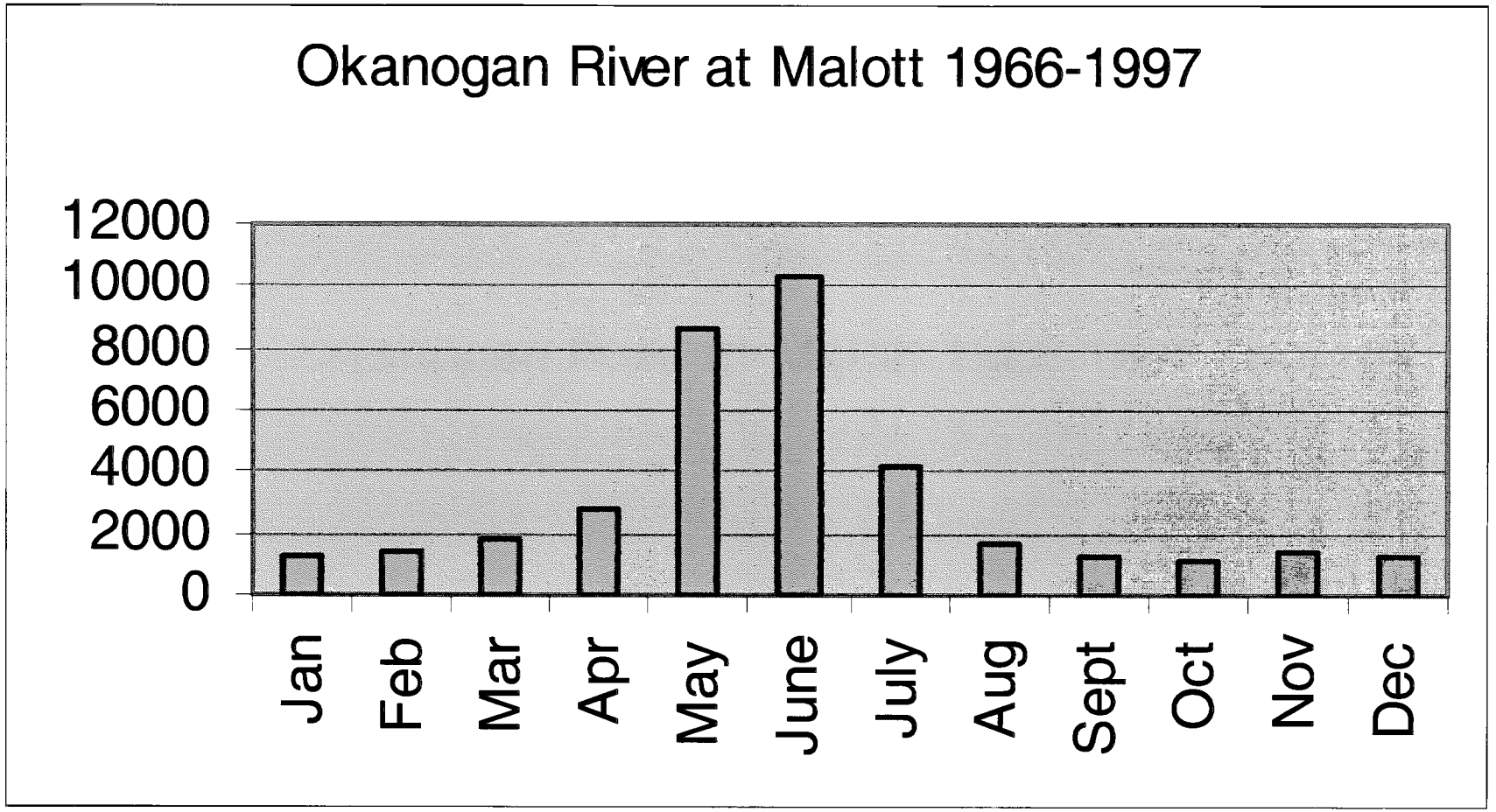


Figure 3-12
Average Monthly Flow (cfs) in the Okanogan River at Malott, Washington

In making this determination, Ecology cited studies showing that irrigation diversions can completely dry up the creek and flow can be zero from February to September, resulting in the total loss of salmon and steelhead runs in the stream.

3.3.1.3 Columbia River System

The Columbia River system drains an area of 259,000 square miles (FERC 1996b). The three project area dams form run-of-the-river reservoirs that have a limited effect on river flows compared to several upstream dams that are operated, in part, for flood control. Wells, Rocky Reach, and Rock Island dams are relatively low dams that were designed for hydropower production and have very little capacity to impound water for flood control. Chief Joseph Dam, immediately upstream from the project area, and other Federal dams on the Lower Columbia River are also run-of-the-river dams (BPA et al. 1995a). Upstream Federal storage dams operated for flood control are Grand Coulee on the Upper Columbia, Albeni Falls on the Pend Oreille River, Libby on the Kootenai River and Hungry Horse on the Flathead River. Coordinated flow release schedules for the Federal Columbia River Power System are established each year in Watershed Management Plans. Grand Coulee Dam has the capacity to store 5.19 million acre-feet of water in Lake Roosevelt. As the largest source of water to the Mid-Columbia River, releases from Lake Roosevelt at Grand Coulee Dam have a substantial impact on Mid-Columbia River flows directly downstream.

3.3.2 WATER QUALITY

The Mid-Columbia River has been designated a "Class A," or excellent quality water body (Chapter 173-201A WAC). Reaches of the four major Mid-Columbia River tributaries studied were classified by Ecology as either Class A or Class AA (extraordinary) waters. Class AA designations apply to the Wenatchee River from the Wenatchee National Forest boundary to its headwaters, the Little Wenatchee, White, Chiwawa, and Entiat Rivers from the Wenatchee National Forest to its headwaters, the Methow River upstream from its confluence with the Chewuch and Twisp Rivers. Characteristic protected uses of Class A and Class AA waters include water supply (domestic, industrial, and agricultural); stock watering; fish and shellfish rearing, migration, spawning, and harvesting; wildlife habitat; recreation; and commerce and navigation.

Salmon and steelhead rearing, migration, and spawning in the Mid-Columbia River and its tributaries are the beneficial water uses most sensitive to water quality. High water temperatures may delay the return of adult salmonids to spawning grounds and cause mortality of juvenile fish rearing in small tributary streams. High water temperatures and low flows may also cause stress or mortality of rearing salmonids due to reduced dissolved oxygen levels in tributaries. Mid-Columbia River salmon and steelhead are also sensitive to high levels of dissolved gas that can lead to gas bubble diseases during high spill periods.

Water quality standards for Class A waters (Chapter 173-201A WAC) include limits for fecal coliform organisms (geometric mean less than 100 colonies per 100 milliliters), dissolved oxygen (minimum requirement of 8.0 milligrams per liter), and total dissolved gas (total dissolved gas, maximum of 110 percent saturation). Temperature (maximum of 64.4° F (18.0º C) due to human activities), pH (acceptable range of 6.5 to 8.5), and turbidity (no increase of 5 nephelometric turbidity units [NTUs] if background is less than 50 NTU, or less than a 10 percent change if background is greater than 50 NTU) are additional water quality standards that apply to the project area waters.

There are also established limits to concentrations of toxic, radioactive, or deleterious material below levels that have the potential to adversely affect water use, biota, or public health. Further,

aesthetic values should not be impaired, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

Class AA water quality standards (Chapter 173-201A WAC) are more stringent for some specific parameters compared to Class A standards. Fecal coliform shall not exceed a geometric mean value of 50 colonies per 100 milliliters, dissolved oxygen shall exceed the 9.5 milligrams per liter minimum, and water temperature shall not exceed 61° F (16º C) due to human activities.

To comply with Section 303(d) of the Clean Water Act, Ecology has compared existing water quality data to State standards (Ecology 1998a). As a result, several Mid-Columbia River reaches and tributaries were placed on a list of water quality limited water bodies (i.e., the 303[d] list) in 1996. The latest 303(d) list for the State of Washington was updated by Ecology in 1998 and submitted to USEPA for approval. Ecology is developing total maximum daily loads (TMDLs) for the specific water quality parameters that exceed standards. TMDL studies will include discharge limits for pollutant sources aimed at compliance with water quality standards and beneficial use restoration and protection. In addition, the PUDs are working directly with USEPA in developing the draft TMDLs for the Columbia and Snake Rivers.

Total dissolved gas supersaturation is a prominent water quality concern in the Mid-Columbia River. Total dissolved gas supersaturation in the Mid-Columbia and Snake Rivers was identified in the late 1960s and 1970s as detrimental to salmon, and those concerns have reappeared as reservoir management agencies have reinstituted spill as a means to aid fish passage at hydropower facilities (NMFS 1995). Total dissolved gas supersaturation is a condition that occurs when atmospheric gases are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100 percent total dissolved gas is in a supersaturated condition. Supersaturation may occur through natural or dam-related processes that either increase the amount of air dissolved in water or reduce the amount of air the water will hold.

Total dissolved gas supersaturation in the Mid-Columbia River is well documented and has been linked to salmon and steelhead mortality and migration delays (Beiningen and Ebel 1970; Ebel et al. 1975; Gray and Haynes 1977; BPA et al. 1995a). Fish that are exposed to excessive total dissolved gas supersaturation can develop gas bubble disease, a harmful and often fatal condition.

Total dissolved gas supersaturation varies substantially by season and by dam (BPA et al. 1995a). Total dissolved gas supersaturation in the Mid-Columbia River during periods of high run-off and spill at hydropower facilities occurs primarily because of entrainment of gases when turbulent water plunges deeply in the tailrace pools. Passing water through turbines does not increase gas saturation appreciably (BPA et al. 1995a). Most total dissolved gas variation just downstream of spillways is explained by the variation in spill rates and spillway plunge depth, spill pattern and gas abatement structures and operations.

In addition to depth and pressure, total dissolved gas supersaturation is affected by water temperature. As water temperature increases, the amount of dissolved gas that can be held in solution decreases, resulting in higher total dissolved gas levels when dissolved gas concentrations remain constant. This temperature effect is important in the Mid-Columbia River where temperatures vary daily and seasonally during salmon and steelhead migrations, and where temperature regimes have been altered by hydropower projects (Beiningen and Ebel 1970). During the spring and summer, water temperatures in the Mid-Columbia River increase from about 43° F (6°C) to about 64° F (18°C). Within this temperature range, an increase in temperature of 1.8° F (1°C) will result in an

increase of about 2 percent of total dissolved gas saturation (Colt 1984).

A risk analysis conducted for the Federal Columbia River Power System biological opinion (NMFS 2000a) estimated a 4 to 6 percent increase in juvenile fish passage survival through the system, at spill levels that would not exceed 120 percent of total dissolved gas saturation in the tailrace of Columbia River dams (as compared to the 110 percent total dissolve gas water quality standard). NMFS determined that there was little evidence that this improved survival would be substantially reduced by gas bubble trauma-related mortality. Backman and Evans (2002) and Backman et al. (2002) examined migrating adult and juvenile salmon and steelhead collected from the Snake and Lower Columbia Rivers and from the bypass systems at Federal dams and reached similar conclusions. Based on the overall benefits of spilling water to pass juvenile fish in the Columbia and Snake Rivers, Ecology grants "approval to spill", thereby allowing slight exceedances of the total dissolved gas standard. Although the State water quality standard for total dissolved gas is set at 110 percent of saturation, the waiver stipulates that total dissolved gas should not exceed 115 percent in the forebay and 120 percent in the tailrace of Columbia and Snake river dams (Koehler and McDonald 1997).

3.3.2.1 Project Area

The Mid-Columbia River is relatively unpolluted and has few sources of wastewater or other pollution. However, based on the Army Corps of Engineers and Ecology monitoring results, the Mid-Columbia River was placed on the 303(d) list for total dissolved gas, water temperature, pH, and a water column bioassay (Ecology 1998a). Sources of water quality impacts include agriculture run-off and irrigation return flows, depletion of instream flows from diversions, and impoundment and flow regulation of hydropower projects.

The Army Corps of Engineers measures temperature and total dissolved gas regularly at each dam (U.S. Army Corps of Engineers 1998). The Columbia River below Rock Island (Station 44A070) and near Chelan, Washington (Station 47B070), has been monitored by Ecology for temperature, conductivity, dissolved oxygen, total dissolved gas, pH, fecal coliforms, suspended solids, turbidity, ammonia, phosphorous, nitrate and nitrite, and hardness (BPA et al. 1995a; Ecology 1998b). Total and dissolved metals data from sampling in 1998 just upstream of Rock Island Dam was also included (Parametrix 1999a).

In October 1999, Chelan County PUD began a program of water quality monitoring of Rocky Reach reservoir between the Wells Dam tailrace and the Rocky Reach tailrace (Parametrix 1999a). The primary purpose of the program is to provide information to support a Water Quality Certification for relicensing of the Rocky Reach Project. The program will also provide information needed to define the relationships between water quality and beneficial uses, including fisheries, recreation, water supply, and aesthetics. Nutrients, chlorophyll *a*, phytoplankton, zooplankton, and attached benthic algae are being sampled seasonally to provide information on trophic conditions. Other conventional water quality analyses include water temperature, pH, dissolved oxygen, turbidity, and total suspended solids.

The temperature regime of the Mid-Columbia River is largely influenced by releases from Lake Roosevelt, the primary deepwater storage facility created by Grand Coulee Dam. Lake Roosevelt becomes thermally stratified during the summer, and the temperatures of surface water released at Grand Coulee Dam can be very warm (U.S. Army Corps of Engineers 1993). Conversely, water released at depth (through the turbines) is cold.

High water temperatures can adversely affect salmonids by increasing the incidence of disease;

altering the timing of adult and juvenile migrations; changing incubation, hatching, and maturation times; and affecting gas supersaturation (BPA et al. 1995a; Chapman et al. 1994a, 1995a; Dauble and Mueller 1993). High water temperatures can also be lethal to fish.

Water temperatures exceeding 66° to 70° F (19° to 21° C) have also been shown to delay adult anadromous salmonid migration (Dauble and Mueller 1993). Spawning fish have limited energy reserves, and any delay in migration may reduce those reserves to the point where fish may not be able to spawn successfully (BPA et al. 1995a). High temperatures not only reduce energy reserves by blocking fish migration but also by increasing the fishes' metabolic rates.

High water temperatures can be lethal to salmon and steelhead after some exposure duration. When exposed to temperatures of 70° F (21° C) or above for more than 7 days, 50 percent of adult salmon and steelhead populations experience mortality (Dauble and Mueller 1993).

Water temperatures at levels that may not directly kill anadromous salmonids may cause indirect stress-related mortality (Dauble and Mueller 1993). Higher temperatures in combination with other stresses, such as disease through pathogenic agents and total dissolved gas, can result in increased pre-spawning mortality (a lethal effect) as well as decreased spawning viability and egg viability (McCullough 1999).

The Mid-Columbia River hydroelectric projects are run-of-the-river facilities with very limited capacity for storage and flow regulation. The very rapid flushing rates in these reservoirs limit the potential warming that can occur. Water temperatures do not appear to be significantly warmed through the Mid-Columbia River projects (U.S. Army Corps of Engineers 1993).

Jaske (1967) concluded that dams and reservoirs on the Columbia River had only a nominal effect on the annual mean temperature of the entire system, and this effect was less than 1.8° F (1° C) over the 30-year period 1936 to 1966. He also found that the projects had delayed the occurrence of annual maximum peak temperatures in proportion to the increased travel time of water flowing through the system.

Suspended solids and turbidity in the Mid-Columbia River are relatively low (BPA et al. 1995a). The Grand Coulee project and downstream reservoirs slow the river flow and allow solids to settle. Turbidity and suspended solids in Mid-Columbia River tributaries are commonly higher compared to the mainstem (BPA et al. 1995a).

Wells Dam

Water temperature and total dissolved gas levels sometimes exceed State standards at Wells Dam based on measurements reported by the U.S. Army Corps of Engineers (1998 and 1999) (Table 3-8). Ecology cited high total dissolved gas below Wells Dam and temperature exceedances in the abandoned Wells Hatchery spawning channel as the basis for listing the Columbia River as water quality limited (Ecology 1998a).

Ambient monitoring data collected by Ecology downstream from Wells Dam near Chelan, Washington generally indicates good water quality (Table 3-9). Dissolved oxygen levels stayed above 8 milligrams per liter and pH remained within the standard range of 6.5 to 8.5. Fecal coliform organisms, suspended solids, phosphorous, turbidity, and nitrate levels were low (Ecology 1998b).

Rocky Reach Dam

Temperature and total dissolved gas measurements from below Rocky Reach Dam are summarized in Table 3-8. The mainstem of the Columbia below Rocky Reach Dam is in the same segment as the Rock Island Dam. This reach was listed as water quality limited due to temperature, total dissolved gas, and a water column bioassay, as described for Rock Island Dam (Ecology 1998a).

TABLE 3-8. SUMMARY OF DAILY TEMPERATURE AND TOTAL DISSOLVED GAS MONITORING RESULTS SUMMARY FOR MID-COLUMBIA RIVER DAMS

STATION		CHIEF JOSEPH DAM	WELLS DAM	ROCKY REACH DAM	ROCK ISLAND DAM
Water Years for Temperature[1]		**1981 to 1993**	**1981 to 1997**	**1981 to 1997**	**1981 to 1997**
Temperature (°F)	Max	68.0	68.0	68.7	74.6
1998 Total Dissolved Gas[2] (%)					
Forebay	Avg	107.5	108.0	107.0	107.7
	Max	114.7	113.0	117.3	121.3
	Min	98.7	103.8	90.9	90.4
Tailrace	Avg	108.7	111.9	114.4	114.7
	Max	119.3	121.2	121.2	124.8
	Min	93.3	105.8	105.8	103.2

[1] Values are from Army Corps of Engineers 1998 (1994-1997 data for Chief Joseph Dam were not available at this site).
[2] Values are from Army Corps of Engineers 1999.

The maximum water temperature recorded in the Rocky Reach reservoir (Columbia River near Chelan) between 1981 and 1997 was 20.2°C. This was similar to the maximum temperature observed (68.6° F or 20.4°C) during the extreme drought year of 2001 (Parametrix, Inc. and Thomas Payne Associates 2002). This evaluation also observed that the presence of the Rocky Reach Project (compared to a simulated no project condition) results in some warming of the river during July and early August and some cooling from late August through October. The maximum warming effects (0.9° F) coincided with low river flows, high air temperatures, and long daylight hours. The maximum cooling effect (0.7° F), coincided with low flows, low air temperatures and shortened daylight hours. Similar temperature effects are expected for the other Mid-Columbia River projects.

Except for the total dissolved gas and water temperature issues, water quality in the Columbia River at Rocky Reach Dam is generally good (see Table 3-9). Dissolved oxygen levels do not typically decline below 8.0 milligrams per liter, and turbidity and suspended sediments are relatively low since the dam slows the river and allows sediment to settle out. Ammonia levels are typically below the freshwater standard. Mean annual phosphate concentrations often exceed levels that could stimulate excessive algae growth, but relatively rapid flushing in the Rocky Reach reservoir limits primary productivity there (NMFS et al. 1998c).

Preliminary results from recent Chelan County PUD studies indicate that phosphorus concentrations in the water column are well below the levels that promote phytoplankton blooms, but nutrients in nearshore, shallow areas are supporting relatively high levels of attached benthic algae (Parametrix 2000b).

Excessive sediment loading to the Columbia River has occurred at the mouth of the Entiat River since much of the Entiat River watershed burned in the 1994 Tyee fire. This loading has created a delta at the mouth of the Entiat River because of increased flows from the Entiat River and decreased flows of the Columbia behind Rocky Reach Dam (Whitehall 1999 personal communication).

TABLE 3-9. WATER QUALITY DATA SUMMARY FOR THE MID-COLUMBIA RIVER

PARAMETERS	STAT	COLUMBIA RIVER NEAR ROCK ISLAND[1]	COLUMBIA RIVER AT ROCK ISLAND[2]	COLUMBIA RIVER NEAR CHELAN[3]	WA STATE STANDARDS[4]
Water Years		**Aug - Oct 1998**	**1975 to 1990**	**1993**	
Temperature	Avg	65.8	N/A	50.0	64.4° F
(° F)	Max	69.1	73.4	64.8	
	Min	60.1	33.4	34.7	
Conductivity	Avg	134	N/A	123	
(mmhos/25°C)	Max	157	220	137	
	Min	119	95	111	
Dissolved Oxygen	Avg	8.96	N/A	11.1	>8 mg/L
(mg/L)	Max	9.53	16.3	13.5	
	Min	8.63	7.9	9.2	
Oxygen Saturation	Avg	N/A	N/A	98.6	110.0%
(%)	Max	N/A	N/A	109.2	
	Min	N/A	N/A	89.5	
pH	Avg	7.82	N/A	8.1	6.5 - 8.5
	Max	8.04	9.2	8.4	
	Min	7.62	6.8	7.6	
Fecal Coliforms	Avg	N/A	N/A	1	<100 col/100mL
(colonies/100ml)	Max	N/A	N/A	2	
	Min	N/A	N/A	1	
Suspended Solids	Avg	2 u	N/A	2	
(mg/L)	Max	2	300	3	
	Min	2 u	0.1	1	
Water Years		**Aug - Oct 1998**	**1975 to 1990**	**1993**	
Ammonia Nitrogen	Avg	N/A	N/A	0.010	~0.25 mg N/L
(mg N/L)	Max	N/A	0.26	0.018	
	Min	N/A	0	0.010 u	
Total Phosphorus	Avg	N/A	N/A	0.012	~0.035 mg/L[5]
(mg/L)	Max	N/A	0.74	0.020	
Turbidity	Avg	N/A	N/A	0.7	
(NTU)	Max	N/A	11	1.4	
	Min	N/A	0.6	0.4	
Nitrate + Nitrite	Avg	N/A	N/A	0.1	~10 mg/L
(mg/L)	Max	N/A	0.43	0.3	
	Min	N/A	0	0.1	
Hardness	Avg	66	N/A	N/A	
(mg/L CaCO3)	Max	73	110	N/A	
	Min	62	49	N/A	

TABLE 3-9. WATER QUALITY DATA SUMMARY FOR THE MID-COLUMBIA RIVER (CONTINUED)

PARAMETERS	STAT	COLUMBIA RIVER NEAR ROCK ISLAND[1]	COLUMBIA RIVER AT ROCK ISLAND[2]	COLUMBIA RIVER NEAR CHELAN[3]	WA STATE STANDARDS[4]
Total Metals (µg/L)					
Aluminum	Max	34.9	N/A	N/A	87
Cadmium	Max	0.13	N/A	N/A	0.78
Copper	Max	0.88	N/A	N/A	7.9
Mercury	Max	0.00068	N/A	N/A	0.012
Lead	Max	0.141	N/A	N/A	1.7
Zinc	Max	2.18	N/A	N/A	71
Dissolved Metals (µg/L)					
Aluminum	Max	4.63	N/A	N/A	N/A
Cadmium	Max	0.06	N/A	N/A	0.72
Copper	Max	0.69	N/A	N/A	7.5
Mercury	Max	0.00084	N/A	N/A	N/A
Lead	Max	0.053	N/A	N/A	1.5
Zinc	Max	2.45	N/A	N/A	70

[1] Values are from Parametrix 1999a.
[2] Values are from BPA et al. 1995a.
[3] Values are from Ecology 1998b.
[4] Values are from Chapter 173-201A WAC.
[5] Mid-Columbia reservoirs have a retention time of less than 15 days and do not meet the classification of lake. Therefore, this value is an indication of potential eutrophication rather than a standard.
~ = Values are approximate from USEPA 1986, 1998, and Chapter 173-201A WAC.
N/A = Not available/applicable
mg/L = milligrams per liter
µg/L = micrograms per liter
$CaCO_3$ = calcium carbonate
^{o}C = degrees Celsius
mmhos/25^{o} C = milli-mhos
u = Not detected above the reported sample quantitation limit.

Rock Island Dam

The Army Corps of Engineers measures temperature and total dissolved gas data at Rock Island Dam (see Table 3-8). Temperatures in the Columbia sometimes exceed State standards set by Ecology (64.4° F or 18ºC) with a maximum of 75° F (23.8º C) at Rock Island Dam (U.S. Army Corps of Engineers 1998). The Columbia River below Rock Island Dam was placed on the 303(d) list for temperature and total dissolved gas (Ecology 1998a).

The Columbia River upstream from Rock Island Dam near Wenatchee, Washington was placed on the State 303(d) list due to a water column bioassay (Ecology 1998a). However, outfall permit samples collected in this area for the Alcoa aluminum plant indicated that all total and dissolved metals concentrations were below Washington State standards (see Table 3-9) (Parametrix 1999a). The source of toxic effects indicated by the bioassay is unknown.

Water quality in the Columbia River at Rock Island is generally good (see Table 3-9). Dissolved oxygen levels do not typically drop below the State Class A minimum standard of 8.0 milligrams per liter. Occasional dissolved oxygen concentrations below the standard may occur when hot weather coincides with irrigation withdrawals, low flows, and irrigation return flows containing high levels of nutrients and organic matter. Turbidity and suspended solids

are usually low. The pH levels have exceeded the standard with a maximum of 9.2 at Rock Island, but yearly averages range from 6.7 to 8.1, within the standard 6.5 to 8.5 range (BPA et al. 1995a). Total phosphate concentrations at the dam (maximum of 0.74 milligrams per liter, BPA et al. 1995a) indicate enriched nutrient conditions that could promote excessive production of algae and other aquatic plants.

3.3.2.2 Associated Tributaries

The main tributaries flowing into the Mid-Columbia River are on the west side of the Columbia River: the Wenatchee, Entiat, Methow, and Okanogan Rivers. Land use on the east side is mostly non-irrigated agriculture, barren, or rangeland (USGS 1998). There are smaller streams entering from the east, such as Foster Creek and Rock Island Creek. No water quality data were available for these creeks. However, these small creeks have very limited flows, and therefore their contribution to the Columbia is considered negligible.

Wenatchee River

Water quality data were acquired at the Ecology ambient monitoring station near the mouth of the Wenatchee River and are summarized in Table 3-10. Water quality in the Wenatchee River is generally good; however, the river was placed on the 303(d) list for temperature, pH, and dissolved oxygen (Ecology 1998a). Sediment samples collected near the mouth of the Wenatchee River indicated that there were no toxic accumulations of organic or inorganic chemicals present (Hindes 1994).

Various tributaries of the Wenatchee River are on the 303(d) list, indicating impaired water quality conditions that limit beneficial uses of these streams (Ecology 1998a). Mission Creek, the tributary closest to the mouth of the Wenatchee River, is listed for temperature, fecal coliforms, DDT, and guthion (azinphos-methyl). Mission Creek was also listed for concentrations of 4,4'-DDT and 4,4'-DDE above standard levels in edible rainbow trout tissue. Low dissolved oxygen conditions have also been measured in Mission Creek (Hindes 1994). Additional information specific to Mission Creek is included in the draft Wenatchee River watershed Ranking Report Addendum (Wenatchee River Watershed Steering Committee/Technical Advisory Committee 1996).

Peshastin Creek, upstream of Mission, is 303(d) listed for temperature (Ecology 1998a). Substandard dissolved oxygen concentrations, and elevated turbidity and fecal coliform concentrations have also been measured in Peshastin Creek (Hindes 1994). Icicle Creek enters the Wenatchee River upstream of Peshastin Creek and is listed for dissolved oxygen and temperature. Upstream of Icicle Creek is Chiwaukum Creek, which is listed for temperature. Nason Creek enters where Wenatchee Lake drains into the Wenatchee River, and is listed for temperature. The Little Wenatchee River drains into Wenatchee Lake, and is also listed for temperature. Low dissolved oxygen conditions have also been measured on the Little Wenatchee River (Hindes 1994).

The Chiwawa and White Rivers, the largest tributaries that drain the north end of the Wenatchee River watershed, were not included on the 303(d) list (Ecology 1998a). However, low dissolved oxygen concentrations have been measured on several occasions in both streams (Hindes 1994). Other creeks in the Wenatchee River watershed are Brender Creek, a tributary of Mission Creek listed for fecal coliforms and dissolved oxygen; and Chumstick Creek, listed for dissolved oxygen, pH, and fecal coliforms (Ecology 1998a).

TABLE 3-10. WATER QUALITY DATA SUMMARY FOR MID-COLUMBIA RIVER TRIBUTARIES

STATION		WENATCHEE RIVER AT WENATCHEE	ENTIAT RIVER NEAR ENTIAT	METHOW RIVER NEAR PATEROS	OKANOGAN RIVER AT MALOTT	WA STATE STANDARDS[1]
Water Years		**1992 to 1997**	**1994 to 1997**	**1992 to 1997**	**1992 to 1997**	
Temperature	Avg	48.4	45.5	46.9	50.2	64.4° F
(° F)	Max	70.2	66.9	66.2	72.1	
	Min	32.0	32.0	32.0	32.0	
Conductivity	Avg	62	84	145	221	N/A
(mmhos/25°C)	Max	107	152	300	396	
	Min	28	32	59	86	
Dissolved Oxygen	Avg	12.3	12.2	11.8	10.8	>8 mg/L
(mg/L)	Max	15.6	15.4	15.1	14.7	
	Min	9.4	9.1	9.2	7.7	
Oxygen Saturation	Avg	106.4	102.2	101.5	95.1	110.0%
(%)	Max	127.3	115.0	109.0	109.6	
	Min	84.6	96.1	96.5	85.0	
pH	Avg	7.7	8.0	8.0	8.1	6.5 - 8.5
	Max	9.4	9.0	8.7	8.5	
	Min	6.8	7.4	7.0	7.4	
Fecal Coliforms	Avg	16	11	8	25	<100 col/100mL
(colonies/100ml)	Max	130	72	150	96	
	Min	0.05	1 u	1 u	1	
Suspended Solids	Avg	11	13	7	21	N/A
(mg/L)	Max	116	198	122	153	
	Min	1	1 u	1 u	1 u	
Ammonia Nitrogen	Avg	0.009	0.008	0.008	0.009	~0.25 mg/L
(mg/L)	Max	0.018	0.022	0.019	0.023	
	Min	0.010 u	0.010 u	0.010 u	0.010 u	
Total Phosphorus	Avg	0.027	0.045	0.027	0.044	N/A
(mg/L)	Max	0.785	0.911	0.817	0.867	
	Min	0.010 u	0.010 u	0.010 u	0.010 u	
Turbidity	Avg	3.6	3.9	2.5	7.2	N/A
NTUs	Max	60.0	50.0	45.0	65.0	
	Min	0.3	0.4	0.3	0.8	
Nitrate + Nitrite	Avg	0.2	0.2	0.2	0.1	~10 mg/L
(mg/L)	Max	0.4	0.4	0.4	0.1	
	Min	0.1	0.1	0.1	0.1	

[1] Values are from Chapter 173-201A WAC.
~ = Values are approximate from USEPA 1986, 1998, and Chapter 173-201A WAC.
u = Not detected above reported sample quantitation limit. N/A = Data not available.
Source: Ecology 1998b.

Other parameters in the Wenatchee River have levels below State standards. Although fecal coliform levels included a maximum of 130 colonies per 100 milliliters (Ecology 1998b), the geometric mean met water quality standards. Turbidity, suspended solids, nitrate, and ammonia are usually low (Ecology 1998b). Total phosphorous levels are high at certain times (maximum of 0.79 milligrams per liter), and may stimulate algae growth (Ecology 1998b).

Based largely on water quality conditions, the Chelan County Conservation District led a diverse group of organizations, agencies, and individuals in a consensus ranking of subwatersheds within the Wenatchee River watershed (Hindes 1994). Mission Creek was assigned the number one ranking based on exceedances of water quality standards, concerns that elevated nutrients and bacteria may be causing water quality problems in the Lower Wenatchee River, sandstone soils that are vulnerable to erosion following disturbance, the presence of viable anadromous fish runs, and other criteria.

Local landowners and residents have formed a watershed association and are working with the Chelan County Conservation District on a Federal grant and other cleanup projects to improve water quality in the Mission Creek subwatershed (Wenatchee River Watershed Steering Committee 1998). Other subwatersheds were ranked in the following order: Chumstick Creek, White River, mainstem Wenatchee River, Nason Creek, Peshastin Creek, Icicle Creek, the Chiwawa River, and the Little Wenatchee River. A watershed action plan and implementation schedule have been developed to promote water quality improvements throughout the Wenatchee River watershed from on-site sewage systems, agriculture, forestry, and stormwater (Wenatchee River Watershed Steering Committee 1998).

Entiat River

Entiat River water quality is generally good (see Table 3-10). The Entiat River was listed on the State 303(d) list in 1996 because temperature and pH levels that exceeded State standards for monitoring during 1985 through 1991. However, based on acceptable water temperatures and pH in more recent years, Ecology has removed the Entiat River from its most recent proposed list (Ecology 1998a). No tributaries of the Entiat River were listed as water quality limited.

Dissolved oxygen levels measured near the town of Entiat have a range of 9.1 to 15.4 milligrams per liter (Ecology 1998b), meeting the Washington State minimum standard of 8.0 milligrams per liter. Fecal coliform, suspended solids, ammonia, turbidity, and nitrate levels are usually low. Total phosphorous can be high at times and may stimulate algal growth (Ecology 1998b).

Several large fires have occurred in the Entiat River Basin since 1970, the most recent one in 1994. This has resulted in increased sediment loads in the Entiat River, with large deposits forming a delta at the Entiat River mouth and into the Columbia River. Immediately following the fire, the USFS implemented erosion and flood control measures. Monitoring now includes sediments and temperature. It is evident that more sediment is being transported, but water temperatures have not changed much since the fire of 1994 (Whitehall 1999 personal communication).

Methow River

Water quality data from Ecology's monitoring station near Pateros on the Methow River are summarized in Table 3-10. Water quality is generally good. The Methow River is listed for temperature upstream of the mouth at the inflow to the Winthrop National Fish Hatchery (Ecology 1998a). The Twisp River, a tributary of the Methow River, is also listed for temperature.

The Upper Methow and Chewuch Rivers are classified as AA (extraordinary), and the Lower Methow and Twisp Rivers meet the class A (excellent) standards. Discharges from Winthrop and Twisp municipal wastewater treatment systems have not been identified as factors affecting the water quality. Sediment loading is not considered a major problem even with the logging, grazing, land clearing, agricultural cropland, development, and road building in the watershed (NMFS et al. 1998c).

Dissolved oxygen levels in the Methow River usually remain above the State minimum standard of 8 milligrams per liter, pH generally remains within the limits of 6.5 to 8.5, and fecal coliform counts are generally low. Suspended solids, ammonia, turbidity, and nitrate generally have low levels, while phosphorous concentrations may stimulate algal growth (Ecology 1998b).

Okanogan River

Water quality data collected by Ecology at the Malott sampling station on the Okanogan River is summarized in Table 3-10. The Okanogan River is listed for dissolved oxygen, temperature, and fecal coliform organisms (Ecology 1998a). Water temperatures exceed standards partly because of natural phenomena (low gradient and solar radiation on the upstream lakes), as well as sedimentation and summer low flows due to Canadian water storage and irrigation (NMFS et al. 1998c). The Okanogan was also listed for 4,4'-DDE, 4,4'-DDD, PCB-1254, and PCB-1260 concentrations above standards in edible carp tissue during 1994 (Ecology 1998a). A study in 1977 by the Pacific Northwest River Basins Commission identified that water quality problems have been attributed to return flows of irrigation water, livestock impacts on bank vegetation and stability, erosion from non-irrigated cropland, and forest harvest practices, such as road construction (NMFS et al. 1998c).

Several tributaries of the Okanogan River have also been listed as water quality limited (Ecology 1998a). Tallant Creek and an unnamed creek at Okanogan river mile 28.4 were listed for DDT. The Similkameen River, a major tributary of the Okanogan near the Canadian border, is listed for temperature at the Ecology monitoring station (river mile 5.0) and at the inflow to the Similkameen Hatchery. Also listed is arsenic, likely due to tailings piles in British Columbia (Ecology 1998a). Osoyoos Lake, on the Canadian border, is listed for 4,4'-DDE and 4,4'-DDD concentrations above standards in an edible fish tissue sample collected in 1989. Ninemile Creek runs into Osoyoos Lake, and is listed for DDT (Ecology 1998a). Dissolved oxygen, temperature, and pH levels have exceeded State standards in Omak Creek, but this stream is not 303(d)-listed because it is on the Colville Indian Reservation and does not fall under the jurisdiction of the State (Ecology 1998a).

The Okanogan River at Malott has pH levels within the State standard range of 6.5 to 8.5, and ammonia and nitrate levels are low (Ecology 1998b). Suspended solids and turbidity seem to be elevated at the mouth of the river compared to what would be expected from the Similkameen River and Osoyoos Lake combined (NMFS et al. 1998c). Phosphorous concentrations can increase at times and may stimulate algal growth (Ecology 1998b).

3.3.2.3 Columbia River System

General descriptions of water quality data for the Columbia River indicate that dissolved oxygen, turbidity, suspended sediments, and pH levels are not a problem. Ammonia levels have exceeded criteria upstream of this reach at Grand Coulee Dam and downstream of this reach at Priest Rapids Dam (BPA et al. 1995a). Rock Island Dam ammonia levels were below criteria (BPA et al. 1995a), as were levels near Chelan (Ecology 1998b). In general, annual mean nitrate levels remain below criteria.

Phosphorus concentrations in Lake Roosevelt and the Mid-Columbia River have greatly declined

since the 1980s (Rensel Associates 1999). This change has been attributed to the 1995 termination of phosphorus discharges to the Columbia River from a Canadian fertilizer plant just north of the border. The nutrient decline has resulted in a shift from borderline nitrogen limitation of phytoplankton growth and mesotrophic (i.e., moderately enriched) conditions to strong phosphorus limitation and oligotrophy (i.e., nutrient poor, low productivity conditions) in Lake Roosevelt and the Mid-Columbia River. Further decline of nutrient levels in the mainstem river may result as large upstream reservoirs retain available nutrients.

There are a few apple-packing facilities located along the Mid-Columbia River. Most of these facilities only discharge non-contact cooling water. There are about 10 facilities discharging process water, which includes chlorine, and they are monitored according to Ecology permits. These facilities generally meet permit limits and are not considered to have a major impact on the water quality (Huber 1999 personal communication).

3.4 VEGETATION

Key Terms

Aquatic Macrophytes – Plants that occur entirely immersed within or under water.

Noxious Weeds – Non-native plants that have been introduced to Washington and can be destructive and competitive with native plants and difficult to control by cultural or chemical practices. These exotic species can reduce crop yields, replace native plant and animal habitat, affect land values and recreational opportunities, and infiltrate waterways.

Riparian Vegetation – Riparian zones are broadly defined as those non-aquatic areas contiguous with waterbodies (wetlands, lakes, streams, and rivers) that are influenced by, and which influence, that waterbody. Often riparian zones exhibit higher plant and animal diversity and productivity than surrounding uplands, and are particularly important to fish and wildlife in arid regions. Riparian vegetation may or may not be distinct from the adjacent upland vegetation.

Wetlands – Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reroduction. Wetlands generally include marshes, bogs, peatlands, and similar areas such as river overflows, mudflats, and natural ponds.

* *See Chapter 7 for a complete listing of all Key Terms.*

Vegetation influences the quality of salmonid feeding, resting, rearing, and migratory habitat through several mechanisms including water quantity, quality, and temperature, as well as foraging opportunities. Evapotranspiration and infiltration in a watershed, which directly affect the amount of water released to streams, is dependent on the type and extent of vegetation present. Vegetation can control the nature and quality of sediment entering streams by its ability to bind soils and sediments. Shoreline and riparian vegetation provide shading to streams, which directly influences stream temperatures and the resulting survival of many fish species. Litter fall, photosynthesis, and respiration also provide food sources for fish as described below under riparian vegetation (Spence et al. 1996).

Land use agricultural and industrial practices (such as forestry, grazing, and mining) can alter watershed processes by changing the amount and type of upland vegetation. These changes affect the quantity and routing of water, sediments, nutrients, and other dissolved materials delivered to streams (Spence et al. 1996). In addition, irrigation and application of chemical fertilizers and pesticides associated with these land uses can affect water quality.

Described below is the vegetation within the Columbia River system, classified in groups by upland, riparian/wetland, and aquatic plant communities. These sections are followed by a discussion of rare plants and noxious weeds. The latter sections include tables of rare plant and noxious weed species that potentially occur in the project area or associated tributaries.

3.4.1 UPLAND VEGETATION

3.4.1.1 Project Area

The botanical investigations that have been conducted directly in the project area of the dams (Caplow 1990) identified undeveloped areas of shrub-steppe vegetation. These investigations have been part of more recent license requirements to determine if rare and sensitive plant species may occur in the vicinity of the project area and whether project operations can affect these species (FERC 1975a, 1989a). Vegetation sampling can also be a component of habitat surveys for determining adequacy of riparian and upland habitat for fish and wildlife resources. From these surveys, records indicate that the flora is dominated by big sagebrush, rabbitbrush (*Chrysothamnus* spp.), bitterbrush (*Purshia tridentata*), bluebunch wheatgrass, balsamroot (*Balsamorhiza sagitatta*), and numerous non-native weed species such as cheat (*Bromus tectorum*), bulbous bluegrass (*Poa bulbosa*), knapweeds (*Centaurea* spp.), Russian thistle (*Salsola kali*), and western tansy-mustard (*Descurainia pinnata*).

Human occupation and land use occurs throughout the project area, ranging from residential and commercial development to irrigated orchards (predominantly apple, pears, and cherries) and rangeland grazing. These land use practices typically result in the change from native plant communities to communities dominated by non-native plants. Human occupation or use has occurred on more than 75 percent of the project area.

3.4.1.2 Associated Tributaries

Because of their large watershed basins, the associated tributaries pass through a variety of vegetation zones, including, at lower elevations, the big sagebrush/bluebunch wheatgrass or shrub-steppe zone. Above this zone are: (1) the *Artemisia tripartita/Festuca idahoensis* (three-tip sagebrush/Idaho fescue zone) shrub-steppe zones; (2) forested low-montane zones dominated by ponderosa pine, Douglas-fir, and grand fir (*Abies grandis*); and (3) subalpine zones dominated by lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarpa*) (Franklin and Dyrness 1988). Alpine areas that are generally devoid of trees occur at the highest elevations in the watersheds of the associated tributaries.

3.4.1.3 Mid-Columbia River System

The Columbia River floodplain and the foothills of the Cascade Mountains are primarily within the *Artemisia tridentata*/*Agropyron spicatum* (big sagebrush/bluebunch wheatgrass or shrub-steppe) vegetation zone, which is characteristic of the driest portions of the Columbia Basin physiographic province (Daubenmire 1988; Franklin and Dyrness 1988). The Columbia River passes through four major plant communities within this vegetation zone, beginning near Richland, Washington, and proceeding north through the Mid-Columbia River projects: shrub-steppe (with sagebrush), shrub-steppe (without sagebrush), ponderosa pine (*Pinus ponderosa*), and stands of Douglas-fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*).

3.4.2 RIPARIAN AND WETLAND VEGETATION

Riparian vegetation directly affects aquatic biota by contributing organic detritus (dead leaves and other plant material, and insects) to the associated water body. These organic inputs form the basis of the aquatic food web, which includes salmonid

species. Most aquatic organisms (including invertebrates and fish) are indirectly dependent on inputs of terrestrial detritus to the stream for their food.

Riparian vegetation also moderates temperature gradients in narrow reaches of streams and rivers where forest and shrub vegetation can shade the water. Riparian vegetation can slow stream velocities, remove sediment, and transform chemical pollutants, while naturally armoring shorelines and contributing large woody debris. Without riparian vegetation, a stream's biological substrate can diminish. Riparian vegetation also provides non-aquatic wildlife habitat and effective buffers between water resources and neighboring agricultural and urban development.

Changes in riparian vegetation and the biotic processing of detritus, as well as other factors, determine the kinds and abundance of aquatic organisms living in streams, from headwaters to large rivers. Removal of riparian vegetation significantly affects stream organisms by: (1) decreasing food inputs; (2) increasing the potential for primary productivity in aquatic plants; (3) increasing summer water temperatures; (4) changing water quality and quantity; and (5) decreasing terrestrial habitat for adult insects (Knight and Bottorff 1984).

Wetlands provide physical and biological functions in a watershed. Biological functions include food web support and habitat for fish and wildlife. Physical functions include stream baseflow support, flood storage and floodflow desynchronization, and nutrient and sediment retention.

Maps of important wetland and riparian habitats for wildlife have been developed by WDFW. Wetlands identified by the National Wetland Inventory are also included on these maps. Additional habitat inventory work has been conducted by Payne et al. (1975) and by the Washington Natural Heritage Program.

3.4.2.1 Project Area

Historically, riparian vegetation formed in dynamic equilibrium with the disturbance caused by seasonal flows and flood events of the Columbia River. This dynamic, successional regime characterizing the natural system changed when hydroelectric dams were placed in the Columbia River, where relatively stable pool elevations favor mature plant communities. Currently, riparian zones in the Columbia River system vary from sparse vegetation to relatively complex, mature shrub- and tree-dominated habitats. Many areas along the reservoirs have been converted to orchards or other agricultural or development uses. Portions of shoreline have also been rip-rapped to prevent erosion.

Development of riparian vegetation in the project area is restricted by the arid conditions, rip-rapped embankments, and agricultural development. At lower elevations in undeveloped areas of the tributaries, shrub and forest riparian zones are dominated by species such as white alder (*Alnus rhombifolia*), water birch (*Betula occidentalis*), black cottonwood (*Populus trichocarpa*), willows (*Salix* spp.), and quaking aspen (*Populus tremuloides*). Common shrub species include wood rose (*Rosa woodsii*), redtwig dogwood (*Cornus sericea*), and snowberry (*Symphoricarpos alba*). Common herbaceous species include stinging nettle (*Urtica dioica*) and reed canarygrass (*Phalaris arundinacea*).

Wetland habitat in the vicinity of the Rock Island Dam includes mostly emergent habitats dominated by cattail (*Typha latifolia*) and bulrush (*Scirpus* spp.) (FERC 1988). Small areas of shrub-dominated wetlands are predominately willows and Russian-olive (*Elaeagnus angustifolius*). Wetland habitat in the vicinity of the Rocky Reach Dam consists of small patches of emergent vegetation located in protected coves where sediment has accumulated. Palustrine emergent habitat accounted for 13.1 acres of wetland habitat, where 90 patches of such habitat

averaged 0.2 acre (FERC 1996b). These areas are dominated by cattail and bulrush.

3.4.2.2 Associated Tributaries

Along associated tributaries, riparian zones vary from being barren of vegetation to supporting relatively complex shrub- and tree-dominated habitats. Many areas along associated tributaries have been converted to orchards or other agricultural or development uses. Portions of shoreline have also been rip-rapped to prevent erosion.

Because of their large basins, associated tributaries pass through a variety of naturally occurring vegetation zones. From lower to higher elevations, these zones include the *Artemisia tripartita/Festuca idahoensis* (three-tip sagebrush/Idaho fescue zone) shrub-steppe; forested low-montane zones dominated by ponderosa pine, Douglas-fir, and grand fir (*Abies grandis*); and subalpine zones dominated by lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarpa*) (Franklin and Dyrness 1988).

The character of their associated upland and riparian zones changes substantially as these tributaries pass from one zone to another. Along the deeply incised streams of the Cascade Mountains and Okanogan Highlands, riparian vegetation is usually limited to stream banks, but is more extensive where level bottomlands or terraces exist.

Large areas of wetlands exist within the watersheds of the associated tributaries. For example, more than 4,300 acres of wetlands have been mapped on the National Wetland Inventory in the Entiat watershed (Entiat Planning Unit 1999) and more than 17,200 acres in the Wenatchee watershed (Wenatchee River Watershed Steering Committee 1996). Most of these are associated with the upper and mid-portions of the rivers. Vegetated wetland habitats include emergent, shrub, and forested wetland classes.

3.4.2.3 Mid-Columbia River System

Because most of the Mid-Columbia River system is impounded, wetland and riparian habitats are similar to those described for the project area (see Section 3.4.2.1, Project Area).

3.4.3 AQUATIC VEGETATION

Aquatic plant communities in river and reservoir systems are characterized as more or less distinct zones of vegetation that are influenced by a complex of environmental variables such as water depth, exposure, turbidity, salinity, and soil characteristics (Swindale and Curtis 1957; Sculthorpe 1967; Cowardin et al. 1979). Aquatic bed habitats are those wetland and deepwater zones dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (Cowardin et al. 1979). Aquatic bed habitats include areas dominated by algae or aquatic mosses, as well as rooted or vascular plants. Such habitat provides escapement and rearing habitat for numerous aquatic species. The scope of the following discussion is limited to aquatic bed habitats dominated by vascular plants (aquatic macrophytes).

3.4.3.1 Project Area

Some information is available on aquatic vegetation in the project area reservoirs (Tabor et al. 1980). Vegetation mapping in and around the Rocky Reach reservoir (river miles 473.6 to 515.5) identified 979 acres of aquatic bed habitat. Approximately 470 acres of this was dominated at that time by Eurasian milfoil (*Myriophyllum spicatum*), a State-listed noxious weed (Ebasco Environmental 1990). Other species included waterweed and pondweeds (*Potamogeton* spp.). Between 1984 and 1991, the overall acreage of aquatic biomass in the Rocky Reach reservoir

increased approximately 15 percent (FERC 1996b). Duckweed, sago pondweed, and waterweed have also been documented in aquatic bed communities at Wells reservoir (river mile 537.2) (Tabor et al. 1980).

3.4.3.2 Associated Tributaries

Little information is available on aquatic vegetation resources in the associated tributaries. It is likely that many of the same aquatic macrophytes found in reservoirs of the Columbia River also occur in suitable habitats in the associated tributaries.

3.4.3.3 Mid-Columbia River System

Prior to the construction of dams, aquatic bed habitats along the Columbia River system were predominantly limited to narrow zones along the shorelines and larger zones in backwater areas. Data collected by Tabor et al. (1980) from 23 sites along the Columbia River between Rooster Rock State Park (river mile 128.5) and Washburn Island (river mile 538) suggest that floating and submergent aquatic plants were reduced by pre-dam water level fluctuations. Historically, where water level fluctuation was reduced, plants with these growth forms occurred predominantly and had higher areal coverage.

Aquatic bed vegetation in the lower non-tidal reaches of the Columbia system (Interstate 5 to The Dalles, river miles 106 and 192, respectively) is typically restricted to embayments and other protected sites. These areas are dominated by native species such as duckweed (*Lemna minor*), waterweed (*Elodea canadensis*), sago or fennel-leaved pondweed (*Potamogeton pectinatus*), and the non-native curled pondweed (*Potamogeton crispus*) (Stanford Research Institute 1971; Tabor et al. 1980; Annear 1992 personal communication). No information is available on the areal extent of aquatic bed habitat in this part of the Columbia system.

At McNary reservoir (river mile 317), sago and curled pondweeds are the dominant species in aquatic bed communities (Tabor et al. 1980). In their investigation of the Hanford Reach (river miles 345 to 396), a free-flowing reach of the Columbia River upstream of McNary Dam, Fickeisen et al. (1980) identified no aquatic bed vegetation. However, the native persistent-sepal or Columbia yellow cress (*Rorippa columbiae*) (a Federal species of concern and State-listed threatened species) grows submerged for most of the year in portions of the Hanford Reach (Sackschewsky et al. 1992) and forms small patches of aquatic bed vegetation (Antieau 1992 personal observation).

3.4.4 RARE PLANTS

The project area and associated tributary watersheds provide habitat for numerous rare plant species (Table 3-11). Although there are only two species Federally listed as threatened in the vicinity of the project area, there is also one species that is proposed for listing, and eleven plants that are Federal species of concern. All of the species in Table 3-11 are listed as sensitive, threatened, or endangered by the State of Washington (USFWS 1998; WDNR 1997). The Federally listed species (Ute ladies' tresses; *Spiranthes diluvialis*) occurs in Okanogan County, and has recently been found along the Rocky Reach reservoir shoreline (Chelan County PUD 2001). This hydrophilic orchid would likely be affected by substantial changes in the reservoir water surface elevation, particularly reservoir drawdown. The other Federally listed species, Oregon checker-mallow (*Sidalcea oregana* var. *calva*), occurs in the Wenatchee River watershed, but does not occur in or near the immediate project area of the dams and would not be affected by reservoir water level changes.

All of the species without Federal listing status included in Table 3-11 are known to occur in the watersheds of the associated tributaries and/or in areas close to the project areas (within 50 feet of

the maximum pool elevation of the project reservoirs). Ten species have populations within 50 feet of the maximum pool elevation of some reservoirs in the project area (Caplow 1990; Chelan County PUD 2001). However, all but three of these ten species are upland-dwelling species and are not associated with the wetted shorelines of these reservoirs. One exception, longsepal globemallow (*Illiamna longisepala*), occurs in riparian zones associated with tributaries to the Columbia River. Other exceptions include Ute ladies' tresses and giant helleborine (*Epipactis gigantea*), known to occur on or near the wetted shorelines of some project area reservoirs. The remaining species in Table 3-11 occupy a broad diversity of habitats ranging from low elevation to high elevation and wetland/riparian habitats to rock/cliff habitats.

TABLE 3-11. PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE PLANT SPECIES FOUND IN THE PROJECT AREA OR IN WATERSHEDS OF THE ASSOCIATED TRIBUTARIES

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS[1]	STATE STATUS[2]	OCCURRENCE[3]
Agoseris elata	Tall agoseris	-	S	AT
Agrostis borealis	Northern bentgrass	-	S	AT
Anemone nuttalliana	Pasqueflower	-	S	AT
Aster sibericus var. *meritus*	Arctic aster	-	S	AT
Astragalus arrectus	Palouse milk-vetch	-	S	AT, PA
Astragalus misellus var. *pauper*	Pauper milk-vetch	-	S	AT, PA
Astragalus sinuatus	Whited milk-vetch	FSC	E	AT
Botrychium ascendens	Triangular-lobed moonwort	FSC	S	AT
Botrychium crenulatum	Crenulate moonwort	FSC	S	AT
Botrychium lanceolatum	Lance-leaved grape fern	-	S	AT
Botrychium lunaria	Moonwort	-	S	AT
Botrychium paradoxum	Two-spiked moonwort	FSC	S	AT
Botrychium pinnatum	St. John moonwort	-	S	AT
Botrychium simplex	Little grape-fern	-	S	AT
Camissonia pygmaea	Dwarf evening-primrose	-	T	AT
Carex atrosquama	Blackened sedge	-	S	AT
Carex buxbaumii	Buxbaum sedge	-	S	AT
Carex capillaris	Hair-like sedge	-	S	AT
Carex chordorrhiza	Cordroot sedge	-	S	AT
Carex comosa	Bristly sedge	-	S	AT
Carex dioica	Yellow bog sedge	-	S	AT
Carex eleocharis	Narrow-leaved sedge	-	S	AT
Carex heterone	Different-nerved sedge	-	S	AT
Carex hystricina	Porcupine sedge	-	S	AT
Carex magellanica ssp. *irrigua*	Poor sedge	-	S	AT
Carex norvegica	Scandanavian sedge	-	S	AT
Carex proposita	Smoky mountain sedge	-	S	AT
Carex saxatilis var. *major*	Russett sedge	-	S	AT

TABLE 3-11. PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE PLANT SPECIES FOUND IN THE PROJECT AREA OR IN WATERSHEDS OF THE ASSOCIATED TRIBUTARIES (CONTINUED)

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS[1]	STATE STATUS[2]	OCCURRENCE[3]
Carex scirpoidea var. *scirpoidea*	Canadian single-spike sedge	-	S	AT
Carex sychnocephala	Many-headed sedge	-	S	AT
Carex tenuiflora	Sparse-leaved sedge	-	S	AT
Carex vallicola	Valley sedge	-	S	AT
Carex xerantica	White-scaled sedge	-	S	AT
Chaenactis thompsonii	Thompson chaenactis	-	S	AT
Chrysosplenium tetrandum	Northern golden-carpet	-	S	AT
Cicuta bulbifera	Bulb-bearing water hemlock	-	S	AT
Cryptantha spiculifera	Snake River cryptantha	-	S	AT
Cryptogramma stelleri	Steller rockbrake	-	S	AT
Cypripedium fasciculatum	Clustered lady-slipper orchid	FSC	T	AT
Cypripedium parviflorum	Yellow lady-slipper orchid	-	E	AT
Delphinium viridescens	Wenatchee larkspur	FSC	T	AT
Draba aurea	Golden draba	-	S	AT
Draba cana	Lance-leaved draba	-	S	AT
Eleocharis rostellata	Beaked spike-rush	-	S	
Elitrichium nanum var. *elongatum*	Pale alpine forget-me-not	-	S	AT
Epipactis gigantea	Giant helleborine	-	S	AT, PA
Erigeron salishii	Salish fleabane	-	S	AT
Eriophorum viridicarinatum	Green-keeled cotton-grass	-	S	AT
Gentiana glauca	Glaucous gentian	-	S	AT
Gentianella tenella	Slender gentian	-	S	AT
Geum rivale	Water avens	-	S	AT
Geum rossii var. *depressum*	Ross avens	-	S	AT
Githopsis specularioides	Common blue-cup	-	S	AT, PA
Hackelia hispida var. *disjuncta*	Sagebrush stickseed	-	S	AT, PA
Hackelia venusta	Showy stickseed	FSC	E	AT
Iliamna longisepala	Longsepal globemallow	-	S	AT, PA
Listera borealis	Northern twayblade	-	S	AT
Mimulus pulsiferae	Pulsifer monkeyflower	-	S	AT
Nicotiana attenuata	Coyote tobacco	-	S	AT, PA
Oxytropis campestris var. *gracilis*	Slender crazyweed	-	S	AT
Parnassia kotzebuei	Kotzebue grass-of-Parnassus	-	S	AT
Pellaea brachyptera	Sierra cliff-brake	-	S	AT
Pellaea breweri	Brewer cliff-brake	-	S	AT
Petrophyton cinerascens	Chelan rockmat	FSC	T	AT, PA
Phacelia lenta	Sticky phacelia	FSC	T	AT
Platanthera obtusta	Small northern bog orchid	-	S	AT

TABLE 3-11. PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE PLANT SPECIES FOUND IN THE PROJECT AREA OR IN WATERSHEDS OF THE ASSOCIATED TRIBUTARIES (CONTINUED)

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS[1]	STATE STATUS[2]	OCCURRENCE[3]
Polemonium viscosum	Skunk polemonium	-	S	AT
Potentilla diversifolia var. *perdissecta*	Diverse-leaved cinquefoil	-	S	AT
Potentilla nivea	Snow cinquefoil	-	S	AT
Potentilla quinquefolia	Five-leaved cinquefoil	-	S	AT
Rubus acaulis	Nagoonberry	-	S	AT
Salix glauca	Glaucous willow	-	S	AT
Salix tweedyi	Tweedy willow	-	S	AT
Salix vestita var. *erecta*	Rock willow	-	EX	AT
Sanicula marilandica	Black snake-root	-	S	AT
Saxifraga cernua	Nodding saxifrage	-	S	AT
Saxifraga rivularis	Pygmy saxifrage	-	S	AT
Saxifragopsis fragarioides	Strawberry-saxifrage	-	S	AT
Sidalcea oregana var. *calva.*	Oregon checker-mallow	PE	E	AT
Silene seelyi	Seely silene	FSC	T	AT
Sisyrinchium septentrionale	Blue-eyed grass	-	S	AT
Spiranthes diluvialis	Ute ladies' tresses	FT	T	AT, PA
Spiranthes porrifolia	Western ladies' tresses	-	S	AT
Talinum sediforme	Okanogan fameflower	-	S	AT
Teucrium canadense ssp. *viscidum*	Woodsage	-	S	AT
Trifolium thompsonii	Thompson clover	FSC	T	AT, PA
Trimorpha elata	Tall bitter-fleabane	-	S	AT
Utricularia minor	Lesser bladderwort	-	S	AT
Vaccinium myrtilloides	Velvet-leaf blueberry	-	S	AT

[1] FSC = Federal Species of Concern, FT = Federal Threatened, PE = Proposed Endangered
[2] S = State-listed Sensitive, T = State-listed Threatened, E = State-listed Endangered, EX =Potentially Extirpated from Washington
[3] PA = Project Area (within 15 meters of maximum pool elevation), AT = Associated Tributaries

Source : WDNR (1997).

3.4.5 NOXIOUS WEEDS

The State of Washington regulates the presence and spread of noxious weeds under authority of the Noxious Weed Control Act and its implementing code (RCW 17.10.007 and WAC 16-750). These species are of relevance because habitat improvement projects planned under any alternative should include plans to ensure that these plants do not spread, and are eradicated whenever encountered.

State-listed noxious weeds are classified into one of three categories. Class A weeds are non-native species with a limited distribution in Washington. Eradication of these species is mandatory in Washington. Class B weeds are non-native species that are presently limited in distribution in Washington and pose a serious threat to resources. Control of these weeds is mandatory in those counties in which these species occur.

Class-B Designate weed species are those species where control is mandatory. Control is defined as

the prevention of all seed production in a single program year, with the eventual aim being a reduction of the total acreage of infestation to a point where eradication is possible. Class C weeds are noxious weeds that are common throughout most of Washington. Infestations of Class-B Non-designate and Class C weeds are typically so expansive that weed control or the prevention of seed production is not feasible. Some Class C weeds are selected by the various County Weed Boards as priority weeds in their counties, where control becomes mandatory for those selected species. Weeds designated as "Additional" by some counties are those designated by the county noxious weed control board as requiring control in that county.

New invader weeds are those species not yet formally recognized by the State Noxious Weed Board as Class A weeds, but present in a county and posing a serious threat. For purposes of this analysis, only Class A, B-Designate, Additional, and New Invader weeds are included. Numerous species of State-listed noxious weeds are found within the vicinity of the project area and in the watersheds of associated tributaries (Table 3-12). Generally, Class B weeds are more abundant and broadly distributed than the other classified noxious weeds. Knapweeds and starthistles (*Centaurea* spp.), kochia (*Kochia scoparia*), and hawkweeds (*Hieracium* spp.) are frequently present in upland areas surrounding each of the projects, in the watersheds of the associated tributaries, and in the Mid-Columbia River system. Parrotfeather (*Myriophyllum aquaticum*), and Eurasian water milfoil (*Myriophyllum spicatum*), fanwort (*Cabomba caroliniana*), and purple loosestrife are found in reservoirs and associated wetland habitats of the project area and associated tributaries.

TABLE 3-12. STATE-LISTED NOXIOUS WEEDS FOUND IN CHELAN, DOUGLAS, AND OKANOGAN COUNTIES

SCIENTIFIC NAME	COMMON NAME	CLASS[1]	OCCURRENCE[2]
Abutilon theophrasti	Velvet-leaf	A	CH, DG, OK
Carduus pycnocephalus	Italian-thistle	A	CH, DG, OK
Carduus tenuiflorus	Slenderflower-thistle	A	CH, DG, OK
Centaurea calcitrapa	Purple starthistle	A	CH, DG, OK
Centaurea macrocephala	Bighead knapweed	A	CH, DG, OK
Centaurea nigrescens	Vochin knapweed	A	CH, DG, OK
Crupina vulgaris	Common crupina	A	CH, DG, OK
Euphorbia oblongata	Eggleaf spurge	A	CH, DG, OK
Helianthus ciliars	Texas blueweed	A	CH, DG, OK
Heracleum mantegazzianum	Giant hogweed	A	CH, DG, OK
Hieracium floribundum	Yellow devil hawkweed	A	CH, DG, OK
Hydrilla verticillata	Hydrilla	A	CH, DG, OK
Isatis tinctoria	Dyers woad	A	CH, DG, OK
Mirabilis nyctaginea	Wild four-o-clock	A	CH, DG, OK
Peganum harmla	Peganum	A	CH, DG, OK
Salvia aethiopis	Mediterranean sage	A	CH, DG, OK
Salvia pratensis	Meadow clary	A	CH, DG, OK
Salvia scalrea	Clary sage	A	CH, DG, OK
Silybium marianum	Milk-thistle	A	CH, DG, OK
Solanum elaeagnifolium	Silverleaf nightshade	A	CH, DG, OK
Solanum rostratum	Buffalo-bur	A	CH, DG, OK
Soliva sessilis	Lawnweed	A	CH, DG, OK
Sorghum halepense	Johnson grass	A	CH, DG, OK
Spartina patens	Salt-meadow cordgrass	A	CH, DG, OK
Spartium junceum	Spanish broom	A	CH, DG, OK
Tamarix ramosissima	Saltcedar	A	CH, DG, OK

TABLE 3-12. STATE-LISTED NOXIOUS WEEDS FOUND IN CHELAN, DOUGLAS, AND OKANOGAN COUNTIES (CONTINUED)

SCIENTIFIC NAME	COMMON NAME	CLASS[1]	OCCURRENCE[2]
Thymelaea passerina	Spurge-flax	A	CH, DG, OK
Zygophyllum fabago	Syrian bean-caper	A	CH, DG, OK
Centaurea diffusa	Diffuse knapweed	Additional	CH
Centaurea repens	Russian knapweed	Additional	CH
Cirsium arvense	Canada thistle	Additional	CH
Kochia scoparia	Kochia	Additional	CH
Linaria vulgaris	Linaria vulgaris	Additional	CH
Tribulus terrestris	Puncture vine	Additional	CH
Alhagi maurorum	Camelthorn	B-Designate	CH, DG
Alopecurus myosuroides	Black grass	B-Designate	CH, DG
Amorpha fruticosa	Indigo bush	B-Designate	CH, DG
Anchusa arvensis	Annual bugloss	B-Designate	CH, DG
Anchusa officinalis	Common bugloss	B-Designate	CH, DG
Anthriscus sylvestris	Wild chervil	B-Designate	CH, DG
Bryonia alba	White byrony	B-Designate	CH, DG
Cabomba caroliniana	Fanwort	B-Designate	CH, DG
Carduus acanthoides	Plumeless-thistle	B-Designate	CH, DG, OK
Carduus nutans	Musk thistle	B-Designate	CH, DG, OK
Cenchrus longispinus	Longspine sandbur	B-Designate	CH, DG
Centaurea biebersteinii	Spotted knapweed	B-Designate	CH, DG
Centaurea diffusa	Diffuse knapweed	B-Designate	OK
Centaurea jacea	Brown knapweed	B-Designate	CH, DG
Centaurea jacea x nigra	Meadow knapweed	B-Designate	CH, DG
Centaurea maculata	Spotted knapweed	B-Designate	CH
Centaurea nigra	Black knapweed	B-Designate	CH, DG
Centaurea solstitialis	Yellow star-thistle	B-Designate	CH, DG, OK
Chaenorrhinum minus	Dwarf snapdragon	B-Designate	CH, DG
Chondrilla juncea	Rush skeletonweed	B-Designate	CH, DG
Cyperus esculentus	Yellow nutsedge	B-Designate	CH, DG
Cytisus scoparius	Scot's broom	B-Designate	CH, DG, OK
Daucus carota	Wild carrot	B-Designate	CH, DG
Echium vulgare	Blueweed	B-Designate	CH, DG
Egeria densa	Brazilian elodea	B-Designate	CH, DG
Eruca vesicaria ssp. *sativa*	Garden rocket	B-Designate	CH, DG
Euphorbia esula	Leafy spurge	B-Designate	CH, DG, OK
Geranium robertianum	Herb-robert	B-Designate	CH, DG
Hieracium atratum	Polar hawkweed	B-Designate	CH, DG
Hieracium auranticum	Orange hawkweed	B-Designate	CH, DG
Hieracium caespitosum	Yellow hawkweed	B-Designate	CH, DG
Hieracium laevigatum	Smooth hawkweed	B-Designate	CH, DG
Hieracium pilosella	Mouse-ear hawkweed	B-Designate	CH, DG
Hypochaeris radicata	Spotted cats-ear	B-Designate	CH, DG
Impatiens glandulifera	Policeman's helmet	B-Designate	CH, DG
Lepidium latifolium	Perennial pepperweed	B-Designate	CH, DG
Lepyrodiclis holosteoides	Lepryodiclils	B-Designate	CH, DG
Leucanthemum vulgare	Ox-eye daisy	B-Designate	CH, DG
Linaria dalmatica	Dalmatian toadflax	B-Designate	CH, DG, OK
Lysimachia vulgaris	Garden loosestrife	B-Designate	CH, DG
Lythrum salicaria	Purple loosestrife	B-Designate	CH, DG, OK
Lythrum virgatum	Wand loosestrife	B-Designate	CH, DG
Myriophyllum aquaticum	Parrotfeather	B-Designate	CH, DG
Myriophyllum spicatum	Eurasian water milfoil	B-Designate	CH
Onopordum acanthinum	Scot thistle	B-Designate	CH, DG, OK

TABLE 3-12. STATE-LISTED NOXIOUS WEEDS FOUND IN CHELAN, DOUGLAS, AND OKANOGAN COUNTIES (CONTINUED)

SCIENTIFIC NAME	COMMON NAME	CLASS[1]	OCCURRENCE[2]
Picris hieraciodes	Hawkweed ox-tongue	B-Designate	CH, DG
Potentilla recta	Sulfur cinquefoil	B-Designate	CH, DG
Rorippa austriaca	Austrian field cress	B-Designate	CH, DG
Senecio jacobaea	Tansy ragwort	B-Designate	CH, DG
Shaerophysa salsula	Swainson-pea	B-Designate	CH, DG
Sonchus arvensis	Perennial sow thistle	B-Designate	CH, DG
Spartina alterniflora	Smooth cordgrass	B-Designate	CH, DG
Spartina anglica	Common cordgrass	B-Designate	CH, DG
Torillis arvensis	Hedgeparsley	B-Designate	CH, DG
Ulex europaues	Gorse	B-Designate	CH, DG
Anchusa officinalis	Common bugloss	New Invader	OK
Cardaria draba	White-top	New Invader	OK
Hieracium auranticum	Orange hawkweed	New Invader	OK
Hieracium caespitosum	Yellow hawkweed	New Invader	OK
Linaria vulgaris	Linaria vulgaris	New Invader	OK
Polygonum cuspidatum	Japanese knotweed	New Invader	OK
Senecio jacobaea	Tansy ragwort	New Invader	OK

[1] A = State recommends mandatory eradication, B = State recommends mandatory control, Additional = Requires control by specific counties, New Invader = Not yet formally recognized as weeds, but considered a serious threat

[2] CH = Chelan County, DG = Douglas County, OK = Okanogan County

Source: State Noxious Weed Board.

3.5 WILDLIFE

Key Terms

Candidate Species – As defined by NMFS, candidate species are wildlife, fish, or plants being considered for listing as endangered or threatened, but for which more information is needed before they can be proposed for listing.

Endangered Species – A species of plant, fish, or wildlife which is in danger of extinction throughout all or a significant portion of its range.

Habitat Improvement – Management of wildlife or fish habitat to increase its capability for supporting wildlife or fish.

Listed Species – Wildlife, fish, or plants that are identified as either threatened or endangered within a region, State, or nation. Federally listed species are listed by USFWS or NMFS and consequently receive statutory protection throughout areas where their populations are in decline under the Endangered Species Act.

Mitigation – Measures designed to counteract environmental impacts or make impacts less severe. These measures may include amending an impact by not taking a certain action or part of an action; minimizing an impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environment.

Monitoring – HCP monitoring consists of two types: (1) compliance monitoring, in which NMFS monitors the permittee's implementation of the requirements of the HCP, incidental take permit terms and conditions, and implementation agreement, if applicable; and (2) effects and effectiveness monitoring, in which the permittee (or other designated entity) examines the impacts of the authorized incidental take (effects) and implementation of the operating conservation program to determine if the actions are producing the desired results (effectiveness).

Old-Growth Forest – A forest stand characterized by trees well past the age of maturity (dominant trees exceed 200 years of age). Stands exhibit declining growth rates and signs of decadence such as dead and dying treees, snags, and downed woody material.

** See Chapter 7 for a complete listing of all Key Terms.*

This section describes the wildlife-related licensing requirements and aquatic and shoreline wildlife species that are present in the project area, the tributaries, and in the Columbia River system. Wildlife conservation measures currently being conducted by the Chelan and Douglas County PUDs are described followed by threatened, endangered, and sensitive wildlife species that may occur in the vicinity of the project area and tributaries.

3.5.1 WILDLIFE-RELATED LICENSE REQUIREMENTS

Existing licenses for the Wells, Rocky Reach, and Rock Island Projects include the provision that FERC may require modifications to dam features and operations and/or require certain new facilities for the purpose of conserving wildlife resources (Article 31, FERC 1957a; Article 41, FERC 1962a; Article 15, FERC 1975a). Additional license requirements that are specific to individual projects are described below. For Wells, the Douglas County PUD must (1) provide funds for wildlife research and mitigation projects related to project operations (Article 41, FERC 1975b); and (2) in cooperation with WDFW, produce an annual progress report on the wildlife mitigation program (Article 41, FERC 1975b). For Rocky Reach, Chelan County PUD must provide funds for wildlife research and mitigation projects related to project operations (Article 32, FERC 1957a). For Rock Island, Chelan County PUD must conduct mitigation and monitoring activities, as deemed necessary, for bald eagles, Canada geese, and wood ducks (Articles 404-407, FERC 1989a).

3.5.2 AQUATIC WILDLIFE

3.5.2.1 Project Area

The project area provides habitat for a variety of waterfowl and aquatic furbearers. Waterfowl use of the reservoirs is mostly for wintering habitat. Up to 17,000 ducks and geese have been observed overwintering on Rocky Reach reservoir, and 2,000 to 5,000 ducks and geese were observed overwintering on Rock Island reservoir (BPA et al. 1995b, River System Operation Review, Appendix N). Numbers of wintering ducks and geese at Wells reservoir are unknown. Common winter residents, by relative abundance, are American coots (*Fulica americana*), American wigeons (*Anas americana*), Canada geese (*Branta canadensis*), greater/lesser scaup (*Aytha* spp.), mallards (*Anas platyrhynchos*), and ring-necked ducks (*Aythya collaris*).

Other wintering waterfowl include gadwalls (*Anas strepera*), northern shovelers (*Anas clypeata*), buffleheads (*Bucephala albeola*), Barrow's goldeneyes (*Bucephala islandica*), ruddy ducks (*Oxyura jamaicensis*), common mergansers (*Mergus merganser*), and teal (*Anas* spp.). Common loons, pied-billed grebes (*Podilymbus podiceps*), eared grebes (*Podiceps nigricollis*), and western/Clark's grebe (*Aechmophorus occidentalis*) have been noted using the reservoirs.

Breeding waterfowl are mostly Canada geese, mallards, and common mergansers (*Mergus merganser*). Each year about 95 Canada geese pairs nest on Rock Island reservoir, 57 geese nest on Rocky Reach reservoir, and 84 geese nest on Wells reservoir (Fielder 1997; Hallet 1994, 1995, 1996, 1997). Nest sites are on islands and in goose nesting structures maintained by Chelan County PUD and WDFW. An unknown number of mallards and common mergansers also nest on islands and backwater areas along the reservoirs. Wildlife management areas, established as mitigation for hydroelectric project operation, as well as shoreline orchards and residential lawns, provide waterfowl brooding and grazing areas.

Other breeding waterfowl in the project area include wood ducks (*Aix sponsa*), which nest in natural and artificial nesting structures along Rock Island and Wells reservoirs. The Chelan County PUD maintains 92 wood duck nesting structures along the Rock Island reservoir, and WDFW maintains about 100 wood duck boxes

along the Wells reservoir. Wood duck nest boxes are not present along the Rocky Reach reservoir, and wood ducks are not known to nest in this area. Nesting habitat for cinnamon teal (*Anas cyanoptera*), green-winged teal (*Anas crecca*), gadwalls, pied-billed grebes, and coots is provided in reservoir backwater areas, although specific information on breeding occurrence is lacking for these species.

Aquatic furbearers present in the project area include beavers (*Castor canadensis*), muskrats (*Ondatra zibethicus*), and mink (*Mustela vison*). River otters (*Lutra canadensis*) are also present, but less common. Riparian vegetation, especially cottonwoods, willows, and emergent vegetation in backwater areas, provides important habitat for these species.

3.5.2.2 Associated Tributaries and Columbia River System

The lower reaches of the Wenatchee, Entiat, Methow, Okanogan, and Chelan Rivers, as well as the Columbia River system contain habitat similar to that of the project area (the Mid-Columbia River from the tailrace of Rock Island Dam to the tailrace of Chief Joseph Dam). Species expected to be present in these areas are the same as for the project area.

3.5.3 SHORELINE WILDLIFE

3.5.3.1 Project Area

Much of the shoreline adjacent to the reservoirs has been developed for fruit orchards. Wetland and riparian vegetation is limited and in some cases is artificially developed and maintained as a mitigation and licensing requirement for previous Federal and public utility actions. Shoreline areas and islands that provide dense riparian vegetation and protected areas for wildlife include the Rock Island Ponds, Turtle Rock Island, Earthquake Point, Daroga State Park at Rocky Reach reservoir, Bueana Bar, Cassimer Bar wetland, Washburn Pond, Park Island, Bridgeport Bar Wildlife Area at Wells reservoir, and the numerous riparian areas of the Wells reservoir.

Wildlife species that use shoreline habitats include terrestrial mammals, birds, amphibians, and reptiles. Douglas County PUD funds WDFW to operate and manage several waterfowl and game bird habitat areas including the Bridgeport Bar, Central Ferry Canyon, Indian Dan, and Foster Creek wildlife areas. Mule deer (*Odocoileus virginianus*) inhabit range adjacent to each of the three reservoirs, and bighorn sheep (*Ovis canadensis*) are present near the Rocky Reach reservoir. The WDFW manages a big game winter area adjacent to the west shore of the downstream half of Rocky Reach reservoir. A deer fence, State Highway 97, and a railroad separate the winter range from the reservoir shoreline area, thus the project area is not an important component of the habitat base of big game herds.

The shoreline of the Wells reservoir, particularly the eastern shore, is not as developed as the other reservoirs in the project area due to a lack of access and because the PUD is the primary property owner for all of the lands immediately adjacent to Lake Pateros. This ownership pattern is unique to the Wells reservoir and provides extensive tracks of riparian and undisturbed shrub-step habitat for wildlife. These areas are used extensively by wintering mule deer and game birds. Douglas County PUD provides the primary funding to WDFW for the enhancement of mule deer habitat in Central Ferry Canyon, Indian Dan, and Foster Creek wildlife areas.

Other terrestrial mammals that use shoreline areas include a variety of bat species, small mammals, badgers (*Taxidea taxus*), striped skunks (*Mephitis mephitis*), and coyotes (*Canis latrans*). Shrub-steppe shorelines provide habitat for Great Basin pocket mice (*Perognathus parvus*), deer mice (*Peromyscus maniculatus*), and western harvest mice (*Reithrodontomys megalotis*), while talus slopes are used by yellow-bellied marmots (*Marmota flaviventris*), bushy-tailed woodrats (*Neotoma cinerea*), and Nuttall's cottontails

(*Sylvilagus nuttalli*). Riparian cottonwood, Ponderosa pine, and willow areas provide forage and cover for a variety of species.

Shorebirds found along the reservoirs include killdeer (*Charadrius vociferus*), spotted sandpipers (*Actitis macularia*), terns (*Sterna* spp.), herons, and gulls. Soras (*Porzana carolina*), and possibly Virginia rails (*Rallus limicola*), may nest in the emergent vegetation of the backwater areas, although this has not been confirmed. Upland game birds that use the project area shorelines are ring-necked pheasants (*Phasianus colchicus*), California quail (*Lagopus californicus*), chukars (*Alectoris chukar*), and mourning doves (*Zenaidura macroura*). Raptors that commonly nest in the vicinity of the reservoirs include red-tailed hawks (*Buteo jamaicensis*), American kestrels (*Falco sparverius*), ravens (*Corvus corax*), great horned owls (*Bubo virginianus*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), and western screech-owls (*Otus kennicottii*). Cliffs and large cottonwoods and Ponderosa pines provide raptor nesting sites. Artificial nesting platforms established by Chelan County PUD also are used by some species, and nest boxes maintained by the Chelan County PUD and WDFW are used by kestrels.

Songbirds that use shoreline areas include the yellow warbler (*Dendroica petechia*), song sparrow (*Melospiza melodia*), marsh wren (*Cistothorus palustris*), cedar waxwing (*Bombycilla cedrorum*), Nashville warbler (*Vermivora ruficapilla*), MacGillivray's warbler (*Oporornis tolmiei*), solitary vireo (*Vireo solitarius*), warbling vireo (*Vireo gilvus*), Bullock's oriole (*Icterus bullockii*), Lazuli bunting (*Passerina amoena*), and western tanager (*Piranga ludoviciana*). Belted kingfishers (*Ceryle alcyon*) use willows and cottonwoods as hunting perches. The large cottonwoods and ponderosa pine provide perch and nest sites for raptors and woodpeckers. Riparian and wetland vegetation provide nest, forage, and cover habitat for songbirds. Fruit orchards are used by a variety of birds, especially mourning doves (*Zenaida macroura*).

Amphibians likely to be present in wetland areas include Pacific treefrogs (*Hyla regilla*), tiger salamanders (*Ambystoma tigrinum*), long-toed salamanders (*Ambystoma macrodactylum*), Columbia spotted frog (*Rana luteiventris*), western toads (*Bufo boreas*), Great Basin spadefoots (*Scaphiopus intermontanus*), and bullfrogs (*Rana catesbiana*). Shallow backwater areas and temporary pools provide habitat for these species.

Reptiles present in project area include painted turtles (*Chrysemys picta*), western rattlesnakes (*Crotalus viridis*), gopher snakes (*Pituophis catenifer*), western fence lizards (*Sceloporus occidentalis*), western skinks (*Eumeces skiltonianus*), rubber boas (*Charina bottae*), and western terrestrial and common garter snakes (*Thamnophis* spp.). Some of these species are closely associated with wetlands (i.e., painted turtles) while others are more common along rocky and talus shorelines (i.e., rubber boas).

3.5.3.2 Associated Tributaries

In the upper reaches of the Wenatchee, Entiat, Methow, and Okanogan Rivers, and in the tributaries of these rivers, faster flowing, small streams bordered by riparian forest are present. These upper reaches provide habitat for a variety of riparian forest and stream associated wildlife, such as American dippers (*Cinclus mexicanus*), Steller's jays (*Cyanocitta stelleri*), ruby-crowned kinglets (*Regulus calendula*), and tailed frogs (*Ascaphus truei*). The tributaries of the Wenatchee, Entiat, Methow, and Okanogan Rivers extend into remote areas where species such as bobcats (*Lynx rufus*) and mountain lions (*Felis concolor*) are expected to be more common than in developed areas.

3.5.3.3 Columbia River System

The Columbia River system is a vast area that includes approximately 1,200 river miles and a

wide variety of associated habitats, including estuarine areas, riparian coniferous forests, riparian hardwood forests, wetlands, rocky cliffs, and shrub-steppe habitats. Wildlife present in this large, complex system include many of the wildlife species that occur in the Pacific Northwest. Species include marine mammals; estuarine shorebirds; riparian-forest-associated birds and mammals; and shrub-steppe- and cliff-associated wildlife such as northern sagebrush lizards (*Sceloporus graciosus graciosus*), bighorn sheep (*Ovis canadensis*), and golden eagles (*Aquila chrysaetos*). More detailed information on wildlife present in the Columbia River System is available in Appendix N of the Columbia River System Operation Review (BPA et al. 1995b).

3.5.4 WILDLIFE AND HABITAT ENHANCEMENT AND MONITORING

Chelan County PUD conducts a variety of wildlife and habitat enhancement and monitoring projects on the Rock Island and Rocky Reach reservoirs (Table 3-13). These include installing and maintaining goose nesting structures and wood duck nest boxes; conducting waterfowl, goose, and eagle surveys; and protecting riparian habitat. Some of these activities are required as part of licensing and settlement agreements, while others are voluntary. Habitat enhancement and monitoring projects on the Wells reservoir are conducted by WDFW, as part of a 1974 Settlement Agreement between Douglas County PUD and WDFW. These activities include protection of riparian areas, maintenance of goose nesting structures and goose nesting islands, construction and maintenance of wood duck nesting boxes, upland game bird habitat enhancement and feeding, planting of food plots for overwintering waterfowl, and habitat enhancement for overwintering mule deer herds.

3.5.5 PISCIVOROUS BIRD CONTROL ACTIVITIES

Studies indicate that gulls, cormorants, terns, and other piscivorous birds prey on juvenile salmonids (Mace 1983; Wood 1987; Schreck et al. 1997; Shreck and Stahl 1998; Collis et al. 1999, 2001). In spring 1982, gulls were found to consume 2 percent of the migrating salmon at the Wanapum Dam along the Mid-Columbia River (Ruggerone 1986). In the Columbia River estuary, Caspian terns (*Sterna caspia*) consumed approximately 12 percent of the outmigrating salmon smolt in 1997 (WDFW 2000). Ryan et al. (2001) found that 4.2 percent of PIT-tagged salmonids released in the Columbia River Basin in 2000 were detected from piscivorous bird colonies in the basin.

At the Wells, Rocky Reach, and Rock Island dams, prevalent avian predators include California gulls (*Larus californicus*), ring-billed gulls (*L. delawarensis*), and Caspian terns (USDA Animal and Plant Health Inspection Service [APHIS], unpublished data). At the Wells Hatchery, double-crested cormorants (*Phalacrocorax auritus*), common mergansers (*Mergus merganser*), herons (great blue heron [*Ardea herodias*] and black-crowned night heron [*Nycticorax nycticorax*]), and belted kingfishers (*Ceryle alcyon*) are the most abundant predators of salmonid smolt (APHIS, unpublished data). Quantitative data are not available on salmonid mortality by avian predators at the Wells Dam, Rocky Reach Dam, Rock Island Dam, or Wells Hatchery.

Chelan County PUD (in conjunction with the University of Washington, WDFW, and NMFS) is currently assessing the impacts of piscivorous birds on juvenile migrating salmonids.

To minimize bird predation on salmonids at the Wells, Rocky Reach, and Rock Island dams and the Wells Hatchery, Chelan and Douglas County PUDs fund avian predator control programs. These programs are implemented by APHIS, as outlined in the Cooperative Service Agreements between the PUDs and the APHIS. Control activities are based on an integrated wildlife damage management approach in which the most practical and appropriate methods to resolve wildlife conflicts are selected. Control methods emphasize non-lethal techniques, including hazing (i.e., propane canons, pyrotechnics, and

TABLE 3-13. RECENT AND ONGOING HABITAT MITIGATION AND ENHANCEMENT PROJECTS IN THE PROJECT AREA

PROJECT	LICENSE REQUIREMENT
Wells	
In 1974, the Douglas County PUD gave WDFW over 5,000 acres of land and provided funding to manage the area for wildlife	yes
The Douglas County PUD voluntarily provides supplemental annual funding, and has since 1995	no
Erect raptor poles (1984 pool raise agreement)	yes
Dike sloughs and provide flow restriction gates at Cassimer Bar to control/minimize water level fluctuations within the wetland areas of the wildlife area	yes
Conduct winter-time bald eagle surveys	no
Spray noxious weeds on the Project lands along the reservoir	no
Rocky Reach	
Erect and maintain 28 artificial goose nesting structures	no[1]
Conduct goose nesting surveys (4-5 per year)	no[1]
Provided $700,000 to WDFW for purchase of 20,000 acres of wildlife winter range	yes
Funded a 3-year mule deer habitat use study ($145,000)	no[1]
Conduct winter bald eagle surveys	no[1]
Wrap mature riparian trees for protection from beavers	no[1]
Contract botanist to conduct rare and sensitive plant survey	no[1]
Spray noxious weeds on the Project lands along the reservoir	no[1]
Maintain three upland bird feeders along the reservoir	no[1]
Purchased 70 acres of wildlife habitat lands bordering the reservoir	no[1]
Rock Island	
Erect and maintain 23 artificial goose nesting structures	10 required
Conduct wood duck and goose nesting surveys (4-5 per year)	no[1]
Erect and maintain 92 wood duck nest boxes	60 required
Erect 6 raptor perch sites	no[1]
Conduct winter bald eagle surveys and monitor effect of recreation on bald eagles	no[1]
Wrap mature riparian trees for protection from beavers	no[1]
Conduct controlled burn to suppress noxious weeds and improve goose nesting and brooding areas on islands	no[1]
Fence a riparian corridor on Rock Island Creek to protect habitat from cattle overgrazing	no[1]
Purchase and manage 43 acres of riparian wildlife habitat	yes
Preserve 960 acres of Home Water Company property for wildlife habitat preservation	yes
Acquisition, creation of wetlands and management of 107 acres at river confluence	yes
Rehabilitated seven natural springs to improve water availability for wildlife	yes

[1] Although this specific activity was not required as part of Chelan County PUD's licensing requirements, the license does require the PUD to conduct wildlife mitigation activities.

non-target shooting) and overhead wire exclusion systems. The overhead wires span the tailrace of each dam and the hatchery rearing ponds, and inhibit bird access to fish (Figure 3-13). When necessary, lethal methods, which include direct shooting of target individuals, supplement non-lethal methods.

Ring-billed gulls are the primary species targeted for control activities, with other gulls, double-crested cormorants, mergansers and other diving ducks, and Caspian terns also being frequently controlled (APHIS, unpublished data). The number of birds hazed or killed in a given year varies greatly. For example, at the Rock Island Dam, annual hazing levels of ring-billed gulls ranged from 450 instances to 3,371 instances between 1996 and 2001. (A hazing instance is defined as hazing of one bird during one site visit. For example, if an individual bird were to return to a site four times and was hazed during each visit, the number of hazing instances would be four.) During this same time period, from 201 to 1,075 ring-billed gulls were killed annually at the Rock Island Dam.

3.5.6 THREATENED AND ENDANGERED SPECIES

This section describes Federally and State-listed threatened, endangered, and sensitive wildlife species in the project area and associated tributaries. State priority habitats are also discussed. In addition, a brief description of Federally and State-listed threatened or endangered species in the Columbia River system is provided.

3.5.6.1 Federally Listed Species

Project Area

Only one Federally listed threatened species, the bald eagle, is known to occur in the project area (WDFW 1999). Northern spotted owls, gray wolves, and grizzly bears all occur in the nearby Wenatchee National Forest, Okanogan National Forest, and Colville Indian Reservation, but there are no records for these species in the aquatic and riparian habitats of the project area (WDFW 1999).

Associated Tributaries

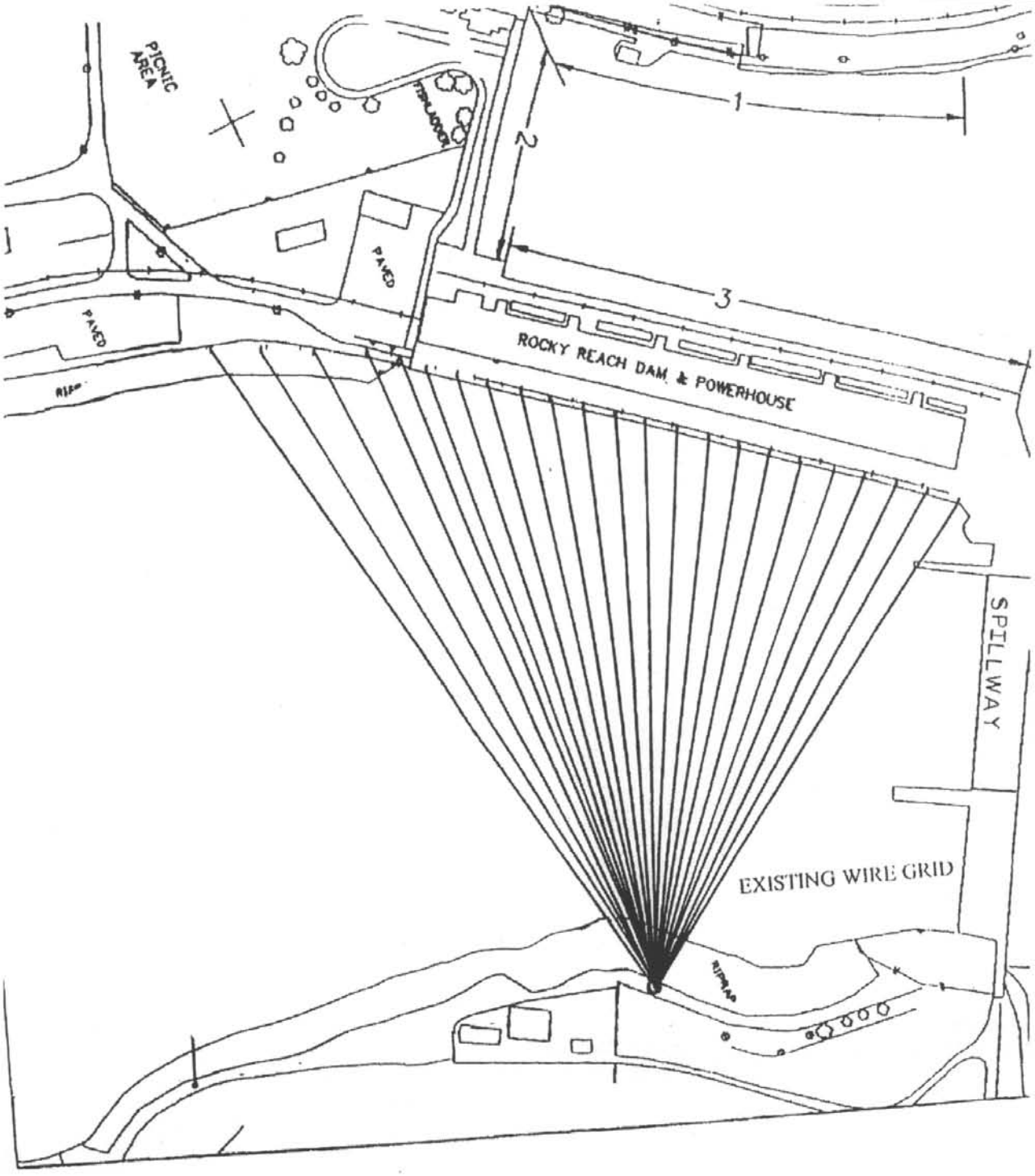
Five Federally listed threatened or endangered species are known to occur in the riparian and aquatic habitats of the project area tributaries (Wenatchee, Entiat, Methow, and Okanogan Rivers, and their associated tributaries) (Table 3-14). These species include the bald eagle (threatened), northern spotted owl (threatened), gray wolf (endangered), and grizzly bear (threatened).

Bald Eagle

Bald eagles generally occur along shores of saltwater and freshwater lakes and rivers that support substantial prey densities (generally anadromous fish or waterfowl) (Livingston et al. 1990; Stalmaster 1987). Breeding bald eagles use large trees for nesting that are generally within a mile of water and have an unobstructed view of water (ODFW 1996; Anthony and Isaacs 1989). Nest trees are usually within old-growth or residual old-growth stands, but some nesting also occurs in riverine forests dominated by cottonwood (*Populus* spp.) (ODFW 1996). Both breeding and wintering bald eagles forage over open water and use riparian trees for perching.

Two nesting bald eagle sites are known to occur in the vicinity of the project area. Since 1995, a nest site near Rocky Reach reservoir has been active each year (Fielder 1999 personal communication) and a nest site near Wells Dam has been intermittently active (Stoefel 1999 personal communication). Nesting eagles in the project area prey primarily on waterfowl. Wintering bald eagles are more common than nesting eagles in the project area.

Wintering bald eagle use averages about 12 eagles at Rock Island reservoir, 50 eagles at Rocky Reach reservoir, and 22 eagles at Wells reservoir (Fielder 1999 personal communication; Hallett 1994, 1995, 1996, 1997). Waterfowl, especially coots, are the main food source of wintering bald eagles in the area. Cottonwood



Parametrix, Inc. Mid-Columbia HCP/EIS/553-1543-020/01(10) 12/01 (K)

Figure 3-13
Overhead Wire Exclusion System for Avian Predators, Rocky Reach Dam

TABLE 3-14. THREATENED, ENDANGERED, AND SENSITIVE WILDLIFE SPECIES OCCURRING IN THE MID-COLUMBIA PROJECT AREA AND ASSOCIATED TRIBUTARIES

	OCCURRENCE[1]						
				TRIBUTARIES			
	FEDERAL STATUS[2]	STATE STATUS[3]	PROJECT AREA[4]	WENATCHEE[5]	ENTIAT[5]	METHOW[5]	OKANOGAN[5]
Mammals							
California bighorn sheep (*Ovis canadensis*)	SC	none	yes	yes	yes	no	yes
California wolverine (*Gulo gulo*)	SC	C	no	yes	no	yes	no
Canada lynx (*Lynx canadensis*)	P	T	no	yes	yes	yes	yes
Fringed myotis (*Myotis thysanodes*)	SC	M	no	yes	no	no	no
Gray wolf (*Canis lupus*)	E	E	no	yes	yes	yes[6]	no
Grizzly bear (*Ursus arctos*)	T	E	no	yes	yes	yes	yes
Long-eared myotis (*Myotis evotis*)	SC	M	no	no	no	no	no
Long-legged myotis (*Myotis volans*)	SC	M	no	no	no	yes	no
Pacific fisher (*Martes pennanti*)	SC	E	no	no	no	no	no
Townsend's big-eared bat (*Plecotus townsendii*)	SC	C	no	no	no	no	no
Small-footed myotis (*Myotis ciliolabrum*)	SC	M	N/A	N/A	N/A	N/A	N/A
Spotted bat (*Euderma maculatum*)	none	M	no	no	no	no	yes
Western gray squirrel (*Sciurus griseus*)	SC	T	no	no	no	yes	yes
Yuma myotis (*Myotis yumanensis*)	SC	none	no	no	no	no	no
Birds							
American white pelican (*Pelecanus erythrorhynchos*)	None	E	yes	no	no	no	yes
Bald eagle (*Haliaeetus leucocephalus*)	T	T	yes	yes	no	yes	yes
Black tern (*Chlidonias niger*)	SC	M	N/A	N/A	N/A	N/A	N/A
Black-backed woodpecker (*Picoides arcticus*)	none	C	no	no	no	yes[6]	no
Burrowing owl (*Speotyto cunicularia*)	SC	C	no	no	no	no	yes

TABLE 3-14. THREATENED, ENDANGERED, AND SENSITIVE WILDLIFE SPECIES OCCURRING IN THE MID-COLUMBIA PROJECT AREA AND ASSOCIATED TRIBUTARIES (CONTINUED)

	OCCURRENCE[1]						
				TRIBUTARIES			
	FEDERAL STATUS[2]	STATE STATUS[3]	PROJECT AREA[4]	WENATCHEE[5]	ENTIAT[5]	METHOW[5]	OKANOGAN[5]
Columbian sharp-tailed grouse (*Tympanuchus phasianellus*)	SC	T	yes	no	no	yes	yes
Common loon (*Gavia immer*)	none	C	yes	yes	no	no	yes
Ferruginous hawk (*Buteo regalis*)	SC	T	no	no	no	no	no
Flammulated owl (*Otus flammeolus*)	none	C	no	yes	no	no	no
Golden eagle (*Aquila chrysaetos*)	none	C	yes	no	no	yes	yes
Great blue heron (*Ardea herodias*)	none	M	yes	yes	no	no	yes
Great gray owl (*Strix nebulosa*)	none	M	no	no	no	yes	yes
Harlequin duck (*Histrionicus histrionicus*)	SC	none	no	yes	no	yes	no
Little willow flycatcher (*Empidonax traillii*)	SC	none	N/A	N/A	N/A	N/A	N/A
Lewis' woodpecker (*Melanerpes lewis*)	none	C	no	yes	no	no	no
Loggerhead shrike (*Lanius ludovicianus*)	SC	C	no	no	no	no	no
Northern goshawk (*Accipiter gentilis*)	SC	C	no	yes	yes	yes	no
Northern spotted owl (*Strix occidentalis*)	T	E	no	yes	yes	yes[6]	no
Olive-sided flycatcher (*Contopus borealis*)	SC	none	N/A	N/A	N/A	N/A	N/A
Osprey (*Pandion haliaetus*)	none	M	yes	yes	yes	no	yes
Peregrine falcon (*Falco peregrinus*)	SC	E	no	yes	no	yes	no
Pileated woodpecker (*Dryocopus pileatus*)	none	C	no	no	no	yes	yes
Red-necked grebe (*Podiceps grisegena*)	none	M	no	no	no	no	no
Sandhill crane (*Grus canadensis*)	none	E	yes[7]	no	no	no	no
Three-toed woodpecker (*Picoides tridactylus*)	none	M	no	yes	no	yes	yes
Vaux's swift (*Chaetura vauxi*)	none	C	no	yes	no	no	no
Western bluebird (*Sialia mexicana*)	none	C	no	no	no	yes	no

TABLE 3-14. THREATENED, ENDANGERED, AND SENSITIVE WILDLIFE SPECIES OCCURRING IN THE MID-COLUMBIA PROJECT AREA AND ASSOCIATED TRIBUTARIES (CONTINUED)

	OCCURRENCE[1]						
				TRIBUTARIES			
	FEDERAL STATUS[2]	STATE STATUS[3]	PROJECT AREA[4]	WENATCHEE[5]	ENTIAT[5]	METHOW[5]	OKANOGAN[5]
Western grebe (*Aechmophorus occidentalis*)	none	M	yes[7]	no	no	no	no
Western sage grouse (*Centrocercus urophasianus*)	SC	T	no	no	no	no	no
White-headed woodpecker (*Picoides albolarvatus*)	none	C	no	no	no	yes[6]	no
Amphibians							
Cascades frog (*Rana cascadae*)	SC	none	N/A	N/A	N/A	N/A	N/A
Columbia spotted frog (*Rana luteiventris*)	SC	C	yes	yes	no	yes	yes
Tailed frog (*Ascaphus truei*)	SC	M	no	yes	yes	yes	no
Tiger salamander (*Ambystoma tigrinum*)	none	M	no	no	no	no	no
Reptiles							
Northern sagebrush lizard (*Sceloporus graciosus*)	SC	none	no	no	no	no	no
Mollusks							
Giant Columbia River limpet (*Fisherola nuttalli*)	none	C	no	no	no	yes	yes
Giant Columbia River spire snail (*Fluminicola columbiana*)	SC	C	no	yes	no	yes	yes
California floater (*Anodonta californiensis*)	SC	C	no	no	no	no	no

[1] Species presence or species habitat listed in WDFW records. For nongame species with no State status, this category is not applicable (N/A) because WDFW does not keep records for these species.
[2] E= Federally listed as endangered, T = Federally listed as threatened, P = proposed for listing, SC = species of concern.
[3] E = State listed as endangered, T = State listed as threatened, C = candidate for State listing, M = State listed as priority species.
[4] Includes aquatic and riparian areas from the tailrace of Rock Island Dam to the tailrace of Chief Joseph Dam.
[5] Includes aquatic and riparian areas of the river and its tributaries.
[6] USFS (1995) documented this species' presence in the area.
[7] Fielder (1999 personal communication) documented this species' presence in the project area.

and ponderosa pine trees provide important perch sites for these eagles. Nesting and wintering bald eagles have also been observed in the lower reaches of the project area tributaries, where adequate nest and perch sites and concentrations of waterfowl are present (WDFW 1999).

Northern Spotted Owl

The northern spotted owl is associated with dense forests that contain structural features characteristic of old-growth forests (i.e., multiple canopy layers, large diameter live trees, and snags) (Thomas et al. 1990). On the east side of the Cascade Mountains, these owls forage mostly on small mammals, especially northern flying squirrels (*Glaucomys sabrinus*) and bushy-tailed woodrats (*Neotoma cinerea*) (Forsman et al. 1984). Northern spotted owls have been recorded in the upper reaches of the riparian forests in the Wenatchee and Entiat watersheds (WDFW 1999).

Gray Wolf

Gray wolves have been eliminated from most areas of Washington State, and their current range is strongly influenced by the presence/absence of humans and development (Johnson and Cassidy 1997). Within remote areas, they use a variety of habitats (Johnson and Cassidy 1997). Prey species include ground squirrels, hares, rabbits, deer, elk, and bighorn sheep (Ingles 1965). Gray wolves are not present in the project area vicinity and their presence in the tributary watersheds is limited to the extreme northern portions of the north Cascades (WDFW 1999).

Grizzly Bear

Grizzly bears are rare in Washington State, with a minimum of 10 to 20 bears estimated in the north Cascades and 26 to 36 bears in the Selkirk range (including Canada) (Johnson and Cassidy 1997). As with gray wolves, grizzlies are limited to remote environments, but within these areas, they utilize a variety of habitats (Johnson and Cassidy 1997). Grizzly bears are opportunistic, omnivores, and their diet includes fish, rodents, carrion, insects, and plants (Mealey 1980; Hamer et al. 1977). These bears are not present in the project area vicinity and their presence in the tributary watersheds is limited to remote areas in the north Cascades and Canada.

Federally Proposed Species and Species of Concern

No wildlife or plant species currently proposed for Federal listing are known to breed or reside in the aquatic and riparian habitats of the project area, and one proposed species, the Canada lynx, occurs in the vicinity of the associated tributaries (WDFW 1999). There are 37 species of concern that potentially occur in the project area and associated tributaries (see Table 3-14) (WDFW 1999). Species of concern include 9 mammal species, 11 birds, 3 amphibians, 1 reptile, 2 mollusks, and 11 plant species. Most of these species are likely to be present in the immediate vicinity of the project area and tributaries. However, species associated with forested areas, small streams, and remote areas (i.e., California wolverine, Pacific fisher, burrowing owl, northern goshawk, and tailed frog) are not expected to occur in the project area, as suitable habitat is not available.

State-Listed Species

State threatened and endangered species present in both the project area and associated tributaries are the American white pelican, Colombian sharp-tailed grouse, and bald eagle (see Table 3-14) (WDFW 1999). In addition, the peregrine falcon, northern spotted owl, Canada lynx, gray wolf, grizzly bear, and western gray squirrel are known to occur in the immediate vicinity of the tributaries (WDFW 1999). One sandhill crane sighting was recorded in the mid-1970s in the project area, but no records for this species exist for the tributaries (Fielder 1999 personal communication; WDFW 1999). Provided below are State-listed species not previously discussed.

American White Pelican

American white pelicans are colonial nesters that usually breed on isolated islands in freshwater lakes (WDFW 1999). Nesting success is influenced by human disturbance, mammalian predators, flooding, and erosion. This species requires shallow waters for foraging, such as lake and river edges, and open areas within marshes (WDFW 1999). The prey base of American white pelicans consists of fish, amphibians, and crustaceans. Over 100 white pelicans regularly use the Wells reservoir from May to early October (Hallet 1994, 1995, 1996, 1997), and this species has also been recorded on the Okanogan River (WDFW 1999).

Sharp-tailed Grouse

The sharp-tailed grouse occurs in grasslands and shrub savanna (Smith et al. 1997). The species is in serious decline, due to conversion of its habitat to agriculture and other uses (Smith et al. 1997). Sharp-tailed grouse have been recorded near the shoreline of the Mid-Columbia and Okanogan Rivers (WDFW 1999). However, this species is predominantly associated with upland habitats.

Peregrine Falcon

The continental peregrine falcon is a rare and local breeder in eastern Washington (Smith et al. 1997). This species was formerly extirpated from the State, but is now being reintroduced at certain locations (Smith et al. 1997). The habitat associations of these reintroduced birds are not well understood. The single record of this species in the project and tributary vicinity is from a tributary of the Beaver Creek and the Methow watershed (WDFW 1999).

Canada Lynx

In Washington State, lynx are found above the 4,500 foot elevation in forested environments (WDFW 1991). The population dynamics of lynx are largely dependent on snowshoe hares, their main prey (WDFW 1991). When hare abundance is high, lynx densities are generally high as well; when hare abundance is low, lynx densities are generally low. Denning sites of lynx are most often in mature forests older than 200 years (WDFW 1991). Lynx are not present in the project area, as suitable habitat is not available. However, lynx have been reported in the vicinity of the project area tributaries (WDFW 1999).

Western Gray Squirrel

In eastern Washington, western gray squirrels are found in walnut tree groves planted by early settlers (Ryan and Carey 1995). The walnuts provide the primary food source for the squirrels. Other factors important to western gray squirrels are availability of large trees for nesting and proximity to water (WDFW 1991). Western gray squirrels are not present in the project area, but do occur in riparian areas in the Methow and Okanogan watersheds (WDFW 1999).

Sandhill Crane

Sandhill cranes are found in large tracts of open habitat, where visibility is good from all vantage points (WDFW 1991). Nesting sites are generally in shallow water marshes that have dense emergent plant cover, and feeding grounds include meadows, grasslands, and grainfields (WDFW 1991). During 1976, Paul Fielder, wildlife biologist for Chelan County PUD, observed two sandhill cranes along the Wells reservoir, but no other records exist for this species in the project area or the associated tributaries (Fielder 1999 personal communication; WDFW 1999). This species is probably a rare migrant in the project area.

State Candidate and Monitor Species

State candidate species are species that are proposed for listing as threatened or endangered. Monitor species include wildlife species for which WDFW monitors status and distribution. Little is known about many of these species, but biologists are concerned about their well-being.

State candidate species known to occur in the project area include common loons and golden eagles (see Table 3-14) (WDFW 1999). In addition, burrowing owls, California wolverines,

Columbia spotted frogs, flammulated owls, Giant Columbia River limpets, Giant Columbia spire snails, black-backed woodpeckers, Lewis' woodpeckers, white-headed woodpeckers, northern goshawks, pileated woodpeckers, Vaux's swifts, and western bluebirds are known to occur in the aquatic and riparian habitat of the project area tributaries (WDFW 1999).

Two State monitor species, the osprey and great blue heron, occur in both the project area and their associated tributaries (WDFW 1999). Several osprey nests are located along the project area reservoirs and a great blue heron rookery is present near Rock Island reservoir (Fielder 1999 personal communication). Western grebes (monitor species) have been observed at the reservoirs and are likely to be present in the lower reaches of the project area tributaries. Four other State monitor species (the spotted bat, great gray owl, three-toed woodpecker, and tailed frog) are known to occur in the tributaries only (WDFW 1999).

State Priority Habitats

Riparian zones, wetlands, islands, talus slopes, cliffs/bluffs, and shrub-steppe habitats are present throughout the immediate vicinity of both the project area and associated tributaries. Waterfowl concentration areas occur along Wells, Rocky Reach, and Rock Island reservoirs, and in the lower reaches of the project area tributaries. Old-growth/mature forest, alpine and meadow habitats, snag-rich areas, aspen stands, and high quality instream habitats are present, but rare, along the upper reaches of the project area tributaries.

3.5.6.2 Columbia River System

Federally listed threatened and endangered wildlife species that use aquatic and riparian habitats of the Columbia River System include the bald eagle, northern spotted owl, Steller sea lion (*Eumetopias jubatus*), and marbled murrelet (*Brachyramphus marmoratus*).

General habitat associations and habitat use of bald eagles and northern spotted owls are described in Section 3.5.5.1, Federally Listed Species. Marbled murrelets forage on inland saltwaters and on the ocean within 1.2 miles of shore (WDFW 1991). These birds nest in mature and old-growth forests within 50 miles of the ocean (WDFW 1991; Csuti et al. 1997). The Columbia River, at its confluence with the Pacific Ocean, provides foraging habitat for marbled murrelets, with possible breeding evidence here as well (Smith et al. 1997).

Steller sea lions occur in coastal waters and use rocky shorelines and islands for haul outs and rookeries. Their diet consists primarily of fish, squid, and octopus (Osborne et al. 1988). Their use of the Columbia River system includes a haul out at the mouth of the river (Brueggeman 1992) and occasional foraging in the Columbia River estuary.

3.6 LAND OWNERSHIP AND USE

3.6.1 PROJECT AREA

3.6.1.1 Wells Dam

Wells Dam, owned by Douglas County PUD, encompasses approximately 60 acres and includes the 4,460-foot dam, a powerhouse integrated into the dam itself, transmission facilities, and a fish hatchery complex. The construction of Wells Dam created a 30-mile reservoir (Lake Pateros) encompassing approximately 9,740 acres. Wells reservoir provides approximately 98,000 acre-feet of usable storage and 331,200 acre-feet of total storage.

The Wells Project has a large fish hatchery located on the west side of the dam and another hatchery located on the Methow River near the town of Winthrop. The Methow Hatchery also has three fish acclimation ponds with one pond located on each of the main tributaries to the Methow River including a pond on the Chewuch and Twisp Rivers, and an acclimation pond located on the upper mainstem Methow River (see Figure 1-5). Recreational facilities were constructed as part of the dam project, and include Marina Park in Bridgeport, Columbia Cove Park in Brewster, Memorial Park in Pateros, and the Wells Dam Overlook Park next to the dam. The park at the dam site consists of lawn, picnic shelters, restrooms, an interpretive area, and a petroglyph display. The visitors center at Wells Dam includes historical and electrical displays and a fish viewing center. The other parks are described in more detail in Section 3.10, Recreation.

The area surrounding the Wells Dam is mostly privately owned land that is used for orchards, rangeland, and residences. Douglas County PUD owns most of the shoreline lands surrounding the Wells reservoir. The State and Douglas County PUD own and operate several wildlife areas in the vicinity of Wells Dam. They include the Foster Creek Wildlife Area, Bridgeport Bar Wildlife Area, Center Ferry Canyon Wildlife Area, Washburn Pond, Cassimer Bar, and the Indian Dan Wildlife Area. Federal lands managed by the BLM are located east (a small parcel close to the dam) and west (a larger parcel located 2 miles away) of the dam. Five miles to the northwest are the forest lands of the Okanogan National Forest. Bridgeport State Park is located approximately one mile to the east of Bridgeport. Recreation is a principal use near the dams and reservoirs.

Zoning in the vicinity of the Wells Dam and within Douglas County (between Chief Joseph Dam and Wells Dam) is 42 percent river irrigation agriculture, 30 percent dryland agriculture, 20 percent commercial agriculture, and 8 percent rangeland conservation. The north side of the Columbia River in this same section is within Okanogan County, and is zoned minimum requirement district. This zoning classification is for all uses that are generally unrestricted.

3.6.1.2 Rocky Reach Dam

The Rocky Reach Dam complex, owned by Chelan County PUD, is spread over approximately 75 acres and includes the dam, powerhouse, visitor information center, fish hatchery, and park (Chelan County PUD 1997a). The 2,500-foot Rocky Reach Dam creates a 43-mile reservoir (Lake Entiat) encompassing approximately 8,235 acres. Rocky Reach's reservoir provides approximately 35,000 acre-feet of storage.

Fish-related facilities at the dam include passage structures and a fish hatchery. Rocky Reach also has a visitor information center and park. The visitor center attracts over 100,000 visitors annually. The visitor center has a lobby, restaurant, theatre, and fish viewing room. The facility also includes two interpretive museums: the Gallery of Electricity and the Gallery of the Columbia. The museum houses exhibits and displays that relate the early history along the Columbia River, the construction and operation of the dam, and a history of electricity and its generation. Adjacent to the information center is a 30-acre park featuring a picnic area, playground, lawn, and gardens.

A broad river valley surrounds the Rocky Reach Dam and there are several land uses located adjacent to the dam. These mainly include apple orchards that line both sides of the Columbia River. However, there are also private residences, a residential subdivision, some commercial uses, and Lincoln Rock State Park.

Similar to Wells Dam, Rocky Reach was required to develop parks and recreation areas. Daroga State Park, Lincoln Rock State Park, Orondo Park, Entiat Park, Chelan Falls Park, and Beebe Bridge Park are part of the Rocky Reach Project.

These parks are discussed in more detail in Section 3.10, Recreation.

State and Federally owned lands are also located in the vicinity of Rocky Reach. The Swakane State Wildlife Recreation area encompasses the area above and to the west of the dam site. Further west of the dam is Wenatchee National Forest land. Most of the land located east of the dam is privately owned, except for some interspersed Federal public lands that are managed by the BLM.

Zoning in the vicinity of the Rocky Reach Dam is commercial agriculture on the Douglas County side (east), and public lands and facilities on the Chelan County side (west).

3.6.1.3 Rock Island Dam

The Rock Island Dam complex, owned by Chelan County PUD, consists of a 3,800-foot dam, two powerhouses, transmission towers and lines, maintenance facilities, and offices. The dam is a run-of-the-river type that does not have significant water storage capacity (7,500 acre-feet of storage). However, the dam creates a 21-mile reservoir covering an area of approximately 3,300 acres (Chelan County PUD 1997b).

The dam complex's fish hatchery facilities are composed of a central hatchery located just upstream of Rocky Reach Dam and five satellite hatcheries located in the tributaries. As part of the dam's development, several recreational sites were constructed and became part of the dam's Federal operating license. These include Wenatchee Riverfront Park, Walla Walla Point Park, Wenatchee Confluence State Park, and Rock Island Hydro Park. These parks are discussed in more detail in Section 3.10, Recreation.

Land ownership and uses in the vicinity of the dam includes private, State, and Federal lands used for recreation, conservation, range land, and private residences. State and Federally owned lands are located generally east, west, and south of the dam. Approximately 3 miles south of the dam is the Colockum State Wildlife Recreation Area. Located east and west of the dam are public lands administered by the BLM. These Federal lands are mostly located along Rock Island Creek and Douglas Creek east of the dam and on Wenatchee Heights west of the dam, and are interspersed among privately owned land. Located a few miles north of the dam is the Alcoa aluminum plant. There are no adjacent land uses because of the steep bluffs located next to the Columbia River in this area.

Zoning along the Columbia River in the vicinity of the Rock Island Dam is dryland agriculture on the Douglas County side (east) and rural/industrial on the Chelan County side (west).

3.6.2 LICENSE REQUIREMENTS

The original licenses for the Wells, Rocky Reach, and Rock Island Projects include by reference general terms and conditions by FERC for major projects. These general conditions do not directly address land use, except for Article 8, which states:

> In the construction and maintenance of the Project, the location and standards of roads and trails, other land uses, including the location of quarries, borrow pits, spoil disposal areas, and sanitary facilities, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Similarly, Article 48 for the Wells Hydroelectric Project provides the licensee the authority to grant permission for certain types of use and occupancy of project lands and waters if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project.

Subsequent amendments to the licenses have added specific requirements for public access for recreation, but do not otherwise address land use. Generally, the FERC licenses require licenses to allow public access, to a reasonable extent, to project waters and adjacent public lands for navigation and outdoor recreational purposes, including fishing and hunting.

3.6.3 ASSOCIATED TRIBUTARIES

The tributaries associated with the three dams mainly lie within a three county area that includes Douglas, Chelan, and Okanogan counties. Within this area, the main land use surrounding three of the major tributaries (Wenatchee, Entiat, and Methow Rivers) is the National Forest lands of the Wenatchee and Okanogan National Forests. Major land uses and ownership for each of the three counties is characterized below.

3.6.3.1 Chelan County

Approximately 80 percent of Chelan County is mountainous, sparsely to heavily forested and undeveloped. Much of the county's land area is reserved for conservation, habitat, forestry, and outdoor recreation, because either the USFS or National Park Service owns approximately 74 percent of the county. The State also owns several wildlife recreation areas including Swakane, Entiat, and Chelan Butte. The State also owns the Ice Caves Heritage area located north of Chelan.

The majority of development has largely been restricted to the narrow valley floors around the Wenatchee and Entiat Rivers and Lake Chelan. The major land use activity within the river valley areas of the Wenatchee and Entiat Rivers is agricultural, consisting largely of the production of apples, pears, and soft fruits. The amount of land used for agricultural purposes remains fairly constant. Although orchard lands are being converted to residential/commercial use in the urban fringe areas around Wenatchee, this trend is offset by expansion of irrigation districts to previously unused land. The conversion of unused land to residential, agronomic, and recreational use is expected to continue.

Industrial development is limited. For the most part, industrial activities are located along the Columbia River in the Wenatchee/East Wenatchee urban area. There are some manufacturing activities within the agricultural areas, most of which are associated with the fruit production industry.

The main residential and commercial concentrations are located in and around the incorporated towns and cities. There are extensive year round and summer home developments along the shores of lower Lake Chelan and to lesser degree around Lake Wenatchee. Some limited tourist commercial activities are located along U.S. Highway 2 up through the Wenatchee valley. Leavenworth, at the upper end of the valley, has developed extensive tourist commercial facilities. Substantial residential growth has occurred in the Wenatchee area.

Zoning adjacent to the Wenatchee River, from the mouth at the Columbia River up to the town of Cashmere, is predominantly rural residential/ resource (RR5 and RR10) with a small amount of rural village (RV). Between the towns of Cashmere and Leavenworth, zoning adjacent to the river becomes predominantly commercial agricultural lands (AC), with smaller areas zoned rural residential/resource (RR2.5 and RR5) and rural village (RV). Within the towns of Cashmere and Leavenworth, zoning becomes city urban growth area (UGA). Beyond the town of Leavenworth, the Wenatchee River runs through the Wenatchee National Forest to its source at Lake Wenatchee, with the exception of the land surrounding the town of Plain, which is outside of the Forest. This land is zoned primarily rural residential/resource (RR2.5, RR5, and RR20).

The majority of the Entiat River (the upper two-thirds) is within the Wenatchee National Forest. Zoning adjacent to the Entiat River, from its

mouth at the Columbia River up to the town of Ardenvoir, is predominantly commercial agricultural lands (AC). Beyond the town of Ardenvoir, up to the boundary of the Wenatchee National Forest, zoning is almost entirely rural residential/resource (RR5 and RR10).

3.6.3.2 Douglas County (Greater East Wenatchee)

Unlike Chelan County where most of the land is mountainous and therefore undeveloped, approximately 80 percent of the land in Douglas County is flat or rolling and suitable for agricultural purposes or range. The rolling plateau from Waterville to Banks Lake is primarily used for grain production, while the lowland areas are engaged in the production of apples, pears, and soft fruit. Near the Columbia River, there is a narrow floodplain that provides level areas where urban development and apple orchards have been established. The valley sides of the Columbia River are fairly steep, making them generally unsuitable for development.

In contrast to Chelan and Okanogan counties, Douglas County does not have a large percentage of Federal or State land ownership and thus most of the land is in private ownership. The State owns several wildlife recreation areas including the Central Ferry and Foster Creek State Wildlife Recreation areas. Federal lands (managed by the BLM) are scattered along the Columbia River and some drainage basins such as Rock Island Creek and Douglas Creek.

The greater East Wenatchee urban area is about 31,000 acres in size. About one-third of this area is comprised of residential uses with commercial and industrial land uses accounting for another 10 percent of the urban area. As stated previously, residential development in the East Wenatchee area has accelerated during the last 5 years and is a trend that is expected to continue.

3.6.3.3 Okanogan County

The western half of Okanogan County is dominated by dense, rugged, and mountainous terrain that comprises much of the Okanogan National Forest. Agricultural uses are concentrated in the central portion of the county mainly along the county's major river valleys of the Columbia, Okanogan, and Methow Rivers. The southeast corner of the county is covered by the extensive holdings of the Colville Indian Tribe.

Timber, habitat, conservation, and recreation are the main uses of the National Forest land in the county. These uses in particular surround the Methow River valley. The State also owns the Methow State Wildlife Recreation Area that rings the Methow River valley.

Agriculture, pasture, and residential ranches are some of the chief uses found in the unincorporated areas of the Methow and Okanogan river valleys. Similar to the other counties, apples, pears, and soft fruits are the main crops along with hay.

Residential areas are found primarily around the county's incorporated cities and towns, and in the larger unincorporated communities in the county. Commercial and industrial development is also found in the larger cities, such as Oroville, Tonasket, Omak, Okanogan, Brewster, Pateros, and Twisp. In particular, Omak, the county center for services and trade, is experiencing an increasing rate of growth.

The Methow and Okanogan Rivers are within Okanogan County. Both sides of the Methow River are zoned Methow Review District from the source to just north of the town of Methow (approximately 75 percent of the river corridor). This zoning classification requires more detailed review for proposed development projects than the other zoning classification in Okanogan County, which is minimum requirement district. The lower 25 percent of the Methow River

corridor and the entire length of the Okanogan River are zoned minimum requirement district.

3.6.4 COLUMBIA RIVER SYSTEM

The land ownership and uses in the Columbia River Basin are a reflection of the settlement pattern and history of the area. Native cultures were concentrated in the river valleys and early explorers reported populations of Indians as high as 50,000 along the Columbia and Snake Rivers. Particularly important locations were major fishing areas located around falls and rapids. Early settlers used the river system for transportation and trading settlements soon sprang up around the rivers.

In the late 1800s, fertile soils, abundant natural resources, liberal Federal land dispersal policies (Homestead Act, Donation Land Act, Timber Culture Act, and Desert Land Act), and development of the railroad all helped to spur development of interior areas of the State, particularly the Columbia Basin. One result of the U.S. Government's influence in settling the region was the granting of land for the railroad in the 1860s and 1870s. Congress made a series of land grants to the railroads each of which was 640 acres in size. However, these land grants alternated on either side of the rail lines. Many of the grants were sold off to private individuals or timber companies, while others were retained in Federal ownership. This resulted in a checkerboard pattern of intermingled Federal and private land ownership (Foster Wheeler 1995) that still exists today.

In the early 1900s, large public works projects, particularly hydroelectric and irrigation, caused further development of both urban and agricultural areas such as Grand Coulee and Electric City. Cheap and abundant power also attracted wartime industries such as aluminum companies to the area in the 1940s.

In general, existing land uses typical of the Columbia River Basin include cropland, forest, range, and urban development. Cropland uses include pasture, orchards, nurseries, and dry and irrigated lands used to grow crops. Forestry uses include commercial timber harvest, wildlife habitat, and open space. Natural meadow areas and the dry shrub-steppe land cover are largely used as rangeland. Most of the commercial and industrial land uses are concentrated in the urban areas of the Columbia Basin.

Land ownership or management of property in the Columbia Basin is a mixture of Federal, State, private, and Tribal interests. More than 20 Federal agencies manage lands within the basin. The primary agencies are the USFS, BLM, National Park Service, USFWS, BOR, Army Corps of Engineers, and defense agencies, such as the U.S. Army, and U.S. Department of Energy (USDOE).

Indian Tribes also control large areas of the basin. These Tribes include the Yakama, Colville, and Spokane Tribes. Ownership of Tribal lands can be classified into three categories: (1) lands held in trust by the Tribal government or Federal Government, (2) lands allotted to individual Indians and now held as private Indian lands, or (3) lands allotted to individual Indians which were subsequently sold to non-Indians and now are in private ownership.

State-owned lands are generally managed for timber harvest, mining, wildlife habitat conservation, grazing, and recreation (Foster Wheeler 1995). There are a few relatively large areas of State ownership near the Columbia River and its tributaries and these are generally wildlife recreation areas. However, there are also lands that were granted to the State from the Federal government. These were grants of sections within each township (sections 16 and 36). As with the railroad grants, this has resulted in a checkerboard pattern of evenly scattered parcels.

3.7 SOCIOECONOMICS

3.7.1 COUNTY DEMOGRAPHICS

The three project area counties are largely rural with relatively low population. In 2000, the population of Washington State was 5,894,121 while the populations of Chelan, Douglas, and Okanogan Counties were 66,616, 32,603, and 39,564 people, respectively (U.S. Census 2000). Together, the three counties contain just 2.4 percent of the State population while covering 10,010 square miles, or 15 percent of the State.

Since 1990, Washington State population increased by 1,580,520 or 26.8 percent. The study area counties have grown at a similar or slightly slower rate. During this period, Chelan County grew by 14,366 persons (27.4 percent), Douglas County by 6,398 (24.4 percent), and Okanogan County by 6,214 (18.6 percent) (U.S. Census 2000).

Future population growth for the three county areas is generally expected to exceed the Statewide rate of growth. By 2010, Washington State is expected to have 6,693,325 persons, 13.5 percent more than in 2000. Chelan County will reach 76,093 persons by 2010, a 14.2 percent increase from 2000. Douglas and Okanogan counties will increase 21.4 and 11.3 percent, respectively, over the same period to reach populations of 39,596 and 44,061 persons, respectively (Washington State Office of Financial Management 1995).

Statewide, 57 percent of the population lives in incorporated areas. Chelan County is roughly similar, with 45 percent of the population in incorporated places. Wenatchee is its largest city, with 27,856 persons in 2000. Other Chelan County cities and towns include Chelan (population 3,522 people), Cashmere (population 2,965 people), Leavenworth (population 2,074 people), and Entiat (population 957 people) (U.S. Census 2000).

Douglas and Okanogan counties are more rural, with 32 and 40 percent, respectively, of their population in incorporated areas. The largest cities in Douglas County are East Wenatchee (population 5,757 people), Bridgeport (population 2,059 people), and Waterville (population 1,153 people). In Okanogan County, the largest cities are Omak (population 4,721 people), Okanogan (population 2,484 people), and Brewster (population 2,189 people) (U.S. Census 2000).

The three project area counties have proportionately more persons of Hispanic origin (persons of Hispanic origin can be of any race) than the State as a whole, largely due to the amount and type of agricultural employment. Chelan, Douglas, and Okanogan counties were 19.3, 19.7, and 14.3 percent Hispanic, respectively, in 2000, compared to 4.4 percent for the entire State. Native American populations are low in Chelan and Douglas Counties, about 1 percent, but are 11.5 percent of the Okanogan County population due to the presence of the Colville Indian Reservation. Black, Asian, and other races are a small part of the area population (about 1 percent) (U.S. Census 2000).

3.7.2 TRIBAL DEMOGRAPHICS

This section briefly describes the demographics of the Indian Tribes that fish the Columbia River. These include the Confederated Tribes of the Colville Reservation (Colville Indians), Confederated Tribes and Bands of the Yakama Indian Nation (Yakama Indians), Confederated Tribes of the Umatilla Indian Reservation (Umatilla Indians), Confederated Tribes of Warm Springs Reservation (Warm Springs Indians), and Nez Perce Tribe. Of these reservations, only the Colville Reservation is located within the project area (Chelan, Douglas, or Okanogan counties).

The total population on each of the five project area reservations in the year 2000 was:

- 7,587 persons for the Colville Reservation,
- 31,799 persons for the Yakama Reservation,
- 2,927 persons for the Umatilla Reservation,
- 3,314 persons for the Warm Springs Reservation, and
- 17,563 persons for the Nez Perce Reservation (U.S. Census 2000).

There were 4,528 Native Americans (59.7 percent) on the Colville Reservation. Most of the remainder, 32.6 percent, were white. On the Yakama Reservation, 7,411 persons were Native American (23.3 percent), 10,605 persons (33.4 percent) were white, 422 persons (1.3 percent) were Asian, and 11,655 persons (36.7 percent) were classified as some other race. About half of the population or 1,427 persons (48.8 percent) of the Umatilla Reservation was Native American in 2000. Most of the rest (1,377 persons or 47 percent of the reservation population) were white. Most of the Warm Springs Reservation is peopled by Native Americans (91.7 percent) with a small percentage of whites (4.8 percent). Lastly, the Nez Perce Reservation is only 11.7 percent Native American with the majority of persons (84.6 percent) being white (U.S. Census 2000).

3.7.3 COUNTY ECONOMIES

Compared to Washington State, the project area counties have historically had higher unemployment and lower per capita income. Unemployment in 2000 in Chelan, Douglas, and Okanogan counties was 8.9, 7.5, and 10.9 percent, respectively, while the Statewide unemployment rate was 5.2 percent (Washington Employment Security Department 2000a). The Statewide average annual wage in 2000 was $37,038, while in Chelan, Douglas, and Okanogan counties average annual wage was $23,874, $20,896, and $19,659, respectively (Washington Employment Security Department 2000b).

Consistent with their rural character, employment in the area counties is much higher in agriculture and forestry and lower in manufacturing compared to the entire State, where agriculture, forestry, and fishing comprise 2.3 to 3.4 percent of the jobs and manufacturing comprises 2.3 to 7.2 percent of State-wide employment (Table 3-15). Washington State is the nation's largest grower of apples, and the three counties produce 35 percent of the State's output. The apple industry has suffered in recent years. The value of the State's 1997 apple crop dropped $90 million from the previous year, with production down about 9 percent. Growers harvested a record crop in 1998. Prices, however, declined sharply even though many apples were left on the tree. The price for processing apples was often below the cost of harvesting. Prices and demand have been affected by the Asian financial crisis and a tariff imposed by Mexico.

Other important fruits grown in the area include pears and sweet cherries. As a consequence of the high level of agriculture, employment varies substantially by season. Employment in government is similar to the rest of the State, but accounts for a much higher portion of the total wages paid. Employment in the service sector is lower than in the entire State.

3.7.3.1 Chelan County

In Chelan County, agriculture is the largest sector in terms of employment, although not in terms of wages paid due to the seasonal nature and large number of relatively low-skilled jobs (see Table 3-15). Fruit, led by apples, is the major crop. The primary fruit growing areas are along river valleys, where water is available for irrigation and natural air drainage produces a favorable climate.

TABLE 3-15. PERCENT TOTAL EMPLOYMENT AND WAGES PAID FOR SELECTED SECTORS, 1998

	WASHINGTON STATE		CHELAN COUNTY		DOUGLAS COUNTY		OKANOGAN COUNTY	
	% TOTAL EMPLOY-MENT	% OF AVERAGE WAGE	% TOTAL EMPLOY-MENT	% OF AVERAGE WAGE	% TOTAL EMPLOY-MENT	% OF AVERAGE WAGE	% TOTAL EMPLOY-MENT	% OF AVERAGE WAGE
Agriculture, Forestry, Fishing	3.7	47.2	23.5	55.1	34.0	65.2	31.2	55.7
Manufacturing	14.4	127.7	7.2	147.8	2.3	108.7	5.4	139.4
Retail	17.8	54.2	16.9	68.1	17.3	75.1	12.6	72.4
Services	26.1	108.5	19.0	106.4	13.2	114.5	18.0	102.2
Government	17.0	102.4	16.2	148.5	19.7	156.1	20.3	163.5

Source: Washington State Office of Financial Management 2000

In the manufacturing sector, aluminum is the largest industry. This industry is made possible by the availability of large quantities of low-cost electricity. Wages in manufacturing are relatively high and contribute substantially to the County's economy.

In the service sector, health care is the leading industry and accounts for almost half of the sector's employment. This industry also pays relatively high wages. Hotels and lodging are also important in the services sector. Chelan County attracts a relatively large number of tourists and recreationalists, making lodging the second-largest industry in the sector. However, this industry is seasonal and pays relatively low wages, reducing its importance to the local economy.

The tourist industry also supports a substantial portion of the retail sector in Chelan County. In the government sector, local government related to education accounts for half of the employment. State government employment is split roughly between community colleges and the Department of Transportation. Federal employment is mostly related to land and wildlife management in the Wenatchee National Forest. All government-sector jobs are relatively well paid.

3.7.3.2 Douglas County

Agriculture dominates Douglas County employment. As in Chelan County, fruit growing is very important along river valleys, primarily the Columbia. Douglas County also has large areas on the Columbia Plateau where wheat is grown. Wheat production is both dry land and irrigated. Little manufacturing is based in Douglas County; however, some persons employed in manufacturing in the Wenatchee area (Chelan County) live across the Columbia in East Wenatchee (Douglas County).

As in Chelan County, most service-sector employment is in health care. Other service-sector and retail employment supports local businesses and residents and is less dependent on tourism than Chelan County. Government is the largest non-agricultural sector in Douglas County, and 87 percent of government employment is in local government, most of which is devoted to education.

3.7.3.3 Okanogan County

Okanogan County is the third-largest producer of apples in the State, after Yakima and Chelan counties. Other important fruit crops include

cherries and pears. The County also produces large amounts of grains, including wheat, barley, oats, and corn. Much of this agriculture requires irrigation during part of the year.

Okanogan County supports large numbers of livestock, including beef, sheep, and lambs. Forestry employment has declined recently due to harvest restrictions and is not expected to regain its once-substantial role. Manufacturing is a relatively small part of the County economy. Most of the manufacturing is tied to the timber and wood products industry, and hence has been volatile.

Similar to both Chelan and Douglas counties, health care is the largest industry in the service sector. Another major employer in the service sector is Tribal administration for the Colville Indian Reservation. Combined with the Colville Tribal Enterprise (included in the trade sector), Native Americans constitute an important part of the County economy. Government is the second-largest employment sector in Okanogan County, next to agriculture. As in most areas, local government employment in education is the largest single employer. The County also has relatively large Federal employment providing maintenance and management of irrigation systems and National Forest lands.

3.7.4 TRIBAL ECONOMIES

Although Indian Tribes are considered sovereign nations, the economies of the Columbia Basin Tribes are intricately connected to the greater Pacific Northwest economies of Washington, Oregon, and Idaho. The project area Indian Tribes engage in a variety of commercial, industrial, tourism, recreation, gaming, and natural resource activities that create jobs and personal income for Indians and non-Indians alike. In Washington State alone, the 27 Federally recognized Tribes contribute nearly $1 billion yearly to the economy of the State (Tiller and Chase 1999).

The average annual wage for Tribes in Washington remains significantly lower than the State as a whole. For Tribal-owned enterprises in eastern Washington (Colville and Yakama Indian Tribes), the average annual wage was estimated at approximately $16,907 (Tiller and Chase 1999), compared to year 2000 average Statewide wage of $37,038. Provided below is more detailed information on the components of the economies of the project area Indian Tribes.

Historically, natural resources have been the mainstay of the economies of the Indian Tribes in the Columbia Basin. Hunting, fishing, and gathering are activities that have been important to Tribes for thousands of years. These activities not only continue to be important economically, but also for subsistence and ceremonial purposes. Today, the natural resource portion of the affected Tribal economies, which constitutes 8 percent of the total employment, is made up of fishing, agriculture, food processing, forestry/timber production and wood processing, livestock grazing, and power production (Table 3-16).

Fishing is the main Tribal industry that would be most affected by activities at the three project area dams. The Tribes in the area conduct both a commercial and non-commercial (subsistence and ceremonial) fish harvest. Four of the Tribes are part of the commercial fishery that occurs in the mainstem of the Columbia River between Bonneville and McNary dams (referred to as Zone 6). Known as the Columbia River Treaty Tribes, the Warm Springs, Umatilla, Yakama, and Nez Perce Indians participate in the commercial fishery for fall-run chinook salmon, summer steelhead, coho salmon, and sturgeon. In 2000, the Tribes landed 52,419 chinook salmon, 15,540 steelhead, 6,299 coho salmon, and 3,447 sturgeon during the commercial fishing season (Joint Columbia River Management Staff 2001).

TABLE 3-16. PERCENT TOTAL EMPLOYMENT PAID FOR SELECTED SECTORS, 1997-1998

	WASHINGTON STATE % TOTAL EMPLOYMENT	INDIAN TRIBES % TOTAL EMPLOYMENT
Agriculture, Forestry, Fishing	3.7	8.0
Manufacturing	14.4	6.0
Retail	17.8	2.0
Services	26.1	52.0[1]
Government	17.0	29.0

[1] The majority of this percentage is casino and gaming employment (approximately 45 percent).
Source: Tiller and Chase 1999.

No information is available on how the fish harvest is divided among the four Tribes. The commercial fishery represents a significant part of the economies of the four Tribes. Estimates of the Tribal salmon fishery in Washington were valued at almost $7 million in 1997 (Tiller and Chase 1999). However, over time, there has been a substantial decline in salmon stocks, and this decline has affected the economies of the project area Tribes.

The subsistence fish harvest for the four Treaty Tribes includes the fish species listed above and also includes sockeye and spring- and summer-run chinook salmon. In 2000, the Treaty Tribes caught 14,635 fall-run, 11,250 spring-run, and 280 summer-run chinook salmon, 6,628 steelhead, 2,765 sockeye salmon, 1,884 coho salmon, and 324 sturgeon, and for subsistence or ceremonial purposes (LeFleur 2001 personal communication; Joint Columbia River Management Staff 2001).

Three of the project area Tribes have made large investments in agriculture. These include the Yakama, Umatilla, and Nez Perce Indians. Each of these has lands dedicated to irrigated cropland (the Nez Perce Indians also practice some dry land farming). For example, the Yakama Indian's Land Enterprise has been establishing fruit orchards since 1989. They have constructed a cold storage facility and are in the process of developing their own fruit-processing warehouse. In 1999, the Yakama Indians planted approximately 1,138 acres of orchard land, primarily producing apples. Other crops produced by the Yakama Indians include cherries, peaches, nectarines, plums, pears, apricots, asparagus, sweet corn, wheat, and alfalfa (Yakama Indian Nation 2001).

Forestry is another of the resource-based industries that make up Tribal economies. All five Tribes utilize this resource to some extent, and several of the Tribes—particularly the Yakama, Colville, and Warm Springs Tribes—rely heavily on this resource. The Yakama Indian Nation manages approximately 309,000 acres of commercial timber on reservation land and has an annual sustained harvest of 143 million board feet of timber. The Yakama Forest Products Division employs 130 people. They recently dedicated ground for construction of a new $35 million large-log sawmill that will add 150 employees (Daily Journal of Commerce 2001).

Forestry enterprises operated by the Colville Indians include Colville Tribal Logging, Colville Indian Precision Pine, Colville Timber Resource Company, and Inchelium Wood Treatment Plant. The Warm Springs Indians operate Warm Springs Forest Products. While there are no available figures for the value of the timber harvest for the five area Tribes, there is an estimate for timber harvest from all Tribal lands in Washington State. In 1997, the value of the timber harvest from

Tribal lands was approximately $71.2 million. This industry contributes substantially in terms of wages, income, and employment for Indians and non-Indians (Tiller and Chase 1999).

While all of the project area Tribes likely use some land for grazing, the Umatilla Indians actively engage in this activity. They use grazing land for both cattle and horses and as late as the 1960s exercised grazing rights on Federal land adjacent to the reservation. The Umatilla Indians are interested in forming a livestock cooperative to exercise their grazing rights on Federal land again (Umatilla Tribes 2001).

The Warm Springs Indian Tribe is also involved in power production. The Tribe has constructed generating and power transmission facilities at Pelton Reregulating Dam and are co-licensees of the Pelton-Round Butte project. The facilities are owned and operated by the Warm Springs Power Enterprises, which sells the electrical power to PacifiCorp.

Tribal governments are another important segment of the Indian economy (see Table 3-16). Government activities may include housing, health and human services, fire protection, police, planning, Tribal court, education, public works, economic and community development, and recreation. Aside from carrying out their traditional administrative functions, Tribes own and manage enterprises across a wide spectrum of economic activity.

As described in the land use section, one of the biggest changes to the economies of the Tribes has been the development of casinos. In 1988, the U.S. Congress passed the Indian Gaming Regulatory Act, which authorized casino gaming as a way to promote a viable economic base for Tribal government programs, economic development, and self-sufficiency. As a result, all five Tribes have developed casinos. These include the Yakama Indians' Legends Casino; the Umatilla Indians' Wildhorse Casino Resort; the Warm Springs Indians' Indian Head Gaming Center; the Nez Perce Indians' Clearwater River Casino and It'SE YE YE Casino; and the Colville Indians' Mill Bay Casino, Coulee Dam Casino, and Okanogan Bingo-Casino. The casinos have become major employers of the Native American populations on the reservations they serve. In 1997 and 1998, casinos and gaming provided approximately 23 percent of Tribal employment (see Table 3-16).

3.8 ECONOMICS

Key Terms

aMW – Average megawatts per hour for every hour in the period from March through September for this project.

First Year Value – First year vlaue is the cost and foregone power revenues incurred in the first year of the 50-year analysis period.

Levelized Value – Constant stream of values, using a given iterest rate, that produces the same net present value as the non-constant stream of values (if future values change over time).

Net Present Value – Discounted values today of the future values using a given discount rate.

* *See Chapter 7 for a complete listing of all Key Terms.*

This section describes the regional need for power and the economic costs of implementing the fish conservation measures representing existing conditions for each of the three Mid-Columbia River dams.

3.8.1 EXISTING POWER NEEDS

Douglas County PUD owns the Wells Project, which has a capacity of 840 megawatts. A fixed portion of this power serves the needs of Douglas County residents, and the remaining power output is sold under long-term contracts to various utilities in the Pacific Northwest to meet their energy needs. When the PUD's share of the project output is not sufficient to meet the needs of Douglas County residents, the Douglas County PUD purchases the needed energy from other generating plants.

Chelan County PUD owns the Rocky Reach and Rock Island Projects, with power generation capacities of 1,280 megawatts and 624 megawatts, respectively. Power operations are similar to those described above for the Wells Project.

3.8.2 FUTURE LOAD PROJECTIONS

The Wells, Rocky Reach, and Rock Island Projects are part of the Northwest Power Pool subregion of the Western Electric Coordinating Council (previously known as the Western System Coordinating Council) region of the North American Electric Reliability Council. Peak summer demand of the Western Electric Coordinating Council region is expected to increase about 2.2 percent for the current 10-year planning period (2001 to 2010). The winter power demand in the Northwest Power Pool subregion is expected to increase an average of about 2.0 percent (the Northwest's peak power demand is in the winter). Energy load growth rates over this same period are expected to increase at 2.4 and 1.8 percent, for the Western Electric Coordinating Council and Northwest Power Pool, respectively.[4]

[4] See WSCC (Western Systems Coordinating Council), 10-Year Coordinated Plan Summary 2001-2010, August 2001. Note – WSCC is the predecessor organization to the WECC (Western Electricity Coordinating Council) created on April 18, 2002.

3.8.3 POWER GENERATION AND DEMAND BALANCE

The region currently has a balance of generation and demand (Western System Coordinating Council 2001). If an economic recovery occurs that results in an increased demand for energy, an imbalance of supply and demand will result in an energy shortfall. In addition to the imbalance in supply and demand, a loss of energy and capacity associated with the proposed project alternatives would impact the Northwest Power Pool transmission system during emergencies, when the generation is needed to stabilize the region's transmission system or to recover from an electrical outage. The location of these projects in relation to the Northwest Power Pool's transmission system can have a significant effect on the reliability of the transmission system. This is due to the substantial size of the projects' capacities and energy output, their location in the Northwest Power Pool's transmission system, and their location relative to the markets being served.

The impact of energy and capacity losses associated with the alternatives could be mitigated over time if new generation plants are brought on line. However, due to the volatility in the short-term energy prices within the Western Electric Coordinating Council region and the Northwest Power Pool region, plans to add more generation capacity have been either delayed or cancelled. If this trend continues, energy and capacity losses associated with the project alternatives may not be replaced, which would reduce the reliability of the transmission system in the region.

The total effect from lost energy and capacity and changes in prices depend on the number of new generating plants constructed over the next 50 years.

3.8.4 2002 COSTS FOR EXISTING CONDITIONS

Provided in Table 3-17 and illustrated in Figures F-1 through F-9 (Appendix F) are the annual costs for fish conservation measures for each of

the three dams. Costs include measures for juvenile and adult passage, hatchery-based compensation, monitoring and evaluation, and predator control but do not include or quantify other hydropower costs and benefits not associated with these fish conservation measures. The value of voluntary spill is calculated as the replacement cost of the foregone energy and capacity.

TABLE 3-17. ANNUAL COSTS OF MITIGATION MEASURES UNDER EXISTING CONDITIONS (IN MILLIONS OF DOLLARS)

FISH PROTECTION MEASURES[1]	WELLS	ROCKY REACH	ROCK ISLAND
Passage	3.6	7.3	0
Gas Abatement	0.2	0.25	0.25
Predator Control	0.2	0.2	0.2
Hatchery Program	2.9	0.9	2.5
Spill Program	0[2]	8.0	3.2
Monitoring and Evaluation	0.4	2.0	0.4

[1] Includes only baseline conditions.

[2] Included with passage program.

3.9 AESTHETICS

3.9.1 PROJECT AREA

The project area is located within the middle reach of the Columbia River, which is the geographic center of Washington State. However, because the project is on the east side of the Cascade Mountains, it is considered to be within eastern Washington. The project setting is primarily rural (with the exception of the urbanized areas of Wenatchee and East Wenatchee). In general, the area surrounding the three dams includes rangeland, irrigated farmlands, and a mixture of private and Federally owned lands.

3.9.1.1 Wells Dam

Wells Dam is located in an agricultural valley surrounded by scenic shrub-steppe desert. The land is mostly privately owned, and is used for orchards, rangeland, and residences. Federal lands managed by the BLM are located east (a small parcel close to the dam) and west (a larger parcel located 2 miles away) of the dam. Five miles to the northwest are the forest lands of the Okanogan National Forest. Views from the several waterfront parks in the area can be considered scenic, with the natural beauty of the Columbia River in the foreground, and the shrub-steppe hills in the background. Outside of the winter months, the intermingling of green, irrigated parcels with brown, non-irrigated parcels provides an impression of a desert and oasis. In the winter, much of the area is infrequently covered by snowfall.

3.9.1.2 Rocky Reach Dam

A broad river valley surrounds the Rocky Reach Dam, with apple orchards lining both sides of the Columbia River. Private residences, a residential subdivision, some commercial uses, and several parks are also part of the visual setting of the area. Similar to the Wells Dam vicinity, the land surrounding Rocky Reach reservoir is generally rural in character, with approximately half of the land being undeveloped shrub-steppe, grasslands, or exposed rock. The other half is developed for agriculture, recreation, and residential uses. Also similar to the Wells Dam vicinity, the several

parks and agricultural land intermixed with the non-irrigated shrub-steppe hills provide an impression of a desert and oasis setting outside of the winter months.

The reservoir impoundment (Lake Entiat) dominates the scene in the local area, being visible from a large area (the lake extends upriver about 43 miles and has a surface area of approximately 98,000 acres). Because the river terraces are relatively level and sparse vegetation is present, there is little or no visual screening of the project and impoundment. Where slopes along the shoreline are relatively gentle, narrow bands of riparian vegetation and wetland areas exist.

Adjacent to the visitor center and powerhouse, 30 acres of lawns and gardens add to the scenery. In addition, 8,000 colorful annual flowers are planted in a new design each year. A display of bright red, white, and blue annual flowers depicts the U.S. flag, and several varieties of dahlias add to the color at the visitor center grounds.

3.9.1.3 Rock Island Dam

The aesthetics in the vicinity of Rock Island Dam differ from the aesthetics in the vicinity of Wells and Rocky Reach dams in that the Columbia River valley narrows into steep bluffs in this area. The dam creates a 21-mile reservoir covering approximately 3,300 acres, along which several parks are located; there are no visible adjacent land uses because of the steep bluffs.

3.9.2 ASSOCIATED TRIBUTARIES

The main tributaries associated with the three dams include the Wenatchee, Entiat, Methow, and Okanogan Rivers (in order from south to north). The Wenatchee and Okanogan National Forests surround most of the Wenatchee, Entiat, and Methow Rivers, while the lower portion of the Okanogan River is bordered on the east by the Colville Indian Reservation. The scenery along all four rivers and their associated creeks is predominantly rural in the lowlands and forest in the higher elevations. The scenery in the lowlands varies between narrow valley floors surrounded by mountainous terrain, with numerous apple and other fruit orchards to rolling plateaus.

3.10 RECREATION

Recreational opportunities associated with streams and rivers are important to both residents and visitors. Both directly and indirectly, water-related activities and settings define an important part of the area's quality of life and economy. Public and private lands on and near the project area and its tributaries are used for a wide variety of recreational activities.

The original license for the Wells Dam included by reference general terms and conditions for major projects (FERC 1953). With regard to recreation, Article 7 states:

> So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent lands owned by the Licensee for the purpose of full public utilization of such lands and water for navigation and recreational purposes, including hunting and fishing, and shall allow to a reasonable extent for such purposes the construction of access roads, wharves, landings, and other facilities…

Policies on recreational use were clarified by Order No. 313, Issuing Statement of General

Policy, Recreational Development (FERC 1965). This order encourages preparation of comprehensive recreation plans for all projects. Pursuant to this and other FERC requirements, Douglas County PUD prepared public use and recreation plans for the Wells Project that are now part of the project license (FERC 1987a). Recreational facilities and improvements included in the plan are described below in Section 3.10.1, Project Area. The recreation plan is updated every 5 years.

The original license for the Rocky Reach Dam (FERC 1957a) included the same general terms and conditions regarding recreation described above for the Wells Dam. The recreation plan for the project (Exhibit R), prepared pursuant to Order No. 313 (FERC 1965) and other requirements, was approved in 1976 (FERC 1976). Since the plan's approval, Chelan County PUD has implemented the overall plan, with some small revisions submitted for FERC approval (Chelan County PUD 1991). The facilities and improvements included in the current plan are described below in Section 3.10.1, Project Area.

The original license for the Rock Island Dam (FERC 1957a) included the same general terms and conditions regarding recreation described above for the Wells Dam. Like the Rocky Reach Project, a recreation plan was prepared for the project and was approved (FERC 1989b). The plan is being implemented, with a request to expand the camping and picnicking facilities at the North Confluence Park (Chelan County PUD 1992). The facilities and improvements included in the plan are described below in Section 3.10.1, Project Area.

3.10.1 PROJECT AREA

Tourism and recreation are important to the local economies in the project area. The reservoirs formed by the three dams, as well as numerous public parks in the project area, are popular sites for recreational activities including boating, camping, swimming, hiking, soccer, softball, and football. While some recreational fishing occurs in the reservoirs, the relatively undeveloped shorelines and littoral zones and low water retention time in the reservoirs are factors that are not conducive to a high abundance of most resident fish (BPA 1995e). In addition, Washington State Regulations prohibit or limit fishing in the mainstem Columbia River due to the recent listing of threatened and endangered species. Descriptions of existing recreational facilities in the project area are provided below, followed by a brief discussion of existing recreational fishing conditions.

3.10.1.1 Existing Recreational Facilities

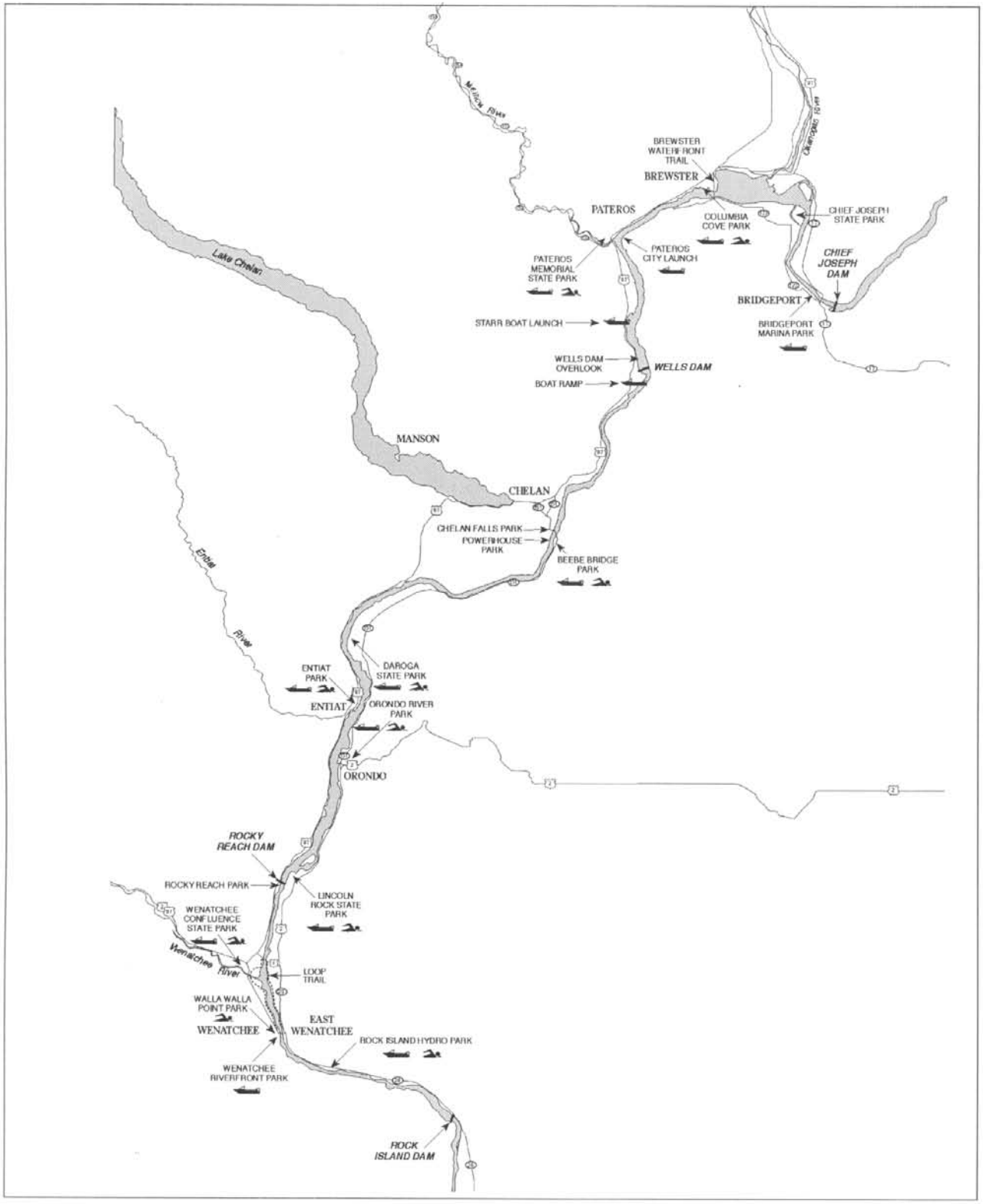
In addition to the public recreational facilities described below and shown on Figure 3-14 (listed proceeding upstream), there are many private residences along the reservoir with direct access to the water. Recreation at all sites on the river is most intensive during the summer season: Memorial Day through Labor Day. The opening of fishing season is also a period of peak activity.

Rock Island Hydro Park

Rock Island Hydro Park is located on 70 acres, 2 miles south of East Wenatchee on State Route 28. The park includes baseball/soccer fields (two with lights), picnic areas, picnic shelter, swimming, boat launch, boat trailer parking, tennis, volleyball, 1.1 miles of trail, and restrooms. In 1997, 180,913 people visited the park, while in 1998 the user numbers increased to 181,331 people. The park had the most users in July and August, with the lows occurring in October and November. The park is owned and managed by Chelan County PUD (Chelan County PUD 1999e).

Wenatchee Riverfront Park

Wenatchee Riverfront Park is located on 31 acres in downtown Wenatchee along the Rock Island



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SCALE IN MILES

0 2.3 4.6

N

WATER DEPENDENT FACILITIES

Boat Ramp

Swimming Beach

Figure 3-14
Project Area Parks

reservoir. The park includes 1.1 miles of shoreline trail, special event mini-railroad, ice rink, two-lane boat launch, short-term moorage, boat trailer parking, and restrooms. The park trail connects with Walla Walla Point Park and the Wenatchee State Park to provide 5 miles of paved bicycle and pedestrian trail. This trail connects through bridges to East Wenatchee, where the Apple Capitol Recreation Loop trail follows the east bank of the reservoir. In 1997, 964,654 people visited the park. In 1998, the park had an increase to 969,804 visitors. The park was busiest between July and August, with the lowest amount of activity occurring in October and November. The park is owned and managed by Chelan County PUD (Chelan County PUD 1999e). The East Wenatchee segment of the trail is managed by the Douglas County Parks Department.

Walla Walla Point Park

Walla Walla Point Park is located on 70 acres in Wenatchee (and adjoins Wenatchee Riverfront Park). The park includes a fourplex soccer/ softball complex (each with field lights), swimming, 1.2 miles of trail, tennis, volleyball, horseshoe pits, playground equipment, restrooms, picnic shelters, and a special events area. In 1997, 635,649 people visited the park, with the majority of the use occurring during daytime as opposed to overnight park users. In 1998, the user numbers increased to 655,364 people, continuing the same trend of daytime use. The park had the most users between July and August, with the lows occurring in October and November. The park is owned and managed by Chelan County PUD (Chelan County PUD 1999e).

Wenatchee Confluence State Park

Wenatchee Confluence State Park is located on 200 acres in Wenatchee on both sides of the Wenatchee River where it joins the Columbia River. The park includes camping (59 tent/recreational vehicle sites, 51 of which have electricity, water, and sewer), baseball/soccer field, two-lane boat launch, boat trailer parking, swimming, restrooms, showers, picnic shelter, volleyball, tennis, playground equipment, Wenatchee River pedestrian bridge, 4.5 miles of trail, wildlife area, interpretive graphics, and a recreational vehicle dump station. An estimated 362,322 people visited the park in 1997, with the majority of the use occurring during daytime as opposed to overnight park users.

In 1998, the park had an increase to 485,266 people, continuing the same trend of daytime use. The significant increase in visitors from 1997 to 1998 is primarily due to the flooding that occurred in 1997 that inhibited many visitors from using the park's facilities. The park saw the most visitors between July and August, with very low activity occurring in October and November. The park is owned by Chelan County PUD (Chelan County PUD 1999e) and leased to the Washington State Parks and Recreation Commission.

Rocky Reach Dam

Rocky Reach Dam and visitor facilities are located on 38 acres, 6 miles north of Wenatchee on State Route 97A. The visitor facilities include extensive landscaping, 20 picnic areas, 2 picnic shelters, playground equipment, 2 horseshoe pits, visitor center, fish viewing room, historical galleries, 3 restrooms, and 241 parking spaces. In 1998, 276,488 people visited the park, while in 1999 the user numbers increased to 289,827. Most people visit the park between Memorial Day and August, with very little activity from September through April. The facilities are owned and managed by Chelan County PUD (Chelan County PUD 1999e).

In support of the relicensing process for the Rocky Reach hydroelectric project, the Chelan County PUD recently completed a detailed recreation study, which included a recreation

resources inventory, a recreation needs forecast and analysis, and a recreational use assessment. The *1999/2000 Recreational Use Assessment Study Report* (Howe Consulting, Inc. and Duke Engineering & Services, Inc. 2001a) assessed recreation occurring at existing developed recreation sites and dispersed uses within the Rocky Reach Project boundary (from Rocky Reach Dam to Wells Dam). The *Recreation Resources Inventory Summary Report* (Howe Consulting, Inc. and Duke Engineering & Services, Inc. 2001b) assessed developed and undeveloped recreational sites located on public and private lands; mitigation lands; lands owned and/or managed by Federal, State, and local agencies; and lands owned by non-government organizations. The inventory also assessed the adequacy of access to the project reservoir from adjacent lands. The *Recreation Needs Forecast and Analysis* (Howe Consulting, Inc. and Duke Engineering & Services, Inc., 2001c) assessed the recreation needs in the Rocky Reach Project area.

Lincoln Rock State Park

Lincoln Rock State Park is located on 65 acres, 7 miles north of East Wenatchee on State Route 2. The park includes camping (94 tent/recreational vehicle sites: 35 with electricity and water; 32 with electricity, water, and sewer; and 27 standard), a baseball field, a three-lane boat launch, 6 tie-up docks, 102 boat trailer parking spaces, short-term moorage, swimming, 6 restrooms (44 toilets, 12 showers), 166 picnic tables, 3 picnic shelters, playground equipment, an open court area, 2 volleyball courts, 2 tennis courts, 3 horseshoe pits, amphitheater, concession building, recreational vehicle dump station, and 148 day-use parking spaces.

In 1998, 256,508 people visited the park, with the majority of the use occurring during daytime as opposed to overnight. In 1999, the user numbers decreased to 232,181 people, but still continued the same trend of daytime use. The decrease in visitors from 1998 to 1999 can be attributed to charges that began in 1998 for daytime park users and also an increase in camping fees. The park has the most users between Memorial Day and August, with lows occurring from September through April. The park is owned by Chelan County PUD (Chelan County PUD 1999e) and is leased to the Washington State Parks and Recreation Commission.

Turtle Rock Island

Turtle Rock Island is a 160-acre island located approximately 2 miles upstream from the Rocky Reach Dam. A small (less than 1 acre) sandy beach attracts boat-in visitors to the island. While no recreational facilities are located on the island, boat-in visitors use the beach for swimming and relaxing. Given the small size of the beach area, use is limited by the number of boats (approximately four to five) that the beach can accommodate at one time. The island possesses wildlife habitat value, and a Washington State fish hatchery is located on the island. The site is owned by Chelan County PUD (Chelan County PUD 1999e).

Orondo River Park

Orondo River Park is located on 5 acres on the east side of Rocky Reach reservoir, approximately 2 miles north of Orondo. The park includes 14 recreational vehicle sites (10 with electricity and water), 10 to 15 tent sites, 1 restroom (4 toilets, 4 showers), swimming, a volleyball court, a one-lane boat launch, 3 tie-up docks, 14 boat trailer parking spaces, short-term and overnight moorage, 14 picnic tables, a picnic shelter, concessions, a horseshoe pit, JetSki rentals and marine gas, and 22 day-use parking spaces. A total of 36,824 people visited the park in 1998, with the majority of the use occurring during daytime as opposed to overnight. In 1999, visitor numbers increased to 43,278, continuing the same trend of daytime use. Memorial weekend through August were the busiest times for visitors, while September through April were the months that had the least number of visitors.

The park is managed by the Port of Douglas County.

Daroga State Park

Daroga State Park is located on 140 acres on the east shore of Rocky Reach, 8 miles north of Orondo. The park offers camping (28 tent/recreational vehicle sites with electricity and water, 17 walk-in or boat-in sites, and 2 group camping areas), a baseball field, a soccer field, 2 basketball courts, an open court area, tennis courts, a two-lane boat launch, boat trailer parking, playground equipment, a combination tennis and basketball court, short-term moorage, swimming, 4 restrooms (38 toilets, 12 showers), 3 picnic shelters, a 2.5-mile shoreline trail, and a recreational vehicle dump station. In 1998, 137,360 people visited the park, with the majority of the use occurring during daytime as opposed to overnight camping. In 1999, visitors increased to 164,611 people, continuing the same trend of daytime use. The park had the most users between Memorial weekend and August, with the lows occurring between September and April. The park is owned by Chelan County PUD (Chelan County PUD 1999e) and is leased to the Washington State Parks and Recreation Commission.

Entiat Park

Entiat Park is located on 40 acres on the west side of Rocky Reach reservoir in Entiat. The park includes camping (50 tent sites and 31 recreational vehicle sites with complete hookups), boat launch, boat trailer parking, swimming, 3 restrooms (12 toilets, 4 showers), recreational vehicle dump station, playground equipment, 108 picnic tables, 1 picnic shelter, a volleyball court, 2 horseshoe pits, and 43 day-use parking spaces. In 1998, 150,278 people visited the park. The majority of the park was used for daytime activities rather than camping. In 1999, use decreased to 84,390 people, continuing the same trend of daytime use. The significant decrease from 1998 to 1999 can be attributed to 'counting device' construction changes that occurred near the entrance to the park. A new counter was installed in 1999, replacing an inadequate and often inaccurate counting device. The park had the most users between Memorial weekend and August, with the lows occurring from September through April. The park is managed by the City of Entiat Parks and Recreation Department.

Beebe Bridge Park

Beebe Bridge Park is located on 56 acres on the east shore of Rocky Reach reservoir, 21 miles north of Orondo on State Route 97. The park offers camping (46 tent/recreational vehicle sites with electricity and water), 3 restrooms (24 toilets, 6 showers), 196 day-use parking spaces, 14 picnic tables plus 14 more in a picnic shelter, a swimming area, a two-lane boat launch, short-term boat moorage, 2 tennis courts, playground equipment, a baseball field, a soccer field, a volleyball court, an open court area, a shoreline trail, and a recreational vehicle dump station. In 1998, 109,923 people visited the park, with the majority of the use occurring during daytime as opposed to overnight. In 1999, there was a decrease to 97,346 visitors, the majority of the visitors using the park for daytime activities. The park had the most users between Memorial weekend and August, with the lows occurring from September through April. The park is managed by Chelan County PUD (Chelan County PUD 1999e).

Wells Dam Overlook

The Wells Dam Overlook is a tree-filled park overlooking the Columbia River and Wells Dam. The park includes a turbine runner from Wells Dam on display, an interpretive area, a petroglyph display, picnic shelter, and restrooms. No use estimates are available. The park is managed by Douglas County PUD. Boat launch facilities are provided below Wells Dam and to the north of the dam off of Highway 97.

Pateros Memorial Park

Pateros Memorial Park is located in the town of Pateros at the confluence of the Methow and Columbia Rivers on the Wells reservoir. The park includes a paved pedestrian walkway along the riverfront, picnic shelters, boat launches, fishing and ski docks, and restrooms.

Pateros City Boat Launch

Also in Pateros is a boat launch located at the upstream end of Memorial Park. This boat launch is open all year round and contains a dock and parking sites. This launch is also managed by the city of Pateros.

Peninsula Park

Also in Pateros, Peninsula Park on the Methow has a swimming area, picnic shelter, restrooms and play area. No use estimates are available for this park. The park is managed by the City of Pateros. A boat launch facility with toilets is provided on the Methow River just above Pateros and off of State Route 153.

Columbia Cove Park

Columbia Cove Park is located in Brewster and is a day-use area complete with a sandy beach and swimming area, picnic shelters, boat launch and dock facilities, basketball court, play area, and restrooms. It is located adjacent to ball fields and the city swimming pool. No use estimates are available. The park is managed by the City of Brewster.

Brewster Waterfront Trail

The Brewster Waterfront Trail is a ½-mile graveled pedestrian walkway along the Wells reservoir adjacent to the downtown area. The park includes picnic areas and benches. The park is accessible at several locations. No use estimates are available. The park is managed by the City of Brewster. Boat launch facilities, with public toilet, are also provided on the Okanogan River, upstream of Monse.

Chief Joseph State Park

This park is located on an island on the south shore of Wells reservoir, west of Bridgeport. The park is largely undeveloped, with a simple boat launch. No motor vehicles are allowed on the island. No estimates of use are available for the park. The park is managed by the Washington State Parks and Recreation Commission.

Bridgeport Marina Park

The Bridgeport Marina Park is located adjacent to the Wells reservoir in Bridgeport. The park includes 18 full hookup recreational vehicle sites, 2 tent pads, restrooms, a playground, beach and swimming area, boat docks, 2 boat launches, picnic shelters, and a gazebo. In 1997, 69,108 people visited the park, with the majority of the use occurring during daytime as opposed to overnight. In 1998, the user numbers increased to 74,131 people, continuing the same trend of daytime use. The park had the most users between July and August, with the lows occurring in October and November. The park is managed by the City of Bridgeport.

3.10.1.2 Recreational Fishing

Washington State Fishing Regulations for 2002 indicate that recreational fishing within the project area is open year-round for game fish other than trout (smallmouth bass, walleye), and is operated as catch and release only for sturgeon all year. In addition, fishing is open to summer/fall-run chinook salmon due to the strong return of these fish in 2002. Fishing for trout in the project area at all three dams is closed at all times, as is fishing between the upstream line of each dam to boundary markers 400 feet downstream of the fishladders at Rocky Reach and Rock Island dams, and 400 feet downstream of the spawning channel discharge (on the Chelan

County side) and the fishladder (on the Douglas County side) at Wells Dam. Fishing for spring-run chinook, steelhead, and bull trout is closed due to their Federal listing status. However, when numbers of hatchery returning fish exceed escapement goals, there are provisions for a limited steelhead fishery in the Okanogan and mainstem Columbia Rivers.

In addition to the game fish species mentioned above, over 20 other species (such as northern pikeminnow, whitefish, northern squawfish, and pumpkinseed) may be taken by anglers while fishing in the project area. However, in a dissolved gas monitoring survey conducted by Dell et al. (1975), resident game fish accounted for less than 2 percent of the total of 32,289 fish sampled. A description of the resident fish expected to occur in the project area is included in Section 3.2.8, Species of Concern, along with brief life-history descriptions.

Angling activity specific to the Rocky Reach reservoir was documented in the *1999/2000 Recreational Use Assessment Study Report* (Howe Consulting, Inc. and Duke Engineering & Services, Inc. 2001a) prepared as part of the relicensing process for the Rocky Reach Dam. Boat runs, car runs, and on-site interviews were conducted during mid-day and early afternoons, and creel surveys were conducted in the early morning and late afternoon/early evening.

In summary, relatively few anglers were observed in Rocky Reach reservoir or along undeveloped shorelines. During the peak season, an average of less than two people per day were observed shore angling at public recreation sites, with most of the people observed during weekday observations. During peak-season boat runs, people in about 5 percent of the boats were observed angling. An average of approximately 1.5 boats per weekday and an average of 6 boats per weekend day were observed being used for angling. During fall season boat runs, approximately 40 percent of the boats observed were used for angling. An average of almost five anglers per day were observed along undeveloped shorelines during peak-season weekends. No anglers were observed along undeveloped shorelines during weekday boat runs. The most angling activity that was observed during monitoring efforts was during late summer, when summer/fall-run chinook salmon fishing was open on the Columbia River (opened August 10 and closed October 21, 2000).

3.10.2 ASSOCIATED TRIBUTARIES

3.10.2.1 Existing Recreational Opportunities

The four tributary rivers (Okanogan, Methow, Entiat, and Wenatchee) are popular for a variety of recreational activities. Active recreation on these rivers includes kayaking, rafting (private and commercial), other boating, fishing, and swimming. The rivers are indirectly related to camping, hiking, bird watching, and similar outdoor activities that benefit from a waterfront setting.

The Interagency Committee for Outdoor Recreation (IAC) has Statewide responsibility for assisting local, State, and Federal agencies in planning, acquiring, and developing recreational resources. In 1990, the IAC published detailed profiles of each county, including an inventory of recreational facilities by type of provider. Summaries of the profiles for the three counties within the project area (Chelan, Douglas, and Okanogan counties) are shown in Tables 3-18, 3-19, and 3-20. The IAC updated this inventory in 1995, but the updated version does not categorize the data by county, thus the 1990 data remains the most current information available.

Chelan County includes large areas of Federally managed lands used for recreation and other purposes. These include the Wenatchee National Forest, North Cascades National Park, Lake Chelan National Recreation Area, and several wilderness areas. The county has trails for hiking, horseback riding, and off-road vehicle riding. The Wenatchee River is popular for recreation. Fishing is currently closed except for

TABLE 3-18. RECREATIONAL FACILITIES IN CHELAN COUNTY BY TYPE OF PROVIDER, 1990

	LOCAL	STATE	FEDERAL	PRIVATE	TOTAL[1]
General					
Number of Sites	51	15	84	32	**182**
Developed Acres	527	42,049	838	4,959	**48,373**
Shoreline (feet)	26,464	124,576	196,390	14,390	**361,820**
Boating					
Moorage Slips	36	85	140	470	**731**
Moorage Buoys	0	4	0	26	**30**
Launch Lanes	6	8	0	6	**20**
Trailer Parking	110	313	35	348	**806**
Camping/Day Use					
Total Camp Units	402	454	764	874	**2,494**
Units with Hookups	201	31	0	671	**903**
Day Picnic Tables	363	128	65	ns[2]	**556**
Day Picnic Shelters	14	4	8	ns[2]	**26**
Swimming					
Indoor Pools	1	0	0	0[3]	**1**
Outdoor Pools	4	0	0	6[3]	**10**
Swimming Beach (feet)	2,368	786	0	380	**3,534**
Sports					
Baseball/Softball Fields	52	0	0	ns[2]	**52**
Football/Soccer Fields	22	0	0	ns[2]	**22**
Tennis Courts	35	0	0	14	**49**
Other Courts	35	0	0	ns[2]	**35**
Trail Miles					
Hike	0	25	1,414	ns[2]	**1,439**
Horse	0	5	1,301	ns[2]	**1,306**
Recreational Vehicle/Motorcycle	0	0	370	ns[2]	**370**

[1] More recent countywide date is not available.
[2] ns = not surveyed
[3] Private sector data reflects sites with pools only, not total number of pools.

Source: Interagency Committee for Outdoor Recreation (1990)

TABLE 3-19. RECREATIONAL FACILITIES IN DOUGLAS COUNTY BY TYPE OF PROVIDER, 1990

	LOCAL	STATE	FEDERAL	PRIVATE	TOTAL[1]
General					
Number of Sites	31	6	1	7	**45**
Developed Acres	247	3,067	58	73	**3,455**
Shoreline (feet)	1,650	32,800	21,120	8,720	**64,290**
Boating					
Moorage Slips	15	66	0	0	**81**
Moorage Buoys	0	0	0	0	**0**
Launch Lanes	3	7	1	4	**15**
Trailer Parking	120	640	30	3,512	**4,302**
Camping/Day Use					
Total Camp Units	33	96	0	285	**414**
Units with Hookups	12	67	0	165	**244**
Day Picnic Tables	135	60	6	ns[2]	**201**
Day Picnic Shelters	10	3	0	ns[2]	**13**
Swimming					
Indoor Pools	1	0	0	0[3]	**1**
Outdoor Pools	3	0	0	1[3]	**4**
Swimming Beach (feet)	0	180	0	0	**180**
Sports					
Baseball/Softball Fields	14	0	0	ns[2]	**14**
Football/Soccer Fields	7	0	0	ns[2]	**7**
Tennis Courts	17	0	0	0	**17**
Other Courts	5	0	0	ns[2]	**5**
Trail Miles					
Hike	0	0	0	ns[2]	**0**
Horse	0	0	0	ns[2]	**0**
Recreational Vehicle/Motorcycle	0	0	0	ns[2]	**0**

[1] More recent countywide date is not available.
[2] ns = not surveyed
[3] Private sector data reflects sites with pools only, not total number of pools.

Source: Interagency Committee for Outdoor Recreation, 1990

TABLE 3-20. RECREATIONAL FACILITIES IN OKANOGAN COUNTY BY TYPE OF PROVIDER, 1990

	LOCAL	STATE	FEDERAL	PRIVATE	TOTAL[1]
General					
Number of Sites	76	47	68	33	**224**
Developed Acres	1,053	47,724	525	3,048	**52,350**
Shoreline (feet)	54,970	182,797	199,865	50,525	**488,157**
Boating					
Moorage Slips	0	41	0	38	**79**
Moorage Buoys	0	0	0	0	**0**
Launch Lanes	26	35	11	8	**80**
Trailer Parking	108	1,110	53	94	**1,365**
Camping/Day Use					
Total Camp Units	247	640	1,662	1,271	**3,820**
Units with Hookups	72	103	0	740	**915**
Day Picnic Tables	230	221	96	ns[2]	**547**
Day Picnic Shelters	22	9	2	ns[2]	**33**
Swimming					
Indoor Pools	0	0	0	0[3]	**0**
Outdoor Pools	7	0	0	9[3]	**16**
Swimming Beach (feet)	1,890	1,987	0	500	**4,377**
Sports					
Baseball/Softball Fields	34	0	0	ns[2]	**34**
Football/Soccer Fields	10	0	0	ns[2]	**10**
Tennis Courts	28	0	0	7	**35**
Other Courts	9	0	0	ns[2]	**9**
Trail Miles					
Hike	0	0	1,349	ns[2]	**1,349**
Horse	0	0	1,302	ns[2]	**1,302**
Recreational Vehicle/Motorcycle	0	0	270	ns[2]	**270**

[1] More recent countywide date is not available.
[2] ns = not surveyed
[3] Private sector data reflects sites with pools only, not total number of pools.

Source: Interagency Committee for Outdoor Recreation, 1990

whitefish in the winter. Kayaking and commercial whitewater rafting are popular from Leavenworth downstream. Lake Wenatchee and Wenatchee State Park are popular locations for swimming and boating. Both public (USFS) and private campgrounds are located along the entire river. Also in Chelan County, the Entiat River provides a setting for several USFS campgrounds. A listing of the 1990 recreational facilities in Chelan County is provided in Table 3-18 (more recent countywide data on both public and private facilities are not available).

In contrast to Chelan and Okanogan counties, Douglas County does not have large areas of land under public ownership. Most camping facilities, especially those with hookups, are provided by the private sector. There are few sporting facilities (see Table 3-19). Most of the camping and day use facilities are provided by the private sector. As would be expected from the low amount of recreational facilities available, travel and recreation have a relatively small impact on the local economy in Douglas County.

Similar to Chelan County, Okanogan County has large areas of Federally managed lands used for recreation and other purposes. These include Okanogan and Colville National Forests and Pasayten and Lake Chelan-Sawtooth wilderness areas. Travel and recreation have a large effect on the county economy (see Table 3-20). On the Methow River and below Mazama, most recreational sites are privately operated. Above Mazama, the USFS provides camping and access. The river is used for fishing, rafting, and kayaking. The Okanogan River provides fishing and boating. Most camping facilities on the river are privately operated.

Tourists expend more dollars on hotels in Chelan County, while campground spending is greatest in Okanogan County (Table 3-21). Because of the increased number of hotels in the Wenatchee area, greater tourist employment opportunities occur in Chelan County, with a corresponding increase in income from local and State taxes.

TABLE 3-21. ESTIMATED TRAVEL IMPACTS BY COUNTY, 1997

	CHELAN	DOUGLAS	OKANOGAN
Campground Spending ($000)	31,810	1,670	32,940
Hotel, Motel, B&B Spending ($000)	112,110	6,400	32,410
Travel-generated Payroll ($000)	39,680	4,040	18,340
Travel-generated Employment (# jobs)	3,650	380	1,690
Local and State Taxes ($000)	14,550	1,710	7,190

Source: Dean Runyan Associates (1998)

3.10.2.2 Recreational Fishing

Washington State Fishing Regulations for 2002 indicate that some recreational fishing occurs in the four tributaries to the project area. However, the entire area is generally closed to salmon and steelhead fishing.

The Entiat River, from its mouth to Entiat Falls, is open for whitefish only from December 1 through March 31. The rest of the year, this section of the Entiat River is closed to recreational fishing.

The Methow River, from its mouth to Gold Creek and from Weeman Bridge to the falls above Brush Creek, is open for whitefish only from December 1 through March 31. The rest of the year, these sections of the Methow River are closed to recreational fishing. The Methow River from Gold Creek to Weeman Bridge (8 miles upstream from Winthrop) is open (catch and release) for all game fish from June 1 through September 30, and for whitefish only from December 1 through March 31. The Twisp and Chewuch Rivers are open to catch and release trout fishing while the Lost River is open to limited retention fisheries for bull trout, rainbow trout, and cutthroat trout. The Methow River tributaries that are not listed in special rules are open June 1 through October 31 for all game fish, but closed to salmon and steelhead.

The Okanogan River, from its mouth to the highway bridge at Malott, is open year-round for all game fish other than trout, salmon, and steelhead. Upstream of the highway bridge at Malott, the Okanogan River is open to fishing for the same species from June 1 through August 31. The Okanogan River is closed to fishing for salmon, steelhead, and resident trout at all times although it was open for chinook salmon fishing in 2002, and steelhead fishing in 2001.

The Wenatchee River, from its mouth to Lake Wenatchee, is currently closed to all fishing.

3.11 CULTURAL RESOURCES

Key Terms

Character Defining Features – The components of an historic property that contribute to its historical significance.

Cultural Resource – Nonrenewable evidence of human occupations or activity as seen in any district, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature associated with the cultural practices or beliefs of a living community.

Historic Integrity – The extent to which a property has retained its original design and setting.

Historic Property – A property listed on the National Register of Historic Places.

National Register of Historic Places – The official Federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

Section 106 of the Historic Preservation Act – A Federal regulation that requires properties with Federal involvement to take into consideration impacts to properties listed in or eligible for the National Register.

* *See Chapter 7 for a complete listing of all Key Terms.*

The cultural resource properties in the project area include archaeological sites, historical sites, and traditional cultural properties. These properties are defined as a location associated with a "community's historically rooted beliefs, customs, and practices," which may include geographic places and natural resources.[5] Congress developed Section 106 of the National Historic Preservation Act to avoid unnecessary harm to historic properties. Section 106 applies to "properties already listed in the National Register, properties determined eligible for listing, and properties not formally determined eligible but that meet specified eligibility criteria."[6]

Assessment of National Register of Historic Places eligibility entails evaluation of cultural properties identified under a set of criteria specified in 36 CFR 60.4:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association, and:
>
> - that are associated with events that have made a significant contribution to the broad patterns of our history; or
> - that are associated with the lives of persons significant in our past; or
> - that embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> - that have yielded, or may be likely to yield, information important in prehistory or history.

3.11.1 PREHISTORIC ARCHAEOLOGY

Archaeologists generally agree that a five-phase system represents a simplified prehistory of the Columbia Plateau region, which includes the Rock Island and Rocky Reach dam areas and the areas surrounding the tributaries that flow into the

[5] National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties, p. 1.

[6] Advisory Council on Historic Preservation workbook, Section 106, Step-by-Step.

Columbia River near these dams. The prehistory of the Wells Dam area follows a similar, but distinct, chronological sequence that is described later in this section. The Columbia Plateau phases (Clovis, Windust, Vantage, Frenchman Springs, and Cayuse) each represent a time period possessing distinct settlement and/or subsistence patterns. Researchers have interpreted differences between the phases to represent changes in subsistence and settlement systems, or adaptational shifts. Table 3-22 presents a prehistoric sequence for the Columbia Plateau, defining the periods in terms of archaeological characteristics and chronological sequence.

Table 3-23 presents the chronological sequence for the lower Okanogan valley region, which includes the Wells Dam area. The tables show the phases, from top to bottom, from the most recent to the oldest defined for the region. This arrangement mirrors an archaeological stratigraphic profile, with the youngest materials, deposited most recently, nearest the top. The paragraphs following these tables, which expand on the information presented in them, are presented in chronological order: from oldest to most recent.

Although it is uncertain when people first arrived in the area, the occasional discovery of Clovis projectile points suggests a minimum date somewhere between 12,000 and 11,000 years Before Present (BP). The Clovis point, a large, bifacially flaked point with a large "flute" or flake scar at the base, is the most diagnostic artifact type of this period (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982). In Washington to date, there have been no extensive analyses published on these early materials. The cache of approximately 14 Clovis points discovered near Wenatchee yield proxy tephra dates of post-11,250 BP (Mehringer 1989). Consequently, the characteristics of settlement and subsistence during this period are purely conjectural. Based on evidence from elsewhere in the United States, however, archaeologists believe that Clovis-age settlement consisted of small, highly mobile bands of hunter-gatherers. Although many researchers cite Clovis points as evidence for big-game hunting, it is possible that these early inhabitants of the region had a more generalized adaptation, based on the wide distribution of these points in varied environments.

By 10,500 years BP, small, highly mobile bands populated the developing grasslands using a generalized subsistence strategy that was seasonally structured around a complex resource base. Similarly, technological innovations allowed for more intensive use of certain seasonal resources. The most diagnostic artifact is a large, stemmed or lanceolate projectile point. Other stone artifacts include bifacially flaked knives, wide, flat endscrapers, gravers, burins, bola stones, grooved net sinkers, milling stones, choppers, and simple flake tools. Bone tools include wedges, single-piece and composite harpoons, foreshafts, atlatl spurs, awls, and needles. Sparse scatters of artifacts covering areas no greater than a few hundred square meters suggest small group size and high mobility. Habitation sites included rockshelters, caves, and open areas that were frequently reused over long periods of time (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982).

Riverine sites adjacent to rapids contain an abundance of fish remains and associated artifacts, such as grooved net sinkers and gorges. This evidence indicates increasing intensification of anadromous fish populations in the Columbia and its tributaries. In drier, upland sites, a predominance of milling stones suggests that seed gathering was also an important aspect of subsistence. The diverse composition of faunal and floral remains indicates that subsistence, while still generalized, was increasingly structured by seasonally abundant or available resources (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982).

TABLE 3-22. COLUMBIA PLATEAU CHRONOLOGICAL SEQUENCE

YEARS BP[1]	DESCRIPTION OF CULTURE HISTORICAL PHASES	
150-present	**Historic Period**	**Historic Period.** Euroamericans settle in region.
250-150	**Late Prehistoric Period**	**Ethnographic Period.** Introduction of Euroamerican technology and non-indigenous diseases lead to culture change and significant population collapse for Native American groups.
2500-250		**Cayuse Phase.** Population concentrated in large, nucleated winter villages of 50+ housepits. People dispersed to gather roots in the spring and to hunt in the fall and winter. This seasonal round became increasingly diverse and well organized over time. Trade with coastal groups was common. The phase includes contracting-stemmed projectile points and triangular basal or corner-notched projectile point types.
4500-2500	**Middle Prehistoric Period**	**Frenchman Springs Phase.** Introduction of semi-subterranean houses and more specialized camps for hunting, root collecting, and plant processing. Several styles of contracting-stemmed points predominate. Many have argued that the ethnographically observed "Plateau Culture" had emerged by the end of the phase. Diagnostic projectile points include leaf-shaped points, broad-stemmed points with rounded shoulders, and triangular points with concave, expanding bases.
8000-4500		**Vantage Phase.** Inhabitants were highly mobile, opportunistic foragers adapted mainly to riverine environments. Increasing reliance on fish with less use of game. Sites are located along stream margins and points are similar to those of the Windust Phase. Leaf-shaped (Cascade) and large (Cold Spring) side-notched projectile point types used, likely as atlatl tips.
10,500-8000	**Early Prehistoric Period**	**Windust Phase.** Characterized by small, highly mobile bands of foragers/collectors who exploited plant and animal resources using a seasonal settlement system. Sites are generally small and exhibit low artifact densities. Diagnostic of the phase are large, shouldered or basal notched lanceolate projectile points.
12,000-10,500		**Clovis.** Characterized by small, highly mobile bands of hunter/gatherers that exploited a wide range of subsistence resources, including bison and elk. Sites are usually small, exhibit low artifact densities, and are associated with older landforms, especially upland plateaus. Large lanceolate, fluted projectile points (Clovis points) are diagnostic.

[1] Before Present
Source: Chatters (1989); Galm et al. (1987); Lothson et al. (1982)

TABLE 3-23. CHRONOLOGICAL SEQUENCE FOR THE LOWER OKANOGAN VALLEY REGION

YEARS BP[1]	DESCRIPTION OF CULTURE HISTORICAL PLACES
c. 1,000 - present	Cassimer Bar. Introduction of Euroamerican technology and non-indigenous diseases lead to culture change and significant population collapse for Native American groups. Increase in seasonal mobility and a shift to portable mat houses. People dispersed to gather roots in the spring and to hunt in the fall and winter. This seasonal round became increasingly diverse and well organized over time. Trade with coastal groups was common. The phase includes smaller triangular square shouldered with low corner notches and triangular basal-notched projectile point types (Columbia Corner Notched, Columbia Stemmed).
c.3,000-c.1,000	Chiliwist. More specialized camps for hunting, fishing, root collecting, and plant processing. Several styles of contracting-stemmed points predominate. Change from small dispersed winter pithouse habitation to aggregation into winter villages during this phase. Diagnostic projectile points include triangular slightly shouldered contracting-stemmed points, and triangular points with square shoulders and straight to slightly contracting stems (Nespelem Bar, Rabbit Island Stemmed).
c.4,700-c.3,000	Indian Dan. Introduction of semi-subterranean houses. Inhabitants were highly mobile, opportunistic foragers adapted mainly to riverine environments. Increasing reliance on fish with less use of game. Camps and single pithouses are located along stream margins on upper terraces. Projectile points are large, shouldered or unnotched lanceolates (Mahkin Shouldered, Cascade).
8,000-c.4,700	Okanogan. Characterized by small, highly mobile bands of foragers/collectors who exploited plant and animal resources using a seasonal settlement system. Sites are generally small and exhibit low artifact densities. Diagnostic of the phase are large basal notched lanceolate projectile (Cascade) points.
11,000-8,000	Clovis. Characterized by small, highly mobile bands of hunter/gatherers that exploited a wide range of subsistence resources, including bison and elk. Sites are usually small, exhibit low artifact densities, and are associated with early landforms, especially upland plateaus. Large lanceolate, fluted projectile points (Clovis points) are diagnostic.

[1] Before Present
Source: Chatters (1986); Grabert (1968a); Hollenbeck and Carter (1986)

Between 8,000 and 4,500 years BP, inhabitants of the region restricted their range to riverine areas, with some use of upland montane environments. With a gradual warming of the climate, regions became drier and subsistence activities became progressively less variable across the seasons. Inhabitants were probably organized as highly mobile, opportunistic foragers adapted mainly to riverine environments. Graves containing beads of olivella shells indicate that trade took place, at least indirectly, between the Pacific coast and the Columbia River Basin.

Sites and isolated projectile points dating to this period are located within river basins and at the confluence of major rivers. Faunal assemblages at these sites indicate that opportunistic hunting was restricted to a narrow range of vertebrate species. Among these species, deer and rabbit predominate followed by coyote and birds. Aquatic species, however, are found in much greater frequencies than terrestrial species, suggesting an increased focus on riverine resources as the climate warmed. Overall, the remains of freshwater mussels predominate, followed by salmon, sturgeon, or trout remains (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982).

Between 4700 and 4500 years BP, an increase in precipitation in the region significantly altered the nature and distribution of land use during this period. Non-riverine environments gradually became more productive, leading to more diversely structured micro-environments affecting local adaptations. In addition to open sites and

rockshelters, riverine and some non-riverine environments contain pithouses. Some inhabitants were probably sedentary foragers living in widely dispersed pithouses, strategically located in game wintering areas, while others, especially along the Mid-Columbia River, maintained a mobile, opportunistic foraging adaptation. Except for a hiatus between 3800 and 3400 years BP, pithouses become more frequent throughout the period.

Toward the end of the period, non-pithouse sites are believed to reflect functionally distinct habitations including hunting camps, shell-fish processing camps, fishing camps, and plant-processing camps. Inhabitants of the region structured mobility around the availability of annual resources. Along with evidence of an increase in the use of seasonally available resources, archaeologists noted an increase in the evidence of food storage technology. Storage pits found in pithouse and rockshelter floors often contain the remains of salmon, deer, roots, and fresh-water mussels (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982).

A return to drier conditions by 2300 to 2200 years BP affected the nature and distribution of land use. As resource productivity and diversity decreased, resources became concentrated into fewer productive patches. Archaeological evidence indicates:

- intensification of resource collection within these more patchy micro-environments; and
- an increase in travel time between resources.

Researchers have noted the wide distribution of villages of 10 to 200 pithouses on the middle and Upper Columbia River. Common artifacts of this period include narrow contracting-stemmed projectile points and triangular basal- or corner-notched points, stone bowls, elongated pestles, self-handled mauls, nephrite adze blades, tubular stone pipes, beads of clam, olivella, and dentalium shell, pendants of abalone shell, and anthropomorphic and zoomorphic rock carvings. In the winter, people inhabited pithouse clusters, often in defensible locations. In the spring, they dispersed into small foraging groups inhabiting temporary root camps or fishing camps. Fishing was a mainstay in the summer and fall months. People stored fish, large game, and root crops for consumption during the winter months when small groups aggregated into large villages (Chatters 1989; Galm et al. 1987; Hollenbeck and Carter 1986; Lothson et al. 1982).

3.11.1.1 Wells Dam Area

G.F. Grabert (1968a) conducted salvage excavations in the Wells reservoir in the late 1960s. He noted that sites occur along much of the shoreline, with the exception of the right bank between Brewster and the mouth of the Okanogan River and the left bank between Brewster and Bridgeport. The majority of the recorded sites are small procurement camps, although pithouse villages occur near the mouth of the Okanogan River (Grabert 1968a).

Salvage excavations conducted by Chatters in the reservoir area during the early 1980s further refined Grabert's cultural phases, as shown in Table 3-18 (Chatters 1986; Grabert 1968a). Chatters excavated 13 sites with 28 structures situated on two terraces just above the reservoir. These sites yielded radiocarbon dates ranging between 360 and 7,730 BP, which indicated that large pithouses appeared after 4,040 BP (Chatters 1986).

Prehistoric use of the environments in the Wells Dam area could have resulted in sites similar to those described for the Rock Island and Rocky Reach dams.

3.11.1.2 Rocky Reach Dam Area

During the late 1950s, Washington State University surveyed the inundation area for the proposed Rocky Reach Dam reservoir and

selected several sites for salvage excavation. These early investigations recorded pithouses, hunting/fishing/gathering camps, and river mussel shell middens (Gunkel 1961).

In 1983, Washington State University updated these studies and corroborated an earlier conclusion: the Rocky Reach reservoir area lacks village sites, which characterize moderately large population aggregations along the Columbia River up- and downstream from this area. Although radiocarbon dates ranging from 8,200 to 1,000 BP suggest long-term use of the area, the scarcity of village locations is problematic. The researchers also note that this stretch of the river does not have easily accessible fisheries locations such as rapids, falls, and tributary mouths, but its steep canyon walls offer prime habitat for deer, elk, and bighorn sheep; a rock alignment, which is adjacent to river margin terrace, may have been used as a hunting blind or drive line for these animals. Schalk and Mierendorf note that the Rocky Reach area may have supported temporary hunting camps for groups that resided outside of the area, or that people who adapted to a highly mobile hunting strategy lived in the narrow valley for most of the year (Schalk and Mierendorf 1983).

As part of a proposed pool elevation raise, Chelan County PUD requested that Eastern Washington University resurvey the reservoir margin in 1990. Eastern Washington University's results reconfirmed Schalk and Mierendorf's previous findings. The 1990 study suggests that residential sites:

- may exist on level landforms outside of the project area;
- may have formerly been located on the developed terraces above the reach; or
- may be deeply buried (Boreson 1992; Galm 1990).

Prehistoric use of the environments in the Rocky Reach Dam area could have resulted in sites similar to those described for the Rock Island Dam area. However, the probability for discovering village sites within the Rocky Reach segment appears to be lower than in other sections of the project area.

3.11.1.3 Rock Island Dam Area

Washington State University published a comprehensive report based on its reservoir-wide survey and testing program for the Rock Island Dam hydroelectric project in 1982, and Eastern Washington University produced a management plan for the reservoir in 1988 (Lothson et al. 1982; Galm and Masten 1988). Prehistoric sites within the Rock Island reservoir located north of the Wenatchee highway bridge (State Route 285) are situated on low terraces that extend up to 1 mile from the river. Sites in this area include both temporary resource procurement camps and permanent village locations, and the majority of them cluster around the confluence of the Columbia and Wenatchee Rivers. Small shellfish gathering sites occur on the downstream side of alluvial fans, such as at the base of the Rock Island Dam and north of the Wenatchee Flats. The Rock Island rapids area was also an important bighorn sheep hunting area (Lothson et al. 1982).

The area of the reservoir above the dam and south of the Wenatchee highway bridge is located along a more constricted segment of the river, and much of the steeply sloping sides of the canyon lie beneath 6 to 18 meters of water. Five large sites, which archaeologists suggest were summer and fall fishing camps, occupied both prehistorically and ethnohistorically, lie near the dam, which was formerly the Rock Island Rapids (Lothson et al. 1982).

Based on analysis of sediments and stratigraphy in the reservoir area, archaeological sites in the Rock Island Dam study area do not pre-date 13,500 BP. Cascade type projectile points and radiocarbon dates recovered directly from the sites around the reservoir place the earliest datable prehistoric occupation just prior to 3,000

BP. Diagnostic artifacts and radiocarbon dates obtained from various locations around the reservoir suggest continual occupation into the late prehistoric period. Researchers propose that prehistoric peoples living in the Rock Island Dam area used the winter village settlement pattern by 4,500 BP and long mat lodges by 1,100 BP (Galm and Masten 1985, 1988; Lothson et al. 1982).

Prehistoric use of the environments in the Rock Island Dam area could have resulted in domestic archaeological sites, such as villages and camps, along with resource procurement and processing stations for fish, mammals, birds, and edible and utilitarian plants, as well as lithic and mineral raw materials. In addition, trails could connect these places, and burials could occur throughout the project area. Prehistoric use could have resulted in isolated remains that could include projectile points and other artifacts or features such as cache pits, fire hearths, or petroglyphs. These sites provide information regarding settlement and subsistence strategies.

3.11.1.4 Associated Tributaries

The major tributaries that flow into the Columbia River near the Wells, Rocky Reach, and Rock Island reservoirs include the Wenatchee, Entiat, Methow, and Okanogan Rivers. Prehistoric use of the environments in these tributary basins could have resulted in sites similar to those described for the Wells, Rocky Reach, and Rock Island dams, possibly with a greater emphasis on smaller, short-term resource procurement sites.

3.11.1.5 Columbia River System

The Columbia River has served as a focal point for prehistoric settlement and subsistence patterns throughout the plateau's prehistory. A wide variety of wildlife, including deer, elk, sheep, migratory waterfowl, and resident and anadromous fish are part of an abundant resource base that relies on the riparian and aquatic environments of the Columbia Basin. Prehistoric peoples residing in this region focused their subsistence strategies on these environments to procure food and technological resources. Prehistoric archaeological resources in the project area fit the general pattern seen throughout the Columbia River system area.

3.11.2 HISTORICAL RESOURCES

The following paragraphs provide a general historical context for the Wells, Rocky Reach, and Rock Island dam areas of the Columbia Basin. The subsections that follow contain information specific to each of the reservoir areas and the major tributary basins adjacent to these reservoirs.

The earliest effects of Euroamerican contact appeared in Columbia River native communities before the Euroamericans themselves. Although researchers have not yet determined when epidemic diseases first emerged, some (e.g., Campbell 1989) have suggested that waves of epidemics may have started prior to direct contact. Epidemics of various diseases continued to decrease populations to differing extents. Columbia River Indian groups lost a majority of their population to introduced diseases, such as smallpox, cholera, typhus, chickenpox, or measles, and the health of the survivors was reduced (Boyd 1985; Cook 1955; French 1961). Population estimates for the Okanogan (Sinkaietk), Methow, Isle de Pierre (Rock Island Sinkuse), and Wenatchee Indians prior to the epidemics of the late eighteenth century are 3,200. After disease spread through the area, the combined figure for these groups and the Sahaptin-speakers along the Mid-Columbia River was estimated at 2,674 (Mooney 1928).

The first Euroamerican exploration of the Columbia Basin region was most likely Lewis and Clark's expedition, which traveled through the area of the Snake and Columbia Rivers in 1805 to 1806. Soon after Lewis and Clark returned to St. Louis, Missouri, fur trappers

moved into the northern Columbia Basin region and built Fort Okanogan (Johansen and Gates 1967; Meinig 1968).

In the 1850s, warfare erupted with the interior Native American Tribes, under pressure from an influx of white miners, cattlemen, and settlers. Washington's territorial governor, Isaac I. Stevens, attempted to end these bitter conflicts by holding a council at Walla Walla in 1855. The Indians in attendance ceded the majority of their territory in return for the establishment of lands reserved for the exclusive use of Tribal members. In 1872, Ulysses S. Grant established the Colville Reservation for members of the Colville, Entiat, Methow, Nespelem, Nez Perce, Sinkaietk, Palouse, Sanpoil, Senijextee, Sinkiuse, and Wenatchee Tribes (Ruby and Brown 1986). But the treaties did not eliminate trouble and growing pressure from whites resulted in a series of short, bloody battles.

After 3 years of skirmishing, the U.S. Army increased its presence in the area and compelled the Native Americans to reaffirm the Stevens treaties. The lasting result of this period of upheaval was a slowing of settlement east of the Cascades. It was not until the early 1870s that permanent settlements began to increase in the Columbia Basin. On a trip across the Washington Territory, Governor Stevens called the region "the Great Plains of the Columbia" and maintained it would support a farming population (Johansen and Gates 1967; Meinig 1968).

Before any farming could commence, settlers had to decide how this area of sagebrush and rolling hills could be cultivated. Early cattlemen had overgrazed the free lands, with little concern for the consequences. Farmers arriving in the region, in response to railroad promises of inexpensive land, realized dry land farming was the only method that could be employed. The topography of the region lends itself to growing crops on a grand scale. Wheat was the crop of choice for two reasons: wheat was a dry land crop and, to be profitable, it had to be cultivated in huge quantities. Both of these conditions existed in the Columbia Basin. Wheat flourished in this limited-moisture environment (Johansen and Gates 1967; Meinig 1968).

Settlers interacted in ways with the Indians that led to changes in their culture. Alcohol, disease, and dislocation disrupted social and political organization. Euroamericans also often hired Indians to act as guides, portagers, as transporters of goods and messages, and to cut timber, and tend herds and crops, all of which took native people away from their traditional subsistence-oriented activities. Euroamericans introduced hay, tobacco, and garden crops into the Columbia Basin by 1860, and researchers speculate that enforced sedentism may have caused Columbia River Indians to adopt agriculture in favor of seasonal root gathering (Boyd 1985; French 1961; Ruby and Brown 1986).

Railroads, which did not service this region until the late 1880s, encouraged wheat growing. Wheat farming communities created demands for inbound consumer goods and farming machinery. Railroads changed the economic picture for local grain growers by shipping wheat at lower prices. At the same time, they guaranteed themselves steady employment for their rail cars. Prior to this time, the cost of transporting a bushel of wheat to England via ship proved less expensive than sending it to American millers (Johansen and Gates 1967; Meinig 1968).

Storage facilities for the harvested winter wheat grew in numbers as the crops increased in volume. Initially, one-floor warehouses were able to accommodate smaller volumes of sacked grain, but later, grain elevators were used to store winter wheat in bulk quantities for shipment by barges on the Columbia River. Barge shipment on the Columbia River replaced railroad cars as the primary means of transporting grain out of the Columbia Basin. No agricultural commodity in the State ranked higher than wheat. By 1910, it represented 44 percent of the total value of Washington crops. Wheat was not the only crop

grown in the region. Irrigation allowed farmers to broaden their agricultural horizons. The first major irrigation project in the Columbia Basin was a private venture called the Sunnyside Canal, which began operating in 1892 (Kirk and Alexander 1990; Meinig 1968; Schwantes 1996).

By the early twentieth century, promoters had recognized the importance of government involvement in irrigation projects. Accordingly, the Federal government acquired area irrigation projects, which became part of a larger effort by the U.S. Reclamation Service. Completion of numerous irrigation projects brought to an end the struggle, started in the early twentieth century, of individual farmers or loosely knit private consortiums to bring water to the parched acres of land in the region. Farmers used the irrigation canals to water hay, apples, cherries, peaches, pears, berries, grapes, peas, beans, and potatoes (Johansen and Gates 1967; Meinig 1968).

As population in the State increased, the demand for beef increased proportionally. Livestock raising became more profitable because railroads could satisfy this demand more efficiently. In the 1870s and early 1880s, most cattle raised in the basin were either driven long distances on foot through Snoqualmie Pass or shipped down the Columbia River on boats. Later, ranchers moved cattle to Seattle or Midwestern markets via the railroad. Rail connections with the Northern Pacific Railroad allowed cattlemen to ship their cattle direct to market without the losses incurred during long drives (Johansen and Gates 1967; Holstine 1994; Meinig 1968).

The massive amounts of electrical power produced by early hydroelectric plants influenced the region in another manner. During World War II, the available electrical power made possible rapid expansion of the wartime and post-war economy. Aluminum for airplanes, sub-assemblies for destroyers, and castings for the Seattle shipyards were produced in the region. Population in the region swelled as more industrial output was required and more jobs were created. The availability of inexpensive electrical power continued to draw businesses to the region (Johansen and Gates 1967).

3.11.2.1 Wells Dam Area

David Stuart and David Thompson, representing the American Pacific Fur Company, established Fort Okanogan at the confluence of the Columbia and Okanogan Rivers in 1811. After the War of 1812, the fort briefly belonged to the Canadian Northwest Company, which later merged with the Hudson's Bay Company. During this period, the fort served as the gateway to other outposts further north.

The Hudson's Bay Company abandoned the fort in 1860. G. F. Grabert excavated this site as part of his salvage work for the Wells reservoir. His findings confirmed the locations of warehouses, blacksmithing sheds, and the Main House. In addition, Grabert noted that the occupants subsisted primarily on a diet of horse meat, augmented with deer and salmon. Grabert concluded that the abandonment of the fort was planned and orderly, due to the apparent removal of structures and useable lumber and hardware from the site, and a lack of complete artifacts. Indians returned to the area after the Hudson's Bay Company left, superimposing hearths and stone flake debris over several segments of the Euroamerican debris (French 1969; Grabert 1968b; Meinig 1968; Mitchell 1968).

During the historic period, the Wells reservoir area was part of the Methow and Sinkaietk Indian territories. Methow people, whose ancestral lands lay within the Moses, or Columbia reservation accepted allotments in this area. Others followed Chief Moses to the Colville Reservation in the 1870s. The southern extent of Sinkaietk territory is located at the confluence of the Columbia and Okanogan Rivers. The Sinkaietk, whose name means "people of the water that does not freeze," are closely related to the Methow people living just downstream along the Columbia. This group did not participate in the Walla Walla treaty

council, nor did they follow Chief Moses, whose reservation was established in their ancestral lands. The Sinkaietk remained in their homeland after the Moses Reservation was established and then terminated in 1884. Today the Tribe is part of the Confederated Tribes of the Colville Reservation (Ray 1936, 1974; Ruby and Brown 1986).

Beginning in the late 1880s, settlers entered the area and established homesteads. The pioneers found fertile soil, but poor transportation facilities. Riverboat service aboard the City of Ellensburg between Brewster and Wenatchee was sporadic due to high or low water levels or ice (Kirk and Alexander 1990; Meinig 1968).

In the mid-1910s, Alfred Z. Wells established an orchard and company town below the modern location of Wells Dam. The town, now named Azwell, still serves as a fruit packing and shipping center. Further upstream, Pateros is also an orchard center, which grew as a result of its rail link to Wenatchee. The town was originally located in a narrow stretch of the Columbia, but the rise of Lake Pateros behind the Wells Dam in 1967 forced it and the railroad to relocate onto a higher terrace (Dorpat and McCoy 1998; Kirk and Alexander 1990; Ramsey 1973).

Historic period use of the environments in the Wells Dam area could have resulted in sites similar to those described for the Rock Island and Rocky Reach dams.

3.11.2.2 Rocky Reach Dam Area

Within the Rocky Reach Dam area, the Wenatchee, Sinkiuse, Entiat, and Chelan Indians occupied the banks of the Columbia River between the mouths of Swaukane and Antoine Creeks. The Entiat Indian territory, which may have overlapped that of the Wenatchees, centered around the confluence of the Entiat and Columbia Rivers. Further upstream, the Chelan Indians settled around Lake Chelan or moved to the Colville Reservation after the 1855 treaty negotiations. The Chelan people were the subject of intensive missionary efforts by Roman Catholic priests who used the unusual earthquake of 1872, which blocked the flow of the Columbia for a day, to covert the Indians to Christianity (Ruby and Brown 1986).

Cattle ranchers settled in the foothills above the Entiat valley by 1860. After summer grazing ended, ranchers herded cattle and sheep from the mountains to stock boat moorings or railcars, creating wide drive line trails along the Columbia. A cattle ranch at the mouth of the Entiat River continued operating as late as 1907 (Holstine 1994).

In the mid-1860s, Chinese miners, migrating from the Californian and British Columbian gold fields, excavated a ditch adjacent to the Entiat River, near its confluence with the Columbia, where they placer mined for gold. The Chinese occupied a village along the Columbia across from the mouth of the Chelan River. After mining activities slowed in the area, timber harvests in the foothills increased, creating the need for sawmills in the area. Charles A. Harris constructed the Entiat Mill in 1892. Construction crews for the Rock Island Bridge used timbers floated down the Columbia from this mill. Local farmers also shipped grain down the Columbia. A tram at Orondo hauled grain from the upper terrace of the plateau down to the water. Shippers used the tram from 1902 until 1909, when a branch line of the Great Northern Railroad reached the town of Douglas (Holstine 1994; Hull 1929; Kirk and Alexander 1990; Meinig 1968; Western Historical Publishing Co. 1904a).

In the fall of 1872, an earthquake collapsed a segment of a cliff face, located about 2 miles north of Entiat, into the Columbia River. The river was dammed for several hours, until it broke loose in a "column fifteen feet high." The spot along the Ribbon Cliffs is known today as Earthquake Point (Western Historical Publishing Co. 1904b).

As early as 1904, civic planners in Orondo projected use of hydroelectric power to run the roller in their flour mill. Charles A. Harris constructed one of the first power plants in the area for the Entiat Light and Power Company by 1908. Rocky Reach Dam was one of five hydroelectric power plants erected during the late 1950s and early 1960s on the Columbia (Dorpat and McCoy 1998; Hull 1929; Kirk and Alexander 1990; Western Historical Publishing Co. 1904a).

Historic period use of the environments in the Rocky Reach Dam area could have resulted in sites similar to those described for the Rock Island Dam area.

3.11.2.3 Rock Island Dam Area

Within the Rock Island Dam area, the Sinkiuse and Wenatchee occupied the banks of the Columbia River around Rock Island and the mouth of the Wenatchee River. David Thompson and other fur traders from the North West Fur Company arrived in the Wenatchee valley by 1811, portaging past the Rock Island rapids on July 7.

Indian-Euroamerican relationships in the area deteriorated in the late 1850s when miners murdered the Sinkiuse leader's son. Leadership of the Tribe and other non-treaty Mid-Columbia River Indians passed to Chief Moses. Moses and his followers never occupied the Columbia Reservation (also known as the Moses Reservation) that the U.S. Government set aside for them in 1879. The lands returned to public domain, and Moses and his band moved to the Colville Reservation (Ruby and Brown 1986).

Chief Tecolekun signed the treaty at Walla Walla, but was killed during skirmishes with the U.S. Army in 1858. The Yakima Treaty grouped the Wenatchees with the Yakama because of their association at the Wenatschapam fishing site. This fishery was sold, at the urging of the Yakima agent, to fund an irrigation project on the Yakama Reservation. Beginning in 1911, Wenatchee people began moving to allotments on the Colville Reservation (Ruby and Brown 1986).

By 1860, the trappers populating the valley had been replaced by Euroamerican and Chinese placer miners. The miners worked claims along the sand and gravel banks and bars of the Columbia and its tributaries, including Chinaman Flat near Malaga. Wenatchee became a trading post for early settlers and miners and was incorporated in 1888. That same year, the first steamboat, the City of Ellensburg, traveled up the Columbia from Pasco to Brewster and used four guy lines to sail past Rock Island.

The Great Northern Railroad entered the region in 1892, which prompted the city to move closer to this new transportation route and to the Columbia River. One year later, the railroad built the Rock Island Bridge, which, along with the Columbia River Bridge located further upstream, is now listed in the National Register of Historic Places. Rock Island Dam was the first hydroelectric project on the Columbia River. Puget Sound Power and Light Company constructed the dam between 1929 and 1933, and its innovative design included three fishladders (Dorpat and McCoy 1998; Holstine 1994; Hull 1929; Kirk and Alexander 1990; Mitchell 1968; Thomas 1975; Tyrell 1916; Writers' Program 1941).

Historic occupation or activities in the Rock Island Dam area could have left a variety of remains, including buildings, structures, sites, and discarded equipment and other artifacts that reflect many types of use. Euroamerican exploration, trade with Indian people, and military activities associated with the Indian uprising of 1855 and 1856 left camp and fort sites. Settlement and farming sites may include cabins, homesteads, farms and ranches, corrals, towns, and school and commercial buildings.

The development of water resources throughout the Columbia Basin for transporting goods, producing electricity, irrigating farmlands, and domestic use could result in such remains as

wells, spring boxes, water wheels, flumes, irrigation ditches, pipes, power lines, and poles. Transportation has been particularly important to the culture history of the Columbia River Basin. Artifacts and features associated with Indian and explorer trails, wagon roads, and railroads, including rail and road grade segments, bridges and trestles, tunnels, construction camps, dumps, rail cars, and equipment could exist in the project area. Ethnohistoric sites could be similar to the prehistoric sites described for the Rock Island Dam, with the addition of items of Euroamerican origin. Ethnohistoric use could have resulted in isolated remains that could include projectile points and other artifacts or features such as cache pits, fire hearths, or petroglyphs.

3.11.2.4 Associated Tributaries

Tributary drainages flowing into the Columbia River served as important fishery, hunting, and gathering sites beginning in the prehistoric period and continuing into ethnohistoric times. Miners staked claims in the foothills of the Cascades east of the Columbia River and in the hills surrounding the Okanogan River valley beginning in the 1860s. As the prospects for mining waned in these areas, timber cutting opportunities increased, which continue into the present. Settlers built the first trading post near the mouth of the Wenatchee River. The Wenatchee Flat site, which is actually comprised of several archaeological sites, served as a crossroads and meeting place for Native and Euroamerican peoples. This site is now listed in the National Register (Brown and Wilson 1971).

Historic-period Euroamerican use of the environments in the Wenatchee, Entiat, Methow, and Okanogan River drainage areas could have resulted in sites similar to those described for the Wells, Rocky Reach, and Rock Island dams, with a greater potential for mining and logging camp remains in these areas. Ethnohistoric sites could be similar to the prehistoric sites described for the three dam areas, with the addition of items of Euroamerican origin. Ethnohistoric use could have resulted in isolated remains that could include projectile points and other artifacts or features such as cache pits, fire hearths, or petroglyphs.

3.11.2.5 Columbia River System

During the historic period, the Columbia River figured prominently in the first direct contact between Native peoples living in the Columbia Basin and Euroamericans. Traders, trappers, and, later, homesteaders followed the Columbia's route to settle in the interior plateau. The river not only contributed food resources to the occupants of the area, but also provided a means of transportation. Later, irrigation systems and hydroelectric power plants constructed along the Columbia brought change to the agricultural and industrial sectors of the region. Historic period archaeological sites, buildings, and structures within the project area fit within the greater pattern of historical resources seen throughout the Columbia River system drainage area.

3.11.3 INDIAN TRADITIONAL CULTURAL PLACES AND RESOURCES

Indian groups generally are concerned about development that occurs within their aboriginal territories. Federally recognized Tribes are concerned about their treaty rights, and the various Tribal groups often want to protect traditional cultural properties which include cultural heritage and traditional religious sites, as well as traditionally used natural resources that occur in geographically limited locations. In addition, Indians consider the natural landscape, and individual elements that comprise it, as spiritually sacred; these include, but are not limited to: cultural sites (archaeological and rock art/feature sites), fisheries, cultural plants, and wildlife. The following paragraphs provide a general ethnohistorical context for the Wells, Rocky Reach, and Rock Island dam areas of the Columbia Basin; the subsistence practices

described below in the Tribal ancestral lands form an integral part of traditional lifeways for these groups (Hanes 1995). The subsections that follow contain information more specific to each of the reservoir areas.

At the time of Euroamerican contact, the Interior Salishan-speaking Sinkiuse, Wenatchee, Chelan, Methow, Entiat, and Sinkaietk Indian groups resided along the Columbia River. These Columbia River Indian groups visited a number of environmental settings during the year's subsistence activities. These people employed various technologies to harvest each resource at the time and place it was available. Both men and women conducted the yearly subsistence work of fishing, gathering, and hunting resources that were consumed fresh and processed for winter storage. Recent work (e.g., Hunn 1990) on the land use of the Indians of the Mid-Columbia River has supplied many details, particularly on the use of plants. Certain ceremonial activities accompanied the yearly harvests especially as the groups welcomed and gave thanks to each of the major food groups of salmon, roots, berries, and others.

Early spring activities began with root collecting as family groups left their winter settlements and camped near root digging grounds. Women used digging sticks and woven bags to collect roots and pack them back to their camps for baking in earth ovens and drying for use as winter supplies. While many roots are sparsely distributed, camas sometimes is concentrated in great meadows where large numbers of people could gather during the harvest season for work and socializing. Family groups carried the dried roots back to the winter settlements and buried them in below-ground caches before they set out again to collect more resources.

Groups then gathered at productive fishing stations along rivers when the spring salmon runs began. The men fished while the women cleaned and dried the fish. As the catch dwindled, the groups again stored their supplies and left in later May to dig a variety of roots including bitterroot, camas, kaus, lupine, wild carrot, onion, and others, establishing camp sites and moving them as the harvest progressed. Groups with access to streams where lamprey eels, suckers, whitefish, and sturgeon ran interrupted their root digging to net or spear these fish (Hunn 1990; Ray 1932; Spier and Sapir 1930; Teit 1928).

Salmon and steelhead runs appeared in the rivers during summer, drawing the groups to return the new root surpluses to their winter caches and harvest the fish. Men pursued their traditional role of fishing and women cleaned and dried the catch. Between fish runs, women gathered and dried berries, including golden currant, gooseberry, dogwood, serviceberry, cranberry, huckleberry, blackberry, and chokecherry (Hunn 1990; Ray 1932).

Beginning in August, Columbia River Indian groups moved into the mountains where they camped through the early fall to harvest and smoke-dry several species of huckleberries. While the women picked and harvested berries, nuts, and moss, men hunted deer, elk, bear, cougar, wolf, and fox in the mountains. The groups likely split at times to allow some to return to the rivers in early September to harvest the fall-run chinook salmon run which provided much of the winter supply. They made a kind of pemmican from pounded salmon and dried berries, mixed with salmon oil. In October, people moved back to their winter settlements, processing the dying salmon of the fall-run chinook salmon run (French 1961; Hunn 1990; Ray 1932; Spier and Sapir 1930).

Columbia River groups maintained permanent winter settlements along protected tributaries to the Columbia and other rivers. Living in semisubterranean houses, mat lodges, or other types of substantial structures, extended families used the winter months to make and repair tools, baskets, clothing, and other necessary items. They visited other groups, conducted religious and social ceremonies, exchanged information

and food surpluses, and repeated the stories of their mythology that instructed children about how to make their living and how to treat other people. Burials of various types were associated primarily with the winter settlements (Hunn 1990).

3.11.3.1 Project Area

Wells Dam Area

Ethnographers list Tkuyatum, located at the mouth of the Okanogan River, about 3 miles upstream from Brewster, and Xantcin, or "little rocky gate," just south of Pateros, as Sinkaietk villages (Ray 1936, 1974; Ruby and Brown 1986).

Rocky Reach Dam Area

Principal Wenatchee villages located in the Rocky Reach study area include Patlkinulu, located on the west bank of the Columbia, 8 miles north of the Wenatchee River, and Ntiatku, meaning "weedy river," at the present site of Entiat. The latter village was jointly used by the Wenatchee and Chelan Indians. Additional villages of the Chelan people included Niyalqen, or "basin in which the creek meanders", north of Winesap at the confluence of Maple Creek and the Columbia River, Nairrp on the west side of the Columbia between Beebe and Bonita, and an unnamed village at the mouth of Antoine Creek. Cwaxtinten, meaning "barking dog," was located near the mouth of Byrd Canyon about 6 miles north of Entiat, and Swaxtciltan, or "horse haven," was situated on a bench above the Columbia River near Tenas George Canyon south of Wagnersburg. A camp called Xaxa'tqu, meaning "dragon jaws," was located 1mile downstream from Wagnersburg on the east side of the Columbia (Ray 1936, 1974).

Rock Island Dam Area

Ethnographers have identified several Indian place names near the Rock Island Project area. A permanent village, Tapiskin or Nqolaqom, was located below the dam near the mouth of Colockum Creek. Two villages, Skilkatin and Skwietaktcin, were located near Stemilt and Squillichuck Creeks south of Wenatchee. Nikwikwiestku, "purplish rock," and Skwiltaktcin, "two owls," were located south of the modern Wenatchee business district. These sites were a small summer camp and a summer fishing and gathering village, respectively. The largest of the Sinkiuse villages, Kawaxtcin, meaning "living on the banks (river's edge)," was located at the mouth of Rock Island Creek. A Wenatchee camp named Pat'l'kinu'lu was located near Zena, 8 miles north of the mouth of the Wenatchee River. The villages Stchopas and Kultaktcin, "delta," were situated near the mouth of the Wenatchee River (Ray 1936, 1974).

3.11.3.2 Tributaries

A Wenatchee village named Alota's, which housed about 200 people, was located on the north bank of the Wenatchee River, about half a mile downstream from Monitor. Further north, where Leavenworth is currently located at the mouth of Icicle Creek, the village Tcamaus or "narrow in the middle" served as the principal Wenatchee fishing site. Almost 200 people occupied this village during the summer, but visitors swelled the population to 2,000 to 3,000 during salmon and steelhead runs. The largest Wenatchee village, Ntua'tckam, was located where the town of Cashmere is presently. This permanent village housed 400 residents throughout the year (Ray 1936).

3.11.3.3 Columbia River System

Indian groups generally are concerned about "the totality of the regional landscape," in which "all landscape components participate in a system of

complex inter-relationships" (Hanes 1995). Indians consider the natural landscape, which includes cultural sites, fisheries, cultural plants, and wildlife, as sacred. The subsistence practices described in the paragraphs above take place in Tribal ancestral lands that form an integral part of traditional lifeways for these groups (Hanes 1995). The project area is part of sacred lands whose landscape and features "serve as constant reminders of (the Native people's) spiritual identity" (Hanes 1995).

Throughout the millennia, salmon and steelhead have played an important role in culture of Native American Tribes along the Columbia River (Hanes 1995). During pre-contact times, Tribes established fishing sites where they regularly harvested salmon. The Supreme Court decision *U.S. vs. Oregon* established that the 1855 treaties of the Yakama, Warm Springs, Umatilla, and Nez Perce Tribes had reserved for these Tribes the right to fish as found in *United States vs. Winans.* Federal District courts in Washington and Oregon have defined the Tribal fishing rights, on or off their reservations. The court has decided that the Columbia River Tribes were entitled to 50 percent of all harvestable fish destined for the traditional fishing places. In 1974, the *U.S. vs. Washington* court case, which addressed the fishing rights of Puget Sound Tribes, determined that, for the purposes of measuring harvestable fish, there is no difference between hatchery and native salmon. These court decisions interpreting the Tribes' treaty-reserved fishing rights are the legal framework supporting the Native American traditional practice of harvesting salmon and steelhead along the Columbia River.

3.11.4 CULTURAL RESOURCES LICENSE REQUIREMENTS

3.11.4.1 Wells Dam and the Management of Cultural Resources

The license under which the Wells Dam is currently operating was issued on July 12, 1962, and amended on September 23, 1982. The original license was issued prior to the 1966 enactment of Section 106 of the Historic Preservation Act, which requires that projects including Federal involvement consider impacts to historic resources that qualify for listing in the National Register. Consequently, the original license included few measures to protect cultural resources. The cultural resource considerations listed in the original license occur in article 44, which prescribed the following measures be taken to protect cultural resources:

> The Licensee shall cooperate with the Secretary of the Interior in the preparation of a public use plan for the area and in the possible salvage of the archaeological data and shall, upon written request of the Commission, make available to the Secretary, or to a qualified agency designated by the Secretary, reasonable amounts of monies not to exceed a total of $10,000 in the preparation of a public use plan and not to exceed a total of $55,000 to compensate for expenses incurred in archaeological investigations in the pool area.

When the Wells license was amended on September 23, 1982, to address the effects of raising the pool level approximately 2 feet, cultural resource issues were more thoroughly considered (FERC 1982). Under the amended license, the PUD determined that 13 archaeological sites within the affected area were eligible for the National Register. To mitigate for the inundation of these sites, the State Historic Preservation Officer required that data recovery be conducted at the sites before the pool level was

raised. These excavations occurred in 1983 and 1984 (Chatters 1986:iii).

3.11.4.2 Rocky Reach Dam and the Management of Cultural Resources

The Rocky Reach Dam is currently operating under a license that was issued on July 11, 1957. The cultural resource considerations in the license occur in Article 37 and are the same as those listed in the Wells Dam license Article 44. In March 1983, Article 49 was added to the license. This article prescribed the following measures:

> The Licensee shall, prior to the commencement of any construction at the project, consult with the Washington State Historic Preservation Officer (SHPO) about the need for any cultural resource survey and salvage work. The licensee shall make available funds in a reasonable amount for any such work as required. If any previously unrecorded archaeological or historical sites are discovered during the course of construction or development of any project works or other facilities at the project, construction activity in the vicinity shall be halted, a qualified archaeologist shall be consulted to determine the significance of the sites, and the licensee shall consult with the SHPO to develop a mitigation plan for the protection of significant archaeological or historical resources. If the licensee and the SHPO cannot agree on the amount of money to be expended on archaeological or historical work related to the project, FERC reserves the right to require the licensee to conduct, at its own expense, any such work found necessary.

3.11.4.3 Rock Island Dam and the Management of Cultural Resources

The Rock Island Dam operates under a license that was issued on January 18, 1989. As part of the approval of this license, a Cultural Resource Management Plan was drafted to avoid or mitigate impacts to cultural resources within the project area. At the time the license was issued, the Cultural Resource Management Plan was concurred upon by the SHPO, the Colville Tribes, and the Advisory Council on Historic Preservation before being finalized. The primary purpose of the Cultural Resource Management Plan was to "assist the Chelan County PUD in achieving compliance with applicable laws, regulations, and guidance pertaining to the management, protection, and enhancement of cultural resources" (Galm and Masten 1988).

3.11.5 CULTURAL RESOURCES SUMMARY

The project area (which includes the reservoir areas behind Wells, Rocky Reach, and Rock Island dams, and portions of the of the Wenatchee, Entiat, Methow, and Okanogan drainage basins) contains a wide variety of cultural resources. Although many of these resources have been recorded, additional sites and properties no doubt remain to be discovered. Few of the previously recorded sites have been evaluated for National Register eligibility. Table 3-24 summarizes the types of sites that exist within the project, which were described in the previous subsections of this report, and lists the four National Register listed properties recorded in the project area. While all the site types may be present in all the project areas, their numbers may differ, and not all sites would be eligible for listing in the National Register of Historic Places.

TABLE 3-24. CULTURAL RESOURCE SITE TYPES IN THE PROJECT AREA

PROJECT AREAS	SITE TYPES											
	PREHISTORIC/ETHNOHISTORIC				HISTORIC						TCP[1]	NATIONAL REGISTER-LISTED PROPERTY
	VILLAGE	CAMP	QUARRY	PETROGLYPH	TRAIL	BURIAL	IRRIGATION	TRANSPORTATION	SETTLEMENT	MINING		
Rock Island reservoir	X	X		X	X	X	X	X	X	X	X	Rock Island Railroad Bridge Columbia River Bridge
Rocky Reach reservoir	X	X		X	X	X	X	X	X	X	X	
Wells reservoir	X	X		X	X	X	X	X	X	X	X	
Wenatchee River drainage	X	X	X	X	X	X	X	X	X	X	X	Wenatchee Flat archaeological site
Entiat River drainage	X	X	X	X	X	X	X	X	X	X	X	
Methow River drainage	X	X	X	X	X	X	X	X	X	X	X	
Okanogan River drainage	X	X	X	X	X	X	X	X	X	X	X	

[1] TCP = traditional cultural properties

Source: Compiled from Cultural Resources Inventory and Report Records on file at the Office of Archaeology and Historic Preservation.

3.12 ENVIRONMENTAL JUSTICE

This section was prepared in compliance with Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, dated February 11, 1994. The purpose of this analysis is to provide information on opportunities provided to minority and low-income populations for participating in the project planning process and to determine whether the proposed alternatives would result in disproportionately high and adverse effects on minority and/or low-income populations.

3.12.1 REGULATORY FRAMEWORK

Executive Order 12898, issued by President Clinton in 1994, provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." In the accompanying memorandum, President Clinton urged Federal agencies to incorporate environmental justice principles into analyses prepared under NEPA and emphasized the importance of public participation in the NEPA process.

In response to Executive Order 12898, NMFS is conducting this environmental review to (1) explicitly consider human health and environmental effects related to projects that may have a disproportionately high and adverse effect on minority or low-income populations; and (2) implement procedures to provide "meaningful opportunities for involvement" by members of those populations during project planning and development. In making determinations regarding disproportionately high and adverse effects on minority and low-income populations, mitigation and enhancement measures and all offsetting benefits to the affected minority and low-income populations may be taken into account.

3.12.2 MINORITY POPULATIONS

As described in Section 3.7.1, County Demographics, the three-county area has proportionately more persons of Hispanic origin than the State as a whole, largely due to the amount and type of agricultural employment that occurs in the area. The three-county minority population ranges from 14 to 20 percent of the total residential population (U.S. Census 2000).

The majority of the Hispanic population within the three-county area resides in the greater Wenatchee area (75 percent of the Chelan County Hispanic population), the greater East Wenatchee area (60 percent of the Hispanic population in Douglas County), Bridgeport (20 percent of the Douglas County Hispanic population), and Brewster (23 percent of the Okanogan County Hispanic population) (Washington State Office of Financial Management 2001). All three of these towns are located adjacent to the Columbia River, and are within the project area.

Native American populations represent about 1 percent of Chelan and Douglas counties, but comprise 11.5 percent of Okanogan County due to the presence of the Colville Indian Reservation (U.S. Census 2000). The Colville Indian Reservation is located adjacent to and northeast of the project area, with the Columbia River forming the reservation's southern border and the Okanogan River forming the reservation's eastern border.

Section 3.7.2, Tribal Demographics, provides a brief description of the Native American population residing on reservations that utilize the fish resources in the Columbia River. These reservations include the Colville, Yakama, Umatilla, Warm Springs, and Nez Perce

reservations. Total population for all five reservations is 63,190 people; however, not all residents are Native American.

3.12.3 MINORITY AND LOW-INCOME EMPLOYMENT

As described in Section 3.7.3, County Economies, the three-county area has a higher percentage of agriculture, forestry, and fishing employment opportunities compared to the State as a whole. These industries encompass up to 34 percent of employment in the three-county area, and the Hispanic population has a major role in agriculture-related industries. Over 55 percent of the county wages are within this industry. About 8 percent of Native Americans are employed in agriculture, forestry, and fishing, although the primary source of Tribal income is now in the gaming (casino) industry. Average annual wages for Native Americans in the three-county area is $16,907, as described in Section 3.7.4, Tribal Economies.

Native Americans also fish for subsistence, which is not included as employment data. Native Americans are dependent on subsistence fishing not only to provide a portion of their meals, but also as part of their lifestyle, reflecting deeply held attitudes, values, and beliefs of sharing with others. The opportunity to participate in subsistence activities reinforces cultural and related values in both Native and non-native communities. The distribution of fish and wildlife within Native American communities contributes to the cohesion of kinship groups and to community stability through sharing of resources derived from harvest activities.

3.12.4 OUTREACH TO MINORITY AND LOW-INCOME POPULATIONS

Executive Order 12898 provides that Federal agencies shall ensure meaningful participation of minority and low-income populations in the decision-making process. The implementation of appropriate public outreach activities and the provision of opportunities for public involvement are key component of compliance with the order. Throughout development of this project, NMFS has undertaken public outreach efforts. These activities are summarized below.

- The Notice of Intent was published in the Federal Register on January 6, 1999, announcing the NEPA process for the Wells, Rocky Reach, and Rock Island Anadromous Fish Agreements and HCPs.

- A scoping brochure was mailed to over 285 individuals, agencies, private businesses, and environmental organizations inviting the public to comment on the EIS. The mailing list included 22 media sources.

- In January 1999, an invitation to participate in the scoping process was advertised in local newspapers of the three-county area. This included the *Douglas County Empire Press* in East Wenatchee and the *Wenatchee World* in Wenatchee, whose distributions cover the areas where the majority of Hispanic and Tribal populations reside (see Section 3.12.2, Minority Populations).

- Public scoping meetings open to the general public were held on January 20, 1999, in Wenatchee, Washington, and January 21, 1999, in Brewster, Washington. Together, these two towns are near where approximately 69 percent of the Hispanic population in the three-county area reside (approximately 54 percent of the Hispanic population resides in the greater Wenatchee/East Wenatchee/Cashmere area, and approximately 15 percent more resides in the greater Brewster/Bridgeport area) (Washington State Office of Financial Management 2001). In addition, Brewster is within 5 miles of the Colville

Indian Reservation, which allowed for Tribal member attendance.

- The Tribes were invited to an additional agency meeting held on March 3, 1999, to discuss the EIS issues and alternatives.

- The DEIS public comment period (for written letters) occurred from January 6, 1999, to February 6, 1999, and was later extended to April 1999. Letters received after the scoping period and during the EIS process were also reviewed and used to help define issues, alternatives, and impacts.

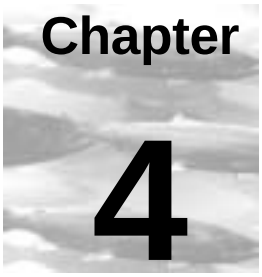
- The DEIS was published on December 29, 2000, followed by a 90-day public review comment period during which written letters on the DEIS were received. Copies of the DEIS were sent to 11 towns in the project area, 2 school districts, 7 television stations, 11 newspapers (2 in the areas of low-income population associated with the project), and radio stations in Chelan and Wenatchee. The public was encouraged to review and comment on the DEIS.

- DEIS public meetings were held on March 6, 2001, in East Wenatchee, Washington, where the public was given opportunity to voice comments on the DEIS. Approximately 54 percent of the Hispanic population of the three-county area resides in the greater Wenatchee/East Wenatchee/Cashmere area.

- Following the DEIS public meetings and up through March 2002, NMFS conducted meetings with the project applicants, State and Federal resource agencies, affected Tribes, and American Rivers to ensure that agencies, Tribes, and environmental organizations' concerns were incorporated into the NEPA process. Based on the DEIS comment letters and verbal concerns brought forth during the meetings, the PUDs and NMFS agreed to revise the HCPs in 2002.

- A 30-day HCP public comment period for the revised HCPs was held beginning June 25, 2002.

As a result of Tribal comments on the DEIS, NMFS revised the HCPs to address Tribal concerns. The primary Tribal concern was whether NMFS would guarantee the HCPs' goal of no net impact, which included a 7 percent hatchery production level to compensate for unavoidable project mortality. The HCPs were consequently revised to respond to these concerns as described in Section 4.13.3, Environmental Justice, Alternative 3; Section 4.13.17.1, Secretarial Order 3206; and Section 4.13.17.2, Federal Trust Responsibility.



Environmental Consequences

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CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 4

- Chapter 4 was revised to respond to changes in the HCPs that affect the resources differently than as described in the DEIS.
- More information was provided in Chapter 4 where DEIS commenters had questions or requested additional information or discussion of an issue.
- The avian predator control measures sections provide more recent information on this program.
- The hatchery compensation section was revised to reflect changes from the 1998 HCPs to the 2002 HCPs.
- Chapter 4 contains an increased discussion on Pacific lamprey effects from the action alternatives.
- Additional discussion is provided on where the projects are at this time relevant to the HCP phases.
- Corrections and revisions to the projects' relationship to laws and policies, particularly legislation pertinent to Tribal governments (all sections revised and updated) are included in Chapter 4.
- New references were added throughout Chapter 4 to update the information provided in the DEIS.
- Additional Economics, Aesthetics, and Environmental Justice sections are now included in Chapter 4.
- Resource sections within Chapter 4 were revised to reflect the additional mitigation measures that are components of Alternative 2.
- The cumulative effects analysis that was previously within Chapter 4 was moved into a separate chapter (Chapter 5).

Chapter

4 ENVIRONMENTAL CONSEQUENCES

This chapter uses the information presented in Chapter 3 to assess the effects of project operations under each of the three alternatives on land features/geology/soils, fisheries resources, water resources (quantity and quality), vegetation, wildlife, land ownership and use, socioeconomics, economics, aesthetics, recreation, cultural resources, and environmental justice. Note that a summary of the physical, regulatory, and procedural differences among the alternatives is described in detail in Section 2.6, Alternative Comparison. A summary of the environmental consequences of each alternative is presented in Table 2-9.

Alternative 1 represents existing conditions and includes the ongoing mitigation measures necessary to comply with existing permits. Alternatives 2 and 3 would include the mitigation measures described under Alternative 1, as well as the mitigation measures described under each of these alternatives in Chapter 2 (see Section 2.3.3 [Alternative 2] and Section 2.3.4 [Alternative 3]. No other mitigation measures are associated with the projects.

The Plan Species Accounts, which would occur under Alternative 3, would result in additional new habitat restoration projects in the four tributaries (Methow, Okanogan, Entiat, and Wenatchee). The specific projects are unknown at this time, but each project would undergo various permitting and regulatory reviews at the time the specific project is proposed. Recommended projects for Plan Species Account funding are described in Section 4.1.3.2, Associated Tributaries. Mitigation measures to protect sensitive natural resources would be proposed at that time. The reviewing lead agency would then determine the necessary protective measures to permit the project while protecting the environment. In addition, the HCPs include a tributary assessment program that would be utilized to monitor and evaluate the relative performance of projects.

A discussion of the extinction risks for endangered Upper Columbia River spring-run chinook salmon and steelhead is included in Chapter 5 and Appendix E, and the pertinent results are summarized for each alternative in the Threatened and Endangered Species subsections.

This chapter is organized the same as Chapter 3, with the addition of sections to discuss unavoidable adverse effects, irreversible and irretrievable commitment of resources, and the relationship between short-term uses and long-term productivity.

4.1 LAND FEATURES, GEOLOGY, AND SOILS

4.1.1 ALTERNATIVE 1 (NO-ACTION)

4.1.1.1 Project Area

Continued operation, maintenance, and planned facility upgrades for the fishways and associated entrances, fishladders, bypass systems (collection entrances and intake screens), turbines, and hatcheries would not result in disturbances to the river bottom. The general geological and soil characteristics of the project area would not be altered by the proposed project modifications. The existing storage and downriver movement of sediments at the three projects would continue.

Soil erosion along the river shoreline would not be expected to occur as a result of the ongoing activities under Alternative 1.

4.1.1.2 Associated Tributaries

Under Alternative 1, no PUD funds would be available to enhance habitat in the Mid-Columbia tributaries. Over the next 50 years, however, habitat restoration within the Wenatchee, Entiat, Methow, and Okanogan watersheds is expected to occur through other various Federal, State, and local funding sources that are aimed to help restore salmon and steelhead runs in the Mid-Columbia River system. The projects would likely include efforts to (1) acquire shoreline areas that are considered important salmonid habitat, (2) remove fish barriers, (3) restore and enhance fish habitat, (4) increase stream flow, and (5) enhance overall water quality.

These projects would help to decrease sediment transport and delivery, increase large woody debris in streams, reduce bank erosion, increase channel bank stability, increase in-pool channels, and contribute to the overall objective of improving stream channel conditions for fish spawning, rearing, foraging, and resting.

Short-term increases in turbidity and sedimentation could occur from construction activities such as culvert modifications, placement of in-channel diversions (rock weirs, roots, boles, boulder barbs, and large woody debris) in streams, and construction projects that may require temporary roads for site access. Over the long term, effects to site geology, soils, and sediments from these projects would return to background levels as a result of natural processes (e.g., reestablished vegetation).

4.1.2 ALTERNATIVE 2

4.1.2.1 Project Area

Section 7 consultation for associated on-site facility improvements for fish passage would not result in significant changes to soils and geologic resources in the project vicinity. If drawdown were to occur (possible under either Alternatives 2 or 3), the effects would be more substantial.

Although reservoir drawdown below the current operating range is not planned or currently recommended for the Wells, Rocky Reach, and Rock Island projects, drawdown to natural river conditions could be proposed under Alternatives 2 or 3. This approach would facilitate the downstream passage of juvenile salmonids if fish passage or survival goals are changed or project monitoring indicates that the goals are not being achieved.

If drawdown is considered a viable option for any dam over the next 50 years, a separate EIS would be prepared with an in-depth analysis conducted for each resource affected.

Increased reservoir drawdown has been considered to improve fish passage conditions at other Columbia Basin projects (BPA et al. 1995a; U.S. Army Corps of Engineers 1992, 2000). The types of reservoir and downstream effects to be expected from large reservoir drawdowns were tested and modeled on the Lower Snake and Elwha rivers (BPA et al.1995a; U.S. Army Corps of Engineers 1992; National Park Service 1995; BOR 1995; FERC 1993b; Stoker and Williams 1991). The drawdown concept also occurs at hydroelectric projects where large reservoir fluctuations are a part of normal operations (Washington Water Power Company 1998; Seattle City Light 1994; Riedel et al. 1992).

Reservoir drawdown would resemble natural river conditions, reducing the area and depth of the project reservoirs. Water flow velocities would increase and channel cross-sectional area

would decrease to the original size. The deltas at the mouths of the tributary streams have likely increased in size over time due to the influence of the slack water reservoirs. Sediment entrained in the higher-velocity flows in the tributaries settles out rapidly as velocities decrease at the reservoir. The resulting enlarged deltas could present barriers to fish migrations until new channels are cut through the deltas. This downcutting would increase turbidity levels in the mainstem over the short term.

Drawdown would result in a major increase in erosion to shoreline areas by wave action and other shoreline erosion processes. Increased erosion would occur in the exposed drawdown zone from wind, rain, run-off, and freeze/thaw processes. Additional slumping of steep shoreline areas is common. These erosion processes decline with time as sediment availability decreases and sediment is redistributed in the reservoir.

4.1.2.2 Associated Tributaries

No changes would occur to geologic conditions and soils within the four tributaries as a result of Section 7 implementation under Alternative 2 for the Wells, Rocky Reach, and Rock Island Projects (provided habitat improvements are not required to aid in the recovery of listed species). Independent actions by local, State, and Federal agencies are expected to continue to occur as described under Alternative 1. The potential benefits and adverse effects associated with these activities are described under Alternative 1.

4.1.3 ALTERNATIVE 3

4.1.3.1 Project Area

Similar to the other alternatives, the project improvements planned for fishways, bypass systems, and turbine units under Alternative 3 would not alter project area geology, soils, turbidity, or sedimentation from existing conditions. Effects from drawdown, as described under Alternative 2, would also occur under Alternative 3 if drawdown were implemented.

4.1.3.2 Associated Tributaries

Alternative 3 would provide PUD funding for fish habitat improvement projects in the four tributaries. This funding would be in addition to other funding sources available to enhance fish habitat in the area. The amount and availability of the PUD funding would be guaranteed under the HCPs, while there would be no guarantee of the amount or availability of funding from other sources. Specific projects identified in the HCP supporting documents (NMFS et al. 1998b) that would help to improve geomorphic conditions in the tributaries include:

- protection of the Lower White River to minimize future effects to the unstable alluvial materials;
- protection of wetlands at Lake Wenatchee and the mainstem of the Methow River to help avoid future increases in sedimentation and turbidity;
- recruitment of large woody debris in the Wenatchee River to restore channel stability;
- restoration of floodplain function in all tributaries to reduce sedimentation and turbidity;
- protection of riparian bottomlands in the Entiat River watershed to reduce the potential of sedimentation, shoreline erosion, landslides, and turbidity;
- restoration of side channel functions in the Methow River to aid in minimizing shoreline slumping and erosion; and
- revegetation and stabilization of the erosive banks on the Okanogan River between the Similkameen River and Omak Creek to avoid future erosion.

Proposed construction projects that could increase turbidity and sedimentation over the short term include modifications of diversion dams and culverts planned at several streams, placement of in-channel habitat structures, and construction projects that may require temporary roads for site access. Over the long term, effects to site geology, soils, and sediments from these projects would be reduced.

Some habitat improvement projects in the four tributaries would likely result in short-term erosion and turbidity effects. Construction-related projects along river and stream shorelines would likely require a State Joint Aquatic Resource Permit Application (JARPA) and other related permits that evaluate project effects on the existing natural resources, including geology and soils. Through project permitting, BMPs would be identified, and soil erosion and control plans would be required. Review of these construction projects for potential erosion, sedimentation, turbidity, and landslide effects are important considerations to ensure that fish habitat improvements protect existing natural resource conditions, to the extent practicable.

4.2 FISHERIES RESOURCES

Four fish species currently listed as threatened or endangered in the Mid-Columbia River basin are expected to occur within the project area or in areas potentially affected by project operations. These species are:

- Columbia River Distinct Population Segment of bull trout (listed as threatened on June 10, 1998; 63 FR 31674),
- Upper Columbia River spring-run chinook salmon (listed as endangered on August 2, 1999; 64 FR 41835),
- Upper Columbia River steelhead (listed as endangered on August 18, 1997; 62 FR 43974), and
- Middle Columbia River steelhead (listed as threatened on March 25, 1999; 64 FR 14517).

Although adult and juvenile bull trout are occasionally observed passing the projects, little is known about their migratory behavior in the Mid-Columbia River. Specific measures to address the effects of project operations on bull trout are not included in the existing mitigation and compensation programs established through the FERC license and settlement agreements. At this time, informal consultation between FERC, the PUDs, and USFWS has been initiated in an attempt to develop information specific to this species. This information can then be used to determine appropriate mitigation actions at the projects.

Any effects of the Wells, Rocky Reach, and Rock Island dams on Mid-Columbia River steelhead would most likely be limited to changes in water quality because this species occurs in the Yakima River, located downstream of these hydroelectric projects. Measures implemented at the projects to address water quality would be the same for each of the listed species. For this reason, the following discussions of threatened and endangered species relate specifically to Upper Columbia River spring-run chinook salmon and steelhead.

There are three alternatives being considered in this EIS to protect endangered Upper Columbia River spring-run chinook salmon and steelhead: no-action (Alternative 1), hydropower conservation measures to protect anadromous fish, including Section 7 consultations (Alternative 2), and HCP Section 10 permits (Alternative 3). Although there are fundamental differences between the two action alternatives (Alternatives 2 and 3), both provide protection to the listed species. Alternative 3 would provide the same level of protection to all of the Endangered Species Act-listed and unlisted Plan

species (Upper Columbia River spring-run and summer/fall-run chinook, sockeye, and coho salmon and steelhead). Alternative 1 represents a continuation of the existing conditions, without specifically addressing compliance with the Endangered Species Act for the recovery of listed species. As a result, Upper Columbia River spring-run chinook salmon and steelhead have a high likelihood of extinction under Alternative 1 within the next 100 years. For this reason, Alternative 1 is considered to be non-viable for the protection of the listed species.

Independent (non-PUD-funded) tributary habitat improvements and fish passage survival improvements at the Lower Columbia River dams are expected to benefit Upper Columbia River anadromous fish species. Modifications to harvest regulations and hatchery practices likely to occur over the next 50 years would also benefit these stocks. All of these beneficial actions would occur for all three alternatives presented in this EIS.

Other activities that are likely to affect both the listed and unlisted species are also expected to occur in the region. These activities may or may not be directly linked to the Mid-Columbia River hydroelectric projects. For example, the hatchery programs that were developed to mitigate for inundation by the PUD projects are covered under separate Endangered Species Act consultation proceedings and will continue regardless of the consultations on project operational impacts. Other stipulations outlined in the settlement agreements between the PUDs and the fishery agencies and Tribes would also continue unless specifically modified by Alternative 2 or 3.

Because there are a limited number of measures that can be implemented at the Mid-Columbia River hydroelectric projects to increase fish passage survival, many of the protection measures are expected to be similar for each of the action alternatives. In addition, many of the operational protocols that the projects currently operate under were established through the collaborative work of PUD, Federal, State, and Tribal biologists, so they are unlikely to change substantially under any of the alternatives. Therefore, the operational measures and protocols discussed under Alternative 1 would also generally apply to the two action alternatives, unless specific differences are identified.

The intent of Alternative 2 is to develop long-term protection and recovery plans for listed species and additional protection for other anadromous species. However, the protection levels are likely to be greater for the listed species due to the additional authority provided to NMFS through the Endangered Species Act. Any means necessary to accomplish this goal would be required at the projects, up to full mitigation of the project effects. The intent of Alternative 3 is to achieve and maintain no net impact on the listed and unlisted Plan species and to establish criteria for implementing correction and mitigation measures to achieve no net impact to the Plan species. These no net impact measures include funding hatchery supplementation and tributary habitat improvements to mitigate for the unavoidable project passage-related mortality.

As discussed previously, the potential measures proposed under Alternative 2 are not currently supported by either FERC or the PUDs. Extensive negotiations would likely be required under Alternative 2 to resolve biological and technical issues before these measures could be implemented. This would likely delay any assistance to listed and unlisted anadromous fish species. It is also likely that ensuing litigation would delay the implementation of protective measures indefinitely. Measures under Alternative 3, however, would be implemented sooner because of PUD support for the HCP procedures, protocols, and standards. Some of the HCP measures have already been implemented, while others would be implemented after the HCPs are approved.

One potential measure that could be recommended under all the alternatives during the

next 50 years (which would have substantial environmental effects on many of the existing natural, physical, and social resources) would be reservoir drawdown to natural river levels. Drawdown would only be available during relicensing of the three Mid-Columbia River projects. The current FERC licenses expire in 2006, 2012, and 2029 for the Rocky Reach, Wells, and Rock Island projects, respectively. Drawdown would be more likely under Alternatives 2 and 3, because of the authority provided by the Endangered Species Act. Regardless of the alternative, drawdown would likely only occur as a last resort because of the extensive socioeconomic and environmental consequences.

Natural river drawdown would help to mimic the natural river conditions that existed prior to the construction of the hydroelectric facilities, potentially returning juvenile and adult survival to pre-dam levels. Although not recommended by any Federal, State, or local agencies at this time, the review of natural river drawdown was requested by organizations during public scoping for this EIS. Consequently, natural river drawdown at the three dams (Wells, Rocky Reach, and Rock Island) has been evaluated at a brief summarizing level to help understand and compare the overall differences between the alternatives.

Drawdown to minimum operating pool, which is an option under the current licenses, has not been shown to increase juvenile survival in the Mid-Columbia River. Drawdown to minimum operating pool would increase water velocities but would not increase flow rates. While there is some (although inconsistent) data showing a correlation between flow and survival in the Mid-Columbia River, there is no information that correlates water velocity and survival. Therefore, minimum pool drawdown was not evaluated in this EIS.

4.2.1 ALTERNATIVE 1 (NO-ACTION)

Under Alternative 1, the three Mid-Columbia River hydroelectric projects would operate according to existing FERC license articles, settlement agreements, and interim stipulations. Long-term operational plans would continue to be implemented through existing coordinating committee protocols. The existing settlement agreements stipulate prescriptive measures to mitigate and compensate for the loss of anadromous fish habitat and production due to reservoir inundation, as well as losses associated with anadromous fish passage (juvenile and adult) at the projects. These agreements identify mitigation and enhancement measures, but do not contain specific survival rates or recovery goals for any species.

Alternative 1 includes the following protection measures:

- Measures that allow for efficient upstream passage of adult fish through fishways and reservoirs to minimize the potential for fish injury and pre-spawning mortality. Examples include hydraulic and structural fishway improvements; specifically, ladder modifications and improved attraction flow to help move fish more quickly into the ladder systems and over the dams.

- Measures that provide downstream passage of juvenile salmonids while minimizing fish injury. Examples are spill, bypass systems, and predator control programs.

These measures would be applied at the projects and do not include off-site compensation, such as tributary habitat improvements. Furthermore, these mitigation measures are intended to benefit all anadromous fish species more or less equally, with no specific additional measures implemented for Endangered Species Act-listed species.

Although a Section 7 consultation was completed for the construction of the Rocky Reach juvenile

fish bypass facility, this process was initiated as part of the Rocky Reach HCP. If the HCP is not approved, reinitiation of consultation could occur. Therefore, the stipulations included in the biological opinion are not considered part of Alternative 1. Similarly, the stipulations included in the biological opinion over the Wells Dam interim protection plan are not included in Alternative 1 because the time-frame covered by that consultation has expired.

Implementation and monitoring would be conducted through the Mid-Columbia Coordinating Committee for Rocky Reach (under the Mid-Columbia Proceedings), and through the individual coordinating committees for the Wells and Rock Island projects.

4.2.1.1 Endangered Anadromous Salmonid Species

The effects of the operation of the Mid-Columbia River projects were assessed in the Quantitative Analysis Report (QAR), as summarized in Appendix E. The draft QAR report summarizes available information for Endangered Species Act-listed Upper Columbia River steelhead and spring-run chinook salmon, reviews alternative approaches to estimating the risks of extinction and recovery perspectives, and provides preliminary estimates of the relative risks of extinction under a range of alternative management and climate and environmental scenarios.

The QAR also provides analyses of the potential survival improvements that could be gained throughout the life cycle of listed Upper Columbia River salmonids from hydropower system modifications, enhanced habitat, and changing climate and environmental conditions (i.e., ocean survival). Based on the analyses contained in the QAR, Upper Columbia River spring-run chinook salmon and steelhead have a high likelihood of extinction (i.e., greater than a 95 percent chance within the next 100 years) if the most conservative (1980 to 1994 brood) survival rates continue into the future. Continuing the status quo as proposed under Alternative 1 is unlikely to appreciably change this conclusion. Refer to Chapter 5, Cumulative Effects, for a detailed discussion of the QAR results.

Juvenile Migration/Survival

Protection and recovery measures for fish species listed under the Endangered Species Act would be similar to the mitigation and enhancement measures implemented for unlisted species under Alternative 1.

Wells Dam

Under Alternative 1, the Douglas County PUD would continue to operate the Wells Dam in accordance with the 1990 Wells Settlement Agreement (FERC 1991). The juvenile mitigation measures include:

- minimizing turbine unit and spill gate maintenance during the juvenile outmigration period, and
- operating the surface bypass system as recommended by the Wells Coordinating Committee bypass team to provide bypass operations for 80 percent of the spring and summer migrations.

The juvenile project passage survival rate estimates are greater than the 93 percent juvenile project passage survival goal established in the HCP (see Section 3.2.6.4, Total Project Survival – Juvenile Migrants). These survival rates would apply to approximately 80 percent of the spring and summer migrating smolts under Alternative 1.

The northern pikeminnow removal program was implemented as part of the HCP process, and is not a requirement under the Wells Settlement Agreement. Therefore, it is assumed that this program would not continue under Alternative 1. The avian predator control measures, as defined

in the Cooperative Service Agreement between Douglas County PUD and the USDA Animal and Plant Health Inspection Service, are expected to continue at the Wells Dam and Wells Hatchery. Although these programs are also not a requirement in the settlement agreement, they are relatively inexpensive to operate and were developed through the Mid-Columbia River Coordinating Committee process.

Rocky Reach Dam

Under Alternative 1, the Chelan County PUD would continue to operate Rocky Reach Dam in accordance with measures prescribed in the existing FERC license (FERC 1957a,b, 1968) and consistent with the spill levels set forth in the Fourth Revised Interim Stipulation, now expired (FERC 1996a). Additional protection measures were identified in the Section 7 consultations for spring-run chinook salmon and steelhead (NMFS 2002c). As this was an interim consultation (until relicensing in 2006), and initiated to cover the construction of the juvenile bypass system as a part of the HCP, the measures are not assumed to continue into the future for Alternative 1. Additional measures are, however, expected to be required through the relicensing process. The following mitigation measures are likely to occur under Alternative 1:

- Construct a permanent bypass system.[1]
- Operate the turbines within normal power efficiency bands and continue to replace old turbine runners with new reduced-gap runners.
- Spill at a level equal to 15 percent of the daily average flow for 36 days of the juvenile spring-run chinook salmon and steelhead migration period. Up to an additional 6 days of 15 percent spill may be added, if necessary to encompass 90 percent of the Okanogan River sockeye salmon run. In the summer, spill at a level equal to 10 percent of the daily average flow for a total of 34 days between June 15 and August 15.
- Continue to implement predator control programs.

These mitigation measures are expected to improve fish passage efficiency for juvenile fish at the Rocky Reach Dam, particularly with respect to surface bypass system development. It is assumed that continued refinement of the bypass system would result in survival rates for spring-run chinook salmon and steelhead that are similar to those observed in the bypass systems at the Lower Snake River dams (estimated at 97 to 98 percent). Because of the configuration of the dam, which forms a cul-de-sac on the powerhouse side of the river, most of the fish that pass through the bypass would otherwise likely pass through the turbines, which have a lower survival rate (estimated between 90 and 93 percent). The bypass system offers an alternative passage route for juvenile fish, which tend to accumulate at the downstream end of the cul-de-sac (near Turbine Units 1 through 3).

Although spillway survival is usually expected to be the same or slightly higher than bypass survival (98 to 99 percent), the Rocky Reach spillway is not particularly effective at the lower spills implemented to date. From 8 to 19 percent of the fish are typically passed in 15 percent spill (Steig and Adeniyi 1997; English et al. 1998c, 1999). Other mainstem Columbia and Snake River dams typically achieve much higher spill-to-fish passage ratios at this spill volume. The apparent inefficiency of the Rocky Reach spillway is believed to be associated with the configuration of the dam. Juvenile fish that enter the cul-de-sac (adjacent to the powerhouse) tend to pass the project through the bypass system or the turbine units rather than moving back upstream to encounter the spillway.

[1] Because the new juvenile bypass system is an integral component of the HCP, for the purpose of comparison it is analyzed in Alternative 3 (HCP) rather than in Alternative 1 (no-action).

The survival estimates developed as a result of PIT-tag evaluations conducted in 1998 and 1999 represent the best available information regarding both the direct and indirect effects of the Rocky Reach Hydroelectric Project on the survival of juvenile spring-run chinook salmon and steelhead (see Table 3-4). These PIT-tag studies indicate that juvenile spring-run chinook salmon survival is at least 85.9 percent (see Section 3.2.6.4, Total Project Survival – Juvenile Migrants). Bickford et al. (1999, 2000b, 2001) estimated chinook salmon survival at 93.9 percent and steelhead survival at between 95.9 and 96.7 percent. However, these evaluations included only a single-release strategy, which does not include all the sources of mortality occurring at the dam (see Table 3-4).

Single release-recapture models can only measure project effects from the point of release to the PIT-tag detector (which is typically located within a juvenile bypass channel or fish handling facility). Thus, some of the mortality associated with passage via turbines or the spillway or the indirect mortality occurring downstream of the project is not included in these survival estimates. Therefore, these survival estimates are likely somewhat higher than would have been measured if the paired release-recapture model were utilized. Future studies to determine project survival estimates would likely be based on paired release methodologies.

Survival estimates are required for all species, over a variety of river flow and project operational conditions, to reliably assess project-related mortality rates. Future studies could demonstrate different survival rates than those recently observed.

Despite the improvements in juvenile fish passage efficiency, additional protection and enhancement measures could be implemented at the project to improve the survival of listed species. Under Alternative 1, additional measures can be implemented through the pending Mid-Columbia Proceeding with FERC and during relicensing. However, Alternative 1 would provide approximately the same level of protection to the Endangered Species Act-listed fish as the unlisted species. As a result, Alternative 1 is likely to result in lower survival for the listed species compared to the expected survival that would likely result under Alternatives 2 or 3.

The current predator removal programs appear to be altering the population structure of northern pikeminnow in the project area. These programs are expected to result in a substantial reduction in predation rates on migrating anadromous salmonid smolts and are expected to continue under Alternative 1.

Rock Island Dam

Under Alternative 1, the Chelan County PUD would continue to operate Rock Island Dam in accordance with the existing FERC settlement agreement and license articles (FERC 1987a, 1989a). Currently, the primary methods for maximizing juvenile spring-run chinook salmon and steelhead survival at the Rock Island Dam are spill and predator control measures. The existing spill program developed as a result of provisions in the Rock Island Settlement Agreement and is based on a Fishery Conservation Account of $2.05 million (1986 dollars adjusted for inflation). Through this process, the agencies and Tribes can request spill at any time, with the lost revenue to the PUD subtracted from the account. Once the spill equivalent of $2.05 million has been subtracted from the account, the PUD will have fulfilled its yearly obligation under the settlement agreement.

The predator control program includes removal of northern pikeminnow from the forebay and tailrace, predatory bird hazing, and avian predator exclusion wires strung across the tailrace. These activities are expected to reduce the overall losses of Plan species associated with passage at the project.

Mitigation measures that are expected to continue under Alternative 1 include:

- predator control programs,
- providing daily average spill levels as requested by the fishery agencies and Tribes through the Fishery Conservation Account, and
- evaluating spillway modifications to increase spill effectiveness.

These mitigation measures are expected to maintain current juvenile fish passage survival rates at the Rock Island Dam.

The survival estimates developed as a result of PIT-tag evaluations conducted from 1998 through 2002 represent the best available information regarding both the direct and indirect effects of the Rock Island Dam on the survival of juvenile chinook salmon and steelhead. Juvenile spring-run chinook salmon survival was estimated at between 88.9 and 95.6 percent, based on total project survival PIT-tag evaluations conducted on hatchery-reared yearling fall-run chinook salmon between 1998 and 2002 (see Table 3-5). Total project survival of juvenile steelhead was estimated at 95.8 percent based on evaluations conducted with hatchery-reared juvenile steelhead in 1999 (Stevenson et al. 2000). Direct juvenile salmonid survival estimates calculated at the spillway and powerhouses (91.1 and 94.5 percent, respectively), although not conclusive, are consistent with the trends identified in PIT-tag survival evaluations.

Implementing the mitigation measures under Alternative 1 would not allow for the continued evaluation of project effects on listed species, and from the limited data currently available, would not result in sufficiently high survival to ensure the continued existence of spring-run chinook salmon. Without continued research and evaluation and improved passage survival measures, Alternative 1 is expected to result in lower long-term survival for anadromous fish species than either Alternative 2 or 3.

Adult Migration/Survival

The Douglas and Chelan County PUDs operate three of the five non-Federal Mid-Columbia River hydroelectric projects. Upper Columbia River spring-run chinook salmon and steelhead from the Methow and Okanogan Rivers must pass four Lower Columbia River Federal hydroelectric projects and all five of the Mid-Columbia River dams to reach their spawning grounds. The Entiat River fish runs must pass the lower river projects and four Mid-Columbia River projects; the Wenatchee River fish runs must pass the lower river projects and three of the five Mid-Columbia River dams. Although the Mid-Columbia River steelhead stock does not migrate past any of the five Mid-Columbia River projects, they are subject to variations in flow and other water quality parameters influenced by project operations at the Mid-Columbia River projects (and the upstream Federal projects). Although the combined effects of all five Mid-Columbia River projects on each of these species are unknown at this time, there could be cumulative effects. For example, physiological stresses associated with water quality conditions in the reservoirs or fish passage conditions at the dams could cumulatively affect the survival of juveniles or adults.

The direct mortality of adults passing individual projects is likely minimal under normal operating conditions. However, each dam presents the potential for migration delays, increasing energy expenditure as fish move through the fishladders, increasing incidences of involuntary fallback through the dam, and increasing exposure to high concentrations of dissolved gases. Increased migration rates through the relatively slack water reservoirs may, however, counteract some of these effects.

The effects (positive or negative) and magnitude of the cumulative effects to adult anadromous fish are largely unknown at this time. While existing technologies allow adults to be tracked during their migrations past the projects, and in some

cases all the way to the spawning areas, with few exceptions (e.g., death resulting from falling back through the projects), they do not indicate the cause of any observed mortality. As new technologies become available, it is likely that additional assessments would be conducted under Alternative 1 as well as both action alternatives.

Adult passage information (such as the time spent immediately downstream of the dam, success at passing into the collection channel and fishway entrances, and time spent passing through the ladders) is typically assessed using radio-telemetry techniques. Although previous studies have not determined a direct relationship between project passage times and reproductive success, reducing passage times is expected to reduce energy expenditures and improve the likelihood that adult fish would survive to spawn.

Radio-telemetry studies only provide information for tagged fish that pass the project. Failure to pass a project may result from project operations (such as passage facility design, attraction water effectiveness, or complicated downstream flow patterns. At the same time, fish that fail to pass a project could be destined for downstream spawning areas or may have been injured previously during their upstream migration. In addition, tag failure or tag loss can be misinterpreted as fish failing to pass a project, resulting in an overestimate of project effects.

There are limited data available to assess the survival of adult anadromous salmonids passing the Mid-Columbia River projects. Radio-telemetry evaluations conducted between 1993 and 1998 contain the bulk of the available data, but survival was not specifically addressed in any of these studies.

Project operations are not expected to directly affect adult migrations in tributary streams. However, migration delays or injuries resulting from project passage could potentially reduce the ability of fish to reach their natal spawning grounds. Bjornn et al. (2000) reported that radio-tagged adult salmon and steelhead that fell back at one or more Columbia and Snake River dams escaped to tributary streams at significantly lower rates than fish that did not fall back. There was also a higher rate of unaccounted-for fish among those that fell back. In addition, they observed that fish that fell back multiple times tended to escape to tributaries at lower rates than fish that fell back one time, particularly for upriver stocks.

Typical reservoir water level fluctuations are not expected to affect the ability of adult fish to enter the mainstem tributaries. If reservoir drawdown was implemented to improve juvenile survival, access to these tributaries by upstream migrating adults may initially be limited due to alluvial sediments that have accumulated at the confluences to the mainstem Columbia River.

The effects of project operations on the survival of migratory bull trout are largely unknown, although adult bull trout have been observed using the adult fishways. Preliminary radio-telemetry evaluations in the project area observed no substantial impacts relative to project passage (see Section 3.3.8.1, Life Histories – Bull Trout/Dolly Varden). While none of the tagged fish fellback below the dam after navigating through the fishladders, some of the tagged fish migrated back downstream through the projects after spending weeks to several months in upstream tributaries. Although the downstream passage route at the projects is unknown, there were no indications of dam passage impacts. Migration rates and apparent upstream passage delays are similar to other anadromous salmonids, and the tagged fish entered tributary streams prior to the spawning season. As with other radio-telemetry studies, however, any potential effects on spawning success could not be determined (see Section 3.2.5.1, Upstream Migration of Adults). Radio-telemetry studies are ongoing for bull trout in an effort to determine if, or to what extent, bull trout are being affected by project operations.

Wells Dam

To minimize and mitigate for potential effects of project operations on adult spring-run chinook salmon and steelhead under Alternative 1, the Douglas County PUD would:

- maintain and operate adult passage facilities at the project according to criteria stipulated in the 1990 Wells Settlement Agreement (FERC 1991);
- investigate entrance and ladder conditions to ensure that access is not impeded during project passage. Should a structural problem be identified within the fishladder, Douglas County PUD has agreed to improve ladder operations with specified criteria to minimize delays at the dam;
- operate the spill and turbine units in a manner that optimizes the attraction flows at the fishway entrances and improves adult passage, while meeting requirements for juvenile fish passage; and
- conduct fish passage studies to identify and correct potential adult passage problems.

Radio-telemetry studies indicate that the median passage time for adult spring-run chinook salmon at the Wells Dam is similar to that observed at other Mid-Columbia River projects. However, passage times for steelhead appear to be substantially faster than for spring-run chinook salmon or other anadromous fish species. Initial evaluations found that the majority of the passage delays at the project were associated with operation of the brood collection traps on the east and west ladder fishways. In addition, prior to implementing collection gallery operational modifications, fish would delay within the fishway collection galleries (Stuehrenberg et al. 1995). Trap operations increase the total project passage times by 5 to 10 times over those observed during non-trapping periods (English et al. 2000).

Despite the relatively fast passage time for steelhead at the project, the Okanogan River bound steelhead experience some delay at the mouth of the Okanogan River due to elevated water temperatures in the Okanogan River. There is no evidence suggesting that these delays are related to project operations, and only indirect data suggesting that the delays may be affecting overall spawning success.

There is little information to suggest that substantial injuries are occurring to adult fish passing through the fishladders under normal operating conditions. Therefore, the greatest potential for injury and mortality to adult fish is believed to be associated with fish falling back through the project after initially passing upstream. Although the fallback rate for spring-run chinook salmon is relatively low, there are no data to determine if there is any effect on survival. The fallback rate of adult radio-tagged steelhead at Wells Dam was 6.8 percent in 1999 (English et al. 2001) (see Section 3.2.5, Adult Survival at Projects).

Rocky Reach Dam

Mitigation measures for adult spring-run chinook salmon and steelhead under Alternative 1 would include maintaining and operating the adult passage facility according to criteria in the existing FERC license and subsequent stipulations. Evaluations have shown that at least 80 percent of the adult sockeye and summer-run chinook salmon passage delays occur in the fishway entrance pools. It is likely that similar delays occur in this area for spring-run chinook salmon and steelhead as well (see Section 3.2.5, Adult Survival at Projects), although there is only indirect information suggesting that these factors may be affecting overall spawning success.

Limited data exist to assess the survival of adult salmon and steelhead fallbacks or steelhead kelts passing downstream through the project. However, it is likely that adult passage survival through the juvenile bypass system or the spillway is greater than through the turbine units.

Rock Island Dam

Under Alternative 1, the Chelan County PUD would maintain and operate the adult passage facilities at the project according to criteria included in the existing FERC license and settlement agreement. The effects of these actions on adult fish would be similar to those described for the Rocky Reach Dam (see Section 3.2.5, Adult Survival at Projects).

Adult Reservoir Spawning

There is no available information suggesting that substantial spawning activity of adult spring-run chinook salmon or steelhead occurs in the Wells, Rocky Reach, or Rock Island reservoirs. However, some steelhead spawning might occur in the tailraces (similar to summer/fall-run chinook salmon spawning) or at the mouths of the mainstem tributaries. If spawning occurs in these areas, the operation of the Wells, Rocky Reach, and Rock Island powerhouses may have some effect on steelhead spawning.

Although bull trout are occasionally observed in the project areas, they are generally believed to spawn in small headwater tributaries. Therefore, project operations are only expected to affect bull trout spawning for those fish that migrate past one or more of the dams to reach their spawning grounds. However, potential effects during passage are unknown at this time (see discussion of potential effects in the Adult Migration/ Survival section).

Tributary Habitat Improvements

Under Alternative 1, the PUDs would not fund off-site mitigation, including habitat-related projects to enhance adult spawning and juvenile rearing in the Mid-Columbia River tributary streams. As with the other two alternatives, some tributary habitat improvement projects are expected to occur through funding sources other than the PUDs.

Hatchery Production

The hatchery programs currently supported by the Chelan and Douglas County PUDs were developed to mitigate for the loss of spawning habitat with the inundation of the mainstem Columbia River by the project reservoirs, and for estimated losses associated with fish passage at the projects. Under Alternative 1, these facilities would likely continue to be funded by the PUDs and operated by WDFW in accordance with their various license articles, settlement agreements, and interim stipulations, as well as the policies and guidelines of the State and Section 10 permits issued under the provisions of the Endangered Species Act. The Section 10 permits describe the efforts implemented to avoid and minimize the effects that hatchery-reared fish may have on Endangered Species Act-listed salmonids. These efforts include protocols for adult collection and spawning, rearing and release strategies, fish health management programs, and environmental monitoring. These protocols are based on sound fish husbandry principles, and are therefore expected to be followed for all hatchery stocks and would equally benefit unlisted fish species.

Wells Dam

Under Alternative 1, the Douglas County PUD would continue to fund the current hatchery compensation programs for spring-run chinook salmon at the Methow Fish Hatchery and for steelhead at the Wells Hatchery and off-site acclimation facilities according to stipulations in the 1990 Wells Settlement Agreement (FERC 1991). Operation of the Wells Hatchery program has previously received a Section 10 permit (#1094, issued to WDFW on February 4, 1998), and a biological opinion concerning NMFS's issuance of the permit has been completed. Operation of the Methow Fish Hatchery was considered in the review of a Section 10 permit (#1196 to WDFW) and in a biological opinion prepared for NMFS's issuance of that permit (NMFS 2002c). Therefore, Endangered Species Act requirements would be satisfied for the PUD-

funded hatchery compensation program under Alternative 1.

The Methow Hatchery was built as part of the 1990 Wells Dam Settlement Agreement and was intended to compensate for an assumed total project mortality rate of 14 percent (including reservoir and dam passage). Steelhead production was also increased at the Wells Hatchery to compensate for 14 percent steelhead dam passage loss. However, recent juvenile survival studies suggest an average mortality of about 3.8 percent. Under Alternative 1, the compensation levels would be adjusted to reflect the actual fish passage losses, according to stipulations in the Wells Settlement Agreement (FERC 1991). Based on the measured mortality rates, there would be about a 70 percent reduction in hatchery production, compared to existing hatchery production.

Since inception in 1992, the Methow Hatchery has been operating under a supplementation strategy. Under this program, the genetic integrity of the Methow River chinook stock supercedes the hatchery production goals established in the 1990 Wells Settlement Agreement. The hatchery program also includes the development of spring-run chinook salmon broodstock management protocols and the volitional release of smolts from acclimation ponds located in tributary streams.

Rocky Reach Dam

The Turtle Rock, Rocky Reach Annex, and Chelan Falls hatchery facilities are owned and funded by the Chelan County PUD and operated by the WDFW in accordance with Section 10 permit #1094 (issued to WDFW). A biological opinion concerning NMFS's issuance of that permit has been completed (NMFS 1998b). The Section 10 permit describes the efforts required to avoid and minimize effects to the listed species. However, this permit will be replaced by permit #1395 in 2002 or 2003, which might contain additional restrictions to further minimize the potential effects on listed species. Therefore, although Chelan County PUD has committed to sufficiently fund the hatchery program to mitigate for the estimated project-related losses, hatchery protocols or production restrictions might not allow that level of supplementation.

Under Alternative 1, the Chelan County PUD would continue to fund the operation and maintenance of these hatcheries at a level equivalent to the 1996 budgeted operation and maintenance costs, adjusted annually for inflation. The existing production capacities are believed to more than compensate for juvenile fish passage losses and for original inundation behind Rocky Reach Dam. The hatchery program would likely continue to be operated by WDFW, in a manner consistent with the recovery of spring-run chinook salmon and steelhead populations.

Rock Island Dam

The Eastbank Hatchery complex and associated satellite facilities are owned and funded by the Chelan County PUD and operated by WDFW. The spring-run chinook salmon programs were considered in the review of Section 10 permit #1196 (issued to WDFW) and in the biological opinion concerning NMFS's issuance of that permit (NMFS 2002c). The Section 10 permit requirements are similar to those described previously, although this permit will likely be modified or amended within a year. Therefore, Endangered Species Act requirements would be satisfied for the PUD-funded hatchery compensation program under Alternative 1.

Under Alternative 1, Chelan County PUD would continue to fund the operation and maintenance of these hatcheries in accordance with the Rock Island Settlement Agreement. Funding would be maintained at a level equivalent to the 1998 budgeted operation and maintenance costs, adjusted annually for inflation. The existing production capacities are believed to compensate for original inundation behind Rock Island Dam and more than compensate for juvenile fish passage losses at the project.

Although Chelan County PUD has committed sufficient funding levels to mitigate for the estimated project-related losses, hatchery protocols or production restrictions might not allow that level of supplementation throughout the 50-year time-frame.

Associated Tributaries

Effects associated with hatchery supplementation in the Mid-Columbia River tributaries include the potential interactions between hatchery and wild stocks (competition, predation, and disease transmission) and potential changes or alterations to the genetic integrity and diversity of both populations. Competition between hatchery and wild juvenile fish may occur where food and space requirements overlap or are limited. However, there is little information to document the magnitude or significance of these potential interactions in the Mid-Columbia River region.

There is also little information on the potential predation of hatchery fish on wild fish, although the typical size difference between hatchery and wild fish suggests that such interactions are possible. Although disease transmission fish to fish (horizontal transmission) can occur in hatcheries or other areas where affected and unaffected fish are held in close contact, there are limited data suggesting that this is a substantial problem in the riverine environment. All three of these potential interactions would be greatest at or near the hatchery release points, and would be expected to decrease over time and space as the fish migrate downstream.

The potential risk of changing the genetic integrity and diversity of wild and hatchery fish populations would be minimized by the utilization of appropriate hatchery management practices. The current strategies of the Mid-Columbia River hatchery program were developed to be consistent with the NMFS interim policy on artificial propagation under the Endangered Species Act. Therefore, no additional effects are expected from the Mid-Columbia River hatchery programs.

Monitoring and Evaluation

Under Alternative 1, the PUDs would continue to implement the research and monitoring plans identified in their license articles, settlement agreements, and interim stipulations. The primary purpose of these plans is to ensure that the mitigation measures are being implemented in accordance with existing licenses and agreements.

Wells Dam

Under Alternative 1, the Douglas County PUD would conduct the following monitoring and evaluation measures developed through consultation with the Wells Coordinating Committee:

- Continue to assess juvenile run timing at the Wells Project with real-time hydroacoustic monitoring, and to periodically verify these data with fyke-net evaluations.
- Evaluate the adequacy and effectiveness of the hatchery programs.
- Evaluate juvenile fish passage efficiency at the project using the best available techniques. Douglas County PUD evaluated fish passage efficiency of the bypass system in 1990, 1991, and 1992.
- Periodically evaluate adult passage through the project fishways.
- Provide adult fish counts on a 24-hour basis.

Rocky Reach Dam

Under Alternative 1, the Chelan County PUD would conduct the following monitoring and evaluation measures:

- Continue to assess juvenile run timing using the juvenile fish bypass sampler.
- Assess the injury, mortality, and descaling of juvenile fish passing through the bypass system.

- Provide adult fish counts on a 24-hour basis.

Rock Island Dam

Under Alternative 1, the Chelan County PUD would conduct the following monitoring and evaluation measures:

- Continue to assess juvenile run timing using the Powerhouse 2 juvenile fish sampler.
- Monitor the condition of fish passing through the bypass for injury, mortality, and gas bubble disease rates.
- Continue to evaluate spillway modifications to improve juvenile fish passage efficiency and minimize total dissolved gas levels downstream.
- Provide adult fish counts on a 24-hour basis.

4.2.1.2 Other Anadromous Salmonid Species

Alternative 1 provides the same level of protection for all anadromous fish species, regardless of their listing status under the Endangered Species Act. The protection criteria are based primarily on project operational guidelines rather than survival rate criteria.

Juvenile Migration/Survival

Wells Dam

The effectiveness of the Wells Dam juvenile fish protection measures for non-Endangered Species Act-listed species, provided by Alternative 1, would continue to be evaluated primarily through fish passage efficiency criteria. The fish passage efficiency criteria, established in the 1990 Wells Settlement Agreement, are set at 80 percent for spring migrants and 70 percent for summer migrants (FERC 1991).

According to hydroacoustic evaluations conducted between 1990 and 1992, the Wells bypass system has an average fish passage efficiency of about 92 percent for spring migrants and about 96 percent for summer migrants (Skalski 1993). Therefore, the established passage efficiency criteria are being met under existing conditions. In addition to meeting these criteria, the overall survival for the unlisted anadromous species are expected to be similar to those discussed for the listed species. Dam passage survival has been calculated at between 97.4 and 98.6 percent for all anadromous salmonids (see Table 3-3). Although these survival rates were developed using primarily data from other projects in the basin, they are in line with the estimates of project passage survival from project-specific survival studies (see Table 3-4). Therefore, dam passage survival is expected to be similar for all the alternatives at the Wells Dam (Table 4-1).

Rocky Reach Dam

Under Alternative 1, the Chelan County PUD would continue to operate Rocky Reach Dam in accordance with the existing FERC license and interim stipulations for the protection of unlisted species.

The Rocky Reach Dam juvenile fish protection procedures would be primarily prescriptive in nature, with no specific outcome-based performance (i.e., survival) goals. The main goal of the juvenile fish protection measures at Rocky Reach Dam for unlisted species would be to complete the construction of the permanent bypass system.

Although the bypass system is currently being built, it is an integral part of the HCPs and is therefore discussed under Alternative 3. Prior to the completion of the bypass system, Chelan County PUD would provide interim protection to juvenile migrants through the use of spill.

Although the mitigation measures for Rocky Reach Dam are not based on survival rates under Alternative 1, survival rates can be estimated to allow comparisons between the EIS alternatives. In lieu of specific survival data for each

anadromous fish species passing the Rocky Reach Dam, the available dam-specific data (as well as data from other projects in the Columbia River basin) were used to estimate survival for each species. Based on this general information, juvenile fish dam passage survival ranges from 90.8 to 94.1 percent (Table 4-2). Specific project passage survival studies, which include indirect and delayed mortality, indicate total project survival rates between 85.9 and 96.7 percent (see Table 3-5).

Rock Island Dam

Under Alternative 1, Chelan County PUD would continue to operate Rock Island Dam in accordance with their existing FERC license and the Rock Island Settlement Agreement (FERC 1987a). The primary method for maximizing juvenile anadromous fish survival at the Rock Island Dam is through spill. Spill passage is believed to be the most benign passage route for most species (Chapman et al. 1994a), although the resulting increases in downstream total dissolved gas can impact aquatic resources, including anadromous fish. The spill program would be implemented based on the Fishery Conservation Account described previously (see Section 4.2.2.1 under Juvenile Migration/ Survival).

Similar to the juvenile fish mitigation measures for unlisted species described for the Rocky Reach Dam, the mitigation programs at the Rock Island Dam are prescriptive, and do not include survival goals. For the purposes of comparing alternatives, however, survival under Alternative 1 can be estimated.

Based on general information, juvenile salmonid dam passage survival for all species is expected to range between 91.1 and 94.5 percent (Table 4-3). While these estimates do not include indirect and delayed mortality factors, project-specific survival studies indicate survival rates of between 88.9 and 95.6 percent for chinook salmon and 95.8 percent for steelhead (see Table 3-5). Survival for the remaining species was calculated based on the available (on-site and off-site) route-specific information. They ranged from 91.5 to 94.4 percent for sockeye and coho salmon, and 91.1 to 94.1 percent for summer/fall-run chinook salmon (see Table 4-3).

Adult Migration/Survival

Several radio-tag studies indicate that the adult fishways at the Mid-Columbia River dams are generally effective at providing passage for anadromous adult fish under normal operating conditions, although passage times for summer/fall-run chinook salmon appear to be longer than for spring-run chinook salmon and steelhead (see Table 2-4). Summer- and fall-run chinook salmon are also likely to be more vulnerable to delays because their migrations extend further into the summer, when water temperatures are higher. Higher temperatures increase the fish's metabolic rate, resulting in greater energy expenditures. Their migration period also tends to be closer to their spawning periods, allowing less time to compensate for migration delays. Although these factors are suspected to increase the rate of pre-spawning mortality for some of the anadromous species, there is no data to verify or quantify the effects.

The adult fishways at the PUD projects are operated according to criteria established in existing FERC licenses, settlement agreements, and interim stipulations.

NMFS has determined that total per-project mortality of Upper Columbia River adult spring-run chinook salmon and adult steelhead is likely between 1.2 and 3.2 percent (NMFS 2002d, 2000a, 1998a). However, it is not currently possible to differentiate between hydrosystem caused mortality and natural mortality (which undoubtedly occurs) with the technologies available (see Section 3.2.5.1, Upstream Migration of Adults). Per-project mortality estimates based on available information include both sources. Therefore, mortality rates attributable to the effects of hydroelectric projects

TABLE 4-1. JUVENILE FISH SURVIVAL CALCULATIONS BY PASSAGE ROUTE AND ALTERNATIVE AT WELLS DAM

SPECIES	PROPORTION OF FISH THROUGH EACH PASSAGE ROUTE[1]			PROPORTION SURVIVING EACH PASSAGE ROUTE DURING SPILL/BYPASS OPERATIONS[1]			NON-SPILL/BYPASS OPERATIONS TURBINE SURVIVAL[2] (90-93%)	ALL ROUTES COMBINED– TOTAL SURVIVAL (%)[1]
	SPILLWAY PASSAGE (%)	BYPASS PASSAGE (%)	TURBINE PASSAGE (%)	SPILLWAY SURVIVAL (98-99%)	BYPASS SURVIVAL (98-99%)	TURBINE SURVIVAL (90-93%)		
Alternative 1[3]								
Subyearling Chinook	NA	96.4	3.6	NA	75.6 – 76.4	2.6 – 2.7	18.0 – 18.6	96.2 – 97.6
Yearling Chinook	NA	92.4	7.6	NA	72.4 – 73.2	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Sockeye	NA	92.4	7.6	NA	72.4 – 73.2	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Coho		92.4	7.6	NA	72.4 – 73.2	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Steelhead	NA	92.4	7.6	NA	72.4 – 73.2	5.5 – 5.7	18.0 – 18.6	95.9 – 97.4
Alternative 2[4]								
Subyearling Chinook	1.3	96.4	2.3	1.3	93.5 – 94.5	2.1	0.9	97.7 – 98.8
Yearling Chinook	2.7	92.4	4.9	2.6 – 2.7	89.7 – 90.6	4.4 – 4.5	0.9	97.5 – 98.7
Sockeye	2.7	92.4	4.9	2.6 - 2.7	89.7 – 90.6	4.4 – 4.5	0.9	97.5 – 98.7
Coho	2.7	92.4	4.9	2.6 – 2.7	89.7 – 90.6	4.4 – 4.5	0.9	97.5 – 98.7
Steelhead	2.7	92.4	4.9	2.6 – 2.7	89.7 – 90.6	4.4 – 4.5	0.9	97.5 – 98.7
Alternative 3[5]								
Subyearling Chinook	NA	96.4	3.6	NA	89.8 – 90.7	3.1 – 3.2	4.5 – 4.7	97.3 – 98.4
Yearling Chinook	NA	92.4	7.6	NA	86.0 – 86.9	6.5 – 6.7	4.5 – 4.7	97.0 – 98.3
Sockeye	NA	92.4	7.6	NA	86.0 – 86.9	6.5 – 6.7	4.5 – 4.7	97.0 – 98.3
Coho		92.4	7.6	NA	86.0 – 86.9	6.5 – 6.7	4.5 – 4.7	97.0 – 98.3
Steelhead	NA	92.4	7.6	NA	86.0 – 86.9	6.5 – 6.7	4.5 – 4.7	97.0 – 98.3

1 Based on assumed survival and passage rates through the available passage routes.
2 Turbine survival estimate for the time period not covered by spill and/or bypass operations.
3 80 percent of spring and summer migration covered by 7 percent flow through the bypass.
4 99 percent of spring and summer migration covered by 7 percent flow through the bypass and 33 percent through the spillway.
5 95 percent of spring and summer migration covered by 7 percent flow through the bypass.
NA = Not available.

TABLE 4-2. JUVENILE FISH SURVIVAL CALCULATIONS BY PASSAGE ROUTE AND ALTERNATIVE AT ROCKY REACH DAM

SPECIES	PROPORTION OF FISH THROUGH EACH PASSAGE ROUTE[1]			PROPORTION SURVIVING EACH PASSAGE ROUTE DURING SPILL/BYPASS OPERATIONS[1]			NON-SPILL/BYPASS OPERATIONS TURBINE SURVIVAL[2] (90-93%)	ALL ROUTES COMBINED– TOTAL SURVIVAL (%)[1]
	SPILLWAY PASSAGE (%)	BYPASS PASSAGE (%)	TURBINE PASSAGE (%)	SPILLWAY SURVIVAL (98-99%)	BYPASS SURVIVAL (98-99%)	TURBINE SURVIVAL (90-93%)		
Alternative 1[3]								
Subyearling Chinook	12.0	NA	88.0	9.9 – 10.0	NA	66.9 – 69.2	14.0 – 14.4	90.8 – 93.6
Yearling Chinook	13.8	NA	86.2	11.4 – 11.5	NA	65.6 – 67.7	14.0 – 14.4	90.9 – 93.7
Sockeye	21.5	NA	78.5	17.8 – 18.0	NA	59.7 – 61.7	14.0 – 14.4	91.5 – 94.1
Coho	13.8	NA	86.2	11.4 – 11.5	NA	65.6 – 67.7	14.0 – 14.4	90.9 – 93.7
Steelhead	12.5	NA	87.5	10.4 – 10.5	NA	66.5 – 68.8	14.0 – 14.4	90.8 – 93.6
Alternative 2[4]								
Subyearling Chinook	51.2	20.0	28.8	49.7 – 50.2	19.2 – 19.4	25.7 – 26.6	0.9	95.4 – 97.0
Yearling Chinook	31.6	34.2	34.2	30.7 – 31.0	32.8 – 33.2	30.5 – 31.5	0.9	94.9 – 96.6
Sockeye	51.2	11.7	37.1	49.7 – 50.2	11.3 – 11.4	33.0 – 34.1	0.9	94.9 – 96.6
Coho	31.6	34.2	34.2	30.7 – 31.0	32.8 – 33.2	30.5 – 31.5	0.9	94.9 – 96.6
Steelhead	30.4	49.7	19.9	29.5 – 29.8	47.7 – 48.2	17.7 – 18.3	0.9	95.9 – 97.3
Alternative 3[5]								
Subyearling Chinook	12.0	36.0	52.0	11.2 – 11.3	33.2 – 33.5	44.5 – 45.9	4.5 – 4.7	93.3 – 95.4
Yearling Chinook	13.8	43.1	43.1	12.9 – 13.0	39.7 – 40.1	36.9 – 38.1	4.5 – 4.7	93.9 – 95.8
Sockeye	21.5	18.9	59.6	20.0 – 20.2	17.4 – 17.6	51.0 – 52.7	4.5 – 4.7	92.9 – 95.1
Coho	13.8	43.1	43.1	12.9 – 13.0	39.7 – 40.1	36.9 – 38.1	4.5 – 4.7	93.9 – 95.8
Steelhead	12.5	62.5	25	11.6 – 11.8	57.6 – 58.2	21.4 – 22.1	4.5 – 4.7	95.1 – 96.7

1 Based on assumed survival and passage rates through the available passage routes.
2 Turbine survival estimate for the time period not covered by spill and/or bypass operations.
3 84 percent of spring and summer migration covered by 15 percent flow through the spillway.
4 99 percent of spring and summer migration covered by 40 percent flow through the spillway and a 6 kcfs sluiceway bypass.
5 95 percent of spring and summer migration covered by 15 percent flow through the spillway. NOTE: This does not include expected survival improvements from three weeks of 25% spill for sockeye during the spring migration for all spring migrating species.
NA = Not available.

TABLE 4-3. JUVENILE FISH SURVIVAL CALCULATIONS BY PASSAGE ROUTE AND ALTERNATIVE AT ROCK ISLAND DAM

SPECIES	PROPORTION OF FISH THROUGH EACH PASSAGE ROUTE[1]			PROPORTION SURVIVING EACH PASSAGE ROUTE DURING SPILL/BYPASS OPERATIONS[1]			NON-SPILL WINDOW TURBINE SURVIVAL[2] (90-93.5%)	ALL ROUTES COMBINED– TOTAL SURVIVAL (%)[1]
	SPILLWAY PASSAGE (%)	FIRST POWERHOUSE PASSAGE (%)	SECOND POWERHOUSE PASSAGE (%)	SPILLWAY SURVIVAL (98-99%)	FIRST POWERHOUSE SURVIVAL (90-93%)	SECOND POWERHOUSE SURVIVAL (90-93.5%)		
Alternative 1[3]								
Subyearling Chinook	16.5	9.1	74.4	12.9 – 13.1	6.6 – 6.8	53.6 – 55.7	18.0 – 18.6	91.1 – 94.1
Yearling Chinook	23.7	8.1	68.2	18.6 – 18.8	5.8 – 6.0	49.1 – 51.0	18.0 – 18.6	91.5 – 94.4
Sockeye	24.0	13.4	62.6	18.8 – 19.0	9.7 – 10.0	45.1 – 46.8	18.0 – 18.6	91.5 – 94.4
Coho	23.7	8.1	68.2	18.6 – 18.8	5.8 – 6.0	49.1 – 51.0	18.0 – 18.6	91.5 – 94.4
Steelhead	24.6	5.1	70.3	19.3 – 19.5	3.7 – 3.8	50.6 – 52.6	18.0 – 18.6	91.6 – 94.5
Alternative 2[4]								
Subyearling Chinook	60.0	9.1	30.9	58.2 – 58.8	8.1 – 8.4	27.5 – 28.6	0.9	94.8 – 96.7
Yearling Chinook	59.2	8.1	32.7	57.4 – 58.0	7.2 – 7.5	29.1 – 30.3	0.9	94.7 – 96.7
Sockeye	60.0	13.4	26.6	58.2 – 58.8	11.9 – 12.3	23.7 – 24.6	0.9	94.8 – 96.7
Coho	59.2	8.1	32.7	57.4 – 58.0	7.2 – 7.5	29.1 – 30.3	0.9	94.7 – 96.7
Steelhead	61.6	5.1	33.3	59.8 – 60.4	4.5 – 4.7	29.7 – 30.8	0.9	94.9 – 96.8
Alternative 3[5]								
Subyearling Chinook	30.0	9.1	60.9	27.9 – 28.2	7.8 – 8.0	52.1 – 54.1	4.5 – 4.7	92.3 – 95.0
Yearling Chinook	29.6	8.1	62.3	27.6 – 27.8	6.9 – 7.2	53.3 – 55.3	4.5 – 4.7	92.2 – 95.0
Sockeye	30.0	13.4	56.6	27.9 – 28.2	11.5 – 11.8	48.4 – 50.3	4.5 – 4.7	92.3 – 95.0
Coho	29.6	8.1	62.3	27.6 – 27.8	6.9 – 7.2	53.3 – 55.3	4.5 – 4.7	92.2 – 95.0
Steelhead	30.8	5.1	64.1	28.7 – 29.0	4.4 – 4.5	54.8 – 56.9	4.5 – 4.7	92.3 – 95.1

1 Based on assumed survival and passage rates through the available passage routes.
2 Turbine survival estimate for the time period not covered by spill and/or bypass operations.
3 80 percent of spring and summer migration covered by 16% and 11% flow through the spillway, respectively, via the Fishery Conservation Account process.
4 99 percent of spring and summer migration covered by 40% flow through the spillway.
5 95 percent of spring and summer migration covered by 20 percent flow through the spillway.

are undoubtedly lower than those presented, but to an unknown extent.

Wells Dam

Previous radio-telemetry evaluations at Wells Dam indicate that summer/fall-run chinook salmon experience passage delays negotiating the collection channel and entering the ladder (see Table 2-4). However, recent modifications to ladder operations have indicated a substantial reduction in the passage times of adult summer/fall-run chinook salmon. Closing the side entrances to the ladder resulted in passage time reductions from 52.5 to 20.6 hours in 1997 and from 38.5 to 19.0 hours in 1998. There is no indication that sockeye salmon experience substantial delays passing the project. Although there are no known direct sources of mortality to adult salmonids at the Wells Dam under normal operating conditions, mortality could occur as a result of fallback through the spillway, bypass, or turbine units. However, the magnitude of these potential effects is unknown.

Under Alternative 1, the Douglas County PUD would maintain and operate adult passage facilities in accordance with the 1990 Settlement Agreement (FERC 1991). The implementation of these plans would be expected to minimize the effects to adult fish passing the project by ensuring that fishways are being operated with the established criteria, thereby minimizing passage delay. These operations are expected to be similar for all three alternatives.

Rocky Reach Dam

Under Alternative 1, the Chelan County PUD would maintain and operate adult passage facilities according to the existing FERC license. As with the fishways at the Wells Dam, there is some evidence to suggest that sockeye and summer-run chinook salmon experience passage delays in the entrance pools of the Rocky Reach fishway (Stuehrenberg et al. 1994). However, there are no data to suggest any direct injury or mortality resulting from fish passage under normal operating conditions (refer to Section 3.2.5, Adult Survival at Projects for more information).

Rock Island Dam

Under Alternative 1, the Chelan County PUD would maintain and operate adult passage facilities in accordance with the existing FERC license and settlement agreement. The potential problems associated with passage through these fishways are attributed to delays in locating the entrances, and in the junction pools. However, the available data suggest that passage conditions (passage time and fallback rates) are similar or slightly better at Rock Island Dam than at Rocky Reach or Wells dams (refer to Section 3.2.5, Adult Survival at Projects for more information).

Adult Reservoir Spawning

No direct effects of project operations on sockeye salmon spawning are expected because sockeye tend to spawn well upstream of the projects in streams associated with Lake Wenatchee and Lake Osoyoos. Summer/fall-run chinook salmon are expected to exhibit substantial spawning activity in the Mid-Columbia River reservoirs; however, the spawning habitat is primarily restricted to upper reservoir or tailrace areas. The potential spawning-related effects of project operations include deposition of fine sediments that may reduce incubation and spawning success, scour or relocation of gravel near the tailraces, and fluctuations in pool elevation. Total dissolved gas levels resulting from spill at the projects may increase stress levels in migrating fish and may potentially result in an increased incidence of pre-spawning mortality.

Only summer/fall-run chinook salmon commonly spawn in the mainstem Columbia River, and the majority of spawning occurs after the voluntary summer spill period has ended and total dissolved gas levels meet water quality standards. For those fish that do spawn when spill is occurring, depth compensation should provide sufficient refuge from these dissolved gas levels to protect the spawning adults.

No substantial impacts of project operations on reservoir-spawning species are expected, because of the projects' limited ability to control river flows. In addition, any impacts are expected to be similar to existing conditions.

Hatchery Production

As discussed previously, the hatcheries funded by the Chelan and Douglas County PUDs are operated by WDFW in accordance with policies and guidelines of the State and Section 10 permits issued by NMFS under the provisions of the Endangered Species Act. The strategies of incorporating natural broodstocks into the artificial production programs are expected to strengthen the natural spawning populations and improve the genetic diversity in the hatchery stocks. These hatchery program changes might result in fewer total hatchery fish produced in the short term, particularly for diminished stocks that cannot support broodstock programs, but in the long term, these changes should result in stronger and healthier stocks throughout the region. Potential effects to the anadromous species related to the hatchery programs are expected to be similar for all alternatives, as discussed previously (see Section 4.2.2.1 under Hatchery Production).

Tributary Habitat Improvements and Monitoring

The previous discussions of tributary habitat improvements and monitoring programs related to the Endangered Species Act-listed stocks are also applicable to the unlisted species under Alternative 1 (see Section 4.2.2.1 under Tributary Habitat Improvements).

4.2.1.3 Resident Fish Species

Project Areas

Little is known about the effects of project operations on resident fish populations in the Mid-Columbia River. In general, the most important effects are related to spawning success, early survival of juveniles, and food supply. Typically, the most substantial influence on all of these issues is the fluctuation in water levels related to hydroelectric project operations. Because all of the Mid-Columbia River PUD projects are run-of-the-river dams, they have limited ability to control these levels. Normal reservoir fluctuations are minor, ranging from 3 to 10 feet. The reservoirs are generally narrow, with relatively steep banks, so these water level fluctuations have limited influence on the wetted area of the river. The minor exceptions are the shallow bar areas associated with tailraces, the mouths of tributary streams, and the occasional backwater or off-channel ponds.

The Wells reservoir is larger and shallower than the other reservoirs, and the water level fluctuations are greater. Therefore, the effects of water level fluctuations are also greater at the Wells Dam and are more prone to influence resident fish populations. This is particularly true in the relatively wide and shallow area near the mouth of the Okanogan River (Brewster Flats). Drawdown would likely result in a greater reduction in habitat for resident fish in the Wells reservoir than in the other two reservoirs. However, there is little information on resident fish population sizes and population trends in any of the reservoirs to quantify the actual effects of water level fluctuations or other project operations.

Under Alternative 1, some predator control programs would continue to be implemented. These activities would also have substantial effects on resident fish populations in the reservoirs. The programs target the removal of northern pikeminnow, which have been shown to be the primary predator fish on juvenile salmonids in the basin. When salmonid smolts are not migrating downstream, however, the northern pikeminnow diet consists of a greater proportion of non-salmonid prey, as well as an increase in non-fish species. Predator reductions

would result in the increased survival of salmonid smolts passing the projects, as well as increased survival and reduced competition for other resident fish species in the reservoirs.

Other anadromous or migratory species that occur in the Mid-Columbia River area are white sturgeon and Pacific lamprey. There are no indications that other fish pass the projects in appreciable numbers. Therefore, it is unlikely that project operations would substantially affect these other resident fish populations.

Pacific Lamprey

Pacific lamprey are a migratory species that pass the Mid-Columbia River projects through all available routes. There is no specific information concerning the mortality rates of this species passing the projects, although they are particularly susceptible to impingement on turbine intake diversion screens. The only screens that are currently in operation at the Mid-Columbia River dams are at turbine units 1 and 2 at the Rocky Reach Dam. These screens were installed to increase the efficiency of the bypass system. Substantially fewer fish pass through the turbine units that are currently unscreened, so fewer fish are available for diversion with additional screens. Under Alternative 1, no additional turbine intake screens are expected to be installed at any of the three projects.

Other effects on lamprey from project operations are unknown, although passage through the turbines is likely to result in some injuries and direct or indirect mortality. Fyke net data collected at the Wells, Rocky Reach and The Dalles dams indicate that lamprey tend to be spatially separated from juvenile salmonids as they pass through turbine units (Hatch and Parker 1996; Peven 2002 personal communication). Because lamprey do not have a swim bladder, they cannot easily regulate their position in the water column and tend to be closer to the bottom than the surface. This behavior likely makes them less likely to benefit from juvenile salmonid surface bypass systems at Wells or Rocky Reach dams. They might also pass more readily through the turbines than the surface-oriented spill bays. Therefore, a high proportion of lamprey likely pass the Mid-Columbia River projects through the turbines.

Although lamprey tend to migrate at night when predation rates are likely lower, passage through the turbine units may subject migrating juvenile lamprey to increased predation risks. Both avian and piscivorous predators prey on juvenile lamprey and are attracted to prey that have been concentrated spatially and temporally by dam operations (Hatch and Parker 1996). As a result, current predator control measures implemented at the PUD projects under Alternative 1 would likely benefit lamprey.

In 1996, 2,121 adult lamprey were counted passing Rock Island Dam, while only 979 were counted at Wells Dam (Hatch and Parker 1996). Although this suggests that a substantial population may be spawning in the Wenatchee River system, counting lamprey tends to be problematic because they migrate near the bottom, along the edges of the adult fishways, or pass through the fish counting weirs, making them difficult to observe. Even comparing adult salmonid fishladder counts (which are much more reliable numbers) between projects can be problematic for estimating tributary spawning escapements (Carie 1996).

White Sturgeon

Little is known about the population levels of white sturgeon in the Mid-Columbia River region, although limited sampling suggests that the populations are small (see Section 3.2.8.1, Life Histories). The mainstem dams present substantial migration barriers to this species because they do not readily use fishladders. Therefore, the populations of sturgeon in the Mid-Columbia River are considered to be isolated or semi-isolated populations. Isolated fish populations are generally considered less genetically fit to withstand habitat or population disturbances, although the overall extent or

severity of these effects is unknown. In addition, the extent that sturgeon pass the projects and the potential effects of dam passage are unknown.

The predator control measures implemented at the projects under Alternative 1 would likely benefit sturgeon populations in the reservoirs. Northern pikeminnow have been found to prey on sturgeon eggs, and walleye prey on sturgeon larvae in areas downstream of McNary Dam (Pacific States Marine Fisheries Commission 1992).

Associated Tributaries

Project operations under Alternative 1 would not alter tributary habitat or resident fish populations that occur there. However, migratory species that move between the tributary and reservoir areas might be affected by project operations, as discussed previously. In addition, hatchery fish planting activities would result in temporary increases in competition for habitat and food resources with resident species. The extent of this competition and the effects on resident fish populations are currently unknown. The increased use of volitional release strategies for hatchery fish from acclimation ponds would reduce the densities of hatchery fish in the tributaries and minimize the potential negative interactions with resident fish. Under these strategies, hatchery fish leave the ponds when they are ready to begin their downstream migrations and are therefore unlikely to spend much time in the tributaries.

4.2.2 ALTERNATIVE 2

Under Alternative 2, the Wells, Rocky Reach, and Rock Island hydroelectric projects would be operated according to existing FERC licenses, settlement agreements, and interim stipulations as modified by voluntary or involuntary proposals under license reopener clauses or at relicensing which would be reviewed by NMFS's biological opinions for listed species. These biological opinions would specifically address two fish species listed under the Endangered Species Act: Upper Columbia River spring-run chinook salmon and steelhead. If additional anadromous fish species are listed under the Endangered Species Act in the future, protection from the Section 9 take prohibitions would be addressed independently.

The existing FERC licenses and settlement agreements include measures to mitigate for the loss of anadromous fish habitat and production due to reservoir inundation, as well as losses associated with anadromous fish passage (juvenile and adult) at the projects. As discussed under Alternative 1, listed species have a high likelihood of extinction under these measures alone. All measures necessary to prevent extinction and aid in the recovery of listed species, up to full mitigation for the project effects, would be utilized under Alternative 2.

4.2.2.1 Endangered Anadromous Salmonid Species

The effects of the operation of the Mid-Columbia River projects were assessed in the draft Quantitative Analysis Report (QAR). A summary of the QAR has been provided in Appendix E. The report summarizes available information for Endangered Species Act-listed Upper Columbia River steelhead and spring-run chinook salmon, reviews alternative approaches to estimating the risks of extinction and recovery perspectives, and provides preliminary estimates of the relative risks of extinction under a range of alternative management and climate and environmental scenarios.

For listed fish, measures implemented under Alternative 2 are expected to meet the Alternative 3 juvenile dam passage survival standards at a minimum, while additional on-site measures could be required to ensure that the ongoing operation of the PUD-owned projects would not jeopardize the continued existence of Endangered Species Act-listed steelhead and spring chinook

salmon. Alternative 3 establishes a no net impact goal for each project, consisting of a 91 percent combined adult and juvenile fish project passage survival goal, with hatchery compensation and off-site mitigation programs to account for the 9 percent unavoidable loss.

Juvenile Migration/Survival

The effectiveness of protection and recovery measures for spring-run chinook salmon and steelhead would be based on project-specific survival estimates; fish passage efficiency estimates (if direct estimates of survival were not available) and the long-term recovery status of the species. In general, survival goals are based on the analyses contained in the QAR.

Conditions for the survival and recovery of the listed anadromous fish species are expected to be similar for both Alternatives 2 and 3, although the measures and implementation schedule necessary to reach or approach these conditions might be different for each of the alternatives. Under Alternative 2, Endangered Species Act consultations would ensure that the PUD projects do not jeopardize (appreciably reduce the likelihood of both the survival and recovery) the continued existence of the Endangered Species Act-listed species. Any measures could be required to achieve this goal, although litigation could delay implementation. In comparison, protective measures for unlisted species would be similar to those described under Alternative 1, because of the uncertainty associated with NMFS' ability to obtain additional measures through either license reopener or relicensing processes for unlisted species. However, measures implemented under Alternative 2, to protect the listed species, would likely provide additional protection for unlisted species.

Similar to Alternative 1, reservoir drawdown is a potential (although remote) protection measure for anadromous fish species under Alternative 2. However, this option could only occur as a result of relicensing procedures. Rocky Reach is due for relicensing in 2006, while the relicensing of the Wells and Rock Island projects would occur by 2012 and 2029, respectively.

Drawdown could result in faster juvenile migration speeds due to higher water velocities, slightly lower water temperatures, increased turbidity, and potentially lower total dissolved gas levels over the long term. Each of these factors is expected to increase the survival of migrating juvenile fish. In the short term, however, lower water levels would increase the density of predator fish and increase the incidence of predator/prey encounters and substantially increase turbidity and sedimentation over existing conditions. Each of these factors is expected to decrease the survival of migrating juvenile fish. As a result of the water quality impacts described above (lower water temperatures and total dissolved gas levels), adults should also benefit in the long term, and only be minimally affected in the short term by increased turbidity sedimentation. However, increased water velocities would decrease the migration rates of adult fish and increase the energy expenditures needed to migrate through the area. As a result, the net effect of drawdown on adult salmonids is uncertain.

A detailed site-specific evaluation and separate EIS would be required to determine the benefits and environmental effects of drawdown under any of the alternatives, before the measure could be implemented.

Wells Dam

Under Alternative 2, the Douglas County PUD would operate the Wells Dam in accordance with the existing license articles and the 1990 Settlement Agreement (FERC 1991), as well as any additional measures required as a result of relicensing, license reopener proceedings, or Endangered Species Act consultations.

The juvenile fish protection measures implemented under Alternative 2 would be similar to those already implemented (Alternative

1) and would be similar to several of the proposed actions identified for Alternative 3.

Juvenile project survival has been measured at 99.7 percent for hatchery-reared yearling spring-run chinook salmon (Bickford et al. 1999) (see Table 3-5). Similar studies conducted in 1999 and 2000 on hatchery steelhead resulted in total project survival estimates of 94.3 and 94.6 percent, respectively (Bickford et al. 2000a, 2001). Thus, the existing conditions meet the fish passage efficiency criteria established in the 1990 Wells Settlement Agreement, satisfy projected recovery goals established in the QAR, and exceed the 93 percent juvenile project passage survival criterion proposed in the HCP. Therefore, there would likely be no additional requirements to increase turbine survival or bypass efficiencies at Wells Dam under Alternative 2, unless new research demonstrated a need for higher survival goals.

Increased spill levels are expected to be the primary method of increasing juvenile fish passage survival rates, if necessary. It is estimated that up to 40 percent of river flow could be spilled at Wells Dam without exceeding the total dissolved gas water quality standards. This estimate is based on the ratio of 1 percent of saturation increase for every 4 percent increase in spill, and a typical forebay total dissolved gas level of 110 percent during the spill season (Klinge 2002).

Rocky Reach Dam

Under Alternative 2, the Chelan County PUD would continue to operate Rocky Reach Dam in accordance with the existing license articles, as well as any additional measures required as a result of relicensing, license reopener proceedings, or Endangered Species Act consultations. Although the Rocky Reach Fourth Revised Interim Stipulation (FERC 1996a) has expired, the unlisted anadromous fish species would be protected by the continued implementation of measures established through reopener proceedings, settlement agreements or at relicensing.

The protection and enhancement measures discussed for Alternative 1 would also likely occur under Alternative 2, and are expected to increase the survival of juvenile fish passing Rocky Reach Dam. Alternative 2 also includes a 6,000-cubic-feet-per-second (cfs) sluiceway (in the event that the current bypass system does not adequately avoid a jeopardy determination). This sluiceway would draw water and fish from the forebay at the downstream end of the powerhouse cul-de-sac. The sluiceway channel would be cut into the cul-de-sac wall and would carry the water and fish in an elevated channel over the existing structures and roadways to discharge at some downstream location on the right bank.

Challenges to this concept included the unknown capacity to effectively draw fish past the powerhouse intakes to the location of the sluiceway entrance. It would also be difficult to control water velocity within this large flow without making the structure extremely long with a gradual slope. Although preliminary modeling evaluations have been conducted on the feasibility of this type of bypass, it would likely take several years of modeling to design and construct the system. This would be followed by several years of fish passage evaluations to determine if it is better than the current bypass system.

Verification of juvenile fish passage survival might be required to determine if adequate protection was being provided to reduce the likelihood of extinction of the listed species. It is assumed that continued refinement of the bypass system would result in improved survival rates for spring-run chinook salmon and steelhead. Until the level of survival is verified, however, or if additional protection measures were needed to protect the listed species, spill would likely be increased at the Rocky Reach Dam. It is estimated that up to 40 percent of river flow could be spilled at Rocky Reach Dam and still remain

within the total dissolved gas water quality standards. However, total dissolved gas abatement structures might be required to allow the necessary spill levels, while remaining within the water quality criteria.

Under Alternative 2, NMFS would determine, through the Endangered Species Act consultation process, the most appropriate survival goals and protection measures (in the event of a jeopardy determination) for the protection of threatened and endangered species. NMFS would modify these survival goals as necessary to ensure that the listed stocks of anadromous fish were not jeopardized by the projects or their operations. Specific protection measures for threatened and endangered species would not occur under Alternative 1.

Survival studies in 1999 and 2000 estimated overall survival through the Rocky Reach reservoir and dam at 95.9 and 96.7 percent for hatchery-reared steelhead smolts (Bickford et al. 2000a, 2001) (see Table 3-5). As previously discussed, however, these evaluations were conducted using the single-release PIT-tag methodology, which does not include all of the sources of mortality associated with passing the project (see Section 4.2.1.1, Endangered Anadromous Salmonid Species). A radio-telemetry evaluation in 1999 estimated total project passage survival of run-of-the-river steelhead at 96.6 percent, although the accuracy of radio-telemetry studies for estimating juvenile fish passage survival is unknown at this time (Stevenson et al. 2000).

A paired-release PIT-tag evaluation, conducted in 1998 with hatchery-reared yearling fall-run chinook salmon, estimated survival at 85.9 percent (Eppard et al. 1999) (see Table 3-4). Bickford et al. (1999) estimated chinook survival at 93.9 percent, although this evaluation was a single-release PIT-tag study. Accurate survival estimates are required over a variety of river flow and project operational conditions to reliably assess project-related mortality, and future studies could demonstrate different survival rates than those recently observed. If a consistent pattern of lower survival is demonstrated, or if the survival rates are not deemed adequate to prevent the extinction of the listed species, NMFS would impose additional protection measures.

The existing predator control program at Rocky Reach Dam is expected to continue under Alternative 2. This program includes the removal of northern pikeminnow from the forebay and tailrace areas, as well as predator bird hazing and exclusion wires strung across the tailrace. Between 1994 and 2002 over 51,000 predatory northern pikeminnow were removed from the vicinity of Rocky Reach Dam under this program (West 2001; West 2002 personal communication). The predator control program is expected to result in a significant reduction in predation rates on migrating salmon and steelhead smolts.

Rock Island Dam

Under Alternative 2, the Chelan County PUD would continue to operate the Rock Island Dam in accordance with the FERC license and Rock Island Settlement Agreement (FERC 1989a), in addition to any modification required as a result of Endangered Species Act consultations performed as a result of project relicensing, or license reopener processes. A full discussion of the existing mitigation measures is provided in Section 4.2.2.1 under Juvenile Migration/Survival – Rock Island Dam. It is likely that NMFS would initially require increases in spill. Unlike the other Mid-Columbia River hydroelectric projects, spilling an estimated 40 percent of the total river flow would result in exceeding the total dissolved gas water quality standard. Under these circumstances, total dissolved gas abatement structures would be needed to continue to meet the water quality criteria. Although spillway flow deflectors (the most widely used gas abatement structures in the basin) appear to increase juvenile fish mortality by 1 to 3 percent, spillway survival is expected to be greater than turbine fish passage survival (Giorgi et al. 2002). If spill was not able

to meet the necessary protection levels for the listed species, other measures necessary to aid in the protection of listed species could be stipulated, up to full mitigation for project effects.

Currently, the primary methods for maximizing juvenile spring-run chinook salmon and steelhead survival at the Rock Island Dam are through spill and predator control programs. Although the spill program under Alternative 1 is based on an annual conservation account (power revenue loss) of $2.05 million (in 1986 dollars), this program would be modified or replaced under Alternative 2 with a program that would allow greater spill levels to avoid extinction of the listed species, if necessary.

The predator control program includes the removal of northern pikeminnow from the forebay and tailrace areas, as well as predator bird hazing and exclusion wires strung across the tailrace. Between 1995 and 2002 approximately 36,500 predatory northern pikeminnow were removed from the vicinity of Rock Island Dam under this program (West 2001, West 2002 personal communication). The predator control program is expected to result in a substantial reduction in predation rates on migrating salmon and steelhead smolts.

These protection measures are expected to increase the survival of juvenile fish passing the Rock Island Dam. Survival studies estimate survival at about 95.8 percent for steelhead and between 88.9 and 95.6 for chinook salmon (see Table 3-5).

Adult Migration/Survival

Although the combined effects of all Columbia River hydroelectric projects on the listed species is unknown at this time, many of the effects are likely cumulative. The presence of these dams results in migration delay, thereby influencing migration speed and timing of adult fish. However, the increased migration speed of adults passing though the relatively slack water reservoirs likely results in no appreciable change to overall migration timing of returning adult fish compared to natural river conditions.

There is limited available data to assess the survival of adult anadromous salmonids passing the Mid-Columbia River projects. Radio-telemetry evaluations conducted between 1993 and 1998 provide the bulk of the available information, although survival was not specifically addressed in these studies. Although the radio-telemetry technique is problematic for addressing adult passage survival, the study results are the best available data for determining potential project-related effects.

Reservoir drawdown is a remote possibility under Alternative 2 (through the FERC relicensing process). Reservoir drawdown is expected to affect the migration rate of adult fish. Unless the dams were breached, adults would still need to pass through (modified) fishways, and there would also be a reduction in the amount of slack water habitat in the smaller reservoirs. These factors could result in an increase in the migration time and the energy expended by migrating adult salmonids. A separate EIS on drawdown effects would be necessary, if drawdown were to become a potential action alternative during relicensing, because of the potentially extensive environmental impacts associated with drawdown.

The effects of project operations on migratory bull trout are unknown, although adult bull trout have been observed using the adult fishways. Based on their presence at the project, their migratory behaviors, and recent radio-telemetry data (Stevenson and Hillman 2002), some portion of the population passes through the turbines, spillways, juvenile fish passage systems, or adult fishways, either voluntarily or involuntarily. Studies to determine whether the projects affect bull trout are underway at all three of the PUD dams. The mitigation requirements for protecting bull trout would be determined through

consultations between FERC, the PUDs, and USFWS.

Wells Dam

The protection and enhancement measures planned for adult spring-run chinook salmon and steelhead under Alternative 2 would be similar to the mitigation measures discussed previously for Alternative 1.

Specific operational procedures have been developed to minimize the effects of project operations on the passage of adult fish at the project. NMFS would assess these project facilities and operations to determine if modifications are necessary to ensure that project operations do not jeopardize the continued existence of listed anadromous fish.

There is no indication that substantial injuries are occurring to adult fish passing upstream through the fishladders under normal operating conditions. Therefore, the greatest potential for injury and mortality to adult fish is believed to be associated with fallback. Fallback rates for spring-run chinook salmon and steelhead are relatively low, with 3.6 percent fallback observed for spring-run chinook in 1993 and 6.8 percent fallback observed for summer-run steelhead in 1999 (Stuehrenberg et al. 1995; English et al. 2001). During the summer-run steelhead study, all but one of the fish that fellback over Wells Dam either reascended the dam or were detected in spawning streams downstream of the dam.

Steelhead kelt monitoring in 1999-2000 indicated that all of the radio-tagged kelts observed at Wells Dam passed through the project during the juvenile outmigration and were provided an opportunity to pass downstream of the project via a non-turbine passage route (spill and/or bypass routes). However, there was no assessment of the ultimate fate of these kelting steelhead. Similarly, no accurate fate information was available for fish that fellback over Wells Dam during the 1993 spring-run chinook study. Further investigating the potential effects of fallback on adult survival might be a requirement established either during the relicensing process or through Endangered Species Act consultations.

Rocky Reach Dam

For the protection and enhancement of adult spring-run chinook salmon and steelhead under Alternative 2, the Chelan County PUD would maintain and operate the adult passage facility according to the existing FERC license, or as modified by Section 7 consultations conducted as a result of relicensing or reopener proceedings. Specific operational procedures have been developed to minimize the effects of project operations on the passage of adult fish at the project. NMFS would assess these project facilities and operations to determine if modifications are necessary to aid in the recovery of listed species.

At least 80 percent of the sockeye and summer-run chinook salmon passage delay apparently occurs in the fishway entrance pools, and it is likely that similar effects are responsible for spring-run chinook salmon and steelhead delay. However, there is only limited information indicating that these factors may be affecting overall spawning success. In addition, there is little data to assess the survival of adult salmon or steelhead fallbacks or steelhead kelts passing downstream (refer to Section 3.2.5, Adult Survival at Projects for more information). The assessment of adult salmonid fallback or steelhead kelt survival at the project might be a requirement established through Endangered Species Act consultations in either relicensing or reopener proceedings.

Rock Island Dam

For the protection and enhancement of adult spring-run chinook salmon and steelhead under Alternative 2, the Chelan County PUD would maintain and operate the adult passage facilities at the project according to the existing FERC license, the Rock Island Settlement Agreement, relicensing or license reopener processes, and any future Section 7 consultations. Specific

operational procedures have been developed to minimize the effects of project operations on the passage of adult fish at the project. The effects of these actions are similar to those described for the Rocky Reach Dam (refer to Section 3.2.5, Adult Survival at Projects for more information). NMFS would assess these project facilities and operations to determine if modifications are necessary to aid in the recovery of listed species.

Adult Reservoir Spawning

There is no available information indicating that substantial spawning activity of adult spring-run chinook salmon or steelhead occurs in the Wells, Rocky Reach, or Rock Island reservoirs, although some steelhead spawning might occur in tailrace areas (similar to summer/fall-run chinook salmon spawning) or at the mouths of the mainstem tributaries. As a result, the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects may have some effect on steelhead spawning success in these areas. Potential indirect effects associated with adult passage conditions at the projects are similar to those described previously for threatened and endangered species (Adult Migration/Survival).

If implemented, drawdown would increase the amount of mainstem spawning habitat, although it is unlikely to affect spring-run chinook salmon, which typically spawn in upper tributary areas. It is not clear how much this would benefit steelhead.

Although bull trout are occasionally observed in the project areas, they are generally believed to spawn in small headwater tributaries. Therefore, project operations are not expected to directly affect bull trout spawning beyond the potential migration effects that may be occurring at the dams.

Tributary Habitat Improvements

Similar to Alternative 1, the PUDs would not provide funding for habitat-related measures for adult spawning and juvenile rearing in the Mid-Columbia River tributary streams to aid in the protection and recovery of listed species under Alternative 2. However, funding from other sources might be available to improve tributary habitat.

Hatchery Production

The hatchery programs currently funded by the Chelan and Douglas County PUDs were developed to mitigate the loss of spawning habitat from the inundation of the mainstem Columbia River by the project reservoirs and estimated losses associated with fish passage at the projects. Under Alternative 2, these facilities would continue to be funded by the PUDs and operated by WDFW in accordance with policies and guidelines of the State, as well as Section 10 permits issued under the provisions of the Endangered Species Act. The Section 10 permits describe the efforts implemented to avoid and minimize adverse effects to Endangered Species Act-listed species. These efforts include protocols for adult collection and spawning, rearing and release strategies, fish health management programs, and environmental monitoring. These protocols are expected to be followed for all hatchery stocks and would equally benefit unlisted fish species. However, if NMFS determines that the current hatchery production levels are likely to jeopardize the continued existence or recovery of the listed species, the production levels could be reduced.

Hatchery production could also be reduced at project relicensing or license reopener proceedings under Alternative 2. Recent juvenile fish passage survival studies indicate that survival through the Mid-Columbia River projects is greater than initially estimated. These differences are likely the result of more accurate evaluation techniques and the fish passage improvements

that have already been implemented at the projects.

Wells Dam

Under Alternative 2, the Douglas County PUD would continue to fund the current hatchery compensation programs for spring-run chinook salmon at the Methow Fish Hatchery, for steelhead at the Wells Hatchery, and for off-site acclimation facilities according to stipulations in the 1990 Wells Settlement Agreement (FERC 1991). Operation of the Wells Hatchery has been reviewed under Section 7 of the Endangered Species Act, and a Section 10 permit (#1094) was issued to WDFW on February 4, 1998 (NMFS 1998b). However, this permit will expire in May 2003, and will be replaced with Permit #1395. Under Alternative 2, the new permit is expected to include Douglas County PUD as a joint permittee with WDFW.

Operation of the Methow Fish Hatchery was considered in the review of Section 10 Permit #1196 (to WDFW) and the biological opinion concerning NMFS's issuance of that permit (NMFS 2002c). This permit will likely be amended, or modified, within the next 12 months. The modifications are expected to include the PUD as a joint permittee. Therefore, Endangered Species Act requirements would be satisfied for the operational protocols of the PUD-funded hatchery compensation program under Alternative 2. As with Alternative 1, reduced hatchery production levels are expected to occur under Alternative 2, as is provided for in the existing settlement agreement. Additional reductions could also be implemented to protect listed species or to compensate for actual fish losses at the project.

Hatchery production established through the 1990 Wells Settlement Agreement is intended to compensate for an assumed total project mortality rate of 14 percent (including reservoir and dam passage mortality). Recent juvenile survival studies suggest that the actual losses are substantially lower than 14 percent (about 4 percent). Therefore, under the terms of the existing settlement agreement, hatchery production established to mitigate for fish passage losses at Wells Dam could be reduced by about 70 percent (from 14 to about 4 percent) under Alternative 2. Similar reductions could occur under Alternative 1.

Rocky Reach Dam

The Turtle Rock, Rocky Reach Annex, and Chelan Falls hatcheries are owned by the Chelan County PUD and operated by WDFW. They have previously been reviewed under Section 7 of the Endangered Species Act and issued a Section 10 permit (#1094) to WDFW. The Section 10 permit describes the protocol necessary for WDFW to avoid and minimize adverse effects to listed species (similar to those described previously). However, this permit will expire in May 2003, and will be replaced with Permit #1395. Under Alternative 2, the new permit would be expected to include Chelan County PUD as a joint permittee with WDFW. Therefore, Endangered Species Act requirements would be satisfied for the PUD-funded hatchery compensation program under Alternative 2.

Under Alternative 2, the Chelan County PUD would continue to fund the operation and maintenance of these hatcheries at a level equivalent to the 1996 budgeted operation and maintenance costs, adjusted annually for inflation. The existing production capacities are believed to compensate for original inundation behind Rocky Reach Dam, and more than compensate for juvenile fish passage losses (i.e., produce more juvenile salmon and steelhead each year than are killed by the projects).

The hatchery program would likely continue to be operated by WDFW in a manner consistent with the recovery of spring-run chinook salmon and steelhead populations. As a result, the Chelan County PUD is currently working with the fishery agencies and Tribes to develop a conservation and supplementation strategy instead of a strictly numerical compensation program as used in the

past. Under Alternative 2, NMFS would likely require that these programs use locally adapted broodstock to the extent possible. Similar program changes are expected to occur under Alternative 1.

Rock Island Dam

The Eastbank Hatchery Complex is owned by the Chelan County PUD and operated by WDFW. The spring-run chinook salmon program was considered in the review of Section 10 Permit #1196 (to WDFW) and a biological opinion concerning NMFS's issuance of that permit (NMFS 2002c). The Section 10 permit requirements are similar to those described previously. This permit will be amended or modified in the next 12 months, and the modifications under Alternative 2 would include adding the PUD as a joint permittee. Therefore, Endangered Species Act requirements are satisfied for the operational protocols of the PUD-funded hatchery compensation program under Alternative 2, although the allowable production levels could be reduced in the future to protect listed species.

The Chelan County PUD would continue to fund the operation and maintenance of these hatcheries at a level equivalent to the 1998 budgeted operation and maintenance costs, adjusted annually for inflation. The existing production capacities are believed to compensate for juvenile fish passage losses at Rock Island Dam.

Associated Tributaries

Potential effects associated with hatchery supplementation in the Mid-Columbia River tributaries are similar to those described under Alternative 1. These include the potential interactions between hatchery and wild stocks (competition, predation, and disease transmission) and the potential changes or alterations to the genetic integrity and diversity of both populations. Compared to Alternative 1, modifications likely to occur under Alternative 2 would reduce these negative hatchery effects and lead to improved return per spawner ratios, benefiting the listed species.

Monitoring and Evaluation

Under Alternative 2, the PUDs would continue to implement research and monitoring to ensure that mitigation measures implemented at each of the projects are achieving the goals outlined in the existing license articles, settlement agreements, and interim stipulations. Additional research would also be required to determine the survival of both juvenile and adult spring-run chinook salmon and steelhead at the projects and through the system. In addition, evaluations to determine what effects adult passage conditions have on adult spawning success and fecundity might be required, as well as evaluations to determine the extent of kelt passage and survival and the contribution of kelts to the overall population structure of listed steelhead. Extensive water quality monitoring would be required, as would evaluations of methodologies to reduce total dissolved gas levels. Life-cycle modeling evaluations would also be conducted periodically to ensure that the species are recovering. This information is vital to the development and monitoring of long-term protection measures.

Wells Dam

Under Alternative 2, the Douglas County PUD would conduct similar monitoring and evaluation measures described under Alternative 1. Other monitoring and evaluation programs might also be required to ensure that project and system survival rates of both juvenile and adult spring-run chinook salmon and steelhead are maximized to ensure the protection of listed species. Increased water quality monitoring might also be required to ensure that the project is operating with as little impact as possible.

Although the effectiveness of the existing mitigation measures for juvenile fish appears to be high (total project survival is estimated near 97 percent for all anadromous species), survival estimates would need to be verified over the long

term. Uncertainties regarding adult survival estimates based on radio-telemetry studies indicate that new survival assessment techniques need to be developed for this life stage. As new technologies are developed, Douglas County PUD might be required to evaluate project effects on adult steelhead and spring-run chinook salmon. The Douglas County PUD might also be required to participate in periodic run stock assessment modeling efforts to document the status of listed species found in project waters.

Rocky Reach Dam

Under Alternative 2, the Chelan County PUD would continue to conduct monitoring and evaluation measures similar to those described under Alternative 1, in addition to efforts similar to those described for the Wells Dam under Alternative 2.

Rock Island Dam

Under Alternative 2, the Chelan County PUD would continue to conduct monitoring and evaluation measures similar to those described under Alternative 1, and additional efforts similar to those described for the Wells Dam under Alternative 2.

4.2.2.2 Other Anadromous Salmonid Species

Similar to Alternative 1, the criteria for protecting unlisted species under Alternative 2 are based primarily on project operational guidelines outlined in the existing FERC licenses and settlement agreements rather than survival criteria.

Compared to Alternative 1, the spring migrating, unlisted anadromous salmonid species (juvenile sockeye and coho salmon) are generally expected to benefit from the protection measures instituted under Alternative 2 for the listed species due to the overlap in both migration timing and habitat utilization. Alternatives 1 and 2 are likely to provide equivalent protection levels for summer migrating species (juvenile summer/fall-run chinook salmon).

Drawdown would have similar effects on the unlisted species, as described previously for the Endangered Species Act-listed species. However, summer/fall-run chinook salmon are primarily mainstem-spawning fish, so the increased spawning habitat resulting from reservoir drawdown is expected to benefit them to a greater degree.

Juvenile Migration/Survival

Wells Dam

There would be no additional measures for unlisted species implemented at the Wells Dam under Alternative 2, beyond what is currently required under the existing FERC license and settlement agreement. However, some unlisted species could benefit from any additional measures implemented for listed species, especially for those species that have similar run timing or use common habitat. For example, juvenile protection measures that may be required for spring-run chinook salmon and steelhead would likely benefit sockeye and coho salmon as well.

Currently, the Wells juvenile bypass system has an average fish passage efficiency of 92 percent for all spring migrants, and 96 percent for all summer migrants (Skalski 1993). The overall survival rates for the unlisted anadromous species are expected to be similar to those discussed above for the listed species.

Yearling chinook survival at Wells Dam is expected to be similar to the 99.7 percent survival rate measured during a juvenile project survival study conducted in 1998. No estimates of juvenile project survival are available for sockeye or subyearling chinook salmon, and, as such, the calculated estimates of dam passage survival for those species are currently the best estimates of survival available for Wells Dam.

Rocky Reach Dam

There would be no additional measures for unlisted species implemented at the Rocky Reach Dam under Alternative 2, beyond what is currently required under the existing FERC license or future relicensing or license reopener proceedings. However, unlisted species are expected to benefit from some of the measures implemented for listed species, especially those species that have similar migration timing. For example, unlisted juvenile sockeye and coho salmon typically migrate through the Columbia River at the same time as listed juvenile spring-run chinook salmon and steelhead. These potential benefits are similar to those listed above for the Wells Dam.

The main goal of the juvenile fish mitigation measures at the Rocky Reach Dam for unlisted species is to develop a safe (less than 2 percent mortality) bypass system. Based on available information, estimates of juvenile survival range from 94.8 to 97.0 percent for unlisted anadromous salmonid species (see Table 4-2). These survival rates are comparable to the 95 percent juvenile dam passage survival goal established for Endangered Species Act-listed species in the HCP (Alternative 3). They are also based on spilling 40 percent of the total river flow over 99 percent of the spring and summer juvenile migration period.

In the event that the bypass does not meet required survival standards, Alternative 2 includes a 6,000-cfs sluiceway that would draw water and fish from the forebay at the downstream end of the cul-de-sac. This bypass option is discussed in greater detail in Section 4.2.2.1, Endangered Anadromous Salmonid Species, for the listed species.

For comparison purposes, it is assumed that similar protection measures would be provided to both the listed and the unlisted species under Alternative 2. However, greater protection measures could actually be required for the listed species than for the unlisted species, because of the greater authority provided by the Endangered Species Act compared to the Federal Power Act. As a result, some plan protection measures that might be beneficial to the listed species may be detrimental to others. For example, turbine intake screens would likely improve the survival rate of spring-run chinook salmon and steelhead but present a substantial impingement and descaling hazard to sockeye and subyearling fall-run chinook salmon. Such conflicting measures are less likely to occur under Alternative 1, because no greater protection measures would be provided for listed species under Alternative 1.

Additional protection measures for unlisted species might also be provided during the relicensing process currently underway for Rocky Reach Dam.

Rock Island Dam

The protection measures implemented at the Rock Island Dam under Alternative 2 would follow the requirements of the existing FERC license and settlement agreement or license reopener proceedings. Although the primary focus of the alternative would be to protect the listed species, similar to the Wells and Rocky Reach dams, unlisted species are expected to benefit from some of the measures implemented for listed species.

The primary method for maximizing juvenile anadromous fish survival at the Rock Island Dam is through spill. For comparison purposes, it is assumed that up to 40 percent of the total river flow would be spilled throughout 99 percent of the spring and summer juvenile migration periods under Alternative 2.

Similar to the juvenile fish mitigation measures for unlisted species described for Rocky Reach Dam, the protection programs at Rock Island Dam would most likely be prescriptive, and may not include survival goals. For the purposes of comparing alternatives, expected survival under Alternative 2 can be estimated by combining passage-route survival data (see Table 4-3).

However, due to the number of uncertainties related to these calculated survival estimates, the estimates are only used to compare alternatives or specific components within alternatives.

Based on available information, juvenile survival for the unlisted anadromous salmonid species passing the Rock Island Dam are expected to range from 94.8 to 96.7 percent for sockeye salmon and fall-run chinook salmon (see Table 4-3). These survival rates are comparable to the 95 percent juvenile dam passage survival goal established for Endangered Species Act-listed species in the HCP (Alternative 3). They are also based on spilling 40 percent of the total river flow over 99 percent of the spring and summer juvenile migration period.

Adult Migration/Survival

Results from several radio-tag studies have indicated that the adult fishways at the Mid-Columbia River dams are generally effective at providing passage for anadromous adult fish, although passage times for summer/fall-run chinook salmon appear to be longer than for spring-run chinook salmon and steelhead (see Table 2-4). Summer/fall-run chinook salmon are also likely to be more vulnerable to delays because their migrations extend longer into the summer, when water temperatures are higher. Higher temperatures increase metabolic rates and result in greater energy expenditures by migrating fish. Their migration period also tends to be closer to their spawning periods, allowing less time to compensate for migration delays. Although these factors might be increasing the rate of pre-spawning mortality for some of the anadromous species, there are no data to verify or quantify the effects.

Under Alternative 2, the adult fishways at the PUD projects would be operated according to the same criteria as described under Alternative 1. Potential improvements identified as a result of evaluations conducted for listed species are also expected to benefit the unlisted species.

Reductions in adult mortality and fallback, as well as the protection of downstream migrating steelhead kelts (post-spawning adults), would be factored into the design and operation of any juvenile bypass systems, adult passage facilities, and project operation protocols.

Wells Dam

Radio-telemetry evaluations at the Wells Dam indicate that summer/fall-run chinook salmon experienced passage delays negotiating the collection channel and entering the ladder (see Table 2-4). However, recent modifications to ladder operations have indicated a substantial reduction in the passage times of adult summer/fall-run chinook salmon. Closing the side entrances to the ladder resulted in passage time reductions from 52.5 to 20.6 hours in 1997 and from 38.5 to 19.0 hours in 1998. There are no indications that sockeye salmon experience substantial delays passing the project. Although there are no known direct sources of mortality to adult salmonids at Wells Dam under normal operating conditions, mortality could occur as a result of fallback. However, the magnitude of the effects is unknown.

Under Alternative 2, the Douglas County PUD would maintain and operate adult passage facilities in accordance with the existing FERC license and the 1990 Wells Settlement Agreement (FERC 1991). Adult fish passage facilities would also be subject to measures resulting from relicensing, license reopener processes, or Endangered Species Act consultations. The Douglas County PUD would also continue to operate spill and turbine units in a manner that accommodates adult passage, while meeting requirements for juvenile fish passage. The implementation of these adult fish passage operations would be expected to minimize the effects on adult fish passing the project. These operational parameters would be implemented under Alternative 1 as well.

Rocky Reach Dam

Under Alternative 2, the Chelan County PUD would maintain and operate adult passage facilities in accordance with the existing FERC license, as well as any future protocols established during relicensing, license reopener processes, and corresponding Endangered Species Act consultations. There is evidence at Rocky Reach Dam to suggest that sockeye and summer-run chinook salmon experience passage delays in the fishway entrance pools at Rocky Reach Dam. However, there are no data to suggest any direct injury or mortality resulting from fish passage under normal operating conditions.

Rock Island Dam

Under Alternative 2, the Chelan County PUD would maintain and operate adult passage facilities in accordance with the existing FERC license and settlement agreement, as well as any future protocols established during relicensing, license reopener processes, or Endangered Species Act

consultations. The potential problems associated with passage through these fishways are attributed to delays in locating the entrances, and in the junction pools. However, the available data suggest that passage conditions at Rock Island are better than at Rocky Reach or Wells dams (see Table 2-4).

Adult Reservoir Spawning

No direct effects of project operations on coho or sockeye salmon spawning are expected under Alternative 2 because they spawn well upstream of the projects in tributary streams. Summer/fall-run chinook salmon is the one species that is expected to exhibit substantial spawning activity in the Mid-Columbia River reservoirs. However, their spawning habitat is primarily restricted to upper reservoir or tailrace areas (see Section 4.2.2.2, Other Anadromous Salmonid Species). Project operations related to adult passage of unlisted species is expected to be similar to Alternative 1.

Hatchery Production

As discussed previously, the hatcheries funded by the Chelan and Douglas County PUDs are operated by WDFW in accordance with policies and guidelines of the State and Section 10 permits issued under the provisions of the Endangered Species Act. Hatchery operations for unlisted species under Alternative 2 are expected to be similar to those described for Alternative 1 (see Section 4.2.2.1, Endangered Anadromous Salmonid Species).

Tributary Habitat Improvements and Monitoring

Under Alternative 2, the PUDs would not provide funding for off-site habitat improvements. The previous discussions of tributary habitat improvements and monitoring programs related to the Endangered Species Act-listed stocks are also expected to be applicable to the unlisted species under Alternative 2 (see Section 4.2.2.1, Endangered Anadromous Salmonid Species).

4.2.2.3 Resident Fish Species

Project Areas

The potential effects of project operations on resident fish under Alternative 2 are the same as those discussed previously for Alternative 1 (see Section 4.2.1.3, Resident Fish Species), with the possible exception of Pacific lamprey. As discussed previously, the potential increased use of turbine intake screens to improve the juvenile dam passage survival rates for listed species would increase the potential effects to Pacific lamprey migrating past the projects because of their susceptibility to injury or impingement on intake screens. Although the potential use of intake screens under Alternative 2 has not been determined, additional screens are unlikely to provide substantial benefits at Wells or Rocky Reach dams, but could be used to increase bypass efficiency at Rock Island Dam.

Other project modifications designed to increase juvenile salmonid bypass survival are not expected to substantially benefit or affect lamprey because their vertical spatial distribution tends to be deeper than juvenile salmonids (Hatch and Parker 1996). Such modifications are also not expected to substantially change the effect on other resident fish species under Alternative 2 compared to the existing conditions, because the purpose of the modifications is to improve fish passage survival at the projects. Fish that do not encounter the bypass modification structure would pass the projects in a manner similar to under Alternative 1.

Associated Tributaries

Project operations under Alternative 2 would not alter tributary habitat or resident fish populations that occur there. However, migratory species that move between the tributary and reservoir areas might be affected by project operations, as discussed previously. These effects are not expected to be substantially different from existing conditions (Alternative 1).

4.2.3 ALTERNATIVE 3

The HCPs represent long-term protection, mitigation, and enhancement plans for all Plan species to aid in the recovery of Endangered Species Act-listed species (see Section 2.4.3.1, HCP Species). The HCPs include provisions to minimize the direct effects of project operations on fish species and aquatic resources, as well as provisions for hatchery funding and tributary habitat restoration activities. These latter features are intended to compensate for unavoidable effects that cannot be mitigated or eliminated as part of project operations or improvements made to project structures. The overall objective is to achieve no net impact to each of the Plan species through the establishment of a 91 percent combined adult and juvenile survival goal for listed and unlisted Plan species. The 9 percent unavoidable mortality would be mitigated through hatchery and tributary enhancement programs.

The HCPs are intended to be consistent with basinwide efforts to protect salmonids that originate upstream of the Mid-Columbia River hydroelectric projects. The focus of the HCPs is to establish a cooperative planning and implementation process to achieve specific survival standards for all anadromous salmonid species, regardless of their Endangered Species Act listing status. This effort would include the participation of State and Federal fishery agencies and local Native American Indian Tribes who sign the HCP agreements. Under Alternative 1, salmonid protection measures would likely address on-site, project-specific issues on a case-by-case basis. Decisions would continue to be made by the existing coordinating committees, and there would be no specific planning strategy to recover the listed species.

4.2.3.1 Endangered Anadromous Salmonid Species

The effects of the operation of the Mid-Columbia River projects were assessed in the draft Quantitative Analysis Report (QAR). A summary of the draft QAR is provided in Appendix E. The draft report summarizes available information for Endangered Species Act-listed Upper Columbia River steelhead and spring-run chinook salmon, reviews alternative approaches to estimating the risks of extinction and recovery perspectives, and provides preliminary estimates of the relative risks of extinction under a range of alternative management and climate and environmental scenarios.

The survival standards established in the HCPs were initially developed through negotiations between State and Federal resource agency and PUD biologists. The QAR process, which was developed with the support and participation of each of these groups, determined that implementing the HCP standards (at all five Mid-

Columbia River PUD projects) would increase juvenile survival by between 116 and 135 percent of the recent survival levels (1982 to 1996 juvenile passage years). In addition, implementation of the proposed Tributary Conservation Plan would further increase survival to a total of between 123 and 149 percent of the recent survival levels.

Under Alternative 3, the HCP coordinating committees would direct the PUDs in the use of a variety of protective measures to reach the survival standards. These measures could be used independently or in any combination to achieve the performance standards for each Plan species, including the listed spring-run chinook salmon and steelhead species. In comparison, the protective measures implemented through the Endangered Species Act consultations under Alternative 2 would be implemented to maximize the survival of only listed species, while the protection of unlisted species would be provided through existing FERC licenses, settlement agreements and future license reopener or relicensing processes (similar to Alternative 1).

The Alternative 3 protection measures would apply to all Plan species. Under Alternative 2, protection measures would be implemented primarily for the listed species, although the unlisted species might coincidentally benefit from some of the measures. No new protection measures would be implemented under Alternative 1. Therefore, NMFS is less likely to achieve protective measures for unlisted species that are comparable to Alternative 3. Under Alternative 3, the HCP tributary habitat conservation programs would be initiated within 90 days after FERC approval. Therefore, the overall protection and recovery potential of the listed species is expected to be similar or better under Alternative 3 compared to Alternative 2, while the protection measures for unlisted species would likely be greater under Alternative 3 than either Alternative 1 or Alternative 2 (see Table 2-8).

As discussed, bull trout are not included as a Plan species. Therefore, the survival standards established in the HCPs do not apply to bull trout. FERC has initiated informal consultations with the PUDs and USFWS under Section 7 of the Endangered Species Act to begin evaluating the effects of project operations on bull trout. Protection of bull trout would be the same for all EIS alternatives.

Juvenile Migration/Survival

Given the present inability to differentiate between the sources of adult mortality, initial compliance with the combined adult and juvenile survival standard would be based upon the measurement of juvenile project survival. The juvenile fish passage survival standard is to achieve 93 percent juvenile project passage survival through the project areas, including direct and indirect mortality, wherever it occurs (see Section 4.1.2 of the Wells HCP and Section 5.2.2 of the Rocky Reach and Rock Island HCPs – 93% Juvenile Project Survival and 95% Juvenile Dam Passage Survival).

Wells Dam

Juvenile salmonid survival studies at Wells Dam indicate total project survival estimates of 99.7 percent for hatchery-reared juvenile spring-run chinook salmon (Bickford et al. 1999) and 94.3 to 94.6 percent for hatchery-reared steelhead smolts (Bickford et al. 2000a, 2001) under existing conditions (see Table 3-4). If the Wells bypass system is equally beneficial for all Plan species, there would be no additional requirements over the next 50 years to increase dam passage survival unless juvenile project passage survival fell below 93 percent in the future. Verification of survival rates would occur every 10 years, using representative (surrogate) spring-migrating and summer-migrating species.

Adjustments to the compensation levels, as a result of the survival studies, would occur under all HCP Phases, although compensation for initial inundation of the projects would not be adjusted.

The completed survival studies show that the dam passage survival standards are being exceeded at Wells Dam, so existing hatchery programs compensating for project passage mortality could be reduced. The Douglas County PUD is expected to reduce the existing 14 percent compensation level to 3.8 percent for yearling chinook salmon and steelhead, based on survival studies that indicated an average survival of 96.2 percent. Similar reductions are expected for Alternatives 1 and 2.

The predator control programs would continue to be implemented and are expected to benefit all Plan species, bull trout, and other non-predator resident species.

Rocky Reach Dam

Programs for the protection and enhancement of spring-run chinook salmon and steelhead under Alternative 3 would be based on the same performance standards as those described for Wells Dam. Although project operations under Alternative 3 would be similar to those outlined for Alternative 2, the effectiveness of these operations would be evaluated and modified, with the requirement of making continual progress toward achieving no net impact.

Recent PIT-tag and radio-tag evaluations on hatchery-reared and run-of-the-river steelhead smolts indicate project passage survival estimates of between 95.9 and 96.7 percent (Bickford et al. 2000b, 2001; Stevenson et al. 2000) (see Table 3-4). These studies indicate that steelhead are likely meeting the HCP survival standards (Phase III – Standard Achieved). However, as discussed earlier, the single-release evaluation method does not include all the factors that could influence survival, and the radio-telemetry method has not been fully evaluated (see Section 4.2.1.1, Endangered Anadromous Salmonid Species). As a result, additional evaluations would be required to evaluate juvenile passage survival at Rocky Reach Dam before a determination can be made about meeting the HCP survival standards. Survival would be reevaluated every 10 years using representative spring- and summer-migrating species.

In contrast to steelhead, survival studies using hatchery chinook salmon indicate juvenile project passage survival at between 85.9 and 93.9 percent, for an average of 89.9 percent (Eppard et al. 1999; Bickford et al. 1999). However, the 93.9 percent estimate is from single-release PIT-tag evaluations, and therefore might overestimate the actual juvenile fish project passage survival rate (see Section 4.2.1.1, Endangered Anadromous Salmonid Species; Rocky Reach Dam).

If the survival estimates generated from Phase I testing (2004 to 2006) indicate that the pertinent survival standards are not being achieved, then Chelan County PUD would move to Phase II (Additional Tools). In this phase, the Rocky Reach HCP Coordinating Committee would decide on the additional tools for the PUD to implement in an effort to reach the survival standard. By comparison, under Alternative 2, NMFS would be primarily responsible for ensuring that listed species were being adequately protected, while the Mid-Columbia Coordinating Committee would likely determine appropriate measures for unlisted species. If the Phase I survival studies indicate that the standards have been achieved for a given species, then the PUD would move to Phase III for that species.

Phase III indicates that the appropriate standard has either been achieved or is likely to have been achieved and provides additional or periodic monitoring to ensure that survival of the Plan species remains in compliance with the HCP survival standards. Under Phase III, the HCP coordinating committees would determine which representative species (one for spring migrants and one for summer migrants) would be tested in each subsequent 10-year interval (see Wells HCP Section 4.2.5.1 and Rocky Reach and Rock Island HCPs Section 5.3.3 – Phase III).

If necessary, improving juvenile dam passage survival might be accomplished through additional modifications to the bypass system. However, increasing the proportion of fish passing through the surface collection system would be increasingly more difficult due to the limited number of fish that are available for passage at this location. This limitation is due to the configuration of the dam that creates a cul-de-sac on the powerhouse side of the forebay. Fish migrating down the other side of the river would not enter the area influenced by the attraction flow of the collector until they had avoided passing the project through the spillway and most of the turbine units. It is also important to note that increasing the efficiency of one aspect of the collector may result in a decrease in the efficiency of another aspect due to the finite number of fish in the cul-de-sac area. Alternative 1 does not include specific survival goals, thus fewer bypass modifications would be expected. Bypass modifications under Alternative 2 would target survival improvements for listed species.

Installing additional turbine intake screens to provide greater protection to the listed species at Rocky Reach Dam is also problematic because of the potential injury and impingement rates to other species, such as sockeye salmon, subyearling chinook salmon, and lamprey. In addition, the number of fish that pass through the higher numbered turbines (currently unscreened) is substantially lower than the units that currently have screens.

Because of the potential limitations related to increasing fish passage through the surface bypass system, spill might continue to be a component of the juvenile passage system at the Rocky Reach Dam during the HCP term. However, the use of spill may be limited by water quality standards for total dissolved gas (see Section 3.3.2, Water Quality). This might require the implementation of a total dissolved gas abatement program.

Rock Island Dam

Performance standards for juvenile fish passage at the Rock Island Dam are the same as those described for the Wells and Rocky Reach dams. Although project operations under Alternative 3 would be similar to those for the listed species under Alternative 2, the effectiveness of these operations would be evaluated and modified, with the goal of making continual progress toward achieving no net impact to all the Plan species.

PIT-tag and radio-tag evaluations at Rock Island Dam indicate that juvenile project passage survival for chinook salmon is between 88.9 and 94.7 percent (average of 92.3 percent). If this were still the case after HCP Phase I evaluations (2002 to 2004), Chelan County PUD would move to Phase II (Additional Tools). In this phase, the Rock Island HCP Coordinating Committee would decide on the additional tools for the PUD to implement in an effort to reach the survival standard. In comparison, under Alternative 2, NMFS would have the primary role in determining the appropriate measures for listed species, although coordination with the Rock Island Coordinating Committee would likely occur.

Juvenile steelhead survival studies indicate a project survival rate of between 92.0 and 99.8 percent (95.9 percent arithmetic mean) (Stevenson et al. 2000; Skalski et al. 2001). If this were still the case after HCP Phase I evaluations (2002 to 2004), Chelan County PUD would move to Phase III (Standard Achieved) for steelhead. In this phase, no additional juvenile passage measures would be required over the term of the HCP, unless future survival studies indicate a survival rate less than 93 percent. Survival rates would be verified every 10 years under Phase III (Standard Achieved), using species representative of spring and summer migrants. The representative species for each migration period would be determined by the HCP coordinating committees.

Survival evaluations for each of the Plan species would occur during Phase I testing, under varying environmental conditions and over successive outmigrations. Based on these evaluations, each Plan species would be assigned a phase category. As a result, different phase determinations could be in effect at the same time for different species. Under Alternative 1, survival studies would likely be limited to spillway survival assessments because spill is the primary fish bypass option at Rock Island Dam. Although spill is also likely to be the primary bypass option under Alternative 2, survival studies would likely occur for the listed species to verify the effectiveness of the spill program.

The assumed reliance on spillway passage to achieve the juvenile dam passage survival standards might be limited by the generation of high downstream total dissolved gas levels as a result of spilling water at the project. Although the possible addition of spillway flow deflectors or other gas abatement features would likely minimize total dissolved gas production, some flow deflectors appear to increase juvenile fish passage mortality by 1 to 3 percent compared to standard spill bays (Giorgi et al. 2002).

Although the use of turbine intake screens is a potentially viable measure for implementation at Powerhouse 1, the potential impingement and injury rates to some of the other Plan species, and to other resident species, are expected to minimize their use under all the EIS alternatives.

Adult Migration/Survival

The protection measures planned for improving adult migration and survival for spring-run chinook salmon and steelhead under Alternative 3 are similar for all the alternatives, as discussed under Alternative 2 (see Section 4.2.2.1 under Adult Migration/Survival).

In addition to the protocols discussed under Alternative 2, under Alternative 3 the PUDs would emphasize adult project passage measures to ensure achievement of the 91 percent combined adult and juvenile project survival goal for each Plan species. The PUDs would also modify areas of the adult fish passage system that are identified as consistently failing to meet the HCP Adult Fish Passage Plan for Wells Dam, the Detailed Fishway Operating Plan for Rocky Reach and Rock Island dams, or other standards subsequently established by the HCP coordinating committees. Modifications would likely be made where substantial delays occur, as well as to minimize or eliminate identified sources of adult injury or mortality.

Although the inclusion of the no net impact standard in the HCP under Alternative 3 incorporates adult survival into the overall 91 percent project survival standards, accurate adult survival information is not obtainable with existing technology. As a result, there are no specific plans to assess overall adult survival at the projects under Alternative 3 (or the other EIS alternatives) until accurate assessment procedures are available. Although radio-telemetry methodologies are the best procedures to assess adult passage conditions at hydroelectric projects, they have proven problematic for assessing survival.

The effects of water temperature, passage delays, and fallback can indirectly affect spawning success. Adult spring-run chinook salmon and steelhead do not feed during their upstream migration, so they must expend considerable energy reserves for migrating and sexual development. Therefore, migration delays resulting from project passage can result in additional energy expenditures that might result in a potential for increased pre-spawning mortality or reduced spawning success. Although the effects of a single project are not likely to be substantial, the cumulative effects of multiple projects could have a measurable effect. As discussed earlier, however, adult spring-run chinook salmon and steelhead enter the Mid-Columbia River several months before spawning,

which reduces the potential effects of passage delays on spawning success.

Adult Reservoir Spawning

There is no available information indicating that substantial spawning activity of adult spring-run chinook salmon or steelhead occurs in the Wells, Rocky Reach, or Rock Island reservoirs, although some steelhead spawning might occur in tailrace areas (similar to summer/fall-run chinook salmon) or at the mouths of the mainstem tributaries. As a result, the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects may have some limited effect on steelhead spawning. Any effects would be similar for all three EIS alternatives.

If implemented under Alternative 2 or 3, drawdown would increase the amount of mainstem spawning habitat, although this would likely not affect spring-run chinook salmon spawning. It is not clear how much this would benefit steelhead. Drawdown is not included as an option under Alternative 1.

Although bull trout are occasionally observed in the project areas, they are generally believed to spawn in small headwater tributaries. Therefore, project operations are not expected to directly affect bull trout spawning beyond the effects on migration that may be occurring at the dams.

Hatchery Production

No specific facility changes are proposed for hatchery production under Alternative 3. The operation of the hatchery facilities being funded by the PUDs has either been previously addressed or would be addressed in separate biological opinions and corresponding Section 10 permits. However, any new Section 10 permits would include the PUDs as joint permittees with WDFW.

Hatchery production is based on initial inundation of fish habitat by the projects and ongoing fish losses from project operations. Under the existing FERC licenses and settlement agreements, assumptions were made concerning ongoing fish losses at the projects. If the HCPs were implemented, supplementation levels would be set at a maximum of 7 percent, in addition to the levels established to mitigate for project inundation.

Under the HCPs, hatchery production to compensate for project passage losses would decrease for some species compared to existing production levels (Table 4-4). These decreases are because the production levels stipulated in the existing licenses and settlement agreements for project passage losses exceed the maximum 7 percent HCP level. The existing hatchery compensation level for fish passage losses at Wells Dam was assumed to be 14 percent, while the HCP compensation level is 7 percent, and would be further reduced to 3.8 percent, based on project survival studies that measured the average juvenile project passage survival rate at 96.2 percent (see Table 3-5). Therefore, compensation for passage losses provided for the Wells Project would decrease by about 70 percent compared to existing conditions. A similar reduction is also expected under Alternatives 1 and 2 because the existing settlement agreement allows hatchery production to be adjusted based on actual fish passage losses. However, additional hatchery reductions could occur under Alternative 2 if NMFS determines that the existing production levels are likely to jeopardize the continued existence of the listed species (see Section 3.2.4.4, Interaction Between Hatchery Stocks and Wild Stocks). Under Alternative 3, the initial hatchery production levels would remain unchanged until 2013.

Although the existing production levels for the Chelan County PUD projects are also believed to be greater than the actual fish passage losses, the PUD has agreed to continue funding existing hatchery production levels until 2013. At that time, adjustments can be made based on actual losses measured at the projects, or concerns about

TABLE 4-4. CHANGES IN HATCHERY PRODUCTION FUNDED BY THE MID-COLUMBIA RIVER PUDS FOR PROJECT IMPACTS TO ANADROMOUS FISH SPECIES UNDER TERMS OF THE HCPS

		CURRENT HATCHERY PRODUCTION[1]				
PROJECT	SPECIES	INUNDATION PRODUCTION	PASSAGE LOSS PRODUCTION	TOTAL CURRENT PRODUCTION	INUNDATION AND HCP CAPACITY OBLIGATION[2]	INUNDATION AND ADJUSTED HCP PRODUCTION[3]
Wells						
	Summer Steelhead	300,000	180,000	480,000	390,000	348,858
	Summer Chinook	804,000	400,000	1,204,000	1,004,000	912,570
	Spring Chinook[4]	0	450,000	450,000	337,500[4]	286,071[4]
	Fall Chinook[5]	0	100,000	100,000	0	0
Rocky Reach						
	Summer Steelhead	165,000	35,000	200,000	195,000	200,000
	Summer/Fall Chinook	1,620,000	400,000	2,020,000	1,820,000	2,020,000
	Spring Chinook	0	144,000	144,000	90,000[5]	144,000
	Sockeye[6]	0	0	0	300,000	0[6]
Rock Island						
	Summer Steelhead	0	200,000	200,000	51,275	200,000
	Summer/Fall Chinook	0	1,640,000	1,640,000	541,385	1,640,000
	Spring Chinook	0	816,000	816,000	298,853	816,000
	Sockeye	0	200,000	200,000	571,040	200,000
Total PUD Production						
	Plan Species	2,889,000	4,565,000	7,454,000	5,599,053[4]	6,767,499[4]

[1] Hatchery compensation is typically specified as pounds of fish of various sizes; the production numbers (fish) included in this table were developed by dividing the specified pounds of fish to be produced by the specified fish sizes.

[2] Assumes the maximum compensation level for unavoidable project passage losses (7%) under the HCPs.

[3] Agreed-upon production levels through 2013 under Alternative 3 for original inundation and unavoidable project mortality. Except for Wells (where the levels are adjusted for the estimated 3.8% fish passage mortality rate), these levels include compensation that exceeds the production levels estimated to mitigate for 7% unavoidable project mortality. These amounts are subject to recalculation every 10 years beginning in 2013.

[4] Includes 225,000 spring-run chinook salmon raised in place of the Douglas County sockeye salmon obligation. This obligation will phase out in 2005.

[5] Voluntary program (outside of FERC license or settlement agreement). WDFW voluntarily terminated this program in 2002.

[6] HCP Rocky Reach Hatchery Committee would determine the appropriate option for providing this mitigation.

the effects of the hatchery programs on the listed species. Production levels can also be adjusted every 10 years after 2013, as appropriate.

The hatchery facilities that were developed to compensate for ongoing fish passage losses at the Mid-Columbia River projects are the Methow and Wells hatcheries for Wells Dam; the Eastbank Hatchery for the Rock Island Dam; and Turtle Rock, Rocky Reach Annex, and Chelan Hatchery for the Rocky Reach Dam. Although production levels would change for the Wells Project as a result of project survival studies, production at the Rock Island and Rocky Reach facilities would not be affected by survival study results until at least 2013. If the mortality rate for a particular Plan species is estimated at less than these initial levels in the future, the hatchery supplementation for fish passage losses can be reduced, such that no net impact is maintained.

Although no specific modifications to the hatcheries were identified in the HCPs, there is the potential that hatchery operations could be altered. These potential alterations are likely to be the result of requirements under the independent Section 10 permits (see Alternative 2). However, there are no substantive differences between the hatchery programs under any of the EIS alternatives.

Tributary Habitat Improvements

The tributary habitat improvement projects conducted under Alternative 3 would be funded through the PUD contributions made to a Plan Species Account. The initial PUD contributions to the fund would be based on compensation for 2 percent unavoidable fish passage mortality. Along with the combined adult and juvenile project passage survival rate goal of 91 percent and the 7 percent hatchery compensation rate, the total compensation would result in no net impact to all Plan species.

The funds provided to the Plan Species Account would supplement funding from other conservation plans or programs to preserve, enhance, or restore fish habitat and water quality within the region. Whenever feasible, the tributary committees would coordinate with other programs to establish a cost-sharing process, seek matching funds, and piggyback programs onto other habitat improvement efforts. Tributary habitat improvement measures would be selected based on biological soundness and cost efficiency, and ultimately decided upon by the tributary committees. The selection criteria include concepts for providing increased spawning and rearing habitat for critical populations not adequately mitigated by other measures, or improving survival rates during critical life stages or time periods. Because the HCPs are multi-species plans, the biological requirements of all the Plan species would be included in the decision-making process. Therefore, the tributary improvement activities are expected to be beneficial to all Plan species, although all species are unlikely to benefit equally from each individual habitat improvement project recommended by the tributary committees.

Tributary habitat conservation and restoration efforts conducted under Alternative 3 would place the highest priority on maintaining and improving stream channel diversity and floodplain function. The principal means of meeting this objective is to conserve and protect riparian habitat. Such measures are expected to result in an overall improvement in incubation and rearing conditions for all fish species that occur in the tributary streams. The protection and enhancement of riparian habitat is expected to decrease bank erosion, sedimentation, and scouring of channel substrate and improve water quality in the tributary stream areas. These efforts are expected to result in increased natural production levels for both anadromous and resident fish species.

Habitat conservation and restoration measures that would increase the natural production of anadromous fish species (as well as bull trout) would include but not be limited to:

- providing access to currently blocked stream sections or oxbows,

- removing or modifying irrigation/diversion dams or other passage barriers on tributary streams,

- improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long holding period, and

- improving instream flow conditions by correcting problematic water diversion or withdrawal structures.

Such tributary habitat conservation and restoration measures are expected to improve the migration conditions for all anadromous or migratory fish species and increase the opportunities for successful spawning. Considering the current habitat conditions in the tributary streams, habitat improvement projects are expected to have a net benefit to most fish species and other aquatic organisms, because the HCP tributary committees are expected to select projects based on sound ecological principles.

Monitoring and Evaluation

Monitoring efforts for all Plan species under Alternative 3 are similar to those described for threatened and endangered species under Alternative 2. These studies would make substantial contributions to:

- quantify the effects of project operations on all the Plan species,

- provide guidance to make appropriate structural and operational modifications at the projects to adequately protect these species, and

- assess the adequacy of the hatchery compensation levels at maintaining no net impact on the Plan species.

There are no specific research and monitoring requirements under Alternative 3 beyond ensuring that the standards have been met. As an example, there are no additional water quality monitoring efforts required under the HCPs (e.g., total dissolved gas, temperature, or gas bubble disease monitoring), nor are there specific requirements to evaluate juvenile fish passage efficiency, run timing, or adult passage rates. These monitoring requirements are covered under existing licenses or settlement agreements, if applicable.

Although this monitoring would be outside the provisions provided for in the HCP, Ecology may require water quality monitoring in addition to the requirements under existing licenses, settlement agreements, and the HCPs. Additional monitoring could also be required as a result of project relicensing procedures. Although the HCPs do not require the verification of the actual compensation provided by the habitat improvements associated with the Plan Species Account, the PUDs would provide additional funding for a Tributary Assessment Program. This assessment program is funded separately from the Plan Species Account and would evaluate the relative benefits of different types of habitat enhancement projects funded by the Plan Species Account. The Tributary Assessment Fund is intended to ensure that appropriate projects are being funded.

With the exception of the monitoring programs funded by this Tributary Assessment Fund and the verification of fish passage survival levels, monitoring programs are expected to be similar for all three alternatives.

4.2.3.2 Other Anadromous Salmonid Species

Summer/fall-run chinook and sockeye salmon are also included as Plan species in the HCPs. Mid-Columbia River coho salmon are considered extinct, and would therefore not be protected under the Endangered Species Act statutes but are

included as an HCP Plan species (see Table 2-7). There are some residual coho salmon populations in the Mid-Columbia River as a result of prior and current hatchery programs and as a result of straying from the Lower Columbia River coho populations. BPA is currently funding a study to assess the feasibility of reintroducing coho salmon to the Mid-Columbia River (BPA 1999).

These three unlisted Plan species are expected to benefit from improvements in juvenile and adult fish passage facilities developed for the threatened and endangered species under both action alternatives, as well as tributary habitat improvement programs implemented under Alternative 3, because their habitat requirements and fish passage characteristics tend to overlap with those of the two listed species. Alternative 3 also applies the same survival rate performance standards for these Plan species as for the endangered species discussed previously. As a result, the HCP coordinating committees are not expected to select mitigations that adversely affect any of the Plan species.

Juvenile Migration/Survival

There are limited data concerning specific project effects on passage survival for each individual anadromous fish species. Although data collected on one anadromous fish species can be used as a general surrogate for the other species, project-specific survival assessments for each Plan species are required to satisfy the HCP requirements, unless otherwise agreed to by the HCP coordinating committees.

The juvenile fish passage survival standards and the proposed protection programs for the three unlisted Plan species are the same as those described for the threatened and endangered species under Alternative 3 (see Section 4.2.3.1, Endangered Anadromous Salmonid Species). Additional information specific to the unlisted Plan species is also discussed under Alternative 2 (see Sections 4.2.2.1, Endangered Anadromous Salmonid Species and 4.2.2.2, Other Anadromous Salmonid Species).

Wells Dam

The protection measures for unlisted Plan species under Alternative 3 would be the same as those discussed previously for the endangered species (see Section 4.2.3.1, Endangered Anadromous Salmonid Species). Based on fish passage efficiency information, the survival rates of the unlisted Plan species are expected to be comparable to those for spring-run chinook salmon and steelhead (see Table 4-1). As a result, substantial modifications to the juvenile bypass system are not expected to occur under Alternative 3. However, research and monitoring would be required for each Plan species to determine if the HCP survival standards are being met. Failure to meet these performance standards would require the use of interim tools and then additional tools or the implementation of the dispute resolution process. It is likely that increased spill would be implemented to improve survival rates, if necessary. Detailed discussions of the potential long-term implications of implementing the provisions of the HCP are provided previously in Section 4.2.3.1 under Juvenile Migration/Survival.

Project survival estimates from yearling summer-run chinook salmon and fish passage efficiency estimates for spring-migrating sockeye and summer-migrating subyearling chinook salmon indicate that the survival through the Wells Project for unlisted Plan species is sufficiently high that few, if any, modifications in existing project operations would likely be required to meet the Phase III goals of the HCP.

Rocky Reach Dam

Although project operations under Alternative 3 might be similar to those for Alternative 2, the effectiveness of these operations would be evaluated and modified, with the goal of achieving no net impact by no later than 2013.

Survival estimates are limited for the unlisted Plan species. The reservoir and dam passage survival studies conducted in 1998 and 1999 (Eppard et al. 1998; Bickford et al. 1999) estimated the total project passage survival for yearling fall-run chinook salmon at 85.9 percent (see Table 3-5). Although Bickford et al. (1999) also estimated chinook survival in 1998 at 93.9 percent, this was a single-release study that does not include all of the potential dam passage mortality (see Section 4.2.2.1, Endangered Anadromous Salmonid Species).

Additional survival estimates (based on the proportion of fish using each passage route and the assumed survival rate for each route) suggest that the survival is currently less than the 95 percent dam survival standards established for the HCPs (see Table 4-2, Alternative 1). Thus, additional protection measures are required to meet the HCP performance standards for all the Plan species. Chelan County PUD, with NMFS's approval, is currently constructing a juvenile bypass system in the cul-de-sac area of this project. This structure will be operational in 2003 and should improve survival of all Plan species. Chelan County PUD will conduct a fish passage efficiency study of the bypass system. This study is aimed at providing the necessary information to adjust spill levels in future years such that there is a high likelihood of achieving the survival standards for the unlisted Plan species. Phase I survival studies will be conducted in 2004, 2005, and 2006.

Protection measures planned to improve juvenile fish passage survival at the project are the same as those discussed previously for the Endangered Species Act-listed species (see Section 4.2.3.1, Endangered Anadromous Salmonid Species). However, the inclusion of these other Plan species under the no net impact provisions of the HCP might eliminate or limit the use of certain fish passage enhancement measures at the project. For example, sockeye salmon and early summer/fall-run chinook salmon migrants are believed to be more susceptible to injury and descaling from turbine intake screens. This might prevent the use of additional intake screens to improve the surface collector bypass efficiency for spring-run chinook salmon or steelhead. Minimizing the use of intake screens might also benefit other fish species that are not specifically included as Plan species (e.g., Pacific lamprey).

As discussed, the inability to meet the specified survival performance standards for any of the Plan species by the end of Phase I (2006) would require additional protection measures for those species. The protection measures would be on-site structural or operational modifications. Failure to meet these performance standards would require the use of additional tools or the implementation of a dispute resolution process.

Rock Island Dam

The protection measures for unlisted Plan species under Alternative 3 would be the same as those discussed previously for the Endangered Species Act-listed species (see Section 4.2.3.1, Endangered Anadromous Salmonid Species). As previously discussed, the primary measures for maximizing juvenile fish passage survival at the Rock Island Dam are through spill and predator control programs.

Although survival measurements are limited for these Plan species, estimated reservoir and dam passage survival of PIT-tagged yearling chinook salmon ranged from 88.9 to 95.6 percent (see Table 3-5). Radio-telemetry evaluations estimated survival rates for hatchery and run-of-the-river chinook salmon at 93.9 and 94.7 percent, respectively (Stevenson et al. 2000). However, the use of radio-telemetry to measure juvenile survival is a relatively new methodology, which has not been fully evaluated. As a result, PIT-tag studies are believed to provide more reliable estimates of survival. In addition, naturally produced fall-run chinook salmon outmigrate as subyearlings during the summer (as opposed to the hatchery-reared fall-run chinook salmon that outmigrate as yearlings during the spring). Thus, the application of these survival

estimates to summer/fall-run chinook salmon is only an approximation that would need to be verified under Alternative 3.

In addition, calculating individual survival rates for the various passage routes (using measured or assumed survival and passage rates for each passage route) suggest that the dam passage survival rate might be below the HCP performance standards (see Table 4-3). If this is verified through project-specific survival studies, additional measures might be needed to meet the survival standards for some or all of the unlisted Plan species.

These measures might include:

- improving additional spill gates,
- developing a powerhouse surface collector and bypass system,
- installing a forebay guidance curtain,
- installing turbine intake screens at Powerhouse 1, or
- modifying the turbines to increase turbine passage survival.

These plan protection measures, used individually or in combination, are expected to improve the survival of juvenile salmon and steelhead smolts passing the project to levels approaching the survival standards of the HCP. Failure to meet these performance standards would require the use of additional tools (see Figure 2-5) or the implementation of the dispute resolution process.

Adult Migration/Survival

The procedures and measures for improving adult migration and survival conditions for the unlisted Plan species would be the same as those discussed previously for listed species (see Section 4.2.3.1, Endangered Anadromous Salmonid Species). Although the protection measures are expected to benefit all the Plan species, the extent of the benefit would vary by species.

Adult Reservoir Spawning

Under Alternative 3, changes in project operations would be primarily confined to structural changes at the projects and would be unlikely to substantially change river flow conditions. However, changes in spill patterns and volumes resulting from altered project operations to improve juvenile fish passage survival could alter downstream water quality conditions (see Section 3.3.2, Water Quality).

Potential effects on reservoir spawning of the Plan species under Alternative 3 are similar to those discussed previously for the Endangered Species Act-listed species (Section 4.2.3.1, Adult Reservoir Spawning). These effects include water level fluctuations, sedimentation or scouring of spawning habitat, and elevated total dissolved gas levels.

These factors could potentially affect summer/fall-run chinook salmon more than the other Plan species because summer/fall-run chinook salmon spawn primarily in mainstem areas where project effects would be greater. However, this species typically spawns in relatively deep water, and the resulting progeny migrate downstream soon after emergence. Therefore, project operations are unlikely to substantially affect the reproduction success. Any effects would be similar for all the EIS alternatives.

Hatchery Production

Potential changes in hatchery production levels and operational procedures affecting the Plan species are similar to those described for the endangered species in Section 4.2.3.1 under Hatchery Production. The initial hatchery production levels would remain unchanged until

at least 2013 under Alternative 3. Under Alternative 2, these production levels would not change. However, production levels could be reduced under Alternative 2 if NMFS determines that such levels would jeopardize the continued existence of the listed species, through direct or indirect interactions of hatchery fish with naturally produced fish (see Section 2.5.5, Artificial Fish Production).

Tributary Habitat Improvements

The procedures for making tributary habitat improvements would be the same as those discussed for the threatened and endangered species in Section 4.2.3.1, Tributary Habitat Improvements. PUD-funded habitat improvement measures are not included in either Alternative 1 or 2.

Monitoring and Evaluation

Monitoring programs under Alternative 3 would be similar to those discussed previously under Monitoring and Evaluation in Section 4.2.2.1, Endangered Anadromous Salmonid Species, although they would also include specific survival studies for all the Plan species to verify that the HCP performance standards are being met. These studies would make substantial contributions to:

- quantify the effects of project operations on all the Plan species,
- provide guidance to make appropriate structural and operational modifications at the projects to adequately protect these species, and
- assess the adequacy of the hatchery compensation levels at maintaining no net impact on the Plan species.

This information would be used in an adaptive management approach, which would assess the benefits or results of the protection plans to conserve and/or recover each Plan species. This adaptive management approach is an essential part of the HCPs because the protection measures rely on survival results rather than strictly dam operation procedures (e.g., fish passage efficiency).

4.2.3.3 Resident Fish Species

Project Areas

There are no intended changes to project operations specifically aimed at resident fish species under any of the alternatives. Therefore, the effects of project operations on resident fish in the project areas are not expected to differ substantially from either Alternative 2 or existing conditions (Alternative 1). Under all three alternatives, the appropriate agencies or coordinating committees would consider the potential effects that activities aimed at protecting the Plan species would have on resident fish. Salmonid species (particularly smolting fish) are generally more sensitive to environmental changes and more prone to physical injury (related to project passage) compared to most resident fish that occur in the project area. Therefore, bypass facilities designed to achieve a high level of salmonid passage survival would be unlikely to substantially affect resident species that pass the projects. An exception would be the possible use of turbine intake screens at Rock Island Dam. Intake screens are known to impinge juvenile lamprey.

Associated Tributaries

Resident trout spawn and rear in tributary streams throughout the Mid-Columbia River region. The spawning and rearing habitat requirements for these fish are similar to those used by anadromous salmonids. Therefore, potential habitat improvements resulting from projects funded by the Plan Species Account are expected to also benefit resident trout species. Descriptions

of the types of projects expected to be funded by the Plan Species Account are provided in Section 2.3.4.8, HCP Conservation Plan and Compensation Measures, under Tributary Conservation Plan.

Any reduction in hatchery anadromous fish production that might occur under the action alternatives would also reduce the potential effects of competition for food and space, disease transmission, or direct predation by hatchery fish on resident trout.

Pacific lamprey spawn in low-gradient stream segments of smaller tributaries, including streams feeding the mainstem reservoirs. The low-gradient segments of many of the Mid-Columbia River tributaries tend to occur in the lower watershed. These areas are also most likely to be affected by land-use practices (primarily farms and orchards). Thus, tributary improvement projects (such as improving access, increasing stream flows, increasing instream habitat, and water quality improvements) in these areas are expected to benefit lamprey spawning and rearing.

The HCPs provide a funding source for improving tributary habitat that might be beneficial to non-Plan species, such as bull trout and Pacific lamprey. Although there are no plans or provisions to evaluate whether the habitat improvements benefit or adversely affect non-Plan species, it is assumed that the tributary committees would consider effects to non-Plan species in the determination of which habitat improvement projects to implement.

None of the EIS alternatives provide funds or specific provisions to address potential project effects to bull trout, which are currently listed as threatened under the Endangered Species Act. Bull trout are known to occur in the project area, and have been observed passing the projects through the adult and juvenile fish passage facilities. The potential take of this species would require a separate consultation under Section 7 of the Endangered Species Act between FERC and USFWS. Any future listings of non-Plan species would also require separate action under either Alternative 2 or 3.

4.3 WATER RESOURCES (QUANTITY AND QUALITY)

4.3.1 WATER QUANTITY

4.3.1.1 Alternative 1 (No-Action)

Project Area

Over the next 50 years, the mainstem Mid-Columbia River dams would continue to be operated by the PUDs with the primary objective of power production. These dam and reservoir operations are generally based on instantaneous power demands, as described in Section 2.2.2, Dam and Reservoir Operations. The number of turbines in operation and the resulting water discharge from each facility would continue to vary frequently, with typical daytime peak flows being about 135 percent of nighttime low flows. Flow releases from the Chief Joseph Dam upstream are timed to increase power generation at downstream dams throughout the day. Hourly coordination among dam operators would continue to maximize power generation efficiency by minimizing reservoir drawdown and maintaining optimal water levels for the turbines.

To maximize power production, Mid-Columbia River dam operators would continue to minimize the amount of water that is discharged over spillways. Forced spill would occur whenever the reservoir is at its normal maximum operating level and reservoir inflows exceed the hydraulic capacity of those turbines being used to meet the instantaneous power demand. When forced spill does occur, it would typically be at night when energy demand is lowest.

Associated Tributaries

Water quantities in the Mid-Columbia River tributaries and other reaches of the Columbia River may change due to climatic factors, modified water withdrawals, or changes in the operations of upstream storage reservoirs and tributary dams. Wet and dry climatic cycles are difficult to predict, as are the potential effects of global warming. These factors influence the amounts of precipitation and the rate of snow-melt, and ultimately the river flows. There are currently no plans to change the operations of those projects upstream of the Wells Dam. Some future changes in tributary stream flows are likely to occur under Alternative 1 as irrigation withdrawals or other water uses change due to Federal, State, and locally funded enhancement projects and regulations being implemented to protect threatened and endangered species in the tributary watersheds. However, such changes would be unrelated to PUD reservoir management. Average discharge from each of the Mid-Columbia River tributaries ranges from less than 1 to about 6 percent of the average Columbia River flows during high-flow months (spring), and typically less than 1 percent during low-flow months (fall) (see Section 3.3.1, Water Quantity).

4.3.1.2 Alternative 2

Project Area

Monthly average flows and peak flows in the Mid-Columbia River and its tributaries are not expected to change under Alternative 2, beyond the possible changes discussed under Alternative 1. The frequency and quantity of forced spills are also not expected to change from existing conditions.

To provide additional protection for listed species, measures to increase downstream passage survival of juvenile salmonids would be instituted under Alternative 2. These measures would include increased spill during specific migration time periods for the listed species. Although voluntary spill is limited by the requirement not to exceed the water quality standards for total dissolved gas, it is estimated that spill could increase to encompass 40 percent of the total river flow.

Because of the limited storage capabilities of the reservoirs, these potential changes in dam operations would have only a minor and short-term effect on river flows. During spill events, a portion of the river flow is directed over the spillway rather than through turbines; however, the total quantity of water released from the dam is generally not affected.

Reservoir drawdown, a measure to increase water velocities and decrease outmigration periods for juvenile salmon and steelhead, is a remote possibility for the next 50 years. If FERC licenses are amended to allow for drawdown, reservoirs could be drawn down by as much as 30 to 50 feet, and water particle travel times (the average time it would take for water molecules to travel through the reach in question) would substantially increase.

Associated Tributaries

Similar to Alternative 1, changes in water quantities in the associated tributaries would be attributed to independent actions and not related to Alternative 2 actions.

4.3.1.3 Alternative 3

Project Area

Water quantity in the project area under Alternative 3 would not be substantially different from Alternative 2. There are no proposed changes to operations at the three dams that would affect water quantity, and the development of juvenile fish bypass systems at Rocky Reach

and Rock Island dams would likely be similar under both alternatives.

Improvements to the juvenile dam passage system could result in a reduction in the amount of spill at the projects, thereby reducing total dissolved gas levels, but would not affect the total river flow. As run-of-the-river facilities, the Mid-Columbia River projects have little influence over total river flows. Although the bypass system at Rock Island Dam is based primarily on spillway passage, the focus is to increase the efficiency of spill (e.g., passing more fish with less water). At Rocky Reach Dam, improvements to the surface bypass system could decrease the use of spill. However, spill could also increase due to the need to meet the HCP survival standards, if the standards cannot be achieved with existing spill levels and the juvenile fish bypass system.

Despite the potential changes in spill, these measures would not substantially alter water quantities (e.g., dam discharge rates, monthly flows, or peak flows) in the river. Modifications to the spill program or turbine systems would affect how the water passes a dam, but would not change river flows. Because of the very limited capability to store water in these run-of-the-river reservoirs, actions to avoid or minimize reservoir level fluctuations would have a limited influence on river flows.

Associated Tributaries

The water quantity in some Mid-Columbia River tributaries (i.e., the Wenatchee, Entiat, Methow, and Okanogan Rivers) could be improved under Alternative 3 compared to Alternatives 1 and 2 through tributary habitat improvements, funded as part of the HCPs. In the selection of habitat improvement projects for funding, high priority would be given to the acquisition of land or interests in land, such as conservation easements or water rights. These conservation measures would likely provide some improvements in tributary instream flow conditions, such as higher summer stream flows.

Most of the HCP habitat restoration strategies recommended for the Wenatchee River watershed center on efforts to maintain or increase the complexity of stream channels and floodplains (NMFS et al. 1998b). Benefits from several tributary riparian restoration projects include increasing late-summer instream flows and desynchronizing flood events.

Instream flow has been identified as a limiting factor in the Methow River (Washington State Conservation Commission 2000). Low-flow conditions are caused in part by irrigation diversions, and the effects are exacerbated by cold weather (which further reduces the available instream habitat). Efforts are underway to address this problem.

Water quantities in other tributaries of the Mid-Columbia River would not change under HCP habitat improvement strategies. Efforts to improve salmonid production in the Okanogan River drainage through facilitation and funding of improved agricultural practices would have little effect on flow and temperatures. However, implementation of the Okanogan Flow Management Program to mitigate for impacts to sockeye salmon from the Wells Project would affect flows in the Okanogan River. These flow manipulations would be developed to improve spawning and incubation conditions in the river that would benefit sockeye salmon and kokanee production. Implementation of this flow management program is expected to occur under all the alternatives.

Recommended strategies for Entiat River habitat enhancements focus on improving structural complexity of the stream channel and improving woody debris recruitment. These HCP recommendations for the Entiat River watershed do not target instream flows, and no changes in water quantity are expected to result from their implementation. Although some instream flow improvements might be expected over the 50-year term of the HCPs, these projects are not considered a priority in this basin.

4.3.2 WATER QUALITY

4.3.2.1 Alternative 1 (No-Action)

Project Area

Mid-Columbia River water quality may improve over time as Ecology continues to work toward compliance with the Clean Water Act. For all Washington streams that are listed as having impaired water quality under Section 303(d) of the Clean Water Act, including the Mid-Columbia River and its tributaries, Ecology is required to develop and implement total maximum daily load (TMDL) limits to restore water quality for beneficial uses. The Mid-Columbia River in the project area is currently on the 303(d) list for total dissolved gas, water temperature, pH, and a water column bioassay. Although draft TMDLs have been developed for the Mid-Columbia River, these standards are likely to change. As a result, they are not specifically addressed in the comparison of the alternatives. The PUDs are working directly with the USEPA on the draft TMDLs, and compliance with the final TMDLs would occur regardless of the alternative selected for this project.

Associated Tributaries

Water quality in the Mid-Columbia River tributaries is generally good, although they are or have been listed on the Ecology 303(d) list for several constituents (see Section 3.3.2.2, Associated Tributaries). The Wenatchee River is listed for exceeding the water quality standards for temperature, pH, and dissolved oxygen; the Methow River for temperature; and the Okanogan River for temperature, dissolved oxygen, fecal coliform, and various pesticides. Although the Entiat River has no current listings, it has been listed in the past for temperature and pH.

Water quality in the tributary rivers is also generally expected to improve over the next 50 years. In addition to Ecology efforts to develop and implement TMDLs for compliance with the Clean Water Act, other agencies have undertaken watershed planning. These programs are critical to reverse the trend of water quality degradation. However, water quality is generally very good in the Mid-Columbia River tributaries, so progress would be slow to result in measurable improvements. Because these tributaries produce only a small portion of the total Mid-Columbia River flows, improvements in water quality may not be noticeable in the Columbia River mainstem. Water quality is generally not considered the limiting factor in Mid-Columbia River tributary salmonid productivity, so water quality improvements would have a limited ability to help fish without other habitat improvements (e.g., increased summer low flows and channel structure improvements).

A watershed action plan and implementation schedule have been developed to promote water quality improvements throughout the Wenatchee River watershed from pollutant sources such as on-site sewage systems, agriculture, forestry, and stormwater (Wenatchee River Watershed Steering Committee 1998). The Chelan County Conservation District has initiated a watershed planning process for the Entiat River that includes water quality evaluations (Jones 1999). Alternatives to enhance fish habitat by restoring riparian vegetation, if implemented, would provide increased shade and may reduce summer water temperatures. Efforts to improve instream flows through improved conservation practices in the Methow River watershed (Methow Valley Water Pilot Planning Project Committee 1994) may also improve water temperatures and other water quality constituents.

In the Okanogan River watershed, the Okanogan Conservation District and Okanogan County have joined with other agencies and interested parties to draft a plan that addresses non-point and point source pollution and identifies implementation strategies (Okanogan Watershed Stakeholder's Advisory Committee and Technical Advisory Committee 1999). Actions identified in this plan

directly address water quality improvements for constituents identified on the 303(d) list: water temperature, dissolved oxygen, fecal coliform bacteria, pH, dicholoro-diphenyl-tricholoroethane (DDT), poly-chlorinated biphenyls (PCBs), arsenic, instream flows, and turbidity and sediment.

Riparian reserve protection and other land management improvements on USFS lands may further improve water temperatures, dissolved oxygen concentrations, sedimentation, and other water quality variables in Mid-Columbia River tributaries. These efforts to improve water quality are expected to continue and result in incremental water quality improvements over time.

4.3.2.2 Alternative 2

Project Area

Of the Mid-Columbia River water quality constituents on the 303(d) list, total dissolved gas is directly affected by project area dam operations. Increased spills to facilitate juvenile salmonid migrations have the potential to increase total dissolved gas concentrations under Alternative 2. For example, if 93 percent juvenile project passage survival is required for protecting threatened and endangered salmonid species passing the Rocky Reach Project, then it may become necessary to divert more water to the spillway to increase survival. Conversely, actions responding to Ecology requirements and voluntary mitigation efforts by the PUDs (e.g., spill deflectors) are likely to reduce total dissolved gas downstream from the dams.

To comply with the Clean Water Act, the spillways would be modified to reduce total dissolved gas levels to no more than 110 percent saturation, or Ecology would grant waivers of the 110 percent total dissolved gas saturation standard to allow 115 percent saturation in project forebays and 120 percent saturation in tailraces to improve fish passage over the spillway. Preliminary assessments suggest that, with revised standards or temporary waivers, it might be possible to spill up to 40 percent of the total river flow (if necessary to meet fish survival criteria) and still comply with the water quality standards for total dissolved gas. However, total dissolved gas abatement measures would be required at some locations, such as Rock Island Dam, to allow this level of spill. The ability to control total dissolved gas is likely to be a limiting factor in using spill to achieve the necessary fish survival rates under Alternative 2. Similar total dissolved gas abatement measures are expected to occur under Alternative 1.

Other water quality constituents on the 303(d) list for the Mid-Columbia River project area are generally not expected to change under Alternative 2. Because high dams upstream (e.g., Grand Coulee Dam) are not equipped to release cooler water from deep in the reservoirs, and because the project area reservoirs are run-of-the-river projects that warm up and cool off quickly with ambient temperature changes, little can be done to improve high summer water temperatures. The 303(d) decision matrix indicates that the pH listing was based on two excursions beyond the criterion in 1991, and remedies to the problem may not be available (Washington State Department of Ecology 1996).

If reservoir drawdown is implemented to improve juvenile salmon and steelhead outmigration survival in the spring, some marginal changes in water quality could occur. Measurable changes in water temperature are not expected to occur under the drawdown scenario. Some localized short-term increases in turbidity and suspended solids, resuspension of pollutants, increased nutrients, and possible downstream reductions in dissolved oxygen could occur, depending on the extent of drawdown. These effects would dissipate over time, and water quality would return to pre-drawdown conditions. Drawdown in not included as an option under Alternative 1.

Associated Tributaries

Similar to Alternative 1, Alternative 2 would have no effect on water quality in the Mid-Columbia tributaries, as no off-site measures would be implemented to avoid jeopardizing the continued existence of the listed species. Habitat restoration activities under Alternative 2 are expected to occur through funding sources other than the PUDs, and would be similar to those already planned in the region and discussed above for Alternative 1.

4.3.2.3 Alternative 3

Project Area

Similar to Alternative 2, water quality in the Mid-Columbia River may improve over time under Alternative 3 as Ecology implements TMDL limits for parameters that do not meet water quality standards. Efforts to meet 93 percent juvenile project passage or 95 percent juvenile dam passage survival for all Plan species may include diverting more river flow to spillways where fish survival is generally higher than other passage routes (particularly the turbine passage route). Increasing spill levels to improve survival rates is more likely at Rocky Reach and Rock Island dams than at Wells Dam because of the efficiency of the Wells Dam surface bypass system. Reduced spill levels are expected to occur under Alternative 3 at Rocky Reach Dam, compared to Alternatives 1 and 2, because of the expected reliance on the juvenile bypass system to increase juvenile survival at the projects. Spill is the primary method to improve juvenile passage survival at Rock Island Dam for all the alternatives, although spill levels are expected to be greatest under Alternative 2 and the lowest under Alternative 1.

Increased spill to improve fish survival could result in higher total dissolved gas supersaturation, thereby conflicting with efforts to meet the water quality standards for total dissolved gas. The HCPs commit the PUDs to work cooperatively with Ecology to meet water quality standards. Some combination of mitigation to reduce gas entrainment at spillways (e.g., spill deflectors) and changes or waivers for the 110 percent saturation limit would likely be necessary to meet HCP commitments to both the fish survival and water quality standards. The signatory parties to the HCP have committed to work together to address water quality issues (see Section 6, Reservoir Habitat and Water Quality of the Wells, Rocky Reach, and Rock Island HCPs).

Associated Tributaries

The tributary habitat improvement projects funded by the HCPs are expected to benefit water quality. For example, water conservation measures that increase summer low flows would also lower water temperatures and improve dissolved oxygen conditions during this critical time of the year. No PUD-funded tributary improvement projects are included under Alternatives 1 and 2. As a result, no changes in tributary water quality are expected.

4.4 VEGETATION

4.4.1 ALTERNATIVE 1 (NO-ACTION)

4.4.1.1 Project Area

Ongoing operations at the three dams would have no effect on vegetation (including wetlands) within the project area. There are no plans to change water levels beyond existing conditions under any of the FERC licenses.

4.4.1.2 Associated Tributaries

Planned projects that are outside of the jurisdiction of the PUDs would affect riparian

vegetation located in the watersheds of the four tributaries. As part of the Federal- and State-mandated WRIA and USFS habitat improvements, riparian habitat along the associated tributaries would be acquired for preservation, enhancement, and restoration. Larger buffer areas along the stream corridors would be set aside and converted from existing land uses (largely agricultural) to riparian habitat.

Habitat improvements by sources other than the PUDs may involve the removal of non-native or agricultural plant species; adding or enhancing soils; and planting native riparian, wetland, or upland overstory vegetation. Habitat conservation areas may also be protected from human intrusion. These actions would have a beneficial effect on vegetation by removing non-native species, converting disturbed areas back to a more natural state, and increasing plant survival rates. These projects are independent of the three dams, and would occur regardless of the action alternative selected. Ongoing hydroelectric project operations would have no effect on vegetation in the project area, including the four tributaries. Habitat restoration projects are independent and would not affect any restoration efforts conducted through the WRIA initiatives or other Federal, State, local, or voluntary restoration projects.

4.4.2 ALTERNATIVE 2

4.4.2.1 Project Area

Under Alternative 2, the three projects would implement measures to improve adult and juvenile fish passage past the dams, continue the funding of the hatchery programs, monitor and evaluate the success of fish passage measures, and analyze the potential for fish survival and recovery with the proposed measures. Some of the actions that would be implemented at the dam sites include modifying ladder operations, in particular improving the entrances to the ladders; operating the surface bypass system continuously during migratory periods; operating turbines at peak efficiencies; increasing amount and extent of spill; and implementing a predator removal program and a gas abatement program. Similar to Alternative 1, the actions associated with dam facility improvements are in-water improvements and would have no adverse effect on shoreline vegetation.

The increased program of spills at the dams during fish migratory periods would also have no adverse effect on shoreline vegetation. This is because there would be no change to the existing water level fluctuations downstream of the three dam sites.

Unlike conditions under Alternative 1, another potential (but remote) operational change that could occur over the next 50 years under Alternative 2 may be to drawdown reservoirs as part of NMFS's regulatory authority to ensure salmon and steelhead survival. Drawdown would affect riparian zone vegetation and wetlands located near the reservoirs, as well as aquatic bed vegetation. The relatively static nature of the water levels in the reservoirs has resulted in the formation of wetlands and mature riparian vegetation in those areas that are not developed for orchards, other agriculture, or development, or rip-rapped to prevent erosion. Drawdown would result in loss of riparian, aquatic, and wetland vegetation because these vegetative types are dependent on being saturated or located near a constant water supply.

One rare plant species could also be affected by the potential drawdown of the reservoir pools under Alternative 2. The giant helleborine is known to occur on or near the three reservoir shorelines. Drawdown could also increase the potential spreading of noxious weeds into currently wetted areas that would be exposed during drawdown conditions. This effect would not occur under Alternative 1.

4.4.2.2 Associated Tributaries

Similar to conditions under Alternative 1, implementation of Alternative 2 would have no effect on vegetation in the tributaries. Independent habitat restoration conducted by other agencies or voluntary organizations and individuals would also occur and likely result in improvements in native vegetation habitats.

4.4.3 ALTERNATIVE 3

4.4.3.1 Project Area

Similar to Alternatives 1 and 2, there would be no effects to vegetation within the project area from any construction and operation improvements that may occur from implementation of this alternative. The only exception would be vegetation effects from drawdown, which have the potential of occurring under either Alternative 2 or 3. Drawdown effects from implementation of Alternative 3 would be the same as described under Alternative 2. These effects include loss of riparian, wetland, and aquatic vegetation. Over time, new riparian, wetland, and aquatic vegetated areas would be created at the lower elevation shoreline.

4.4.3.2 Associated Tributaries

Tributary improvements planned, designed, and implemented independent of the action alternatives would likely include land acquisition and habitat improvement of shoreline areas along the four tributaries. Additional funding would be available under the HCPs, and thus a greater level of habitat restoration would be possible. HCP actions that occur at the project areas would not affect vegetation in the tributaries. Some of the main areas where tributary riparian vegetation has been recommended for protection and restoration using HCP funding include the following:

- Wenatchee watershed
  - Lower White River
  - Lower Wenatchee River
  - Lower Peshastin Creek
  - Lower Nason Creek
  - Lower and Upper Icicle Creek
  - Chumstick Creek
  - Ingalls Creek
  - Negro Creek
  - Camas Creek
  - Mission Creek
  - Brender Creek

- Entiat watershed
  - Lower Entiat River
  - Mud Creek
  - Mad River
  - Preston Creek
  - Fox Creek
  - Stormy Creek
  - Roaring Creek

- Methow watershed
  - Lower Gold Creek
  - Lower Twisp River
  - Lower Chewuch River
  - Lower Benson Creek
  - Lower Lost River
  - Upper and Lower Methow River
  - Beaver Creek
  - Hancock Creek
  - Wolf Creek

- Okanogan watershed
  - Upper mainstem Okanogan River
  - Lower Similkameen River

4.5 WILDLIFE

4.5.1 ALTERNATIVE 1 (NO-ACTION)

4.5.1.1 Project Area

Wildlife habitat enhancement and monitoring (e.g., installation and monitoring of Canada geese nesting structures and wood duck nest boxes) at the project locations are currently conducted according to FERC licensing agreements, as well as on a voluntary basis. These activities would continue under Alternative 1. The PUDs would also continue to fund avian predator control programs to reduce the level of gull, cormorant, and other piscivorous bird predation on juvenile salmon at the dams and the PUDs' hatcheries. There are no threatened and endangered species affected by current licenses.

4.5.1.2 Associated Tributaries

Due to the presence of threatened and endangered fish species in the associated tributaries, a variety of habitat improvements are likely to take place through independent agency actions in the associated tributaries. Watershed action plans are currently underway in the four tributaries, and include habitat protection, preservation, and improvement projects. These activities (funded by Federal, State, and local entities) include both instream enhancement and riparian habitat and floodplain restoration and enhancement.

4.5.2 ALTERNATIVE 2

4.5.2.1 Project Area

Similar to Alternative 1, the Alternative 2 fish protection and enhancement actions that would occur at the dams would have a negligible effect on most wildlife, including Federally proposed species, species of concern, State-listed species, State candidate species, or State monitor species. Because wildlife species do not pass through the dams, improvements to adult fish passage (e.g., hydraulic and structural fishway modifications, improvements to juvenile passage from changes to spill programs and installation [Rocky Reach and Rock Island Dams], and modification [Wells Dam] of permanent juvenile bypass facilities) would have no direct effect on wildlife.

Fish passage improvements at the dams could indirectly affect piscivorous birds. Disoriented juvenile salmonids are a substantial source of prey for piscivorous birds, which concentrate around the dams during juvenile salmonid migration. If improvements to juvenile bypass systems cause less disorientation to juvenile fish, piscivorous bird prey availability in the tailrace would be reduced. This reduction in prey availability, combined with the intensification of avian predator control measures (such as installing more avian overhead exclusion wires and increasing hazing activities) may result in a decline in piscivorous birds in the vicinity of the dams. Similarly, if avian predator control activities are intensified at the hatcheries, piscivorous bird abundance would likely decline at these locations. Consequently, there is likely to be a lower abundance of piscivorous birds compared to Alternative 1.

Other wildlife species that occur in the project area do not depend on juvenile or adult salmon and steelhead as prey, and thus would not be indirectly affected by improved fish passage at the dams. Mink do prey on salmonids, but other prey (other fish, birds, and mammals) constitute the majority of their diet. Therefore, changes in salmonid abundance or passage rates at the dams would not affect mink populations in the area (Verts and Carraway 1998). River otters prey on fish to a greater extent than mink, but for otters in the vicinity of the dams and reservoirs, slow-moving resident fish (such as northern pikeminnows and suckers) likely comprise the majority of their fish prey (Toweill and Tabor

1982). Consequently, changes in resident fish abundance resulting from the pikeminnow removal programs may negatively affect the populations of river otters in the vicinity of the dams (Verts and Carraway 1998). In comparison to Alternative 1, there would likely be no changes in other wildlife species, excepting river otters, which could have a reduction in their preferred prey species under Alternative 2 but are not expected to be affected under Alternative 1.

In the unlikely event of drawdown, effects would depend on the timing, extent, and duration of drawdown. Waterfowl would be affected through reductions in plant forage, invertebrate prey, and nesting/brood-rearing backwater areas, and an increase in predator access to nest sites. Effects of drawdown to amphibians would include stranding of egg masses and loss of breeding and foraging habitat. Den sites of aquatic furbearers would be lost through lowering of the river water level, and these species could also be affected by reductions in food availability (i.e., riparian and aquatic vegetation and resident fish species). These effects would not occur for Alternative 1 because drawdown is not planned under existing conditions.

4.5.2.2 Associated Tributaries

As with Alternative 1, no PUD-funded habitat improvement projects would be conducted during the 50-year term of Alternative 2. However, similar to Alternative 1, a variety of independently funded habitat improvement projects are likely to occur that could improve wildlife habitat over time, such as an increase in riparian habitat, restoration, and instream habitat enhancement.

4.5.3 ALTERNATIVE 3

4.5.3.1 Project Area

As with Alternatives 1 and 2, likely fish protection and enhancement actions that would take place at the dams under Alternative 3 would have a negligible effect on most wildlife. Potential effects to piscivorous birds could occur as under Alternative 2, if juvenile salmonid passage improves and avian predator control activities are intensified.

4.5.3.2 Associated Tributaries

Habitat improvements under Alternative 3 would include the PUDs funding projects to improve the productive capacity of salmonid habitat present in associated tributary streams. These PUD-funded projects would be in addition to tributary habitat improvement projects independently funded by other resource agencies. Projects funded by the HCPs would include both habitat protection and habitat restoration. Habitat protection projects would focus on maintaining existing floodplain and riparian areas. Such actions would prevent these areas from being converted to residential and other developments. Consequently, although these types of projects would not represent an immediate benefit for wildlife, the projects would prevent riparian and floodplain habitat loss. As such, habitat protection projects associated with the HCPs would have long-term benefits for riparian- and aquatic-associated wildlife (including waterfowl, aquatic furbearers, riparian-associated songbirds, and other species such as deer and black bear that use riparian habitats intermittently). These additional wildlife benefits would not occur under either Alternatives 1 or 2.

During the season of construction, these activities would cause short-term noise and visual disturbance. Wildlife species would either be lost or displaced to other areas during the time of disturbance. However, most species would return to the area upon completion of the construction activities. Projects may also cause a short-term loss of habitat, as construction equipment and use may destroy existing vegetation. Cleared areas would likely be replanted with native vegetation that provides optimum conditions for large woody debris entry into adjacent streams. Short-

term disturbance could occur to bald eagles; however, over the long term, the habitat improvements would increase the number of bald eagle prey. Riparian habitat improvements are likely to increase waterfowl foraging and nesting habitat.

Apart from the short-term disturbance to wildlife, these tributary projects would improve conditions for wildlife, depending on the types of projects that occur. Plantings of riparian vegetation would provide increased nesting, foraging, and breeding habitat for riparian-associated birds, and forage and cover for beaver, as well as deer and other land mammals. Changes to stream hydrology that could occur with habitat improvement projects, such as creation of eddy and backwater areas, would improve foraging and breeding habitat for waterfowl and amphibians. Improvements in salmon and steelhead spawning habitat, and concomitant increases in spawning salmon, would represent an increase in prey availability for black bear, river otter, and turkey vultures and other carrion-eating birds.

Habitat protection projects that would have the most benefit to wildlife are projects in areas that currently contain good wildlife habitat (i.e., presence of riparian trees and shrubs and good aquatic habitat) but are threatened by development.

Habitat restoration projects would include enhancing riparian habitat, restoring floodplain function, and improving fish passage to wetlands. Riparian and aquatic habitat improvements would cause a short-term disturbance to wildlife in the vicinity, but would have long-term benefits to songbirds, raptors, waterfowl, aquatic furbearers, amphibians, and land mammals that occasionally use riparian habitats.

One possible exception to beneficial effects of habitat improvements is the effect of fish introductions on amphibians. If fish passage is improved such that anadromous and resident fish gain access to areas that are currently occupied by amphibians but devoid of fish, effects to amphibians could occur. Fish prey on amphibians and can cause local declines or extinction in amphibian populations (Blaustein and Wake 1990; Corn 1994). Habitat restoration projects that would have the most benefit to wildlife are those that involve restoring riparian vegetation and improving wetland and backwater habitats. These effects could occur under any alternative because independent and PUD-funded tributary enhancement projects could open up portions of streams to fish that may have been recently closed to fish passage due to habitat deterioration or other fish blockage conditions.

4.6 LAND OWNERSHIP AND USE

4.6.1 ALTERNATIVE 1 (NO-ACTION)

4.6.1.1 Project Area

Existing FERC licenses for the three dams would not alter land uses or zoning in the vicinity of the project area.

4.6.1.2 Associated Tributaries

As part of the Federal, State, and local watershed improvements that have been identified to improve endangered fish habitat, land along the shorelines of the tributaries may be acquired for preservation and restoration. This would convert existing private land ownership to public land and change the main land use (agriculture) to natural habitat and conservation. There are several other land use implications of this change in ownership:

(1) there would be less access to the shoreline areas for recreation, (2) there would be no additional residential development along the shoreline, (3) no industrial uses would be allowed near the shoreline, and (4) some zoning may change based on whether public entities purchased private lands, or other voluntary land use restrictions were placed on private lands.

Historical floodplain areas could return to floodplain conditions to provide increased salmon habitat. There may be some areas where the rivers or streams would be allowed to flood naturally. Many of these areas that have been protected from flooding and land uses (such as homes or agriculture) occur in floodplains. As part of allowing flooding to occur, there may be areas where the existing land uses (such as residences) could be displaced, and these properties would be acquired. The potential for these activities to occur exists regardless of the alternative selected for the three hydroelectric projects. Operations under Alternative 1 would not affect these proposed land use changes.

4.6.2 ALTERNATIVE 2

4.6.2.1 Project Area

Protection measures for fish migrating past the dams would include hydraulic and structural fishway improvements to allow for increased upstream passage by adult fish, such as modifications to ladders and changes in water flow to attract fish. Measures would also be implemented to increase the downstream passage of juvenile salmonids (such as increased spill programs, improved fish bypass systems, expanded predator control devices, and improvements to reduce dissolved gas levels). The planned structural and facility improvements at the dam would not change predominant adjacent land uses or zoning: power production, fish survival and production, tourism, or zoning along the Columbia River. However, other potential dam operations (such as drawdowns) would change agricultural land uses, particularly along the shorelines and on the river itself. Zoning may also change dependent on the altered land use. Alternative 2 is similar to Alternative 1, except under drawdown conditions, which would not occur under Alternative 1.

Drawing down the reservoirs would make it considerably more difficult to obtain irrigation water for agriculture. Inflow lines would be extended and larger pumps would be needed. This work would require a one-time capital cost, and would also increase yearly maintenance costs. These factors could result in loss of irrigated agricultural lands in the vicinity of all three dams, which may also affect zoning as agriculture is converted to commercial/industrial, residential, or other land uses. These effects would not occur under Alternative 1.

4.6.2.2 Associated Tributaries

Alternative 2 would not affect any land use along the associated tributaries, and the effects from independently funded watershed improvements as described under Alternative 1 would also be applicable under Alternative 2.

4.6.3 ALTERNATIVE 3

4.6.3.1 Project Area

Similar to Alternatives 1 and 2, land use and zoning at the three dams would not substantially change under Alternative 3 (excepting under drawdown conditions). While there would be modifications to structures and operation of the dams to improve fish passage and survival, the land use would remain oriented to power production, fish survival and production, and tourism. None of the on-site modifications would affect any off-site areas near the dams or reservoirs.

When making land use or related permit decisions on PUD-owned lands that affect reservoir habitat,

the PUDs would consider the cumulative effects that land use decisions may have on the PUDs' ability to meet the conservation objectives of the HCPs, their respective FERC license requirements, and other applicable laws and regulations. They would notify and consider comments from the HCP signatory parties regarding land use permit applications on PUD-owned lands. In addition, they would notify all applicants for permits to use or occupy project lands or water that such use may result in an incidental take of Endangered Species Act-listed species.

The drawdown effects to land uses and zoning described under Alternative 2 could also potentially occur under Alternative 3. These effects would not occur under Alternative 1. This would include loss of agricultural lands, and potential conversion to industrial/commercial, residential, or other land uses.

4.6.3.2 Associated Tributaries

The Plan Species Account could provide money to acquire easements or purchase property for habitat improvements along the four main project tributaries. This work would be in addition to the Federal, State, and local effort to preserve and enhance habitat that is common to all three alternatives. Habitat improvements would largely focus on the riparian areas that presently are used extensively for agriculture, but may also include some scattered residential and commercial land uses. Protecting these areas would require the acquisition of land along the shoreline and conversion from its present land use to an undisturbed shoreline buffer. This buffer area would likely be a formally designated land use type similar to a Native Growth Protection/ Conservation Easement. Certain types of activities, such as farming, would then be prohibited from occurring within the buffer area.

It is not possible to predict the extent of land acquisition and conversion to the shoreline buffer at this time, because off-site habitat compensation measures have not yet been fully evaluated, and land values for particular land acquisitions have not been determined. However, the three dams would make a yearly contribution to the Plan Species Account, and there would be an opportunity to provide meaningful off-site habitat improvements for fish through these land acquisitions. As a result of this funding, there would be some shoreline areas along the four tributaries acquired for this purpose. Agricultural areas are likely candidates for conversion to shoreline habitat, as well as floodplains (as discussed under Alternative 2).

The types of land ownership potentially affected by land acquisition include private ownership, particularly in the lower reaches of the Wenatchee, Entiat, and Methow Rivers and most of the Okanogan River, except for the Colville Indian reservation lands along the lower reaches of the Okanogan River. There are also some scattered public lands administered by the BLM and State-owned lands located along the Entiat, Methow, and Okanogan Rivers. National Forest lands occur along the riparian and shoreline areas of the upper reaches of the Wenatchee, Entiat, and Methow Rivers.

Acquisition of these lands and conversion from agricultural to conservation areas would likely affect zoning in the area. The additional zoning change from implementation of Alternative 3 would not occur under Alternatives 1 and 2.

4.7 SOCIOECONOMICS

4.7.1 ALTERNATIVE 1 (NO-ACTION)

Socioeconomic effects can be either direct or indirect. Direct effects result when employment or expenditures in an industrial sector either increase or decrease (for example, when a new manufacturing plant moves into an area and hires new workers). Indirect economic effects result when one industry purchases goods and services from another. For example, when a manufacturing plant closes, income to restaurants may be affected because there are fewer workers eating meals out.

Employment and economic activity is supported by the three hydroelectric projects in several industrial sectors. Employees working at the dams and hatcheries are either government employees or contract personnel, and overall, are an important part of the local economies (see Table 3-15). Project area construction workers usually live in the general project area and indirectly support the local economy.

Scientific research and engineering studies for the projects are often conducted outside of the three counties by service-sector employees in the Puget Sound or Tri-Cities area. This employment sector is relatively larger statewide than in the project counties. This activity has relatively little affect on the local economy.

The hydroelectric projects also support agricultural employment by providing a source of affordable electricity and allowing access to stable river elevations that are conducive to the withdrawal of irrigation water for orchards and crops located near the reservoirs. Agricultural employment is a very important component of the local economy, in both direct and indirect employment. Although irrigation could occur without the hydroelectric projects, substantial modifications to the existing facilities would be required.

Tribal economies would be directly affected by continuing the current operations at the three dams. Results of the QAR suggest that continued operations would have a high potential to result in the likely extinction of Upper Columbia River spring-run chinook salmon and steelhead stocks in the next 100 years, if survival continues in the future as it did between 1980 and 1994 (this assumption is conservative). Tribes rely on the fish harvest for income, as well as subsistence. For example, these two fish species constituted approximately 47 percent of the subsistence fish harvest in 2000. Steelhead alone accounted for 20 percent of the commercial fish harvest in 2000. The decline in these two fish stocks would take place slowly over time, but this would require Tribal members engaged in fishing to find replacement for the loss of income and subsistence resources.

Independently funded tributary habitat enhancements, improvements in fish passage survival at Lower Columbia River dams, and modification of harvest regulations and hatchery practices are likely to benefit fish stocks (listed and unlisted species) and thus the segment of Tribal economies dependent on the fish harvest. These activities would occur under all three of the alternatives.

4.7.2 ALTERNATIVE 2

Most current activities at the three hydroelectric projects would continue under Alternative 2. There would be some change in the direct and indirect employment related to the projects. Hatcheries would continue operating at their current level. Continued operation and maintenance of the facilities and modifications to improve fish passage would provide some employment in the government and construction sectors. Ongoing studies and research would be required to evaluate and monitor how the projects affect spring-run chinook salmon and steelhead.

This work would be primarily performed by government and private scientists and construction employees residing in Chelan and Douglas counties, as well as scientists from throughout the region. However, no substantial changes in employment and economic activity are likely under Alternative 2 compared to Alternative 1.

The possibility of additional future protective measures over the next 50 years under Section 7 of the Endangered Species Act remains open. These measures could require structural and operational modifications to the projects that could affect recreational activities and regional employment. If the projects are required to operate at minimum pool levels to improve fish passage, recreational activities could be substantially reduced. This would have a substantial adverse effect on the local county economies. Structural modifications at the dams include the construction of fish bypass systems, nitrogen abatement structures, and potential modifications to fishladders that could provide short-term increases in construction employment. These employment increases could have short-term benefits to the local and regional economies.

If drawdown occurs, reduced pool elevations would substantially impair the production of electricity and would have a resultant impact on local hydropower-related employment and construction. Drawdown would also affect irrigation for adjacent agricultural areas, primarily fruit orchards. Many water withdrawal systems would have to be modified to reach the lower water level, resulting in a one-time capital cost. Lower water levels would also require more energy to operate the pumps, increasing operating costs. Increased costs could cause some orchards to go out of business, which would affect Douglas and Okanogan counties more than Chelan County. Since agriculture is a primary industry for these areas, there would be a substantial effect on other businesses in the area. This effect would not occur under Alternative 1.

The economic effects of Alternative 2 could be severe if pool levels were substantially reduced, including the loss of hydropower-dependent jobs and increases in electricity prices for farmers and businesses in the local communities served by the PUD dams. However, the likelihood of implementing drawdown is low.

Future protective measures developed for listed fish species under Section 7 of the Endangered Species Act would modify existing FERC licenses, settlement agreements, and interim stipulations. However, at this time, it is unknown if FERC or the PUDs would support the proposed measures. Therefore, negotiations to resolve biological and technical issues may take some time, thus delaying assistance to listed species. This may contribute to further declines in the two listed fish species. As described under Alternative 1, declines in spring-run chinook salmon and steelhead would affect Tribal economies, as these two species constitute substantial components of the Tribal fish harvest.

The QAR indicates that listed species survival would increase once protective measures are in place, such as a 93 percent juvenile project passage survival rate. With this passage rate, listed species' juvenile survival rates are predicted to increase from 116 to 135 percent over current levels. Increases in spring-run chinook salmon and steelhead survival would benefit Tribal fishing economies, provided that similar survival rates occur at the four Federal dam projects on the Lower Columbia River. These benefits described would not occur under Alternative 1. However, Alternative 2 may not necessarily benefit fall chinook and sockeye salmon; therefore, harvest benefits may not occur.

Drawdown of the Wells reservoir would have a negative effect upon that portion of the Colville Tribal economy that is dependent upon water being withdrawn for orchard, cropland, and grazing pastures along the shorelines of Lake Pateros. It is not clear what effect a drawdown would have on fish survival. While natural river

drawdown would help to mimic natural river conditions prior to construction and operation of the three dams, minimum pool drawdown has not been shown to improve juvenile survival in the Mid-Columbia River. Therefore, it is not possible to predict the effect of a drawdown on the Tribal fishing economy.

Effects from independent tributary habitat enhancements would be the same as under Alternative 1.

4.7.3 ALTERNATIVE 3

Similar to Alternative 2, most current activities at the three hydroelectric projects would continue under Alternative 3. Operation and maintenance of the facilities and modifications to improve fish passage would be similar to current activities and would continue to provide employment in the government and construction sectors. The continued funding for hatchery operations would not have any economic effects because it would be a continuation of existing expenditures, and therefore would not create new jobs or have other economic effects. Extensive use of survival studies and research to monitor and evaluate the effects of the hydroelectric projects and hatcheries on survival and recovery of anadromous salmonid species would be required for the 50-year term of the HCPs. Chelan and Douglas County PUDs perform much of the monitoring and evaluation in-house. When consultants are used, they are regularly hired from the local or regional workforce. Some monitoring would also occur under Alternatives 1 and 2, and the extent of monitoring under Alternative 2 is not as well defined over the 50-year time period as under Alternative 3.

Alternative 3 includes new funding of off-site activities to increase salmonid productivity in areas other than the project reservoirs and facilities. A Plan Species Account would be established and supported with contributions from each of the PUDs. Money would be provided to acquire mitigation sites and to support operation and maintenance of off-site mitigation measures. The habitat protection and restoration activities funded by the Plan Species Account would be carried out by local watershed and conservation groups, realtors and surveyors, land use consultants, and general contractors. Some of these actions would also occur independent of any alternative, but more activities would occur under Alternative 3.

The funding for off-site measures would bring new expenditures into the area, create new jobs, and provide new income. The expenditures would most likely be in the consulting and general construction industry in the three project counties (Chelan, Douglas, and Okanogan).

For the Wells Project, the Douglas County PUD would make an initial contribution to the fund of $1,982,000 in 1998 dollars. The expenditure would generate an expected 8 jobs in the local construction industry and 21 total jobs in the region. After 5 years, the PUD would either make annual payments of $176,178 (1998 dollars) through the term of the HCP or an up-front payment of $1,761,780 (equivalent to 10 annual payments in 1998 dollars). If the 10-year up-front payment option were selected, the HCP parties would determine how the remaining annual payments would be made. This funding would generate one construction job and two total jobs in the region.

For the Rocky Reach Project, Chelan County PUD would fund the Plan Species Account at $229,800 (1998 dollars) annually. This funding would generate two construction jobs and five total jobs in the region.

For the Rock Island Project, the Chelan County PUD would fund the Plan Species Account at $485,200 (1998 dollars) annually. This funding would generate 4 construction jobs and 10 total jobs in the region.

The new expenditures for off-site habitat improvements would have a very small positive

effect on the local economies. Since the combined labor force for the three counties was 63,679 in 1998, even a maximum increase of 38 jobs would not be substantial, but would be greater than under either Alternative 1 or 2.

Alternative 3 would also provide economic benefits by ensuring that the projects could continue to operate in a manner that supports agricultural and recreational activities. This is not as likely under either Alternatives 1 or 2.

Long-term protection and recovery plans for all Plan species, as well as Endangered Species Act-listed species, would be developed under this alternative. This would not occur under either Alternatives 1 or 2. The QAR indicated that juvenile survival rates for listed species would increase from 123 to 149 percent over current levels. Increases in spring-run chinook salmon and steelhead survival would benefit Tribal and local fishing economies. Further increases in fishing and fish returns would be provided should further survival improvements be implemented at the four Federal dam projects on the Lower Columbia River.

In addition to listed species, other Plan species' survival would be improved. This would result in healthier stocks of other fish species that compose the Tribal fishery, such as fall chinook, coho, and sockeye salmon. This would have a beneficial effect on Tribal economies in terms of maintaining the existing levels of fish take for income or subsistence purposes. If fish stocks continue to improve, this alternative could result in additional jobs and income for the Tribes. This benefit would not occur under Alternative 1 and has the potential to occur under Alternative 2, although primarily for listed species.

Effects from independently funded tributary habitat enhancements, improvements in fish passage survival at Lower Columbia River dams, and modification of harvest regulations and lower river hatchery practices would be similar to those proposed under Alternatives 1 and 2. Effects from drawdown of the reservoirs behind the three dams would be similar to those described for Alternative 2.

In summary, Alternative 3 would result in socioeconomic benefits by creating additional jobs and providing new income and expenditures in the local economies through the funding of off-site activities to increase salmonid productivity. This effect would be in addition to those independent WRIA-funded activities that would occur under any of the alternatives.

4.8 ECONOMICS

This section describes the costs of the three alternatives over the next 50 years (see also Section 3.8, Economics, for additional information and definition of key terms). Alternative 1 represents the no-action alternative, or implementation of existing conditions with no changes over the next 50 years. Alternatives 2 and 3 include the costs of implementing the mitigation measures associated with each of these action alternatives. Subtracting costs and foregone power revenues of Alternatives 2 and 3 from Alternative 1 provides the increased cost of implementing the additional fish conservation measures associated with Alternatives 2 and 3.

Each of the alternatives would reduce the amount of available capacity and energy that can be generated at the Wells, Rocky Reach, and Rock Island hydroelectric projects. This is primarily a result of spill. The lost capacity and energy of the three hydroelectric projects (combined) during the months of March through September are as follows:

- Alternative 1: 87 average megawatts of energy and 316 megawatts of capacity per month,
- Alternative 2: 628 average megawatts of energy and 1,064 megawatts of capacity, per month, and

- Alternative 3: 168 average megawatts of energy and 439 megawatts of capacity per month.

This information is illustrated in Figures F-7 through F-15 (Appendix F).

4.8.1 EVALUATION METHODOLOGY

The economic evaluation of each alternative is based on an incremental approach, which means that the economic cost of each alternative was determined by estimating the life cycle costs and the forecasted foregone power revenues (based on replacement cost in the wholesale power market) for each of the alternatives. Costs and benefits for this analysis are based on the costs and benefits associated with fish conservation measures. The analysis does not include or quantify hydroelectric costs or benefits not related to project alternatives.

The evaluation was conducted over the projected 50-year life of the alternatives. It accounts for future projected inflation, real cost (not including inflation), power price, and the time value of money. Three generally accepted approaches for presenting the results are as follows:

- net present value,
- levelized value, and
- first year value.

Refer to Section 3.8, Economics or the Glossary for a definition of these values. To provide a thorough evaluation, all three approaches were used in this economic analysis.

The key economic parameters used for this analysis are summarized below:

- discount/interest rate: 7 percent,
- date of initiation: 2002,
- period of analysis: 50 years,
- general inflation rate: 2.5 percent, and
- real growth rate: 1.0 percent.

Table 4-5 summarizes the key power pricing parameters used in this analysis to develop the replacement costs of lost power from spill.

The electricity price forecast used in the analysis is based on costs of owning and operating natural gas-fired combined-cycle and single-cycle combustion turbines. The power value for the light-load hours (10 p.m. to 6 a.m. Monday through Saturday and all day Sunday) is based on the variable cost of operating a combined-cycle combustion turbine. The peak heavy-load hour power values are based on the full costs (fixed and variable) of a gas-fired combined-cycle turbine. The power value of the super-peak heavy-load hour is based on building and operating a single-cycle combustion turbine. The power pricing parameters that were used to calculate energy replacement costs are provided in Table 4-5.

Figure 4-1 illustrates the electricity price forecast in nominal and real terms over the 50-year life of the alternatives. The future real amounts do not include inflation, whereas the future nominal amounts include the effects of inflation.

4.8.2 ALTERNATIVE 1 (NO-ACTION)

Alternative 1 capital costs vary by project (Figures F-1 to F-3 [Appendix F]). Capital costs for the Wells Project include large nonrepetitive costs associated with some of the more expensive fish studies. For the Rocky Reach Project, Alternative 1 costs are associated with the bypass construction. There are no capital costs associated with the Rock Island Project.

Operation and maintenance costs for the Wells Project include hatchery operations and maintenance, bird hazing associated with the predator control program, administration of the gas abatement program, and other ongoing fish and miscellaneous studies (Figure F-4 [Appendix F]). For the Rocky Reach and Rock Island projects, operation and maintenance costs include those associated with the hatcheries, bypass operations (Rocky Reach Project), and predator

TABLE 4-5. POWER PRICING PARAMETERS USED TO CALCULATE ENERGY REPLACEMENT COSTS (IN 2002 DOLLARS)

MARGINAL PLANT PARAMETERS[1]	NATURAL GAS-FIRED COMBINED-CYCLE FACILITY COSTS	SINGLE-CYCLE COMBUSTION TURBINE
Heat Rate, MMBtu/KWh	6,858	9,816
Capital Cost, $/MW	$633,984	$609,600
Operation and Maintenance – Fixed, $/MW/yr	$10,871	$0[2]
Operation and Maintenance – Variable, $/MWh	$2.84	$3.76
Percent Capacity Factor	65%	4.5%
Plant Life, years	30	30
First Year[3]	**THE FOLLOWING ARE BLENDED COSTS**	
Natural Gas	$2.64/mcf	
Power Price (average annual price)[2]	$35.10/MWh	
Energy Value	$22.19/MWh	
Capacity Value	$125,000/MW-year	

MW = megawatt mcf = thousand cubic feet MWh = megawatt hour

[1] Northwest Power Planning Council's proposed new resource assumptions for the 5th Power Plan, April 2002.

[2] Costs are variable and included under operation and maintenance costs.

[3] The first year annual price is based on building and operating a combined-cycle combustion turbine and a single-cycle combustion turbine for the super peak periods. The power price includes both capacity and energy.

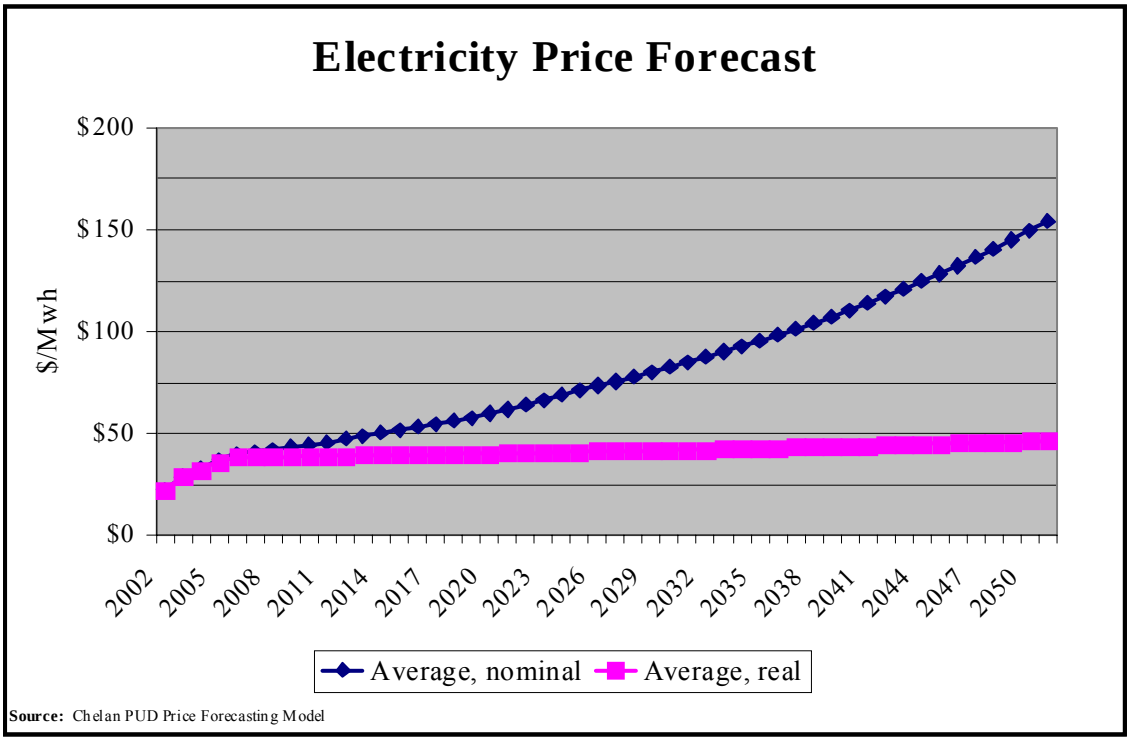


Figure 4-1. Electricity Price Forecast

control programs (Figures F-5 and F-6 [Appendix F]). Total costs (including capital, operations, and maintenance) are provided in Table 4-6, including foregone power revenues using the three economic measures.

Spill under Alternative 1 is considerably less than under the other alternatives, resulting in the least amount of energy loss and a lower need for capacity replacement (Figures F-7 through F-15 [Appendix F]). Monthly energy loss does not correlate directly with the monthly spill because there is more energy loss during peak flow months (May through July) due to the increased river flow. Capacity replacement varies from energy loss based on fuel supply limitations and the ability to replace the lost energy. The analysis assumes that energy and capacity would be replaced by a natural gas-fired combined-cycle combustion turbine with an 85 percent capacity factor and a 7.0 percent reserve requirement (WECC guidelines used by Northwest Power Pool for thermal power plants). For example: replacement capacity = (MW capacity loss/ capacity factor) * (1 + reserve requirement).

4.8.3 ALTERNATIVE 2

Alternative 2 capital costs are greater than Alternative 1 for the Rocky Reach and Rock Island projects and are equivalent for the Wells Project (Figures F-1 through F-3 [Appendix F]). This is due to the Rocky Reach sluiceway capital costs and the gas abatement costs associated with increased spill for the Rock Island Project.

Operation and maintenance costs are also more expensive under Alternative 2 compared to Alternative 1. The additional costs include an increased predator control program for the listed species for all three projects, the sluiceway operations for the Rocky Reach Project, and the additional hatchery costs associated with the Rock Island Project.

Spill is the primary factor affecting energy loss and capacity replacement, and is significantly higher and for more months of the year under Alternative 2 than the other alternatives. Alternative 2 would result in the greatest energy losses and capacity replacement requirements for all three projects. The maximum losses would occur primarily in May and June and the lowest losses would occur in September and March (refer to Figures F-10 through F-15 [Appendix F]).

Over the next 50 years, the cost of implementing Alternative 2 ranges from 300 to over 500 percent greater than implementing Alternative 1, considering net present value as shown in Table 4-6.

Costs of reservoir drawdown were projected using the net present value of foregone power revenues. For a year-round reservoir drawdown, the estimated net present value of foregone power revenues would be $3.9 billion for Wells, $5.0 billion for Rocky Reach, and $2.7 billion for Rock Island over the 50-year analysis period.

For a seasonal reservoir drawdown to the crest of the spillway, costs would be $2.1 billion for Wells, $2.9 billion for Rocky Reach, and $1.6 billion for Rock Island. This latter estimate is based on 100 percent loss of energy and capacity for 6 months (March 15 through September 15) over the 50-year analysis period.

4.8.4 ALTERNATIVE 3

Capital costs associated with Alternative 3 include funding for the initial Plan Species Account and additional fish studies for the Wells Project and additional hatchery costs for the Rocky Reach and Rock Island projects (with hatchery costs greater for Rock Island than Rocky Reach). Alternative 3 capital costs are greater than costs for the other alternatives for the Wells Project due to the initial funding cost of the Plan Species Account. For the Rocky Reach Project, Alternative 3 is less than Alternative 2 due to the higher sluiceway costs associated with Alternative 2. For the Rock Island Project, Alternative 3 costs are less than Alternative 2

because mitigation costs associated with dissolved gas would not be needed.

Operation and maintenance costs are higher for Alternative 3 than for the other alternatives for all three projects. These additional costs include an increased predator control program, additional fish studies associated with the evaluation monitoring, HCP committee costs, Plan Species Account payments, and additional hatchery costs.

Spill is generally higher under Alternative 3 compared to Alternative 1 but substantially lower than under Alternative 2 (Figures F-7 through F-9 [Appendix F]). Spill may vary by year for Rocky Reach dependent on the effectiveness of the bypass (Figure F-8). If the evaluation studies verify that the bypass facility is successful in helping to meet the no net impact standard for juvenile fish, then the amount of spill can be reduced.

The energy loss and capacity replacement needs are generally greater for Alternative 3 compared to Alternative 1, but substantially less than under Alternative 2 for all projects. Implementation of Alternative 3 would result in a 20 to 85 percent increase in project costs over Alternative 1, with the least increase (20 percent) associated with the Wells Project and the greatest increase (85 percent) associated with the Rock Island Project.

Drawdown costs associated with Alternative 3 would be similar to those described under Alternative 2.

TABLE 4-6. SUMMARY OF COSTS (IN MILLIONS) AND FOREGONE POWER REVENUES

	PROJECT COSTS OF IMPLEMENTING FISH CONSERVATION MEASURES[1]								
	WELLS			ROCKY REACH			ROCK ISLAND		
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 3
Net Present Value[2]									
Costs	$79	$82	$90	$237	$358	$261	$103	$101	$95
Foregone Power Revenues	$77	$785	$98	$155	$1,116	$250	$67	$587	$221
TOTAL	$156	$867	$188	$392	$1,474	$511	$170	$688	$316
Levelized Value[3]									
Costs	$6	$6	$7	$17	$26	$19	$7	$7	$7
Foregone Power Revenues	$6	$57	$7	$11	$81	$18	$5	$43	$16
TOTAL	$12	$63	$14	$28	$107	$37	$12	$50	$23
First Year Value[4,5]									
Costs, levelized	3	3	4	11	16	12	4	4	4
Foregone Power Revenues	3	35	4	7	50	15	3	24	9
TOTAL	6	38	8	18	66	27	7	28	13

[1] Not including reservoir drawdown.

[2] Net present value is the discounted value today of the future values using a given discount rate.

[3] Levelized value is the constant stream of values, using a given interest rate, that produces the same net present value as the non-constant stream of values (if future values change over time).

[4] First year values are the costs and foregone power revenues incurred in the first year of the 50-year analysis period.

[5] This approach is consistent with FERC's approach to economic analysis (Mead Corporation, Publishing Paper Division, 72 FERC 61,027 [July 13, 1995]), where the power losses of the alternatives are equated to the current (2002) amount that would be paid for the same amount of power produced by alternative resources. The current year approach compares the alternatives without the effects of inflation or escalation on the costs or foregone power revenues.

4.9 AESTHETICS

4.9.1 ALTERNATIVE 1 (NO-ACTION)

4.9.1.1 Project Area

Under Alternative 1, existing fish mitigation and compensation measures for all three dams would continue. Continued operation, maintenance, and planned facility upgrades for the fishways and associated entrances, fishladders, bypass systems (collection entrances and intake screens), turbines, and hatcheries associated with the three dams would not result in any changes to the aesthetics in the areas of the three dams because these facilities are primarily located within the water column or subordinate to the projects' dominant concrete features.

4.9.1.2 Associated Tributaries

No PUD-funded improvements would occur in the tributaries under Alternative 1. However, over the next 50 years, habitat restoration within the Wenatchee, Entiat, Methow, and Okanogan watersheds would occur from ongoing WRIA projects being funded through various Federal, State, and local funding sources that are aimed at helping restore salmon and steelhead runs in the Mid-Columbia River system. The USFS would also continue to support local projects to improve stream conditions for salmonid habitat on National Forest land. Short-term construction-related effects to the aesthetics of the area could result from these fish habitat enhancement projects within the tributaries (such as culvert modifications and projects that may require temporary roads for site access), but no long-term or permanent detrimental effects to the aesthetics of the area would occur under Alternative 1.

Overall aesthetic effects from these projects would be improvements in the appearance of natural conditions. The hydroelectric project operations would not affect these efforts or the aesthetic conditions along the tributaries.

4.9.2 ALTERNATIVE 2

4.9.2.1 Project Area

Under Alternative 2, the fish mitigation and compensation measures described under this alternative would occur, and an increase in spill would occur at any or all of the three dams as needed to prevent the extinction of listed species. In addition, FERC may order drawdown, which would result in exposure of more shoreline. The effect of the increased shoreline exposure on aesthetics in the area would depend on the amount of increased drawdown and the length of time the drawdown would remain in effect.

Drawdown would expose substantial amounts of barren shoreline, which in general is not appealing to tourists and visitors of the area, as described under Section 4.10, Recreation. However, provided that FERC orders a permanent drawdown of the reservoirs, over time, new vegetation would become reestablished along the exposed shoreline. Therefore, the negative effects on aesthetics would be reduced over time as barren and exposed shorelines are revegetated. This impact would not occur under Alternative 1.

4.9.2.2 Associated Tributaries

Alternative 2 is not expected to affect aesthetics in the tributary areas, and therefore effects to aesthetics would be the same as described under Alternative 1.

4.9.3 ALTERNATIVE 3

4.9.3.1 Project Area

The effects of Alternative 3 to the aesthetic conditions of the project area are similar to Alternatives 1 and 2, which is negligible. The

proposed project improvements to increase fish survival would not noticeably alter visual conditions in the project area. However, drawdown could occur under either Alternatives 2 or 3. Aesthetic effects from drawdown are described under Alternative 2, and predominantly consist of exposed shorelines that lack vegetation. If permanent drawdown occurs, the barren shorelines would become vegetated over time, and it is likely that efforts would be made to plant native vegetation in these areas.

4.9.3.2 Associated Tributaries

The actions associated with Alternative 3 at the project sites (the dams and reservoirs) would have no effect on the aesthetic resources located at the tributaries. Similar to Alternatives 1 and 2, WRIA habitat restoration projects would occur along the four tributaries. Alternative 3 would help to increase funding for habitat restoration beyond that provided by the WRIA-funded or other voluntary efforts to conserve, restore, and enhance salmonid habitat in the tributaries. Consequently, long-term effects to the aesthetics in the areas of the associated tributaries would be improved through the provision of the Plan Species Account funds.

These efforts would include the purchase of water rights and land, with subsequent habitat restoration. The development of conservation easements for the protection of critical riparian areas and spawning and rearing habitat would help to preserve native vegetation and natural conditions along the tributaries. An expected increase in public use and viewing of fish and wildlife would likely occur over the long term. The fencing of livestock supported by the Plan Species Account along riparian areas would further enhance the natural beauty of the tributary streams.

In the short term, some construction-related effects from restoring riparian and stream habitat could negatively impact tributary aesthetics in specific areas. Some construction equipment may require vegetation removal for access to specific shoreline areas. However, over the long term, these effects would decrease as vegetation becomes restored in the construction areas.

4.10 RECREATION

4.10.1 ALTERNATIVE 1 (NO-ACTION)

4.10.1.1 Project Area

Under the current licenses and amendments, including the recreation plan (Wells: FERC 1962a,b, 1982; Rocky Reach: FERC 1953, 1957a,b, 1976; Rock Island: FERC 1975a, 1987a, 1989a), there would be no effect on recreational facilities or opportunities, other than recreational fishing, from construction and implementation of fish passage improvement measures. Implementation of fish passage improvements is designed to have a beneficial effect on the survival rate of anadromous fish, and therefore could result in an improvement to salmonid fisheries. The fish passage improvement measures are not expected to have a significant effect on resident fish. The recreation plans for the projects are updated every 5 years and can be revised to accommodate changing recreational needs.

4.10.1.2 Associated Tributaries

Although no changes are expected to occur to recreational facilities within the project area, recreational access and facilities could be affected by the ongoing WRIA projects and watershed action plans in each of the tributaries over the next 50 years. These projects may decrease some recreational use in the tributaries through purchase of shoreline easements for fish habitat protection and restoration.

4.10.2 ALTERNATIVE 2

Under Alternative 2, protective measures that would be implemented in the near term include modifications to equipment at the dams and an increase in spill. Recreational use in the immediate vicinity of the dams is limited to shoreline activities.

4.10.2.1 Project Area

For planned and known actions that would occur under Alternative 2, there would be few, if any, changes to recreational activities or facilities due to structural improvements or modifications. At all three dams, existing fishways, ladders, and bypass systems would continue in operation and be maintained to increase efficiency. Similar to Alternative 1, none of the actions associated with Alternative 2 would affect recreation, except for potential brief closures of public viewing areas near the structures during project construction.

Over the long term, the most substantial action that could potentially occur would be drawing down any or all of the projects to natural river levels. This action could have substantial effects on recreation. Without modifications, the lower water levels would render boat ramps, docks, and beaches unusable from April through August when peak recreational activity occurs. This would be a substantial loss of recreational facilities, and if not modified, could potentially affect a large number of users.[2] The lower water level would also indirectly affect recreation by reducing the aesthetic qualities of the waterfront areas. The lowered pool would expose an unvegetated area of silt, sand, and rock. The loss of aesthetic quality could result in substantially lower recreational activity, until the shoreline areas were revegetated.

Effects to recreation from drawdown at the Wells reservoir would occur to Pateros Memorial Park, Pateros Peninsula Park, Brewster Columbia Cove Park, Brewster Waterfront Trail, and Bridgeport Marina Park. Instead of waterfront settings, the parks would instead front an expanse of silt, sand, and rock. There are five public parks located near the Rocky Reach reservoir (Lincoln Rock State Park, Orondo State Park, Daroga State Park, Entiat Park, and Beebe Bridge Park) that would be affected by drawdown. In addition to the loss of the boat ramps and beaches, the lower water levels would also have aesthetic effects that would indirectly reduce recreational activity.

Effects from drawing down the Rock Island reservoir would be low to moderate. In the Wenatchee River, the potential change of 2.5 feet would probably not cause substantial aesthetic effects to views from Riverfront Park. Parks affected near the Rock Island reservoir include Riverfront Park, Wenatchee Confluence State Park, and Rock Island Hydro Park. The boat ramps and beaches would not be usable, unless modified. These effects would not occur under Alternative 1.

The loss of recreational opportunity and setting would result in a corresponding loss in recreation expenditures, employment, and tax revenues, at least in the near term. Recreational expenditures are important to Chelan and Okanogan counties, but many of the recreational opportunities are located in mountain and upland settings away from the project area and would not be affected. Of the 80 total boat launches in Okanogan County, only the five launch lanes located in Pateros Memorial Park, Brewster Columbia Cove Park, and Starr Boat Launch would be affected. In Douglas County, relatively more facilities could be affected (for example, 14 of 15 total boat launch lanes). These effects would not occur under Alternative 1.

[2] The total number of visitors to parks in the project area is known. However, data that distinguish between water-dependent uses (such as boating, fishing, and swimming) and non-water-dependent uses (such as picnicking or camping) are not available. Therefore, the number of recreational users that would be affected cannot be calculated.

If drawdown were to occur, there would be an increase in recreational fishing opportunities for coldwater fish (such as trout) that prefer free-flowing river habitat, and a decrease in fishing opportunities for warmwater fish (such as bass and walleye) that prefer reservoir habitat, in comparison to Alternative 1.

4.10.2.2 Associated Tributaries

Effects to recreation sites and fishing opportunities are similar to Alternative 1. Habitat improvements proposed under the WRIA projects and other action plans could temporarily affect some recreational activities along project tributaries. Access for fishing may be restricted over the short term while improvements are constructed, and possibly for a short time thereafter to allow vegetation to become reestablished. These restrictions would be temporary and probably would not last more than one season. The overall effect would not be substantial.

Over the long term, non-PUD funded habitat improvements in the tributaries would probably benefit other game fish, such as trout. This would improve recreational fishing opportunities and indirectly benefit the local economies. These benefits would occur under both Alternative 1 and 2.

4.10.3 ALTERNATIVE 3

4.10.3.1 Project Area

The protective measures planned under Alternative 3 would have no effect on recreational activities or facilities in the project area other than recreational fishing. Similar to Alternative 2, modifications and improvements to improve fish passage would not alter recreational use (except for brief closures of public viewing areas during construction), and are designed to have a beneficial effect on the survival rate of anadromous fish. Therefore, the protective measures planned under Alternative 3 could result in improvements to the spring-run chinook, summer/fall chinook, and sockeye salmon and steelhead fisheries, in addition to improvements that would occur under Alternatives 1 and 2.

Outside of drawdown, pool level fluctuations under Alternative 3 at the three reservoirs would continue to be similar to existing conditions (Alternative 1). Stable and predictable water levels generally benefit recreational users and fishing residents, and would not affect recreational facilities. However, drawdown, a possibility under Alternative 3, would result in recreational impacts as described under Alternative 2. These include loss in use of recreational facilities and opportunities associated with shoreline access.

4.10.3.2 Associated Tributaries

Tributary habitat improvement projects funded through the Plan Species Account would likely result in increased recreational benefits to tourists and residents in the area. An increase in recreational access may occur through the expansion of public lands and fishing opportunities from new conservation easements and the public purchase of private lands. Passive recreational benefits may occur, such as increased opportunities to view native restored riparian habitats. Some of these benefits would also occur through WRIA and other volunteer efforts, but the benefits would be greater through the additional funding provided by the Plan Species Account.

4.11 CULTURAL RESOURCES

In general, cultural resources must be at least 50 years old to be eligible for the nation's inventory of historic places, known as the National Register of Historic Places (National Register). The types

of properties listed in the register include archaeological sites and buildings and structures, as well as traditional cultural properties or places that are associated with a community's historically rooted beliefs, customs, and practices. Cultural resources dating to the last 50 years do not meet the National Register criteria unless they are of exceptional importance. This exception is described in the National Park Service Bulletin No. 22, *Guidelines for Evaluating and Nominating Properties That Have Achieved Significance Within the Last 50 Years* (Sherfy and Luce 1998).

The National Historic Preservation Act and NEPA require the consideration of historic resources prior to implementing projects affecting the environment. Section 106 of the National Historic Preservation Act requires that projects with Federal involvement take into account the effects such actions would have on properties that are listed in or eligible for the National Register. The NEPA indicates that it is the "responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs and resources to the end that the Nation may… preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice."

The following sections address the effects that the alternatives would have on properties eligible for the National Register and provide mitigation measures for potential effects. An adverse effect occurs to cultural resources when the characteristics that make a property eligible for the National Register are diminished or destroyed. An adverse effect also occurs when an undertaking causes irreversible damage or destruction to a historic site or its setting. The area of potential effect, or geographic area within which the proposed project may affect cultural resources, includes the dams themselves and the reservoirs behind Wells, Rocky Reach, and Rock Island dams, and portions of the Wenatchee, Entiat, Methow, and Okanogan drainage basins.

4.11.1 ALTERNATIVE 1 (NO-ACTION)

4.11.1.1 Project Area

Wells Dam

Under the current license (1963) and amendments (1982), there would be no new effects to cultural resources. As outlined in Chapter 3, data recovery occurred in 1982 to mitigate for the inundation of 13 National Register-eligible archaeological sites. Additional archaeological sites adjacent to the reservoir could be exposed due to ongoing natural processes and human use of the reservoir, such as erosion, vandalism, artifact collection, and vehicle use across archaeological sites. Because no historically significant buildings or structures are located within the study area, there would be no ongoing potential effects to buildings and structures. Under the current license, the Douglas County PUD has developed a Memorandum of Agreement with the Colville Tribes and the State Historic Preservation Office to address such effects.

Rocky Reach Dam

Under the current license for Rocky Reach Dam, no new effects to cultural resources are anticipated. The ongoing effects caused by natural processes and human actions noted in the previous discussion for Wells Dam could also affect cultural resources within the Rocky Reach Dam study area. As described in Chapter 3, the current Rocky Reach Dam license issued in 1957 originally included minimal stipulations regarding the management of cultural resources. In 1983, the license was amended to include Article 49, which designates protection measures, including consultation with the State Historic Preservation Officer regarding construction projects that could

affect cultural resources. As part of Chelan County PUD's relicensing of the Rocky Reach Dam, the PUD would develop a cultural resource management plan. This plan would be reviewed and approved by FERC, affected Tribes, and the State Historic Preservation Officer.

Rock Island Dam

No new effects are anticipated under the current license for the Rock Island Dam, issued in 1989. Under this license, the Chelan County PUD created a cultural resource management plan to address the management of cultural resources associated with the project, which was reviewed and approved by FERC, affected Tribes, and the State Historic Preservation Officer. The ongoing effects due to natural processes and human use that are listed in the previous discussion for Wells Dam also apply to Rock Island Dam. Under the current license, such effects would be addressed according to management processes stipulated in the cultural resource management plan.

4.11.1.2 Associated Tributaries

Independent tributary enhancement projects may affect cultural resources along the shorelines of the four tributaries. However, these projects are likely to require environmental review and permitting that would ensure that cultural resources are protected during construction and over the long term. The applicant and lead agency for these projects would be required to conduct this environmental review. Ongoing dam operations would have no effect on cultural resources within the tributaries.

4.11.2 ALTERNATIVE 2

4.11.2.1 Project Area

Wells Dam

The Wells Dam was constructed in the 1960s and does not appear to possess the exceptional significance necessary for properties less than 50 years old to be listed in the National Register. Therefore, the previously described modifications to the dam would not affect a historic structure. In addition to modifications to the dam, Alternative 2 includes the implementation of management procedures, such as developing solutions to improve fish passage and operating the surface bypass system 24 hours per day to encourage migration of spring-run chinook salmon and steelhead. These actions would not involve noticeable fluctuations in water levels or ground disturbances that would affect cultural resources. Similar to Alternative 1, there would be no effect to cultural resources at the project sites from implementation of Alternative 2.

Prior to the inundation of the Wells reservoir in the 1960s, archaeologist G.F. Grabert identified numerous prehistoric sites along the historic shoreline of the Columbia River. Grabert also identified and excavated the archaeological remains of Fort Okanogan, the American Pacific Fur Company fort established in 1811 at the confluence of the Columbia and Okanogan Rivers (Grabert 1968b). A subsequent study of the Wells reservoir area reported on 23 prehistoric archaeological sites, some of which had been previously identified (Chatters 1986).

Unlike conditions under Alternative 1, NMFS has the authority under Alternative 2 to request any protection measures that would assist in the survival of endangered salmon and steelhead species, including the potential drawing down of reservoir waters to alter river flow. The fluctuation in water levels caused by drawing down the reservoir could affect sites along the

shoreline and other sites that are currently inundated by the reservoir. Alternating wet and dry conditions could cause the deterioration of organic material found in these archaeological sites. Wave action and fluctuations in water levels may also cause erosion to archaeological sites, and artifact collectors could be attracted to exposed sites. If NMFS requires reservoir drawdown, actions to protect cultural resources would be included in the operational constraints of the project.

Rocky Reach Dam

Under Alternative 2, the on-site protection measures for adult and juvenile passage in the Rocky Reach Dam area would be similar to those listed for the Wells Dam. The Rocky Reach Dam, constructed in the 1960s, does not appear to possess the exceptional significance necessary for properties less than 50 years old to be listed in the National Register. Therefore, the previously described modifications to various components of the dam would not affect a historic structure.

In addition to modifying components of the Rocky Reach Dam, Alternative 2 involves the introduction of new management measures, such as developing corrective actions for adult fish passage, if necessary, and utilizing a 24-hour per day spill plan to encourage juvenile passage. Such management actions would not create noticeable fluctuations in water levels or ground disturbances that would affect archaeological sites, buildings, structures, or traditional cultural properties eligible for listing in the National Register.

Prior to the inundation of the Rocky Reach reservoir in the 1960s, Washington State University surveyed the flood zone and identified the remains of pithouses, resource procurement camps, and shell middens. A subsequent study of the reservoir conducted by Washington State University in 1983 located similar site types. Neither study identified prehistoric village sites in the area. The later study concluded that the area's apparent absence of village sites could be a result of the local topography, which lacked an easily accessible fishery. Although it is doubtful that undiscovered prehistoric village sites are located in this area, it is possible that additional small camps and resource procurement sites are located within the Rocky Reach Project area. Historic period activities such as exploration, fur trapping, homesteading, and ranching may have occurred in this area, and historic period archaeological sites are also located in this area.

If NMFS requires drawing down the Rocky Reach reservoir for the protection of endangered species, effects could occur to prehistoric and historic archaeological sites. Effects to the Rocky Reach Project area would be similar to those listed for the Wells Project area. However, actions to protect cultural resources would be included in the operational constraints of the project. In conclusion, effects from Alternative 2 are similar to those of Alternative 1, excepting impacts that could occur under drawdown, which would not occur under Alternative 1.

Rock Island Dam

Alternative 2 would improve adult and juvenile fish passage in the Rock Island Dam project area by using measures similar to those listed for Rocky Reach Dam, along with improved fishway efficiency created by maximizing the number of adult migrants that enter the facilities. Juvenile passage through non-turbine routes (e.g., spill), while minimizing the production of total dissolved gas.

Constructed in 1933, the Rock Island Dam was the first hydroelectric dam on the Columbia River. A 1988 National Register evaluation of the structure determined that modifications have rendered the dam ineligible for the National Register. The National Register form indicates that, "the components of the dam installed between 1930 (when actual work began at the site) and 1936 (when the center fishladder was added) have all been altered virtually beyond

recognition, with the exception of the downstream wall and front façade of Powerhouse 1" (Holstine 1988). Because the dam is ineligible for the National Register, changes to dam features, such as ladder modifications, would not affect a historic resource.

In addition to minor modifications to components of the Rock Island Dam, Alternative 2 includes a new management program, such as modeling to correct delay problems and operating the spillway to facilitate the movement of different fish species. These measures would not result in noticeable changes in water levels or ground disturbances that could affect archaeological sites, nor would such actions affect historic buildings and structures or traditional cultural properties.

Prehistoric and historic archaeological sites are commonly found near natural sources of water. As noted in Section 3.11, Cultural Resources, a comprehensive study of the Rock Island Dam reservoir identified prehistoric hunting, fishing, and village sites in the study area (Lothson et al. 1982). Historic period activities such as exploration, fur trapping, homesteading, ranching, and hydroelectric development may have also left historic archaeological sites in the project area. Therefore, additional undiscovered prehistoric and historic sites could be located within the project area.

If the status of endangered species requires NMFS to drawdown the Columbia River, currently inundated sites located within the reservoir could be exposed. In this instance, the Rock Island Dam project area has the potential of experiencing the same effects to archaeological resources as the Wells Dam. However, actions to protect cultural resources would be included in the operational constraints of the project. In conclusion, effects to cultural resources under Alternative 2 are similar to Alternative 1, except for additional impacts that would occur with the drawdown scenario.

4.11.2.2 Associated Tributaries

Alternative 2 is not expected to affect cultural resources in the tributary areas; therefore, effects to cultural resources would be the same as under Alternative 1.

4.11.3 ALTERNATIVE 3

4.11.3.1 Project Area

Wells Dam

Because the Wells Dam does not appear to be historically significant, potential modifications to the dam (such as altering fishladders) would not affect a historic resource. These results are the same as under Alternatives 1 and 2. As noted in Section 3.11, Cultural Resources, the Wells Dam includes numerous archaeological sites (Chatters 1986; Grabert 1968a). This alternative would not include ground disturbance or fluctuation of water levels that could affect archaeological sites. Drawdown effects are as described under Alternative 2.

Rocky Reach Dam

Because the Rocky Reach Dam does not appear to be historically significant, modifications to the dam, such as the addition of a turbine bypass system and turbine runners, would not affect a historic property. These results are the same as under Alternatives 1 and 2. As noted in Section 3.11, Cultural Resources, prehistoric and historic archaeological sites are located within the Rocky Reach Dam project area, primarily in the vicinity of the reservoir. None of the previously described actions associated with Alternative 3 would result in ground disturbance or increased fluctuations of water levels. This alternative would therefore not affect resources eligible for listing in the National Register. Drawdown effects are similar to that described under Alternative 2.

Rock Island Dam

Because alterations to the Rock Island Dam have rendered it ineligible for the National Register, the addition of a turbine bypass system and other such modifications to the dam would not affect a historic resource. These results are the same as under Alternatives 1 and 2. As noted in Section 3.11, Cultural Resources, previous archaeological surveys have identified prehistoric and historic archaeological sites located within the Rock Island Dam project area. Because the operational modifications associated with Alternative 3 would not result in ground disturbance or increased fluctuation of reservoir water levels, effects would not occur to cultural resources eligible for listing in the National Register. Drawdown effects are similar to that described under Alternative 2.

4.11.3.2 Associated Tributaries

Alternative 3 would involve habitat enhancement of the tributaries leading into the Wells, Rocky Reach, and Rock Island reservoirs. These enhancement projects are in addition to those WRIA-funded projects that would occur independent of project alternatives. The tributaries affected by this action include the Wenatchee, Entiat, Methow, and Okanogan Rivers. Specific effects to resources located on or near the different tributaries have been listed below for each watershed. Rather than detailing all habitat restoration measures for each area, this section identifies specific measures that could potentially affect historic resources.

National Register-eligible archaeological sites, historic structures, and traditional cultural properties could experience effects due to proposed tributary enhancements. As described in Section 3.11, Cultural Resources, prehistoric use of the tributary areas could have resulted in the development of domestic archaeological sites, as well as resource processing stations for fish, mammals, birds, and plants. Archeological sites could also include campsites, burials, isolated finds, fire hearths, petroglyphs, and trails. Historic period remains within the tributary areas may be associated with fur trading, mining, logging, settlement, and farming. Historic period properties could consist of archaeological sites and structures such as irrigation canals, culverts, and old logging dams. Cultural resources within the tributary areas could also include plants important for Native American subsistence, spiritual, and medicinal purposes and traditional cultural properties identified by Tribes (Hanes 1995).

Wenatchee Watershed

The habitat restoration measures proposed for the Wenatchee watershed would improve the stream channel and floodplain conditions. Restoration measures may involve restoring floodplain function with the addition of vegetation along the river, altering diversion points to increase instream flows, reestablishing fish passage to wetlands currently cut off by Highway 2, developing riparian habitats in rights-of-way along highways, modifying diversion dams to encourage anadromous fish passage to Upper Icicle Creek, altering specific culverts to enhance the passage of anadromous salmonids, and restoring the mouth of Deep Creek and portions of Icicle Creek. Most of these actions would involve ground disturbance through such activities as planting vegetation along riverbanks or reestablishing access to wetlands by digging channels. Effects could occur to archaeological sites and traditional cultural properties located within the areas where restoration projects would be implemented. Historic structures, such as irrigation canals and culverts, could also undergo effects due to the tributary habitat restoration program in the Wenatchee watershed.

Entiat Watershed

Within the Entiat watershed, proposed restoration measures focus on enhancing the stream channel and floodplain to encourage fish development.

Restoration would include improving fish habitat with the addition of boulders and wood debris to increase the number of pools in the river, revegetation along the lower reach of the Entiat River, and potential changes in the levels of water used by local irrigators. Depositing boulders and wood debris in the river is likely to disturb soils adjacent to the river with the use of heavy equipment along the riverbank. Other restoration measures, such as revegetation, would disturb soils and potentially effect archaeological resources or traditional cultural properties located within the study area. Historic structures, including irrigation canals and culverts, could also undergo effects due to this action. Fluctuating water levels caused by changing water use by irrigators could expose archaeological sites and lead to site erosion and unauthorized artifact collection.

Methow Watershed

The proposed Methow watershed restoration plan includes purchasing conservation easements, water rights, and land in critical spawning and rearing sites located throughout the Methow Valley. In addition, efforts would be pursued to restore riparian vegetation through livestock fencing and revegetation programs, restoring the side channel reaches of the watershed, and restoring riparian habitat on Lower Libby and Gold Creeks and on the Lower Twisp and Chewuch Rivers. These activities would likely be funded through the Plan Species Account. If these activities are funded through the Plan Species Account, effects could include minor ground disturbances, with subsequent effects on archaeological sites, traditional cultural properties, and historic structures.

Okanogan Watershed

In the Okanogan watershed, proposed habitat restoration measures focus on improving stream channel and floodplain conditions along the mainstem of the Okanogan River, restoring anadromous salmonid passage in Salmon and Omak Creeks and into Skaha Lake, revegetating and stabilizing portions of the Okanogan River bank, revegetating denuded portions of the Lower Similkameen River, revegetating the middle Similkameen River if fish passage is restored in this river, revegetating and stabilizing portions of the erosive banks on the Okanogan River between Bonapart and Omak Creeks, and adding rock structures at selected locations in the watershed to enhance spawning habitat. Each of these actions has the potential of creating ground disturbances that would affect archaeological resources, traditional cultural properties, and historic properties.

Alternative 3 includes tributary habitat enhancement activities funded by the PUDs. As noted previously, habitat enhancement could include disturbances to shoreline areas where prehistoric and historic archaeological sites are commonly found. To limit effects to archaeological sites, an archaeological survey would likely be required by the permitting agency. To assist in planning the survey and evaluating archaeological sites and historic properties, the entities responsible for implementing these projects would contact the Washington State Archaeologist and the affected Indian Tribes. A Washington State archaeological inventory form would be prepared for each site identified during the survey and submitted to the Office of Archaeology and Historic Preservation for a formal determination of National Register eligibility. In consultation with the State Archaeologist and the affected Indian Tribes, the implementation entity would assess the effect any project would have on any sites eligible for the National Register.

Mitigation measures would be developed for each National Register-eligible property that would be affected by the proposed tributary enhancement project. Mitigation measures could include excavation of archeological sites or stabilizing sites by covering them with fill. Historic properties would be documented to the standards

of the National Park Service's Historic American Building Survey/Historic American Engineering Record.

The tributary enhancement revegetation and floodplain development could result in exposed archaeological sites. As mentioned previously, increased artifact collection can occur when sites are exposed. To limit collection, a program would be developed to monitor exposed archaeological sites. This would be required to be conducted by the project applicant responsible for the project.

4.12 ENVIRONMENTAL JUSTICE

Executive Order 12898 (59 Federal Register 76299, 1994) directs Federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

None of the alternatives would affect human health of any population located in the vicinity of the projects. The conservation measures included in each of the alternatives would not affect pollutants or prey consumed by fish and, therefore, human health would not be impacted under any alternative.

4.12.1 ALTERNATIVE 1 (NO-ACTION)

Alternative 1 would not affect minority employment regarding hydroelectric operations in the project area. Although minorities are regularly hired by Chelan and Douglas County PUDs, minorities do not constitute a substantial portion of the employment force for ongoing fish studies, hatchery operations, or other project operations or maintenance. No change is expected in minority populations in the project area relative to ongoing hydroelectric operations. However, it is likely that fishing success and/or fishing opportunities may decrease without additional conservation measures aimed at increasing salmon survival in the Columbia River. Decreases in fishing opportunities would affect those minority populations employed in fishing, as well as subsistence harvest. As described in Section 3.7.4, Tribal Economies, agriculture, fishing, and forestry constitute up to 8 percent of Tribal employment.

4.12.2 ALTERNATIVE 2

Similar to Alternative 1, minority employment regarding hydroelectric operations for conservation measures would not be affected under Alternative 2. Increased survival of listed salmonid species (and possibly for unlisted species if increased conservation measures for these species are agreed upon during relicensing), would be expected to increase salmonid populations, which would aid in fishing success and may help to increase overall fishing opportunities in the Columbia River.

If drawdown were to occur under Alternative 2, the loss of irrigation water for agriculture would affect minority employment, with an expected decrease in the number of agricultural jobs available in the three-county area. The minority populations in the three-county area that rely on agricultural employment would likely be displaced and would leave the area in search of employment elsewhere. Thus, the overall minority population may decrease, as well as the number employed and their overall income. The effect from drawdown on minority populations would be evaluated in a separate NEPA analysis because of its substantial and potentially adverse effect on the human environment. Unlike conditions under Alternative 2, these population and employment effects would not occur under Alternative 1.

Hatchery operations also have the potential to impact naturally spawning populations (see Section 2.3.2.4, Interaction Between Hatchery Stocks and Wild Stocks) and consequently,

NMFS could require a reduction in hatchery production as a result of Endangered Species Act consultation for any hatchery species. This reduction would likely affect Tribal harvest and subsistence fishing success and opportunities, as well as fishing opportunities for any minority or low-income persons accustomed to fishing in this area. This impact would be offset to the extent that protective measures would be successful in increasing the number of naturally produced spawners. This impact would not occur under Alternative 1.

4.12.3 ALTERNATIVE 3

Effects under Alternative 3 would be similar to Alternative 2 in that the fish conservation measures associated with Alternative 3 would likely result in increased fishing success and opportunities. Similarly, in the case of drawdown, minorities employed in agriculture would likely have a loss in employment.

Alternative 3 would likely increase fishing opportunities and success for unlisted salmon species compared to Alternatives 1 and 2 because the conservation measures associated with Alternative 3 include both Endangered Species Act-listed and unlisted species.

A reduction in hatchery operations under Alternative 3 could not occur until at least 2013, and would subsequently be reviewed every 10 years to determine effects of hatchery production on wild fish. During these reviews, NMFS could require a reduction in hatchery production. This contrasts with Alternative 2, where the hatchery review and a potential decrease in hatchery production could occur at any time over the next 50 years, and Alternative 1, where hatchery production would not decrease. As under Alternative 2, the impact of reduced hatchery production would be offset to the extent that protective measures would be successful in increasing the number of naturally produced spawners.

4.13 RELATIONSHIP TO LAWS AND POLICIES

This section addresses the State and Federal statutes, implementing regulations, and executive orders that potentially apply to the alternatives considered in this EIS. It also considers the relationship of alternatives with State laws, Tribal treaties and settlements, and U.S. treaties. The environmental effects analysis discussed in this section provides the primary basis for the conclusions on compliance with environmental laws.

4.13.1 NATIONAL ENVIRONMENTAL POLICY ACT

This EIS was prepared pursuant to regulations implementing the NEPA (42 USC 4321), and in compliance with Federal regulations for preparing an EIS (40 CFR 1502). This EIS considers three alternatives, provides required discussions and analysis, and includes results of public meetings, public scoping, coordination, and opportunities for comment. Section 1.5, Regulatory Framework, provides additional information on regulatory requirements and processes.

4.13.2 FEDERAL POWER ACT

The Federal Power Act provides FERC with the exclusive authority to license non-Federal water power projects on navigable waterways and Federal lands. During relicensing for each project, FERC decides (1) whether to issue the license to an applicant, and (2) the conditions that should be placed on the license to protect or enhance existing environmental resources. FERC considers the project's consistency with Federal and State comprehensive plans for improving, developing, or conserving the waterway. FERC weighs competing interests, including both power and non-power uses, to ensure a proper balance.

As part of its licensing responsibilities, FERC complies with the Endangered Species Act and the Clean Water Act.

The fish protection measures developed under the action alternatives would comply with NMFS's responsibilities under Sections 10a, 10j, and 18 of the Federal Power Act, pertaining to anadromous fish protection.

4.13.3 PACIFIC NORTHWEST ELECTRIC POWER PLANNING AND CONSERVATION ACT

Congress passed the Northwest Power Act in 1980 (16 USC 829d), creating the Northwest Power Planning Council. The council's membership and programs are summarized in Section 1.5.2.5, Other Federal, State, and Local Requirements. The council is not a Federal agency and does not have regulatory control of Columbia River resources. Most of the programs under the council are funded by BPA revenues and do not directly involve the PUDs. Still, there are some programs that are related to the proposed action, and NMFS ensures that salmon and steelhead species conservation and recovery programs are consistent during their environmental review of the programs.

- The Council's Multi-Species Framework Project brings State, Federal, and Tribal governments together with stakeholders to review alternative approaches to fish and wildlife policy from a basinwide perspective. The project emphasizes restoring environmental conditions for multiple species through changes in river management and hydropower project operating policies. This EIS considers effects to the ecosystem in Sections 4.2, Fisheries Resources, through 4.5, Wildlife, and the HCP also takes an ecosystem approach that is consistent with the Council's multi-species strategy.

- The Fish Passage Center is part of the Council's Fish and Wildlife Program, and provides the information basis for Federal, State, and Tribal recommendations for fish passage at Federal Columbia and Snake River hydroelectric projects. The alternatives considered in this EIS would involve continued coordination of their flow programs with the Center.

4.13.4 TITLE 77 REVISED CODE OF WASHINGTON

Title 77 addresses regulations and laws of WDFW. Pertinent Title 77 chapters relevant to the action alternatives include 77.15 Fish and Wildlife Enforcement, 77.16 Diversion of Water, 77.85 Salmon Recovery, and 77.95 Salmon Enhancement Program. Implementation of either Section 7 or Section 10 of the Endangered Species Act (Alternative 2 or 3) would meet WDFW's approval for fish protection measures of the five Plan species.

4.13.5 FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act requires consultations with USFWS when any water body is impounded, diverted, controlled, or modified for any purpose by any agency under a Federal permit or license. The purpose of this act is to ensure that potential effects to fish and wildlife are identified and mitigated. Compliance with the Fish and Wildlife Coordination Act occurs through this EIS, through project licensing, and through the Endangered Species Act compliance activities incorporated in Alternatives 2 and 3.

USFWS has been continually advised or consulted with during the HCP and EIS development process. The DEIS comments from USFWS have been responded to during the preparation of the revised HCP and this FEIS (see Appendices B and C).

4.13.6 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Also known as the Magnuson Act, this act establishes a 200-mile fishery conservation zone and regional fishery management councils. The zone was amended to be the Exclusive Economic Zone, and its inner boundary includes the ocean shorelines of the coastal states, where Columbia River salmon and steelhead are found. The potential effects to fisheries in this zone include an overall increase in salmonid populations through an alternative's success in increasing salmonid survival through the three dams. The Magnuson Act was amended to give NMFS the jurisdiction of managing the habitat of commercially harvested fish.

4.13.7 CLEAN WATER ACT

The Clean Water Act of 1977 (33 USC 26) was designed to restore and protect the chemical, physical, and biological integrity of U.S. waters. The USEPA is responsible for enforcing the act, but has delegated enforcement authority to Ecology for waters within the State of Washington. The Colville Tribes have been delegated enforcement authority for water within the Colville Tribes Reservation. Sections 3.3 and 4.3, Water Resources (Quantity and Quality) discuss water quality issues related to the alternatives in this EIS and how the alternatives meet the regulations.

4.13.8 WETLANDS PROTECTION

Executive Order 11990 directs Federal agencies to minimize the destruction, loss, or degradation of wetlands. All waters of the U.S., including wetlands, fall under the Clean Water Act, and the U.S. Army Corps of Engineers is responsible for wetlands protection. Wetlands issues related to the alternatives are discussed in Section 4.4, Vegetation.

4.13.9 ENVIRONMENTAL JUSTICE

Executive Order No. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, requires that Federal agencies avoid unequal distributions of adverse effects to minority and low-income populations. Refer to Sections 3.12 and 4.12, Environmental Justice, for a more detailed description of how minorities and low-income populations were considered in this EIS.

4.13.10 STATE, AREA-WIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

Executive Order No. 12372 instructs agencies to consider the consistency of a proposed action with approved State and local plans and laws. This EIS analysis discusses land use plans in Section 4.6, Land Ownership and Use; fisheries plans in Section 4.2, Fisheries Resources; recreation in Section 4.10, Recreation; and cultural resources in Section 4.11, Cultural Resources. However, given the size of the project area and the limited direct effects that were identified as a result of the proposed action, a detailed review of other land owners' plans, water rights agreements, and watershed plans was not determined to be applicable. To achieve the same goals, this EIS was prepared with input from cooperating and responsible agencies, and the EIS will be circulated with appropriate State and local entities to satisfy review and consultation requirements.

4.13.11 FLOODPLAIN MANAGEMENT

Executive Order 11988 requires Federal agencies to evaluate actions they might take in a floodplain and ensure that the actions consider flood hazards, floodplain management, and alternatives to avoid or minimize potential harm. Section 4.3, Water Resources (Quantity and Quality), of the EIS includes discussions of water quantity effects of the alternatives. However, the hydroelectric projects are run-of-the-river facilities not

designed for storage or flood control purposes, and the tributary actions would not involve plans to change the overall floodplain in the project area, except in the unlikely event of drawdown under Alternative 2. If drawdown is considered, a separate NEPA analysis would be conducted.

Tributary enhancement could involve changes in shoreline areas that would affect floodplains under all alternatives. Effects from flooding to land use are discussed in Section 4.6, Land Ownership and Use.

4.13.12 HERITAGE RESOURCE PROTECTION

A number of Federal laws protect the nation's historical, cultural, and prehistoric resources as described below.

4.13.12.1 National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires that Federal agencies evaluate the effects of Federal actions on historical, archeological, and cultural resources and afford the Advisory Council on Historic Preservation an opportunity to comment on the proposed action. Compliance with the National Historic Preservation Act for all of the alternatives is discussed in Section 4.11, Cultural Resources.

4.13.12.2 Archeological Resources Protection Act and Native American Graves Protection and Repatriation Act

Section 4.11, Cultural Resources, of this FEIS discusses the potential for effects to resources protected by these acts, which protect the treatment of known and unknown archeological sites, Native American human remains, and cultural items. In the mainstem area of the project, all of the alternatives have the same potential for continued erosion, potential exposure, and damage of cultural sites in the reservoir areas. Although the upstream tributary projects involve no known cultural or archeological resource sites, appropriate construction, monitoring, and surveillance programs would be necessary to prevent or minimize effects to resources as individual tributary projects are developed.

4.13.13 WATER RIGHTS

The western states obtained ownership of streams and control of the water within each State upon admission to the union. State laws regulate the acquisition and use of water and limit its use to beneficial purposes as defined by the State. Washington State law governs individual water rights, which are granted in terms of the type of water use, the period of use, the source of water, the location of the point of diversion and place of use, and the rate and total volume of water that may be diverted. Ecology is responsible for the State's water permitting program, and the mainstem Columbia River and each of the tributaries have highly complex water rights obligations. Although Alternative 3 proposes tributary enhancement programs in areas where existing water withdrawals have historically affected habitat, the HCPs would not involve major effects to existing water rights agreements. None of the alternatives would affect water rights on the mainstem Columbia River.

4.13.14 RECREATION RESOURCES

A number of acts require that Federal agencies consider and minimize the recreational and scenic effects of actions involving water resource projects. The primary acts affecting the Columbia basin are described below.

4.13.14.1 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act of 1968 designates qualifying free-flowing river segments as wild, scenic, or recreational. This act does not currently apply to rivers in the EIS study area.

However, designation for the Hanford Reach, a 50-mile free-flowing segment of the Columbia River below Priest Rapids Dam, has been considered repeatedly over the past several years, both in the U.S. Congress and in the Washington State Legislature. The Hanford Reach was declared a National Monument in 2000. Still, none of the alternatives would affect a potential designation because they would not have a significant adverse effect on water resources or fisheries in the reach. In addition, the plan area itself would not qualify for designation because of the existing reservoir impoundments.

4.13.14.2 Wilderness Act

The Wilderness Act of 1964 (16 USCA 1131) established the National Wilderness Preservation System. Areas designed under the act and subsequent legislation are to be administrated for the use and enjoyment of the public, leaving them unimpaired as wilderness. Development activities are generally prohibited, and Federal agencies must consider whether their actions would affect wilderness values. Although there are wilderness areas in the basin, none are located in the project area.

4.13.14.3 Water Resources Development Act

Congress authorizes and amends the Water Resources Development Act biennially. This act generally requires public and interagency participation in changes to reservoir operation criteria. The FERC licensing process (and the existing license conditions for the projects) ensures compliance with the act, and none of the alternatives considered in this EIS would involve substantial changes to reservoir operations, excepting the possibility of drawdown as described under Alternative 2. If drawdown is considered, it would be evaluated under a separate NEPA analysis in the future.

4.13.15 FEDERAL WATER PROJECT RECREATION ACT

This act (16 USCA 4612) requires full consideration of water resources projects for outdoor recreation and fish and wildlife enhancement. The FERC licensing process and the existing license requirements generally satisfy the requirements of the act. This EIS examines the additional fisheries requirements that may be needed for compliance with the Endangered Species Act.

4.13.16 POLLUTION CONTROL

Federal agencies are required to carry out other Federal environmental laws governing effects to people and the environment. However, the alternatives discussed in this EIS do not involve specific actions regarding pollution control laws, and instead consider broader decisions for Endangered Species Act compliance and resource protection. To the extent that subsequent projects (including tributary enhancement projects) would be implemented, appropriate documentation would be developed, and any applicable pollution control permits would be obtained.

4.13.17 LEGISLATION PERTINENT TO TRIBAL GOVERNMENTS

The United States Government's trust responsibility for Indian resources requires Federal agencies to take measures to protect and maintain treaty and trust resources. The responsibilities include legal interests and rights, including lands and resource use, such as Tribal rights to fisheries of Columbia Basin salmon and steelhead species. Hatchery fish also represent Indian treaty trust assets.

4.13.17.1 Secretarial Order 3206

This order, titled American Indian Tribes and the Endangered Species Act, was developed jointly by the Secretaries of Commerce and the Interior

for NMFS and USFWS, and provides guidelines for coordinating Endangered Species Act compliance and Tribal trust responsibilities. The five principles of the 1997 Secretarial Order 3206 (American Indian Tribes and the Endangered Species Act) have been followed during HCP and EIS development for the three dams. These principles are: (1) working directly with the Indian Tribes on a government-to-government basis to promote healthy ecosystems, (2) recognizing that Indian lands are not subject to the same controls as Federal public lands, (3) assisting Tribes in developing and expanding Tribal programs so that healthy ecosystems are promoted and conservation restrictions are unnecessary, (4) being sensitive to Indian culture, and (5) making available to Tribes information related to Tribal trust resources and Indian lands and facilitating the mutual exchange of information and striving to protect sensitive Tribal information from disclosure.

The Colville, Umatilla, and Yakama Tribes hold rights to the affected fisheries. They have participated in the development of the HCP agreements, and they will be involved in implementation of the HCPs as members of the Coordinating Committee if they sign and become parties to the HCPs. For any Tribe that does not sign the HCPs, NMFS intends to coordinate directly with that Tribe regarding implementation of any HCP permit. NMFS has also provided additional opportunities for comments and coordination through the development of the original and revised HCPs and this EIS. Continued coordination and cooperation between the Tribes, NMFS, and the PUDs is planned under implementation of Alternatives 2 and 3.

The HCP agreements will supercede the 1989 Rock Island and 1990 Wells settlement agreements. The HCPs represent an increase in environmental protection over the pre-existing settlements. However, under the Wells and Rock Island settlement agreements, the Colville, Yakama, and Umatilla Tribes had the right to participate on the Mid-Columbia Coordinating Committee. Without the HCP agreement (Alternatives 1 and 2), this right would have continued for each of those Tribes through the remaining term of the Wells and Rock Island licenses and any annual licenses issued prior to relicensing. Because the Umatilla and Yakama Tribes did not sign the HCPs, under Alternative 3, those tribes will not have the right to attend or vote at the Mid-Columbia committee meetings. The HCP agreements include provisions to allow any committees established under the agreement to allow the participation of any other governmental entity (including Tribes). Thus, the parties to the HCPs may elect to have the non-signatory Tribes participate on the committees.

Tribal trust resources include both wild and hatchery fish, which would be affected differently by dam and by action alternative. Hatchery fish produced in the Mid-Columbia are subject to the treaty rights of the Yakama and Umatilla Tribes (U.S. vs. Washington, 759 F.2d 1353 [9th Cir. 1985]). Under Alternative 1, there would be no change in the amount of hatchery fish produced over time, although sockeye salmon production has been replaced with an option for the management of instream flows in the Okanogan River in Canada for the Wells Project, because the current hatchery production has not led to a substantial increase in adult runs.

Under Alternative 2, hatchery production would include the following:

- Wells Project - The same amount of chinook salmon and steelhead would be produced as described under Alternative 1, although production could be reduced because of the potential negative effects of hatchery fish on naturally spawning populations of Endangered Species Act-listed fish. In addition, Douglas County PUD would fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with the Endangered Species Act recovery goals for listed spring-run chinook salmon and

steelhead populations. However, because of the potential effects of hatchery fish on natural populations, and considering that project-related mortality is 3.8 percent rather than the assumed 14 percent, hatchery production would be reduced under Alternative 2, particularly for the listed species.

- Rocky Reach and Rock Island projects - The same amount of chinook salmon and steelhead would initially be produced as described under existing conditions, although production could be reduced at any time because of the potential effects of hatchery fish on natural populations. Hatchery production of unlisted species would not be changed unless the production levels are determined to affect the listed species. In addition, changes in hatchery procedures and evaluations would be funded to ensure that the hatchery compensation program is consistent with recovery of spring-run chinook salmon and steelhead populations.

For Alternative 3, monitoring of both on-site and hatchery mitigation measures would be conducted, and mitigation measures would be modified as necessary to achieve or maintain the no net impact standard. Under Alternative 3, significant issues that concern the Tribes include whether NMFS can and should guarantee the HCPs' goal of no net impact. The goal includes a 7 percent hatchery production level to compensate for unavoidable project mortality. However, if NMFS determines at a future date that this level of hatchery production hinders propagation and survival of wild fish, it may be necessary to reduce the number of hatchery fish produced.

The HCPs allow NMFS to alter productions levels below 7 percent based on Endangered Species Act concerns at 2013 and every 10 years thereafter. Such a change in hatchery production would not negate the PUDs' obligation to meet a no net impact standard in 2013. The HCP agreements include certain procedural safeguards to ensure that a decision to reduce hatchery production would be made only after thorough documentation and consideration of the need to do so. In addition, the HCPs ensure that any reduction in hatchery production will be accompanied by a commensurate increase in survival or other mitigation by requiring achievement of no net impact.

A comprehensive evaluation of the hatchery mitigation program would be conducted to assess the effectiveness for achieving the no net impact standard in 2013 and every 10 years thereafter. Based on the results of these evaluations, adjustments could be made to the program. However, hatchery compensation for unavoidable project mortality would not exceed 7 percent without agreement of the parties that signed the HCPs. Refer to Table 4-4 for the hatchery production estimate by project.

Tribal letters and comments on the DEIS are provided in Appendix B. Responses to Tribal letters on the DEIS and a description of NMFS's revisions to the HCPs in response to Tribal concerns are provided in Appendix C.

4.13.17.2 Federal Trust Responsibility

The Federal trust responsibility between Indian Tribes and the Federal Government is not defined, in part, because of reluctance by Tribes and Congress to place limits on "trust." Chief Justice Marshall characterized American Indian Tribes as "domestic dependent nations" involving (1) the government or nation-state status of Tribes, and (2) a special Tribal relationship with the United States (Cohen 1982). Marshall described the trust relationship as one that "resembles that of a ward to his guardian." This relationship has been consistently recognized by Federal courts ever since and has been described as "special," "unique," "moral," and "solemn." In addition, the rights reserved by the Tribes in treaties and agreements, which were not expressly terminated by Congress, continue to this day.

These Tribal rights and authorities extend to natural resources, which are reserved by treaties, executive orders, and Federal statutes. The Federal courts have developed the Canons of Construction, guiding premises, that treaties and other Federal actions "should when possible be read as protecting Indian rights in a manner favorable to Indians" (Cohen 1982).

The courts' interpretations of Tribal rights and treaty language continues to evolve and define Federal legal responsibilities. The primary focus of the Federal government trust responsibility is the protection of Indian-owned assets, natural resources on reservations, and the treaty rights and interests that Tribes reserved on off-reservation lands. In carrying out its responsibilities, NMFS must assess proposed actions to determine potential effects on treaty rights, treaty resources, or other Tribal interests. Where potential effects exist, the agency must consult with affected Tribes and explicitly address those effects in planning documents and final decisions. Consultation with the Tribes is an essential step in carrying out that responsibility.

When used in the context of government-to-government relationships, the term consultation means an active, affirmative process that (a) identifies issues and seeks input from appropriate American Indian governments; and (b) considers their interests as a necessary and integral part of the NMFS decision-making process. The Federal government has a legal obligation to consult with American Indian Tribes. This legal obligation is based in laws, executive orders, and statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision.

Formal consultation between NMFS and the Tribes on a government-to-government basis would occur prior to issuance of a ROD or a final biological opinion on the HCPs. The Services can withdraw from the HCP agreement and revoke the permit even if the no net impact standard has been met, if the Plan species are not rebuilding and the projects are a significant factor in the failure to rebuild. The HCPs now specify that no net impact standards must be achieved by 2013. This allows adequate time to assess the project operation tools used to improve fish survival conditions and to evaluate these improvements over several fish population life cycles. These time periods include the 5 years (Phase I period beginning in 1999) for the PUDs to reach the performance standards, 3 years of evaluation of the juvenile survival metrics (juvenile project survival or juvenile dam passage survival), and about two adult return cycles.

The HCPs include a provision with respect to Indian Tribal treaty or reserved rights claims. The HCPs note that "nothing in this Agreement is intended to nor shall it in any way abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in any treaty, executive order, statute or court decree." In addition, the HCPs have been revised to state that "this Agreement will not be utilized against another Party in any manner whatsoever in any legal proceeding other than a legal proceeding to enforce or interpret this agreement."

With respect to Tribal authorities in any other forum (e.g., U.S. vs. Oregon), there would be no difference between Alternatives 2 and 3.

4.13.18 TREATY OBLIGATIONS

4.13.18.1 Columbia River Treaty of 1961

This power planning treaty between the United States and Canada established four large reservoir dams in the Upper Columbia reaches, and defined the cooperative use of the dams for water supply, flood control, and power generation. Through the related agreement described below, the PUDs are responsible for providing a portion of the power benefits guaranteed to Canada by the treaty, and this treaty will not expire until 2024. No alternative will affect this treaty.

4.13.18.2 Pacific Salmon Treaty

In 1999, the United States and Canada signed an agreement for the long-term conservation and equitable sharing of their salmon resources. Most of the new fishery arrangements will be in effect for 10 years, beginning in 1999. The new agreement (1) established abundance-based fishing regimes for Pacific salmon fisheries under the jurisdiction of the Pacific Salmon Treaty; (2) created two bilaterally managed regional funds to promote cooperation, improve fishery management, and aid stock and habitat enhancement efforts; and (3) included provisions to enhance bilateral cooperation, improve the scientific basis for salmon management, and apply institutional changes to the Pacific Salmon Commission. The agreement's implementation will affect the quantity of fish available for commercial, recreational, and subsistence fisheries, as well as Indian treaty allocations. The goal of the Pacific Salmon Treaty is coordinated management of Pacific salmon throughout their range to ensure sustainable fisheries and maximize long-term benefits to the treaty parties. The 1999 agreement was reached within the framework of the Pacific Salmon Treaty Act of 1985 (Public Law 99-5, 99 Stat. 7: 16 U.S.C. 3631-3634) (Waldeck and Buck 1999).

The agreement established abundance-based fishing regimes for the Pacific salmon fisheries under the jurisdiction of the Pacific Salmon Treaty. These regimes, which allow fishery harvest to vary from year to year, are designed to implement the conservation and harvest-sharing principles of the Pacific Salmon Treaty. That is, larger catches will be allowed when salmon abundance is higher, and catches will be significantly constrained in years when stock abundance is down. It is believed that this type of regime will be more responsive to the conservation requirements of salmon than the fixed-catch ceilings that existed under the original Pacific Salmon Treaty arrangements (Waldeck and Buck 1999).

The cornerstone of the new fishing accord is abundance-based management. Under this management approach, harvest rates for each salmon stock are set relative to stock abundance. The objectives of abundance-based management are to (1) sustain wild stocks; (2) prevent overfishing; (3) set a predictable framework for sharing the burdens of conservation and benefits of stock recovery; (4) provide cost-effective, responsible fishery management; and (5) establish a common basis for stock assessment, fishery monitoring, and performance evaluation (Waldeck and Buck 1999).

Without Endangered Species Act protection, Alternative 1 would likely result in a decrease in wild stock available for harvest under the Pacific Salmon Treaty, thereby reducing the number of fish available for Indian harvest. With protection for listed salmon species and some additional protection for unlisted species, Alternative 2 should help improve salmonid stock available for harvest. Alternative 3 would result in greater short-term benefits for the Plan species as the PUDs reach their goals of no net impact. Over time, and once a biological opinion has been completed for all dams under Alternative 2, the benefits provided under either Alternative 2 or 3 should help increase salmonid populations available for harvest under the Pacific Salmon Treaty.

4.13.18.3 Wy-Kan-Ush-Mi Wa-Kish-Wit (Spirit of the Salmon)

The Spirit of the Salmon is an anadromous fish restoration plan for the Columbia River developed by the Columbia River Inter-Tribal Fish Commission, which represents the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes (CRITFC 1996). The plan's 25-year objectives are to rebuild salmon populations that will support Tribal ceremonial, subsistence, and commercial harvests and to rebuild lamprey and sturgeon populations to naturally sustainable levels. The plan includes hypotheses and

recommended actions, including subbasin-by-subbasin return goals and water restoration actions that could achieve the plan goals. Technical recommendations are to increase survival at each stage of the species' life cycle. Included in the plan are recommendations for hydroelectric operations, habitat protection and rehabilitation, fish production and hatchery reforms, and recommendations for in-river and ocean harvests. The Tribes are currently seeking to obtain support for the plan by local, State, Federal, and other Tribal governments. The action alternatives should help improve fish survival under the plan, and Alternative 3 will help support the Tribes' goal of habitat protection and rehabilitation. Alternative 1 will not support this plan because no increased salmonid survival would occur.

4.14 UNAVOIDABLE ADVERSE EFFECTS

Any of the alternatives considered in this FEIS could result in adverse environmental effects, including those that cannot be avoided or completely mitigated. For each resource area that may be affected, Chapter 4 describes the anticipated effects and describes measures that can be taken to avoid or mitigate the effects and to lessen the significance of the effects.

Again, it is important to distinguish the ongoing and historic adverse effects of the hydroelectric projects from the probable effects of the alternatives. All of the alternatives involve approaches to minimize harm to fish species, to compensate for fish losses, and to enhance the potential for species survival.

All alternatives would result in mortality to Federally protected salmon and steelhead. Alternative 3 proposes mitigation and enhancements to result in no net impact, the equivalent of 100 percent survival for all Plan species.

In large part, specific details about individual actions that would occur under Alternatives 2 and 3 are still to be determined, based on additional technical studies. However, Alternatives 2 and 3 involve a long-term monitoring program designed to document the level of effects and to allow the PUDs to respond with necessary actions to minimize or mitigate for potential effects.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

None of the alternatives involve an irreversible commitment to use, modify, or affect non-renewable resources such as cultural resources or minerals. However, the alternatives do involve protected salmon and steelhead species, which historically have been considered a renewable resource but are now in threat of extinction. As salmon and steelhead recovery may occur over a long but still unknown period of time, the 50-year term of Alternative 3 does involve a commitment of resources to protect salmon and steelhead. Incidental take of the protected species would be allowed as long as the HCPs are implemented as agreed.

Under Alternative 2, an irretrievable commitment could occur if the species continue to deteriorate to the point that renewal can only occur over a longer period of time and at great expense. However, the analyses conducted for this EIS did not reveal that Alternatives 2 and 3, designed to protect endangered or threatened fish, involved substantial differences in their effect on the protected species. Alternative 1 can only protect endangered and threatened fish through ongoing license agreements. None of the other activities related to the HCPs or the proposed action is considered likely to result in an irreversible and irretrievable commitment of resources.

4.16 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This discussion considers some of the differences between short-term needs and uses of the environment and resources and maintaining and enhancing long-term productivity. In most resource areas, the two action alternatives would not have substantially different results. Alternative 1 would result in the highest likelihood of extinction for listed species, and therefore, it is not a viable long-term alternative. Based on existing information, Alternatives 2 and 3 appear to have a similar potential to increase listed salmon and steelhead populations, support increased productivity, and potentially contribute to the long-term recovery of the protected species, although Alternative 3 would likely be implemented more rapidly than Alternative 2 (see Section 2.6.5, Implementation Schedule). Although similar improvements and enhancements to the projects are proposed for the action alternatives, only the HCPs (Alternative 3) include a program for enhancing tributaries and substantially increasing the survival and productivity of unlisted anadromous fish.

The primary consideration would be between the competing short-term and long-term needs for ensuring salmon and steelhead survival and recovery and providing power. The PUD proposed action, Alternative 3, is for a 50-year permit to operate the projects under the HCPs, allowing the PUDs to take a long-term approach for complying with the Endangered Species Act and to plan and market their power production programs. This would improve the PUDs' abilities to obtain long-term financing, develop long-term power sales agreements, and maintain the low utility rates they now provide to their customers. At the same time, the HCPs define the level of mitigation and compensation that would be required over the 50-year period in terms of funding the HCPs and modifying operations at the plant.

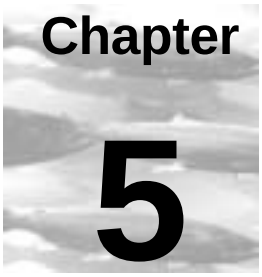
While individual actions can be modified as needed, the level of funding for hatchery and tributary compensations and the performance goals cannot be changed as long as the HCPs are being implemented as agreed. While this provides a substantial amount of planning and financial certainty for the PUDs and their customers, there is some risk of uncertainty on the long-term effects to the species, given the limits of existing information. Alternatives 2 and 3 incorporate an adaptive management approach designed to reduce this risk of uncertainty by allowing the PUDs, the resource agencies, and others to adjust their programs based on new information. There are also options for resource agencies to withdraw from the HCP if this program is not meeting the needs of the listed species.

Alternative 2, however, could require modifications to the project features as necessary to aid in the recovery of listed species at any time as long as the species remain Federally protected. Additional protection for unlisted species could occur at project relicensing periods. Alternative 2 does not provide a maximum amount of funding or operational changes that could ultimately be required. At any time, new information about protected species in the Mid-Columbia River Basin could reopen discussions about the effects of the projects and the actions that may be required. This would provide the maximum amount of flexibility for managing overall recovery of listed Upper Columbia River species (although delays in implementation of new protective measures would be likely as a result of FERC's administrative processes and litigation), but it provides a substantially lower level of planning and operating certainty for the PUDs. While it is impossible to predict the full range of actions that could be required in the future, they most likely would involve increased funding from the PUDs for species recovery and changes in

hydropower operations, some of which could substantially reduce power production capabilities.

Alternative 1 mitigates for some of the effects caused by project operations through existing license stipulations, amendments, and settlement agreements. Alternative 2 provides additional protection for species once they are listed as threatened or endangered, and for unlisted salmonid species during license reopener and relicensing occurrences, although the extent of protection is unknown and the timeline for implementation is uncertain for unlisted species. Alternative 3 is designed to provide no net impact survival conditions for both Endangered Species Act-listed and unlisted anadromous salmonids in the middle reach of the Columbia River. The HCPs would reduce the likelihood of extinction and enhance recovery opportunities for listed fish. The HCPs would help to rebuild and protect unlisted anadromous salmonid populations with the goal of preventing their future listing under the Endangered Species Act.

Alternative 3 would also provide long-term habitat improvements to the tributaries over the next 50 years through annual funding to the Plan Species Account. The funds would be used by the Tributary Committee to restore and enhance salmonid breeding habitat.



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CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 5

- Chapter 5 is a cumulative effects analysis that was previously placed in Chapter 4 by resource section under the subsection titled Columbia River System. Due to the public request to expand and relocate the cumulative effects analysis to a separate chapter for ease in locating the analysis, these sections are now consolidated under Chapter 5.

- Included in Chapter 5 is a cumulative effects analysis by Evolutionarily Significant Unit.

- Cumulative effects sections were added for those resources not previously included in the DEIS, including Aesthetics and Environmental Justice.

5 CUMULATIVE EFFECTS

5.1 INTRODUCTION

Cumulative effects, also called cumulative impacts, are those environmental consequences that result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions, regardless of which agency, person, or other entity undertakes them (see CFR 1508.7). For this EIS, potential cumulative effects include activities described within the Columbia River system that may affect the natural resources within the project area, especially Plan species.

The identification and analysis of cumulative effects provides regional decision-makers and the public the context within which the effects are occurring and the environmental implications of the interactions of known and expected management activities. The Columbia River system is an ecologically complicated and intensively managed system that requires sophisticated analyses of potential cumulative effects from proposed project activities. However, during subsequent analyses of site-specific activities, local cumulative effects would be assessed in greater detail on a project basis.

The alternatives analyzed in this EIS would establish management direction that allows for the use of mitigation measures (referred to as tools in the HCP) for increasing salmonid survival within the Wells, Rocky Reach, and Rock Island Dam project areas. A consistent management direction within the project area would provide a coordinated aquatic management structure for addressing the biological needs of anadromous salmonid species in the Mid-Columbia River region.

This cumulative effects section describes the incremental and interactive effects that the three Mid-Columbia PUD dams may have on other recovery activities within the Columbia River ecosystem. The cumulative effects analysis in this chapter analyzes how those activities that are planned or expected to occur in the river system would affect or be affected by the activities resulting from the implementation of the action alternatives. The cumulative effects analysis is on a resource-by-resource basis, with special emphasis on aquatic systems.

Federal, State, Tribal, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives that may include changes in land and water use patterns. These potential changes could affect anadromous fish species or their habitat. In addition, the geographic scope of the affected area, which encompasses numerous government and private entities exercising various authorities or rights, make any analysis of cumulative effects difficult and even speculative. This section identifies management actions that, based on currently available information, are reasonably certain to occur. It also identifies goals, objectives, and proposed plans by State and Tribal governments.

Actions of Federal, State, Tribal, and local entities, as well as private landowners, are expected to continue affecting listed and unlisted species in the Columbia River basin. The cumulative effects are difficult to accurately analyze considering the broad geographic landscape, the socioeconomic and political variation in the area, and the uncertainties associated with government and private actions.

5.2 EVOLUTIONARILY SIGNIFICANT UNITS

Two Evolutionarily Significant Units, listed as endangered under the Endangered Species Act, occur in the Mid-Columbia River region. Although these populations are affected by the operations of the Mid-Columbia River PUD dams, they are also affected by activities in the tributary areas, as well as activities in the Lower Columbia River. Many of these independent activities would be similar for all the alternatives.

5.2.1 UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON

The Upper Columbia River Evolutionarily Significant Unit of spring-run chinook salmon was listed as endangered under the Endangered Species Act in March 1999 (NMFS 1999a). Spring-run chinook salmon are found in all of the major watersheds in the Mid-Columbia River except the Okanogan River drainage. Three independent populations of spring-run chinook salmon are identified for the Evolutionarily Significant Unit, including those that spawn in the Wenatchee, Entiat, and Methow Basins (Ford et al. 1999).

The extinction risks for these populations are 50 percent for the Methow, 98 percent for the Wenatchee, and 99 percent for the Entiat River populations. These extinction risks represent existing conditions under Alternative 1, and are based on the assumption that the median adult returns from the 1980 through 1994 brood years will continue into the future.

5.2.2 UPPER COLUMBIA RIVER STEELHEAD

The Upper Columbia River Evolutionarily Significant Unit of steelhead was listed as endangered under the Endangered Species Act in August 1997 (NMFS 1997). NMFS considers all steelhead returning to tributary streams upstream of the confluence of the Yakima River as belonging to the same Evolutionarily Significant Unit (61 Federal Register, 960730210-6210-01). This Evolutionarily Significant Unit includes steelhead spawning in the Wenatchee, Entiat, Methow, and Okanogan watersheds, and smaller tributaries to the Mid-Columbia River. However, due to limited data, these populations are evaluated as two aggregate spawning groups – Wenatchee/Entiat composite and the Methow composite.

Only anadromous forms of steelhead are listed due to uncertainties regarding the status of resident forms (rainbow trout), and interactions between the two life-history forms. The steelhead produced at the Wells Fish Hatchery are included in the Evolutionarily Significant Unit because NMFS considers them essential to the recovery of natural populations.

The extinction risks for these populations vary as a result of assumptions relative to the effectiveness of hatchery fish to spawn naturally. At the low end, assuming that hatchery fish reproduce about 25 percent as effectively as wild fish, the risk of extinction is about 28 percent for the Methow composite and 35 percent for the Wenatchee/Entiat composite. However, assuming that hatchery fish reproduce as effectively as wild-origin fish, the extinction risk increases to 100 percent for both groups.

5.3 FEDERAL PROGRAMS DEVELOPED FOR SALMONID RECOVERY

A number of Federal programs have been initiated in recent years to increase the overall abundance of salmon and steelhead in the Columbia River Basin. These programs were developed to address concerns for all the anadromous salmonid species, though particular emphasis is placed on the Endangered Species Act-listed stocks.

The following reports collectively outline the current Federal initiatives for salmon recovery in the basin for the years 2001 through 2010.

- *2000 Columbia River Basin Fish and Wildlife Program* – Northwest Power Planning Council (2000)
- *Final 2000 Federal Columbia River Power System Biological Opinion* – NMFS (2000a)
- *Cumulative Risk Initiative* – NMFS (2001b)
- *Conservation of Columbia Basin Fish: Final Basinwide Recovery Strategy* or All-H Paper – Federal Caucus (2000)
- *Interior Columbia Basin Final Environmental Impact Statement and Proposed Decision* – USFS and BLM (2000)
- *Biological Opinion on Federal Columbia River Power System Operations Affecting Bull Trout and Kootenai River White Sturgeon* – USFWS (2000)

These documents address proposed recovery processes for listed species, as well as overall improvements in the environmental conditions throughout the basin for the benefit of all aquatic species. The reports focus on four general areas of concern in the recovery process: mainstem habitat and passage, tributary habitat, harvest, and hatcheries.

5.3.1 MAINSTEM HABITAT AND PASSAGE

The documents described above represent a substantial effort to address mainstem habitat and passage problems. The 2000 Columbia River Basin Fish and Wildlife Program outlines the principles, goals, and general strategies for recovery. The Basin-wide Recovery Strategy, the Cumulative Risk Initiative, and the biological opinions provide further details of programs that are oriented to address listed species' life cycles. The strategies include reform of hatchery and habitat restoration practices throughout the basin from the estuary to the tributary areas. The strategies also include reforming harvest management and operational methods, together with improved funding and accountability, for improvements to ecosystem health and fish protection. The primary objective of these actions is to provide benefits to juvenile and adult salmon passage through the hydroelectric system, thus providing cumulative benefits to the proposed action alternatives.

5.3.2 TRIBUTARY HABITAT

The 2000 Columbia River Basin Fish and Wildlife Program outlines conceptual and procedural approaches to tributary habitat restoration, while the biological opinions and Basin-wide Recovery Strategy contain more substantive discussions of tributary habitat. The process for recovering tributary habitat to improve adult spawning and juvenile rearing conditions would result in the production of more fish that would benefit from beneficial actions provided by the HCPs. Restoration of degraded tributary habitat is one objective of the 2000 Columbia River Basin Fish and Wildlife Program.

5.3.3 HARVEST

The documents do not directly address harvest but assume that the recent trends in harvest management will continue. These trends include substantial reductions in the total exploitation rates on naturally spawning salmonid populations, fishing regimes responsive to changes in abundance, and management of total fishing mortality (i.e., catch plus associated incidental mortality). The documents support the expansion of selective fishing techniques and the development of mass-mark selective fisheries. The implicit assumption in mass-marking programs is that the programs will enhance selective harvest of hatchery fish and conservation of wild spawned fish.

5.3.4 HATCHERIES

Hatchery reform measures that have been implemented or proposed are discussed in the documents described above. The documents also discuss supplementation and captive rearing programs that are included in the plans.

5.3.5 CURRENT STATUS FEDERAL PROGRAM

NMFS recently issued a progress report on the 199 actions to be implemented within the Federal hydrosystem of the Columbia River Basin (NMFS 2002b). Their review of available information produced the conclusion that implementation of the Basin-wide Salmon Recovery Strategy is generally consistent with the 2000 Federal Columbia River Power System biological opinion, and is adequate to implement the reasonable and prudent alternative for the 199 actions. Of the 124 actions that require definition, implementation, or completion by 2003, 94 are being implemented as expected; the 30 remaining actions are being implemented during 2002. The 75 actions scheduled for later implementation will be implemented by 2010, with 66 of these implemented by 2003. Thus, the beneficial effects of the 199 actions included in the 2000 biological opinion will provide a cumulative benefit, in addition to the HCP provisions.

5.4 REGIONAL PROGRAMS DEVELOPED FOR SALMONID RECOVERY

Although the primary emphasis of the Federal programs to recover Columbia River salmon and steelhead populations is improving juvenile and adult fish passage conditions in the mainstem, regional programs tend to emphasize tributary habitat. One regional emphasis is to ensure adequate instream flows for fish through acquisition of water rights. Restrictions or moratoriums have minimized the number of new water right applications approved within the Columbia River Basin in recent years. Although there is strong support by some interests to ease or eliminate restrictions on water use and development, there are also Ecology and Bureau of Reclamation initiatives to buy-back or lease water rights for increasing instream flows in the various watersheds.

The Northwest Governors released their *Recommendation for the Protection and Restoration of Fish in the Columbia River Basin* in July 2000 (Kempthorne et al. 2000). The goal was the "protection and restoration of salmonids and other aquatic species to sustainable and harvestable levels meeting the requirements of the Endangered Species Act, the Clean Water Act, the Northwest Power Act, and Tribal rights under treaties and executive orders while taking into account the need to preserve a sound economy in the Pacific Northwest." The report includes recommendations for habitat, harvest, and hatchery reforms. The implementation of these recommendations should benefit anadromous fish species and their habitat throughout the basin.

Habitat improvement recommendations include:

- designating priority watersheds and developing watershed management plans;
- coordinating Federal, State, and local planning processes with the Northwest Power Planning Council's Fish and Wildlife Program; and
- working with Federal, State, Tribal, and local governments to implement the National Estuary Program for the Lower Columbia River estuary.

Harvest initiatives include:

- evaluating selective harvest methods and regulations;
- evaluating license buyback programs;
- establishing terminal fisheries below Bonneville Dam and in Zone 6;
- strengthening Federal, State, and local law enforcement programs; and
- increasing predator control fishery programs to minimize the loss of salmonids from predation.

Hatchery reform initiatives include:

- implementing recommendations in the Artificial Production Review Report (Northwest Power Planning Council 1999);
- supporting the regional fish managers and Tribes to develop a comprehensive supplementation plan, including monitoring and evaluation; and
- developing more comprehensive hatchery fish marking programs.

5.5 STATE PROGRAMS DEVELOPED FOR SALMONID RECOVERY

In addition to the overall recommendations of the Northwest Governors, each State has independent initiatives that are expected to affect anadromous fish or their habitat in the basin.

5.5.1 OREGON

Proposed actions by the State of Oregon are described in the *Oregon Plan for Salmon and Watershed Measures* (Oregon Plan 2001), which includes the following programs:

- water quality management plans – Oregon Department of Agriculture;
- TMDLs in targeted basins – Oregon Department of Environmental Quality;
- watershed enhancement programs and land and water acquisitions – Oregon Watershed Enhancement Board;
- instream flow enhancement programs – Oregon Department of Fish and Wildlife and Oregon Water Resources Department;
- fish passage and culvert improvements and replacements – Oregon Department of Fish and Wildlife and Oregon Department of Transportation;
- improvements in forest habitat and other State-owned lands – Oregon Department of Forestry, Oregon Division of State Lands and Oregon Parks Department;

- reductions in sediment runoff from mine sites – Department of Geology and Mineral Industries; and

- State agencies funding local and private habitat initiatives and providing technical assistance for establishing riparian corridors.

Following the development of the Oregon Plan (2001), Oregon voters approved a broad constitutional amendment requiring payment to private property owners for diminution in property values resulting from State and local regulations. This amendment may limit the development of the above-mentioned regulatory initiatives.

5.5.2 WASHINGTON

Several legislative measures have been passed in the State of Washington to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. The 1998 Salmon Recovery Planning Act provides the basis for developing watershed restoration projects and establishes a funding mechanism for local habitat restoration projects. The Act also created the Governor's Salmon Recovery Office to coordinate and assist in the development of salmon recovery plans.

The *Statewide Strategy to Recover Salmon* is also designed to improve watersheds, while the 1998 Watershed Planning Act encourages voluntary water resource planning by local governments, citizens, and Tribes in regards to water supply, water use, water quality, and habitat at the WRIA level. The Salmon Recovery Funding Act established a board to approve localized salmon recovery funding activities.

WDFW and Tribal co-managers implemented the Wild Stock Recovery Initiative in 1992 and completed comprehensive management plans that identify limiting factors and habitat restoration activities. These plans also include actions in the harvest and hatchery components.

Although the Washington legislature amended the Shoreline Management Act to increase protection of shoreline fish habitat, a recent court challenge will delay implementation and possibly require additional amendments. Washington State's Forest and Fish Policy is designed to establish criteria for non-Federal and private forest activities that will improve environmental conditions for listed species, primarily to minimize impacts to fish habitat through protection of riparian zones and instream flows.

The State of Washington is under a court order to develop TMDL management plans on each of its 303(d) water-quality-listed streams, which will result in water quality improvements. The State also established an ongoing program in 2000 to buy or lease water rights for instream flow purposes. The mainstem Columbia River was closed by the State to new water rights appropriations in 1995. These programs should improve water quantity and quality in the State over the long term.

In addition to the programs and initiatives identified for Oregon and Washington, similar programs have been or are being developed in Idaho and Montana. Although these programs would have a greater affect on the Snake River fish populations, they are likely to benefit the Mid-Columbia River stocks as they migrate through the Lower Columbia River.

5.6 INDIAN TRIBES

The Nez Perce, Umatilla, Warm Springs, and Yakama Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the *Wy-Kan-Ush-Mi Wa-Kish-Wit*, or *Spirit of the Salmon* plan (CRITFC 2002). The plan emphasizes the reliance on natural

production and healthy river ecosystems, and addresses hydroelectric operations on the mainstem Columbia and Snake Rivers; habitat protection and restoration throughout the basin (including the Columbia River estuary); fish production and hatchery reforms; and in-river and ocean harvest reforms. The plan provides a framework for restoring anadromous or migratory fish stocks (specifically salmon, steelhead, Pacific lamprey, and white sturgeon) in areas upstream of Bonneville Dam.

The plan should have positive cumulative effects on anadromous and migratory species and their habitat, and includes the objectives of:

- halting the decline of salmon, lamprey, and sturgeon populations in areas upstream of Bonneville Dam within 7 years;
- rebuilding salmon populations upstream of Bonneville Dam to annual run sizes of 4 million fish within 25 years in a manner that supports Tribal ceremonial, subsistence, and commercial harvests; and
- increasing lamprey and sturgeon populations to naturally sustaining levels within 25 years in a manner that supports Tribal harvests.

5.7 RESOURCE EFFECTS

5.7.1 LAND FEATURES, GEOLOGY, AND SOILS

Through review of Federal, State, regional, and Tribal plans, there are no known geologic or soil-based activities that are expected to occur within the Columbia River system that would either affect or be affected by the proposed activities associated with any of the EIS alternatives. Ongoing or future modifications of project facilities, hatcheries, and spill operations are not expected to alter Columbia River soils and sediment conditions outside the immediate project area. Planned or future modifications of other Columbia River Basin hydroelectric projects, including the possible removal of some Snake River dams, would not alter geomorphic conditions in the Mid-Columbia River region.

Tributary restoration projects would not appreciably affect Columbia River sediment conditions. The potential for increased stream turbidity from instream restoration activities would be minimized and diluted prior to reaching the Columbia River through the use of Federal, State, and local land management permit requirements. These permits require best management practices and temporary erosion and sediment control plans for those land-based activities that could affect adjacent waters. Included in these permits is the hydraulic permit approval issued by WDFW, which is required for any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any freshwater of the State. Tributary restoration projects would likely result in decreased watershed and riverbank erosion and reduced sediment delivery to the Columbia River over the long term. Columbia River sediment, baseline, or soil conditions are not expected to be altered. Stable reservoir levels under the action alternatives would also maintain current shoreline and sedimentation conditions in the reservoirs.

5.7.2 FISHERIES RESOURCES

The cumulative effects associated with operating the Mid-Columbia River hydroelectric projects on spring-run chinook salmon and steelhead, and the projected changes in fish population numbers, as a result of implementing the survival standards and tributary improvements of the HCPs, were assessed in the Mid-Columbia River Quantitative Analysis Report (QAR). A summary of this report can be found in Appendix E. The inclusion of summer/fall-run chinook, sockeye, and coho salmon as Plan species under Alternative 3

affords these unlisted species the same level of protection provided to the Endangered Species Act-listed species. Although the QAR analysis focuses on survival changes relative to the HCPs (Alternative 3), Section 7 consultations conducted under Alternative 2 are expected to result in benefits for the listed species, and potentially indirect benefits to some unlisted species. Alternative 1 continues existing conditions, resulting in no new protection programs for either the listed or the unlisted species.

5.7.2.1 Endangered Anadromous Salmonid Species

The QAR represents a long-term cumulative effects analysis for endangered Upper Columbia River spring-run chinook salmon and steelhead. The analysis includes the following components:

- summarizes the available information for the Endangered Species Act-listed anadromous species;
- reviews alternative approaches to estimating the risks of extinction and recovery perspectives; and
- provides preliminary estimates of the relative risks of extinction under a range of alternative management, climate, and environmental scenarios.

The QAR also provides analyses of the potential survival improvements that could be gained throughout the life cycle of listed Upper Columbia River salmonids from hydropower system modifications, enhanced habitat, and changing climate and environmental conditions (e.g., ocean survival).

Within the spring-run chinook salmon and steelhead Evolutionarily Significant Units identified in the Upper Columbia River, there are three independent populations (one each on the Wenatchee, Entiat, and Methow Rivers). These independent populations represent aggregations of one or more local breeding units (demes) that are closely linked by the exchange of individuals among the demes, but are isolated from other independent populations. The QAR analyses are intended to determine the following information for the three independent populations of the listed species:

- **Extinction Risks** – Assess the potential risks of extinction for the major wild populations of the Upper Columbia River steelhead and spring-run chinook salmon Evolutionarily Significant Units given a continuation of recent management and environmental conditions associated with adult returns.
- **Extinction Risk Reductions** – Assess how the projected extinction risks would be affected by proportional increases in the average return per spawner ratios (i.e., the number of returning adult spawners divided by the total number of parent spawners for each brood year (year of spawning).
- **HCP Effects** – Specifically assess how the extinction risks and recovery probabilities might be affected by the implementation of passage survival improvements and the tributary enhancement programs identified in the three HCPs.
- **Combined Effects** – Determine the projected combined effect of the passage survival and tributary improvements identified in the HCPs and the potential additional mitigation measures expected from Federal actions that involve hydropower and habitat (tributary and estuarine). However, artificial supplementation (hatchery production) and harvest modifications were not analyzed.
- **Other Effects** – Determine if additional survival improvements would be needed to achieve survival and recovery objectives for these runs.

For Upper Columbia River spring-run chinook salmon populations, the available data set begins in the late 1950s and early 1960s. To be consistent with other cumulative effects models (e.g., Cumulative Risk Initiative), NMFS applied the most conservative data set available to assess extinction risk and probability of achieving the interim recovery goals. The most conservative data set reflects conditions for brood years 1980 through 1994, although for comparative purposes, the full data set (1960 through 1994 brood years) was also analyzed and reported.

Status of Modeled Populations

The extinction risks for wild Upper Columbia River spring-run chinook salmon and steelhead were assessed by estimating the total annual run sizes and determining the resultant return per spawner ratios. To determine annual run sizes, estimates of pre-spawning mortality, captured broodstock, and harvest rates were added to the annual escapement numbers recorded during spawning ground surveys. The total component of hatchery fish could then be determined and factored out of the spawning populations to estimate total adult returns from wild, naturally spawning parents. The annual returns were then separated into age classes to determine the contribution from each brood year. The annual returns from each brood year were summed to estimate the total number of adults that returned from wild, naturally spawning parents each year (i.e., the return per spawner ratio).

A stable population requires an excess of one returning adult for every adult spawner to account for harvest rates and instream adult mortality. At spawning, a stable population requires a minimum of one return spawner for each spawning parent (i.e., a return per spawner ratio of 1.0). If this ratio is less than one, the population decreases and the risk of extinction increases.

Return per spawner ratios are a common way of expressing the productivity of salmon stocks. They reflect the average rate of replacement over the life of a generation—typically 4 to 5 years for chinook salmon. Return rates can also be expressed as annual growth rates (often termed *lambda*). The QAR modeled the recent (1970 through 1994 and 1980 through 1994 brood years) return per spawner ratios to generate projections of temporal trends or patterns in spawning escapement that can be compared to specific extinction risk criteria over time for spring chinook. In recent years (1980 through 1994 brood years), return rates for Upper Columbia River spring-run chinook salmon translate into annual return rates of 0.89 to 0.98. These results indicate the populations have been trending down at a loss rate of 2 to 11 percent per year.

Estimating the return per spawner ratio for wild steelhead was complicated by the relatively high proportion of hatchery steelhead that spawn naturally. Between 1976 and 1992, the average percent of the spawning populations comprised of wild origin adults was estimated at 27.9 and 11.2 percent in the Wenatchee/Entiat and the Methow Rivers, respectively.

Given the ultimate focus of Endangered Species Act objectives on naturally self-sustaining populations of wild fish, the steelhead productivity analyses in the QAR centered on a special case—scenarios in which hatchery inputs into natural spawning areas would immediately cease. The extinction risks and recovery analyses reported in the QAR all reflect this hypothetical assumption, even though this is unlikely to occur under either Alternative 2 or 3. There would be no changes to the hatchery programs under Alternative 1, which represents existing conditions.

To estimate return per spawner ratios for wild steelhead, an assumption must be made concerning the spawning effectiveness of hatchery fish. Assuming a 100 percent spawner effectiveness level for straying hatchery fish, the average return per spawner ratios for wild

steelhead between 1976 and 1996 on the Wenatchee/Entiat and Methow Rivers were 0.41 and 0.28, respectively. However, with the assumption that hatchery fish were only 50 percent effective at spawning naturally, the return per spawner ratios for wild steelhead increased to 0.66 and 0.45. Assuming that hatchery spawners were only 25 percent effective at spawning further increased the return per spawner ratios for wild steelhead to 0.70 and 0.65.

Extinction Risk Criteria

Three population level criteria were considered in the QAR:

- **Absolute Extinction Level** – Defined as one or fewer wild spawners in 5 or more consecutive years.
- **Quasi-Extinction Level** – Defined as 50 or fewer wild spawners (Methow and Wenatchee Rivers) or 30 or fewer wild spawners (Entiat River) for 5 or more consecutive years. This is the abundance level at which a population is believed to be at extremely high risk of extinction in the immediate future and results in risks that are not usually incorporated into simple population extinction models.
- **Cautionary Level** – Defined as 1,200 or fewer wild spawners per year for the Wenatchee River, 750 for the Methow River, and 150 for the Entiat River.

Interim population recovery goals for spring-run chinook salmon populations were set in the QAR at 3,750 spawners per year in the Wenatchee River, 2,000 spawners per year in the Methow River, and 500 spawners per year for the Entiat River. Interim recovery goals for the three steelhead populations were set at 2,500 spawners for the Wenatchee and Methow Rivers and 500 spawners for the Entiat River.

Factors Affecting the Extinction Risks

Major resource management factors affecting the extinction risks of the Upper Columbia River spring-run chinook salmon and steelhead include:

- harvest,
- hatchery production,
- habitat quantity and quality, and
- hydropower.

These factors are directly influenced by resource management practices and can be altered to increase the survival of listed species.

An additional factor, which is independent of management practices, is the fluctuation in climate and environmental conditions. This fluctuation is believed to have a substantial effect on the ocean survival of anadromous fish species, although the process is not well understood. A key objective of the QAR analyses is to depict the relative improvement in survival necessary to achieve extinction risk and recovery objectives under different assumptions about future climate and environmental survival scenarios. However, the results of analyses using data that represent the poorest climate and environmental conditions (worst-case scenario) are presented in this assessment, providing the most conservative comparison level.

Harvest

Harvest impacts on Upper Columbia River spring-run chinook salmon and steelhead are dominated by in-river fisheries. Until the early 1970s, Upper Columbia River spring-run chinook salmon were harvested, along with returning Snake River stocks in the Lower Columbia River commercial and sports fisheries (WDFW 1999). Harvest rates in those fisheries ranged between 30 and 50 percent per year. However, these fisheries were curtailed substantially in the early 1970s in response to declines in returns and recognition of treaty harvest needs. In recent years, harvest rates

have been reduced further due to listings under the Endangered Species Act.

Steelhead harvest rates in lower river commercial fisheries were relatively high through the 1960s. Direct commercial harvest of steelhead in non-Indian fisheries was eliminated by legislation in the early 1970s. Incidental impacts to steelhead through fisheries directed at other species continued in the lower river, but at substantially reduced levels. In the late 1970s and early 1980s, recreational fishery impacts to steelhead in the Upper Columbia River escalated to very high levels in response to increasing returns augmented by substantial increases in hatchery production and harvest reductions in the Lower Columbia River. Harvest rates on wild steelhead between 1975 and 1985 averaged 10 percent in the Lower Columbia River and 50 to 75 percent above Wells Dam. In 1985, recreational steelhead fishing regulations in this region (and in other Washington tributaries) were changed to mandate the release of wild fish. Treaty harvest of summer-run steelhead (including returns to the Upper Columbia River) occurs mainly in mainstem fisheries directed at up-river bright fall-run chinook salmon.

The basic analyses conducted in the QAR assume that current average harvest rates (encompassing incidental sport and commercial catches) would continue into the future. Those harvest rates generally reflect recent reductions imposed in response to stock listings and general downturns in abundance.

Harvest levels are expected to be relatively similar for all the EIS alternatives, although harvest levels might continue to be limited by the proportion of hatchery and naturally spawning fish. Although relatively large returns of hatchery fish have occurred in the Columbia River in recent years, harvest has typically been restricted because of potential impacts from the incidental catch of the relatively low numbers of natural spawning fish. Similar restrictions are expected to continue under Alternative 1.

Under Alternative 2, NMFS is likely to require a decrease in hatchery production levels, to reduce the potential affects of hatchery fish on the Endangered Species Act-listed species, and to increase the recovery potential (see Section 3.2.4.4, Interaction Between Hatchery Stocks and Wild Stocks). Although similar reductions could also occur under Alternative 3, such reductions would not occur until at least 2013. The hatchery production levels compensating for juvenile fish passage losses at Wells Dam are also expected to decrease, under all the alternatives, because the survival rates are greater than those originally estimated for the 1990 Wells Settlement Agreement (FERC 1990). Decreased hatchery production is likely to reduce the number of harvestable fish in the short term, but increased harvest is expected in the long term as natural stocks recover.

Hatchery Production

Each of the Upper Columbia River tributaries has an associated set of hatchery production programs. Hatchery production, especially of steelhead, increased dramatically in the 1960s and 1970s. Steelhead runs have been predominantly of hatchery origin since at least the early 1970s. Adults returning from these programs can stray and contribute to the production of natural spawning areas. However, the effectiveness of hatchery fish spawning naturally is unknown. The uncertainty related to the historical effectiveness of hatchery fish spawning in the wild has a significant effect on estimates of the wild population productivity.

State hatcheries funded by the Mid-Columbia River PUDs were established to mitigate for the effects of initial inundation of the hydroelectric projects on anadromous fish habitat. These facilities also provide mitigation for ongoing fish passage losses of anadromous fish at the projects. These hatchery programs are covered under a separate Endangered Species Act consultation process, and will continue regardless of the consultations on the operational impacts of the hydroelectric projects. The resulting Section 10

permits describe the efforts being implemented to avoid and minimize the effects that hatchery-reared fish may have on Endangered Species Act-listed salmonids. These efforts include protocols for adult collection and spawning, rearing and release strategies, fish health management programs, and environmental monitoring. These protocols are expected to be followed for all hatchery stocks and would equally benefit unlisted fish species.

In addition to the PUD-funded hatcheries, the Leavenworth National Fish Hatchery Complex releases several million spring-run chinook salmon each year, as mitigation for the construction of the Federal hydroelectric projects upstream of Wells Dam. Although the hatchery production increases the number of fish migrating from (and returning to) the Mid-Columbia River, they can also contribute to a decline in wild fish populations. General impacts of hatchery programs of wild fish populations are presented in Section 4.2.1.1, Endangered Anadromous Salmonid Species – Hatchery Production). Although there is unlikely to be changes in hatchery production due to the potential impacts to unlisted species, hatchery production could be reduced under Alternatives 2 and 3 if such production is likely to jeopardize the continued existence of the listed species (see discussion above under harvest).

Habitat Quantity and Quality

Mid-Columbia River fish runs have been substantially impacted by habitat degradation due to mining, logging, and grazing activities within the tributaries, particularly in the late 1800s and early 1900s. Although habitat conditions are believed to have substantially improved over the last 100 years, the status of tributary habitat is still a limiting factor to the fish production capabilities of the Mid-Columbia River region. The proposed HCPs prioritize habitat protection and restoration for Mid-Columbia River stocks and provide a mechanism for directing PUD funding towards the prioritized activities. The HCPs provide substantial funds ($ 46.5 million in 1998 dollars) to implement habitat improvement activities throughout the Mid-Columbia River region. No PUD funding would be available for habitat protection, restoration, or enhancement under Alternatives 1 or 2.

Additional habitat improvements in the Upper Columbia River Basin have been or are being identified through various local, State, or Federally funded processes. Potential habitat improvements from these processes, however, were not considered in the QAR analyses. The Federal Columbia River Power System biological opinion (NMFS 2000a) and the draft All H Paper (Federal Caucus 2000) also call for extensive off-site mitigation to improve the survival of listed salmon and steelhead populations. Quantifying the potential survival improvements of the various State, Federal, and Tribal habitat actions, outside of those directly incorporated into the HCP process, was not included in the QAR analyses due to the narrow focus on hydropower survival improvements in the QAR assessment. In addition, there is considerable uncertainty of when each of the proposed projects will be implemented and effective. A detailed discussion of tributary and reservoir habitat conditions is presented in Section 3.2.2, Anadromous Fish Resources.

Hydropower

The focus of the proposed HCPs is to minimize the effects of the Mid-Columbia River hydroelectric projects on the anadromous fish species in the region. However, these species are also affected by the four Federal hydroelectric projects on the Lower Columbia River (Bonneville, The Dalles, John Day, and McNary dams) (see Figure 1-1). The operation of these downstream projects is expected to be similar under all three of the EIS alternatives.

Mid-Columbia River Projects

The QAR analyses assume that all five of the Mid-Columbia River hydroelectric dams would be operated to meet the proposed HCP project-specific survival standards. Although Grant

County PUD is not a participating entity in the HCP process, requirements developed through Endangered Species Act Section 7 consultations for the Grant County PUD dams (Wanapum and Priest Rapids) are expected to be similar to the Section 10 consultations for the HCPs for listed species. Therefore, the operation of these dams is expected to be similar for all the EIS alternatives.

The HCPs set long-term standards for passage survival through the Mid-Columbia River PUD projects. The standard at each project is based on achieving no less than 91 percent total project survival for juveniles and adults combined. A rough estimate of fish survival, from each of the Mid-Columbia River tributaries downstream to below Priest Rapids Dam (reach survival) was generated for juvenile spring-run chinook salmon and steelhead.

Although information regarding juvenile passage survivals in the Mid-Columbia River prior to dam construction is unavailable, some data exist for the free-flowing portion of the Snake River prior to the construction of the intervening lower mainstem Snake River dams (Smith et al. 1998). This free-flowing reach consists of approximately 318 miles of the mainstem Snake River upstream from Ice Harbor Dam. Applying Snake River pre-dam survival rates to specific Mid-Columbia River reaches (from each of the Mid-Columbia River tributaries to a point below Priest Rapids Dam) results in average pre-dam juvenile reach survival estimates of between 98 and 99 percent. Although these estimates are based on limited data, from a different river and with different fish stocks, NMFS believes that they represent appropriate estimates of pre-dam survival.

Lower Columbia River Projects

The historic passage survival estimates compiled through the Plan for Analyzing and Testing Hypothesis (PATH) process were used to estimate average base period survival through the section of river from the McNary Dam through the Bonneville Dam (Peters et al. 1999). The average per project survival (87 percent) from Lower Granite through John Day projects was assumed for survival through the two lower river dams (The Dalles and Bonneville). McNary and John Day project survival was assumed to be equal to the average of the Mid-Columbia River projects (85 percent). The resulting aggregate estimate of in-river survival from McNary to Bonneville was 51.5 percent.

A number of options for configuring or operating the Federal hydroelectric projects on the lower mainstem of the Columbia River are under consideration with respect to meeting the survival objectives of the biological opinion for the Federal Columbia River Power System (see Appendix E). The QAR assessed the survival benefits to the Upper Columbia River Evolutionarily Significant Units of spring-run chinook salmon and steelhead, under the assumption that these objectives are met at the Lower Columbia River projects. These survival benefits were combined with the survival benefits resulting from the implementation of the HCPs to determine the overall benefit of the combined measures. The QAR assessed whether these combined measures would be adequate to meet the extinction risk and the recovery criteria for the Upper Columbia River Evolutionarily Significant Units, under different assumptions about future climate and environmental conditions.

Climate and Environmental Conditions

In recent years, theories regarding the potential effect of climate and environmental cycling have gained considerable attention. The available data series for Upper Columbia River spring-run chinook salmon dates from the late 1950s. A set of alternative future climate and environmental scenarios was developed based on this information, using differential analytical time periods.

Three different scenarios reflecting the range of possible future climate conditions were the focus of QAR modeling assessments for spring-run chinook salmon. The first major scenario assumes that background survival conditions

estimated for the years since 1970 reflect the year-to-year variation that will be experienced by Upper Columbia River spring-run chinook salmon in the future. This scenario assumes that the low return rates of the 1990s will be balanced to some extent by higher returns, such as those experienced in the early 1970s.

A second major scenario reflects the assumption that there has been a major downward shift in climate and environmental conditions in recent years, possibly as an effect of long-term natural cycling. This scenario assumes that recent climate regimes (brood years1980 through 1994) and associated spawner/recruit ratios would persist well into the future.

A third scenario, using the full data set, reflects survival rates observed over the last 30 years (mid-1960s to mid-1990s) and addresses the hypothesis that long-term cycling in North Pacific ocean and atmospheric conditions has an important effect on salmon survival. In particular, associations between an index of North Pacific oceanographic and atmospheric conditions (the Pacific Decadal Oscillation index) and salmon production have been postulated. This index is characterized by a 30-year cycle, with a major change from positive to negative conditions observed in the mid-1970s. However, returns in the last 3 years (2000 through 2002) suggest that the ocean and/or climate conditions might be shifting back to levels observed during the 1960s.

Action Analysis

A number of specific actions to improve the survival of spring-run chinook salmon and steelhead have been implemented in the basin or are under consideration. These actions would occur under all three of the EIS alternatives. Additional actions would be implemented to improve the survival of Endangered Species Act-listed species passing Wells, Rocky Reach, and Rock Island dams under Alternative 2. Similar additional actions are expected under Alternative 3 (the HCPs), although the dam passage survival improvements would also be provided to the unlisted anadromous species.

While the survival improvements under each of the alternatives would primarily focus on passage conditions at hydroelectric dams, the contribution of the proposed HCP-funded habitat improvements was also considered in the QAR analyses. These analyses also assume that the survival goals set forth in the HCPs also apply to the Wanapum and Priest Rapids dams, even though these goals will be established through a separate Section 7 consultation. The primary purpose of the QAR was to determine the survival improvements necessary for protecting and recovering wild Upper Columbia River spring-run chinook salmon and steelhead and intentionally did not assess the effects of the long-term supplementation (hatchery) program included as part of the HCPs. Supplementation was not included because of the potential impacts that it can have on naturally spawning populations, as well as the uncertain effectiveness of supplementation to recover and maintain natural production levels, which is NMFS's intent in the application of the Endangered Species Act regulations.

Recovery of wild Upper Columbia River spring-run chinook salmon and steelhead populations will require improved survival throughout the life cycle. The focus on hydropower actions in the analysis reflects the genesis of the QAR effort, to provide analytical tools to use in the assessment of proposed actions at the Mid-Columbia River projects. That fact does not mean that the full burden of achieving survival rates sufficient to recover and sustain natural production would be the sole responsibility of the PUDs. The Upper Columbia River stocks are also subject to hydroelectric dam passage mortality in the Lower Columbia River, due to the four mainstem Federal hydropower projects. Therefore, potential survival changes were assessed given a range of possible scenarios for configuration and operation of the lower river projects.

Interim Recovery Goals and Extinction Risks

Results of the modeling exercise support the contention that hatchery spawner effectiveness is a key uncertainty relative to the level of survival improvements necessary to meet extinction risk and recovery criteria for steelhead. There are two basic rationales supporting the sensitivity analysis of hatchery effectiveness: observations of spatial and temporal differences between hatchery and wild steelhead spawning in the Upper Columbia River tributary streams, and study reviews of the relative effectiveness of hatchery spawners throughout the Columbia River Basin.

Natural stock productivity was evaluated under four alternative assumptions regarding hatchery effectiveness:

- hatchery spawners being equally effective as wild spawners;
- hatchery spawners being 75 percent as effective as wild spawners;
- hatchery spawners being 50 percent as effective as wild spawners; and
- hatchery spawners being 25 percent as effective as wild spawners.

Achieving the proposed HCP passage survival standards will require substantial survival increases over recent historical (1976 to 1996) survival levels to achieve the interim recovery goals for steelhead. Even if the HCP survival standards are achieved, hatchery production would be utilized to partially compensate for the remaining unavoidable project mortality. The remaining impacts are to be mitigated through habitat improvements specifically aimed at increasing the production and survival of anadromous fish populations upstream of the PUD dams – including listed spring-run chinook salmon and steelhead.

Over the long term, Endangered Species Act-listed stocks must be self-sustaining without support from artificial efforts, such as hatchery supplementation. Although not analyzed in the QAR, artificial supplementation is specifically recognized as an important short-term tool to maintain stocks while survival conditions improve to levels that will allow for self-sustaining natural production.

In the case of Upper Columbia River spring-run chinook salmon, supplementation programs might be needed to boost return rates up to the proposed interim recovery goals, because of the extremely low numbers of returning adults produced from wild, natural-spawning fish in recent years. In addition, it is expected to take several years for hydropower and habitat-based survival rates to improve to levels capable of achieving the interim recovery goals.

Steelhead returns into the Upper Columbia River are heavily dominated by returning hatchery fish. Until recently, returning hatchery adults spawning in the wild were predominantly of Wells Hatchery stock, which is considered by NMFS to be negatively influencing the long-term health and survival of wild steelhead. As a result of consultation efforts, however, the Upper Columbia River steelhead hatchery programs are in transition to locally adapted broodstocks.

Due to long-term uncertainty associated with the effectiveness of hatchery supplementation, the QAR analyses did not incorporate continued supplementation as envisioned under the proposed HCPs. However, other HCP actions such as dam passage survival and tributary habitat enhancements were considered in the QAR analyses. In addition, the QAR also assumed that the survival improvements called for at the hydroprojects and tributary enhancements occur instantaneously. In fact, it may take several years or, in some cases, a decade or more before the survival benefits of certain actions (e.g., habitat improvements) are fully realized. Continued supplementation with an appropriate broodstock

represents an important factor to consider when assessing alternative recovery actions.

Modeling Results

The QAR modeling assessed the likely survival improvements resulting from implementation of the HCPs, and whether additional survival improvements would be necessary to meet the extinction risk and interim recovery criteria for the Endangered Species Act-listed stocks. The analyses included the potential benefits from achieving similar survival rates at the Lower Columbia River hydroelectric projects, and the overall effects of future climate/environmental conditions on the recovery process.

Mid-Columbia River Projects

Based on juvenile survival rates of 86 to 88 percent per project for the 1980 to 1994 brood years (the most conservative data set), achieving the proposed HCP passage survival standards would increase Mid-Columbia River reach survival by 16 to 25 percent for steelhead, and by 21 to 35 percent for spring-run chinook salmon. The range in these estimates accounts for the differences in the number of Mid-Columbia River PUD dams that each population migrates past). Additional survival improvements through tributary habitat funding under the proposed HCPs would increase survival by an additional 6 to 10 percent for both spring-run chinook salmon and steelhead. However, because the Endangered Species Act focus is on recovering self-sustaining wild populations in the absence of hatchery support, the assumed 7 percent per project survival increases from supplementation were not added into the model. Although supplementation provides additional returning adult fish, these fish do not necessarily contribute to the rebuilding of naturally spawning wild populations.

Despite these projected survival improvements, the QAR results indicate that additional survival improvements, outside those proposed under the HCPs, would be necessary to achieve extinction risk/recovery criteria, using the most conservative data set (brood years 1980 to 1994). However, using a broader range of data (since the early 1960s), the HCP survival benefits alone are likely sufficient to exceed the levels necessary to meet the interim recovery goals and the 100-year extinction risk criteria (less than 1 percent chance of having no spawners at 100 years).

Lower Columbia River Projects

Under the most conservative data set (brood years 1980 to 1994), additional survival improvements on the order of 20 to 50 percent would be required for spring-run chinook salmon at the Lower Columbia River dams to meet the extinction risk criteria. Steelhead results were similar, but were additionally complicated by basic uncertainties regarding hatchery fish spawning effectiveness. By adding the Lower Columbia River hydroelectric project survival improvements, the probability of meeting the risk/recovery criteria is significantly improved.

The biological opinion for the Federal Columbia River Power System (NMFS 2000a) included reasonable and prudent measures that are expected to improve production and survival during other life cycle stages. NMFS has concluded that implementation of these reasonable and prudent measures would not likely jeopardize the continued existence of the listed species.

Climate and Environmental Conditions

The modeling results indicated that the largest increases in survival necessary to meet risk/recovery criteria were required if the most conservative climate conditions (brood years 1980 through 1994) were assumed to persist for the next 100 years. Under the alternative assumption that future background survival conditions would reflect the range experienced by the 1970 to 1994 brood years, the proposed HCPs' survival improvements for spring-run chinook salmon runs are expected to approach or exceed that necessary to reduce the extinction risk at 100 years to below 5 percent. However, based

upon long-term historical data (1960s through 1990s), achieving the HCP survival goals at the Mid-Columbia projects alone meets the requirements for reaching the interim recovery goals and extinction risks criteria (less than 1 percent risk of no spawners at 100 years).

All three spring-run chinook salmon populations modeled had high long-term (100-year) extinction risks under the assumption of continued low return per spawner ratios using the most conservative data set. Regardless of which data set is used, model runs based on data from the Wenatchee and Entiat River populations showed those populations to be at the highest risk. The model analyses indicate a substantial risk of extinction (using the most conservative data set) over the next 25 to 50 years, assuming no hatchery supplementation, HCP implementation and Lower Columbia River mainstem survival improvements, or positive climate and environmental changes.

Hatchery Production

A set of model runs was made under the assumption that short-term supplementation could successfully boost return levels up to the proposed interim recovery goals. Once the interim recovery standards were achieved, supplementation was ended. Analysis of Alternatives 2 and 3, with respect to Endangered Species Act objectives, required an assessment of the ability of a population to sustain itself in the absence of long-term supplementation or other artificial support. As a result, it was necessary to run the QAR models with the assumption that short-term supplementation would be suspended after interim recovery population levels were achieved. Although these model runs assumed that short-term hatchery supplementation would cease after the interim recovery goals were met, supplementation under the HCPs would not be suspended unless monitoring information indicated a significant detrimental impact to Endangered Species Act-listed species. For comparison purposes in the EIS, hatchery production under Alternative1 would continue regardless of species recovery status.

For this analysis, the short-term extinction risks were represented by projections at 10 and 25 years, while long-term risks were represented at 75 and 100 years. The extinction risks over the long-term were almost equal to the projected risks in the absence of short-term supplementation, although, for a period of time, short-term supplementation was able to sustain production even under the most conservative climate and survival conditions (experienced by the 1980 to 1994 brood years). Improvements in passage, habitat, and climate conditions would be necessary to allow for sustainable natural production in the absence of long- or short-term hatchery supplementation.

Other Factors

Except for the direct and off-site mitigation measures prescribed in the Federal Columbia River Power System biological opinion and the habitat measures included in the HCPs, other habitat improvement measures and recovery projects were not specifically included in the QAR analyses. The overall uncertainty concerning the location, timing, and extent of these recovery projects results in the inability to adequately quantify the potential benefits for inclusion in the QAR analyses. However, these measures are expected to improve production levels and survival of naturally spawning stocks. As with the measures prescribed in the Federal Columbia River Power System biological opinion (NMFS 2000a), these programs are independent of the HCPs, and would therefore occur under all the EIS alternatives.

The QAR analyses did not include the expected benefits of changes to the hatchery programs in the basin. Although hatchery production can play an important role in addressing particular recovery issues, hatchery supplementation is not considered in the assessment of the long-term

sustainability of a listed species. Changes in hatchery programs in the future are expected to minimize the potential impacts on naturally spawning populations.

The QAR assumed that harvest rates experienced by the 1980 to 1994 brood years would continue into the future. Harvest rates are dependent on the abundance of returning adult fish, as well as the mixture of hatchery and naturally spawning fish. They are also expected to change from year to year, as well as from changes in hatchery supplementation and the ability of naturally spawning populations to be self-sustaining. However, recent harvest rates (with the exception of the last few years) were typically below the average used in the QAR analysis.

Cumulative Effect by Evolutionarily Significant Unit

The combined effects of the potential survival improvements from the Lower Columbia River Federal hydropower projects and those that could be gained by meeting the proposed HCPs' survival standards can be calculated by multiplying the estimated survival levels in each section of the river. The QAR results indicate that the greatest survival improvements are needed for the Wenatchee River spring-run chinook salmon and the Methow River steelhead populations. Therefore, using these two populations as surrogates for the larger Upper Columbia River Evolutionarily Significant Units provides a conservative basis for determining the potential cumulative effects of the proposed HCPs.

Spring-Run Chinook Salmon

Under the most conservative assumption (future survival conditions would be similar to those experienced by the 1980 to 1994 brood years), none of the EIS alternatives alone are expected to be sufficient to meet the established extinction risk or recovery criteria. Even with the improvements called for in the Federal Columbia River Power System biological opinion (NMFS 2000a) (including the benefits of off-site mitigation), none of the alternatives would result in meeting these criteria for all populations under this conservative assumption. The analysis also showed that even removal of the Mid-Columbia River dams would fail to meet these recovery targets, using these same conservative future survival assumptions.

Under this combined scenario (lower river and HCP survival improvements), an additional 7 percent survival improvement would be required to meet the 100-year extinction criterion (less than 1 percent chance of no spawners at 100 years). In addition, substantially greater survival improvement (on the order of 100 percent) would be required to meet the interim recovery criteria under this scenario.

Using a broader-based data set (assuming future environmental conditions similar to those experienced since 1970), the combined effects of the Federal system improvements and the proposed HCP actions would exceed the 100-year extinction criteria for the Upper Columbia River spring-run chinook salmon population. Although Alternative 2 would likely result in the same project passage survival rates, it does not include the PUD-funded habitat improvement program. As a result, it is uncertain if the 100-year extinction criterion would be met with the combination of Alternative 2 and the Federal system improvements under future conditions similar to those that existed for the 1970 to 1994 brood years. However, neither Alternative 2 nor 3 (combined with Federal system improvements) would provide the additional survival improvements necessary to meet the interim recovery criteria, although additional survival needs would be greatly reduced (an additional 22 to 27 percent survival improvement needed, as opposed to the approximately 100 percent improvement required using the 1980 to 1994 brood year data set).

Assuming that future climate conditions reflect the entire historical spring-run chinook data set

(since the 1960s), the Upper Columbia River spring-run chinook salmon are expected to meet both the extinction risk criteria and the interim recovery abundance level under the combination of actions in the proposed HCPs and the survival improvements on the Lower Columbia River. Similarly, the survival improvements likely to occur under Alternative 2 (combined with the Federal system improvements) would also meet extinction risk and recovery criteria under these same future climate conditions.

Using the entire data set assumes that future climate and environmental conditions will result in some good survival years (similar to those observed in the 1960s) and some poor survival years (similar to the 1980s through the mid-1990s). The adult returns observed in the last several years have been similar to those observed in the 1960s. Adding the adult returns in 2000 and 2001 (1995 and 1996 brood years) to extend the 1980 to 1994 data series results in mean return per spawner rates similar to the 1970 to 1994 data series.

Thus, the risk of extinction and the probability of reaching the interim recovery goals are dependent on the assumption of future environmental conditions and consequently, which part of the existing data set is used. Under the most conservative view of future environmental conditions (using the 1980 to 1994 brood year data set), even the removal of the Mid-Columbia River dams would not allow the achievement of acceptable risk of extinction or meeting the interim recovery goals. In contrast, if the entire historical data set (1960 to 1994 brood years) better represents future environmental conditions, the extinction risk criteria would be met for each of the populations and substantially fewer additional survival improvements would be needed to meet the interim recovery criteria for each of the populations. Similar results are expected for Alternatives 2 and 3, although the PUD-funded habitat improvement program of Alternative 3 is expected to improve the chances of meeting the criteria under any of the future conditions modeled.

Steelhead

The QAR assessment for Upper Columbia River steelhead indicates that the proposed HCP survival improvements alone would not meet survival improvement requirements for satisfying either the extinction risk or the interim recovery level criteria under a range of possible hatchery spawner effectiveness assumptions (25 to 100 percent). However, the projected survival improvements from the proposed HCP actions and those from the Lower Columbia River survival improvements would meet both the extinction risk and interim recovery criteria if hatchery spawner effectiveness is 25 percent or less. If hatchery spawner effectiveness is between 25 and 50 percent, the projected survival improvements of the combined HCPs and Federal system improvements meet the 100-year extinction risk criterion. However, substantial improvements would be needed to achieve the interim recovery objectives. The extinction risk and the recovery criteria would not be met at 75 percent spawning effectiveness or greater, if poor ocean and climate conditions persist. If hatchery fish are 100 percent as effective at naturally reproducing as wild fish, then the combined survival improvements do not meet either set of criteria. Under these criteria, similar results are expected for Alternative 2, although the lack of the PUD-funded habitat improvement program is expected to somewhat further reduce the likelihood of recovery.

The steelhead model runs do not include long-term (7 percent) hatchery supplementation for summer-run steelhead. Life-cycle model runs incorporating long-term supplementation indicate that supplementation alone could withstand the downturn in survival even under conservative brood year climatic regimes. However, when using long-term supplementation, a high fraction of returning spawners would be of hatchery origin. The long-term effects of such interactions on the relative fitness of wild spawners are not

known. Efforts are underway to minimize negative impacts of hatcheries in the Upper Columbia River through improved broodstock management and selective fishing techniques.

Other Cumulative Effects

Despite the continued effects associated with the lower river projects, recent improvements to fish passage facilities have resulted in substantial reductions in these impacts. Between 1996 and 1999, structural improvements at Lower Columbia River projects have resulted in a 30 percent decrease in turbine passage, which equates to about a 5 percent increase in fish survival at each dam (BPA 2001). Further improvements in fish passage structures in the lower river are expected to continue, although it is uncertain whether the survival will continue to improve at this same rate.

The cumulative effects suggest that the Mid-Columbia River projects under the proposed actions (including dam removal) would not meet the extinction and recovery criteria unless accompanied by substantial improvements in the overall life-history survival conditions. However, substantial survival improvements are expected to occur through fish passage modifications in the hydroelectric system. In addition to the cumulative effects of other hydroelectric projects, other water-related projects in the basin are expected to have substantial effects on anadromous species.

Efforts to reduce the predation rates on juvenile salmonids have had, and will continue to have, substantial influence on the salmon recovery processes. By 1997, the predator control program in the Lower Columbia River had reduced predation rates by northern pikeminnow to an estimated 62 percent of the pre-program levels. Efforts in more recent years to address the predation of salmon and steelhead smolts by Caspian terns in the Columbia River estuary have resulted in substantial predation reductions. Caspian terns nesting on Rice Island were estimated to have consumed about 10.8 million juvenile salmon in 1998, or about 11 percent of the total outmigrating salmon and steelhead. In 1999, terns displaced from Rice Island to East Sand Island consumed an estimated 41 percent fewer salmonids than those remaining on Rice Island (Roby et al. 2000). Preliminary data in 2001 indicated that no terns nested on Rice Island, and the avian predation was estimated at about 4.4 million smolts (NMFS 2002b). This represents a 59 percent reduction in predation since 1998. Continued implementation of the predator control measures at the Mid-Columbia River projects is expected to further reduce both fish and avian predation levels.

The U.S. Army Corps of Engineers is seeking regulatory approval and permits for a proposed Columbia River Channel Improvement Project. This project would deepen the navigation channel of the Columbia River, from its mouth to the mouth of the Willamette River, by 3 feet to a minimum depth of 43 feet, as authorized by Congress. A biological assessment of the proposed channel deepening determined that the project is not likely to have significant adverse impacts to the Endangered Species Act-listed species (chinook and sockeye salmon and steelhead) in the Columbia River system. NMFS and USFWS provided the biological opinions on the project, affirming that the project is not likely to jeopardize the continued existence of Endangered Species Act-listed species in the Columbia River System (NMFS 2002e; USFWS 2002).

5.7.2.2 Other Listed Fish Species

Limited numbers of bull trout have been observed passing through the adult fishladders each year. These numbers range between 16 and 89 in recent years at Wells Dam (Snow 1999), 83 to 183 at Rocky Reach Dam, and 53 to 83 at Rock Island Dam (Hays 2002 personal communication). Although there are no data concerning downstream passage of juvenile or adult bull

trout, they would be restricted to using the same upstream and downstream routes available to the anadromous salmonids that pass the project.

Although bull trout are occasionally observed passing the projects, there is no indication that the Mid-Columbia River populations would be affected by downstream hydroelectric projects. The 2001 radio-telemetry study in the Mid-Columbia River area found that none of the radio-tagged fish passed downstream of Wanapum Dam (Stevenson and Hillman 2002).

Radio-tagging studies indicate that some individuals spent considerable periods of time residing in the mainstem Columbia River. Bull trout that reside in the Columbia River could be affected by water quality changes as a result of upstream hydroelectric projects. Those individuals or populations that reside in the tributary streams would be affected by habitat improvement activities associated with Federal, State, Tribal, or local community programs. Although many of these programs in the Mid-Columbia River area are guided by salmon recovery initiatives, the improvements are expected to benefit other tributary species (especially other salmonids, such as bull trout). These activities would be in addition to those funded by the Tributary Conservation Plans included in the HCPs, and would occur under all three EIS alternatives.

Bull trout is not a Plan species in the proposed HCPs; however, Section 7 consultations under the Endangered Species Act are being conducted between FERC and USFWS for the protection of bull trout relative to the operation of the Mid-Columbia River projects under Alternatives 2 and 3. In addition, NMFS would consult with USFWS over the issuance of Section 10 permits under Alternative 2 or 3. These consultations are expected to provide additional protection to bull trout in the Mid-Columbia River area, beyond that occurring coincidental to the salmon recovery programs provided through the action alternatives. Radio-telemetry evaluations are currently underway to assess the behavior patterns of adult bull trout to determine the distance they migrate and the number of projects that they pass. Although anadromous behavior can occur in bull trout populations, there is no information suggesting that the Mid-Columbia River bull trout populations are anadromous.

5.7.2.3 Other Plan Species

The biological requirements for the other Plan species are similar to those discussed for the Endangered Species Act-listed fish species. These populations are generally subject to the same environmental conditions that constitute the cumulative impacts to the listed fish. Although improvements in passage conditions at the Mid-Columbia River projects and other downstream projects for the listed species are expected to have similar benefits for these unlisted Plan species, there might be some differences in the cumulative effects based on the types of improvements.

Sockeye and fall/summer-run chinook salmon tend to have greater potential for descaling and injury rates than steelhead and spring-run chinook salmon when passing through turbine intake screen bypass systems. There are also limited data concerning the effects of these bypass systems on coho salmon because of the low number of fish in the project area and the limited studies conducted. However, fish passage improvements at the Lower Columbia River projects are expected to benefit all of the Plan species because of the greater number of listed species (and resulting variation in passage requirements) that must be considered when implementing protection measures at these projects. These lower river fish passage improvements would occur for all alternatives.

The increased use of spring spill at the Mid-Columbia River projects for listed steelhead and spring-run chinook salmon under Alternative 2 would also likely provide greater benefits to sockeye and yearling summer chinook salmon, compared to Alternative 1. However, increased

spring spill to protect the listed stocks would not provide additional benefits to summer-migrating subyearling chinook. Increased summer spill levels to protect this ESU would occur only under Alternative 3. Spill programs at the Lower Columbia River projects will most likely continue to cover both the spring and summer migration seasons, providing cumulative benefits to all the Plan species under all three EIS alternatives.

Unlike management under Alternatives 1 and 2, the off-site mitigation funding provided by the HCPs under Alternative 3 compliments the habitat improvement initiatives as part of the reasonable and prudent alternatives of the Federal Columbia River Power System biological opinion (NMFS 2000a), thereby increasing the cumulative benefit to all the Plan species. Although these Federal projects would occur under all the alternatives, a greater overall cumulative benefit to all Plan species is expected under Alternative 3 because of the habitat improvement funding provided by the Mid-Columbia River PUDs.

5.7.2.4 Other Fish Species

With the possible exception of increased total dissolved gas levels resulting from spill at the Mid-Columbia River projects, project operations would have little effect on resident populations in the Lower Columbia River. The resident fish in the basin tend to occur in discrete populations bounded by the hydroelectric projects and accessible tributary streams. Although there are opportunities for fish to move between these populations, this movement is typically greater in a downstream direction as a result of the involuntary entrainment in water passing the dams. Upstream fish movements require a voluntary behavior characteristic within the populations and do not occur inadvertently. The downstream displacement of resident fish might also occur during high-flow spill periods under existing conditions. Although there are some data concerning the abundance of resident fish populations in the system, there is little or no information concerning the effects of the hydroelectric system operations on these populations or the population interactions between reservoirs.

Lamprey and sturgeon are migratory species that might be subject to cumulative effects throughout the hydroelectric system, although there are limited data on their migration behavior in the Mid-Columbia River area.

Juvenile lamprey are susceptible to impingement on turbine intake guidance screens. Although Rocky Reach Dam is the only Mid-Columbia River project that currently uses these devices to improve fish guidance efficiencies (at Turbine Units 1 and 2 only), they are used at other Lower Columbia River dams. At Rocky Reach Dam, fish passage studies in the 1980s and early 1990s showed that juvenile lamprey were traveling below the screens (Peven 2002 personal communication). The projects also impede the upstream migration of lamprey, and the effectiveness of the adult fishladders at passing lamprey is unknown.

The cumulative effects of project operations on lamprey are expected to be similar for all three EIS alternatives. Similarly, habitat improvement projects associated with the reasonable and prudent alternatives in the Federal Columbia River Power System biological opinion (NMFS 2000a) could improve tributary spawning and rearing conditions for lamprey under all the alternatives. However, the additional PUD-funded habitat improvement projects would occur only under Alternative 3.

Sturgeon are rarely observed using the fishladders and are thought to exist in relatively small, isolated populations within the reservoirs. Therefore, project operations under any of the alternatives are not expected to result in substantial cumulative effects on sturgeon. However, a tagging study in 2001 reported one sonic-tagged fish that moved from the Wells Dam

tailrace to downstream of Rocky Reach Dam (RL&L 2002). The overall extent of such migrations (whether sturgeon pass any Lower Columbia River projects) is unknown. The majority of the habitat improvement projects that would occur in the basin under all three EIS Alternatives, as well as the PUD-funded projects associated with Alternative 3, would likely occur in the tributary areas, and would therefore not substantially affect sturgeon.

5.7.3 WATER RESOURCES (QUANTITY AND QUALITY)

5.7.3.1 Water Quantity

The three Mid-Columbia River dams have limited capabilities for water storage. Under all the alternatives, these run-of-the-river reservoirs would continue to pass water volumes discharged from the Grand Coulee and Chief Joseph dams upstream. Water flows in the Columbia River downstream from the project area would continue to experience minor fluctuations based on turbine usage and spillway releases. Monthly flows and peak flows would not be affected. Any operational changes and mitigation measures implemented under any of the alternatives to decrease salmonid mortality through the dams would have negligible effects on flows in the Columbia River system.

Although reservoir drawdown would increase water velocity in the reservoirs, it would not necessarily change reservoir discharge rates. In addition, there are no specific water management changes expected to occur in the Columbia River that would substantially affect water quantity levels in the project area.

5.7.3.2 Water Quality

The run-of-the-river projects of the Mid-Columbia River generally convey unpolluted, high-quality water from the upper reaches and tributary rivers to downstream reaches of the Columbia River. Marginal improvements are likely as Ecology implements TMDLs for specific water quality parameters that exceed standards, and as other agencies and watershed protection organizations work to enhance water quality and improve instream flows.

One water quality parameter that could be affected by Alternatives 2 and 3 is total dissolved gas. There is a cumulative increase in the levels of total dissolved gas supersaturation as a result of spilling from the series of dams in the system. Thus, any reduction in total dissolved gas achieved at Mid-Columbia River dams would benefit water quality downstream. Conversely, if spills are increased to facilitate juvenile salmonid migration, downstream total dissolved gas supersaturation could increase.

As bypass systems (which increase survival and reduce spill requirements) for the Rock Island and Rocky Reach projects are developed over time, it is expected that total dissolved gas levels would decrease in the Mid-Columbia River under Alternatives 2 and 3. Similarly, the potential development of effective dissolved gas abatement structures at the projects could further reduce total dissolved gas levels. Further research would better define the risks of gas bubble disease and other adverse effects caused by total dissolved gas supersaturation under different conditions. Although increased spill could occur under Alternatives 2 or 3 to improve juvenile fish passage, it would be limited by the total dissolved gas water quality standards. It is unlikely that the standards would be changed unless it is demonstrated that risks of adverse effects to fisheries and water quality are acceptable.

There are no other water quality effects that would occur from implementation of Alternatives 2 and 3. In addition, there are no substantial water quality changes expected to occur in the Columbia River that would affect water quality in the project area.

5.7.4 VEGETATION

There are no planned vegetation changes in the Mid-Columbia River region of the project area under any of the alternatives that would affect vegetation elsewhere within the Columbia River Basin. Alternative 3 additionally includes the expected increased riparian habitat restoration in the four tributaries (Methow, Okanogan, Entiat, and Wenatchee) from funding through the Plan Species Account, which would not occur under Alternatives 1 and 2. These vegetation restoration projects would help to provide increased riparian habitat continuity throughout each of the tributaries. Other ongoing Federal, Tribal, regional, State, and local programs would also aid in riparian restoration in tributaries that flow into the Columbia River. These programs include watershed enhancement, vegetation restoration, and land acquisition that support conservation efforts aimed at preserving native vegetation, increasing the recruitment of large woody debris into streams, and increasing shading over coldwater streams.

An exception where loss of vegetation would occur is the potential for drawdown associated with Alternatives 2 or 3. Drawdown could occur within the reservoirs of any of the three hydroelectric projects. Permanent or seasonal drawdown would result in a loss of shoreline vegetation. The loss would be permanent under seasonal drawdown because the fluctuating water levels would prevent colonization by plants, but short term if a permanent drawdown were to occur. Refer to Section 4.4, Vegetation for a discussion of drawdown effects on vegetation in the project area. These effects include the potential for noxious weed invasion and increased sedimentation and loss of native soils when drawdown occurs.

If drawdown were to occur elsewhere in the Columbia River, there would be no effects to vegetation in the Mid-Columbia area or the four tributaries. Drawdown would not occur at any of the three dams under Alternative 1.

5.7.5 WILDLIFE

None of the fish conservation measures associated with Alternatives 1, 2, or 3 affect wildlife, except for the avian predator control activities that occur under all alternatives. Further increases in avian predator control that may occur throughout the Columbia River basin could affect piscivorous bird populations in general. However, current trends in populations of these birds indicate expanding populations (APHIS 2001). Intensification of predator control activities may curtail population growth, but is not expected to result in population reduction for any of the piscivorous bird species in the basin unless substantial efforts greater than that predicted under any of the alternatives were to occur.

Other alternative effects on wildlife include the effects of drawdown, which could potentially occur under Alternative 2 or 3. Drawdown would result in a decrease and change in wildlife populations residing in or using shoreline habitats along the Mid-Columbia River. Permanent drawdown would temporarily affect wildlife food access and cover, particularly for shoreline wildlife such as amphibians and small mammals. Wetland-dependent wildlife would move to newly formed wetlands, and the existing wetlands may dry out over time. Seasonal drawdown would impact wildlife dependent on wetland habitat. The changing shoreline conditions would have a greater effect on resident species than on migratory species because of the difficulty to residents of having to adjust to a seasonally changing water level. Migratory birds would have the advantage of departing the area at specific times of the year, and thereby having a similar water level each season of the year the birds are visiting the area.

The potential for drawdown at other sites is not likely to affect waterfowl in the project area

because these reservoirs are greater than 10 miles distant from the project area and would not immediately affect wildlife species use.

The habitat restoration and conservation easement projects planned in the Columbia Basin will help to increase wildlife populations in the basin. The projects most advantageous to wildlife are primarily those associated with riparian habitat restoration.

5.7.6 LAND OWNERSHIP AND USE

There are no projected changes to land ownership, land use, or zoning under Alternatives 1 or 2. Under Alternative 3, however, the Plan Species Account would be used to purchase land or water rights for conservation or restoration activities. This could result in some land use changes in limited reaches within any of the four tributaries. Alternative 3 would not affect land use in the portion of the project area associated with the dams.

An exception would be drawdown, which could occur under either Alternative 2 or 3. The effects would occur largely to landowners and businesses dependent on water sources. Under drawdown, there would be a decrease in available water for crop production and commercial industry, which would affect livelihoods of farmers and other workers in the Mid-Columbia region, but should not affect agriculture or industry outside the region, such as the Upper Columbia or Lower Columbia River basins. Over the short term, within the Mid-Columbia River Basin, farms may lay fallow and industries may close until alternative crops and businesses develop that are not as dependent on water. Land ownership could change and land values may also decrease if drawdown occurs. There is a possibility that zoning may change dependent on whether agricultural fields are then used for other purposes.

The Federal, Tribal, State, and local programs designed to help salmonid recovery in the Columbia River Basin would not affect land uses in the Mid-Columbia area, except for any land acquisition or restoration projects that may occur in the tributaries. These projects would occur under any alternative, and effects are described under Section 4.6.1.2, Associated Tributaries. These independent projects are not expected to affect any land uses in the Mid-Columbia River area.

5.7.7 SOCIOECONOMICS

Under Alternative 1, there are no expected changes in population, employment, and income that would affect or be affected by the overall Columbia River system over the next 50 years. Under Alternatives 2 and 3, drawdown could affect overall employment, particularly in the agricultural industry. Those no longer employed as a result of the loss of agricultural water resources would be expected to search elsewhere in Washington and Oregon for work. This scenario would occur under either permanent or seasonal drawdown and would primarily affect low-income workers, many of whom are minorities.

Other fish conservation measures associated with Alternatives 2 and 3 at the project sites may result in a small increase in hiring of biologists for conducting studies and engineers for designing fish passage structures or helping to increase fish passage efficiencies at existing structures. These effects are not substantial enough to affect socioeconomics in the Columbia River Basin.

Federal, Tribal, regional, State, and local programs developed for salmonid recovery would help to increase fish populations in the Columbia River system. The increased fish populations would aid the fishing and recreation industries, which are dependent on a reliable fish resource. These efforts are independent of the project and would occur under any of the alternatives.

The Plan Species Account under Alternative 3 would help to support these efforts in the Entiat,

Wenatchee, Okanogan, and Methow Rivers. Although land acquisition would not alter employment in the region, riparian restoration would result in the temporary employment of workers as they help to improve habitat conditions in the four tributaries. Because the effort would likely be short-term and not involve a large number of workers, changes in socioeconomics are expected to be minimal and limited to the communities located near the tributaries. No larger socioeconomic effects would occur in the Columbia River Basin as a result of habitat restoration occurring in the four tributaries.

5.7.8 AESTHETICS

Project aesthetics are not expected to be altered by other activities in the Columbia River, and there are no scenery changes within the project area that could affect other activities and facilities outside the project area under any alternative. There are no other planned projects in the vicinity that would degrade visual quality in the basin. An exception would be drawdown, which could potentially occur under Alternative 2 or 3. Permanent drawdown would affect overall aesthetics in the area with a decrease in quality of the visual scenery over the short term (up to 10 years). Visitors may be attracted to other areas in the Columbia River region and elsewhere, which may alter long-term visitor usage. However, with permanent drawdown, once the shoreline is revegetated, scenery effects would return to existing conditions, although a longer and wider shoreline would be visible. With seasonal drawdown, riparian habitat would be reduced or eliminated, and may not be reestablished because of the constantly fluctuating water levels. In this latter situation, effects to scenery would be permanent.

5.7.9 RECREATION

There are no expected changes in recreational uses at the three dams that would affect other recreational uses or users in the Columbia River system for any of the alternatives. Likewise, there are no anticipated changes in recreational uses throughout the Columbia River system that would affect those uses in the project area. Exceptions are the tributary habitat improvements that would occur under Alternative 3, the potential for project drawdown that could occur under Alternatives 2 or 3, or drawdown that could occur at other dams in the Columbia River. Possible exceptions are described below.

Recreation effects from tributary habitat improvements under Alternative 3 are already described in Section 4.10.3, Associated Tributaries. These effects may include a temporary decrease in access as the tributary construction improvements occur and a potential increase in passive recreation opportunities for viewing new conservation areas or natural resource improvements when the projects are completed.

Effects from project drawdown to recreation users and uses are described in Sections 4.10.2, Alternative 2 and Section 4.10.3, Alternative 3. These effects include a decrease in access and use of recreation facilities that are located at the shoreline of the Columbia River or other recreation boating opportunities within the Columbia River. It is possible that these recreational users could be displaced to other areas of the Columbia River. If drawdown were to occur at other locations in the Columbia River, such as the John Day Reservoir, it is possible that those recreational users could be displaced to areas of the Mid-Columbia River, thereby increasing competition for recreation resources in the project area. However, once water access is reestablished following drawdown, visitation may increase dependent on the extent and quality of fishing and boating opportunities in the project area.

Permanent drawdown may have short-term effects as the vegetation adjusts to the shoreline changes, whereas seasonal drawdown would affect all parks and facilities located along the Columbia River shoreline. These facilities would either be removed altogether or be usable only a portion of the year when water levels rise to pre-drawdown conditions. However, in both situations, once drawdown occurs, there would be less usable area for boating.

5.7.10 CULTURAL RESOURCES

Project operations under any alternative would not affect cultural resources in the Mid-Columbia region. One possible exception would be tributary habitat improvements funded through the Plan Species Account, which would occur under Alternative 3. However, these projects would be reviewed independently once identified, with a separate checklist and environmental permitting process to ensure protection of the environment, including cultural resources. Project operations associated with any of the alternatives would not affect any regional plans regarding cultural resources. In addition, there are no regional cultural resource plans that would affect the project alternatives.

Native and hatchery-raised salmon and steelhead are an important cultural resource for Native American Tribes. Any alternative that would result in the reduction of hatchery or wild fish would result in adverse impacts to the traditional cultural resource of salmon. Alternative 1 would not result in any reduction, although the conservation measures associated with Alternative 1 are not as likely to increase fish populations and decrease mortality through the dams. The fish conservation measures associated with both Alternatives 2 and 3 should help to increase wild fish survival. Alternatives 2 and 3 may both result in a decrease in hatchery production levels. For Alternative 3, the review of hatchery production would occur in 2013 and every 10 years thereafter, whereas for Alternative 2, the reviews are not yet determined.

If a decrease in hatchery production occurs without a simultaneous increase in wild fish populations, then Native Americans would likely have a decrease in the amount of commercial and subsistence harvest of salmon. This effect would occur throughout the Columbia River and affect the several Tribes that reside in the Columbia River Basin.

The Federal, Tribal, State, and local salmon recovery plans, which would occur under any action alternative and are independent of the project, would help to increase production of wild fish, which would be a benefit and occur for all alternatives. These efforts include the Tribal *Wy-Kan-Ush-Mi Wa-Kish-Wit* (also known as Spirit of the Salmon plan), which emphasizes reliance on natural production and healthy river ecosystems. The plan was developed for rebuilding salmon populations upstream of the Bonneville Dam and increasing lamprey and sturgeon populations. The plan was developed to support Tribal harvest.

Alternatives 2 and 3 would help to ensure that the Federal Government's Trust responsibility is implemented in protecting and restoring fish populations, a Native American cultural resource. This includes the habitats needed to support fish resources. In particular, the Plan Species Account associated with Alternative 3 would help to rebuild fish habitat in the four tributaries.

Through implementation of fish conservation measures at the dams, both Alternatives 2 and 3 would help to rebuild fish populations and increase fish survival in comparison to Alternative 1, which would likely result in continuing the existing fish production levels over the next 50 years.

5.7.11 ENVIRONMENTAL JUSTICE

Alternative 1 would have no cumulative effect on low-income and minority populations within and outside of the project area. Under Alternatives 2 and 3, the conservation measures planned at each of the project sites would not affect or change existing employment or demographics of low-income or minority populations either within or outside of the project area. Other components of Alternatives 2 and 3 that may affect low-income and minority workers include the possibility of drawdown, hatchery production changes, and projects funded under the Plan Species Account.

Drawdown is a remote possibility under Alternatives 2 and 3. If drawdown were to occur, irrigation intake structures might no longer be submerged in the project reservoirs, which may affect agriculture and loss of future crops. This effect may result in a decrease of employment opportunities in the Mid-Columbia agricultural basin, which would specifically affect minority and low-income workers. These workers would likely depart the area in search of employment. The displaced workers may move to other areas within the Columbia Basin in search of work, which would increase competition for this type of employment. The significance of this effect would be evaluated in a separate EIS. Drawdown would not occur under Alternative 1.

Changes in hatchery programs that may result in a decreased production of hatchery fish could occur at any time over the next 50 years under Alternative 2. Under Alternative 3, the review of hatchery production would occur in 2013 and every 10 years thereafter to determine if a decrease in hatchery fish would reduce any detrimental effects that hatchery fish may have on Endangered Species Act-listed fish populations. For comparison purposes, hatchery fish production is assumed to remain unchanged under Alternative 1. A decrease in hatchery production would likely result in fewer and less successful fishing opportunities, particularly for Tribal subsistence and ceremonial fisheries.

Funding for the Plan Species Account proposed under Alternative 3 would help to increase the populations of naturally spawning fish in the four tributaries and passing through the Mid-Columbia River. If successful, minority and low-income populations would have greater fishing opportunities and success. This would help minorities and low-income populations in providing fish for subsistence uses and for Tribal harvests. This benefit would not occur under Alternatives 1 and 2.

5.8 CUMULATIVE EFFECTS SUMMARY

The Federal, Tribal, State, and local salmonid recovery programs that are expected to occur throughout the Columbia River Basin would help to increase wild fish populations in the Columbia River. These recovery programs would occur under Alternative 1, and be in addition to those implemented at the Mid-Columbia River PUD projects under Alternatives 2 or 3. These programs address a wide range of issues affecting salmon populations in the basin, typically focusing on the "All H" (hydropower, habitat, hatcheries, and harvest) strategy.

The recovery programs are expected to:

- return river and stream shorelines to natural riparian conditions over time,
- result in land acquisitions to convert agricultural/industrial shoreline habitat into natural riparian habitat conditions,
- result in hatchery reforms that decrease negative effects that hatchery fish may have on wild fish populations,
- help to evaluate fish harvest and develop reforms to minimize the direct and indirect impacts to listed species,

- increase predator control fishery programs, and

- improve water quality conditions in the Columbia River.

These efforts, along with the additional fish conservation measures associated with Alternatives 2 and 3, are expected to increase the production and survival of wild fish in the Columbia River. Alternative 3 would have the increased advantage of a Plan Species Account to help restore salmonid habitat in the four tributaries associated with the Mid-Columbia River. This program would be in addition to other habitat restoration projects that would occur under all the alternatives, but not funded by the PUDs.

Other environmental effects of the Columbia River Basin recovery programs and implementation of Alternatives 2 or 3 include an increase in native riparian vegetation, increase in wildlife dependent on riparian habitat, a decrease in salmonid predators (piscivorous fish and birds), potential changes in land ownership and use (conversion of land to conservation areas), an increase in employment associated with habitat restoration and commercial and recreational fishing, more natural aesthetic settings in salmonid streams, an increase in passive recreational opportunities (such as hiking and boating), and increased protection of Native American cultural resources, including salmon.

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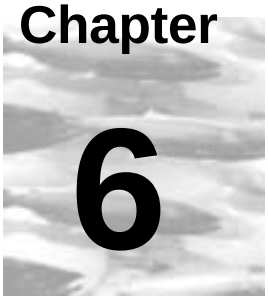

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CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 6

- New references were added for the FEIS.

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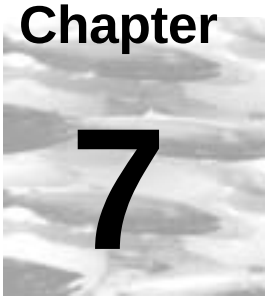


Glossary

CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 7

- Additional terms were added, including those used for economics.

Chapter

7 GLOSSARY

303(d) list – A list of water bodies that the WDOE has identified as having impaired water quality based on evidence that specific water quality standards have not been met. Section 303(d) of the Federal Clean Water Act requires that states prepare and periodically update these lists and develop controls to bring the water bodies into compliance with standards and protect beneficial water uses (e.g., water supply, cold-water fisheries).

Adaptive Management – The process of monitoring the implementation of conservation measures, then adjusting future conservation measures according to what was learned. Adaptive management can also include testing of alternative conservation measures, monitoring the results, and then choosing the most effective and efficient measures for long-term implementation.

Alevin – The life stage of salmonids between hatching and active feeding when the yolk sac is still present, generally equivalent to sac fry or larval stage.

aMW – Average megawatts per hour for every hour in the period from March through September for this project.

Anadromous – Describes the life-history characteristic of a fish species that reproduces in freshwater, migrates to the ocean for some portion of its rearing stage, and returns to freshwater as an adult.

Aquatic Macrophytes – Plants that occur entirely immersed within or under water.

Artificial Supplementation – Hatchery programs that are used to enhance natural reproduction in the natural environment.

Basalt – A fine-grained, igneous rock dominated by dark-colored minerals. Cliffs along the Columbia River Valley are typically formed in basalt.

Base Flow – The normal low flow that occurs seasonally in a river or creek. During a period of run-off from rain or snowmelt, streams rise above base flow levels and then recede to base flows sometime after the runoff event has passed. Base flows are sustained by groundwater discharges or snowmelt that may vary seasonally (e.g., higher base flow in the spring and lower in the summer).

Biological Assessment – A requirement under the Endangered Species Act, to assess the effects of a Federal action on a Federally listed threatened or endangered species. A biological assessment report is prepared by the project proponent and provides existing and projected conditions that affect a threatened or endangered species and the proposed mitigation measures that minimize or avoid impacts to these species.

Biological Opinion – An opinion from USFWS or NMFS as to the effects of a Federal action on a Federally listed threatened or endangered species. A biological opinion is a report that reviews and considers the adequacy of the biological assessment that is initially prepared by the project proponent. The biological opinion includes conservation measures recommended by the agency to protect the listed species.

Biological Productivity – Capacity of an ecological system to produce or support a particular population size of an animal (fish) or plant species.

Broodstock – Group of fish that are used to provide eggs and sperm to produce a hatchery stock for supplementation purposes.

Bypass System – Structure in a dam that provides a route for fish to move through or around the dam without going through the turbines. See also Juvenile Bypass.

Candidate Species – As defined by the USFWS and NMFS, candidate species are wildlife, fish, or plants being considered for listing as endangered or threatened, but for which more information is needed before they can be proposed for listing.

Channel Structure – Channel structure is formed by river bed roughness elements like bars and bends, in-channel logs or debris jams, bank vegetation, and large rocks. Channel structure is important for channel flow velocities, aquatic habitat, and preventing channel erosion.

Columbia Plateau – Relatively flat region of eastern Washington and northern Oregon formed by vast accumulations of near horizontal flows of basalt lava.

Conservation Measures – Actions that a non-Federal property owner voluntarily agrees to undertake when preparing a habitat conservation plan.

Covered Species – Species that have been adequately addressed in an HCP as though they were listed, and are therefore included on the permit or, alternatively, for which assurances are provided by the permittee that such species will be added to the permit if listed under certain circumstances. Covered species are also subject to the assurances of the No Surprises policy. Also referred to as ***Plan species***.

Critical Habitat – Specific areas occupied by a species that contain physical and biological features essential to the conservation of the species, and which may require special management considerations for protection. These areas might provide space for individual or population growth, nutritional or physiological requirements, breeding and rearing habitat, or shelter or cover for protection, or they might represent the historical or geographical distribution of the species.

Cultural Resource – Nonrenewable evidence of human occupations or activity as seen in any district, site, building, structure, artifact, ruin, object, work of art, architecture, or natural feature associated with the cultural practices or beliefs of a living community.

Cumulative Impact or Effect – Under NEPA regulations, the incremental environmental impact or effect of the action together with the impacts of past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Under Endangered Species Act Section 7 regulations, the effects of future State or private activities not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02).

Dam – A structure impounding a river.

Delist – To remove from the Federal list of endangered and threatened species (50 CFR 17.11 and 17.12) because such species no longer meets any of the five listing factors provided under Section 4(a)(1) of the Endangered Species Act and under which the species was originally listed (i.e., because the species has become extinct or is recovered).

Dissolved Oxygen – The amount of oxygen that is in a solution of water.

Drawdown – The distance that the water surface of a reservoir is lowered from a given elevation as water is released from the reservoir. Also refers to the act of lowering reservoir levels.

Effect or Impact – Under NEPA regulations, a direct result of an action that occurs at the same time and place; or an indirect result of an action that occurs later in time or in a different place and is reasonably foreseeable; or the cumulative results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.8). Under Endangered Species Act Section 7 regulations, "effects of the action" means "direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02).

Embankment – The earthen portion of a dam that is typically filled in after the concrete portion is built to form the reservoir.

Endangered Species – A species of plant, fish, or wildlife which is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act – The Endangered Species Act of 1973, 16 USC §§ 1531 through 1543, as amended and its implementing regulations. Federal legislation which provides a means to ensure the continued existence of threatened or endangered species and the protection of critical habitat of such species.

Environmental Impact Statement – A detailed written statement required by Section 102(2)(C) of NEPA containing, among other things, an analysis of environmental impacts of a proposed action and alternatives considered, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitment of resources (40 CFR 1508.11 and 40 CFR 1502).

Evolutionarily Significant Unit – A reproductively isolated animal or fish population that represents an important component in the ecological/genetic diversity evolution of the species. The unit typically has a relatively confined historical or geographical distribution. To be considered an Evolutionarily Significant Unit, a population must satisfy two criteria: (1) it must be reproductively isolated from other population units of the same species, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole.

Fallback – Adult fish that successfully pass upstream of a dam, but are either swept or swim through the spillway, turbines, or navigation locks to below the dam.

FERC License – A Federal license for hydroelectric projects that includes requirements and restrictions about how the projects are maintained and operated. The PUD hydroelectric projects are licensed by FERC under the Federal Power Act.

First Year Value – First year value is the cost and foregone power revenues incurred in the first year of the 50-year analysis period.

Fishladder – A series of ascending pools constructed to enable salmon or other fish to swim upstream to pass a barrier.

Fish Passage Efficiency – The portion of all juvenile salmon and steelhead passing a facility that do not pass through the turbines.

Fish Passage Facilities – The features of a dam that enable fish to move around, through, or over a dam without harm. Facilities generally include an upstream fishladder and/or a downstream bypass system. See also ***Fishladder*** and ***Bypass System***.

Flow (or Discharge) – A measurable quantity of water passing through a dam or a reach of river over a given period of time. Flows for rivers in the United States are commonly reported in cubic feet per second (cfs).

Fluvial – Related to rivers or produced by river action, as a fluvial plain or river bar.

Forebay – The portion of the reservoir at a hydroelectric plant which is immediately upstream of the generating station.

Fry – Life stage of fish between the egg and fingerling stages. For salmon this typically refers to fish less then 50 millimeters long.

Gas Bubble Disease – Condition caused when dissolved gas in supersaturated water comes out of solution and equilibrates with atmospheric conditions, forming bubbles within the tissue of aquatic organisms. Gas bubble disease is also known as gas bubble trauma or GBT.

Gas Supersaturation – Concentrations of dissolved gas in water that are above the saturation (100 percent capacity) level of the water.

Geomorphology – Branch of geology that deals with the form of the earth and earth surface and the changes that take place in river and hillside landforms.

Glacial – Related to or formed by a glacier. Extensive glaciers flowed into the Mid-Columbia River area, greatly influencing the river and valley landforms and geologic deposits.

Gneiss – Coarse-grained, metamorphic rock in which bands of differing mineral composition and texture appear.

Graben – An elongate, trench-like structural form bounded by parallel faults, created when the block that forms the valley floor moved downward relative to the blocks that form the valley wall sides.

Habitat – The location where a particular taxon of plant or animal lives and its surroundings; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

Habitat Conservation Plan (HCP) – Under Section 10 (a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application. The HCP process is intended to provide a comprehensive, long-term management plan to protect and facilitate the recovery of threatened and endangered species, and to provide a framework for "creative partnerships" between the public and private sectors in endangered species conservation (H.R. Rep. No. 97-835, 97th Congress, Second Session).

Habitat Improvement – Management of wildlife or fish habitat to increase its capability for supporting wildlife or fish.

Harass – Defined in regulations implementing the Endangered Species Act promulgated by the Department of the Interior as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering" (50 CFR17.3). NMFS has not defined "harass" by regulation.

Harm – Defined in regulations implementing the Endangered Species Act promulgated by the Departments of Interior and Commerce as an act "which actually kills or injures" listed fish or wildlife; harm may include "significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering" (50 CFR 17.3 and 50 CFR 222.102).

Hatchery – A facility in which fish eggs are incubated and hatched and juvenile fish are reared for release to rivers or lakes.

Headwater Elevation – The average or maximum reservoir elevation at the project dam.

Historic Integrity – The extent to which a property has retained its original design and setting.

Historic Property – A property listed on the National Register of Historic Places.

Hydroelectric – Referring to the production of electric power through use of the gravitational force of falling water.

Hydrology – The science of the continuous cycle of evapotranspiration, precipitation, and run-off.

Incidental Take – Take of any Federally listed fish, wildlife, or plant species that is incidental to, but not the purpose of, otherwise lawful activities. See definition for ***take*** [Endangered Species Act Section 10(a)(1)(B)].

Incidental Take Permit – A permit that exempts a permittee from the take prohibition of Section 9 of the Endangered Species Act, provided that a conservation plan has been developed that specifies the likely take and steps that the

applicant will use to mitigate and minimize the take. An incidental take permit is issued by USFWS or NMFS under Section 10 of the Endangered Species Act for non-Federal applicants.

Incidental Take Statement – An incidental take statement is issued under Section 7 of the Endangered Species Act for projects that involve a Federal action. The statement identifies the extent of the take that would occur as a result of the action, as well as reasonable and prudent measures to minimize the take.

Instream Flow – The amount of water in a river or creek required to sustain fisheries and water quality needs.

Intake – The entrance to a conduit through a dam or water facility.

Juvenile – The early stage in the life cycle of anadromous fish when they migrate downstream.

Juvenile Bypass – Facility that is used to collect, divert or guide juvenile fish around a dam that provides a safer passage route than through the turbine units. See also ***Bypass System***.

Kelts – Adult steelhead that have completed spawning and are returning to the ocean. Steelhead can spawn more than once in their lifetime.

Levelized Value – A constant stream of values, using a given interest rate, that produces the same net present value as the non-constant stream of values (if future values change over time).

Listed Species – Wildlife, fish, or plants that are identified as either threatened or endangered within a region, state, or nation. Federally listed species are listed by USFWS or NMFS and consequently receive statutory protection throughout areas where their populations are in decline under the Endangered Species Act.

Measures – Any action, structure, facility, or program (on-site or off-site) intended to improve the survival of Plan species.

Mid-Columbia River – When used in reference to a geographic area, it means that portion of the Columbia River that begins at its confluence with the Yakima River up to the Chief Joseph Dam. It may also be used to reference the Mid-Columbia River Evolutionarily Significant Unit. See also ***Upper Columbia River*** and ***Mid-Columbia River Steelhead Evolutionarily Significant Unit***.

Mid-Columbia River Steelhead Evolutionarily Significant Unit – The ESU includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Excluded are steelhead from the Snake River Basin.

Mitigation – Measures designed to counteract environmental impacts or make impacts less severe. These measures may include amending an impact by not taking a certain action or part of an action; minimizing an impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environment.

Monitoring – HCP monitoring consists of two types: (1) compliance monitoring, in which NMFS monitors the permittee's implementation of the requirements of the HCP, incidental take permit terms and conditions and implementation agreement, if applicable; and (2) effects and effectiveness monitoring, in which the permittee (or other designated entity) examines the impacts of the authorized incidental take (effects) and implementation of the operating conservation program to determine if the actions are producing the desired results (effectiveness).

National Environmental Policy Act (NEPA) – Federal legislation establishing national policy that environmental impacts will be evaluated as an integral part of any major Federal actions significantly affecting the quality of the human environment (42 USC §§ 4321-4327).

National Register of Historic Places – The official Federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

Net Present Value – Discounted value today of the future values using a given discount rate.

No Net Impact – The objective of the HCPs is to achieve 100 percent no net impact for each Plan species affected by the Wells, Rocky Reach, and Rock Island hydroelectric projects. The no net impact standard consists of two primary components: 91 percent combined juvenile and adult project passage survival achieved by project improvement measures implemented within the geographic area of the projects, and a 9 percent compensation for unavoidable project mortality. The utilities would compensate for the 9 percent fish loss at the projects through a hatchery and tributary habitat fund. Hatcheries would compensate for 7 percent of fish mortality at the projects. Habitat improvements in the Mid-Columbia River tributaries would compensate for the remaining 2 percent mortality. This compensation for project mortality would result in a no net impact standard at the three projects.

No Surprises Policy – A policy of NMFS and USFWS providing regulation assurances for an HCP incidental take permit holder that no additional land use restrictions or financial compensation would be required with respect to species covered by the permit, even if unforeseen circumstances arise after the permit is issued that indicate additional mitigation is needed to protect the species.

Noxious Weeds – These weeds are non-native plants that have been introduced to Washington. Noxious weeds can be destructive and competitive with native plants, and difficult to control by cultural or chemical practices. These exotic species can reduce crop yields, replace native plant and animal habitat, affect land values and recreational opportunities, and infiltrate waterways.

Old-Growth Forest – A forest stand characterized by trees well past the age of maturity (dominant trees exceed 200 years of age). Stands exhibit declining growth rates and signs of decadence, such as dead and dying trees, snags, and downed woody material.

Performance criteria – Standards used to determine the adequacy of the mitigation and conservation measures implemented to protect the species.

Permit – An incidental take permit issued to the PUD pursuant to Section 10(a)(1)(B) of the Endangered Species Act to authorize any incidental take of listed species which may result from the PUD's otherwise lawful operation of the project, conducted in accordance with this agreement.

Permit species – For the purposes of this EIS, Permit species are all Plan species except coho salmon (*Oncorhynchus kisutch*). Permit species do not include coho salmon since wild coho salmon are extirpated from the Mid-Columbia region and therefore not protected by the Endangered Species Act.

Physiographic Regions – Areas with similar landforms, geologic materials, soils, and climate.

PIT-Tag – A Passive Integrated Transponder tag (about the size of a grain of rice) transmits a digital code, unique to an individual fish, when the tagged animal passes through a detection tunnel. The tag uses the power emitted by the detection system to transmit the signal, thus it has no batteries (making it functional for years). The tag is typically used on juvenile fish to assess passage survival, as well as to track adult passage rates.

Plan Species – For the purposes of this EIS, Plan species are spring-run and summer/fall-run chinook salmon (*Oncorhynchus tshawytscha),* sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*).

Powerhouse – Section of a dam that contains the turbine units to generate electricity.

Priority Habitats (as designated by WDFW) – Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or

dominant plant species, a described successional stage, or a specific structural element.

Project – (1) Refers to the Anadromous Fish Agreements and Habitat Conservation Plans Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island hydroelectric projects, or (2) refers to an individual hydroelectric project (reservoir, forebay, dam, and tailrace).

Proposed Action – Under NEPA regulations, a plan that has a goal which contains sufficient details about the intended actions to be taken or that will result, to allow alternatives to be developed and its environmental impacts to be analyzed (40 CFR 1508.23).

Proposed Species – A species for which a proposed rule to add the species to the Federal list of threatened and endangered species has been published in the Federal Register.

Quantitative Analysis Report (QAR) – The Upper Columbia QAR process was established to provide decision makers with current assessments of the status of Endangered Species Act-listed spring-run chinook salmon and steelhead runs returning to the Upper Columbia River. Simple population models were developed for Upper Columbia River spring-run chinook salmon (Wenatchee, Entiat, and Methow populations) and summer steelhead (Wenatchee/Entiat and Methow populations). The models are based on reconstructed spawner to spawner return ratios for historical years. Alternative assumptions regarding the effectiveness of hatchery-origin spawners are considered in the analysis for steelhead, and a range of future environmental conditions were analyzed for spring-run chinook. A range of alternative future survival improvements for Upper Columbia River stocks were modeled, including an analysis of the expected survival improvements that could be expected from implementation of the long-term mitigation measures outlined in the Chelan and Douglas County PUD HCPs.

Radio-telemetry – Methodology consisting of attaching or implanting a radio tag in a fish or animal to track its movements or to detect its presence in specific areas that are monitored with a radio receiver and antenna.

Record of Decision (ROD) – Under NEPA regulations, a concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification and discussion of all factors used by the agency in making its decision, identification of all alternatives considered, identification of the environmentally preferred alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement measures, where applicable, for any mitigation (40 CFR 1505.2).

Redd – Depression in river or lake bed dug by fish for the deposition of eggs (spawning nests).

Reservoir – An artificially impounded body of water.

Resident – Describes the life-history characteristic of a fish species that spends its entire life in freshwater.

Riparian Vegetation – Riparian zones are broadly defined as those non-aquatic areas contiguous with waterbodies (wetlands, lakes, streams, and rivers) that are influenced by, and which influence, that waterbody. Often riparian zones exhibit higher plant and animal diversity and productivity than surrounding uplands, and are particularly important to fish and wildlife in arid regions. Riparian vegetation may or may not be distinct from the adjacent upland vegetation.

Rip-rap – Broken rock, cobbles, or boulders placed on the bank of a stream or river for protection against the erosive action of water.

River Terrace – Relatively flat areas formed by the rivers. Terraces near the rivers are active floodplains; higher terraces have been abandoned by river downcutting and are no longer accessed by flood flows. Floodplain terraces are common locations for wetlands and side channels, and are important areas for storage of floodwaters and aquatic and wildlife habitat.

Run-of-the-River Hydroelectric Project – The Wells, Rocky Reach, and Rock Island hydroelectric projects are run-of-the river projects, which means that they do not store substantial amounts of water in their reservoirs. Run-of-the-river hydroelectric projects produce electric power through use of the gravitational force of falling water, and consist of a powerhouse, spillway, and embankments, as well as fish passage facilities.

Salmonids – Fish of the family Salmonidae, such as salmon, trout (including steelhead), char, and whitefish.

Schist – Medium- or coarse-grained, metamorphic rock dominated by subparallel orientation of platy mica minerals.

Scoping – The process of defining the scope of a study, primarily with respect to the issues, geographic area, and alternatives to be considered. The term is typically used in association with environmental documents prepared under NEPA.

Section 10 – The section of the Endangered Species Act dealing with exceptions to the prohibitions of Section 9 of the Endangered Species Act.

Section 10(a)(1)(A) – That portion of Section 10 of the Endangered Species Act that allows for permits for the taking of threatened or endangered species for scientific purposes or for purposes of enhancement of propagation or survival.

Section 10(a)(1)(B) – That portion of Section 10 of the Endangered Species Act that allows for permits for incidental taking of threatened or endangered species.

Section 10(a)(2)(A) – That portion of Section 10 of the Endangered Species Act that identifies the requirements of a habitat conservation plan.

Section 10(a)(2)(B) – That portion of Section 10 of the Endangered Species Act that identifies the findings that must be made in order to issue an incidental take permit based upon the habitat conservation plan.

Section 106 of the Historic Preservation Act – A Federal regulation that requires properties with Federal involvement to take into consideration impacts to properties listed in or eligible for the National Register.

Section 4(d) – Section of the Endangered Species Act that allows NMFS or USFWS to adopt whatever protective regulations it deems necessary for the conservation of a threatened species. This section does not apply to endangered species.

Section 7 – The section of the Endangered Species Act which describes the responsibilities of Federal agencies in conserving threatened and endangered species. Section 7(a)(1) requires all Federal agencies "in consultation with and with the assistance of the Secretary [to] utilize their authorities in the furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." Section 7(a)(2) requires Federal agencies to "ensure that any action authorized, funded, or carried out by such agency…is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of…" designated critical habitat.

Section 9 – The section of the Endangered Species Act dealing with prohibited acts, including the take of any listed species without the specific authorization of USFWS or NMFS for species under the jurisdiction of each agency.

Sediment – Clay, silt, sand, gravel, and cobbles that are deposited into layers by wind, ice, water, or gravity.

Settlement Agreement – An agreement that settles a legal dispute. In the context of this EIS, relevant settlement agreements are the 1990 Wells Long-Term Settlement Agreement, the 1994 Fourth Revised Rocky Reach Interim Stipulation (expired), the 1987 Rock Island Settlement Agreement, and the Vernita Bar Agreement. In addition, the Wells, Rocky Reach, and Rock Island HCPs are also settlement agreements that are expected to supercede all of the above agreements, except for the Vernita Bar Agreement.

Signatory Parties – For the purposes of this EIS, signatory parties refers to those agencies, tribes, and non-governmental organizations that will ultimately sign and abide by the terms of the HCPs. As a result, each of the signatory parties will be represented on the HCP committees.

Sluice – A spill gate specifically designed to drain water from the surface of the reservoir.

Smolt – A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.

Spawning – The releasing and fertilizing of eggs by fish.

Species –any subspecies of fish or wildlife or plants and any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature.

Spill – Water passed over a spillway instead of going through turbines to produce electricity. Spill can be forced when there is no storage capacity and flows exceed turbine capacity, or it can be planned, for example, when water is spilled to enhance juvenile fish passage.

Spillway – The overflow structure of a dam.

State Environmental Policy Act (SEPA) – Chapter 43.21C RCW. Enacted in 1971, it provides the framework for agencies to consider the environmental consequences of a proposal before taking action. It also gives agencies the ability to condition or deny a proposal due to identified likely significant impacts. The Act is implemented though the SEPA Rules, Chapter 197-11 WAC.

Steering Committee – Group or panel of individuals representing affected interests or stakeholders in a conservation planning program, the private sector, and the interested public, which may be formed by the appropriate development, land use, and mitigation strategies, and to communicate progress to their larger constituencies. USFWS and NMFS representatives may participate to provide information on procedures, statutory requirements, and other technical information.

Storage Reservoir – A reservoir that has space for retaining water from springtime snowmelts. Retained water is released as necessary for multiple uses—power production, fish passage, irrigation, and navigation.

Structural Depression – Valley area formed by geologic faulting.

Subyearlings – Juvenile fish less than 1 year old.

Tailrace – The canal or channel that carries water away from a dam.

Tailwater Elevation – The average or minimum water elevation at the toe of the dam.

Take – Under Section 3(18) of the Endangered Species Act, "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" with respect to Federally listed endangered species of wildlife. Federal regulations provide the same taking prohibitions for threatened wildlife species [50 CFR 17.31(a)].

Threatened Species – Any species designated under the Endangered Species Act that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" [Section 3(19) of the Endangered Species Act].

Tool – For the purposes of this EIS, tool means any action, structure, facility or program (on-site only) at the Wells, Rocky Reach, and Rock Island dams that are intended to improve the survival of Plan species migrating through the dams. Tools do not include fish transportation, drawdowns, dam removal, and non-power operations.

Total Dissolved Gas – Total dissolved gas is the amount of all gases that are in solution (e.g., nitrogen, carbon dioxide, oxygen).

Tributaries – Smaller streams or rivers that enter larger water bodies. For example, the Wenatchee

River is a tributary of the Columbia River and Icicle Creek is a tributary of the Wenatchee River.

Turbidity – A measure of the cloudiness or opaqueness of water. In other words, muddy water has high turbidity and clear water has low turbidity. Turbidity is measured by an instrument that passes a beam of light through a water sample and measures the degree to which the light is scattered by suspended particles.

Turbine – Machinery that converts kinetic energy of a moving fluid, such as falling water, to mechanical or electrical power.

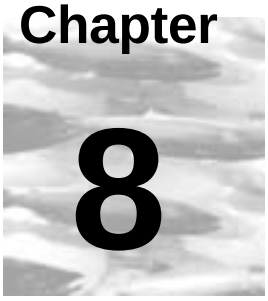
Upper Columbia River – When used in reference to a geographic area, it means that portion of the Columbia River upstream of Chief Joseph Dam. It may also be used to reference the Upper Columbia River Evolutionarily Significant Unit. See also ***Upper Columbia River Spring-Run Chinook Salmon Evolutionarily Significant Unit*** and ***Mid-Columbia River***.

Upper Columbia River Spring-Run Chinook Salmon Evolutionarily Significant Unit – This Evolutionarily Significant Unit contains the only remaining genetic resources of those spring-run chinook salmon that migrated into the Upper Columbia River basin (prior to the construction of Grand Coulee Dam), as well as those spring-run chinook salmon that historically migrated to the Mid-Columbia River region. NMFS also identified six hatchery stocks associated with the Upper Columbia River spring-run Evolutionarily Significant Unit: Chiwawa River, Methow River, White River, Twisp River, Chewuch River, and Nason Creek.

Water Quality Standards – Define the minimum requirements to protect beneficial uses of rivers, creeks, lakes, and other waterbodies and are required by the Federal Clean Water Act for all states to establish and enforce. The current Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A of the Washington Administrative Code) designate water bodies as "Class AA" (extraordinary), "Class A" (excellent), or other classes. Each class has numerical and narrative standards to protect general beneficial uses, with Class AA having the most stringent standards. In the future the standards will be changed to identify specific beneficial uses for each waterbody. Similar to State standards, Tribes administer water quality standards on their lands.

Water Rights – Water rights permits are required from WDOE to withdraw water from rivers, creeks, and lakes, and may be required for groundwater resources. These permits specify where, when, and how much water may be withdrawn.

Wetlands – Areas that are inundated by surface water or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include marshes, bogs, peatlands, and similar areas such as river overflows, mudflats, and natural ponds.



Distribution List

CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 8

- The mailing list was revised, updated, and now includes addresses for all individuals and organizations who provided comment letters on the DEIS.

Chapter

8 DISTRIBUTION LIST

FEDERAL AGENCIES

Bonneville Power Administration (BPA)
Bureau of Indian Affairs (BIA)
Bureau of Land Management (BLM)
Council on Environmental Quality (CEQ)
Federal Energy Regulatory Commission (FERC)
National Marine Fisheries Service (NMFS)
National Oceanic and Atmospheric Administration (NOAA)
Mt. Baker-Snoqualmie National Forest
North Cascades National Park
Office of the Solicitor (USFWS)
Office of General Council, USDA (Forest Service)
Okanogan National Forest
Rural Utilities Service (RUS)
U.S. Army Corps of Engineers – Portland, Walla Walla, and Seattle Districts
U.S. Department of Agriculture (USDA)
U.S. Department of Commerce (DOC)
U.S. Department of Energy (DOE)
U.S. Department of the Interior (DOI)
U.S. Environmental Protection Agency (EPA)
U.S. Fish and Wildlife Service (USFWS)
U.S. Representatives, State of Washington
U.S. Senate, Chief of Staff
U.S. Senators, State of Washington
Wenatchee National Forest

STATE AGENCIES/ELECTED OFFICIALS

Alaska State Department of Fish and Wildlife
Governor, State of Washington
Governor's Salmon Recovery Office
Lieutenant Governor, State of Washington
Oregon State Department of Fish and Wildlife
Oregon Department of Justice
Washington Environmental Council
Washington State Attorney General's Office
Washington State Assistant Attorney General
Washington State Commissioner of Public Lands
Washington State Department of Ecology
Washington State Department of Fish and Wildlife
Washington State Department of Health
Washington State Department of Natural Resources
Washington State House of Representatives,
- Standing Committees -
  - Agriculture & Ecology
  - Environment, Energy & Water Committee
  - Natural Resources
  - Rules
  - Technology, Telecommunications & Energy

Speaker, Washington State House of Representatives
Majority Leader, Washington State House of Representatives
Minority Leader, Washington State House of Representatives
Washington State Representatives, 4th District
Washington State Representatives, 7th District
Washington State Representatives, 10th District
Washington State Representatives, 12th District
Washington State Representatives, 13th District
Washington State Representatives, 15th District
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Washington State Representatives, 24th District
Washington State Representatives, 27th District
Washington State Representatives, 32nd District
Washington State Representatives, 34th District
Washington State Representatives, 35th District
Washington State Representatives, 44th District

Washington State Senate, Standing Committees –
- Agriculture & International Trade
- Environment, Energy & Water
- Natural Resources, Parks & Shorelines
- Rules
- Ways & Means

Majority Leader, Washington State Senate
Minority Leader, Washington State Senate
Washington State Senator, 3rd District
Washington State Senator, 5th District
Washington State Senator, 7th District
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Washington State Senator, 26th District
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Washington State Senator, 39th District
Washington State Senator, 40th District
Washington State Senator, 45th District
Washington State Senator, 46th District
Washington State Senator, 48th District

LOCAL AGENCIES AND SCHOOLS

Cashmere School District No. 22
Chelan County Courthouse
Chelan County Commissioners
Douglas County Commissioners
Douglas County Courthouse
Entiat School District No. 127
Malaga/Colockum Community Council
Mayor, City of Brewster
Mayor, City of Bridgeport
Mayor, City of Cashmere
Mayor, City of Chelan
Mayor, City of East Wenatchee
Mayor, City of Entiat
Mayor, City of Leavenworth
Mayor, City of Pateros
Mayor, City of Rock Island
Mayor, City of Wenatchee
Mayor, Town of Mansfield
Mayor, Town of Waterville
North Central Educational Service District
Port of Douglas County
Wenatchee Valley Chamber of Commerce
Wenatchee Valley College

NATIVE AMERICAN ORGANIZATIONS

Burns Paiute Tribe
Coeur d'Alene Tribe
Columbia River Inter-Tribal Fish Commission
Confederated Tribes and Bands of the Colville Reservation
Confederated Tribes and Bands of the Yakama Indian Nation
Confederated Tribes of the Umatilla Indian Reservation
Confederated Salish and Kootenai Tribes of Flathead Reservation
Confederated Tribes of the Warm Springs Reservation
Kalispel Tribe
Kootenai Tribe of Idaho
Nez Perce Tribe
Northwest Indian Fisheries Commission
Shoshone-Bannock Tribe of Fort Hall
Shoshone-Paiute Tribe of Duck Valley Reservation
Spokane Tribe of Indians

UTILITIES

Avista Corporation
Public Utility District No. 1 of Chelan County
Public Utility District No. 1 of Douglas County
Public Utility District No. 2 of Grant County
Idaho Power Council
Public Utility District No. 1 of Okanogan County
Puget Sound Energy
Portland General Electric
PacifiCorp
Wenatchee Reclamation District

ORGANIZATIONS

American Lands Alliance
American Public Power Association (APPA)
American Rivers
American Rivers, NW Office
Chelan County Pomona No 23
Chelan-Douglas County Land Trust
Friends of the Wild Swan
Greater Wenatchee Community Foundation
Icicle Creek Watershed Council
National Audubon Society
Northwest Power Planning Council (NWPPC)
National Wildlife Federation
Nature Conservancy of Washington
Okanogan Wilderness League
Peshastin Hi-Up Growers
Pacific Northwest Generating Cooperative (PNGC)
Pacific Northwest Utilities Conference Committee (PNUCC)
Public Power Council (PPC)
Quest for Economic Development
Rivers Council of Washington
Save Our Wild Salmon
Sierra Club
Sierra Club Legal Defense Fund
Trout Unlimited
Washington Growers Clearing House Assn.
Washington PUD Association
Washington Trout
Wenatchee Downtown Association

BUSINESSES

ALCOA
American Silicon Technologies
Cashmere Valley Bank
Central Washington Hospital
Cockrill & Weaver, P.S.
Colockum Transmission Company
D. Rohr and Associates
Davis, Wright & Tremaine
Development Partners, LLC
Dick Nason Consulting Inc
Duke Engineering
Erlandsen & Assoc.
Foreman Arch Dodge Volyn & Zimmerman
Gordon, Thomas & Honeywell
Historical Research Associates, Inc.
Hobbs, Straus, Dean & Walker, LLP
Jeffers, Danielson, Sonn & Aylward, P.S
Law Offices of Tim Weaver
Litchfield Consulting Group
Mann & Gellatly
Marson & Marson
Northwestern University
Ogden Environmental and Energy
Pacific Aerospace & Electronics, Inc
Paine Hamblen
Parametrix, Inc.
Perkins Coie
Stemilt Growers, Inc
Steptoe & Johnson
Thompson Ass
Thomas H. Nelson Law Offices
Triangle Associates, Inc.
Troutman Sanders
Van Ness Feldman, P.C.
Vanderstoep, Remund & Kelly
Wenatchee Valley Clinic
Weyerhaeuser Company

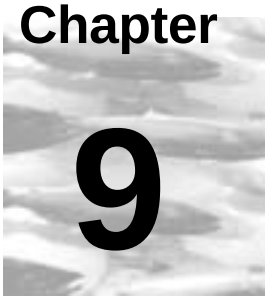
MEDIA

Associated Press
KHQ Television (Spokane)
Douglas County Empire Press
KIMA Television (Yakima)
KING Television (Seattle)
KIRO Television (Seattle)
KOMO Television (Seattle)
KOZI Radio (Chelan)
KPQ Radio (Wenatchee)
KREM Television (Spokane)

KXLY Television (Spokane)
PR Newswire
Seattle Post-Intelligencer
The News Tribune
The Columbian
The Herald
The Oregonian
The Seattle Times
The Spokesman-Review
Tri-City Herald
Wenatchee World
Yakima Herald-Republic

LIBRARIES

Brewster Community Library
Chelan Community Library
Colville Tribal Libraries/Resource Center
Entiat Community Library
Leavenworth Community Library
Multnomah County Library, Central Library
Okanogan Community Library
Oregon State Library
Stream Net Library - Columbia River Inter-Tribal Fish Commission
Twisp Community Library
Umatilla County Special Library District
Washington State Library
Wenatchee Public Library
Winthrop Community Library
Yakima Nation Library
Yakima Valley Regional Library



List of Preparers

CHANGES MADE BETWEEN THE DEIS AND FEIS FOR CHAPTER 9

- Additional FEIS project staff were added.

Chapter

9 LIST OF PREPARERS

The Anadromous Fish Agreements and Habitat Conservation Plans FEIS for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects was prepared by a team of specialists from a wide range of disciplines. The primary team members are listed below.

NAME	BACKGROUND	EXPERIENCE
Ritchie Graves Lead Biologist National Marine Fisheries Service, Portland, Oregon	M.A., Zoology, University of Montana B.S. Biology, Centre College of Kentucky B.S. English, Centre College of Kentucky National Marine Fisheries Service – 9 years Montana Department of Fish, Wildlife and Parks - < 1 year	Experience includes 4 years as a project biologist for the Smolt Monitoring Program at John Day Dam on the Lower Columbia River followed by 5 years of experience evaluating and addressing the effects of mainstem Federal and non-Federal hydroelectric projects on the Columbia and Snake rivers.
Pam Gunther Project Manager Parametrix, Inc., Kirkland, Washington	M.A., Biology, California State University B.S., Wildlife (Forest Resources), University of Washington Parametrix – 10 years U.S. Forest Service – 7 years Ebasco Environmental – 2 years EA Engineering – 2 years	Experience includes more than 18 years in the organization and oversight of environmental impact statements, with expertise in long-range planning and management of natural and biological resources.
Bob Sullivan Fisheries Task Leader Parametrix, Inc., Kirkland, Washington	B.S., Fisheries, University of Washington Parametrix – 16 years Quinault Indian Nation – 5 years	Nineteen years of consulting and research experience on fish habitat assessment and enhancement projects, which includes work evaluating bypass options, total dissolved gas levels, and methods to reduce total dissolved gas at Mid-Columbia hydroelectric projects.
Jim Good Water Resources Task Leader Parametrix, Inc., Kirkland, Washington	M.S., Aquatic Ecology, University of Idaho B.S., Forest Management, University of Missouri Parametrix – 14 years	Experience includes 13 years working with water quantity and quality and sediment issues and pertinent regulations. Other related experience includes hydrology and fish habitat assessments in National Forests with Idaho, Washington, Oregon, and Alaska.
Gary Maynard, AICP Land Use Task Leader Parametrix, Inc., Kirkland, Washington	M.A. Candidate, Geography, University of Washington B.A., Geography, University of Washington Parametrix – 13 years City of Bellevue – 3 years	Experience includes 13 years in land use, energy, natural resources, public services, and noise evaluations, analysis, and management.

NAME	BACKGROUND	EXPERIENCE
Marcia Montgomery Cultural Resources Task Leader Historical Research Associates, Seattle, Washington	M.A., History, Washington State University B.A., History, Lewis and Clark College Historical Research Associates – 3 years BOAS, Inc – 2 years National Park Service– 1 year U.S. Forest Service – 1 year	Experience includes 7 years of experience conducting cultural resource assessments of historic buildings, structures, and archaeological sites and addressing cultural resources according to Section 106 of the Historic Preservation Act, NEPA.
Clay Antieau Plants Task Leader Parametrix, Inc., Kirkland, Washington	Ph.D. Candidate, Horticulture and Botany, University of Washington M.S., Horticulture and Botany, University of Washington B.S., Horticulture, Purdue University Parametrix – 3 years Gaynor Landscape Architects – 3 years Foster Wheeler – 5 years WSU Cooperative Extension – 2 years	Experience includes more than 14 years as a botanist in western Washington specializing in identification and ecology of Pacific Northwest native plants and their habitats. Work includes conducting rare plant and wildlife surveys at hydroelectric projects.
David Mattern, AICP Socioeconomics and Recreation Task Leader Parametrix, Inc., Kirkland, Washington	M.A., Geography, University of Colorado B.S., Geography, University of Washington Parametrix – 18 years	Experience includes more than 16 years in environmental planning with responsibilities in EIS recreation analysis, planning policy evaluations, and land use, visual quality, and public service assessments. Work includes research and reports on land use, visual quality, and recreation for hydroelectric projects.
Julie Grialou Wildlife Task Leader Parametrix, Inc., Kirkland, Washington	M.S., Wildlife Science, University of Washington B.A., Anthropology, Harvard University Parametrix – 4 years Pacific Forest Trust – 2 years Bureau of Land Management – 2 years	Experience includes more than 7 years of work with threatened and endangered wildlife species, habitat evaluations, populations studies, vegetation surveys, and preparation of associated reports.
Bruce Stoker Geology Task Leader Earth Systems, Monroe, Washington	M.S.E., Civil Engineering, University of Washington M.S., Remote Sensing/Geology, University of Michigan B.S., Geology, Michigan State University Earth Systems – 6 years Ebasco Environmental – 9 years U.S. Forest Service – 1 year	Experience includes 19 years in geologic mapping, sediment transport studies, erosion control plans, hydrologic investigations, engineering review, licensing and permitting, and compliance with regulations related to project design.

NAME	BACKGROUND	EXPERIENCE
Jill Czarnecki Project Assistant Parametrix, Inc., Kirkland, Washington	B.S., Geology, University of Puget Sound Parametrix – 2 years	Experience includes 2 years in the organization and preparation of environmental impact statements.
Becky Reininger Aesthetics Task Leader Project Assistant Parametrix, Inc., Kirkland, Washington	M.A., Geography, University of Washington B.A., Environmental Planning, Huxley College at Western Washington University Parametrix – 2 years Pacific International Engineering – 2 years Harza NW/Hosey & Associates – 6 years	Experience includes 10 years in the organization and preparation of environmental documents including EAs, EISs, and FERC License applications.
Daryl Wendle Senior Planner Parametrix, Inc., Kirkland, Washington	M.A., English, New York University B.A., English, University of Oregon Parametrix – 4 years DKS Associates – 3 years KJS Associates – 3 years Beak, Inc. – 2 years	Experience includes 12 years preparing regional transportation planning and environmental impact studies.
Linda Goetz Cultural Resource Specialist Historical Research Associates, Seattle, Washington	Anthropology Graduate Program (1990-1993), University of Washington B.A., Anthropology, Northwestern University Historical Research Associates – 7 years Dames and Moore – 1 year	Experience includes 9 years in archaeological survey, excavation, and analysis. Other related work includes conducting background research, mapping, processing and cataloging archaeological materials, conducting Indian consultation, and writing and editing professional reports.
Lorena Dinger Technical Editor Parametrix, Inc., Kirkland, Washington	Technical Editing Certification Program, Bellevue Community College Parametrix – 2 years Freelance writer/editor – 3 years	Experience includes over 5 years of technical writing and editing experience, 2 years of which focused on preparation of NEPA environmental assessments and environmental impact statements and other environmental documents.

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Biological Opinions Supporting Incidental Take Permits

Final Environmental Impact Statement for Wells, Rocky Reach and Rock Island Hydroelectric Projects – Permit No. 1391, 1392 and 1393 (2002)

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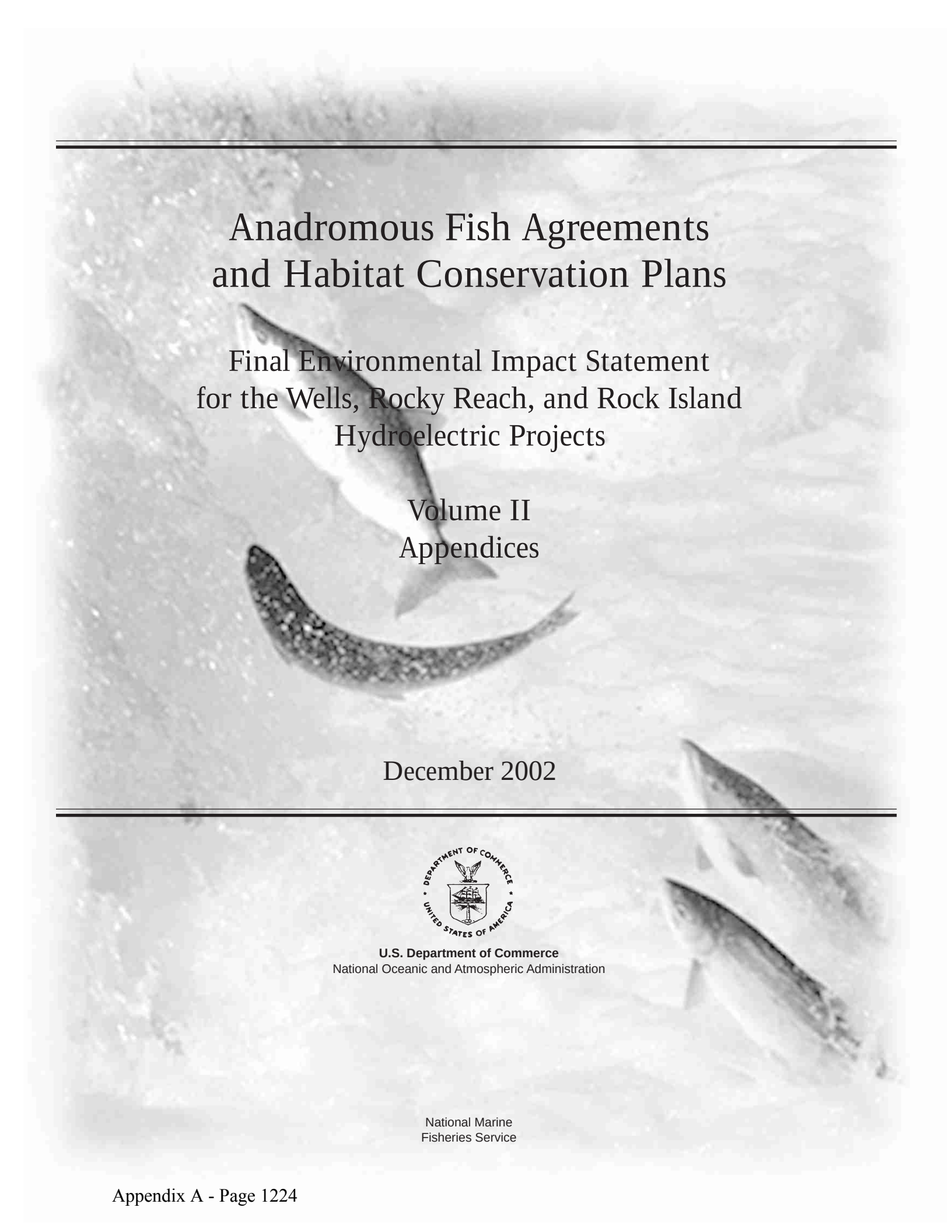

Anadromous Fish Agreements and Habitat Conservation Plans

Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Volume II
Appendices

December 2002

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine
Fisheries Service

Volume II

Appendices

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ACRONYMS

ALCOA	Aluminum Company of America
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BP	before present
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
DDT	dicholoro-diphenyl-tricholoroethane
Ecology	Washington Department of Ecology
EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
HCP	habitat conservation plan
JARPA	Joint Aquatic Resource Permit Application
kcfs	thousand cubic feet per second
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity unit
ODFW	Oregon Department of Fish & Wildlife
PIT	passive integrated transponder
PUD	public utility district
QAR	Quantitative Analysis Report
RCW	Regulatory Code of Washington
ROD	Record of Decision
SEPA	State Environmental Policy Act
TMDL	total maximum daily load
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish & Wildlife
WRIA	Watershed Resource Inventory Area

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DEIS Public Meetings

March 6, 2001

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DEIS Public Meetings in East Wenatchee, Washington
March 6, 2001

This appendix provides the transcripts of the DEIS public meetings held in East Wenatchee, Washington at the Douglas County Public Utility District main office auditorium on March 6, 2001, at 1:00 p.m. and 7:00 p.m. Responses to public comments on the DEIS occurred at the meetings.

1:00 p.m. Meeting Attendees

Bob Dach	National Marine Fisheries Service	525 NE Oregon St Ste 500, Portland, OR 97232-2737
Bryan Nordlund	National Marine Fisheries Service	525 NE Oregon St Ste 500, Portland, OR 97232-2737
Jim Hastreiter	Federal Energy Regulatory Com.	101 SW Main St #920, Portland, OR 97204
Merrill Hathaway	Federal Energy Regulatory Com.	888 1st St NE, GC-11, Washington, DC 20426
Bob Clubb	Douglas County PUD	1151 Valley Mall Pkwy, E. Wenatchee, WA
Steve Hays	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Rod Woodin	WDFW	600 Capitol Way N., Olympia, WA
Dennis Beich	WDFW	1550 Alden St. Ephrata, WA
Jon DeVaney	Rep. Doc. Hastings Office	302 E. Chestnut, Yakima, WA 98901
Lee Barnhebel		90 TCR Carlton, WA 98814
Brian Cates	USFWS	12790 Fish Hatchery Rd, Leavenworth, WA
Brett Joseph	NMFS – General Council	7600 Sand Point Way NE, Seattle, WA 98115
Bob Rose	Yakama Indian Nation	Box 151, Toppenish, WA 98948
Mark Miller	USFWS	Box 848 Ephrata, WA 98823
Lynn Heminger	Douglas County PUD	1151 Valley Mall Pkwy, E. Wenatchee, WA
Bob Bugert	Governor's Office	1133 N. Western Ave., Wenatchee, WA 98801
___ Rice	Irrigator	7776 Ranzle Rd., Blewett, WA 98826
Gray Montague	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Barbara Tilly	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Chuck Peven	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Rob Sutter	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Rick Smith	Wenatchee Reclamation	514 Easy St. Wenatchee, WA 98801-9652
Shane Bickford	Douglas County PUD	1151 Valley Mall Pkwy, E. Wenatchee, WA
Malcolm McLellum	Chelan PUD Attorney	821 Second Ave. Suite 2000 Seattle, WA
Bob Sullivan	Parametrix, Inc.	5808 Lake Wash. Blvd NE, Kirkland, WA 98033
Pam Gunther	Parametrix, Inc.	5808 Lake Wash. Blvd NE, Kirkland, WA 98033

Presentation Part I

Question: Can you explain a little bit about how the relationship of the Biological Opinion that they are operating under now dovetails into the adoption of the HCPs to get some consistencies ….. ?

Bob Dach: There are sort of two related issues that you are thinking about: (1) what's going on in the interim the species were listed in 1997 and 1998 and here it is 2001, and (2) what is covering operations at the project to date. I think that is your question.

Reply: I know there are biological opinions out there.

Bob Dach: There actually are not, well there is a biological opinion for Wells that was finished, we are working how we are covered under one law or not covered under another law, or whether it is good for fish or bad for fish. Over the last few years in our course of trying to exercise the HCPs, if you will, we have sort of been implementing them getting our feet wet, working specific measures of the HCPs over the last few years. Through that process, through the consultation process we've been trying to resolve the inconsistencies. We managed to get a major portion of those resolved for Douglas County, which enabled us to produce their biological opinion on their interim operations. So everything they are doing now is consistent with a program, whatever that may be, for recovering the species over the long-term. We're doing the exact same thing for Chelan County, but because I hate to say this, but there is only one of me, so it sort of takes me a little longer, and Chelan is a little bit more tricky because Douglas was fortunate to have a pretty decent bypass system in place so it was just a matter of making sure that all of the caveats were consistent. For Chelan we are trying to approach it in more of an adaptive way. As you work through an adaptive management process, sometimes, it gets a little complicated on how certain measures under one set of statutes relate to certain measures under another set of statutes. So, in a round about sort of way, what I'm saying is we haven't resolved all of the Chelan issues. But Chelan is in consultation with us, and every year we work out sort of an interim plan until we can figure out how to work all these other things out.

Comment: So this…for the FERC settlement agreement for Chelan.

Bob Dach: For Rock Island?

Comment: The settlement agreement for all the Mid-Columbia.

Bob Dach: There's a settlement agreement in place right now that would be for Rock Island, and yes, we are trying to be consistent with the settlement agreement, with FERC's position on enforcing the settlement agreement, with our legal authority under the ESA, with someone's desire to be protected from third-party lawsuits, with the direction that the HCP has taken us. But, so we're considering all of this in the case of Rock Island. At Rocky Reach, where there was never really a settlement agreement reached from the 1979 lawsuit, which is actually coming out. But because it was never actually reached, we're working under the Fourth Interim Stipulation and trying to make sure that that is

coordinated with everything else that we're doing. I think a good example of that is the construction of the Rocky Reach bypass, which we're working with Chelan right now to ensure that it meets the terms of the stipulation, that it meets the terms of the Endangered Species Act, and it meets the terms of the proposed HCPs.

Question: So they all should be consistent?

Bob Dach: They all need to be consistent. And you can imagine that it is easy to be inconsistent, it's a little bit more difficult to make sure that we are consistent with everything and it takes us a little bit more time. But I think we're getting there.

Comment: If I could add one thing to what I heard in that questions that was how the interim processes dovetail with the HCPs, and I think the fundamental distinction is that the HCPs are considered part of the NEPA process that pertain to the long-term operations of these projects. Whereas the things that Bob has described is the interim protection plans that are really looking at the current operations and the development and compensation of the long-term plans. So by resolving issues of consistencies, and so forth, we are not prejudging what happens in the long-term, trying to solve the problems right now. Obviously, they provide valuable information; it gets us a little further down the road toward the long-term objectives. But we were not separately, through a separate processing decision, to take it to the long-term effort.

Question: Has NMFS been trying to determine if the Section 10 is the correct section, all the time that we have been working on this, seven years?

Bob Dach: The issues that I have raised are the things that come up, you need to keep in mind that they're issues that have been generated by all of the parties. So, we could certainly say that it is consistent and I think that we have. However, it has been pointed out to us from a number of different comments, specifically through the scoping process, that we did last….. , and as a result of the 1998 declaration, people getting back with us questioning whether or not it is something that we can actually do. So those are the sorts of things that we are trying to work our way through now. Again, like a lot of these things we could very well make a decision on what we think is appropriate, but we have to be able to support and justify that with the available information. When it comes down to it, everybody in essence has to be pleased with the outcome or the process isn't going to work. Well it will work but there will be some hiccups along the way. We're working on it; we don't have it resolved yet.

Question: Bob, did I hear you say that there are parties questioning whether or not NMFS should pursue the Section 10 route?

Bob Dach: Yes.

Question: Which parties are concerned….. ?

Bob Dach: I'm not sure I remember….. Of course, council….. A couple of the environmental groups, specifically Save our Wild Salmon and…I've forgot the other one-two NGO that were not part of the original discussions.

Question: Then can I continue on with that? Then is the issue related to Trust responsibilities…..

Bob Dach: That is certainly what the Tribes are concerned with.

Question: What are the concerns of the Tribes?

Bob Dach: It is difficult to paraphrase, but in essence the relationship between Section 10 and the associated features, particularly the No Surprises, not only with the Endangered Species Act but also provisions under the Federal Power Act.

Brett Joseph: I would just caution that what is being reflected here is that in development of the HCPs there has been a consistently supported process, where we've had all of the various stakeholders, including the groups that Bob mentioned, that that resulting process going into the development of a proposal that we are not considering with the permit, but that our decision on the permit will now be on public record that we are now in the process of developing so that those groups that continue to have concerns reviewing the way that it comes together and that it will be available… in the document. That it is incumbent on them, as well as all reviewers to raise those concerns through this process on the record. What we will be relying on is this record.

Bob Dach: Is anyone on the telephone? Is the phone on?

Comment: I don't think so.

Presentation Part II

Comment: Bob, speaking of Douglas, I may have read the BO wrong, but I thought there was a benchmark catch phrase even in the BO, one that I'm concerned with that started with the EIS and that the DEIS or EIS has to be approved by the end of this month.

Bob Dach: Right. The way that the Douglas interim biological opinion is set up was that it has a definite sunset date of April of 2002. Because what we don't want is….. because the Douglas BO says that they are moving in the right direction, it doesn't say that they are doing everything that they can to recover the listed species. That is consistent with our policy, but none-the-less in April of 2002 we're prepared to go back in and say OK you guys are going to have to do all this because we need you to meet these standards for listed species. We couldn't keep pushing that off and saying every two years, "Well, they're moving in the right direction, they're moving in the right direction," because if they're not moving in the right direction quickly enough, it doesn't matter. So, that's why there's a sunset date on the interim biological opinion for Douglas. We gave this until 2002, we put that thing together a year and a half ago, or whenever it was, we made it specific to match up with how long we thought it would take us to get this agreement…the HCP, or to phrase it more correctly, to get a decision on where we're headed with the HCP.

Brett Joseph: Bob if I could clarify one point under our role under the ESA - the manner in which we say what needs to be done is through, is by means of our formulation of a biological opinion. Which is supported by the best available information through the consultation

process at that applies whether we're in a Section 10 process or Section 7, we still have to be developing the record to formulate our biological opinion. This is an iterative process that would be the framework of the biological opinion and allow us to come back to revise our recommendation regarding what needs to be done. But the distinction here is that I think comes in with context is that under the implementation agreement we do not have-we're not preserving authority to dictate what action is taken that goes with the recommendation. But I wanted to clarify that we are not making those recommendations in an arbitrary manner simply because the ultimate burden of proof is on the proponent of the action.

Malcolm McLellum: I think that was unfair. The dispute resolution process in not binding, and it indicates that it is binding and that is technically not true. It's a non-binding decision. The key is that if somebody wants to take the result of the dispute resolution forward with FERC, then the opinion that's derived from the dispute resolution can be admitted into evidence so that the hope is that by going through the dispute resolution process the parties won't find it necessary to continue to fight and be able to take that decision and act on that. And with regards to the burden of proof, NMFS specifically reserves the authority to not take an issue to the dispute resolution; they retain the authority under the Endangered Species Act to deal with enforcement issues through the ESA. That is one of the significant exceptions to an alternate dispute resolution.

Bob Dach: Let me just say that it is an issue. It can be inferred, when we look at it, not to belabor the point too much, but without being clear what it is we would be enforcing, meaning that as long as we are technically inside of the framework of the HCPs, then there would be nothing for us to enforce under Section 9 once we have issued the permit. Now what happens then is there can be some scenarios where in essence everybody would have to agree that your violating Section 9 somehow, in order for us to actually have something that we could actually enforce. Which makes the real application of this a little bit less straightforward.

Comment: As I read it enforcement of the incidental take permit shouldn't be the issue, because NMFS retains the right to enforce an incidental take permit through the ESA without first having to resort to resolving the issue under an alternate dispute resolution.

Brett Joseph: Let me just suggest that for the purpose of this hearing, this is not intended to be a debate although it's good to flag these as issues that have cropped up. To the extent that this raises questions or further clarification maybe warranted, I think it's appropriate to raise it and flag it as an issue, but what is being said here may constitute different interpretations that underscore the issue for having that issue clarified.

Bob Dach: And I have it, and I think it's good to know that it's an issue when we get to issues, I have to..… but I'm not trying to present one side over the other, so thanks for pointing that out.

Question: I have a question about the withdrawal provisions this is a 50-year HCP theoretically but in 15 years or 20 years either of the PUDs could withdraw from the HCPs unilaterally?

Bob Dach: My read is, this is an issue, so we could get into a debate. But my read is not so much that the PUDs are going to want to get out of this agreement. Correct me if I'm wrong, but my read is more that the resource agencies wanted to be able to say after the 15 years that the species weren't coming back that we want out of the agreement. It applies both ways, but in my read, I didn't see the utilities as wanting a way to get out of it.

Comment: That's correct.

Comment: This is more than an HCP under the Endangered Species Act, it's a comprehensive settlement agreement, and it's a mechanism for the parties to the agreement to say after a period of time that they can get out, if they elect to choose to. The PUDs are in a different position - this is an incentive to get as many people in the agreement as signatories and there is….. hopefully have not have trapped somebody who is in it. But if they are dissatisfied with the way it's looking after 15 years, or 20 years in the case of Douglas, that they have an option to get out.

Bob Clubb: The difference between the 15 years and the 20 years is basically because of differences in our license termination dates. Rocky Reach license terminates in the year 2006, Wells projects license terminates in the year 2012. And that was to recognize that that was a little farther out and to give us the same kind of deal that Chelan is having addressing withdrawing provisions.

Bob Clubb: Bob, could you go back to your Tributary Conservation Plan slide, I would just like to get a clarification of something. We talked about if total project survival is greater than or equal to 95 percent.

Bob Dach: Yes.

Bob Clubb: That exceeds our standard.

Bob Dach: Yeah, this actually wasn't an issue until yesterday. As I was clarifying, the differences and I knew that Douglas had a standard in there, but I was reading the standard and it seems to be inconsistent with the standards that we were talking about earlier. And indeed it is a higher standard than what we were talking about earlier, and Shane told me it was because of the expectation was that they could be a little bit higher, that they thought there was going to be a higher survival associated with the bypass.

Comment: So that if they could do better than what the standard is, the benefit for them is to be able to drop the amount that they have to put into the tributary fund.

Bob Clubb: Right. The expectation was that the Wells project was pretty friendly towards the fishery resource, and it was a recognition that the project would have that benefit.

Comment: Okay, I just wanted to make sure that's how to read it.

Bob Dach: Yeah, it's good to point out because it seems like a new standard. Whether or not we understand the definition of project survival here, is another question.

Bob Bugert: Bob, could you explain No Surprises.

Bob Dach: In essence what No Surprises says is that we can't come back five years later and say well it's not working out like we thought, or we forgot something, so you have to do this other stuff. Or you didn't address all the requirements that are necessary to address underneath the Fish and Wildlife Conservation Act, or something along those lines. When we have a deal there's some expectation on the part of the utilities that we are not going to come back for another bite of the apple.

Brett Joseph: Just to add to that. Another way of saying that we're looking across the landscape at all these factors that are maybe contributing to the decline of the species and developing our recovery plans to get species to the point of recovery that activities that are covered under a No Surprises guarantee and that are implementing the Habitat Conservation Plan that we've agreed to, will have the guarantee that as long as they are implementing that plan that we're not going to be adding on, except for a situation where we really addressed or gone to all the other activities through the other consultations, and there is kind of an escape valve where if the species is still in decline after you exhaust all remedies that you have to reassess what needs to be done across the board. But we are not going to be singling out, going kind of in the first instance to the PUDs to gain additional recovery benefits.

Bob Bugert: Can I ask a little clarification on that. Is there a precedent under the Federal Power Act for No Surprises that FERC has had to make a ruling on at all? Has this situation come up yet?

Merrill Hathaway: I think you know that the No Surprises policy was produced in the last administration and was an executive department's initiative to address concerns with the flexibility of the Endangered Species Act enacted by the administration to make it work, so to speak, and is a very important concept if the Endangered Species Act is something that the American people cannot accept…..how people would support it. And it seems to make a lot of sense but we kind of observe that from the point of view of an independent regulatory agency, but the long answer to your question. No there is no ….. , unless you're talking about the Federal Power Act about analogs, depending on how these scenarios workout there is no….. I think the Commission has strongly supported all sorts of collaborative efforts….. subtleties of legal and other questions of the Habitat Conservation Plans as being a collaborative effort, people working together. You know….. so we very much appreciate that and therefore people work collaboratively; they're trusting each other and we hope that if it doesn't come to the point where somebody says "Gotcha," you know, or if someone says, "Guess what heads, I win tail you lose." So, I think the Commission would do it's part to try take the sense if this comes before the Commission, the Commission's responsibility that we would act as consistently as the rest of the .....

Bob Dach: One more thing about No Surprises, it's applicable to all plan species so if sockeye or fall chinook were to be listed in the future, there would be no additional requirements.

Steve Hays: Bob, I think that it's important to point out that the requirements that you are talking about are the survival requirements. If you're not meeting the survival standards then additional tools or whatever would be implemented through the appropriate committee. It's a little bit different from what most people think of HCPs for…or other land use actions. In this case, the survival standards are the requirements subject to No Surprises and the actions necessary to get to those standards can vary considerably.

Brett Joseph: Maybe it would also be appropriate at this point in the presentation to make one additional point. And that is Bob's just gone through a long list of issues some of which are still sort of pending and were never resolved in the negotiations, some of which have been identified by NMFS in preparing this DEIS and others which have been identified by other parties in discussions that have occurred over this period of development, and so we're not distinguishing kind of the source of the issues other than to just flag them as areas of focus. But I also want to mention that not withstanding all of these issues, NMFS has made the decision to proceed with the NEPA process on the expectation that, and actually this is a mutual expectation of the parties that were involved in the negotiations, that not withstanding certain unresolved issues that it would be appropriate and informative to proceed with the environmental review process. And then taking in comments and views obtained through that process as information that our hope is will assist in resolving these issues. So that we can not only make a decision on the permit but also to underscore the point that Malcolm made that this is also an anadromous fish agreement and so we are really doing two decisions here. One is a permitting decision under ESA and the other is a decision of whether to proceed in concluding and negotiating a settlement.

Question: Brett I probably heard what I wanted to hear, but let me ask for clarification. There's a lot of issues here that it's hard to imagine that they could be resolved very easily and is there a way to understand to what extent NMFS will allow certain issues to be out there still hanging before a preferred alternative can actually be decided?

Bob Dach: If there is, I haven't figured it out yet.

Brett Joseph: I think our intent is to avoid having significant issues that are unresolved and still out there hanging at the time that we proceed with out preferred alternative, because for NMFS at that point that we're identifying we're saying this is the alternative that we proposed to go forward with the way the NEPA process works, we're saying subject only to consideration of new issues or additional comments that have not been received. Now we're putting out this draft EIS, flagging all these issues, many of which are unresolved or there is I think there is varying degrees they are not of equal significance. But the next iteration of this will be hopefully a final EIS, if this large number of issues still unresolved, the risk is that we end up having to extend this NEPA process or extend negotiations. And it is certainly our hope that does not occur so we're really focusing on this step in the process, the review of the draft EIS as probably the best opportunity to get as much resolution as we possibly can. And then kind of step back and see where we are, reconvene the parties, because this is a negotiation. But if we need to put something further out for public review, we would have to make that judgment call at that time.

Presentation Part III

Rod Woodin: Another question Bob. One of your issues was coordination with Fish and Wildlife Service. Will that be timed such that consultation or whatever happens has to happen under the time frame to include bull trout?

Bob Dach: Yes. I don't know, we have been talking with Fish and Wildlife Service and we have offered them some plans to do this and they're busy trying to figure out how to proceed. So not knowing exactly how we are going to move forward with bull trout, I'm not entirely sure how to answer your question. We recognize that the intent is to incorporate it and include it; ideally we would include bull trout in the biological opinion that we are going to do. And so we get covered. I'm going to work it in up here, and if I haven't answered it by the end of Section III, you can ask it again.

Question: For non-listed species, I assume that your authority is under Section 18 of the Federal Power Act…..?

Bob Dach: Yeah, what we get into in the DEIS a little bit is what we would do for unlisted species and what we would do to pursue our management authority, if you will, through the other avenues that are available at our disposal. The key one being the Federal Power Act. So Section 18, 10a, 10j of the Federal Power Act. Again, we have a lot of other, these little authorities, but none with the teeth of the Endangered Species Act and the Federal Power Act.

Question: ….. you talked about time lines….. could you talk about the interactions occurring between NMFS and/or FERC and Fish and Wildlife Service over bull trout.

Bob Dach: My last discussions with Fish and Wildlife Service..… You might be able to address this a little better Mark {Miller}, but I'll take a stab at it. Fish and Wildlife Service isn't entirely sure how they want to address bull trout. The recommendation that I offered was that we draft a joint biological opinion. So after we select our preferred alternative, when we're developing the biological opinion on that we also evaluate its effects on bull trout at the same time. So we'll have a joint biological opinion, or concurrent biological opinion, and then for issues specific to bull trout that came up during the biological opinion, we would incorporate that back or at least identify they were going to need to be addressed in the HCPs. So, for instance, the one that has me the most concerned is that the U.S. Fish and Wildlife Service is saying that we don't have enough information to do anything for 50 years. So being that the case, we would incorporate that information into our biological opinions, and working through it in my mind there is some sort of off-ramp if necessary to address the effects on bull trout. And that incorporated into the….. potentially incorporated into the HCPs.

Question: The actions under the proposed alternative with regard to bull trout are actions that would have…..

Bob Dach: ….. a negative effect.

Question: They would have a negative effect?

Bob Dach: That's correct.

Question: Has Fish and Wildlife Service made any determination or made any recommendations with regard to the HCPs under NEPA concerning bull trout?

Bob Dach: I haven't talked to them about that issue. Well they don't have to do NEPA because it's not their action, it's our action. And we could in essence use the NEPA process that we have already developed to satisfy any of that sort of requirement. The biggest issue here is their biological opinion regarding the effects of implementation of the HCPs on listed species. And if they're not going to be able to say without a doubt that, they might be able to but what they've told me is that they are not going to be able to for instance give a No Surprises guarantee for the effects on bull trout for 50 years.

Brett Joseph: And since it is a biological opinion through Section 7, theoretically we could reinitiate consultation if we found something out down the road that could negatively impact bull trout.

Bob Dach: Right. And they would reinitiate consultation with us. And there are some provisions in the HCPs that I think we can underscore to make sure how they can be used. One of the provisions is that if there is a regulatory requirement that requires a modification of the HCPs then that may, there are some steps that can be taken at that point to adjust or modify the HCPs. There are some provisions in the HCPs now that I think we can explore which we have to figure out how we can use. One of the provisions is that if there is a regulatory requirement that requires a modification to the HCPs, then that may, I mean there are some issues, so there are some steps that can be taken at that point to adjust or modify the HCPs. And it may be that it makes the HCPs no longer a viable product to move forward and be adopted.

Question: Whatever the preferred alternative that you come up with, including the HCPs, then you have to consult with the Fish and Wildlife Service?

Bob Dach: That's correct. On the issuance of the permit, but see remember that we also have to consult with them on this issuance of the permit. So ideally we would consult with NMFS and Fish and Wildlife Service at the same time.

Question: So is Fish and Wildlife Service aware and prepared for that consultation?

Bob Dach: No, and I started this conversation out by saying that's what I put on the table. That's the way that I think we can handle it most easily. Meaning that we can look at the effects specifically, one of the other options would be to make bull trout one of the permit species and prepare conservation for them. But I'm thinking that that's probably not going to happen. So, what we have to do is look at the HCPs, see what the effect is on bull trout, see if they have to be modified at all to address the potential effects on bull trout. If they do, we go back to the utilities….. and say that the ESA process has shown that we have to make these sorts of modifications in order to address the effects on bull trout but we still have a program.

Comment: To get a little more specific, in the ESA consultation for bull trout there are no guarantees for the time frame of that consultation.

Bob Dach: That's why I want to do a joint consultation, so that I have a little bit of control over how long it's going to take.

Question: How long do you think it would take, it could take five years to get a biological opinion?

Bob Dach: Not legally. Anything could happen; I mean yeah you're right we could never figure out what would happen with bull trout. We could never produce a biological opinion on the HCPs. We're still trying to produce a biological opinion on the HCPs, they're consulting with us over steelhead and the HCPs. So it's not beyond the realm of reason that it will take us longer than that schedule shows.

Brett Joseph: I think that the issue currently under interagency discussion between the Services is just a matter of how the process of consultation on bull trout should be initiated. Obviously, the biological expertise on bull trout resides with the Service, yet we are the action agency for the purposes of this consultation. So it's kind of, it's not an atypical situation where prior to the formal initiation of consultation, you would use informal consultation to develop the body of the information that would be needed for us, actually in this case Fish and Wildlife to formulate a biological opinion. NMFS is not saying we have no responsibility there, but we're saying we coordinate on a lot of consultations given our dual responsibilities under the ESA and it sure should be no different here. But it is an inefficient allocation of resources just to wait…..

Steve Hays: You would have had to have consulted with the Fish and Wildlife Service over the 2000 biological opinion for the federal system.

Bob Dach: No. It's a different deal because it's not our action, the federal system is not our action. The federal system is Bonneville Power, Corps of Engineers, and Bureau of Reclamation. So they have to deal with U.S. Fish and Wildlife independently.

Steve Hays: So did they consult independently?

Bob Dach: Well, they did but it was sort of a joint, there were two separate biological opinions done. One for anadromous species and one for bull trout at the same time.

Steve Hays: So then were they able to pull that off successfully?

Bob Dach: They were. To us that's the second best. The first best is to do one biological opinion. The second best is to do concurrent joint biological opinions. The third best is to go on about different and merry ways. I guess I'm a firm believer in that most people outside the federal government don't understand that there is a difference between the U.S. Fish and Wildlife Service and National Marine Fisheries Service. So what it ends up looking like is that the government is just running around in circles, they're arguing, they can't make a decision, all of these bad nasty government stereotypes. That's how you get this.

Steve Hays: I guess my point is that that's a far more wide reaching decision that was successfully dealt with.

Bob Dach: Yeah, I don't have a concern that we can deal with this. The problem is that under the federal biological opinion remember that's all been done under Section 7. Section 7 says that with new information, change course again. Under the HCPs, with new information we don't change course, per se. We change course but it all has to be done under the framework of the HCPs. So Section 7 is a little bit more flexible with regard to the species, at least from the standpoint of FERC, than we would have under the HCPs. So it may be a little harder to work out the subtleties. Again, what it might mean is that in five years the Fish and Wildlife Service has a bunch more information on bull trout and they request reinitiating consultation. In which case we would have to do that, and if the Service holds our feet to the fire and we're stuck in this quagmire of violating, National Marine Fisheries Service violating the Endangered Species Act with regard to bull trout on the one hand because we're in agreement with the utilities and a bunch of other parties for the long-term protection of anadromous species on the other hand. That's a situation that would be untenable for us. So we need to make sure that it's clear what's going to happen with bull trout with regard to the HCPs. I think we can work it out, talking with Fish and Wildlife Service I'm optimistic that we can work something out.

Brett Joseph: I just want to suggest a couple of things, in the interest of time. First of all, we have a small tape recorder here, so I would like to encourage everyone to speak up with comments because we're sort of hoping for a transcript or a summary of comments received. And also there are a lot of issues that end up becoming questions and I don't want to create the expectation that we are going to resolve all the issues here. Mainly our objective for today is to receive the public comments. It sounds bureaucratic, but we want to get the comments of the record to clarify if we can, but we don't want to spend a lot of time debating the issues.

Steve Hays: Just another question on something that I was a little unclear of. On a federal action, NMFS action is the incidental take permit, is that correct?

Bob Dach: Right.

Steve Hays: OK, so when you were referring in your earlier slide that you were going to Section 7 consultation over the preferred alternative, you had in your mind that that was the incidental take permit.

Brett Joseph: Right.

Bob Dach: Well…..

Steve Hays: You don't do a consultation on selecting a preferred alternative under NEPA. You do a consultation when you actually decide to issue the permit. Is that correct?

Brett Joseph: Right, that's the point where the proposal that we are receiving, in the permit application, the NEPA process is triggered by the fact that we have received an incidental take permit application from the PUDs. At the point where we decide that our proposal is to issue

that permit, we've identified this as our preferred alternative, subject to the completion of the NEPA process.

Steve Hays: I just wanted to make sure that there wasn't another consultation, that I wasn't…..

Bob Dach: No.

Steve Hays: There is no in-between consultation?

Bob Dach: Right. What made it a little clearer if we had done this a different way. Correct me if I'm wrong, but I believe that you could have submitted to us, not only your HCP but an environmental document, an environmental …as well. And then that could have sufficed for a completed Section 10 application that we would then do a biological opinion on. It would require NEPA on top of that as well, but it would be a little clearer, and you saw what we were doing our opinion on. In essence what it does is mushes them together and to answer your question, no there's not some hidden biological opinion on the issuance of the permit, which would only occur it that were the selected approach.

Bob Dach: Before everyone goes, there is a public meeting tonight, another public meeting. I want to know how we did on time, whether we lost anybody, whether there are things we should change for tonight. If anybody has any suggestions, to make me even clearer. Because you all have a background in this, so folks will come in tonight, if you guys didn't have a background could you follow me?

Answer: It was clear.

Brett Joseph: Were there any other comments?

Bob Dach: My facial read says that there are no other comments.

7:00 p.m. Meeting Attendees

Bob Dach	National Marine Fisheries Service	525 NE Oregon St Ste 500, Portland, OR 97232-2737
Bryan Nordlund	National Marine Fisheries Service	525 NE Oregon St Ste 500, Portland, OR 97232-2737
Jim Hastreiter	Federal Energy Regulatory Com.	101 SW Main St #920, Portland, OR 97204
Merrill Hathaway	Federal Energy Regulatory Com.	888 1st St NE, GC-11, Washington, DC 20426
Bob Clubb	Douglas County PUD	1151 Valley Mall Pkwy, E. Wenatchee, WA
Steve Hays	Chelan County PUD	PO Box 1231, Wenatchee, WA 98807-1231
Rod Woodin	WDFW	600 Capitol Way N. Olympia, WA
Shane Bickford	Douglas County PUD	1151 Valley Mall Pkwy, E. Wenatchee, WA
Bob Sullivan	Parametrix, Inc.	5808 Lake Wash. Blvd NE, Kirkland, WA 98033
Pam Gunther	Parametrix, Inc.	5808 Lake Wash. Blvd NE, Kirkland, WA 98033
Malcolm McLellum	Chelan PUD Attorney	821 Second Ave. Suite 2000 Seattle, WA
David Poirier	Lockwood Canaday Irrigation Co.	2474 W. Malaga Rd.
Larry Gordon		531 33rd NW
Svend Westlund		107 N. Lyle Ave.
Elisabeth Westlund		107 N. Lyle Ave.
George Krakowka		2409 #2, Cyn Rd.
Steve Lachowicz	Chelan County PUD	327 N. Wenatchee Ave.
Lonnie DeCamp		2000 Skyline Dr.
Frasier Strutzel	Monitor Community Council	PO Box 259, Monitor, WA
Tom Clark		555 Antoine Ck Rd, Chelan
Dale Helbig		
L.V. Breckenridge		1380 Eastmont #102, E. Wenatchee, WA
Karin Whitehall		Box 476 Entiat, WA
Arnold Asmussen		Box 1, WA 98830
Lonnie Murphy		1400 N. Anne, E. Wenatchee, WA 98802
Whitey Excubus		City of Rock Island
Mike Doneen		602 Daniels Dr. E. Wenatchee, WA
Jim Davis		1195 Road 1 NE, Coulee City, WA
Glen Klock		2113 Sunrise Circle, Wenatchee, WA
Jack W. Keller		319 So. Chelan St, Wenatchee, WA

Introduction

Bob Dach: We are tape recording the meeting tonight so we can get everyone's comments down so we know what they were. I would help us out if when you made a comment you sort of gave us your name, so we know who to respond to. And either come up to the table and we can get you on the tape recorder, or just yell really loudly. But just to let you know that we are taping for the purpose of making sure that we get comments accurately. We had mostly agency folks here today so I would sort of like to get a feel for who is here

tonight. It sort of helps me out to see who is interested in it, who we're going to be getting comments from and that sort of thing. My name is Bob Dach. I'm with the National Marine Fisheries Service. I'm the one with NMFS that is responsible for doing both the environmental review, the Endangered Species Act review of the proposed Habitat Conservation Plans. So that's who I am and what I'm here for. So maybe Merrill you can just let folks know why you're here.

Merrill Hathaway: I'm Merrill Hathaway with the Federal Energy Regulatory Commission. We license or approve the licensing of the mid-Columbia projects.

Jim Hastreiter: I'm Jim Hastreiter. I'm also with the Federal Energy Regulatory Commission. I just want to mention that we're a cooperating agency with National Marine Fisheries Service on this environmental impact statement.

Brian Nordlund: I'm Brian Nordlund with the National Marine Fisheries Service.

Shane Bickford: Shane Bickford, Douglas PUD.

Karin Whitehall: Karin Whitehall.

Arnold Asmussen: I'm Arnold Asmussen, and I'm here because I have a high distrust of National Marine Fisheries Service, and I question their agenda, and I question their science, and I question the way they run this country like a dictatorship without votes on the things that control our lives from one end to the other. I would like to hear some form of reality in this meeting, and that's why I'm here, I kind of doubt it.

Bob Dach: Well, I'll give you what I know of the issues and leave it to the decision on your own on that one. But I'll try to answer questions you have.

Arnold Asmussen: In general National Marine Fishery agents claim to just be following orders, but collectively they're ruining our country. And I'm not a radical; I'm a typical farmer, rancher, and businessman. So that's what you're trying to explain to, if you'd be a little careful and try to explain the things that don't make much sense.

Bob Dach: Point them out and…..

Arnold Asmussen: I'll do my best.

Bob Dach: I don't want to defend this too much but point them out when I come across something.

Frasier Strutzel: I'm Frasier Strutzel. I represent the Monitor Community Council, and I've also spent the better part of five years or six years on the Wenatchee River Watershed Study. And my view is in line with the bumper sticker on my car out there that says "Save a salmon, plug a bureaucrat."

Bob Dach: Man, I'm going to have a hard time with this crowd.

Comment: Well, I kind of agree with what these guys are saying. I'm just a concerned citizen. I've grown up and lived on this side of the state for sixty years and I grew up on Whidbey Island and I'm a sportsman, fisherman all those years, and I've seen the incompetence of the National Marine Fisheries since they've came to being and the fishing has continually gone downhill and poor management that has continued to go disastrous up in Alaska also, other than Canada that has an aggressive plan to fix the situation. I don't think you guys are doing a very good job.

Comment: I'm like this fellow, I came down here as an interested party. About two years ago, we were down in Railroad Springs, California, and this big vineyard down there, hundreds of acres, all dead, no water. I was talking to the residents that live down there and they just ran out of water and they just died. The race track grass is all gone, the vineyards are gone, so that's why I'm interested. I don't like to see these fellows who talk about taking our dam out. We need that water.

Rod Woodin: I'm Rod Woodin with the State of Washington Fish and Wildlife. I'm here to track your public review process.

Steve Hays: I'm Steve Hays with Chelan County PUD one of the original negotiators of the Habitat Conservation Plan for Rocky Reach and Rock Island. It's our application to National Marine Fisheries Service that the proposed plan for tonight is to review the draft environmental impact statement, and Bob will be explaining the differences between our application and some of the other processes.

Bob Clubb: I'm Bob Clubb, Douglas County PUD, and I was one of negotiators for the HCP. And we represent Wells Project which is the top end of the system. The last dam that passes anadromous fish.

George Krakowka: I'm George Krakowka, concerned citizen. Do we get a chance to talk later?

Bob Dach: Sure.

George Krakowka: OK. That's all I'm going to say now.

Dave Poirier: My name is Dave Poirier representing Lockwood Canaday Irrigation Company.

Whitey Excubus: I'm Wade Excubus, mayor of the city of Rock Island.

Tom Clark: I'm Tom Clark. I'm a public advocate and promoter of salmon recovery.

Steve Lachowicz: I'm Steve Lachowicz. I'm with Chelan County PUD Relicensing Team, a project that will be impacted by decisions that are made on the Habitat Conservation Plan.

Lonnie DeCamp: I'm Lonnie DeCamp. I live in Chelan County.

Lonnie Murphy: I'm Lonnie Murphy and at present I work for Chelan County PUD. Part of the year I also work for the Forest Service in this area and I'm here tonight basically at my own

personal will because I'm interested in what your findings are and seeing if they correlate with what happens.

Svend Westlund: I'm Svend Westlund. Just a curious Douglas County resident.

Elisabeth Westlund: Elisabeth Westlund, I just want to learn more about what's going on.

Pam Gunter: I'm Pam Gunter with Parametrix and we're helping to do the NEPA process and I was hoping that anyone who hasn't signed in can do so.

Bob Sullivan: I'm Bob Sullivan, also with Parametrix.

Bob Dach: Thanks, like I said, I like to know who my audience is.

Presentation Part I

Arnold Asmussen: Why don't you have a part in there [comprehensive strategy for dealing with ESA listed fish species] about working with the public, do you have no desire to do that?

Bob Dach: We do.

Arnold Asmussen: It wasn't listed on the slide.

Bob Dach: I probably should have. For instance, this forum, the whole NEPA process, and I'll get into it a little bit further in the presentation. But the whole reason behind it is such that we can get all the information that we don't have down on paper, and get it out to everybody, the general public, agency decision makers, anybody that's interested. And get their feedback and comment. And we actually have a couple of very specific steps in the process to insure that we are soliciting public comment. Then we go through a process by addressing those comments.

Arnold Asmussen: OK, excuse me I guess I misunderstood. I just thought that if your reason for existence is to serve the public you would list it.

Bob Dach: OK.

Arnold Asmussen: I have a question and I don't want you to think I'm here just to agitate you. I really have an interest in this whole process.

Bob Dach: That's OK.

Arnold Asmussen: Looking at Section 10, does that cover private parties, such as people wanting to drive their boats or have things to do on the Wells Pool?

Bob Dach: Right. If your action is prohibited under the Endangered Species Act, if it's actually going to result in the take of the species.

Arnold Asmussen: That's a pretty broad thing, does this take include to harass?

Bob Dach: Yeah, it could be.

Arnold Asmussen: ….. to look at, and are boats going to be included in that do you know? Or who makes that decision?

Bob Dach: I don't know how to answer that question specifically, you know.

Arnold Asmussen: Because it's really broad. There is business interests I'm sure up and down the river that would like an answer to that.

Bob Dach: Right.

Arnold Asmussen: And I don't think that the boats bother them that much.

Bob Dach: Whether or not specific actions need to have an incidental take permit, I don't know. I don't know, as you say, the definition of take is pretty broad.

Arnold Asmussen: So you're developing federal law to the conditions?

Bob Dach: Well, we're not really developing federal law in this case. What we're doing is evaluating the action of permitting the take that results simply from operating the power plants. So we're not looking at …..

Arnold Asmussen: So, you're just looking at the power plants tonight, in this session? It's confusing.

Bob Dach: Yeah. No. The action that is in essence on the table to us is the action of continuing to operate the power plants.

Arnold Asmussen: And the power plants somewhat license the pool behind them, and control what activities take place on each pool?

Bob Dach: I don't know that, in either case, we're not looking at indirect activities that are related, for instance, to recreation on the pools. We're looking specifically at operation of the projects themselves and the effect that operations of the projects have on these fish. So we're not looking at boating, or fishing or anything like that on the pools themselves. Only, in essence, the fact that the dams are there and generating power, and that will go on.

Arnold Asmussen: I'll reserve those specific questions until I…..

Bob Dach: And then again, I got into it a little earlier; this is a coordinating proceeding.

Presentation Part II

Bob Dach: ….. the allocation of unavoidable mortality is not transferable. Why that's in there is specifically to show that if, say you're only getting 89% total project survival, you wouldn't make up the difference by increasing the number of hatchery fish you put in the water.

Arnold Asmussen: Why?

Bob Dach: The hatchery fish themselves don't lead back to the….. in essence the original listing issue. Which the example I used was the 359 redds on the Wenatchee.

Arnold Asmussen: I'm sorry, I'm a little dense on this one. First of all, I have a question. As I drive to Portland about five times a year, I see hundreds of nets. How are you going to get the fish past the nets to the dams….

Bob Dach: The way I can answer it is that they go through a similar process to determine how many fish they can actually keep. So we have a take that is associated with activity then there is a certain level of take that is allowed. They get to…..

Arnold Asmussen: Who decides it?

Bob Dach: National Marine Fisheries Service.

Arnold Asmussen: That's important, that's why I'm here. You guys are not doing a good job. When they first, when the nets, when they first gave the treaties the Indians caught their fish with nets and spearing. Now if they do that again, they can have all the fish they want.

Question: Do you know the current success rate? I think Wells Dam is one of the safer dams on the river for fish. Do you know what percent of juveniles currently pass through Wells to survive the nitrogen loads?

Bob Dach: The survival level that we have for Wells from evaluations that they have been doing for the last three years show, I want to say for juveniles and this includes the pool, Shane can address this as well because he is the one that is actually conducting the studies. But we're looking at right about 95 percent pool and dam passage survival. The adults, we haven't really, this will come up later, but we haven't figured out how to measure survival in adults yet.

Arnold Asmussen: But they might be doing a little better because..…

Bob Dach: The thought process is that adults are doing better. Yeah. We just don't know how to measure it. But we have measured juvenile dam and pool for a couple of species, juvenile steelhead and yearling chinook. And they're coming out right about 95 percent.

Bob Clubb: Actually the average for the three years is a little better than 96 percent.

Arnold Asmussen: So the best dam on the river is just right on the border of that number.

Bob Dach: This number here, juvenile dam passage survival, is a little bit different than pool and dam passage survival and that's what the Wells studies represent. This 95 percent is just, in essence, through the forebay, dam, and tailrace. The information that we have generated at Wells also includes a significant component in the Wells pool. So the thought process was that between the Wells pool and the Wells dam that survival would

be, it had to be about 93 percent and they're getting 96 percent so they're beating it by about 3 percent. At least for those fish that were tested.

Arnold Asmussen: So you're saying that if you can get 91 percent survival of the smolts heading down the river, you talked about getting them back to recover the species, or are you just talking about getting them out to the ocean?

Bob Dach: The 91 percent number is the number that includes the mortality associated for all of the smolts going out and the adults coming back up. So the combination of all the associated mortality has to be less than 91 percent, less than 90 percent.

Arnold Asmussen: Well then, I want to call your attention…..

Rod Woodin: Just that one dam.

Arnold Asmussen: Just for one dam?

Bob Dach: For one dam, right.

Question: What should be done about the island down there with all those gulls that are…..?

Arnold Asmussen: I was just going to bring that up. Rice Island, are you familiar with that? Forty miles from the mouth, there's 8,000 pairs of nesting Caspian terns down there and they eat between 10 and 20 percent of the salmon migrating past the island. That is not a guess; that is tracking salmon with rice grain sized tags. Thousands of these tiny tags end up consumed, digested, and deposited on the sand of the island. Ten to 20 percent of our salmon we're losing down there, yet nothing's been done about it by the National Marine Fisheries Service and I was just wondering if you just don't care about those 10 to 20 percent,

Bob Dach: Well…..

Arnold Asmussen: Only here at the dams.

Bryan Nordlund: I could actually talk to that a little bit because I work directly with the biologists that worked on that project. There was an attempt that was successful to modify the habitat so that the terns don't nest as readily on Rice Island. That was done in recent years. I guess maybe not so surprisingly there were some groups that were offended by that action. They felt that impacts on arctic terns were not any more tolerable than impacts…..

Arnold Asmussen: So those groups were adhered to, and the terns are still there eating 10 to 20 percent of the salmon?

Bryan Nordlund: They actually, what has happened is the terns a lot of them have relocated off of Rice Island now. They're not in as big of colonies as they used to be.

Arnold Asmussen: I mean those groups overrode the idea of shooting the birds to protect the salmon.

Bryan Nordlund: They had some additional modification planned and there was a court injunction that stopped us from doing any additional habitat modifications because of impacts on migratory birds.

Question: What's the percentage that we're losing there?

Arnold Asmussen: Ten to 20 percent.

Comment: I had a follow up to my question. You said that you decide, U.S. Fish and Wildlife, whatever, National Marine Fisheries Service, decides how many fish they can take out of the river with their nets.

Bob Dach: We have a, we have the, we decide, yeah, we decide. It's not quite that simple. As you can imagine there are a number of interested parties that all have a position, that all gets weighed in any decision that's made. We'll make the final call of that take permit issue. So that we don't do it in a box, so I don't want to imply that. We might not make the right decision, but we at least get a lot of input.

Bryan Nordlund: Keep in mind too…..

Comment: You make that decision each year? When you talk about this, they've been in the river for years now and we even ….. less and fewer and fewer salmon.

Bob Dach: We evaluate the decision annually. So the decisions are…..

Question: So, have you ever published how many fish you allow them to catch?

Bob Dach: Yeah. The percentage of fish allotted to, and again it's the percentage of fish allotted to the Tribes, as it relates to our concern that indirectly they would be taking a lot of wild fish that should be up on the Wenatchee spawning. So they can catch a lot of fish, but their component of the population that's the wild population is really the one that we're concerned with.

Bryan Nordlund: Also you have to keep in mind that Bob and myself are, we're particular to the hydro portion of NMFS, there's other divisions that do sustainable fisheries, is the action you're talking about now. And the Rice Island issue was a habitat issue that our habitat division is handling. We can talk to it but that's not really what we're here for tonight. I mean we're, I mean I would be glad to…..

Arnold Asmussen: I have one more thing I would like to cover and that is I think the reason we're all here is because somebody in the National Marine Fisheries Service had determined that there is a difference between wild salmon and hatchery salmon when DNA testing has shown there is hardly any, if any. But to have a person working out of your office in Seattle, Robin Waples, a senior scientist of National Marine Fisheries Service said he is in favor of getting more data for DNA, but doubts his agency's conclusions will change. In other words, he is going to ignore science, he's a scientist hired by the government and tax payer dollars to evaluate science and implement it, but he's saying he's going to ignore it ….

Steve Hays: Bob, I would just like to mention that, I don't remember the date, but a local group is having Dr. Waples and a ….. geneticist speak here in Wenatchee, as well as a neutral geneticist as well.

Bob Clubb: March 20th.

Steve Hays: March 20th, so you'll have a chance to ask that question…

Bob Clubb: It's at the Red Lion, I think at 7 o'clock.

Shane Bickford: There is also a meeting in the Methow on the 21st, the same group.

Arnold Asmussen: To finish my point, sometime in the last million years two chinook salmon swam up the Columbia River and now we have some biologists who have determined that that is now over 300 separate distinct species that are the offspring of these salmon.

Bob Dach: Stocks.

Arnold Asmussen: Do you know how many total stocks they've determined.

Bob Dach: No, I don't know how many separate stocks there are.

Arnold Asmussen: But I, if we, if these people keep going on they'll take every little creek off the side of the Wenatchee River and they'll have a spring, summer and distinct species for the spring run, summer run, and fall run for each little tributary whether it has any water in it or not. I mean, these people are creating species like some people pass gas. If it weren't for these people being able to declare that these salmon are genetically different, which the DNA doesn't support, we wouldn't be here. The hatcheries would be putting out the salmon that we need. And one more point I'd like to make, here's a top Canadian fisheries biologist named David Welch, and he….. this ….. ocean theory, by telling about the pristine, undammed, Keogh River in British Columbia. Where the coho run has dropped 90 percent. There are no dams on this river but the coho run is down 90 percent since 1970.

Comment: The same goes for the Olympic Peninsula, there's no dams on it, the same goes for Alaska. There are no dams on those pristine rivers at all.

Arnold Asmussen: We're here over some fantasy that some biologist has that we've got these different genetic, and they all started with two salmon hatching. That's why we're here.

Comment: Did you ever hear the word overharvesting….. They're the ones that control that.

Bob Dach: I'm not a good person to debate it with you. There are folks that know way more about it than I do. It would be great if they were here.

Arnold Asmussen: I'm afraid they don't work for the National Marine Fisheries Service. We wouldn't have this problem.

Bob Dach: I could just give you my opinion, I couldn't quote facts and data on it.

Steve Hays: Just a real quick note so we can put things into perspective here. National Marine Fisheries Service obviously has management responsibilities to manage the fishery, manage the habitat, and manage other stuff. But Bob's responsibility is to manage the hydro system actions through the FERC. He didn't write the law, of course there are congressmen out there to review the law. That's one point that you might take up. The other thing is that not even National Marine Fisheries Service is immune to lawsuits and the Rice Island incident they wished to be more aggressive to relocation that the Audubon Society and others allowed them to, and were prohibited by a court injunction. They also have proposed an initiative on a lower percent harvest on some of the fisheries and were successfully sued by an advocacy group. So I guess the whole mess is what comes around, goes around, comes around, so just keep that in mind too. Today though we are talking about the two local PUD's proposals to the National Marine Fisheries Service for a plan to maintain long-term operation and to relicense our hydro projects through a Section 10 process for which we could use more local input. And Bob's going to explain the difference between that and a Section 7 process, which is the federal to federal negotiations that occur for the federal projects which is another alternative that could be used in place of ours.

Comment: I just had one more comment. I know that we've kind of gotten out of focus on the hydro projects impacts, but I think everyone here probably realizes that they do have their…salmon passage and survival. I was wondering if you could clarify the 9 percent unavoidable mortality because that actually is more like potential mortality? I guess you're requiring them to meet 95 percent but yet allowing 9 percent?

Bob Dach: No. We're actually requiring that they meet this 91 percent, that's for a combination of juveniles and adults. So this 9 percent mitigates for that. The 95 percent is a sub-product of this, meaning that 95 percent, specifically of the juvenile population, and specifically at the concrete. So you could look at total juveniles need to be 93 percent, which allows 2 percent mortality per dam on adults, if you wanted to. There is some intent behind those numbers, but the number of importance is the 91 percent, and the 9 percent that we're mitigating for, but it's a combination of juveniles and adults.

Rod Woodin: Bob, you might also clarify that if the measures at the projects achieve greater than 91 percent survival, and it's documented, that the 7 percent hatchery production won't be reduced.

Bob Dach: Right.

Steve Hays: The reason that there is a separate number for at the concrete is because there's a lot more opportunities to do things to improve salmon survival at the dam than there is out in the reservoir, for example, where you have less ability to change things. So that's why they're separate numbers. There was a certain amount of effort that was negotiated as to what we would do at our dam in terms of operations and structures to prevent loss of fish, primarily through turbine passage. That, theoretically, you could only get so much

benefit through anything you might try in the reservoirs so it's an additional allowance for reservoirs and adults…

Comment: I have a question, Bob. This agreement, those numbers, apply specifically to each dam, Wells, Rocky Reach, so you're going to have 9 percent unavoidable mortality at each dam?

Bob Dach: Correct. Times nine if they have to go through nine dams.

Comment: Bob, I would just like to make sure people understand the point about the kind of money that each utility is paying for the habitat improvements over the 50-year life of the proposed plan. Do you have totals for each of the utilities and what that will amount to over 50 years?

Bob Dach: I do not.

Bob Clubb: About $42 million.

Bob Dach: Do you know for Chelan?

Steve Hays: That's for both combined.

Bob Dach: Oh, that's combined?

Comment: $42 million - that could buy a hell of a lot of fish downtown, couldn't it?

Comment: Buy a lot of commercial fishing boats too.

Arnold Asmussen: It could take the whole National Marine Fisheries Service out to dinner.

Bob Dach: Just pay us off and go home.

Comment: Then you'd have to find a job.

Comment: Withdrawing from the plan in 15 years for Chelan and 20 for Douglas. Is it going to be a process established for those two PUDs to approach the agencies to exit the plan?

Bob Dach: There is a process. Basically what it comes down to is that after 15 years, for example for Chelan, if after 15 years the species is continuing to decline then we, the resource agencies, have the option to opt out. There are some caveats in that, so there are some requirements that must be met. But the idea was, that to the best of our ability, we picked the wrong standards and the species are continuing to decline, or we have the right standards and they're still continuing to decline because the measures weren't appropriate, or something. We would have the option to back out of this process and then decide if something different needed to happen. The reality of the situation is that due to the flexibility that the proposal has in it, ideally if we weren't meeting the standards in 15 years, or the species were continuing to decline, there would be ample room inside of the framework to allow us to regroup mid-stream without having to back out of the

agreements. But again, it's in there as a last ditch effort because nobody, as you can appreciate in the federal government, likes to think that they can't make a decision for 50 years. So this is just in case.

Comment: Bob, another comment on the amount of money that Chelan and Douglas PUDs are agreeing to pay over 50 years, is it?

Bob Dach: Over the term of the permit.

Comment: $46 million?

Bob Dach: Taken on good authority.

Comment: Chelan County PUD right now has allocated $44 million for diesel generators that are being installed at Alcoa. The projection is for that $44 million to be paid off in 5 months.

Bob Clubb: I would just like to say one thing, it was actually $42 million for the Tributary Plan, which is just one component of the Habitat Conservation Plan. I addition to that, we produce 7 percent through the hatcheries. Douglas spends $2 million a year on hatchery O&Ms, plus the initial capital contribution. And then there are things being done at the dams that cost millions and millions of dollars. Chelan PUD is proposing to have a surface bypass system, and it is going to cost $168 million. So it's not a fair thing to speak of, that we are just paying $42 million dollars over 50 years for the protection of the resource. You have to have all of these many items that we're doing, which are hundreds and hundreds of million of dollars over the course of this 50 years, not 42.

Bob Dach: I tend to just add to that, when you start talking about money you always get into those sorts of comparisons. The money, the dollar amount was certainly at the time considered to be adequate to cover that mitigation component. So it wasn't as though the utilities were trying to get away with as little as possible. It was that this is about the kind of money that was going to be required in order to do these improvements as a result of the tributary program. We could have asked for more money, but as we work our way through processes we like to be sure that whatever we're asking for, whatever we're going for, whatever our bottom line is, is pretty well seated in the available biological information. People will disagree with the available biological information, and that is one of the reasons that we do these public processes and take comments and do all that other stuff. We put the information we have on the table and people take shots at it. The stuff that we have, I think tends to support the dollar amounts. And again, conscious about the dollar amount itself, just in that, we want to make sure that we have an adequate programming. And I think the take-home point is that the utilities are prepared to ensure that they're funding adequately to take care of that component of the program. Is that reasonable?

Arnold Asmussen: Bob, you're saying that if the stock has continued to decline, or are you taking other factors such as weather, or drought, or anything like that into consideration? Or will it be strictly based on the dams.

Bob Dach: It's quite an involved process, and I don't even understand the ins and outs of the process, but what it does is, it looks at returns, if you will. It looks at the total life history of populations over the course of, I think from our prospective, you really need to look at over a course of about 15 years in order to get a reasonable, in essence, data point. Then you look at whether or not the line from today to 15 years, is moving in this direction or it's moving in this direction.

Arnold Asmussen: I grew up on the Wenatchee River. I've lived …. I've grown up on the river and I know we were in an extreme drought, except from three years, from 1969 clear up to the middle 80's and I know that it had a very bad impact on salmon ..… In '87 U.S. Congress directed the U.S. Army Corps of Engineers to investigate causes of declining salmon runs. And this was 1887. You know, these things happen regardless of the dams. I wonder if you take in the weather conditions.

Bob Dach: Yeah. We're not, because this particular component of the puzzle being discussed here tonight, try not to misconstrue that as being the only thing that is being done, the phase of the recovery, to recover fish populations. It's really not the case. There are things being done everywhere.

Arnold Asmussen: I was nervous about it just being pinned on the dams themselves.

Bob Dach: Yeah, it comes across that way, the dams are big visible objects and we do a lot of big visible expensive work at dams. But I think that if you ask anyone they know that, if you ask somebody that is trying to irrigate crops out in the Methow, for instance. They know that they're not getting away with anything. And the tribes will tell you, if you sit, if I were to go to a tribal meeting, the tribes will tell you it used to be we used go get, we used to have fish coming out of our ears. So, it's a very broad based multi-facetted issue.

Arnold Asmussen: But in 1887, without a dam on the river, congress took it upon themselves because of the severity of the situation, to direct the Corps of Engineers to..…

Bob Dach: Yeah, I think that weren't the conclusions of their report were….. I think they came to overfishing. They said all the big fish wheels down the lower Columbia had to go. From what I remember of the report.

Question: I'd like to say ….. are there any documents put out by National Marine Fisheries Service that address all of these issues affecting salmon, so these people might get an overview?

Bob Dach: Yeah, there's a few. We have a thing we now call the all H paper. All of these are on our website, and our website is in that handout information I gave you. But there is a lot of information on species status reports, there's what we call the all H paper, which addresses, we used to call it the 4-H paper but I think somebody had a copyright on the 4-H's so we had to change it. It's hatcheries, habitat, harvest, and hydropower. So those were, in essence, the big four that we evaluated under this, what we call the all-H paper.

Arnold Asmussen: But weather is not included in those?

Bob Dach: Pardon me?

Arnold Asmussen: But weather is not included in those?

Bob Dach: Well weather comes into play.

Arnold Asmussen: In habitat?

Bob Dach: Yeah, weather comes into play in all of the analyses that you do. This is one of the reasons we say that you can't get one year of data and call that the answer. Because it doesn't take into consideration environmental variables, weather. So that's why you have such a long period of time before you know, that's why you have 12 or 15 years or 15 or 20 years before you know whether you've done good or bad. Because it takes a while to generate that kind of information. But you can't, as you know, say well this is the data point that we got this year but it was a dry year, so we're going to add a fudge factor of 14 percent. It just doesn't work that way.

Steve Hays: Your ocean factors are worked into the CRI.

Bryan Nordlund: CRI and QAR both.

Bob Dach: The CRI is actually now three papers, from what I remember. One of those has been published and two of them are on the way; they're on the website as well. And we have the cumulative, cumulative analytical report, quantitative that's it.

Steve Hays: So that's it?

Shane Bickford: QAR, CRI is the cumulative risk initiative.

Bob Dach: Thank you. But there is probably a hundred other models that other people have done as well. The one's that we have, that we rely upon, are on our website and have been published. And the last big analysis that we did, I think the best analysis that we have done so far, was the one just released in the federal biological opinion on the operation of the federal hydropower system. So BPA, Corps of Engineers, and Bureau of Reclamation, and I think there was 43 dams in that one, something along those lines. And they looked at everything. Bonneville Power out there is trying to fix habitat because they think that they are going to get more of a survival improvement in habitat than they are if they keep tinkering with the projects.

Steve Hays: The bottom line in that decision was the decision not to remove the Snake River dams because other indications were that there might be more loses occurring elsewhere. Is that correct?

Bob Dach: Well the bottom line was removing Snake River dams, in and of themselves, was not a guarantee that they were going to recover fish species. So the politics behind that, then why in the heck would you do it. So where NMFS was at was we don't necessarily know that we can save fish species without removing dams, but we'll work on it for a few years, we'll see if there's a way to keep the dams in place with a bunch of experimenting if there's any way we can recover these species leaving the dams in place. That, in essence, was the decision.

Bryan Nordlund: The other component of that too was you pick out four Snake River dams and it doesn't put any more fish in the Wenatchee River, for example. So that it's broader than just those dams. In looking at all these other habitat, harvest, and hatcheries used in addition to hydro it gives us a chance to try to put in a more comprehensive program together that will address recovery in all the different areas, not just in one particular area, which removing the dams would do.

Comment: When you talk about the species status in 20 years, are you talking about wild species or hatchery species?

Bob Dach: Under the Endangered Species Act, it would be naturally producing species of wild fish, not hatchery fish. Well, not hatchery fish per se. Some of the hatchery fish are covered as well. But we're looking at wild populations. Which is an issue because, you know, when you're talking, probably this year we'll have one of the biggest spring chinook runs we've ever had. It's just not associated with a big wild spring chinook run, unfortunately.

Frasier Strutzel: Excuse me. Bull trout use to be called Dolly Varden until

Bob Dach: Hey, that's Fish and Wildlife Service.

Frazier Strutzel: Until the biologists got hold of it. But we used to have a big run of silvers, silvers we called them, on Lake Wenatchee. Since the protection of bull trout has come into being now the Lake Wenatchee coho aren't there anymore. Isn't Article 3 of the Endangered Species Act concerned with controlling predators.

Bob Dach: I'd have to read Article 3, I don't know off the top of my head.

Frasier Strutzel: I think that either Article 3 or Article 4 says you look to control predation.

Bob Dach: It seems reasonable that's in there somewhere.

Frazier Strutzel: And bull trout is the worst predator in the world on immature salmon, that are an endangered species.

Bob Dach: So what do you do?

Frasier Strutzel: So why are we protecting them?

Bob Dach: So what do you do when one listed species is preying on another listed species?

Frasier Strutzel: Well, you shoot one of them, then you have the other.

Bob Dach: Save the one you like better, huh? Well that's what we worked, that's what we consult with U.S. Fish and Wildlife Service over. Because we have all these plans…..

Frazier Strutzel: It's contradictory.

Bob Dach: Yeah. We have these plans for, you know, the federal government believe it or not is not one big happy family either. The U.S. Fish and Wildlife Service has their species of

concern, we have our species of concern. When we get into this sort of deal, we sit down with those guys and hash it back and forth about what we're going to do for endangered fish.

Frazier Strutzel: So you duke it out?

Bob Dach: Yeah, that might be easier.

Karin Whitehall: I have a comment. If you think back a hundred years ago, 200 years ago, bull trout and salmon co-existed here, so to say that they are a voracious predator on salmon doesn't really make sense. They co-existed.

Arnold Asmussen: The silver runs in Lake Wenatchee are eliminated, and nobody's concerned about that. They are gone. You can't find any silvers in Lake Wenatchee, they've been eliminated.

Bob Dach: Well, you know, this is a, the issue I think that I hear you bringing up, is one of the reasons why Habitat Conservation Plans are appealing. Because it looks at all of the interrelated issues, it doesn't, it intentionally doesn't select one fish over another fish. It provides the program necessary in order to allow these fish to cohabitate. But I understand what you're saying.

Arnold Asmussen: Yeah, they're eliminated so that entire species is gone. You just can't find in Lake Wenatchee. We used to catch them, 20 or 30 at a time when I was a youth.

Shane Bickford: Isn't that part of the 9 percent? (Bob Dach said: The combination of effects [of all three dams] leads to an additional mortality that you won't see in the project area. These HCPs don't really address that. They do to a degree, it's just not completely clear how it's addressed.)

Bob Dach: No. The 9 percent is for fish that are moving through your project. Not the fish, not what happens to them when they get down to the estuary.

Shane Bickford: Unavoidable mortality doesn't take that into account?

Bob Dach: No.

Malcolm McLellum: But Bob, didn't you say before that it's 9 percent allowable take?

Bob Dach: Per dam, so nine times nine

Malcolm McLellum: Nine dams. So that's 81 percent loss.

Bob Dach: It doesn't really work like that, but…..

Malcolm McLellum: No it's not, I didn't finish, I wasn't allowed to finish. It's 81 percent if a 7 percent hatchery program is not working.

Bob Dach: It's even if the hatchery program was working, it still would be a significant component of the wild fish that was not..… So each one of these dams takes a piece, but the issue is a fish that survives through all three projects up here. Survives through the Wells project, the Rocky Reach project, and the Rock Island project. A component of those fish that survive through these projects may die later because of the trip through the system. In which case, there would be a burden on each one of the utilities for that cumulative effect on the species. Everybody takes a scale, fish can only lose so many scales before it dies. So there's…..

Malcolm McLellum: But that's a part of another program that says that the net cumulative effects are not addressed.

Bob Dach: Well we're trying, they're not addressed under the HCPs. So we're, it's an issue that's been identified.

Question: One of the objectives of the Endangered Species Act is to recovery species and to delist them. Right?

Bob Dach: Right.

Question: So what would happen in the event that you saw a delisting of affected species before the 50-year tenure of the agreement was up?

Bob Dach: That's a good question. I don't know what would happen.

Question: There wouldn't be any need for the HCPs?

Arnold Asmussen: You would have to create a new species and declare it endangered.

Bob Dach: Yeah, something would have to get endangered.

Bob Clubb: Well it's more than just endangered species.

Steve Hays: Yeah, the PUDs are proposing to amend their FERC licenses with these plans, so even in the event that these species were delisted and there would be no longer a need for a Section 10 permit. But all the actions taken to preserve and protect those species would have become part of the FERC license, that would remain in effect until the licenses were amended, or until the license term ended and another federal license was issued. So that, the answer to your question is, if these are approved and become part of the license, then it becomes part of FERC's responsibility to make sure that it continues to be implemented, even though the need for a Section 10 permit will go away, if the species were actually delisted.

Bob Clubb: And I think the original intent of the HCP was to provide measures that prevented the necessity for the occurrence of listings.

Bob Dach: Yeah. It wouldn't behoove anybody to just all of a sudden say OK we're done. So, although I wouldn't want to commit the utilities in, like I said it wouldn't seem prudent to

stop doing anything that they had been doing that's resulted in recovering the species. It would be, we would drink a beer over it, I'm sure.

Comment: I'll buy it for you.

Steve Hays: I expect to be pushing up daisies before they're delisted.

Bryan Nordlund: It would take all the fun out of public meetings too, if we're not doing anything right and the species were actually recovering.

End of Presentation

Bob Dach: I can answer any questions, or I can try to…..

Arnold Asmussen: Yes, I have a question.

Bob Dach: Make it something that I didn't address.

Arnold Asmussen: Well, I'd like to give my name and have a written response from NMFS on this one.

Pam Gunther: Well, you know, at this point I would appreciate it if you could come to the microphone so that we can be sure that we have exactly what you say, and state your name first. It's to your advantage.

Arnold Asmussen: My name is Arnold Asmussen, and do you need the address?

Pam Gunther: No, I have it.

Arnold Asmussen: I'd like to make an observation. Back in 1997 when this started, and I'll be a brief as I can, I sat in a meeting up in, I believe it was Twisp, and I asked why a federal agency, such as NMFS that had federal authority, and in my opinion and that of others should be protecting citizens rights from the outside interests, outside of the United States. In the context of federal authority, therefore federal responsibility, I questioned the Indian fishing which consider themselves, depending on what day it is, consider themselves an independent nation and the offshore fishing, outside of our waters, or in our waters by other nations. And those things seem to be the last things that have been addressed, or effectively addressed. And the first thing that our federal agency did was to start taking away private citizens' water rights and property rights. Which is the easiest thing and took the least amount of will and resolve of the National Marine Fisheries Service to do. But it was the first thing that they effectively did, was to take things away from our citizens, while they allowed citizens of other nations to go ahead. Now they lodged protests and they did things to try to curtail it, but effectively no. The Okanogan has a tributary 2 percent of the problem and the terns, I think it's been well documented 10 to 20 percent, perhaps less now are an unprotected species. Is that correct?

Bryan Nordlund: They're protected by the migratory birds or…..

Arnold Asmussen: Well, all animals should be protected. I'm not an anti-naturalist, I believe I want our area to stay nice. But those terns are not an endangered species. And I don't believe they're threatened. They're living on an unnatural island and a small group, I don't know how small….. perhaps large on the internet, got together and decided to protect those birds that are taking 10 to 20 percent of the fish. Now, it has to sting a little bit for the National Marine Fisheries to say well we have to turn back because of that environmental group and not take care of that 10 or 20 percent issue, but we are going to go ahead, and there is a little group up in the Okanogan of citizens, farmers, ranchers, county commissioners, and even recently the Okanogan PUD voted to support the law suit against National Marine Fisheries with $20,000. And that is being ignored. They're going to go ahead and take care of that 2 percent but they're ignoring the 10 to 20 percent of these birds that some environmental group decided to protect. I see that as completely wrong. It should be illegal. And my question is: Why are those terns getting more consideration than the Okanogan and the farmers and ranchers up there? When that's 2 percent and this is 10 to 20 percent. I'd like a written answer. Thank you.

Comment: I just want to say a little bit….. some of you here might not be aware of, but maybe a lot of you are. In the north Atlantic, they had huge numbers of fish for years, no dams, now there's practically no fish. They finally realized it was overfishing and they're trying to do something about it. The Frasier River never had a dam, huge numbers of salmon going up the Salmon River. I was up there, I came here 50 years ago, and I was up there and watched those salmon go up the Frasier River. Now there's none. No dams, no fish. Then south of China, in the islands south of China, there used to be a lot of fish and they finally admit there is too much fishing, there's practically no fish left from overfishing. Not Americans, by the way. And I think that we ought to extend our boundary line. It's only three miles out now, from what I gather. Does anybody agree with that? That our national boundary in the ocean is about three miles out.

Bob Dach: There is an economic exclusion zone, I think it's, I want to say it's 49 miles out.

Question: It is?

Bob Dach: But you could be right, I'm certainly not sure.

Comment: Well, I heard that Japan has 150 coming this way. I don't know if that's true or not, but you hear things like that. And, what is the problem then? It's overfishing, overfishing. Foreigners come in to our area; we're breeding salmon for them to catch. They have miles and miles of nets out there, sweeping the ocean clean of our salmon that we try to raise here. And that's what you're going to be doing, is putting some more salmon out for these people to catch. Then the terns have already been mentioned. Our wonderful government made an island out there when they dredged out the Columbia River and made a place for the terns, about 10,000 of them, eating the smolts going out to the ocean. Now that island, I think, ought to be shoved under water and let the terns go elsewhere. Even though they are an "endangered species" when there's 10,000 of them that's not very endangered. Well the Indians, of course when they first had the agreement in the early 1800s it was for sustenance, and the type of nets they had were hand-made and I don't know what they wove them out of, but they got enough fish for

sustenance. Now they claim there are over 700 nets. And somebody flew over and they counted, and said they counted 1,000 nets. Now I don't know how much of that is true or not, but that's what hit the paper. And they have modern nets. They can't be seen in the water, they're almost invisible. They're catching fish way beyond their sustenance because I know I went down the Columbia River each year now for a while for other reasons stopped in there and they were selling the fish for $2 apiece. Now that isn't sustenance. That $2 buys some other things, usually whiskey if I can use the expression. Anyway, that's enough for me to say. Thank you for listening. Any questions? Somebody must have a complaint about what I said.

Frasier Strutzel: I have some comments I would like to make. I'm Frazier Strutzel and I live at Monitor, Washington P.O. Box 259. But I had a real problem with the Endangered Species Act and the National Marine Fisheries Service enforcement of that. And that is the item I brought up before of the Article 3 or 4, whichever one deals with predation, and I see the National Marine Fisheries Service totally ignoring that. They're actually protecting predators. And I think until you enforce all the articles of the Endangered Species Act, and not the ones that serve your bureaucracy and to further your bureaucracy. I think everything you do should be ignored and I think it's a waste of tax dollars. And I personally will contact my senators and representatives and urge them to cut the National Marine Fisheries Services' budget. I think that's the only way you get an agency under control. If you're going to bring this Endangered Species Act out here and club us over the head, you know, I'm paying for all this every time I send in my power bill. I'm paying for all this crap that's going on. And until you folks start enforcing the entire Endangered Species Act, I think you ought to be ignored and your budget should be cut.

Bob Dach: I just thought I would ask. What do you think, for instance, the utility's proposal of this Habitat Conservation Plan?

Frasier Strutzel: How it's made me mad?

Bob Dach: Just what they're putting on the table. Endangered Species Act aside, what they're putting on the table to, in essence, enhance and recovery these species.

Frasier Strutzel: Do I have a problem with my PUD spending these millions of dollars to enhance salmon runs?

Bob Dach: Yeah.

Frasier Strutzel: Not really. No, I'm a conservationist, my family has been farming in Monitor since 1907, and we've done everything we can to enhance the wildlife in our orchard and in the surrounding hillsides of our orchards. Prime hillsides, and we do everything we can to support the wildlife and the bird populations. And we want to see fish in the rivers. I have no problem with money being spent wisely, but when I see it spent of nonsense, which this is, I have a problem with that. But actual money being spent on the turbines to lessen the kill of fish, that's a good one. I'd pay my share of that one anytime. But this bureaucratic nonsense that we're paying for, which this is, I have a problem with it

because you folks are only enforcing the portions of the Endangered Species Act which further your bureaucracy, that's my problem.

Bob Dach: So it's appealing, if I might paraphrase, to have, I guess what can be phrased certainly as a higher level of willful control over how the money is spent. It's not so much that you don't think there is a need there, it's that you think that it would be much more appropriately addressed if you had a little bit more hand in it.

Frazier Strutzel: What I think should happen is that we should get rid of the Caspian Terns with shotguns, if that's what it takes. That would make sense.

Bob Dach: I don't know if I'm allowed to comment.

Frasier Strutzel: I understand what you're saying, but we need to stop the high seas fishing. I have personal friends that fish on the high seas and they say when the nets are pulled in, and there is incidental kills of salmon, the observers onboard the ship turn their heads the other way. There's no count made of that at all. Those fish are uncounted. We actually had a salmon situation here where Rollie Smitten, who I grew up with, working together for salmon, water and people. Rollie Smitten was director or assistant administrator for the National Marine Fisheries Service. I grew up with Rollie, and he came and he said that the fish issue is not happening on the high seas, and I took issue with Rollie. I said I know for a fact that it is because I know guys out there on ships. And it is happening out there. But we're friends and everything but I took issue with him because I know people who are on those boats. And the observers are letting them get away with the incidental kill of salmon. They're pulling in huge, mile-long, miles and miles of nets and there's, one guy saw over 1,500 salmon kicked overboard one day on one ship. There is over 3,500 ships out there. That's not being addressed by you folks, you're here clubbing our dams over the head, you know. Because somebody has an agenda to try to remove our dams. And that's what's being pushed.

Bob Dach: Are there any more questions?

Steve Hays: Well, if nobody else, I would like to go over a few things. I work for the PUD here, you guys own me and if you don't like what I say you can fire me because I'm an at-will employee. I've given about 8 years, a better part of 8 years of my professional career as a biologist here at the PUD working on this plan. So I wanted to make sure that everybody understood exactly what Bob has been explaining here and what the issue is before us. And the real issue is that there are two alternatives out there for dealing with the Endangered Species Act responsibilities the PUD has through the FERC who has responsibilities, particularly in terms of relicensing the Rocky Reach project, for example, we have to deal with these issues. Because if we don't get it dealt with, FERC is the federal agency who has to deal with National Marine Fisheries Service over the Endangered Species Act. So the issue is, what is the best way to approach the problem. National Marine Fisheries Service can talk to FERC, federal agency to federal agency, and Bob went through at the end there the Section 7 process, which is a federal process whereby their action to grant a new license to Rocky Reach, say, is a federal action that requires consultation. National Marine Fisheries will come and consult with the PUD

and with FERC to try and work out a reasonable approach. But at the end of the day, their opinion is the judgment. The other option is the Section 10 permit, which would not just cover the two listed species, but would be a comprehensive package, hopefully with multiple signatories, not just the National Marine Fisheries Service and FERC but the Fish and Wildlife Service, the state Department of Fish and Wildlife and hopefully some tribes and even perhaps an environmental group. All with the combined commitment to make a process work, that they would take care of the ESA issues through a Section 10 permit. They actually have, at least when we all walked out of the room three years ago, felt that they could even give up some of their opinion-type authority and delegate it into the alternative dispute resolution. And allow the seeking of a third, impartial party to get it worked out. So those are the issues, which process do you citizens in this area feel is a better way to resolve a National Marine Fisheries Service mandate to protect these specific species. Regardless of whether they should be listed or not listed or they're not doing enough out there. We only have here at the PUD, control over those things that we can directly affect. We can't affect other than with our votes, we can't affect offshore harvest or something else. I can affect turbines at Rock Island Dam, I can affect turbine survival. That's the issues, is anyone unclear of what the issue is? If your going to comment on the draft environmental impact statement, the comments they're seeking are what alternative you think should be the preferred alternative, Section 7 or Section 10, and why. What do you like about it and what you don't like about it. What do you like about Section 10 or what you don't like about it. If you like the alternative dispute resolution, you would do them a service and us a service by making that comment. If you don't like it you won't do us a service, you'll do them a service by making that comment. And so forth.

Arnold Asmussen: I'd like to answer that directly. This is Arnold Asmussen, the guy with the previous question, I cannot speak for the Methow Basin Planning Unit, and in no way shape or form am I. But I have been involved with them, and we have been negotiating in a similar scenario with that little drainage that you're going through with the dams, and an HCP is on the table for us, as it will be for you. I think local input of any sort given to the PUDs and the ability of the citizens to come to speak to those decisions is good. Those processes appear to have been manipulated by the National Marine Fisheries in terms of timing and different things that they can do to achieve whatever objectives they have. And I'm not saying their objects are bad, we want salmon in the river, we want to see steelhead fishing back at Pateros, not just below Wells Dam and above Brewster, which is in the gap. But the Section 10 will allow us to speak to the issues and that is appreciated. But I would certainly say with a high degree of wariness what you enter in to them because the fact that the citizens get to have input adds validity to the decisions, rather than just the federal agencies making decisions on their own. And you want to make sure that that validity isn't misled.

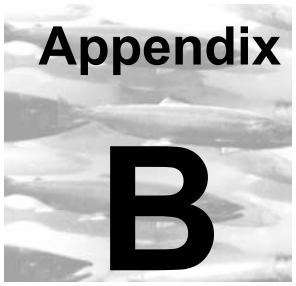
Steve Hays: All I can conservatively say is that none of us three years ago thought that we be at this place in the process that we'd all be walking out of the negotiations with smiles on our faces, but such is life. But at any rate, that's a valid comment that I've heard that concern raised before. Are you better to be part of the process and…..

Arnold Asmussen: You do not want to get in a position where you're being asked to sell the emperor's new clothes. That's a good comparison. When you have to have water, water tables in the Methow going back to pre-date historical man, that's asking an awful lot. And you do not want to get in those positions, I would check and re-check the science and the numbers, but certainly local input is the way to go, I would think.

Steve Hays: So that's all I had to say, I just wanted to make sure that everyone knew what the purpose of today's meeting was, and what the two decisions are with National Marine Fisheries Service and which of the two processes will carry the day when they get through their internal analysis asking themselves whether they can do it this way or not. That's why we want public comment on how it should be approached.

Bryan Nordlund: I just wanted to say that I want to personally thank everybody for showing up here tonight. You know I understand that we've taken some hits, and that's fine. I mean, I'm perfectly willing to listen to public input, especially guys, a lot of you have prepared and I could tell you've done your homework and know the issues as well as you can. I really appreciate the input. The things that we can control, in hydro, our little portion of the ESA world, we're doing to the best of our ability and apologize to those of you who that don't think that we are. I have a passion for trying to protect the fish, I've lived here all my life, I'm a fisherman, I want to see the fish healthy just like you all do. And that's reflected in my work. And I'm here on my own time tonight, and so is Bob and I think so are these guys from FERC. And it's just specifically to solicit public input from people like yourselves that have the same concerns and passions that I do about the fish. So I just wanted to give my personal thanks, not a National Marine Fisheries Service thanks, but my own thanks.

Bob Dach: Again, I'd appreciate any comments that you have to send it to me to the address in that handout. And, no guarantees, but the information can never hurt. You might think we won't do anything with it, but we certainly aren't going to do anything with it if we don't get it.



DEIS Public Comments

Appendix B provides written comments received by the public (including agencies, non-governmental organizations, businesses, and individuals) on the DEIS. Substantive comments in each letter are marked and numbered.

Provided at the front of each letter containing substantive comments is a table directing the reader to the specific NMFS numbered response in Appendix C. The NMFS response may direct the reader to specific FEIS sections that were changed based on the comment or may include a discussion explaining how the HCPs were changed in response to the comment.

Letters without substantive comments are also included in this appendix, although no specific responses were requested by the letter writer. NMFS acknowledges receipt of these letters and the information contained within the letters.

The letters in this appendix are organized in alphabetical order. Refer to the Table of Contents below for the location of specific letters within this appendix.

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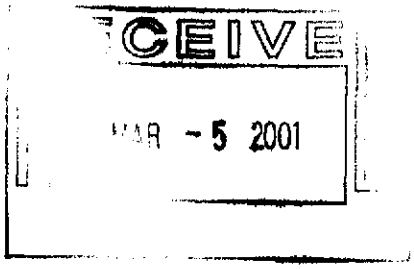
ALCOA

Alcoa Primary Metals

Wenatchee Works
6200 Malaga/Alcoa Highway
Malaga, WA 98828-9784 USA

February 14, 2001



Mr. Bob Dach
Hydro Division
National Marine Fisheries Service
525 NE Oregon St.
Portland, OR 97232-2737

RE: Comments related to the DEIS for the Wells, Rocky Reach and Rock Island Anadromous Fish Agreements and Habitat Conservation Plans.

Dear Mr. Dach:

The proposed Anadromous Fish Agreements and associated Habitat Conservation Plans represent a milestone in the development of environmental protection and species recovery planning. We encourage NMFS to continue their efforts to find a balance between environ-mental concerns and the need for renewable hydroelectric generation. The HCPs, as defined by Alternative 3 in the Draft Environmental Impact Statement (DEIS), should be selected as the preferred alternative and implemented in its' entirety. The assurances provided in the proposed HCPs include long-term monitoring and evaluations, the guarantee of achieving survival standards and the maintenance of No Net Impact conditions for listed and not-listed anadromous salmonids.

No Net Impact, as defined in the DEIS allows for continued generation of renewable, non-polluting, cost-efficient hydroelectric power while ensuring that important fisheries resources are not harmed. Monitoring and evaluation activities outlined within the proposed HCP will ensure compliance with specified survival standards. Fish populations will be enhanced through the production of hatchery fish and wild fish populations will be augmented through the enhancement of fish habitat found in tributary streams.

In contrast, Alternative 2 should not be selected as the preferred alternative. Alternative 2 covers only spring chinook and steelhead, will result in significant delays in the full implementation of recovery plans and will increase the level of uncertainty concerning future dam operations and power generation .

We are encouraged by the long-term certainty prescribed by the proposed HCPs and anadromous fish agreements. Future certainty in fish recovery planning and in power generation will be important to the future economic viability of the Pacific Northwest.

Sincerely,

Robert D. Huber
Northwest Energy Manager
Alcoa Inc
6200 Malaga/Alcoa Highway
Malaga WA 98828

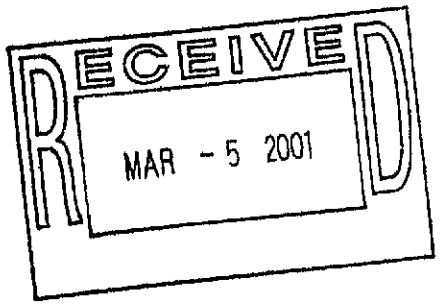
cc: Mr. Dick Nason
PUD No. 1 of Chelan County
P.O. Box 1231
Wenatchee, WA 98807-1231

ALCOA

Alcoa Primary Metals

Wenatchee Works
8200 Malaga/Alcoa Highway
Malaga, WA 98828-9784 USA

March 2, 2001



Mr. Bob Dach
Hydro Division
National Marine Fisheries Service
525 NE Oregon St.
Portland, OR 97232-2737

RE: Comments related to the DEIS for the Wells, Rocky Reach and Rock Island Anadromous Fish Agreements and Habitat Conservation Plans.

Dear Mr. Dash:

Chelan County is under duress. Many longtime area orchardists, burdened by regulations, market conditions and crop failures, are at or near bankruptcy. Family wage jobs are scarce. New housing starts are at a near standstill. Drought conditions have severely impacted energy supplies. There are problems everywhere you turn.

At Alcoa's Wenatchee Works, one of the area's largest employers, skyrocketing energy prices have forced us to cut aluminum production in half over the past few months. Alcoa's employment levels are scheduled to be reduced this summer, further impacting the struggling local economy.

We are fortunate to have contracted with the Chelan County PUD for a supply of reliable, affordable energy from Rocky Reach Dam -- enough to power approximately two of our five potlines under normal water conditions. Without our long-term contract, Alcoa would likely be unable to continue any level of production at the Wenatchee Works.

Looking to the future, it is absolutely vital that the mid-Columbia Habitat Conservation Plan (HCP) be approved to maintain this area's energy production capabilities and provide cost certainty for Alcoa and all Chelan County PUD customers.

The PUD has demonstrated over the years its outstanding stewardship abilities in protecting the environment while efficiently operating and maintaining its hydroelectric projects. We note that the parties to the HCP have agreed that the PUD has an opportunity to meet established fish survival standards, as opposed to dealing with an endless string of costly mandates imposed by outside agencies.

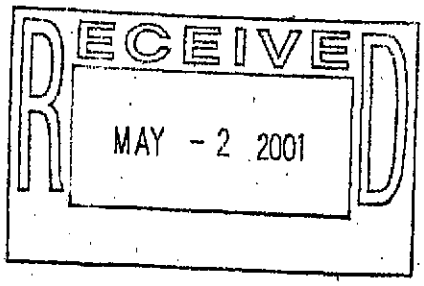
We have every confidence that the PUD will meet the survival standards. It is worth noting that the PUD has forged ahead, absent an approved HCP, on the installation of a permanent fish bypass system at Rocky Reach Dam.

This kind of commitment demonstrates the PUD's innovation and willingness to meet its regulatory obligations in an aggressive, yet cost-effective manner. The Rock Island Settlement Agreement, construction of the supplementation hatchery and fish friendly turbine installations at Rocky Reach Dam are further examples of the PUD's demonstrated stewardship abilities.

Please consider this letter as a vote of support for the long-negotiated HCP that is outlined in the Draft Environmental Impact Statement. We urge the swift adoption of this program. It is the right approach to protecting both critical energy supplies and the environment.

Jack Speer
Northwest Energy Director
Alcoa Inc.
6200 Malaga/Alcoa Hwy.
Malaga, Wa 98828

cc: Mr. Dick Nason
PUD No. 1 Chelan County
PO Box 1231
Wenatchee, WA 98807-1231



May 1, 2001

Bob Dach
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Re: Draft Environmental Impact Statement: Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Dear Mr. Dach:

American Rivers appreciates the opportunity to review the draft Environmental Impact Statement (DEIS) for the proposed Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, dated November 2000. We strongly support and endorse the comments submitted on behalf of the Save Our *Wild* Salmon Coalition (SOS), and have reiterated and emphasized several specific concerns below.

As noted in the DEIS, American Rivers was involved in the development of a long-term anadromous fish protection plan for the three hydropower projects at issue. It was our goal to ensure that any alternative that allows continued project operations would (1) promote recovery of ESA-listed stocks and make certain that such operations do not jeopardize their continued existence, (2) adequately protect non-listed species and provide sufficient mitigation for the effects of the hydropower projects, and (3) comply with all relevant laws and policy. Prior to resolution of several critical issues and finalization of any plan, Public Utility District No. 1 of Chelan County and Public Utility District No. 1 of Douglas County (collectively, the PUDs) submitted the draft Habitat Conservation Plans (HCPs) to the National Marine Fisheries Service (NMFS) for environmental analysis. The limited analysis contained in the DEIS highlights the failings of the proposed HCPs to adequately protect anadromous salmonids and ensure compliance with relevant federal law and policy. Accordingly, American Rivers does not support the proposed HCPs and urges you to more fully evaluate alternatives that sufficiently protect anadromous salmon and steelhead in the Columbia River basin. The alternatives must be consistent with all relevant federal law and policy.

National Environmental Policy Act

As elaborated on in the comments submitted by SOS, the DEIS falls far short of satisfying the fundamental requirements of the National Environmental Policy Act. NEPA requires that federal agencies take a hard look at the consequences of their actions prior to undertaking them. To do

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150 NICKERSON STREET
SUITE 311

so, agencies must carefully consider the significant environmental impacts of the action, including direct, indirect, and cumulative impacts. NEPA also requires that federal agencies evaluate a range of alternatives to the proposed action, including the alternative of taking no action at all. This alternatives analysis is at the heart of NEPA. The DEIS does not meet any of these requirements for the following reasons:

AR

1 • The DEIS fails to take a "hard look" at all of the environmental information and consequences of each alternative, fundamental purposes of the Act.

2 • The DEIS fails to analyze the cumulative impacts of myriad other actions that affect Mid-Columbia salmon and steelhead.

3 • The DEIS fails to consider an adequate range of alternatives

4 • The DEIS fails to adequately inform the public and decision-makers of the requirements and responsibilities of all federal statutes and treaties.

NMFS may not, as it has done throughout this DEIS, ignore relevant information and rely upon conclusory statements and unsupported assertions to satisfy NEPA requirements. General and speculative statements about hoped for benefits fail to ensure informed decision making, one of the fundamental purposes of NEPA. Consideration of a range of reasonable alternatives to the proposed action is a critical component of any NEPA analysis. However, NMFS effectively evaluates only two alternatives, admitting that the no action alternative would violate the ESA. NMFS must explore and objectively evaluate an adequate range of alternatives including a true no action alternative that considers no project conditions, drawdown, and non-power operations,

5 to name a few. Also, NMFS must consider an alternative that would provide greater protection for salmon and steelhead than the proposed action. While such alternatives may cost more, the DEIS presents no information for the decision-maker or the public to draw any conclusion about the benefits, or cost of such a measure.[1]

6 Finally, the cumulative impacts analysis fails to consider a myriad of easily identifiable, foreseeable actions that affect Mid and Upper Columbia River salmon and steelhead. For example, NMFS must analyze the proposed Columbia River channel deepening project, the Lake Chelan Hydroelectric Project, and numerous other land management activities in the basin.

We believe that these deficiencies present an inaccurate picture of the impacts to the public, making it impossible for anyone, including NMFS, to draw any reasoned conclusions about the environmental impacts of the three alternatives presented in this DEIS.

Endangered Species Act

To echo SOS' comments, NMFS' analysis in the DEIS is wholly insufficient to comply with the underlying legal obligations of the Endangered Species Act (ESA), 16 U.S.C. §§ 1531 *et seq.*

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7 [1] The DEIS states that the "purpose of the HCPs is to protect fish in the Mid-Columbia River while generating electricity." DEIS at 1-3. This statement too narrowly cabins the rest of the analysis by removing, among other things, consideration of a true "no action" alternative as well as assumes that the HCPs analyzed in Alternative 3 are the proper means to comply with the ESA. We believe that the purpose and need must be expanded to emphasize protection of listed species and compliance with the requirements of the Endangered Species Act as the purpose of this DEIS. The HCPs are only a proposal to meet the requirements of the ESA, they are not an end in themselves. Indeed, to perform a valid NEPA analysis, NMFS must not assume, as it does in the current purpose and need statement, that the HCP Alternative fulfills the mandates of the ESA.

The ESA is the "most comprehensive legislation for the preservation of endangered species ever enacted by any nation." *TVA v. Hill*, 437 U.S. 153, 180 (1978). "[T]he language, history, and structure of the legislation . . . indicate[] beyond a doubt that Congress intended endangered species to be afforded the highest of priorities." *TVA*, 437 U.S. at 174. As a result, agencies are required to use "all methods and procedures which are necessary," 16 U.S.C. § 1532(2), to "*prevent* the loss of any endangered species, regardless of the cost." *TVA*, 437 U.S. at 188, n. 34. The DEIS does not meet that standard and in fact, if implemented would result in serious harm to listed species in the Mid-Columbia. The DEIS violates the ESA for several basic reasons:

- The DEIS violates the fundamental principle of species conservation – erring on the side of caution in the face of uncertainty.
- The DEIS misunderstands the requirements of the ESA.
- The DEIS fails to analyze inconsistencies between Section 7 consultation requirements and the proposed Section 10 Incidental Take Permit and Habitat Conservation Plan.

8 First and foremost, NMFS repeatedly fails to ensure that uncertainty is resolved in a manner that does not place the species further at risk. Of particular concern is the failure to provide the benefit of the doubt to species with respect to data gaps or information disputes. NMFS' approach undertaken in the DEIS is at odds with the cautionary approach required under the ESA. Any risk must be borne by the projects, not by the listed species. The ESA does not allow for an alternative that provides substantial certainty for the project, while placing the risk of uncertainty on the species.

9 Second, the ESA requires NMFS to consider alternatives that are more protective of fish than the HCP. Failure to do so violates the ESA requirement that take of listed species be minimized and mitigated to the "maximum extent practicable." One possible alternative includes drawdown, which NMFS incorrectly maintains is available only at relicensing.

10 Finally, the DEIS fails to analyze a critical issue raised in some of the scoping comments – that the Section 10 incidental take permit process is available only for non-federal actions. NMFS' Habitat Conservation Planning Handbook maintains that the Section 10 process is intended to address non-federal actions that are not otherwise subject to Section 7 consultation. As such, the Section 10 ITP and HCP process may not even be an available option to the PUDs. Although hydropower projects are owned by non-federal entities, FERC clearly maintains ongoing authority and jurisdiction over the project. This ongoing authority constitutes federal agency action, requiring FERC to initiate consultation under the ESA. Although this procedural analysis was not undertaken during development of the HCPs, the DEIS must address the applicability of Section 10 to the FERC-licensed hydropower projects in question.

11 If such an option is available, it does not relieve FERC of its ESA Section 7 responsibilities to insure that the action is not likely to jeopardize the continued existence of any endangered or threatened species. As such, the ITP and HCP must be consistent with FERC's Section 7 obligations. To ensure consistency, FERC must undertake consultation prior to further development of the HCPs.

Federal Power Act

12 The DEIS fails to adequately analyze statutory requirements of the Federal Power Act despite the intention that the HCPs supercede existing FERC license articles and satisfy NMFS' obligations pursuant to sections 18, 10(a), and 10(j) of the FPA. The FPA requires that the commitment of a

river to power production be reevaluated anew at the time of relicensing and establishes various legal obligations that must be met prior to relicensing. The DEIS fails to analyze any of these requirements, and the fundamental nature of the HCP precludes fulfillment of some.

The DEIS fails to consider the following Federal Power Act requirements:

- The DEIS fails to analyze the requirements necessary for the HCPs to supercede the existing FERC license articles and satisfy NMFS' obligations pursuant to sections 18, 10(a), and 10(j) of the Federal Power Act.
- The DEIS and HCPs limit the requirement that a hydropower project licensee evaluate pre-project conditions as required by the Federal Power Act and NEPA.
- The DEIS provides no analysis of whether the HCPs at issue satisfy the FPA.
- The HCPs' "no surprises" assurances presuppose the term and content of the PUD FERC licenses and are inconsistent with reopener clauses intended to ensure "equitable treatment for fish and wildlife over the terms of the license agreement."

Clean Water Act

13 To reiterate SOS' comments, the DEIS provides no analysis of Clean Water Act requirements. The CWA requires that all federal agencies "having jurisdiction over any property or facility . . . shall be subject to and comply with" all applicable federal, state, and local water quality laws. 33 U.S.C. § 1323. As a federal court has recently held, dams are no exception to this rule. *See National Wildlife Fed'n v. U.S. Army Corps of Engineers*, 92 F. Supp.2d 1072 (D. Or. 2000) (holding that the Corps' dams on the lower Snake River must comply with state water quality standards). Further, NMFS' issuance of an incidental take permit or incidental take statement will require certification under section 401 of the CWA. In light of these requirements, the DEIS is deficient in several respects.

- The DEIS lack any analysis of whether the alternatives will comply with water quality standards.
- The DEIS fails to discuss section 401 certification requirements.

NMFS must analyze the water quality impacts of the hydropower projects at issue – Rocky Reach, Rock Island, and Wells – and ensure compliance with the relevant water quality impacts.

Inadequacy of HCP Provisions

The fundamental principle set forth in the HCP is a "no net impact" standard for salmon and steelhead protection at the hydropower projects. This standard consists of two key components – a 91 percent total project survival rate, including an independent 95 percent juvenile passage rate, and 9 percent compensation through hatchery and tributary improvement programs. The DEIS clearly highlights but overlooks the shortcomings of the proposed standards in the HCP. The serious shortcomings place unacceptable risk on the species contrary to ESA requirements, and fail to sufficiently protect salmon and steelhead.

- The DEIS analysis of adult and juvenile survival standards is insufficient. There exist no scientifically credible methodologies to evaluate survival for all covered species at all life stages.
- The DEIS lacks adequate analysis of the off site mitigation proposals – Tributary Improvement Fund or Hatchery Supplementation Program.
- Inconsistencies between the QAR and the DEIS call the DEIS analysis into question

American Rivers would like to reiterate and emphasize the inadequacy of the HCP provisions as outlined in SOS' comments. In particular, we view the inability to measure the proposed survival standards and the inadequate data to support the independent programs as some of the most significant shortcomings of the HCP. And, although acknowledged in the DEIS, NMFS utterly fails to address these issues. Recent actions undertaken by Chelan County PUD highlight the risk that immeasurable standards place on the species. Chelan County PUD based its decision to forego the minimum spill requirement at the Rocky Reach Hydroelectric Project on limited analysis of yearling spring chinook and steelhead. Although not allowed under the HCP, Chelan County PUD relied on representational studies to support its decision. Development of agreed-upon methods for assessing compliance with survival standards for all species must occur prior to implementation of the HCPs.

14

The DEIS acknowledges that there are limited or no methodologies for assessing juvenile and adult survival for all species and all life stages. NMFS cannot issue an ITP while at the same time expressly acknowledging an inability to determine whether the applicant is in compliance with its terms. Moreover, the ESA requires that NMFS resolve uncertainties and information disputes in favor of the species of concern, contrary to what the HCP currently provides. Until the PUDs complete accurate assessments of juvenile and adult survival, the ESA's cautionary principle prohibits NMFS from assuming that the survival rate estimates in the HCP are correct. The DEIS provides insufficient data to support the estimates.

The DEIS also fails to consider the effect of (1) maintaining a 95 percent juvenile dam passage survival standard over only 95 percent of the run, and (2) excluding spring migrating chinook smaller than 50 mm in length from the 95 percent juvenile dam passage survival for the full run of that species in the event turbine intake screens are installed certain instances.

Further, the DEIS provides insufficient evaluation of the tributary habitat improvement or hatchery supplementation program, both of which are key to attaining the no net impact standard. The DEIS acknowledges that there are no means to assess the benefits from these programs and then simply assumes that the funding and supplementation levels contained in the HCPs are adequate. There is no data to support the proposed funding levels for the tributary habitat fund, and NMFS acknowledges that there is no way to assess whether the tributary program is actually providing 2 percent compensation. While a habitat restoration program is critical to salmon recovery efforts, it must be accompanied by measurable goals and objectives. The DEIS also provides no scientific justification for reducing Douglas County PUDs contribution to the habitat fund in the event it achieves a 95 percent juvenile dam passage survival rate at Wells dam.

15

Similarly, the DEIS provides insufficient analysis of the proposed hatchery program, other than to assert that it must be consistent with ESA recovery goals. The DEIS fails to explain how such consistency may affect the program and its ability to provide 7 percent compensation. Although unable to guarantee 7 percent hatchery compensation, NMFS fails to analyze the effect of not meeting the 7 percent, and in turn, the no net impact standards.

16 Finally, the Quantitative Analytical Report (QAR) relies on several unjustified assumptions in its analysis. There is no data to support that (1) the survival improvements that the HCPs call for at the hydroprojects, and through off-site mitigation, occur instantaneously, (2) Grant County PUD's Priest Rapids Project has achieved a 95 percent juvenile survival standard, and (3) the survival improvements called for in the Federal Columbia River Power System Biological Opinion are being met. Inconsistencies between the QAR and available facts call into question NMFS' reliance on the analysis to draw any conclusions about the adequacy of the HCPs.

All of this adds up to insufficient protection for salmon and steelhead. The significant uncertainty associated with the HCP standards (95/91/7/2 percents), coupled with an inability to determine compliance, is inconsistent with ESA requirements and precludes NMFS from fully assessing the environmental impacts of the HCPs.

Conclusion

The DEIS fails to demonstrate that the proposed HCPs provide sufficient protection to Columbia River Basin salmon and steelhead that are negatively affected by the hydroelectric projects. Moreover, the DEIS highlights the significant shortcomings of the HCPs and their failure to comply with all relevant federal law and policy. American Rivers does not support these long-term salmon and steelhead protection plans. The limited analysis in the DEIS in no way justifies issuance of incidental take permits that will lessen NMFS' ability to undertake whatever actions are necessary to protect and recover listed species for the next 50 years.

Thank you for the opportunity to comment. Please feel free to call if you have any questions regarding these comments.

Sincerely,

Brett Swift

Brett Swift

cc: Susan Fruchter, NEPA Coordinator
Office of Policy and Strategic Planning
Room 6117
Herbert C. Hoover Bldg.
U.S. Department of Commerce
Washington D.C. 20230

American Rivers (AR)

Comment #	NMFS Reference #[1]
1	51
2	6
3	32
4	23
5	32, 34
6	6
7	51
8	21
9	24
10	47
11	47
12	23
13	23
14	18, 56
15	12
16	18, 56
17	28
18	12, 30
19	14
20	15, 22
21	53

[1] see Appendix C

STATE REPRESENTATIVE
12th DISTRICT
CLYDE BALLARD
REPUBLICAN SPEAKER OF
THE HOUSE

State of
Washington
House of
Representatives

FEB 14 2001

RULES
CO-CHAIRMAN

February 12, 2001

Northwest Region - Hydro Program
National Marine Fisheries Service
525 NE Oregon St. Suite #420
Portland, OR 97232-2737

Dear Sirs:

Affordable, reliable electricity has been the lifeblood of Washington's state's economy for decades. Fueled largely by clean, renewable energy from hydroelectric power, our state as a whole has been able to grow and prosper. Now, hydroelectric power is in short supply. Environmental regulations have all but eliminated new hydropower plant construction, and conditions imposed on existing power plants have significantly reduced generation. Our state faces an immense challenge in finding new generation sources to fuel an expanding economy.

In many rural Eastern Washington communities, affordable hydroelectric power is not only critical for growth, it is critical for survival. The agricultural industry is in serious decline, in part due to the cost of endless regulations imposed by unyielding agencies. Aluminum plants are closing or severely cutting production due to rising energy costs. Jobs are in short supply.

For several years, I have been closely watching the development of the Habitat Conservation Plan (HCP for the hydro projects in the mid-Columbia area. Frankly, I have been disappointed that we have all had to wait so long for this plan to wade through the regulatory process. We cannot afford to wait any longer.

The HCP offers hope that the mandates of the Endangered Species Act can be met, while retaining critical hydroelectric power supplies. Rather than relying upon agencies to mandate never-ending fish protection measures, the plan establishes an outcome-based standard. The Public Utility Districts (PUDs) have the opportunity to meet the agree-upon survival standards, with unavoidable losses compensated through state-of-the-art hatchery production and habitat funding.

Finally, we may have a model for addressing fishery protection that embraces common sense. It's about time.

I would like to note for the record that our PUDs have not been waiting for the regulatory review process to conclude before moving ahead with resource portection plans. For example, Chelan County PUD has thoroughly tested a prototype surface collection system at Rocky Reach Dam. Construction of a permanent surface collector will begin later this year. The PUD is also nearing completion of a turbine replacement project, using a more fish-friendly design. The cost of these programs is significant and the PUD should be applauded for its environmental stewardship.

I support the HCP and urge you to move it swiftly through the review process. This is a golden opportunity to demonstrate to the citizens of Washington State that cooperation can yield positive results. Our citizens are growing more and more skeptical that something like this is possible. Don't disappoint them.

With Warmest Regards,

CLYDE BALLARD
Speaker of the House

FEB - 9 2001

LYNN W. BAKER, ED.D.
Superintendent

CASHMERE SCHOOL DISTRICT NO. 222
210 South Division Street
Cashmere, WA 98815-1198
Phone: (509) 782-3355
Fax: (509) 782-4747

February 6, 2001

National Marine Fisheries Service
Northwest Region - Hydro Program
525 N.E. Oregon Street, Suite 420
Portland Oregon 97232-2737

To Whom It May Concern:

Collaboration is one of the best lessons we can teach.

When we're facing a challenge as difficult as protecting salmon and steelhead in the Columbia River, it is remarkable to find a solution such as the Mid-Columbia Habitat Conservation Plan. The fact that it is a negotiated effort in an arena marked by adversarial action provides a valuable template for the future.

I endorse the plan for these reasons:

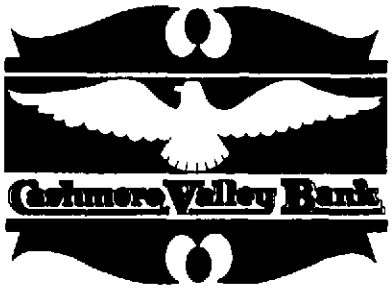
* It ensures protection of salmon and steelhead while maintaining an economical and reliable energy supply for our region.
* It establishes performance standards, based on the best available scientific evidence and allows local PUD fisheries staff to develop the most cost-effective ways to meet them.
* The plan provides a balanced approach to compensation for unavoidable losses.
* It includes a commitment to improve habitat in the Columbia River as well as important tributaries such as the Wenatchee River, a touchstone of our town.
* A dispute resolution process is included to avoid expensive and time-consuming legal battles that would take resources away from helping fish.

Overall the Mid-Columbia Habitat Conservation Plan is a much needed, innovative and rational approach to protecting endangered salmon and steelhead while also ensuring continued operation of our local hydroelectric dams. That power source is crucial to the region to ensure there will be jobs for our students in the future. This is particularly true because our agricultural industry is eroding.

Sincerely,

Lynn W. Baker, Ed.D.
Superintendent

DIRECTORS
RON TRIMBLE
Chairman of the Board
G. TODD COWAN
Vice-Chairman of the Board
KEN MARTIN
President and CEO
LYMAN BOYD
JACK GARLAND
GARY HANNON, M.D.
BRIAN NELSON



FEB 15 2001

ADMINISTRATIVE OFFICERS
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Vice-President & CIO
CONNIE FRITZ
Vice-President/Operations
GREG L. OAKES
Vice-President/Lending
ALAN K. CRAIN
Vice-President & CFO

February 12, 2001

National Marine Fisheries Service
Northwest Region-Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, Oregon 97232-2737

To Whom It May Concern:

As a lifetime resident of North Central Washington who is currently serving as the President of Cashmere Valley Bank, a six branch community Bank with headquarters in Chelan County, I have deep concerns regarding our local economy. The performance of a community bank is the reflection of the success or failure of the customers it serves.

Currently our agricultural based economy is suffering serve setbacks as it deals with the challenges of pesticide use, land use restrictions, water regulations and Federal trade policy. The financial difficulty is resulting in numerous bankruptcies and beginning to impact our unemployment rates, retail sales volume and housing industry.

One of the strengths of our local economy is the dependable, reasonably priced supply of electricity provided by the Chelan County Public Utility District. But they are experiencing increasing costs from salmon and relicensing projects. Sooner or later those costs will need to be pasted along to the local customers. I have grave concerns over the impact of those increases on our local economy.

It is because of the need for the dams to continue to provide reasonably priced power that I support the habitat conservation plan for our PUD's dams on the Columbia River.

Although I am not an expert on the HCP, I understand that it address the mandates of the Endangered Species Act in a logical and reasonable manner. I believe we will be best served by giving our PUD the survival targets and let them decide on how to best meet them. I believe that hatchery programs and habitat improvements are the best way to supplement fish losses. Local control with reasonable oversight makes the most sense to me.

As a banker I understand the impact of regulation on our ability to do what is best for our customers. These regulations are often born of good intention and end up having exactly the opposite of the intended impact. Please don't let this happen to our PUD as they work diligently doing what is best for fish and the best for our local power supply.

Sincerely,

Ken Martin
President

FEB -5 2001

Central Washington Hospital

BOARD of DIRECTORS

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Louis Van Doren

DIRECTOR EMERITUS
Jack C. Bills

February 2, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

To Whom It May Concern:

Central Washington Hospital in Wenatchee and our power provider, Chelan County Public Utility District, share the challenge of providing a vital service at a reasonable cost for our community. As the head of a regional, non-profit hospital, I oversee a team striving daily to accomplish this, even though factors outside our control often drive those costs.

This is why I support the Mid-Columbia Habitat Conservation plan negotiated by Chelan and Douglas County PUDs. It would provide a measure of financial certainty for the complex proposition of protecting and enhancing salmon and steelhead in our region. Its performance-standard approach provides an incentive to find a cost-effective solution, based on the best science available. That ensures a benefit not only for fish, but our region as well, by providing a balanced approach to compensation for an unavoidable loss.

I also endorse the Habitat Conservation Plan's collaborative approach, which includes a method for resolving future disputes and avoids the lengthy governmental processes that can lead to long and expensive legal battles. The plan also provides a guarantee – something that can be hard to come by in these challenging times – of no net impact on fish from the PUDs' hydropower operations. If Chelan and Douglas County PUDs fail to meet that standard within five years, then the regulatory agencies have a guarantee the PUDs will put the agencies' recommendations into place quickly.

In conclusion, the Mid-Columbia Habitat Conservation plan offers a cost-effective process, based on the best scientific information available for protecting the Northwest's salmon and steelhead, and I urge your approval of this innovative approach.

Sincerely,

John T. Evans, Jr., FACHE
President & CEO

FEB -7 2001

BOARD OF COMMISSIONERS

CHELAN COUNTY

STATE OF WASHINGTON
CHELAN COUNTY COURTHOUSE
350 ORONDO AVENUE, WENATCHEE, WA 98801
TELEPHONE (509) 664-5215 SCAN (509) 748-5215
FAX (509) 664-5599

CATHY MULHALL
County Administrator
cathy.mulhall@co.chelan.wa.us

KATHLEEN L. WARD
Clerk of the Board
kathy.ward@co.chelan.wa.us

January 29, 2001

National Marine Fisheries Service
Northwest Region - Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

In our capacity as the elected officials representing the citizens of Chelan County, we are writing to support the mid-Columbia Habitat Conservation Plan (HCP).

Over the past several years, we have literally seen our local government and our citizens strangled by endless federal and state regulations. Our once-plentiful and prosperous orchards are being plowed under because their owners are finding it impossible to make a profit. Government regulations have played a major role in this catastrophe.

Other landowners are also hampered by too many rules and regulations. Substantial amounts of privately-owned land can't be developed due to water rights issues, setback requirements, required lot sizes or other concerns.

The HCP offers some hope that diverse interests can work together and craft workable solutions to address challenging environmental and regulatory issues. It includes a measure of certainty that our hydroelectric dams can continue operating in a cost-effective manner, while meeting fishery obligations mandated by the ESA.

Our county and its economic future rely heavily upon hydroelectric power. With a per-capita income half that of the Seattle area and with unemployment at nearly double-digit levels in Chelan County, we desperately need the affordable energy that the Chelan County PUD provides through ownership of its Columbia River dams.

The outcome-based approach outlined in the HCP makes great sense as opposed to the traditional method of endless mandates with no accountability and a lack of clear goals. The HCP approach sets survival standards to be achieved by the PUD at its dams. The PUD has the expertise to develop cost-effective fish protection and enhancement

programs while maintaining critical operating standards. They have demonstrated their stewardship countless times, most recently with the unique, new surface collection system at Rocky Reach Dam.

We also applaud the approach to compensating for unavoidable losses. The fund provided by the PUD will address some of the critical habitat improvement needs in Chelan County. Those needs are among the items being discussed by Chelan, Douglas and Okanogan counties and the Colville and Yakama tribes as we work on the Upper Columbia River Salmon Recovery Board to formulate recovery planning for our area. The fund may also provide habitat recovery program partnership opportunities.

We support the HCP and urge a fast-track approach to its adoption. Thank you for the opportunity to comment.

Ron Walter
Commissioner

John Hunter
Commissioner

Esther Stefaniw
Commissioner

CHELAN COUNTY POMONA
No. 23

February 15, 2001

National Marine Fisheries Service
Northwest Region - Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

Re: Habitat Conservation Plan

Gentlemen:

The Chelan County Granges have reviewed the "Anadromous Fish Agreements and Habitat Conservation Plans" prepared by the Chelan County Public Utility District #1 dated November 2000. The Granges find Alternative #3 to appropriately and adequately address the environmental impact including the protection of anadromous fish species and non-threatened species and to allow continued operation of the three dams to provide power, recreation, and other uses for the human species.

The Grange has always been a proponent of sound environmental policies and procedures and conservation of our natural resources. We also believe an adequate supply of electrical energy at a reasonable cost is absolutely necessary to allow continued economic viability of the region. Therefore, some compromise is essential to balance the requirements of the resources necessary for people with those of fish and other wildlife.

We strongly encourage you to approve the proposed alternative #3 in the process of re-licensing the Mid Columbia dams and issue the incidental take permits authorized under Section 10 (a)(1)(B) of the Endangered Species Act.

Also for your information, we are attaching a document developed by the Chelan County Pomona Grange in 1992 which reflects the Grange's past as well as its current position and concern on the issue of salmon recovery.

Sincerely,

Shirley Ward
Washington State Deputy Master

Donald W. Dwinell
Master, Chelan County Pomona #23
Master, West Wenatchee Grange

Russ Lukens
Master, Beacon Hill Grange

Jackie Smart
Master, Bee Hive Grange

Dale Stewart
Master, Cashmere Grange

Stephen Clark
Master, Chumstick Grange

LeRoy Sorenson
Master, Entiat Grange

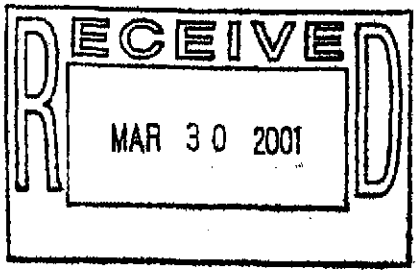
James C. Finley
Master, Manson Grange

Gordon Goodwin
Master, Stemilt Hill Grange

CHELAN-DOUGLAS

LAND TRUST

Preserving our lands for generations to come



March 28, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon St, Suite 420
Portland, OR 97232-2737

To Whom it May Concern,

I have reviewed the Draft EIS for Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. I strongly support Alternative 3, the proposed HCPs for Rock Island Dam, Rocky Reach Dam, and Wells Dam. I am familiar with the provisions of the Endangered Species Act (ESA) and believe that the development of these HCPs is the only practical way for Chelan and Douglas PUDs to meet the requirements of the ESA. I complement the PUDs on their proactive approach to meeting the requirements of the ESA. This is a bold and progressive step that demonstrates true leadership.

Let me make it clear that the Chelan-Douglas Land Trust (CDLT) is not simply an interested observer. The CDLT is actively involved in the protection of salmon habitat and other fish and wildlife habitat in North Central Washington. We recently received nearly $1.5 million from the Salmon Recovery Funding Board to purchase salmon habitat along the Entiat River and we will be applying for additional money from the Salmon Recovery Board in the future. We are developing the capacity and expertise to own properties and easements and manage them for their habitat values. It is likely, therefore, that the CDLT can play an important role in the proposed Tributary Conservation Plan.

CDLT

1 Now that you know where I am coming from, let me state the CDLT perspective on some of the specifics of the Draft EIS. I would rather see the compensation for unavoidable project mortality come more from the tributary program and less from the hatchery programs. The tributary program will provide numerous public benefits above and beyond improving salmonid spawning and rearing habitat. However, I know this is a very difficult and contentious issue. I will support the proposed 7 percent compensation through hatchery programs and 2 percent through habitat improvement programs. The hatchery program should be closely monitored however. On a

2 recent tour of Columbia and Methow River hatcheries I observed firsthand that hatcheries require careful evaluation and monitoring. Otherwise they can become institutionalized commodity production facilities that churn out fish like widgets with little regard for their

genetic makeup and unique life histories. Hatcheries should enhance natural reproduction not attempt to replace it.

3 I also hope that the funds in the Plan Species Account will be spent prudently and in conjunction with other salmon recovery efforts. Chelan, Douglas, and Okanogan counties have developed an outstanding regional process for evaluating projects submitted to the Salmon Recovery Funding Board. Their efforts helped entities in this region to garner nearly $5 million in the latest round of Salmon Recovery Funding Board grants. The proposed Tributary Committee should work closely with this existing group, rather than duplicating their efforts.

4 I also believe that that a majority of the funds in the Plan Species Account should be spent sooner rather than later. There is an urgent need to protect critical habitat now, before it is further subdivided and degraded. With the decline in the orchard economy, many of the orchards along the tributaries will be put up for sale in the next two years. This presents a unique opportunity to acquire property or easements to protect riparian areas and floodplain along the tributaries. Some of the funds in the Plan Species Account also need to be dedicated to the long-term maintenance of these properties and easements. If the CDLT should end up acquiring properties or easements with these funds, we would require that a certain percentage of the funding be dedicated to long-term maintenance. I also recommend that funding be set aside to

5 make property tax payments or payments in lieu of taxes. There will be strong opposition to protecting habitat along the tributaries if this means the properties are removed from the tax rolls. Providing funding for tax payments will make this effort much more acceptable to local citizens and elected officials.

I recognize that there is strong opposition to HCPs from all sides of the political spectrum. Conservation groups argue that HCPs are a sellout and not enough is known about the affected species to make such long-term agreements. While I acknowledge these as valid concerns, I believe that there is more to be gained than lost by the implementation of the proposed HCPs. With the recent HCP revisions (June 1, 2000) that clarify the importance of biological goals, adaptive management, monitoring, permit duration, and public participation, I feel confident that the proposed HCPs can be evaluated and monitored to make changes when appropriate. I therefore strongly support the HCPs as proposed in the Draft EIS.

Yours sincerely,

Gordon H. Congdon

Gordon H. Congdon
Executive Director

Chelan-Douglas Land Trust (CDLT)

Comment #	NMFS Reference #[1]
1	12, 28
2	17
3	13
4	13
5	12

[1] see Appendix C

FEB 12 2001

CITY OF CASHMERE

101 Woodring Street · Cashmere, WA 98815-1034
Business (509) 782-3513 · Fax (509) 782-2840

February 1, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

Dear Sir or Madam:

As mayor of Cashmere, WA, located on the shores of the Wenatchee River, I am very familiar with the competitive interests laying claim to the water of our rivers and streams. Farmers, fishermen, environmentalists, river rafters, power producers … all have a vested interest in our water.

These competing demands frequently result in stalemates at best and court battles at worst. The Habitat Conservation Plan forwarded by Chelan County PUD takes a new approach, and I commend the PUD for its vision.

The HCP offers a common-sense plan for alleviating the fish problem. The HCP sets fixed targets for fish survival, allowing the PUD some freedom in how to meet those targets. Yet it includes regulatory oversight that should satisfy both environmentalists and the various federal and state agencies. It creates a spirit of cooperation not evident in many, many other water issues.

I also strongly support the focus on habitat, since the Wenatchee River is a Columbia River tributary that could stand to gain under the HCP program.

The PUD supplies wholesale power to Cashmere and is an important player in the economic health of our region. The HCP allows the PUD to do what it has always done best -- generate power -- while providing for continued mitigation and enhancement of the local fishery.

I urge you to move ahead on the HCP process.

Sincerely,

Gordon Irle
Mayor

RECEIVED
MAR 29 2001

City of Entiat
Washington

March 12, 2001

To Whom It May Concern:

As Mayor of a community situated along the reservoir created by Rocky Reach Dam, I am directly aware of the importance of balancing river uses.

The City of Entiat relies on tourism created by having an attractive waterway for recreation; on the economic benefits of a sustainable sport fishery; on the use of water to irrigate the fruit orchards within and surrounding the community and on the economic boost afforded our financially stressed region by low electric power rates made possible by Rocky Reach Dam. Implementation of the Habitat Conservation Plan (HCP) will help preserve all of these benefits.

Chelan County PUD has demonstrated how well it knows the business of running its' dams, and the sizable expenditures and endless work on fish protection over the last 20 years are equally significant. With the cooperative approach envisioned by this HCP, there is every reason to believe all the critical resources will be protected long into the future.

On behalf of the City Council of Entiat, I compliment all the participating agencies on the work that went into creating this Habitat Conservation Plan. We support the provisions it contains and recommend their implementation as quickly as possible.

Sincerely,

Wendell Black
Mayor

P.O. Box 228, 14070 Kinzel Street • Entiat, Washington 98822

FEB 12 2001

City
of
Leavenworth
700 HIGHWAY 2 / POST OFFICE BOX 287
LEAVENWORTH, WASHINGTON 98826
(509) 548-5275 / FAX: (509) 548-6429
E-MAIL: leave@televar.com

City Council
Bill Bauer - *Mayor*
Bill Wells - *Mayor Pro-Tem*
Trisha Bradley
Peter D. DeVries
Carl Florea
Jack Koenig
John Pool
Keith Tower

Scott Hugill - *City Administrator*

February 7, 2001

National Marine Fisheries Service
Northwest Region —Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

After discussion with the City Council, I am writing in support of the Chelan County PUD's Habitat Conservation Program (HCP) now under review by your agency.

Since a national fish hatchery is located in our back yard (on Icicle Creek, a tributary of the Wenatchee River in Chelan County), most citizens of Leavenworth are keenly aware of the issues surrounding salmon survival. They know about the competing demands on our rivers and streams – demands for domestic water, irrigation, hydro generation, fisheries and recreation, among others. They are also aware of the stalemates that can result when these seemingly competing interests are at legal loggerheads.

The proposed HCP offers a common-sense approach to the fish problem. The HCP gives Chelan County PUD a fixed target, the outcome-based standard of 91 percent overall survival It allows the PUD time to find the most economical means of satisfying the regulatory agencies' fish protection requirements. And it appears to avoid the courtroom, where so many of these issues end up.

Of particular interest to the citizens of Leavenworth are the provisions for habitat protection and improvements included in the HCP. Leavenworth is situated near several important tributaries to the Columbia River, and we support habitat improvements to these rivers and streams.

On the business side, I represent a community that has become an outstanding pillar of the tourism industry of the Pacific Northwest. More than one million (1,000,000) visitors come to Washington's Bavarian Village each year. It is our hope that the PUD will be allowed to continue as the provider of low-cost, reliable electricity while maintaining its status as a good steward and good neighbor.

Please place the City of Leavenworth on record as supporting the Habitat Conservation Plan (HCP) of Chelan County PUD.

Sincerely,

William J. Bauer

City of Wenatchee

City Hall
(509) 664-3300
Fax (509) 664-3301
129 S. Chelan
P.O. Box 519
Wenatchee, WA 98807-0519

Public Works
(509) 664-3360
Fax (509) 664-5986
25 N. Worthen
P.O. Box 519
Wenatchee, WA 98807-0519

RECEIVED
MAR 16 2001

March 8, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232 – 2737

Dear Sirs:

We would, on behalf of the citizens of Wenatchee, like to collectively voice our support for the mid-Columbia River Habitat Conservation Plan (HCP).

Our community relies heavily upon affordable, reliable hydroelectric power. Public Utility District (PUD) dams therefore provide the foundation for the local economy, which has been struggling for the past several years due to extremely unfavorable agricultural market conditions and intense regulatory pressure. We must maintain the economic stability provided by hydroelectric power to preserve an affordable lifestyle for our citizens and to attract new businesses to the Wenatchee area.

The HCP is a carefully planned, collaborative approach to protect mid-Columbia fisheries resources. By establishing performance standards rather than arbitrary mandates, the HCP provides a measure of business certainty for the PUD and its customer owners while ensuring that effective, scientifically-based fish protection measures are implemented.

The City applauds the Chelan County PUD for not waiting until the conclusion of the HCP regulatory process to start implementing such fish protection measures. At Rocky Reach Dam, for example, testing of a fish collection and bypass system is nearing completion, with the permanent system scheduled for installation next year. This work is a vital part of meeting the fish survival standards outlined in the HCP.

The HCP provides a common sense model for addressing the requirements of the Endangered Species Act, and provides a far more productive approach than court system battles of regulatory disputes. We are hopeful that other jurisdictions will embrace this model throughout the region, as we all must do our part to save our salmon.

It is our understanding that the HCP outlines fish survival standards at the hydroelectric projects, with compensation for unavoidable losses to be provided by a PUD-funded conservation account. We believe this is an excellent idea, as it may provide an avenue for future partnerships with other government entities and organizations for matching funds to address critical habitat areas.

We are hopeful that the HCP will move swiftly through the regulatory review process and that its terms and conditions will be implemented as soon as practical.

Sincerely,

Dennis Johnson
Mayor

Bill Edwardson
City Council

Randy Gold
City Council

Don Gurnard
City Council

Chuck Johnson
City Council

Steve May
City Council

Mark Peterson
City Council

Don Richards
City Council

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 N.E. Oregon, Suite 200, Portland, Oregon 97232
Telephone (503) 238-0667
Fax (503) 235-4228

May 16, 2001

Donna Darm
Acting Regional Administrator
National Marine Fisheries Service
BIN C-15700
7600 Sandpoint Way, NE, Bld. 1
Seattle, Washington 98115

RE: **Comments on the Mid-Columbia Habitat Conservation Plan Draft Environmental Impact Statement**

Dear Ms. Darm:

The Columbia River Inter-Tribal Fish Commission (CRITFC),[1] on behalf of the Confederated Tribes and Bands of the Yakama Nation (YN), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Confederated Tribes of the Warm Springs Reservation of Oregon and the Nez Perce Tribe has reviewed the document entitled, "Anadromous Fish Agreements and Habitat Conservation Plans-Draft Environmental Impact Statement for the Wells, Rocky Reach and Rock Island Hydroelectric Projects" (DEIS). We have prepared the following comments. We also include by reference the comments of the Yakama Nation and the Confederated Tribes of the Umatilla Indian Reservation on the DEIS. We appreciate NMFS granting us additional time to comment on the DEIS.

Overview

The Yakama Nation and the Confederated Tribes of the Umatilla Indian Reservation aboriginally occupied lands in what is today the Mid-Columbia region in Washington State. The Columbia River and its tributaries are a part of that land. Protection of rivers and flows for anadromous fish and wildlife populations, as well as cultural resources and other matters are critically important to these tribes. The existence and operation of the Wells, Rocky Reach and Rock Island Hydroelectric Projects impacts the treaty-reserved natural resource interests of all four CRITFC member tribes. The outcome of the DEIS process could significantly affect rebuilding of fish and wildlife populations impacted by the Project. Therefore, the tribes have a unique interest and stake in this process that cannot be represented by any other entity.

[1] The CRITFC was formed in 1977 per formal resolution of the governing bodies of the four Columbia River treaty tribes: the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon and the Nez Perce Tribe. The Commission is comprised of elected and appointed tribal officials who are members of the respective tribal fish and wildlife committees. The Commission has technical and legal resources that provide assistance to the tribes in protecting and enhancing their federally reserved trust resources.

Anadromous fish stocks that originate above and within the boundaries of the Wells, Rocky Reach, and Rock Island Projects (Projects) are adversely affected by the presence and operation of the Projects. These stocks support ceremonial, subsistence and occasional commercial treaty fisheries in Lower Columbia River Zone 6 by all of the CRITFC member tribes. Thus, CRITFC has a unique interest in this process that cannot be represented by any other party.

DEIS Scoping

In general, CRITFC notes that NMFS has failed to address most of the CRITFC February 5, 1999 comments and recommendations made to the DEIS Notice of Intent to Prepare an Environmental Impact Statement (EIS) on the Habitat Conservation Plans (HCPs) for the Operation of the Projects (NOI). We incorporate by reference into the record the CRITFC February 5, 1999 comments on the NOI (Attachment 1). The purpose of scoping for a NEPA environmental impact statement is to collect a reasonable range of alternatives to be reviewed and analyzed in the statement. We note that the following critical issues included in the scoping comments are not addressed in the DEIS. This is not an exhaustive list of issues raised in the CRITFC comments on the NOI:

CRITFC

1

- The HCP hatchery plan attachment and the no-net impact standard, the foundation of the HCP Agreement, was contingent on the tribes receiving reciprocal assurances relative to treaty-secured fishing rights. The DEIS maintains NMFS position of not guaranteeing that the hatchery component will be met, thus, the no-net impact standard cannot be met.

2

- Other issues between the tribes and NMFS relative to reserved treaty fishing rights, such as potential prejudice against tribes posed by the "no surprises rule," also remain unresolved in the DEIS.

3

- The DEIS did not correct the misleading language of the NOI that states that parties to the 1998 "Commemorative Declaration" signed a declaration acknowledging "*their commitment to complete the regulatory actions necessary to issuing a permit*" (emphasis added). The Declaration did not commit the parties to this language.

4

- The geographic scope should not be limited to the three project area, but should be a reach-based approach consistent with the original intent of the HCP, including the federal projects, Grand Coulee and Chief Joseph, the Priest Rapids Project and the Hanford Reach. In particular, the existence and operation of federal projects above the three Mid-Columbia Projects significantly influences flow management and water quality, which in turn impacts anadromous fish survival through the Projects. This remains a major deficiency of the DEIS.

5

- The DEIS fails to address anadromous fish survival and recovery from a life history and ecological perspective (Williams et al. 1996; Lichatowich

and Mobrand 1995). Anadromous fish productivity cannot be addressed merely by measuring direct survival of a small sample of salmon from one point above the Projects to a point below the Projects.

6 • A cumulative impacts analysis is lacking in the DEIS.

7 • The DEIS should not have used the existing degraded state of salmon stocks and critical habitat as the environmental baseline, but should have used the natural river baseline as the measuring stick for considering harm and benefits. The DEIS should have taken into consideration the fact that the development of hydroprojects in the Mid-Columbia Reach set in motion a decline in fish populations that continues through much of the Columbia River Basin. NMFS themselves argued for use of a natural river baseline in American Rivers et al. v. Federal Energy Regulatory Commission 201 F.3d 1186 (9th Cir. 2000), but has not used this standard in the DEIS.

8 • The DEIS failed to include Pacific Lamprey and sturgeon in the "Plan Species". Current and permanent development of a screened bypass system, under "conditional HCP implementation"[2] at Rocky Reach does not consider lamprey passage, and lamprey have shown a propensity to become impaled upon screen systems at other basin dams (ISAB 98-4 1998).

9 • The DEIS failed to review and acknowledge water quality standards under the Clean Water Act. A recent court opinion states that dams are not above the law with respect to meeting water quality standards (see National Wildlife Federation v. Corps of Engineers, 132 F.Supp.2d 876 (D. Or. 2001).

10 • The DEIS lacks an adequate quantitative analysis as to how much take of the listed species will occur under the proposed alternatives. Further, the DEIS fails to quantify the effects that each proposed alternative would have on the goal of reaching sustainable anadromous fish populations that provide harvestable surpluses for treaty and non-treaty fisheries. The DEIS lacks survival, recovery and delisting goals specific to the listed and non-listed anadromous fish populations considered under the alternatives.

[2] NMFS has allowed Douglas and Chelan PUD to proceed with Phase I of the HCP under a "conditional HCP implementation policy," over strong tribal objections. Given that environmental review is not completed, an HCP Agreement remains unsigned, and a Section 10 Permit has been issued the legality of this action is highly questionable. However, Chelan is proceeding to finalize installation of a major bypass system that will likely exacerbate the decline of Pacific lamprey and sensitive salmon stocks which are Plan Species but not ESA- listed species.

11

- The DEIS fails to describe how the various alternatives relate to other applicable treaties and laws, including tribal treaties, the Clean Water Act and the *U.S.- Canada Pacific Salmon Treaty.*

12

- The DEIS failed to determine whether the 7% hatchery component can actually be achieved with or without Grant PUD's involvement in the HCP. Further, it remains unresolved in the DEIS how "no net impact" (NNI) would be accomplished if NMFS deems the 7% hatchery component unfeasible because of particular genetic or policy concerns with respect to supplementation. This is a key failing of the DEIS.

General Comments

13 There are many incorrect statements and factually erroneous declarations in the DEIS. While the following comments will serve to highlight some of the inaccuracies, we will not address them all. As stated above, most of the scoping issues identified by CRITFC were never addressed in the DEIS. For these reasons, the DEIS is a fatally flawed document and should be completely rescoped and reanalyzed.

14 The document abstract states that the HCPs satisfy the PUDs' regulatory obligations under the Federal Power Act. This is not factually correct. Future relicensings, measures to protect species not addressed by the HCPs and treaty obligations under tribal treaties and the *U.S.-Canada Pacific Salmon Treaty* are all

15 obligations that must be satisfied whether or not an HCP is consummated. Further, the HCPs will not satisfy standards under the Clean Water Act.

16 In the summary section it states that, "the parties have been engaged in cooperative HCP planning for over 6 years." This is not correct. Tribal parties have been in dispute with NMFS and the PUDs for much of that time, and are not in agreement with the proposed HCP documents at this time. Details of these disputes are provided below.

On page S-3 it is stated that, "the effects of Rocky Reach, Wells and Rock Island on anadromous fish *may* continue downstream through the Hanford Reach to McNary Dam." [emphasis added]. The Joint Fisheries Parties agree that the effects will continue downstream, whether they are from dissolved gas generated from the HCP projects, or injuries suffered when passing through these projects.

17 On page S-18 it is stated that the NNI standard of 95% survival per dam was developed in coordination with tribal biologists. However, not all tribal biologists agreed with the standard. The DEIS states that the NNI standard of 95% survival is consistent with the 1995 FCRPS Biological Opinion. While this is factually correct, it leaves out the other major criteria for passage systems required by the 1995 FCRPS, such as an 80% Fish Passage Efficiency (FPE) standard.[3] Because tribal biologists desired that the NNI

[3] Fish Passage Efficiency (FPE), as defined by the 1995 FCRPS Biological Opinion at VIII. 15, refers to the percentage of the juvenile migration that passes over a dam through non-turbine routes. The tribes have

standard would be consistent with the three basin restoration plans,[4] tribal biologists strongly recommended that the NNI standard have dual and complementing components, 95% survival and 80% FPE. This recommendation was rejected by NMFS and the PUDs.

18

Since the signing of the Commemorative Declaration of the HCP on June 27, 1998, the NMFS, Chelan PUD, Douglas PUD, WDFW and USFWS have been under a false assumption that the HCP was established, and that it should be under "conditional implementation"until the environmental review is completed and the Section 10 Incidental Take Statement finalized. The PUDs have embarked upon survival studies to determine HCP NNI standards without agreement from the Joint Fisheries Parties as to methodologies, principles and results. Chelan PUD recently unilaterally declared that they have reached the NNI standard of 95 % at both Rock Island and Rocky Reach dams, and that reduced spill at Rock Island and complete reliance on the Rocky Reach prototype bypass system are appropriate to protect listed and unlisted anadromous fish as they pass these dams (Attachment 2). Several of the Joint Fisheries Parties strongly object to Chelan's unilateral decisions under "conditional implementation" of the HCP as a proxy to reduce critical fish protection measures (Attachments 3,4,5,6,7).

These actions indicate extreme bad faith on the part of Chelan PUD in resolving key issues that remain unaddressed in the DEIS. The acceptance of "conditional implementation" by the non-tribal parties involved in the HCP negotiations has, in effect, stymied important progress in resolving key relicensing issues for the Rocky Reach Project (Attachment 7). The DEIS has not addressed these issues, which are critical to the future of the fisheries resource, because of the very depressed status of listed and unlisted Mid-Columbia anadromous fish stocks (TAC 1997; Cooney et al. 2000). The final EIS should address these issues.

Environmental Baseline

19

The DEIS defines the environmental baseline as the status of the anadromous fish stocks and their critical habitat in the 1970's when they were already depressed and degraded. This is inconsistent with the NMFS' 1995-8 FCRPS Biological Opinion (at page 12) that defines the baseline as the effects of the proposed action that would be added to the past and present impacts of all Federal, State, and private activities in the

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defined FPE as the percentage of the juvenile migration that passes over a dam through spill or surface bypass, and they, as NMFS, have adopted the dual criteria in their Columbia Basin salmon recovery plan, *Wy-Kan-Ush-Mi Wa-Kish-Wit* (Nez Perce et al. 1995). Adoption of the FPE standard is critical because it provides a measurable standard that covers the entire migration, rather than just a snapshot of survival provided by survival studies. An FPE standard also incorporates the available scientific literature that reviews comparative survival studies through different passage routes. This includes scientific information about delayed mortality and smolt-to-adult returns. These attributes cannot be assessed by limiting passage criteria to a simple measurement of survival for a distinct group of salmon through a dam over an extremely limited range of environmental conditions. Thus, the NNI standard lacks consistency and lacks a true assessment of the impacts of the Projects on the anadromous fish resource.

[4] The three plans are the 1995-1998 FCRPS Biological Opinion, the CRITFC tribes' 1995 restoration plan *Wy-Kan-Ush-Mi Wa-Kish-Wit*, and the Northwest Power Planning Council's 1994 *Strategy for Salmon*.

action area. The action area is defined as, "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action."

Critical Habitat

20 The DEIS fails to address listed species critical habitat. This is inconsistent with the 1995 FCRPS Biological Opinion (IV p. 82) which defines critical habitat as that which is critical to the survival and recovery of the species and determines whether or not the proposed operation adversely modifies or destroys the listed salmon's critical habitat.

Specific Comments

S.5 No Action Alternative

21 The No Action alternative, with extant baseline conditions and no action, is not an authentic alternative. Because upper Columbia spring chinook and steelhead are ESA listed, ESA Section 7 consultation and Section 10 Incidental Take permits must be conducted. In the case of the Wells Project, these have been consummated. NMFS, however, has failed to finalize these consultations for the Rocky Reach or Rock Island projects. Thus, this alternative is premature until these consultations are finalized and appropriate permits and biological opinions have been issued. It should be deleted from the final EIS unless these opinions and permits are finalized.

22 The DEIS fails to mention that the Rocky Reach prototype juvenile bypass system has been under dispute from tribal parties since it was first conceived. The Fourth Interim Stipulation for the Rocky Reach Project required Chelan PUD to seek consensus in developing the system. However, conditional implementation of the HCP has allowed Chelan to proceed with development of the system while it is still under dispute (Attachment 7). Thus, Alternative 3 (the HCP) has significantly impacted the other two alternatives. The final EIS must clarify these issues when defining the alternatives.

Currently Chelan PUD is refusing to honor the Fourth Interim Stipulation for Rocky Reach, which requires spill to 15% daily average flow. This situation also impacts the definition of Alternative 1, in that Alternative 1 as described is not reality. Further, the DEIS is incorrect when it states that the "main goal" of the Fourth Interim Stipulation was to build a bypass system. From the Joint Fisheries Parties'perspective, the main goal of the stipulation was to obtain immediate fish protection through spill, and advance mitigation and compensation for losses through the Rocky Reach Project.

23 With respect to Rock Island, the Alternative 1 in the DEIS does not accurately describe the baseline condition. A spill agreement between NMFS and Chelan, under the "conditional implementation" of the HCP, removed the spill authority from the other Joint Fishery Parties and the spill conservation account management specified under the Rock Island Settlement Agreement (Attachments 7 and 8).

S 5.2 Alternative 2 (Section 7 Consultation)

24 The DEIS fails to mention that the QAR report indicated a substantial risk of extinction for Mid-Columbia River spring-run salmon and steelhead if recent survival rates continue without supplementation. The final EIS must correct this oversight. Further, if the Mid-Columbia dams were removed, then recent total life-history survival rates would not continue, because survival, fish critical habitat and productivity would dramatically increase through the Mid-Columbia reach.

25 No rationale is offered why a screened bypass system would be included at each dam for Alternative 2. If spill is sufficient enough to meet downstream passage objectives, then it would stand alone.

26 If studies show that drawdown and decommissioning (dam removal) are necessary to meet recovery standards that provide harvestable surpluses, then these options would proceed under a relicensing process. No rationale is given as to why the decision would be postponed, given the high probability that upper Columbia listed species, closest to extinction in the basin, may expire in the near future without such measures.

27 The DEIS is inconsistent with the 1995-1998 FCRPS Biological Opinion and completely speculative as to the benefits that could be derived from minimum operating pools at the Mid-Columbia Projects. Drawdowns to minimum operating pool have been a fundamental reasonable and prudent measure under the 1995 FCRPS Biological Opinion, and haven't been studied at the Mid-Columbia projects.

28 A major strength of Alternative 2 is that there are many avenues to create and prescribe measures that are necessary for recovery of listed salmon by fishery experts who have the legal and management authorities to protect the resource, and the statutory authorities of the federal agencies are fully maintained. For example, actions through relicensings, actions through the Mid-Columbia Proceedings, actions under the ESA and actions under the Clean Water Act are all possible remedies to promote and achieve meaningful recovery measures. The final EIS should fully describe these attributes associated with Alternative 2, but not available under Alternative 3.

S. 5.3.1 Alternative 3 (Project HCPs)

29 The HCPs fail to include Pacific Lamprey, sturgeon, and ESA listed bull trout. Whether or not these would be afforded protection would be up to other processes, including the Federal Power Act and the Northwest Power Act. This is a key deficiency of the HCP.

30 Full mitigation has not been provided for anadromous fish losses at the HCP projects. From a tribal perspective this includes both listed and unlisted species. Currently, Rocky Reach and Rock Island are illegally taking listed salmon without a Section 7 Biological Opinion under the "conditional implementation" of the HCP as

allowed by NMFS. This demonstrates that under a consummated HCP, listed species would continue to be taken and driven to extinction.

31 Existing hatcheries have not provided adequate compensation for the initial construction of dam and reservoirs and the continual passage losses through the dams. NMFS' supplementation policies that restrict hatchery compensation add additional blockages to full mitigation and compensation.

32 The environmental baseline should consist of pre-project river conditions and population levels of anadromous salmon, or just prior to 1933 when Rock Island was constructed. No rationale is given in the DEIS to explain why the baseline conditions are moved from 1933 to 1977.

33 The terms of the HCP are arbitrary and not biologically based. Each PUD is given from 15-20 years to achieve NNI. Given the current status of the upper Columbia stocks presented in the QAR (Cooney et al. 2000), it is very likely that these stocks will be extinct by the time that the PUDs achieve NNI. Under the HCP alternative, if a stock is headed toward extinction, neither NMFS nor the other fishery parties have leverage to force operational or structural changes to improve passage at PUD projects.

34 NMFS and the USFWS would not withdraw from the HCP if the PUDs met all conditions except the performance standards, which are the heart of the HCP. Thus, the federal agencies with jurisdiction over the ESA would not have the leverage of the ESA to prevent extinctions. Further, NMFS and USFWS are restricted from recommending drawdowns and/or project removal without the consent of the PUDs- effectively removing a key restoration action that may be required to prevent extinctions.

S.5.3.4 HCP Mitigation Objectives

35 The HCP alternative includes measures from a biological standpoint, but not a physical and chemical standpoint. Biological measures and criteria stem from physical and chemical measures. For example, if temperature, a physical parameter, is too warm, then salmonids develop biological responses such as stress, disease and mortality. This is a significant omission in the HCP alternative.

36 As previously mentioned, the effects of the projects on anadromous fish go well beyond 1,000 feet below an individual project. This was an issue raised by tribal biologists but disregarded by NMFS and the PUDs. Water quality parameters such as dissolved gas, can directly and cumulatively impact stocks below a project. These impacts include stress or injury of fish as they pass the project that result in direct and delayed mortality by predators or disease well after the fish have passed an individual project. This is another concern with Alternative 3.

S.5.3.5 HCP Performance Standards

37 The original intent of the NNI standard was to make the dams, "transparent." However, the standards were developed without any quantitative analysis. Further, the standards remain speculative because the PUDs have not obligated themselves to fund measures that will contribute to meeting the standards (ie; spill at dams, habitat improvements and full supplementation production) and the measures themselves remain very speculative. For example, NMFS will not guarantee the 7% hatchery component, because of policy concerns related to genetic management, thus, it is impossible for the NNI standard to be achieved. It is disingenuous and factually wrong for NMFS to characterize Alterative 3 in the DEIS as consistent with the proposed HCPs that guarantee the 7% hatchery component.

38 The habitat component of 2% is purely speculative. It remains unknown whether or not this is obtainable. Specific measures that should be implemented to attempt to achieve this piece of the NNI standard remain unresolved.

39 The 95% and 91% dam and project survival standards, as noted by tribal biologists during the HCP discussions, are not sufficient to foster recovery of severely depressed salmons stocks, particularly to havestable levels. These standards must be viewed from a cumulative, exponential perspective, rather than a linear perspective. From an exponential perspective, the 95% dam survival standard results in (.95) raised to the third power or 85.7% survival through three dams. Likewise, a 91% project survival standard results in only a 75.4 % survival through three hydroprojects. These losses are much too great to sustain, much less recover upper Columbia stocks. Due to the extreme depressed status of the runs and the desire of tribes for recovery of treaty resources, some tribal biologists sought a 98 % survival standard during the HCP discussions.[5] If achieved, this standard would have resulted in a 94.1 % survival rate through three projects or dams.

40 A major omission of Alternative 3 in the DEIS is the failure to include passage and survival standards for adult anadromous fish. This was a contentious issue in HCP negotiations for some tribal biologists. While some adult losses were calculated into the compensation numbers, the lack of measurable adult passage standards allows the PUDs to avoid operational or structural measures necessary to improve adult passage and survival through the projects. Given that one successfully spawning adult can contribute 3,000-5,000 eggs to the next generation, CRITFC has recommended adult passage standards requiring mainstem dam operators to decrease pre-spawning mortality due to dam passage and passage time through their projects by at least 50% (CRITFC 2000). The 2000 FCRPS Biological Opinion at least requires reduction of adult fallback as a means to increase adult passage survival. The HCP alternative fails to provide any standards. Further, power peaking, an action that has been shown to reduce adult passage success (Bjornn and Peery 1992) is not addressed in the DEIS.

[5] During the relicensing process for the Lower Elwha and Glines Canyon dams, tribal, state and federal biologists determined that a 98% juvenile survival standard was necessary to restore five races of anadromous salmon and steelhead to the Elwha River.

S.5.3.6 HCP Phases

41 Because the HCP is already under "conditional implementation," steady progress toward achieving the survival standards should be required. However, the exact meaning of "steady progress" was never defined or quantified by the parties. It is clear that Chelan PUD is failing to make steady progress at both Rock Island and Rocky Reach since juvenile fish guidance decreased in 2000 from 1999 levels (Murphy et al. 2000); in 2001 Chelan ended Rocky Reach spill which in 2000 was 15% of daily average flow and Chelan has reduced 2001 spill from 2000 spill levels at Rock Island (Attachment 8). This raises the question as to the meaning of "steady progress."

42 While in theory it might be appropriate for the PUDs to move on to Phase III if performance standards were met for some species, in reality there may be other species that migrate at the same time that are not achieving the standards. These species may be subjected to passage "tools" that benefit other species but select against the species that have not met the standard. Thus, they are not protected.

43 The Mid-Columbia Coordinating Committee has yet to resolve issues related to the performance standards. There remains serious disagreements about the tools and methodologies to measure the standards, appropriate ranges of flow years to consider, life cycle analyses, delayed mortality and other issues. Under the existing Mid-Columbia settlement agreements and the Mid-Columbia proceedings, the coordinating committees operate under a consensus basis. This would be altered under Alternative 3. Under Alternative 3, the HCP coordinating committee would no longer be ruled by consensus. Instead, the PUDs would have the final decision on what passage tools to use, even in Phase III after NNI and/or the performance standards are not met. This represents a significant loss of authority for the tribes and other members of the Joint Fisheries Parties and is unacceptable.

Wells Dam

44 Section E. 2 of the existing 1990 Wells Settlement Agreement requires Douglas PUD to provide juvenile salmon with an 80% and 70% fish passage efficiency protection over the entire migration (100% of the migration). The Alternative 3 performance standard reduces juvenile protection to the middle 95% of the spring and summer migrations. The lack of protection on the beginning and end of the migration selects against important genetic and life history characteristics of the population and works against overall stock recovery.

Rocky Reach Dam

45 As previously stated, limiting performance standards to point estimates of survival for one group of fish for one environmental condition fails to consider the impacts of hydroproject passage for an entire stock over a number of varied environmental conditions. Further, survival study methodologies employed by the PUD

are in dispute with some of the JFP. In particular, critical assumptions that are necessary to make survival estimates robust continue to be violated.[6]

As Chelan PUD refuses to spill at Rocky Reach for the 2001 migration under the conditional implementation of the HCP, there is no assurance that spill would continue to
46 be provided under Alternative 3 (Attachment 8).

Rock Island Dam

As Chelan PUD has significantly reduced spill at Rocky Reach for the 2001 migration under the "conditional implementation" of the HCP despite entreaties from NMFS (Attachment 6), there is no assurance that spill would be provided under Alternative 3.

Tributary Conservation Plan

47 In the original HCP discussions, about $100 million was deemed necessary by the JFP to achieve a 2% habitat improvement component to NNI. The DEIS states that the PUDs would contribute less than $ 4 million to the habitat fund. This is less that 4% of the original estimate and would fail to achieve the 2% component of the NNI goal.

Hatchery Compensation Plan

48 Alternative 3 would not afford coho the same standards for compensation as the other plan species. It is unclear why this is the case. In Alternative 2, coho would be afforded mitigation and compensation.

S.5.3.9 Provisions for Impacts on other Species

49 It is very likely that the turbine intake screen system at Rocky Reach Dam, installed under "conditional implementation" of the Alternative 3, will likely impinge juvenile lamprey as been seen at Corps' mainstem dam screen systems (NWPPC 1999). Based upon information at Corps dams, the Rocky Reach bypass system will likely injury bull trout, an ESA listed species, because the system passage will cause physical injure similar to that experienced by adult salmon and steelhead. Wagner and Hilson (1991) found 41% of the adult steelhead that fell back through the McNary Dam screen system had visible bruises.

[6] Current survival studies implemented by the PUDs employ mark and recapture techniques that compare downstream passage detection of a group of fish above one dam to those released below the dam. If the fish from both groups fail to experience identical passage conditions downstream, then a key critical assumption necessary to validate the survival estimate is not met. The model assumes that similar arrival times of marked groups to downstream detection sites satisfies the assumption of identical passage conditions. However, Chi-Square Goodness-of-Fit analyses indicate that the groups do not necessarily arrive at the same time, thus, making suspect survival estimates.

S.3.5.14 Clarification of Issues

While Douglas PUD has conducted survival studies, whether or not the 91% project survival parameter has been met is still under dispute. Douglas has yet to conduct a study that evaluates yearling juvenile survival through the entire Wells Pool, nor have they conducted survival studies for subyearling salmon or sockeye.

Verification of Standards

50 No specific biological or statistical standards have been agreed to by the JFP. Representative tools are not available to measure performance standards for all of the planned species. The DEIS appears to indicate that dam passage survival would be the only measurement available to measure the performance standard. Yet the HCP requires survival measurements of the entire project. The DEIS appears to modify the intent of the draft HCP agreements, similar to the modification of the 7% hatchery component.

S.7.2.2 Alternative 2

51 The DEIS fails to mention that Alternative 2 would require NMFS to consult with affected tribes under the Secretarial Order. The DEIS also fails to mention that under Alternative 2, NMFS and the Department of Interior maintain their authorities under the Federal Power Act to condition the dams for fish passage and even condition the dams for project removal.

S.7.2.3 Alternative 3

52 Under Alternative 3, the burden of proof is on the party bringing an issue to dispute resolution. Because Alternative 3 establishes the JFP with the burden of proof, the JFP have the burden of demonstrating that their position (to protect and restore the resource) is accepted by a third party. This is a key drawback of Alternative 3 for the JFP. In Alternative 2 the burden of proof is equally placed between the PUDs and the JFP.

53 The "no surprises policy" guarantees that the PUDs will not have to take additional measures to assure recovery of the resource in the 50 year HCP period. The tribes have no such assurance for the health and abundance of the resource or that their harvest rate will be protected.

These aspects of Alternative 3 are unacceptable to CRITFC.

S.7.4.3 Alternative 3

54 As noted above, Alternative 3 as defined in this DEIS fails to guarantee 100% NNI. Neither the hatchery component nor the habitat component is assured.

Adaptive Management

55 Adaptive management, as defined by Hilborn (1987) means that experimental, probing actions are implemented, monitored and evaluated. Based upon the results, more actions are taken. In the true sense of adaptive management, all passage solutions would be used as probing experiments, including drawdowns. Under the HCP, drawdowns are not jointly considered. Thus, Alternative 2, which allows a range of probing actions, is more likely to achieve an adaptive management context than Alternative 3.

S.7.6.2 Alternative 2

56 Under Alternative 2, provisions of the Clean Water Act, the Federal Power Act, the Northwest Power Planning Act, tribal treaties and other laws and statutes are available to protect and restore Mid-Columbia anadromous fish through increased operational and structural measures and supplementation.

S.7.5.3 Alternative 3

57 Under the HCP, as noted above, Alternative 3 as defined in the DEIS fails to guarantee 100% NNI. Neither the hatchery component nor the habitat component are assured.

S.7.6 Other Environmental Measures (Table S-3)

The DEIS is incorrect or fails to express the following in the environmental comparisons and in general lacks analysis of alternatives from an ecosystem approach as noted by Williams et al. (1996) and Lichatowich and Mobrand (1995):

58 Project area soils- only Alternative 2 provides drawdown or project removal options. Riparian areas would be restored increasing mainstem spawning, incubation and rearing habitats through restoration of lotic properties instead of reservoir/lentic properties (Williams et al. 1996).

59 Reservoir erosion and sedimentation- only Alternative 2 provides drawdown or project removal options. These would reestablish natural river sediment transport regimes in the project area contributing to increased anadromous fish production (Vannote et al. 1980). For example, increases in turbidity would provide cover for juvenile salmon from predators and increase production as noted by Junge and Oakley (1966) and NMFS (2000).

60 Tributary Channel and watershed conditions- only Alternative 2 provides drawdown or project removal options. This would restore vital habitat linkages between tributary and mainstem areas. In particular, summer chinook habitat at the confluence between the tributaries and the mainstem would be restored (Williams et al. 1996).

61 Juvenile Migration/Survival standards- only Alternative 2 has the stated goal to require standards necessary to recover listed species, while leaving flexibility to establish standards through other laws and statutes necessary to recover unlisted species.

62 Adult Migration/Survival standards- only Alternative 2 has the stated goal to require standards necessary to recover listed species, while leaving flexibility to establish standards through other laws and statutes necessary to recover unlisted species. Alternative 3 has no adult standards.

63 Drawdown- as stated above, drawdown will increase fish spawning and rearing habitat and adult and juvenile survival, for a cumulative net production benefit. Winter (1990) gives several examples of anadromous fish restoration through dam removal. These issues are not mentioned, yet they are significant.

64 Bull trout- Alternative 2 allows the USFWS to engage in Section 7 ESA consultations and through the Federal Power Act, condition the projects to protect and restore bull trout. Alternative 3 does not allow this conditioning since bull trout are not an HCP species.

65 QAR results- the DEIS fails to consider that drawdowns or project removals would increase survival and significantly increase productivity through habitat restoration. The QAR did not consider the benefits to habitat restoration. As stated in the table, the effects of supplementation have not been analyzed in the QAR. This is a key deficiency in the DEIS that should be addressed. The statement that "*habitat productivity*" would increase survival under Alternative 3 from 6-10% is completely speculative and not supported by any DEIS analysis.

66 Fisheries resources- this section is not consistent with other parts of the DEIS. For example, under Alternative 3, coho are not afforded immediate supplementation, but the table indicates that they are afforded supplementation. Under Alternative 3, the retention of reservoirs will continue to provide excellent habitat for fish predators on salmon as compared to restoring lotic conditions possible under Alternative 2.

67 Monitoring- under Alternative 2, NMFS and the JFP could condition the licenses and appeal to the Clean Water Act provisions to provide both fish and water quality monitoring. Under Alternative 3, the JFP have no authority to obtain fish and water quality monitoring at the projects.

68 Total Dissolved Gas (TDG)- under Alternative 2 the JFP could condition the licenses and appeal to the Clean Water Act provisions to provide for reductions in total dissolved gas by either drawdowns or project removals that would limit deep plunging and entrainment of nitrogen. These provisions could also force the PUDs to install structural modifications to the dams to reduce TDG. Under Alternative 3, the JFP have no authority to regulate the PUDs to reduce total dissolved gas. Downstream reductions of total dissolved gas would be possible under Alternative 2, which would increase fish survival at lower river dams through increased spill at these dams and decreased risk of

gas bubble trauma from reduced exposure to elevated gas. This is a cumulative benefit that the DEIS failed to fully analyze.

Temperatures- The DEIS failed to address this critical parameter. Data from Jaske and Gobel (1957) and more recent data (Corps 2001) indicates that the projects contribute to violations of temperature standards. Under Alternative 2, the JFP could
69 condition the licenses and appeal to the Clean Water Act provisions to provide both fish and water quality monitoring. Under Alternative 3, the JFP have no authority to obtain fish and water quality monitoring at the projects.

Wildlife- the DEIS fails to mention that under Alternative 2, draw downs and
70 project removal would restore anadromous fish and riparian wildlife habitat. These would also contribute to the restoration and enhancement of wildlife populations. Alternative 3 would not restore riparian wildlife habitat, thus, depression of wildlife populations would persist.

Economics – Alternative 2 would allow for restoration of natural resources through draw downs, project removal, or appropriate passage conditions. These would promote natural river recreational opportunities that are at least equal or greater than that
71 provided by retaining the projects and reservoirs. Increased sport, tribal and commercial fishing activities would be available from restoration of natural resources, yet the DEIS does not address these. As note below, tribal health, welfare and socio-economics could be vastly impacted by the alternatives, yet the DEIS fails to address these issues.

72 Cultural resources- the DEIS fails to address the anadromous fish resource as a critical cultural resource. The projects occupy ceded lands of the Yakama Nation. Maintaining the status quo or limiting restoration under Alternatives 1 and 3 will continue to impact tribal cultural resources.

1.5.2.6 Federal Trust Responsibilities to Indian Tribes

73 The DEIS fails to distinguish the differences between trust responsibilities and treaty protection. The courts in United States v. Oregon have stated that all non-tribal conservation measures must be exhausted before the treaty tribes right to harvest is diminished. Alternative 3 with a "no surprises" policy allows the PUDs to limit their efforts to harvest salmon through their hydroprojects, effectively shifting the conservation burden back to the tribes. This is not consistent with the law and equitable sharing of the conservation burden.

74 The DEIS should state that the tribes will not endorse the HCPs if NMFS will not guarantee the 7% hatchery compensation necessary to achieve NNI.

1.6.3 Alternative 3

75 The footnote on page 1-16 contains contradictory statements. The proposed draft HCP agreements commit to the 7% hatchery component for NNI, yet in the DEIS, NMFS

cannot commit to the 7% hatchery component. Yet, the footnote says that NMFS is committed to the proposed draft HCPs. NMFS can't have it both ways.

76 Since the "conditional implementation" of the HCPs has been implemented, juvenile salmon protection has already been unilaterally diminished by Chelan PUD at Rocky Reach and Rock Island dams. In April, 2001, Chelan reduced Rock Island spring spill from 31 kcfs to 20% of daily average flows and completely ended Rocky Reach spill. This indicates clearly that Alternative 3 would not meet the requirements of the treaties, ESA, the Federal Power Act and the Northwest Power Act.

77 p. 1-25 The CRITFC tribes restoration plan, *Wy-Kan-Ush-Mi Wa-Kish-Wit* has specific recommendations for the hydroprojects and watershed area under consideration yet it is not mentioned in the DEIS.

p. 2-10-2-15

78 The DEIS fails to mention that recent estimates for turbine mortality in the DEIS occurred during high flow years with good water conditions. Estimates have yet to be established for poor water years, yet need to be. Further, the DEIS uses Snake River turbine estimates for Wells, Rocky Reach and Rock Island, when there are specific turbine mortality data for these projects. For example, steelhead mortality through turbines at Wells Dam is cited as 16% while Rock Island turbine mortality was cited as 5.7% or 13% (Whitney et al. 1997). The DEIS should have cited specific data that is available for specific projects.

79 Adult median passage times through fishways is a nebulous statistic. What is more important is the range of outliers in the data set. For example, according to adult passage studies, it can take days and even weeks for some salmon to pass these dams. Such delays compromise adult spawning success and distribution into more favorable spawning areas and waste precious energy reserves.

80 As stated previously, there are problems with the robustness of the estimates of survival using the mark and recapture pit-tag survival studies. At best, they are a snapshot of the survival of a particular group of marked fish and do not adequately represent survival of even one years' migration. Alternative 3 limits accounting of juvenile salmon protection to these snapshots while failing to incorporate passage standards for the migrations as a whole.

81 Juvenile mortality through screen bypass systems is much higher than indicated in the DEIS. For example, subyearling chinook direct and indirect mortality at the Bonneville Dam second powerhouse screen bypass system was documented at 20% (Gilbreath et al. 1993). Matthews 1987 (in Chapman and Witty 1994) notes that yearling chinook suffered an average of 5.8% mortality from the Lower Granite bypass system. In 1977, al low flow year, juvenile mortality in bypass systems was as high as 30% (Park et al. 1978). IDFG (1998) and Deriso et al. (1996) reported that adult returns trended negatively from juvenile pit-tagged salmon that went through multiple bypass systems.

82 Screen systemsalso negatively impact sockeye causing large rates of descaling and impinge juvenile Pacific Lamprey. The DEIS should be modified to include all relevant studies on the impact of these systems on salmon.

83 The DEIS speculates that the Rocky Reach bypass system can achieve a 98% survival rate, without any supporting data. Guidance for migrants in 2000 significantly decreased in 2000, which the DEIS fails to mention. Based upon pit-tag detection guidance for sockeye and subyearling chinook was only 7% and 27% respectively (Murphy et al. 2001). These extremely low guidance rates indicate that spill should be increased. Instead, Chelan PUD, under NMFS' definition of conditional implementation of the HCP, has completely shut off spill (Attachment 8).

84 Under controlled spill conditions, total dissolved gas has not been shown to impact salmon survival (Backman et al. in press; Backman et al 2000). The DEIS fails to examine the wealth of literature available that indicates the extreme risk to salmon populations from not spilling and sending salmon through bypass systems or turbines.

p. 2-16-2-17

85 The DEIS states that adult survival estimates have not been established for the Mid-Columbia. This is incorrect. NMFS and the Idaho Cooperative Fishery Unit presented adult survival data for Mid-Columbia spring chinook and sockeye (Bjornn and Keefer 1999). Survival from Rock Island to Wells Dam for spring chinook is about 91% and for sockeye is about 97%.

p. 2-18

86 The DEIS fails to include NMFS' conclusion in the 1998 Supplemental FCRPS Biological Opinion that there is a strong relationship between flow and reduced travel time for juvenile steelhead. This led NMFS to adopt a target flow in the Mid-Columbia of 135 kcfs for spring migrants. Other supporting literature that indicates reduced travel time for juvenile migrants is related to flow includes Cada et al. (1994) and Williams et al. (1996). Reduction of smolt travel time is positively related to increased smolt-to-adult returns as noted by Petrosky and Schaller (1998) and Schaller et al.(1999) and DeHart (1999). Alternative 3 does not include drawdowns that would decrease smolt travel time to the estuary. The DEIS should be modified to include a holistic assessment of the benefits of increased flows and reduced travel time to salmon production.

2.2.4.1 Water Quality

87 Due to forced spill, the projects can cause total dissolved gas levels to exceed Clean Water Act Standards. Under "conditional implementation" of the HCP, the PUDs are doing little to establish structural remedies to bring the dams into compliance with the standards. The DEIS should be modified to reflect these issues.

88 The loss of turbidity from the existence of the projects has also diminished salmon productivity as noted by NMFS (1999), CRITFC (1999) and Junge and Oakley (1966). The alternatives should be analyzed from this perspective.

2.2.4.2 Water Temperature

89 The creation of the Wells, Rocky Reach and Rock Island Dams has altered thermal regimes in the Mid-Columbia River as noted by Jaske and Gobel (1967) and has at times created thermal blocks for salmon migrations (Major and Mighell 1966). Water temperatures at these dams and passage facilities often exceed water quality standards (DART 1997-2000) for a considerable portion of the summer. Under "conditional implementation" of the HCP, the PUDs are doing little to establish structural remedies to bring the dams into compliance with the standards. Cooler water at depth could be used to regulate thermal regimes in fishways. The DEIS should be modified to reflect this issue.

2.3.3.11 Project Cumulative Effects

90 The DEIS fails to consider cumulative effects from a reach-based perspective. This is inconsistent with the FERC approach for the upper Snake River. In 1997, FERC initiated a cumulative effects analysis through an EIS for the entire upper Snake River reach.

91 The DEIS is also inconsistent with the NMFS cumulative effects approach for the federal hydrosystem. The NMFS 1995-1998 FCRPS Biological Opinion states, under Section V Cumulative Effects (p82) that, "for the purposes of thie analysis, the action area encompasses the Snake and Columbia Rivers, including areas outside the range of listed Snake River salmon that affect natural runoff of water into those areas that are within the listed species' range". Thus, the HCP should include projects and areas above the Wells Project.

p. 3-156 3.9.3.3

92 The DEIS statement that a 1969 Supreme Court decision in *U.S. v. Oregon* established the right to fish at all usual and accustomed areas is incorrect. There was no 1969 decision. The Supreme Court established that the 1855 treaties reserved the rights of the CRITFC tribes to fish as found in *United States v. Winans*. Federal District courts in Washington and Oregon have defined the tribes' rights to fish on and off the reservations in Sohappy v. Smith and U.S. v. Washington. The DEIS sentence that reads,"the court later decided that the Columbia River Tribes were entitled to should be changed to", "The court has decided that..".

4.7 Socioeconomics

93 The DEIS fails to include an analysis of the socioeconomic impacts of the alternatives on tribal economies. Most of the salmon wealth has been taken away from

the tribes and redistributed to non-tribal people in the form of flood control, navigation, irrigation and municipal development. This redistribution of wealth from tribal people that originated in the Mid-Columbia region has resulted in elevated poverty and death rates within tribal populations well in excess of the general population (Ch2 M Hill 1999). In particular, the loss of salmon from construction and operation of the Mid-Columbia PUD hydroprojects has transferred the sustainable wealth created by the river away from tribal peoples and has redistributed this wealth to non-tribal peoples (CH2 M Hill 1999). For example, the Yakama Nation tribal members have access to and take less than 10% of their traditional salmon harvest.

Loss of tribal wealth and the diminishment of opportunities to exercise treaty fishing rights from the depletion of salmon stocks has resulted in disproportionate rates of poverty, disease, mental illness and death in tribal communities compared to non-tribal communities (CH2 M Hill 1999). For example, the per capital income of a Yakama Nation tribal member is only 43% of the State of Washington per capita income, and the poverty rate of a Yakama Nation tribal member is 42.8% compared to the average citizen of Washington State at 10.9 % (CH 2 M Hill 1999).

Further, salmon are the mainstay of tribal religious and cultural practices. Every juvenile salmon that survives hydrosystem passage brings back as an adult some of the river's wealth to the tribal economy and culture. The DEIS alternatives must be evaluated as to their effects on tribal culture and economies and the alternatives ability to redistribute the river wealth back to tribal peoples.

4.10.7 Indian Trust Assets

94

While the guarantee of the 7% hatchery component is an important issue for the tribes, there are other important issues, including the inadequacy and lack of definition for the Alternative 3 performance standards, the "no surprises" policy, and the loss of JFP authorities under various laws and statutes.

The DEIS is incorrect when it states that, "the 7% level is similar to the existing hatchery production under the FERC settlement agreements." The current Wells Settlement agreement provides for a 14% hatchery production level for unavoidable juvenile losses through the Wells Project. Further, the DEIS is incorrect in stating, " meeting the 7 percent annual goal would guarantee a hatchery production level that supports current tribal harvests and ensures the Tribes that hatchery production would not decline." Current tribal harvest objective on upper Columbia anadromous fish stocks are not being met with current hatchery production (Nez Perce et al. 1995).

The courts in *United States v. Washington* have fully supported the tribal position that hatchery fish are treaty trust resources. The final EIS should clarify this issue. Lastly, the DEIS is erroneous in stating that the settlement agreement numbers were for fish losses from original dam construction. Both the Rock Island and Wells Settlement Agreements have mitigation components that require hatchery compensation for juvenile salmon passage losses.

4.10.8 Environmental Justice

95 Both Alternatives 2 and 3 will impact tribal economies that rely upon the health and abundance of treaty anadromous fish in different ways. Alternative 2 will allow retention of federal authorities and protection of treaty resources from a variety of different statues and laws. Alternative 3 will cause federal trustees to essentially dismiss their authorities for a 50 year period. The DEIS is incorrect in stating that Executive Order No. 12898 is not relevant to the DEIS alternatives. The final EIS should provide analysis of the alternatives in relationship to the Executive Order.

4.10.13 Water Rights

96 The implementation of each alternative will impact tribal and non-tribal water rights in different ways. For example, in a low flow year water withdrawals from the Columbia Basin can diminish mainstem flows to the point where spill is jeopardized at the PUD hydroprojects. Further, spill at dams is a water right in that it is the use of water for fish instead of for power. The final EIS needs to analyze the issue of water rights from the perspective of the alternatives.

Summary

The DEIS fails to address fundamental issues raised in CRITFC's scoping comments. In addition, the DEIS contains many erroneous statements and fails to provide analyses for critical issues such as the impact of alternatives on tribal socioeconomics and tribal trust assets. The DEIS is further flawed because it fails to reconcile the fact that NNI is dependent on the 7% hatchery component as called for by the proposed HCPs, while NMFS' position and the DEIS state that the HCPs are "whole" without the 7% hatchery component.

The DEIS fails to analyze the alternatives from an ecosystem perspective and a water quality perspective. The DEIS cumulative and quantitative effects analysis is lacking, and the environmental baseline begins in 1977, which is nearly 50 years after the construction of the Rock Island Project. Further, the DEIS fails to analyze the effects of the alternatives on returning adults to natal spawning areas. The DEIS should be completely rescoped and redone if parties continue to support an HCP concept.

97 The acceptance of "conditional implementation" by the non-tribal parties involved in the HCP negotiations has, in effect, stymied important progress in resolving key relicensing issues for the Rocky Reach Project and has apparently prevented NMFS from completing Section 7 consultations with Chelan PUD and FERC. If biological opinions were issued on the Rocky Reach and Rock Island Projects, the DEIS alternatives would be fundamentally changed.

Given the bad faith of Chelan PUD to "conditionally implement" the HCP through cooperation and consensus of the JFP, NMFS should immediately complete a Section 7 Biological Opinion and declare jeopardy on the operation and structural configuration of the Rocky Reach and Rock Island Projects. Upper Columbia stocks, both listed and unlisted, are in extremely poor status, and cannot withstand protection delays while the HCP process grinds onward at an excruciatingly slow pace.

CRITFC does not support DEIS Alternative 3 for the above reasons. CRITFC recommends that NMFS and the Department of Interior retain their authorities under various statutes and laws to prescribe, in consultation with the tribes, meaningful protection, mitigation and compensation measures for the PUD hydroprojects, as offered in Alternative 2. This is critical to immediately increase anadromous fish survival and productivity to avoid extirpation and to fully recover Upper Columbia populations to a level that provides for tribal and non-tribal harvestable surpluses.

Sincerely,

Don Sampson
Executive Director

Attachments 1-8

CC: Commissioners, tribal attorneys and program managers, Joint Fisheries Parties.

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Columbia River Inter-Tribal Fish Commission (CRITFC)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	15	34	24	67	50
2	38, 43	35	22	68	2
3	44	36	55	69	1, 23, 50
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28	23, 34	61	34	94	16
29	48	62	24	95	20
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31	17, 47	64	48	97	5
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33	20	66	17		

[1] see Appendix C

Confederated Tribes of the Colville Reservation

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RECEIVED
MAY - 4 2001

May 1, 2001

Bob Dach
NMFS, NWR, Hydro Program
525 NE Oregon Street, Suite 420
Portland Oregon 97232 – 2737

RE: **Comments on the Draft Environmental Impact Statement (DEIS) regarding the proposed Anadromous Fish Agreements and Habitat Conservation Plans (HCPs) for the Wells, Rocky Reach and Rock Island Hydroelectric Projects.**

Dear Mr. Dach:

The Confederated Tribes of the Colville Indian Reservation (Colville Tribes) has reviewed the DEIS regarding the *Proposed Anadromous Fish Agreements and Habitat Conservation Plans (HCPs)* for the Wells, Rocky Reach and Rock Island Hydroelectric Projects. We appreciate the opportunity to review the document and provide the following comments. The Colville Tribes has been a participant in the process of this HCP development since it's initiation more than six years ago. We have in good faith attempted to support and move the process forward towards meeting the recovery, protection and conservation of Mid-Columbia anadromous fish resources which are so important to the Colville Tribe's subsistence, religious, ceremonial and cultural way of life. However, since last year it has become evident to the Colville Tribes that several unresolved issues exist with respect to the HCPs which place in question whether they fall short of providing the necessary protection, conservation and recovery for Mid-Columbia River anadromous fish resources. We will discuss these issues and the uncertainties they create for the HCP alternative in our comments below.

General Comments

- The most important element of the HCP alternative from the Colville Tribes perspective is the overall performance standard of 100% which is known as the No Net Impact standard. This standard in our view is the foundation of the HCPs and is intended to achieve no net impact for all plan species at each project. It includes both a project survival requirement of 91%, which includes a 95% juvenile dam passage survival, and a 9% compensation requirement for unavoidable project mortality, which is provided through 7% hatchery and 2% habitat compensation programs. During the late stages of HCP development, the National Marine Fisheries Service (NMFS) determined that they could no longer support the 7% hatchery compensation requirement as had been identified during the prior 4 years of HCP development. They were concerned

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with the potential impacts to ESA recovery from hatchery programs and therefore could not guarantee the 7% compensation level. We question this decision by NMFS, especially since their assessment (QAR) of implementing only the HCP survival and tributary improvements (no hatchery compensation measures), indicate that these HCP actions would not meet interim recovery levels for either spring chinook or steelhead. The reluctance on the part of NMFS to guarantee the 7% hatchery compensation level creates a major concern for the Colville Tribes and as long as the No Net Impact standard remains unresolved, the Colville Tribes will not support the HCP alternative.

- A major objective of the HCP alternative is to protect and conserve both listed and non-listed anadromous fish plan species which include: spring run chinook salmon, summer/fall chinook salmon, sockeye salmon, coho salmon and steelhead inhabiting the Mid-Columbia River basin. The hatchery compensation plan for one of these plan species, Okanogan River sockeye salmon, is inconsistent with this objective. This plan species, and only this species, is subject to a substitution measure, which allows sockeye smolt production to be eliminated and substituted by summer/fall chinook. The Colville Tribes oppose this action and voiced concern on many occasions during the HCP development process that they would not support an action, which substituted one plan species for another. However, one of the HCP proponents, Douglas County PUD continues to pursue this action and just recently reminded the Colville Tribes of their ability to continue this action within the HCP process. Okanogan River sockeye are an important anadromous fish species to the Colville Tribes and we are concerned about the well being of this species in light of the unavoidable losses caused by the Wells Hydroelectric Project. We will not agree to an HCP that contains measures that allow unavoidable mortality of Okanogan River sockeye to be compensated by substituting hatchery production of sockeye for that of another species. 2

- The verification of survival standards also concerns the Colville Tribes. Currently, technology is not available to sufficiently conduct all of the survival evaluations required in the HCPs for all plan species. The HCPs propose to conduct representative survival studies for yearling chinook and steelhead and then develop indirect methods to measure compliance of other plan species during Phase I. Efforts would continue to determine more direct compliance during later phases but no mandatory survival studies to verify survival standards of all plan species is required. This strategy tends to suggest to the Colville Tribes that there is a lack of commitment on the part of the proponents to conduct survival studies on any plan species except the listed species. They want a 50-year agreement that supposedly will conserve, protect and recover all anadromous plan species, both listed and unlisted, but in reality the survival studies only deal with listed species. Why would the Colville Tribes commit to a 50-year agreement that would affect the Tribe's ability to raise other anadromous fish issues that may become important to the 3 4 5

Tribe during the next 50 years, when only listed species will be the focus of this HCP. We can almost certainly obtain those same assurances with the Section 7 Consultation Alternative without having to commit to a 50-year agreement. This issue is discussed in more detail in specific comments, 2, 3, and 4 below.

Specific Comments

* We note that survival estimates and monitoring efforts appear to be heavily reliant upon marking programs (PIT tags, balloon tags, radio tags). We feel that although theoretically this may be sound, in practice, large scale marking programs as needed to assess both juvenile and adult passage rates and survival may not be possible due to the scarcity of test animals. We offer
6 no solution to this situation but question, given the stress and mortality associated with fish handling and marking, the practicality of marking large numbers of Plan or Permit species for either phase I or II evaluation or phase III monitoring efforts.

We also note that survival studies utilizing PIT tags require downstream recovery locations equipped with passive interrogation systems. At present, the primary recovery locations for PIT tagged fish used in survival studies at Wells, Rocky Reach, and Rock Island Dams would be at McNary and John
7 Day Dams. Due to the great distance between the release and the recovery locations and associated in-river mortality, precise survival estimates would require the release of large numbers of PIT tagged fish. For example, approximately 70,000 yearling chinook were required to evaluate survival rates at Rocky Reach and Rock Island Dams in 1998 and even with these large numbers of marked fish the precision of survival estimates were lower than anticipated due to lower than expected recovery rates. Recovery rates for
8 sockeye and zero age chinook would likely be lower than that of yearling chinook, requiring excessive, possibly unrealistic, numbers of PIT tagged fish to conduct the survival studies.

It is our understanding that turbine mortality studies with balloon tags are normally conducted by releasing individual marked fish through turbine intakes. Although we agree that this type of assessment does provide some level of insight into the effects of turbine passage on juvenile salmonids, we do not believe that this assessment technique adequately represents the
9 simultaneous passage of thousands of juveniles through turbine intakes as occurs during peak outmigration periods. We therefore suggest that other evaluation techniques be used in conjunction with balloon tag studies to adequately assess juvenile turbine passage mortality.

* We have noted that the HCPs rely heavily on marking programs to verify compliance with survival standards and have questioned that adequate numbers of test fish will be available to conduct these evaluations. We also note that under "Phase I Measurement and Evaluation, section d" in each HCP it states:

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"If the differences between the study results and the District's performance standard being measured are not statistically significant, then the District's performance standard has been met."

We object specifically to this clause as non-significant differences, which would be interpreted as meaning that the District's have met their performance standards, can easily result from a combination of inadequate numbers of marked fish or lower than anticipated recovery rates.

* We acknowledge the use of surrogate species (i.e., yearling fall chinook for spring chinook) in marking studies as an alternative to marking endangered species. However, we question that yearling chinook and

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juvenile steelhead adequately represent the FPE or mortality rates of juvenile sockeye or zero age chinook summer migrants. We note that Fish Guidance Efficiency research at COE projects has consistently shown both sockeye and zero age chinook to have considerably lower Fish Guidance Efficiencies (FGE) compared to those of yearling chinook and steelhead. In addition, descaling and mortality rates for juvenile sockeye are typically higher than those of yearling chinook and steelhead at Columbia River COE projects. We also note that both turbine passage mortality and predator susceptibility for juvenile sockeye and zero age chinook are likely different from those of yearling chinook and juvenile steelhead. We suggest that FPE and survival

12

estimates derived through the use of tagging studies with yearling chinook and steelhead likely will overestimate FPE and survival for the other Plan species (sockeye, zero age chinook, and possibly coho) under Alternative 3. In addition, because adult passage studies have not been completed for each of the three hydroelectric projects and juvenile studies have not been completed for each of the Plan species, the only standard to which project survival can be

13

measured under Alternative 3 are survival studies of juvenile steelhead and yearling chinook. We further note that the yearling chinook used in such studies were yearling fall chinook as a surrogate for yearling spring chinook. We suggest that both juvenile and adult passage and survival evaluations need to be completed for all Plan species and used to evaluate and monitor compliance standards for all three HCPs. However, we also question the practicality of completing such work and repeating such work on a timely basis as necessary for either evaluation or monitoring activities.

14 * Under Alternative 3, the HCPs indicate that the evaluation portion of Phase I will occur over a three year period. We question that all five Plan species could be evaluated during such a short period of time.

15 * We applaud the consideration given to adult fallbacks in both Alternatives 2 and 3. We are aware of 1999 radio tracking work conducted with adult steelhead in the Mid-Columbia which, when the data analysis is complete, will provide some reference on adult steelhead migration behavior including fallback at mainstem projects. We are not aware of work specifically designed to address: 1) kelt passage in terms of guidance efficiency, direct and delayed mortality (note that kelts are downstream migrants and not true fallbacks) or 2) fallback guidance efficiency, direct and delayed mortality. We believe this to be an outstanding unresolved issue, which has not been adequately addressed in either the action areas of the Wells, Rocky Reach, or Rock Island Projects or elsewhere in the Columbia Basin.

16 * We agree that Pacific lamprey, although currently not listed as a Plan species, may benefit from tributary improvements as part of Alternative 3. Pacific lamprey currently are the focus of dam passage research elsewhere in the Columbia Basin due to declining populations. Currently, little is known of juvenile lamprey FPE or turbine passage mortality and we therefore consider this to be an outstanding unresolved issue. We further request that due to the cultural importance of lamprey to the Colville Tribes, that Pacific Lamprey be included as a Plan species under Alternative 3.

17 We also note that restoration of lamprey populations is consistent with the objectives for basin level biological performance as indicated under the "Anadromous Fish Losses" section of the Northwest Power Planning Council's 2000 Columbia River Basin Fish and Wildlife Program.

"*Halt declining trends in salmon and steelhead populations above Bonneville Dam by 2005. Obtain the information necessary to begin restoring the characteristics of healthy lamprey populations.* " (Page 18)

18 * Similar to Pacific lamprey, white sturgeon are another anadromous species, which have been affected by the development of the hydrosystem but are not listed as a Plan species. The DEIS mentions little about white sturgeon other than that little is known about their population status. Sturgeon are an important species to the Colville Tribes and we believe the most likely impacts to sturgeon populations have been loss of spawning habitat due to inundation and blocked migration due to dam construction. We consider the effect of hydroelectric development on white sturgeon populations in the Mid-

Columbia to be an outstanding unresolved issue, and request that white sturgeon be included as a Plan species under Alternative 3.

19

* We note that natural river drawdown and dam removal, although not considered to be viable alternatives in and of themselves, would appear to remain as possible actions available to be evaluated through the FERC relicensing process under Alternative 2 but, except as where specifically noted, not under Alternative 3.

Alternative 2

"Although natural river drawdown is not an option under the existing FERC licenses, it could be evaluated during relicensing procedures. The current FERC licenses expire in 2006, 2012, and 2028 for Rocky Reach, Wells, and Rock Island dams, respectively." (Page S-11)

"In addition to the required research and monitoring efforts, the following measures, or combination of measures, could potentially be required as a result of the Section 7 consultations:...

... Other non-power actions (i.e., drawdown) if the combination of project and habitat related measures have not adequately addressed the decline of listed species." (pages 1-14 through 1-15

Dam removal is extremely controversial, and can only be legally mandated at project relicensing." (page 2-45)

Alternative 3

Under Alternative 3, it would appear that drawdown or dam removal are actions that could be ordered by FERC as part of the relicensing process,

"HCP's also have termination provisions if the performance standards are not achieved. An HCP could be less than 50 years under the following circumstances:...

...FERC orders removal or drawdown of the project." (page *2-33)*

But, given ...

"*It is the intention of the PUDs that mitigation measures agreed upon as part of the HCP be consistent with, and where possible form the basis of subsequent FERC license articles developed to address impacts on Anadromous salmonids."* (page 2-33)

it would appear that such an order from FERC would be unlikely.

A special provision has been made to allow for drawdown or dam removal without termination of the HCP but requires mutual agreement between the services and the PUDs.

"Any party to the HCP (except the PUDs) may elect to withdraw from the agreement, based on the non-compliance provisions of the HCP agreements. However, NMFS and USFWS will not exercise their right to withdraw from the HCP if the PUDs have complied with all aspects of the agreement but have not met the survival standards. If mutual agreement is reached between PUDs and the two Federal agencies, the services (NMFS and USFWS) can seek natural river drawdown, dam removal, and/or non-power operations without withdrawing from the agreement or suspending or revoking the Incidental Take Permit. " (page 2-33)

We further understand that, based upon the conditions as stated in the "Assurances" sections of the HCPs, signatories to the HCP cannot advocate drawdown or dam removal accept as noted above. However, we assume that non-signatory parties could request an evaluation of drawdown or dam removal as part of the FERC relicensing process for each project.

We request verification that our understanding is correct.

20

* We note that significant differences related to hatchery production exist between Alternatives 2 and 3. Changes in hatchery production are not specifically identified under Alternative 2 although hatchery production may be refined (increased or decreased) based upon effects on listed species.

Under Alternative 3, the HCPs provide 7% hatchery compensation for unavoidable project mortality. We understand from the statement below that the 7% hatchery compensation for unavoidable project mortality is above and beyond that provided for original project inundation (i.e., baseline conditions).

"HCP Baseline Conditions. The HCP's do not address impacts resulting from original project construction or mitigation from past damages. Mitigation measures for these impacts have already been implemented as part of the existing licenses. Prior activities are not considered an action subject to additional mitigation beyond license requirements unless they are considered to cause a continuing "take" of listed species as defined under the Endangered Species Act."

Existing hatchery production levels are initially assumed to provide adequate compensation for original inundation by the projects. Therefore, the baseline is considered to be the existing conditions." (page S-16)

We interpret these statements as meaning that hatchery production would be increased under Alternative 3 to provide an additional 7 percent compensation above baseline conditions (conditions present as of January 1997) unless NMFS determines that such production results in jeopardy to listed species.

However, current PUD funded hatchery production includes compensation for both inundation losses (baseline) and for some level of unavoidable project mortality. For example, Rock Island and Wells Settlement Agreements also provide for passage loss through Eastbank and Methow Hatchery Programs. So at least some of the 7% is already being provided under the existing settlement agreements and the PUD's may be providing additional compensation above what is currently required. Because of this, it is difficult to discern from the DEIS how hatchery production levels for each of the Plan species will change under each HCP. Will the Douglas PUD funding for 14% hatchery compensation be reduced with the adoption of the Wells HCP?

21

In addition, the DEIS states,

"During the development of the HCPs, NMFS determined that the 7 percent hatchery compensation levels might adversely affect wild salmon populations under certain conditions. For example, it may be necessary to use adult salmon and steelhead that are not adapted to the local habitat conditions in order to produce enough juvenile fish to meet the 7 percent compensation level. In order to ensure that these compensation levels do not effect the long -term health of the wild populations, all fish produced under this program must be from local stocks. Therefore, until the specific details of the compensation programs are developed, including identification of appropriate broodstock, maximum percentages of the wild population that can be trapped for broodstock, and the total number of fish that can be produced through artificial means, NMFS can not guarantee that the 7 percent compensation level will satisfy Endangered Species Act requirements and no net impact would not be achieved." (page S-26)

22

It would appear that under Alternative 3, current hatchery production levels could be reduced if they:

- currently exceed the 7% unavoidable project mortality compensation level, or
- are determined to jeopardize the recovery of ESA listed stocks, or
- must rely on insufficient numbers of local broodstock.

We request clarification as to specifically how hatchery production for each Plan species will change from current production levels under each of the HCPs.

23 We note that under "Initial Production Capacities" in the HCPs for the Wells, Rocky Reach, and Rock Island Projects, production of coho is not mentioned. As a Plan species, coho need to be included in the 7% hatchery compensation. As native coho salmon are considered to be extirpated from the Mid-Columbia River region, how will hatchery production levels be established for this species under the HCPs?

24 * We understand that under Alternative 2 a biological opinion will be created and will be a "living document" that will be updated at any time that new information becomes available.

"Specific measures required in the initial biological opinion may be modified or new measures may be required as a result of this process. In addition, if other species were listed under the Endangered Species Act, additional consultation practices would occur." (page 2-27)

We note that under Alternative 3,

"The requirements of Section 10 of the Endangered Species Act provide the guidelines for HCP preparation. The information within each of the HCP's includes the following:.. Proposed mitigation and enhancement measures to address unresolved and unknown future issues (note: an adaptive management plan to address changing circumstances and unknown future events addresses this issue in the proposed HCPs)." (page 2-32)

However, under Alternative 2,

"National Marine Fisheries Service has the legal authority to determine the actions necessary to ensure the survival and recovery of listed species. This includes determining the most appropriate measures to be taken at each project, the necessary level of survival at each project, determining the most appropriate data to be considered when evaluating survival; and modifying the measures as needed if species continue to decline.... Under Section 7, NMFS has a legal responsibility to provide the benefit of the doubt to listed species with respect to gaps in the information base.

If FERC or the PUDs disagree with the NMFS's decisions under this process, lengthy legal proceedings may ensue." (page 2-53)

Under Alternative 3,

"According to provisions in the HCP's, the authority to determine the appropriate protection measures for all of the Plan species, including Endangered Species Act species, fundamentally shifts away from NMFS under Alternative 3 (HCPs) once the incidental take permit has been issued. During Phase I of the HCPs, the PUDs

would have the ultimate authority to determine the measures necessary to achieve the survival standards. During Phase II, a Coordinating Committee (comprised of the PUD responsible for the HCP, NMFS, and each of the signatories to the agreement), jointly decides on the appropriate measures. If the Coordinating Committee cannot reach consensus, the PUDs may continue to determine the appropriate measures unless the matter is addressed through the dispute resolution process."

"The party bringing an issue to dispute resolution must prove its case by a preponderance of the evidence. There is no requirement to provide the benefit of the doubt to the species of concern with respect to gaps in the information base and NMFS has no authority to determine what constitutes the best available information to be utilized in support of any decisions. The dispute resolution process is limited to under 5 months, ensuring that lengthy legal disputes would not occur, and decisions reached through the dispute resolution process are binding." (page 2-53)

We note that both alternatives provide for some level of adaptive management and that adaptive management under Alternative 2 would only apply to listed species whereas under Alternative 3 adaptive management would apply to all Plan species.

We further note that although Alternative 3 appears to provide an expedited mechanism for settling disagreements, the emphasis shifts away from providing the benefit of the doubt to the species of concern. We recognize that the species of concern would include all Plan species under Alternative 3 as opposed to just ESA listed species under Alternative 2. However, given that substantial data gaps pertaining to fish passage and survival do exist and are likely to continue to exist in the future, we doubt that a "*preponderance of evidence*" can be readily assembled to support a resolution in favor of the species of concern. We consider this potentially to be a fatal flaw in Alternative 3, as non-compliance to HCP standards must be proven under the dispute resolution process, presumably through some mark recapture study about which we have already expressed concerns (see Comments 2-4). If such proof is not available, then actions detrimental to the species of concern will be allowed to continue.

25 We believe that lack of direct evidence should not constitute assumed compliance with survival standards.

26 * It would appear that tributary habitat enhancement is possible under both Alternatives 2 and 3. Under Alternative 2, such actions are not expected but could be required if other on-site actions do not lead to the recovery of the two listed species.

"In addition to the required research and monitoring efforts, the following measures, or combination of measures, could potentially be required as a result of the Section 7 consultations:...

7. Improvements in tributary habitat if the project specific measures have not adequately addressed the effects of project operations." (pages 1-14 through 1-15)

Under Alternative 3, a Tributary Conservation Plan and Plan Species Account would be created to compensate for 2 percent of the unavoidable project mortality. Contributions to this account would be made by the PUDs on behalf of each project. We note that for the Wells Project:

"For the Wells Project, the Douglas County PUD would make an initial contribution to the account of $991,000 (1998 dollars adjusted for inflation). If juvenile dam passage survival after three years of evaluations remains greater than or equal to 95 percent, the district would make annual payments of $88,089 (1998 dollars) throughout the HCP term or would pay$1,321,333 (equivalent to 15 years of annual payments), deducting the actual costs of bond issuance and interest. If juvenile dam passage survival is less than 95 percent, the Douglas County PUD shall contribute an additional $991,000 and increase the annual funding to $176,178, or make an up front contribution of $2,642,667 (equivalent to 15 years of annual payments in 1998 dollars), deducting the actual costs of bond issuance and interest." (pages 2-38 through 2-39)

We have several concerns related to this clause.

27 Per our previous comments related to the heavy reliance of the HCPs on the results of marking programs, to ensure that the 95% juvenile passage survival standard is accurately measured, evaluations must be conducted using each of the Plan species and not through the use of surrogates (Comment 3). As

28 indicated in Comment 4, we once again question that survival studies for each of the five plan species can be completed in a three-year period. As indicated in Comment 2 we object to the clause "*If the differences between the study results and the District's performance standard being measured are not statistically significant, then the District's performance standard has been met.*" In this case non-significant differences would result in a reduction in

29 Douglas PUD contributions to the Plan Species Account.

In addition, during Phase III of the HCP, juvenile survival is to be periodically re-assessed. If the 95% survival standard were to be met under Phase I, no provision appears to exist to allow additional monetary compensation if

30 juvenile survival is determined to drop below the 95% standard as measured during Phase III monitoring efforts.

We suggest that a statement such as the following should be added:

"In the event that the 95% survival standard is met for each of the Plan species during the phase I three year evaluation period, but subsequently determined to decline to a survival level less than 95% for any of the Plan species during Phase III monitoring activities, Douglas County PUD will

provide an additional $991,000 and will increase annual contributions from $88,089 to $176,178. The $991,000 (1998 dollars) will be a one time additional payment required for non-compliance with the 95% juvenile survival standard. The increase in annual contributions from $88,089 to $176,178 will continue until further monitoring assessments determine that the 95% juvenile survival standard is met for each of the Plan species. Douglas County PUD may provide an additional $1,321,333 one-time payment in lieu of the additional annual $88,089. "

We further note that the annual payments would begin "*...after three years of evaluations...* " In addition *"The HCPs set an initial 5-year period for the PUDs to meet the 95 percent juvenile dam passage survival standard, followed by up to three years of evolutions.*" From this, we conclude that the annual payments to the Plan Species Account may not begin until eight years after the start of Phase I. We suggest that the initial payment of $991,000 be increased to $1,695,712 (1998 dollars) to account for the eight years of annual payments of $88,089 that will be missed during Phase I.

31

* We question and seek clarification as to what happens if an affected party does not sign the HCPs under Alternative 3. Our understanding is that because the HCPs are voluntary ESA compliance efforts on the part of the PUDs, that technically they need only include the services (NMFS, USFWS), FERC and the PUDs themselves. It would appear that non-signatories couldn't participate as members (either voting or non-voting) on either of the Coordinating Committees or the Hatchery Committee. The same is generally true for the Tributary Committee, however, a non-signatory party could potentially be selected to serve as an expert non-voting member by the Tributary Committee.

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* Within the mid-Columbia River, total dissolved gas (TDG) supersaturation is the foremost water quality concern. It causes migration delays and mortality from "gas bubble disease". Most of the TDG is a result of spilling done to aid downstream fish passage or to manage excessive flows. The high TDG levels persist well downstream of the project area where they originate. Currently, spill deflectors are a voluntary mitigation measure, and WDOE grants waivers to the dams for exceeding TDG levels.

33

We note that spill remains the primary juvenile passage strategy at Rock Island Dam under Alternatives 2 and 3. Spill is also the primary juvenile passage strategy at Wanapum and Priest Rapids dams. We are concerned that increased volumes of spill at Rock Island Dam, as potentially advocated under both Alternatives 2 and 3, may result in increased Total Dissolved Gas levels, which may cripple or preclude spill operations for juvenile passage at the Wanapum and/or Priest Rapids projects.

Given the larger water volumes stored and/or spilled at Chief Joseph and Grand Coulee dams, TDG and other water quality problems originate
34 upstream of the area the DEIS considers. Just as tributaries to the Mid-Columbia are included in habitat and water quality considerations, the effects of the upstream dams should be part of any HCP.

More specifically, the DEIS does not mention any specifics with respect to gas abatement structures at Chief Joseph or Grand Coulee dams. In addition, the large storage behind Grand Coulee Dam (in terms of both areal extent and temporal duration) allows a thermocline to develop during warmer months. The increased temperatures exacerbate the effects of total dissolved gas supersaturation. High water temperatures have other adverse effects on salmonids; these are discussed in a separate section.

Wells: A controlled spill with modified spill bays is currently used for
35 juvenile fish passage, and is relatively successful, having an overall survival rate of 98 percent. The spill form is not clear in the DEIS -- is it a step-pool cascade structure? If so, it might result in relatively lower TDG levels resulting from spills (because of decreased vertical drop). The DEIS states that TDG levels "sometimes" exceed state standards; in fact, the Mid-Columbia is 303(d) listed for this parameter because of high TDG levels below Wells Dam. Could the goal of improved fish passage and WDOE's
36 water quality responsibility to reduce TDG justify a more elaborate structure to accommodate spills (and fish passage)? There is no mention in the DEIS of spill deflectors at Wells Dam, and there have been no new structural modifications there since 1990.

Rocky Reach and Rock Island are part of the same reach for WDOE water quality designations, and are currently listed for TDG, as well as temperature and bioassay levels. Rocky Reach has a spill program to aid juvenile fish passage (and perhaps adult fall-backs and kelts); the program provides for spill levels equal to 15% of daily flows during spring and 10% during summer. In addition, a turbine bypass system (for fish passage) was installed
37 in 1994 and is still being modified. There is no mention in the DEIS of spill deflectors at Rocky Reach Dam.

Rock Island: As mentioned above, TDG, temperature, and bioassay levels are 303(d) listed in the reach that includes Rock Island. Currently, there is a primitive orifice bypass used for spill purposes, and spill is purchased with a
38 conservation account. Thus, timing and magnitude of spill may be dependent on available funds. Given the effect of spill on TDG, this might also restrict options for resolving water quality problems.

A bypass system has never been adequately developed at Rock Island. The DEIS states that several modifications for fish passage are being considered: a forebay guidance curtain, testing spill configurations, turbine bypass systems,
39 and other options for juvenile bypass. Consideration of water quality effects

(especially TDG), including opportunities for improvement, should be part of all bypass development plans.

40 There is no mention in the DEIS of spill deflectors at Rock Island Dam. Both Rock Island and Rocky Reach dams have TDG and gas bubble disease monitoring mentioned as part of Alternative 2, yet there is no planned response to those problems.

41 * The Washington Department of Ecology is in the process of revising the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC). The revised standards, if adopted, will be more stringent with regards to water temperature and dissolved oxygen concentrations. Water body classifications will be "use-based" with specific attention paid to use by salmonids. There do not seem to be provisions within the DEIS or the HCPs to account for or integrate these more stringent water quality standards.

42 For example, the DEIS acknowledges violations of current state temperature standards with maximums as high as 23.8°C and three-month averages ranging from 10.0 to 18.8°C. Temperatures in Tables 3-5 and 3-6 are often in excess of the proposed revised WDOE standards for seasonal daily maximums and moving 7-day averages for daily maximums. For salmonid rearing and migration waters, the proposed water temperature standard is 15°C (moving 7-day average of daily maximums) with no single daily maximum to exceed 17.5°C from June 1 through September 14.

DO levels are linked to temperature; the DEIS consistently states for all three dams that "DO levels do not *typically* drop below 8.0 mg/L" but under the proposed revised standards, this only applies from June 1 through September 14, and only for rearing and migration waters. For salmonid spawning waters, average daily DO levels cannot fall below 10.5 mg/L from September 15 through May 31, with no single daily minimum falling below 9 mg/L.

We also note that the Wells project has inundated the lower 17 miles of the Okanogan River resulting in elevated water temperatures for this reach. Elevations in water temperature have delayed adult sockeye migration into the Okanogan River and possibly resulted in an elevation in pre-spawn mortality rates. This needs to be addressed in the HCP for the Wells Project.

43 * Fall and summer chinook in the Mid-Columbia River are generally considered to outmigrate during the first year of life as zero age summer migrants. However, it is our understanding that a high percentage (46%-78%, John Sneva, WDFW, personal communication 3/21/01) of the Wenatchee River adult summer chinook show scale growth patterns indicative of an additional year in fresh water. These fish may be relatively small in number but an important component of adult returns. In addition, these fish may over-

winter in hydroelectric reservoirs and therefore may arrive at hydroelectric projects at any time during the year such as late summer or early spring.

Summer chinook are not an ESA listed species and therefore not addressed in Alternative 2. They are plan species under Alternative 3, but the holdover component of the juvenile population does not appear to be considered, most likely because this characteristic has not been adequately assessed. We further note that the 95% dam passage survival standard for juveniles under Alternative 3 applies to 95% of the run period for each Plan species, which may not provide adequate protection for holdover summer chinook. We consider this to be an outstanding unresolved issue.

Thank you for the opportunity to comment on the HCP DEIS. If you have questions about our comments or need further clarification, please contact Joe Peone, Director of the Colville Tribal Fish and Wildlife Department at 509 634-2113.

Sincerely,

for Dale Louie

D. R. Michel,
Chairman, Natural Resource Committee
Colville Tribal Business Council

Cc: Tim Brewer — Office Reservation Attorneys
Joe Peone — Fish and Wildlife Dept.

Confederated Tribes of the Colville Reservation (CTCR)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	27	25	21
2	86	26	14
3	57	27	56, 57
4	18, 57	28	22
5	21, 57	29	21
6	57	30	22
7	57	31	12, 30, 75
8	57	32	20
9	56	33	2
10	21, 57	34	1
11	57	35	78
12	57	36	2
13	57	37	2
14	22, 57	38	4
15	93	39	4
16	48	40	4
17	48	41	23
18	48	42	92
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20	17		
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[1] see Appendix C

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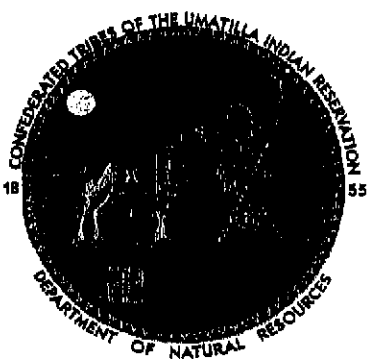

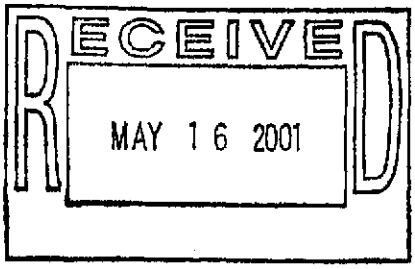

May 1, 2001
Via E-Mail, FAX and U.S. Mail

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Re: Draft Environmental Impact Statement for the Mid-Columbia Anadromous Fish Agreements and Habitat Conservation Plans

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Department of Natural Resources, offers the following comments on the Draft Environmental Impact Statement (DEIS) for the Anadromous Fish Agreements and Habitat Conservation Plans (AFAs/HCPs) for the Wells, Rocky Reach and Rock Island Hydroelectric Projects prepared by the National Marine Fisheries Service (NMFS). Our comments incorporate by reference the comments of the Columbia River Inter-Tribal Fish Commission (CRITFC), submitted on behalf of the Columbia River Treaty Tribes.[1] We also incorporate by reference all prior correspondence and comments submitted by the CTUIR and CRITFC on our behalf, such as Scoping Comments dated February 5, 1999.

[1] The Columbia River Treaty Tribes include the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes of the Yakama Nation. The four tribes possess rights reserved by treaties with the federal government to take a fair share of the fish destined to pass our usual and accustomed fishing places. Among these fish are the anadromous species that originate in the Columbia River and its tributaries, including the Mid- and Upper Columbia.

CTUIR

Introduction

The construction and continued operation of the Wells, Rocky Reach and Rock Island dams have greatly impacted the rights and resources of the CTUIR and its members. They have harmed anadromous fish populations and significantly altered their habitat. These fish and their habitat have been a critical part of tribal existence for thousands of years. Even when faced with the overwhelming power and unfair bargaining position of the United States during negotiations over the Treaty of 1855, the Cayuse, Umatilla and Walla Walla tribes were adamant in specifically securing the pre-existing right to fish at all usual and accustomed places. Retaining the right to continue their traditional fishing practices was a primary objective of our ancestors when they signed the Treaty.[2]

1 While the Draft AFAs/HCPs may have been developed pursuant to provisions of the Endangered Species Act (ESA), NMFS (and other federal agencies) should not lose sight of the fact that they are subject to additional, higher duties and obligations such as those imposed by the Treaty of 1855. In this process and all others involving salmon and steelhead in the Columbia River Basin, the federal government must adhere to the paramount goal of protecting, enhancing and restoring anadromous fish and their habitat so as to lead to sustainable, harvestable fish populations consistent with tribal Treaty Rights. The United States must honor those Rights, ensure the free exercise of those Rights by tribal members, and fulfill its Trust Responsibility toward tribal trust resources.

The DEIS And Underlying AFAs/HCPs Do Not Adequately Honor Treaty Rights Nor Fulfill Federal Trust Responsibility

2 Unfortunately, the Draft AFAs/HCPs and the DEIS examining them indicate that the federal government has fallen far short of above goal thus far. Merely striving to "de-list" species currently listed under the ESA is insufficient. It may serve as an initial step in the right direction, but our Treaty demands more. Other laws have separate mandates, and also require more rigorous results, such as the Federal Power Act, the Northwest Power Act and the Clean Water Act, for example.

3 The Proposed Action (Alternative 3) does not fulfill the federal Trust Responsibility to the CTUIR or other tribes. The Draft AFAs/HCPs lack assurances that 7% hatchery compensation will be achieved, which we believe is essential in order to eventually enjoy healthy, harvestable fish populations. The federal government seems willing to offer "No Surprises" assurances to

4 other parties, but is unwilling to extend equivalent ones to the tribes. The United States is also reluctant to include provisions assuring the tribes that nothing within the AFAs/HCPs will be

5 used against us in possible future litigation, should any arise. Finally, the federal agencies also may be prevented from taking additional necessary recovery and rebuilding measures in the event fish resources continue to deteriorate despite implementation of the AFAs/HCPs.

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[2] *See Tulee v. Washington*, 315 U.S. 681, 684-85 (1942); *United States v. Washington*, 443 U.S. 658, 664-69 (1973).

The Agreements Are Not Ripe For Review

6 Before proceeding further, we should note that we seriously question whether it is appropriate for the AFAs/HCPs to be subject to environmental review at this time. The parties to the negotiations agreed that the documents were not to move forward in the absence of a "final package" acceptable to all the parties. At present, this is not the case—not everyone is "on board" with the draft documents, in particular the tribes. Unfortunately, the DEIS apparently presumes that the AFAs/HCPs are final, official, and suitable for implementation, when in fact
7 there are as of yet no signed HCPs and no ESA Section 10 permits.[3] Thus, the region should be proceeding under regular relicensing, for dams such as Rocky Reach, until the HCP process has reached a satisfactory conclusion.

The DEIS Contains Inaccuracies And Promotes Misperceptions About Tribal Positions and Involvement

8 The DEIS inaccurately portrays the CTUIR's position on a number of issues. While the CTUIR and others offered substantial concessions during negotiations in exchange for the incorporation of certain measures in the AFAs/HCPs, those measures were not included in the Draft AFAs/HCPs submitted to NMFS. Thus, no valid, binding agreements have been reached between the parties as of this date. Consequently, the DEIS cannot and should not imply or suggest that the CTUIR has agreed to the sum of contents of the AFAs/HCPs.

9 In the past, the CTUIR informed NMFS that it should not create the appearance that the CTUIR fully supported the AFAs/HCPs or any portion of them, specifically asking that our name be removed from certain documents.[4] This was not done, and explanations in the DEIS relative to the CTUIR's positions do not adequately convey the fact that we have not agreed to the AFAs/HCPs in their present form.

10 The CTUIR also seeks additional assurances in the AFAs/HCPs addressing not just hatchery and production, as the DEIS mentions. There are other guarantees that are as important to us as those sought by the Public Utility Districts (PUDs), and are required before we can agree to the
11 AFAs/HCPs. Finally, there are assertions that the "No Net Impact" (NNI) concept was developed with tribal biologists, implying wholesale tribal acceptance when that was not the case.[5]

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[3] *See* DEIS at p. 2-35, pp. 2-41 to 42.

[4] *See* Letter from Alphonse F. Halfmoon, Vice Chairman, Board of Trustees, to Mr. William J. Stelle, Jr., Regional Director, Northwest Region, National Marine Fisheries Service, Sept. 28, 1998; Letter from Antone C. Minthorn, Chairman, Board of Trustees, and Alphonse F. Halfmoon, Vice Chairman, Board of Trustees, to Mr. William J. Stelle, Jr., Regional Director, Northwest Region, National Marine Fisheries Service, Dec. 9, 1998.

[5] *See* DEIS, p. 2-35.

NMFS Has Not Complied With The Secretarial Order In Developing The AFAs/HCPs Or The DEIS

12 In participating in the development of the AFAs/HCPs and producing the DEIS evaluating them, NMFS has failed to comply with the 1997 Secretarial Order of the Secretaries of Commerce and Interior entitled "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act." The Secretarial Order requires the agencies to interpret and implement the ESA in a manner that harmonizes the tribal rights and our sovereignty with the Secretaries' duties under the ESA. It also requires that the agencies ensure that tribes not bear a disproportionate share of the conservation burden for listed species. The DEIS must account for the Secretarial Order's requirements, but does not.

The DEIS And Underlying AFAs/HCPs Have Additional, Substantial Deficiencies

The DEIS and the AFAs/HCPs also suffer from numerous other serious flaws that render them inadequate and unsupportable. Some of these are summarized below:

13 The DEIS neglects to address several important legal issues, such as compliance with Clean Water Act requirements for water quality and quantity. The document acknowledges that the projects exceed water quality standards for temperature, yet it contains no information about how this problem could be addressed under the alternatives.[6]

14 The DEIS lacks meaningful analysis of survival, recovery and rebuilding. Quantitative detail is absent in both the AFAs/HCPs and the DEIS on how listed species would be impacted by implementation of the AFAs/HCPs. While the DEIS mentions the Quantitative Analytical Report (QAR) produced by NMFS, it does not incorporate its results into the alternatives analysis. This is a significant oversight in that, according to NMFS's own data in the QAR, measures in addition to those set forth in the AFAs/HCPs will be necessary for recovery:

> "Even under the most optimistic scenarios . . . regarding future survival rates and the effectiveness of supplementation, additional survival improvements beyond those projected for the draft HCP actions would be necessary to achieve extinction risk/recovery criteria."[7]

The DEIS essentially ignores the QAR's finding that meeting the HCP standards and achieving off-site mitigation "would fall short of meeting survival and recovery criteria under the assumptions that 1980-present conditions will continue."[8] Therefore, according to the QAR, additional measures are going to be required for recovery, but such measures are not required nor allowed by the AFAs/HCPs. The DEIS must more fully and completely address these issues relative to all the alternatives.

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[6] *See* DEIS, pp. 3-96 to 3-100.

[7] QAR, p. ii.

[8] QAR, p. iii.

15 | Furthermore, the geographic scope of the DEIS is inadequate. It fails to address or analyze
16 17 | cumulative and synergistic effects. It lacks a reasonable range of alternatives. Its "No Action"
18 | Alternative is inadequately described and evaluated. The DEIS's comparison and contrast of Alternatives 2 and 3 is biased and inadequate. The DEIS fails to fully consider and address
19 | potential constraints on federal authorities under various statutes, and difficulties in fulfilling federal Trust Responsibility, associated with adoption of Alternative 3. The assurance of "No Surprises" for the PUDs is inappropriate for HCPs of this type, covering facilities that are
20 | inextricably interconnected with other facilities and activities *not* covered by the HCPs, *all* of which affect the anadromous fish populations at issue.

21 | "No Net Impact" under Alternative 3 is misrepresented in the DEIS, which fails to take into account recent scientific information or uncertainties about funding. Additional NNI issues should be explored as follows:

22 | • Assess potential impacts on species within the first five years of the HCPs, during the time in which NMFS and the U.S. Fish and Wildlife Service are limited in prescribing or preempting the plans of the PUDs;

23 | • Analyze and explain the biological basis for the draft AFAs/HCPs' assumption that 91% survival + 7% hatchery mitigation + 2% tributary mitigation are additive so as to guarantee zero impact on the species;

24 | • Examine the relationship between the NNI standard and long-term stock viability;

25 | • Analyze whether or not the proposed measurement of the performance standard for 95% Juvenile Dam Passage Survival, by measuring juvenile survival over only 95% of the run, ensures a juvenile passage mortality of only 5% such that the draft AFAs/HCPs address full mitigation for take;

26 | • Examine passage impacts to anadromous fish and lamprey and descaling injuries (particularly on sockeye) if screens are installed, and assess whether such impacts are accounted for within the NNI standard;

27 | • Determine what impacts may occur during the time period that elapses before the PUDs actually meet the proposed survival requirements and analyze whether those impacts can or will be appropriately mitigated;

| • Determine impacts on the species should the survival goals never be reached during the term of the AFAs/HCPs;

28 | • Assess impacts on spring migrating Chinook salmon if they are exempted from the 95% Juvenile Dam Passage Survival standard as planned; and

29 | • Provide an accurate evaluation of losses and determine whether the mitigation proposal is supported by adequate data to ensure no unmitigated take.

30 The DEIS also misrepresents the issue of drawdown in its comparison of the alternatives, making it appear to be a much more accessible and available option under Alternative 3 than it actually would be in reality. In truth, it would be virtually "off the table," notwithstanding the status of the fish, whether their numbers continued to decline, or whether the dams were responsible. Drawdown must therefore be given serious consideration under Alternative 2 and should also be analyzed as its own alternative.

31 The AFAs/HCPs lack satisfactory provisions for measuring and evaluating the results if the plans are implemented. The DEIS states, "There is currently no methodology that all parties support for determining the survival of adult fish through the projects."[9] The DEIS improperly refers to
32 existing conditions as the baseline in its assessment of the alternatives, precluding the meaningful examination of the ongoing, lingering effects of prior degradation. A "natural river" baseline is more suitable and appropriate.

33 The DEIS does not give adequate consideration to lamprey and sturgeon. It does not give
34 adequate consideration to the issue of long-term risks associated with Alternative 3.[10] It does not evaluate the alternatives in terms of the widely accepted scientific determination that re-
35 establishment of more "normative" river conditions is essential to long-term salmonid survival. It does not adequately portray tribal economic issues and impacts. It does not adequately inform
36 the public and decision-makers about the requirements and responsibilities of all applicable
37 federal statutes and treaties. It lacks adequate analysis of the off-site mitigation proposals.

Conclusion

38 The DEIS fails to establish that the proposed AFAs/HCPs are sufficient to protect anadromous fish in the Mid-Columbia region. Standards and benchmarks are difficult to assess. Risks and
39 uncertainties remain disproportionately balanced on the backs of the salmon and the steelhead on which we depend for the exercise and fulfillment of our rights, religion, economy, culture and spirit. This seems particularly inappropriate at the moment, given the unwillingness of the federal agencies to carry out many of the very measures that they prescribed for themselves in operating the federal hydrosystem.

40 Plans for configuring and operating the Rocky Reach, Rock Island, and Wells dams should have more certainty as to whether or not standards will be achieved, and whether or not those standards are in fact enough. Significant doubts as to the ability to comply with even minimal ESA requirements are raised; thus, far greater doubts as to satisfying tribal Treaty Rights and fulfilling the federal Trust Responsibility are inescapable.

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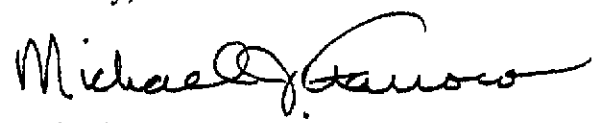
[9] DEIS, p 2-41.

[10] See DEIS, p. 4-77.

The CTUIR remains hopeful that the outstanding issues in the AFAs/HCPs can one day be ultimately resolved in a manner that mutually benefits all the parties. Thank you for your consideration of our comments on the Draft Environmental Impact Statement for the Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects. If you have any questions or wish to discuss any of these matters further, please contact Carl Merkle with our staff at (541) 276-3449.

Sincerely,



Michael J. Farrow
Director, Department of Natural Resources

MJF: DNR EP/RP: CFM: cfm

cc: Susan Fruchter
NEPA Coordinator
Office of Policy and Strategic Planning
Room 6117
Herbert C. Hoover Bldg.
U.S. Department of Commerce
Washington, D.C. 20230

CTUIR Fish and Wildlife Committee
Donald Sampson, Executive Director, CRITFC
Carl Scheeler, Chair, Columbia Basin Fish and Wildlife Authority

Confederated Tribes of the Umatilla Indian Reservation (CTUIR)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	37	25	28
2	23	26	35
3	40	27	22
4	42, 43	28	28
5	19	29	41
6	19	30	24
7	47	31	18
8	44	32	25
9	44	33	48
10	44	34	21
11	44, 83	35	25
12	37	36	20
13	23	37	30
14	6, 7	38	6, 7
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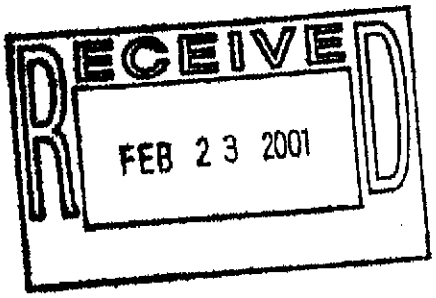
[1] see Appendix C

Development Partners



February 21, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

Greetings:

For the past several years, I have been working with business, government and industry leaders to enhance economic development in North Central Washington. While we have had some successes, there are also many challenges for our region to overcome.

Our region's agricultural industry is suffering, due largely to increasing government and environmental regulations. Our low per-capita income reflects a lack of family-wage jobs. Alcoa, one of this area's two largest industrial employers, is cutting production significantly.

One of our main selling points in keeping existing businesses and attracting new ones is a reliable supply of reasonably-priced electricity from the hydroelectric projects owned and operated by Chelan County PUD.

For the past few years, I have been following the development of the mid-Columbia HCP. It has been my hope that somehow all of the diverse parties involved in this process could come up with a plan to not only protect our fishery resources, but to protect affordable, reliable electricity for residents and businesses in this area. It appears as though the plan that is outlined in the recently released Draft Environmental Impact Statement has a high potential of meeting that goal.

The outcome-based survival standards in the HCP address both performance and compliance in protecting fish. Working with agencies, Indian tribes and other interested parties, the PUD can develop the protection and enhancement measure necessary to achieve the survival goals. Unavoidable losses are compensated through supplementation hatchery production and a significant habitat enhancement fund. Although the fish protection measures will be expensive, it appears that waste will be minimized and our dollars will be channeled into programs that will achieve agreed-upon goals. This is a far better approach than a series of broad-based agency mandates focused on a moving target. Lawyers are the only winners under that scenario.

The HCP provides a measure of certainty for local citizens and businesses and for the other utilities whose customers rely upon Chelan PUD's hydroelectric energy. Meeting the survival standards provides long-term business assurances that fish mitigation requirements won't dramatically escalate in the future. Our PUD should be able to continue to provide the reliable, affordable electricity that we desperately need to sustain, grow and prosper in this region. And, with the ongoing energy crisis in the Northwest, we can ill afford to lose any further generating capacity.

Finally, there is a cooperative plan that makes sense in addressing the requirements of the Endangered Species Act. I support the mid-Columbia HCP and I urge all parties involved to waste no time in implementing this valuable program. Let's keep it moving!

Sincerely,

Jon Eberle
President

CC: Gary Montague, PUD Commissioner

Gateway to Excellence

ENTIAT SCHOOL DISTRICT NO. 127

2650 Entiat Way • Entiat, Washington 98822 • Telephone (509) 784-1800 • Fax (509) 784-2986

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March 28, 2001

Mr. Bob Dach
NMFS, NWR, Hydro Program
525 N.E. Oregon St., Suite 420
Portland, OR 97232-2737

RE. Anadromous Fish Agreements and Habitat Conservation Plans for Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Dear Mr. Dach:

As superintendent of the Entiat School District, I wish to express my concern that Page 2-40 Project Cumulative Effects of the above-referenced plan is inadequate.

It is our position that any further erosion of our tax base would cause irreparable harm to the children and parents of this school district. In our current situation, funds designed to mitigate the loss of fish habitat have seriously impacted the fiscal condition of this school district. The proposal of an additional $45 million for possible land acquisition is obviously a frightening proposition to the officials of this district.

Thank you for providing us an opportunity to express our concern.

Sincerely,

Jeff Davis
Superintendent

FEB 12 2001

FOREMAN ARCH DODGE
VOLYN & ZIMMERMAN PS

DALE M. FOREMAN

124 NORTH WENATCHEE AVENUE, SUITE A

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509/662-9602 FAX 509/662-9606
E-MAIL: dale@fadv.com

BRANCH OFFICES:
MOSES LAKE
CHELAN
OMAK

February 9, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

Re: Comments on Habitat Conservation Plan

To Whom it May Concern:

Having served in the State Legislature to represent the people of North Central Washington (and to protect the interests of all the citizens of the entire State of Washington), it is with a sense of urgency that I write to endorse the concept of Habitat Conservation Plan (HCP) now being reviewed as a way to deal with the important fishery resources of the mid-Columbia.

This region is faced with extremely serious economic problems. The HCP speaks to economic concerns by offering long-term business certainty on fish spending costs and power rates. It speaks to environmental concerns by providing a balanced approach to compensate for unavoidable losses at dams on the river. It affords quick resolution of disputes rather than plunging issues into the limbo of long, drawn out court battles. It promotes cooperation by establishing review panels involving regulatory agencies and PUD staff. And it sets an example for the rest of the country that illustrates how complicated issues can be resolved through hard work and a collaborative spirit.

With pressures mounting on successful hydropower generators as a result of energy shortages in California and elsewhere, it is increasingly important to protect operators, such as Chelan PUD, who have demonstrated their farsightedness and their competency in managing both the environmental and the generation aspects of their industry. This HCP affords outside regulators a way to do their duty to protect fishery resources while allowing Chelan PUD the

flexibility to find creative and workable solutions that produce results. Such an enlightened approach is long overdue. I urge you to do everything possible to allow it to work.

Sincerely,

FOREMAN, ARCH, DODGE
VOLYN & ZIMMERMAN, P.S.

Dale Foreman

DALE M. FOREMAN

DMF:kj
cc: Roger Braden
H:\FOREMAN MISC\NMFS-1.ltr

PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY
MEETING OUR CUSTOMER ENERGY NEEDS IN A COST CONSCIOUS MANNER.
P. O. BOX 878 • EPHRATA, WASHINGTON 98823 • 509/754-0500

May 1, 2001

Bob Dach
National Marine Fisheries Service
Northwest Region, Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

Ref: Draft Environmental Impact Statement for the Anadromous Fish Agreements and Habitat Conservation Plans (HCPs) for the Wells, Rocky Reach and Rock Island Hydroelectric Projects (DEIS)

Dear Mr. Dach:

This letter contains our observations and comments regarding the referenced document. Public Utility District No. 2 of Grant County (Grant PUD) owns and operates the Priest Rapids Hydroelectric Project that consists of the Priest Rapids and Wanapum dams and is geographically situated immediately downstream of the 3 projects that are the subject of this DEIS.

We are generally supportive of the proposed action which, as we understand it, is to issue incidental take permits under Section 10 of the Endangered Species Act to Douglas and Chelan PUDs' based on the HCPs. However, we have a number of concerns with the analysis provided by NMFS in this DEIS and its implications and potential impacts on the Priest Rapids Project. This comment letter will discuss specific concerns regarding the analysis in the DEIS.

GC PUD

1

1. <u>The DEIS Presupposes Consistency of the HCP with the New Federal BiOp and A Non-Existent Basin-Wide Salmonid Protection Programs</u>
The 100 percent no net impact performance standard (NNI) is presented as the centerpiece of the HCPs which are the subjects of the DEIS analysis. However, no scientific justification is given for this standard other than the statement that it is consistent with the performance standards of NMFS' 1995 biological opinion (BiOp) for the Federal Columbia River Power System. In fact, the 1995 BiOp was replaced in 2000. If there is any reason to scrutinize the DEIS in the context of a federal BiOp, the new BiOp should be used for comparison. Furthermore, there is no basis for concluding that the HCPs will be consistent with evolving basin-wide salmon protection plans that do not yet exist (See page 4-39).

2. The Presentation of Vastly Different Alternatives Confuses the Proposed Action

2 Specifically, the DEIS presents separate alternatives relating to Section 7 and Section 10 of the ESA. As we have pointed out in prior correspondence to you, there are substantive and procedural differences between the two Sections that, if glossed over, make it difficult to analyze the impacts of a proposed action and its implications for the various parties to the HCP as well as Grant PUD.

3. The DEIS Presents No Independent Scientific Analysis of the Validity of the NNI Standard

3 At page 4-39, the DEIS states that the NNI standard was developed through negotiations between State and Federal resource agency (sic), PUD, and Tribal biologists. The fact that the NNI standard was negotiated in concert with several parties does not support its scientific validity. We know of no correlation between the NNI standard and the biological needs of listed or non-listed salmonids covered by the HCPs. For example, the DEIS details that the NNI standard is comprised of a 91 percent project survival standard and a 95 percent juvenile dam passage survival standard. The 91 percent project survival standard is derived from an unmeasurable combination of assumptions about dam passage survival of juveniles, reservoir survival of juveniles and the upstream passage survival of returning adults. In addition the HCP relies on assumptions about the efficacy of hatchery supplementation and habitat enhancement projects to achieve the NNI standard. We know of no scientific basis for any of these assumptions. The DEIS acknowledges that many components of the NNI standard cannot be verified (See, page 2-41).

4 We encourage the use of the best available scientific information to support the NNI standard or, in the absence of a verifiable standard, a set of proposed measures which, when analyzed by NMFS, can be shown to meet the requirements of either Section 7 or 10 of the ESA and other applicable law.* A sound means to monitor compliance with the measures and an evaluation system to determine success of the measures are both necessary to prevent the attribution of mortality from these HCP projects to downstream projects.

4. The Water Quality Analysis of the DEIS Is Incomplete.

5 The DEIS states that the mid-Columbia river is on the 303(d) list for exceeding total dissolved gas, water temperature and pH criteria. The DEIS analysis of the alternatives concludes that the preferred alternative is likely to increase total dissolved gas (TDG) levels, with no explanation of how the HCPs would mitigate for these effects or prevent the passage of TDG to downstream projects. Additionally, there is no analysis of how the TDG and temperature impacts would affect fish survival (salmonid and otherwise) within the project areas and downstream. No supporting rationale or analysis is provided as support for the conclusion that the HCPs can be expected to benefit water quality.

* Our understanding of the NNI standard is that it was developed as a negotiated resolution to a variety of regulatory matters and policy issues and goes well beyond what is required for ESA purposes. As such it would not be appropriate or justifiable to apply its standards to other projects.

5. Water Quantity and Socio-Economic Effects Are Not Discussed

The water quantity and socio-economics sections of the DEIS provide no analysis or assessment of the impacts of any of the alternatives under drought conditions or in the
6 event of an energy emergency. As you are aware, the Pacific Northwest is currently experiencing one of the worst water shortages in history. Current projections are that if Columbia Basin runoff declines to 53 million acre-feet as expected, the Pacific Northwest's electricity generators will be unable to meet demand. The proposed action of the DEIS relies on fish spill which exacerbates electricity shortfalls during times of drought or energy emergency. This effect of water quantity shortages and associated socioeconomic impacts should be addressed in the DEIS. Any proposed action should include operational provisions that may be enacted when a declared drought, energy alert or emergency exists.

6. The DEIS Does Not Contain An Adequate Analysis of Impacts on Species Other Than The Four "Plan Species"

7 Four "Plan Species" of salmon are the subjects of the DEIS analysis (See page S-1). The analysis of effects on resident fish species in the Columbia River system concludes that: "Little is known about the effects of project operations on resident fish populations in the Mid-Columbia River" (page 4-27) although it is noted that bull trout have been listed as threatened and are the subject of ongoing consultation and the potential exists for negative impacts on pacific lamprey. The DEIS should be strengthened to reflect available information on the possible effects of the alternatives on other fish species.

7. The DEIS Does Not Meet NEPA Requirements to Consider Cumulative Effects of the Proposed Action

8 The DEIS contains no comprehensive cumulative effects analysis. The only resources evaluated for cumulative effects in this DEIS were listed anadromous salmonids. That analysis was based on an incomplete NMFS analysis that was cited as NMFS (2000c) but not included in the DEIS reference section. In addition, this Quantitative Analytical Report is incomplete, has never received peer review, is not available for public review and any reference to it should be removed and the analysis presented as NMFS' simulations based on a variety of unverifiable assumptions. The analysis presented relies on a subset of available data (1980-94) to conclude that extinction risks are high without presenting information from the full data set analyzed (1960-94) that concludes that extinction risks are actually quite low. The analysis presented also fails to consider recent data showing very large returns of spring chinook. The DEIS fails to include any cumulative effects analysis for summer/fall chinook salmon, sockeye salmon, coho salmon, or any other resource area.

8. The DEIS Does Not Adequately Consider the Impacts of the Proposed Action on Other Agreements Relating to Plan Species

9 The HCPs are intended to support incidental take permits for four permit species including Upper Columbia River summer/fall chinook (page S-1). Fall chinook are protected under the Vernita Bar Settlement Agreement and the Hanford Reach Juvenile Fall Chinook Protection Program. Both Douglas and Chelan PUDs are included in these

programs. However, the DEIS does not analyze the consistency of the HCPs with these other agreements nor does it include an analysis of the obligations of the HCP parties under those agreements.

In conclusion, we reiterate our support for a scientifically supportable HCP and comprehensive DEIS which would justify the issuance of incidental take permits for the permit species. However, for the reasons stated above, we do not believe the DEIS prepared by NMFS adequately provides the necessary science or analysis of the alternatives considered.

Sincerely,

Douglas M. Ancona, Manager
Natural Resources and Regulatory Affairs

Cc:
Susan Fruchter
Dick Nason
Bob Clubb
Brian Brown
Malcolm McClellan
Tim Brewer
Keith Brooks
Brian Cates
Bill Frymire
Jim Hastrieter
Merrill Hathaway
Bob Heinith
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Tim Weaver
Timothy Welch
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Ron Boyce
Mike Erho
Cary Feldmann
Rick Klinge
Chuck Peven
Bob Rose
Shane Bickford
Bryan Nordlund
Steve Hays
Robert McDonald
Thad Mosey
Tom Scribner
Paul Ward
Steve Parker

Grant County Public Utility District (GCPUD)

Comment #	NMFS Reference #[1]
1	27
2	47, 85
3	12, 27
4	29
5	2
6	29, 31
7	48
8	6
9	23

[1] see Appendix C

For North Central Washington
GREATER WENATCHEE COMMUNITY FOUNDATION
For **good.** For **ever.**℠
7 No. Wenatchee Ave., Suite 201 • PO Box 3332
Wenatchee, WA 98807-3332
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E-mail: gwcf@gwcfncw.org

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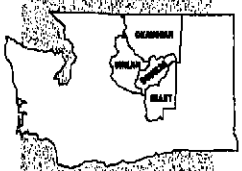

Serving Chelan, Douglas, Grant and Okanogan

March 8, 2001

National Marine Fisheries Service
Northwest Region Hydro Project
525 NE Oregon Street, #420
Portland, OR 97232-2737

Dear Sirs:

The Greater Wenatchee Community Foundation was formed 15 years ago to provide a new source of funding for worthy organizations. Over the years I have had the privilege of associating with a diverse group of social service and educational organizations. While each pursues individual goals, one thing is also clear; each understands the need to work together with others in the community to develop solutions to problems.

It appears a similar spirit of cooperation is behind the Habitat Conservation Plan developed by the Chelan and Douglas PUDs. As outlined in the plan, the PUDs and regulatory agencies work cooperatively to find and implement the best methods for ensuring fish survival. The plan also includes provisions for timely resolution of any disputes. It sets up an oversight committee for coordination and consultation between the PUDs and interested parties and agencies.

The PUDs are a key ingredient in the economic vitality of the Greater Wenatchee area. The plan they are proposing holds the key ingredients to their success, and to ensuring continued economic operation of the public utilities.

While it is important that endangered salmon be saved, it is also important to invest in the most cost-effective, scientifically sound solutions. The plan ensures that the PUDs will do their part to save salmon, while providing for long-term, affordable hydropower for local residents.

I urge you to favorably consider the Habitat Conservation Plan of the two PUDs and to move it forward as quickly as possible.

Sincerely yours,

G. Raymond Taylor
President and CEO

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MAR 12 2001

Icicle Creek Watershed Council
P. O. Box 773
Leavenworth, WA 98826

February 27, 2001

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Marine Fisheries Service
525 NE Oregon Street
Suite 420
Portland, OR 87232-2737

Re: Chelan and Douglas County's Draft Environmental Impact Statement (DEIS) for fish conservation.

Gentlemen:

We appreciate the time and resources the Chelan and Douglas County Public Utility Districts (PUDs), tribes, and agencies spent developing the DEIS and also appreciate the opportunity to comment.

The PUDs want, among other things, to ensure the production of hydroelectric power will not be disrupted by changing requirements for anadromous fish. They want this certainty to last for 50 years. We would like to see fish populations increase with the hope that listed species will be removed from threatened or endangered lists and that other fish species will continue to flourish as well.

The Public Utility Districts indicate in the DEIS that they prefer Alternative three. For the following reasons, we equally prefer Alternative three:

1. Citizens at the local level have an opportunity to be involved through the habitat improvement programs.
2. Alternative 3 promotes an ongoing action separated from the swings of political forces to recover listed fish species while at the same time assuring a measure of protection for other fish species as well.
3. The preferred alternative provides certainty for both the PUDs goal of producing electricity and certainty for those of us who regard fish in our streams as one of the indicators of continued prosperity.

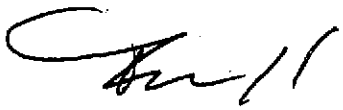
IC

1 We agree with the concerns National Marine Fisheries Service has about the seven per cent hatchery compensation levels and how they may adversely affect wild salmon populations. We recommend that the PUD guarantee in writing that only native stock will be produced under the seven per cent hatchery compensation program and that hatchery management protocol will ensure the genetic integrity of wild fish.

2 We were disappointed to read that such a small portion of the nine percent compensation was given over to habitat improvements. We understand the difficulty in quantifying the results of habitat improvements. Nevertheless, at the heart of declining fish populations, is loss of habitat. We would have preferred four per cent of the compensation given to habitat improvements instead of two per cent with less emphasis on hatchery production.

3 Finally, we would like to see assurance that the majority of funds for habitat improvement and restoration be spent in the first part of the 50-year agreement. The sooner habitat improvements are completed, the sooner the results can be monitored.

Sincerely,



Buford Howell,
President

Icicle Creek Watershed Council (ICWC)

Comment #	NMFS Reference #[1]
1	17
2	12, 28
3	13

[1] see Appendix C

RECEIVED
FEB 20 2001

David Gellatly
Conrad Kuehl

Mann & Gellatly

Commercial Real Estate Rentals & Investments
103 Palouse Street Wenatchee, WA 98801
Bus. (509) 662-5552 Fax (509) 663-4086

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N. E. Oregon Street, Suite 420
Portland, Oregon 97232-2737

February 7, 2001

Gentlemen:

As a longtime businessman in Chelan County and a Lake Chelan Valley resident, I am writing to add my support for the mid-Columbia Habitat Conservation Plan (HCP).

From my perspective, Chelan County businesses, farms and industries are feeling the squeeze of intense regulatory burdens. Often the regulations come in the form of mandates from agencies that know very little about the issues of our area and are unapproachable about unique, local solutions.

The HCP provides Chelan County PUD the opportunity to design programs and systems to meet agreed-upon survival standards for its Columbia River dams. The PUD knows the business of running its dams better than anybody else. Giving the PUD the opportunity to design and implement fish protection measures, rather than respond to agency-driven mandates, makes good sense to me.

Another item that I particularly like is the "no net impact" standard. If the PUD achieves the survival standards at its hydroelectric projects, it provides supplementation hatchery capacity and habitat funding to make up for unavoidable losses. The end result is the certainty that we can relicense Rocky Reach Dam and continue to provide reliable, reasonably-priced electricity to our customer-owners.

It is also important to note that Chelan PUD has not been idly standing by waiting for the HCP to go through the long regulatory process. As an example, the PUD has thoroughly tested a prototype state-of-the-art bypass system at Rocky Reach and will begin a permanent installation in 2001.

While many of us in Chelan County may not agree with the requirements of the Endangered Species Act, it appears that we have little choice but to comply with the law. What we need is a reasonable template to work from that allows for common sense and local solutions in achieving survival standards. This HCP seems to meet that mark. Let's stop wasting time and get it done.

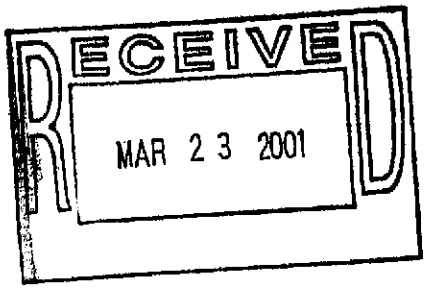
Sincerely,

David Gellatly

David Gellatly
Conrad Kuehl

Mann & Gellatly

Commercial Real Estate Rentals & Investments
103 Palouse Street Wenatchee, WA 98801
Bus. (509) 662-5552 Fax (509) 663-4086



March 20, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N. E. Oregon Street, Suite 420
Portland, OR 97232-2737

Gentlemen:

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the law. What we need is a reasonable template to work from that allows for common sense and local solutions in achieving survival standards. This HCP seems to meet that mark. Let's stop wasting time and get it done.

Sincerely,

David Gellatly

FEB -8 2001

marson and marson lumber, Inc.

(509) 548-5829 • Fax (509) 548-6372

P.O. Box 218 • 11724 Riverbend Dr. • Leavenworth, WA 98826-0218
Drywall Division - Wenatchee (509) 663-5154 • Fax (509) 663-5154

February 6, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

To Whom It May Concern:

Our firm has been in business for 45 years, serving the residents of North Central Washington. The economic situation for our area is very precarious and uncertain for the future. For the past several years, I have watched countless regulations pile up on the citizens of Chelan County. Many of the continued mandates are produced by out-of-town bureaucrats without a regard for our local citizens and our way of life. Our area is now to the point where many orchardists are either ripping out their fruit trees and/or facing bankruptcy. Water regulations are stifling growth in other areas. Housing starts are down and living wage jobs are hard to come by. The future of the Alcoa plant in Wenatchee is in question. All of these things have certainly had an impact on our family-owned business and those of my friends and neighbors.

In these difficult times, one of the blessings we have been able to count on is relatively low-priced, dependable electricity from our citizen-owned public utility district. The PUD has certainly faced its' challenges in dealing with costly mandates as well. Re-licensing the dams, expensive fish programs and many other items have steadily increased rates, although fortunately not nearly as much as in other areas that have to rely upon coal, nuclear power and other more expensive forms of electric generation.

Eastern Washington has not experienced the dynamic economic growth that Western Washington has achieved. People in our area are also very concerned that somehow California will be able to siphon off our power further jeopardizing our area's economy. We must keep our hydroelectric dams providing reasonably priced power if our communities are to have a chance to grow and prosper. That is why I am voicing my support in this letter for the habitat conservation plan for our PUD's dams on the Columbia River.

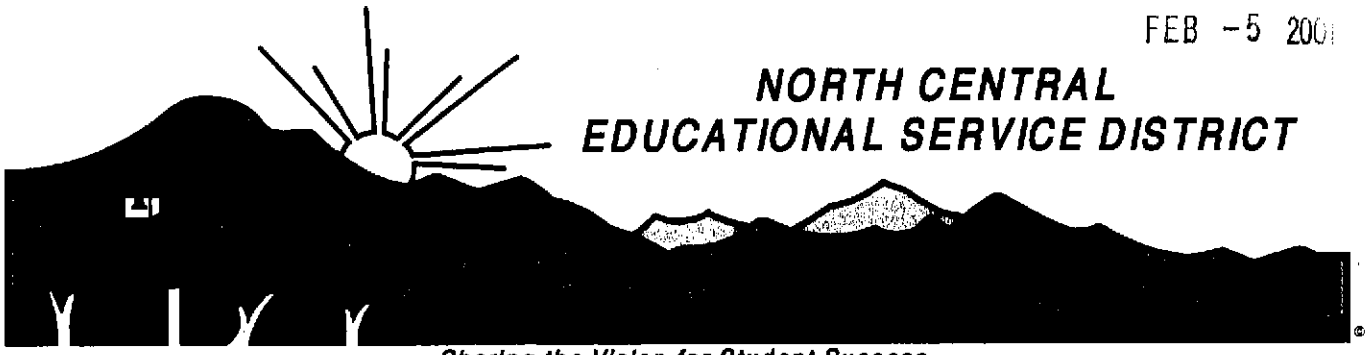
Although I do not know every detail about the HCP, it is my understanding that it addresses the ESA mandates. I support the idea of outcome-based survival standards as opposed to simply ordering the PUD to take expensive actions to protect the fish with no accountability from outside agencies. Having the PUD establish and implement cost-effective, scientifically-based programs that are unique to our dams gives us the opportunity to protect our local power generation while doing what is right for the fish. If we do our part, the dams are protected from removal and re-licensing is assured. That makes good sense.

From my point of view, it seems as though all of these various government agencies, Indian tribes and other parties can rarely agree on anything. We have wasted tens of millions of dollars spending money on fish programs that represented somebody's best guess on solving the problem. The HCP appears to be the exception. Although for some reason, this program took over five years to negotiate. It has taken even longer to wade through the regulations. I noted that some pretty diverse groups, like American Rivers, National Marine Fisheries, Indian tribes and others signed the declaration stating that the HCP is a good idea. Now, maybe we finally have a program we can all support.

Without further delay, please keep the HCP moving forward. We need this program to protect our dams, to meet the ESA mandates and to keep our communities growing and surviving.

Sincerely,

Ken Marson, Jr.
President



January 29, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

To Whom It May Concern:

During my nine years of service as the superintendent of the North Central Educational Service District 171, I have had the pleasure to work with the Chelan County PUD on many successful projects.

In the field of education, the PUD has been a leader in the development of a four-county educational cooperative that provides high-quality, well-respected curriculum from kindergarten through middle school.

Chelan County PUD has also proven to be an outstanding partner in several other successful community education projects, including bringing distance learning to Wenatchee Valley College, helping to develop the North Central Technical Skills Center and developing a Technology Center in the Olds Station Industrial Area.

In my role as both an educator and an avid recreationist, I have noted the PUD's role in yet another collaborative venture – the development of a comprehensive Habitat Conservation Plan (HCP) for the mid-Columbia area. For the record, I wholeheartedly endorse this program.

The HCP demonstrates to our community, from students to business leaders, that parties with diverse interests can work together to develop common-sense programs that address our hydroelectric energy requirements while protecting our valuable fisheries resources.

All too often regulatory agencies seem determined to mandate specific measures, evaluate their success and add on still more measures. We then end up with an endless cycle of more regulation. Under that scenario, the focus on results is lost, millions of dollars are wasted and court battles are the only recourse.

The HCP challenges that trend. With survival standards as the goal, all parties work cooperatively on the development of solutions. Testing ensures results. Unavoidable losses are compensated through a unique balance of natural hatchery production and habitat enhancements.

Endangered Species Act requirements are met while protecting our low-cost hydropower resources that benefit not just our local citizens, but also millions of citizens throughout Washington and the Northwest.

I urge your continued resolve to move the HCP swiftly through the regulatory process. Citizens are anxiously awaiting a national model for cooperatively addressing both our energy and environmental needs. This appears to be it.

Sincerely,

Gene Sharratt
Superintendent

Washington

Northwest
Power Planning
Council

RECEIVED
MAR 26 2001

Frank L. Cassidy, Jr.
"Larry"
Council Chair

March 15, 2001

Mr. Dick Nason
PUD No. 1 of Chelan County
P.O. Box 1231
Wenatchee, WA 98807-1231

Dear Mr. Nason,

The Northwest Power Planning Council appreciates the opportunity to comment on the Habitat Conservation Plan to protect and enhance salmon and steelhead in the Mid-Columbia River. We commend you for sticking with the development of this document, six years in the making.

It is the Council's understanding that a collaborative effort involving a group with diverse interests has worked to develop this Habitat Conservation Plan. Chelan and Douglas PUD's, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Yakama, Colville, and Umatilla Tribes, American Rivers, Inc, and major purchasers of wholesale energy are some of the partners identified as participating in this endeavor. The Council supports the development of these negotiated agreements.

In the next couple of years, the Council will be embarking on a subbasin planning process, and will be working to bring parties with diverse interests together to protect, mitigate, and enhance fish and wildlife harmed by the operation of the hydropower system. Your demonstrated commitment to fish and wildlife will be instrumental in assisting the Council to successfully develop a broad-based plan for the Mid-Columbia.

The Northwest Power Planning Council understands that Chelan County PUD is firmly committed to this Habitat Conservation Plan. We continue to wish you success in your endeavor, and appreciate the hard work you have put in to develop this negotiated agreement.

Regards,

Frank L. Cassidy, Jr., Chairman
Northwest Power Planning Council

RECEIVED
MAR 2 8 2001

Bob Dach
NMFS, NWR, Hydro Program
525 NE Oregon St. #420
Portland, Oregon 97232-2737

March 26, 2001

RE: Comments on DEIS for Wells, Rocky Reach, and Rock Island Hydro Projects

Thank you for allowing the public to comment on future operations of the Mid-Columbia Hydro projects as to their impacts on the fishery resource. The DEIS is very general and is lacking in what it doesn't say rather than what it says. The following comments are directed mostly to habitat considerations rather than dam operations.

OWL

Consistency

1 The Okanogan Wilderness League (OWL) has followed the Mid-Columbia process since the late 1980's and has commented on the different protocols that have been developed for spring chinook recovery in the Methow Basin. I am including two of our comments as enclosures that point out some of the inconsistencies and deviations from the adopted FERC Settlement Agreements. The FERC agreement identifies three separate spring chinook populations in the Methow Basin and the DEIS identifies the spring chinook as "composite" stock. The escapement of wild fish for natural spawning is not consistent with previous protocols.

Fish flow

2 The DEIS recognizes that in-steam flow is a habitat consideration in its analysis of tributaries such as the Wenatchee and the Methow, but fails to analyze fish flows for the Columbia River.

Fish management must be flexible enough to change. It should not be held hostage in committees that have veto power for change. This is especially important when that veto power is held by the PUDs who have an economic vested interest detrimental to the best interest of fish. The HCP(alt 3) runs for 50 years and recognizing the above considerations, is not in the best interest of the fisheries resource. Because of the flexibility in the consultation process the only acceptable alternative in the DEIS is alternative 2.

Sincerely;

encl: 2

Lee Bernheisel
Okanogan Wilderness League
90 TCR
Carlton, Wa. 98814
(509) 997 3794

Okanogan Wilderness League (OWL)

Comment #	NMFS Reference #[1]
1	96
2	97

[1] see Appendix C

FEB 16 2001

PACIFIC AEROSPACE & ELECTRONICS, INC.

February 13, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

On behalf of Pacific Aerospace & Electronics, Inc. (PAE), I am writing to support the mid-Columbia Habitat Conservation Plan (HCP).

PAE employs over 450 people in Chelan County. Our company designs, manufactures and sells components and subassemblies used in technically demanding environments. Affordable, reliable electricity is a critical element of our bottom line. We simply cannot tolerate major price increases and/or interruptions in electric service and remain competitive.

With the energy crisis in California and the Northwest, it is apparent that we maximize all of our existing generation, especially the clean, renewable hydropower dams that fuel this region. Further, new power plants must be built immediately.

From my perspective, it appears that the HCP preserves affordable, reliable hydropower for our business and our communities while meeting federal and state requirements to protect the Columbia River fish.

The HCP offers the Chelan and Douglas PUDs an opportunity to seek cost-effective fish protection methods that are unique to the individual dams, as opposed to seemingly endless fish protection mandates from outside agencies. Mandates without accountability equals waste, and quite frankly that is exactly what we have been seeing from regulatory agencies in the past.

Please add our voice to the public record in support of the HCP.

Sincerely,

Don A. Wright
President & CEO

PNUCC

Bringing the *Power* of good ideas *Together*

April 4, 2001

Ms. Donna Darm
National Marine Fisheries Service
Northwest Region - Hydro Program
525 N.E. Oregon St., Suite 420
Portland, OR 97232-2737

Dear Donna:

The Pacific Northwest Utilities Conference Committee (PNUCC) has played an important role in the region's electric utility industry for over 50 years. As a voluntary, non-profit organization, PNUCC is a forum for bringing the power of good ideas to bear on a range of issues including the recovery of ESA listed salmon.

PNUCC has been engaged in the salmon issue for many years seeking a regional plan that will successfully recover endangered salmon. In order for a plan to succeed it must address the salmon's entire lifecycle; have clear, consistent goals; clearly articulate who is accountable for meeting the goals; and be acceptable by all interested parties. Such a regional plan would provide a guide for local actions for fish. In addition, the regional plan would be used to assure that individual actions at the local level are consistent with the region's goals and are complementary and not at cross-purposes.

The mid-Columbia Habitat Conservation Plan (HCP) is consistent with our regional goals and we ask that NMFS fully endorse it. The HCP successfully meshes fish management with hydropower operations and it embodies many key principles PNUCC strongly supports for recovering salmon in the Pacific Northwest. It establishes overall survival targets for fish. It is comprehensive in nature, relying on habitat improvements and hatchery operations, as well as, hydro operations to improve fish survival. It relies on the innovations of the project owners, giving them the responsibility and accountability for meeting fish survival targets yet provides for oversight from and cooperation with interested agencies and parties. And most importantly, the mid-Columbia HCP is the product of a comprehensive, collaborative process that included all the major stakeholders. We see this as a successful formula that recognizes the unique characteristics of each hydroproject.

In order to maintain system reliability and ensure a stable power supply for the Northwest, it is imperative that the region has certainty to the amount of power available from the NW hydropower system. The HCP provides some additional certainty for the operation of the three dams it addresses and thus their power contributions.

This HCP is one example of how to locally and effectively address salmon recovery. We urge you to adopt the principles of the HCP and move forward on meeting its admirable goals.

Sincerely,

David E. Piper

B. Miller

Gerry Miller	Dave Piper	Jim Miller
Chairman	1st Vice Chairman	2nd Vice Chairman
Goldendale Aluminum	PNGC Power	Idaho Power Company

cc: PNUCC Board of Directors

PESHASTIN HI-UP GROWERS
P.O. Box 446
PESHASTIN, WASHINGTON 98847
FAX: (509) 548-6619
Phone (509) 548-7312

KODIAK
PESHASTIN, WASHINGTON

RECEIVED
MAR 19 2001

March 16, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, OR 97232-2737

Dear Sirs:

Please consider this a strong endorsement of the Habitat Conservation Plan (HCP) for Chelan and Douglas PUDs now under review by your agency.

Agriculture – long the lifeblood of North Central Washington – is hurting. Thousands of fruit trees are being ripped out as growers give up and file for bankruptcy. Agriculture's plight is having a ripple effect throughout our communities, and we are in the midst of a serious economic downturn.

But so far, we can still count on reliable, low-cost energy. It remains a pillar of our past and a key foundation to building our future. We must have ample water to irrigate our remaining and future orchards. We need low-cost power to pump that water to the orchards, to run the packing lines where we process our fruit, and to power the controlled-atmosphere storage that maintains pears, apples and other produce in quality marketing condition. With so many other forces squeezing agriculture, the Habitat Conservation Plan can help by providing more long-term certainty regarding water supplies and electric power.

The Habitat Conservation Plan assures the PUDs of guidelines under which they can operate most effectively and efficiently. It provides a framework for fish mitigation with identifiable targets. The plan lets the local experts direct operations, but with federal and state oversight. It offers a common-sense approach that is good for fish and good for our region.

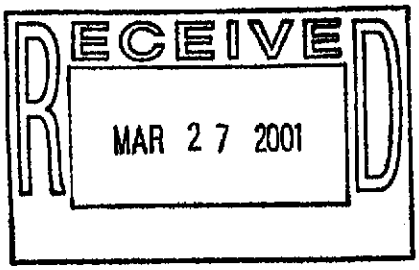
Our PUDs have done a great job caring for our local resources. The Habitat Conservation Plan demonstrates responsible stewardship. We can help fish and help people too, by ensuring the continued production of reliable hydropower for the citizens of the northwest.

Thank you,

Dan Gaspar

Dan Gaspar, General Manager
Peshastin Hi-Up Growers

PNGC Power™
Smart. Local. Connected.



March 26, 2001

Mr. Bob Dach
NMFS, NWR, Hydro Program
525 N.E. Oregon Street, Suite 420
Portland, Oregon 97232-2737

RE: Habitat Conservation Plans Proposed by Chelan and Douglas PUDs

Dear Mr. Dach:

I am writing on behalf of Pacific Northwest Generating Cooperative (PNGC Power) to express support for the Habitat Conservation Plans (HCPs) for the Wells, Rocky Reach and Rock Island Hydroelectric Projects that are currently the subject of a Draft Environmental Impact Statement that is out for public comment. PNGC Power is an energy services cooperative owned by 15 rural electric cooperatives throughout the Northwest. We have a strong interest in plans that effectively protect natural resources while taking into account the serious needs of the rural economy in the Northwest.

There are several aspects to these HCPs that make them worthy of your approval. In fact, these same aspects make these HCPs models that will serve the region well during discussion over other species recovery efforts. First, the emphasis on setting specific outcome-based targets will prove extremely useful during implementation, monitoring, and review of the plans. Proper focus is put upon real results regarding the species themselves, rather than upon fulfilling a checklist of measures that may or may not be effective.

Second, the balance within these plans is very evident and is another key towards creating a viable, enforceable approach. Especially in light of the current predicament in the West Coast energy market, the balancing of species protection and recovery with the need to preserve a reliable supply of energy is crucial for the economic health of the region.

Finally, the level of collaboration evidenced by the diverse array of supporters for these plans is very impressive. As we have seen in many other natural resource proceedings this type of broad collaboration is very difficult to achieve and is to be commended.

In summary, these HCPs form a balanced approach to addressing some very challenging issues. Their unique proposals for creating scientific and economic accountability in species recovery should serve the region well. We ask that you adopt the principles included in these HCPs.

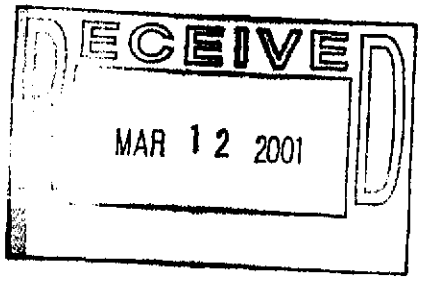
Sincerely,

Scott Corwin
Manager, Government Affairs

Public Power Council

1500 NE Irving, Suite 200
Portland, Oregon 97232
(503) 232-2427
FAX (503) 239-5959

March 9, 2001



Mr. Bob Dach
Hydro Division
National Marine Fisheries Service
525 NE Oregon Street.
Portland, OR 97232-2737

Dear Mr. Dach:

The Public Power Council (PPC) is a trade association of consumer-owned electric utilities in six states here in the Pacific Northwest. We applaud NMFS, Douglas and Chelan PUDs for their efforts to develop long-term habitat conservation plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects.

The proposed Anadromous Fish Agreement and Habitat Conservation Plans (HCP) are particularly timely given the Northwest's present short supply of renewable electric energy. Our region is now struggling to maintain its economic vitality in light of recent developments in the wholesale power market. Solutions to these issues must be found through active planning and long-term solutions. The proposed HCP represents both of these ideals.

We support the proposed Wells, Rocky Reach and Rock Island HCPs as the preferred alternatives for salmon protection, mitigation and enhancement at those hydroprojects. The selection of the long-term HCPs is intended to ensure the future viability of anadromous salmonids while maintaining the benefits of clean, renewable hydroelectric power generation. We encourage NMFS to select and implement Alternative 3 as described in the Draft Environment Impact Statement for the proposed Wells, Rocky Reach and Rock Island Anadromous Fish Agreements and HCPs.

Sincerely,

C. Clark Leone
Manager

SAVE OUR wild SALMON

Main office: 424 Third Avenue W, Suite 100 • **Seattle, WA** 98119 • (206) 286–4455 • (206) 286–4454 fax

Field offices: 2031 SE Belmont Street • **Portland, OR** 97214 • (503) 230–0421 • (503) 230–0677 fax
1511 N Eleventh Street • **Boise, ID** 83702 • (208) 345–9067 • (208) 343–9376 fax
419 Sixth Street, Suite 328 • **Juneau, AK** 99801 • (907) 586–6667 • (907) 463–3312 fax
also in **Washington, DC** and **Spokane, WA**

Alaska Trollers Association
American Rivers
Antioch Living Systems Collective
Association of Northwest Steelheaders
Boulder-White Clouds Council
Clearwater Forest Watch
Coalition for Salmon and Steelhead Habitat
Coast Range Association
Defenders of Wildlife
Earth Justice Legal Defense Fund
Federation of Fly Fishers
Friends of the Earth
Idaho Conservation League
Idaho Rivers United
Idaho Steelhead and Salmon Unlimited
Idaho Wildlife Federation
Institute for Fisheries Resources
Izaak Walton League – Greater Seattle Chapter
Lands Council
Long Live the Kings
The Mountaineers
Natural Resources Defense Council
North Cascades Conservation Council
Northwest Ecosystem Alliance
Northwest Environmental Defense Center
Northwest Resource Information Center
Northwest Sportfishing Industry Association
NW Energy Coalition
Oregon Natural Desert Association
Oregon Natural Resources Council
Oregon Outdoors Association
Oregon Trout
Oregon Wildlife Federation
Pacific Coast Federation of Fishermen's Associations
Pacific Marine Conservation Council
Puget Sound Gillnetters Association
Purse Seine Vessel Owner's Association
River Network
Rivers Council of Washington
Salmon For All, Inc.
Salmon For Washington
Sawtooth Wildlife Council
Sierra Club
The Wilderness Society
Trout Unlimited
Washington Kayak Club
Washington Trollers Association

RECEIVED
MAY - 2 2001

May 1, 2001

Bob Dach
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Re: Draft Environmental Impact Statement: Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Dear Mr. Dach:

The Save Our *Wild* Salmon Coalition, National Wildlife Federation, Friends of the Earth, Cascade Chapter of the Sierra Club, Northwest Sportfishing Industry Association, Pacific Coast Federation of Fishermen's Associations, and Institute for Fisheries Resources appreciate the opportunity to comment on the draft Environmental Impact Statement (DEIS) for the proposed Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, dated November 2000. We have reviewed the document and offer the following comments.

SOWS

The hydropower projects at issue have played a significant role in the decline of anadromous fish populations in the Columbia River basin, several of which are now listed under the Endangered Species Act. Any alternative for continued operations of the projects must promote recovery of these stocks and ensure that such operations do not jeopardize their continued existence. The proposed Habitat Conservation Plan purports to be a comprehensive agreement to promote actions that will improve conditions and lead to the recovery of species. However, based on the limited analysis contained in the DEIS, we believe it would be imprudent for the National Marine Fisheries Service to move forward with the proposed Habitat Conservation Plans (HCPs). Due to the lack of legal and scientific analyses of any of the alternatives in the DEIS, we cannot support any of the alternatives at this time. Section 7 of the Endangered Species Act requires NMFS to consult with the Federal Energy Regulatory Commission over the operation of these projects immediately. Anything less than this, such as the alternatives discussed in this DEIS, does not comply with the law. We are deeply troubled by this blatant lack of compliance with federal law and policy and urge you to reconsider your approach to satisfying your responsibilities under the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Clean Water Act (CWA), and the Federal Power Act (FPA).

1

National Environmental Policy Act

1. The DEIS fails to take a "hard look" at all of the environmental information and consequences of each alternative.

2

The fundamental purposes of NEPA are to guarantee that: (1) federal agencies take a "hard look" at the consequences of their actions before the actions occur by ensuring "that the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts," *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989); and (2) "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision," *id.* at 349. In short, NEPA requires federal agencies to look before they leap. This DEIS fails to serve this critical function.

To satisfy the requirement that it take a "hard look" at the environmental consequences of its actions, an agency must engage in a "reasoned evaluation of the relevant factors" to ensure that its ultimate decision is truly informed, *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1332 (9th Cir. 1992). The DEIS must be searching, detailed and comprehensive; "[g]eneral statements about 'possible' effects and 'some risk,' do not constitute a 'hard look' absent a justification for why more definitive information could not be provided," *Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1380 (9th Cir. 1998).

An agency's failure to include and analyze information that is important, significant, or essential renders an EIS inadequate – for, without such detailed information, there is no way for the public or the agency to adequately assess the impacts of a proposed action. *See California v. Bergland*, 483 F. Supp. 465, 495 (E.D. Cal. 1980), *aff'd sub nom, , California v. Block*, 690 F.2d 753 (9th Cir. 1982) (by failing to disclose key data, "the Forest Service effectively undercut the twin goals of environmental statements: informed decisionmaking, and full disclosure").

NMFS may not, as it has done throughout this DEIS, ignore relevant information and rely upon conclusory statements and unsupported assertions to satisfy NEPA's "hard look" requirement. We believe that these deficiencies present an inaccurate picture of the impacts to the public, making it impossible for anyone, including NMFS, to draw any reasoned conclusions about the environmental impacts of the three alternatives presented in this DEIS.

For example, the HCPs (Alternative 3) rely on "off-site" habitat improvements and hatchery supplementation to make up for 2% and 7%, respectively, of the 9% "unavoidable" mortality caused by these projects. As a threshold matter, NMFS fails to justify or explain this 2/7% division and provides no explanation for how it will measure these needed improvements. *See infra* at 14-15. Compounding this omission, the DEIS contains no explanation for whether the funds to implement these measures will be adequate to achieve the benefits necessary to mitigate for this mortality. The DEIS does not even attempt to connect the funding proposed for Alternative 3 with the actions to be taken as part of the HCPs. Not surprisingly, since the DEIS contains no explanation of what these measures may be, or how/when they will be funded or implemented, NMFS presents no data or scientific analysis whatsoever to explain how the benefits will accrue. The best the DEIS can do is to acknowledge that "there is considerable difficulty measuring the effectiveness of habitat improvement projects, [but] there are numerous areas with degraded habitat in the Mid-Columbia River tributaries that would benefit from improvement or plan protection programs." DEIS at 4-41. This may well be the case, but this conclusory statement does not approach the level of analysis required to allow the public or a decisionmaker to conclude that Alternative 3 will actually provide the survival benefits necessary to mitigate for the effects of the PUD's actions, nor does it present enough information to support NMFS' threshold conclusion that it will result in a quantifiable increase in survival. Such generalized and speculative statements about hoped-for benefits

do not satisfy NEPA's "hard look" requirement. "A mere listing of mitigation measures is insufficient to qualify as the reasoned discussion required by NEPA." *Neighbors of Cuddy Mountain*, 137 F.3d at 1380. Courts routinely reject such vague discussions of mitigation measures where, as here, they "are so general that it would be impossible to determine where, how, and when they would be used and how effective they would be." *Id.* at 1381.

2. The DEIS fails to analyze the cumulative impacts of myriad other actions that affect Middle and Upper River Columbia salmon and steelhead.

3

Perhaps the most glaring omission in the DEIS is NMFS' failure to consider cumulative impacts in its analysis. To ensure that the combined effects of separate activities do not escape consideration, NEPA requires that federal agencies consider cumulative environmental impacts in their environmental analyses. Cumulative impacts result "from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." 40 C.F.R. § 1508.7

NEPA requires a cumulative impacts analysis to: (1) catalogue past projects in the area; (2) assess the cumulative environmental impacts of those projects with the proposed project; and (3) analyze the additive cumulative impact of all reasonably foreseeable Federal and non-Federal actions, whether or not they have actually been proposed. *See City of Carmel-By-The-Sea v. United States Dep't of Transp.*, 123 F.3d 1142, 1160 (9th Cir. 1997) (rejecting cumulative impacts analysis that referred generally to other past "development projects" and did not discuss the additive impacts of foreseeable future projects); *Fritiofson v. Alexander*, 772 F.2d 1225, 1243 (5th Cir. 1985) (agency must consider reasonably foreseeable actions regardless of whether they have yet formally been proposed). Furthermore, NEPA requires that a cumulative impacts analysis provide "some quantified or detailed information" because "[w]ithout such information, neither courts nor the public . . . can be assured that the Forest Service provided the hard look that it is required to provide." *Cuddy Mountain*, 137 F.3d at 1379.

The DEIS falls far short of satisfying a single one of these requirements. For example, the DEIS ignores even the impacts of other dams in the Columbia River. Most notably, the DEIS contains no analysis of the cumulative impacts of these alternatives when combined with the Grant County PUD's Priest Rapids and Wanapum dams, located just downstream of those covered by the HCPs analyzed in Alternative 3. Nor is there any mention of the cumulative effects of hydro operations on the Middle or Upper Columbia River tributaries, such as the Yakima and Chelan rivers. These tributaries house numerous hydro and diversion projects and irrigation withdrawals that have a significant impact on these same listed Middle and Upper Columbia River stocks. In addition, the U.S. Army Corps of Engineers has recently analyzed a proposal to deepen the Lower Columbia River – an action that, if approved, will impact Middle and Upper Columbia River juvenile and adult salmon and steelhead as they migrate through the lowest reach of the Columbia River estuary. This dredging project – while currently awaiting a Record of Decision – has been analyzed in a Final EIS and is therefore clearly "reasonably foreseeable," but there is no mention of it in the DEIS.

These examples are by no means exclusive. There are myriad other, easily identifiable actions and conditions that impact the Middle and Upper Columbia stocks, including, but not limited to, continuing habitat destruction and modification from on-going and proposed land-management activities, such as timber sales and livestock grazing on both public and private lands and the operation of the FCRPS. All of these activities and factors – whether they be in the development stage, or completed projects – must be catalogued and considered in NMFS' cumulative effects analysis.

Nowhere, however, does the DEIS meaningfully discuss the cumulative impacts of any these activities. Although NMFS alludes to its "Quantitative Analytical Report" (QAR) purportedly used to identify cumulative effects, it fails to employ or explain this model, drawing only the most general conclusions about the impacts of actions in other life stages in conjunction with each alternative. *See, e.g.*, DEIS at 4-44 ("The protection and enhancement of riparian habitat ... are expected to result in increased natural production levels for both anadromous and resident fish species."). Such conclusory and generalized statements do not satisfy the requirement that NMFS take a "hard look" at cumulative impacts.

The DEIS compounds these errors by painting an optimistic outlook for the Middle and Upper Columbia's listed stocks. *See, e.g.*, DEIS at 4-4 to 4-16. NMFS' discussion of these other actions takes full advantage of the potential positive effects of actions, but fails to account for – or even mention – any of the actions that may have negative impacts. Looking at only the positive side of the ledger distorts the true picture of the effects of the action to the public and inflates the already speculative benefits of many of these actions. NEPA's cumulative effects requirement demands that NMFS complete a comprehensive analysis that includes all of the actions occurring in the basin.

NEPA "emphasize[s] the importance of coherent and comprehensive up-front environmental analysis to ensure informed decision making to the end that 'the agency will not act on incomplete information, only to regret its decision after it is too late to correct.'" *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1216 (9th Cir. 1998). The DEIS' terse and incomplete discussion of cumulative effects fails to satisfy this fundamental requirement. The DEIS' failure to analyze all past, present, and reasonably foreseeable future actions results in a skewed, and ultimately inaccurate picture of the impacts of the proposed actions, leading to the kind of "blinders-on" decision-making that NEPA is designed to prevent.

3. The DEIS Fails To Consider an Adequate Range Of Alternatives

NEPA, §101(2)(C)(iii), requires that an EIS contain a discussion of the "alternatives to the proposed action." The discussion of alternatives is at "the heart" of the NEPA process. 40 C.F.R. §1502.14. The CEQ regulations require the agency to "[r]igorously explore and objectively evaluate all reasonable alternatives." 40 C.F.R. §1502.14(a). All federal agencies shall, to the fullest extent possible, "[s]tudy, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4322(2)(E); *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519-20 (9th Cir. 1992). A federal agency must look at every reasonable alternative within the "nature and scope of the proposed action," *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982), "sufficient to permit a reasoned choice." *Methow Valley Citizens Council v. Regional Forester*, 833 F.2d 810, 815 (9th Cir. 1987), *rev'd on other grounds sub nom. Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989). The failure to consider all reasonable alternatives is fatal to the adequacy of an agency's NEPA analysis. *Idaho Conservation League*, 956 F.2d at 1519 ("The existence of a viable, but unexamined alternative renders an environmental impact statement inadequate."). The DEIS is deficient in many respects with regard to the alternatives considered.

4

First, according to the Habitat Conservation Planning Handbook, the "no action" alternative "means that no permit would be issued and take would be avoided or that the project would not be constructed or implemented." Handbook at 3-35. The "no action" alternative presented in the DEIS does neither. Indeed, the "no action" alternative is really not an alternative at all because, as NMFS admits, it would violate the ESA and leave both the Federal Energy Regulatory Commission ("FERC") and the PUDs liable for causing a "take" of listed species. DEIS at 1-14 (only the "action alternatives ... will provide FERC and the PUDs legal coverage from the take prohibitions under section 9 of the act."). In short, Alternative 1 fails to present any alternative at all.

NMFS should evaluate a true "no action" alternative that considers "no project" conditions to fully assess the impacts of issuing incidental take permits for the Rocky Reach, Rock Island, and Wells hydroelectric projects. The reason for analyzing river conditions without the project is not just to consider past impacts, but to open up the full range of alternatives and impacts associated with a decision to continue the project. Understanding environmental conditions that would exist without a project is essential to evaluating the ongoing impacts of the projects and discerning key ecological components of a healthy aquatic ecosystem. Only by considering a no-project alternative can NMFS "explore all issues relevant to the public interest, including future power demand and supply, alternative sources of power, the public interest in preserving reaches of wild rivers and wilderness areas, the preservation of anadromous fish for commercial and recreational purposes, and the protection of wildlife." *LaFlamme v. FERC*, 852 F.2d 389, 402 (9th Cir. 1988) (quotation omitted).

4

As Courts have explained:

> [t]he goal of [NEPA] is to ensure that federal agencies infuse in project planning a thorough consideration of environmental values. The consideration of alternatives requirement furthers that goal by guaranteeing that agency decisionmakers have before them and take into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and cost-benefit balance. ... Informed and meaningful consideration of alternatives – including the no action alternative – is thus an integral part of the statutory scheme.

Bob Marshall Alliance, 852 F.2d at 1228 (citations and quotations omitted; emphasis in original).

The DEIS gives short shrift to considering this true "no action" alternative. Instead, NMFS states that, due to perceived legal and timing constraints, "dam removal is not considered a reasonable alternative." If the baseline against which all alternatives are judged is the present state of the hydropower project, there can be no way to evaluate the pluses and minuses of rejecting or substantially modifying those operations. Without collecting and disclosing the costs and benefits of such options, the informed decisionmaking and full public disclosure purposes of NEPA cannot be met.

Whether better characterized as a "no-action" or an action alternative, NEPA requires NMFS to give full consideration to alternatives that include not proceeding with the activities. NMFS must analyze the condition of the river without the project and outline the public benefits gained from restoring the river to a more natural state. Both these inquiries are necessary for NMFS to fulfill its NEPA obligations.

Second, stripping away the alternatives given only brief consideration and eliminated in the EIS, and the "no action" alternative – which violates the ESA – NMFS is left with only two alternatives. Such a narrow range of alternatives does not fulfill NEPA's mandate to rigorously explore alternatives. For example, the Court in *Commonwealth of Massachusetts v. Clark*, 594 F. Supp. 1373 (D. Mass. 1984), found that the Department of Interior had not considered an adequate range of alternatives in its analysis of an offshore oil drilling proposal. Of the thirteen alternatives presented in the document, the court found that, "once the illegal and overlapping alternatives are removed from the FEIS, the Secretary was presented with basically only two different configurations for the sale... the FEIS is hopelessly skewed in favor of only small deletions from the propos[ed action]." Id. at 1380.

The DEIS' failure to consider a reasonable range of alternatives is even more troubling in light of the fact that many alternatives clearly exist. Notably, the DEIS fails to consider any alternative that would be more protective of fish, such as drawdown, non-power operations, or the installation of sluiceways at each

project. While such alternatives may cost more, the DEIS presents no information for the decision-maker or the public to draw any conclusion about the benefits, or cost of such a measure.[1]

Finally, the DEIS relies on inaccurate information in its comparative analysis of alternatives. The DEIS emphasizes repeatedly that Alternative 2 will take longer to implement due to the potential for legal challenges from the PUDs. See, e.g., DEIS at s-32, 1-15, 2-53, 4-6. This fear, however, is nothing more than a straw man of NMFS' own construction. First, while it is true that the PUDs may prefer the less stringent measures that would result from Alternative 3, it is irrational to make the leap from that to a delay. The section 7 consultation with FERC described in Alternative 2 will yield the measures necessary to avoid jeopardy and will provide incidental take coverage for FERC and, by proxy, the PUDs. Even if either entity challenges these measures, they must still adhere to the results of consultation during that challenge, or they would be liable for a take under section 9 of the ESA. 16 U.S.C. § 1538. Thus even if, as NMFS assumes, one of the actors challenges the results of consultation, the measures required must still be implemented immediately to avoid take liability. The DEIS fails to disclose and to account for this fact in its analysis.

4. The DEIS fails to adequately inform the public and decision-makers of the requirements and responsibilities of all federal statutes and treaties.

5

"A reasoned evaluation of the relevant factors" must also include an understanding of all the federal laws with which an agency must comply, especially when those other laws have been enacted to protect environmental and natural resources. In this case, the DEIS fails to inform adequately the public and the decision-makers of the requirements under numerous other laws including, but not limited to the Endangered Species Act ("ESA"), 16 U.S.C. §§1531 *et seq.*, and the relationship between the alternatives and the requirements of these laws and treaties. To give the public and decision-makers the tools necessary to balance all relevant factors, the DEIS must address the basic requirements of these statutes.

For example, the DEIS states that Alternative 3 is intended to meet the requirements of the Federal Power Act and purports to analyze this requirement. Indeed, the DEIS implies that Alternative 3 is the only alternative that meets the requirements of the FPA. The DEIS does not, however, disclose that other alternatives must also comply with the FPA. By failing to disclose and analyze this requirement for the other alternatives, the DEIS presents the public and the decisionmaker with an inflated and inaccurate picture of the benefits of Alternative 3.

Endangered Species Act

NMFS' analysis in the DEIS is wholly insufficient to comply with the underlying legal obligations of the Endangered Species Act (ESA), 16 U.S.C. §§ 1531 *et seq.* The ESA is the "most comprehensive legislation for the preservation of endangered species ever enacted by any nation." *TVA v. Hill*, 437 U.S. 153, 180 (1978). "[T]he language, history, and structure of the legislation . . . indicate[] beyond a doubt that Congress intended endangered species to be afforded the highest of priorities." *TVA*, 437 U.S. at 174.

[1] The DEIS states that the "purpose of the HCPs is to protect fish in the Mid-Columbia River while generating electricity." DEIS at 1-3. This statement too narrowly cabins the rest of the analysis by removing, among other things, consideration of a true "no action" alternative. Moreover, it assumes that the HCPs analyzed in Alternative 3 are the proper means to comply with the ESA. We believe that the purpose and need must be expanded to emphasize protection of listed species and compliance with the requirements of the Endangered Species Act. The HCPs are only a proposal to meet the requirements of the ESA, they are not an end in themselves. Indeed, to perform a valid NEPA analysis, NMFS must not assume, as it does in the current purpose and need statement, that the HCP Alternative fulfills the mandates of the ESA.

As a result, agencies are required to use "all methods and procedures which are necessary," 16 U.S.C. § 1532(2), to "*prevent* the loss of any endangered species, regardless of the cost." *TVA*, 437 U.S. at 188, n. 34. The DEIS does not meet that standard and in fact, if implemented would result in serious harm to listed species in the Middle and Upper Columbia.

Specifically, the DEIS violates the ESA's requirements for three basic reasons. First, the DEIS fails to abide by the ESA's fundamental principle of caution in the face of uncertainty. Second, the DEIS assumes, contrary to law, that the underlying Habitat Conservation Plans (HCPs) are legal in the context of federally regulated hydroelectric dams. Third, the DEIS fails to understand fundamental requirements of the ESA. All three issues are discussed more broadly below.

1. The DEIS Violates the Fundamental Principle of Species Conservation – Erring on the Side of Caution in the Face of Uncertainty.

Effective conservation management requires a conservative, species-protective approach to ensure that management decisions made in the face of uncertainty do not place the species further at risk.[2] An independent peer review panel recently criticized the state of Washington's statewide salmon recovery plan for failing to heed that precautionary principle.[3]

6

The Supreme Court has recognized the importance of this approach in ESA decisionmaking. "Congress has spoken in the plainest of terms, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'" *TVA*, 437 U.S. at 194. The ESA's policy of "institutionalized caution" requires that [t]he risk [presented by an action] must be borne by the project, not by the endangered species. . . .Congress clearly intended that [federal agencies] give the 'the highest of priorities' and the 'benefit of the doubt' to preserving endangered species." *Sierra Club v. Marsh*, 816 F.2d 1376, 1386 (9th Cir. 1987). (citations omitted)(emphasis added). NMFS appears headed down an errant path with the DEIS, by placing the risk of uncertainty squarely on the backs of listed stocks.

NMFS' failure to err on the side of protecting listed fish is endemic throughout the DEIS. *See infra* at 12-14. For example, the DEIS states at the very on-set that the purpose of the preferred alternative, the HCPs, is to protect fish while at the same time generating electricity. DEIS at S-2. The ESA strictly forbids this type of analysis. Instead, the ESA requires that the biological needs of the species be identified and addressed. The ESA only allows economics and other interests to come into the determination once recovery and survival thresholds have been met. Setting out the purpose as one that must protect economic interests is inconsistent with the ESA's obligations in this regard.

This problem is also apparent in the DEIS' analysis of scientific gaps. The DEIS specifically states that under Alternative 3, there is no requirement to provide the benefit of the doubt to the species of concern with respect to data gaps or disputes over information. DEIS at S-33. This determination is clearly inconsistent with the ESA and fails to provide sufficient protection to listed species.

Moreover, NMFS specifically finds in the DEIS that the long-term risks to listed stocks is greater than the long-term risks to the PUDs. DEIS at 4-77. Again, the ESA does not allow for this type of imbalance. The "risk of uncertainty on the long-term effects to the species" cannot legally be balanced on the backs

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[2] See Noss, R.F., M.A. O'Connell, and D.P. Murphy. The Science of Conservation Planning. (Island Press. Washington, D.C. 1997)

[3] Independent Science Panel. Review of "Statewide Strategy to Recover Salmon: Extinction is Not an Option." (2000).

of the fish. Instead, the law requires these risks to be borne by the action. That is, the PUDs' facilities must bare those risks.

Although NMFS and the PUDs might argue that the adaptive management provisions of the HCPs eliminate the illegal risk to the listed stocks, this simply is not the case. The current agreement promises not to use the HCPs' "off-ramp" until year 15 (even if the stocks are plummeting) and the burden of proof requirements under a "no surprises" policy, limit any positive impacts the adaptive management provisions might otherwise present. Simply put, NMFS has negotiated an agreement that while it provides "a substantial amount of planning and financial certainty for the PUDS," it puts a significant risk on the likely survival of the listed species. DEIS at 4-77. We urge NMFS to do what the ESA requires and place the unknown risk on the project, not the species.

2. FERC's Licensing of a Hydroelectric Facility Requires a Section 7 Consultation Process.

The operation of these federally licensed projects should be the subject of a § 7 consultation between the NMFS and the FERC, not the subject of a § 10 incidental take permit (ITP) in an HCP. Issuing an ITP to these projects would be misguided for several reasons.

7

First, § 7 and NMFS' Handbook make clear that the ITPs are available only for nonfederal activities. *See* 16 U.S.C. § 1536(b)(4) & (o) (providing for incidental take statements for federal activities and ITPs for nonfederal actions); HCP Handbook at 1-4 ("[The Section 10] process is designed to address non-federal land or water use or development activities that do not involve Federal action that is subject to section 7 consultation."). As the DEIS makes clear throughout the document, the projects at issue in the HCPs are FERC-licensed projects. *See, e.g.,* DEIS at S-5 (discussing the Wells Hydroelectric Project as a FERC-licensed project). FERC's permitting authority over these projects and its continuing authority over the projects through so-called reopener clauses, constitute federal activities. As such, FERC must consult with NMFS over its actions under § 7 of the ESA. The use of the § 10 HCP process is inappropriate, and likely illegal, in this context.

Second, even if an ITP were appropriate in this context, the ITPs and HCPs would not relieve FERC of its § 7 responsibilities. Section 7 of the ESA requires federal agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species." 16 U.S.C. § 1536(a)(2) (emphasis added). Section 7 also requires federal agencies to conserve listed species. 16 U.S.C. § 1536(a)(1). Section 10 of the ESA merely requires that actions not "take" a listed species. 16 U.S.C. § 1539(a). The difference is extraordinary.

We recognize that NMFS acknowledges the need to complete a § 7 consultation on the implementation of the HCPs. However, by blessing the HCPs first, NMFS simultaneously renders the § 7 consultation process meaningless and places the agencies in a position that, very likely, will result in a process that is contrary to the law. The "no surprises" policy of the HCPs would negate the ability of the agencies to insert provisions into the FERC licenses that the agencies found necessary to comply with their § 7 conservation, survival, and recovery obligations. Contrary to the "no surprises" assurances that certain commitments will not be revisited, NMFS would illegally restrict the ability of FERC and NMFS to comply with their § 7 responsibilities. In the very least, the consultation process must occur prior to any further development or agreement to the HCPs.

Third, a "no surprises" cap on these projects' responsibilities is particularly troubling due to the river-based nature of these operations and each individual dam's impacts on migrating salmon and steelhead. To justify the promises of certainty in the face of rapidly changing conditions, NMFS and Fish and Wildlife Service asserted in their "no surprises" rulemaking that the agencies can rely on conservation contributions from neighboring land owners or voluntary conservation organizations to compensate for

the cap on the permittee's responsibilities. *See* 63 Fed. Reg. 8859 (1998), codified at 50 C.F.R. §§ 17.22(b)(5), (6) & 17.32(b)(5), (6) (1998). This justification makes absolutely no sense for the salmon and steelhead of the middle and upper Columbia River, which will not survive dams that prove to be harmful regardless of the extent to which neighboring landowners step up their conservation contributions. In essence, there is no "neighbor" to make up for the adverse impacts to the species.

Finally, no surprises assurances have already created significant new risks for endangered species as they have been applied over the past five years to nonfederal activities. "No surprises" guarantees tend to lock-in an HCP's initial design, rendering adaptive management meaningless, by setting extremely high burdens of proof for the Services, requiring additional mitigation to first occur on public lands, requiring any additional mitigation to be fully subsidized by the public, and/or allowing any additional mitigation to be voluntary. Even in cases where an HCP's initial provisions are more adequate, changes and additions to these measures may well become necessary over time, including as a result of changes in the permittees' resource management practices, changing environmental conditions, or other foreseeable and unforeseeable circumstances. Rather than repeating our general concerns regarding the no surprises policy here, we include by reference, the National Wildlife Federation's comments on the "no surprises" policy rulemaking and American Lands' comments on the Scoping Notice for these HCPs. These concerns are heightened by the fact that NMFS has found the listed species at issue in these HCPs to be some of the most imperiled in the Columbia River Basin. This is not a time to add to the obstacles these species must face, but rather a time to provide the maximum protections afforded by law and policy.

3. The DEIS Misunderstands the Requirements of the ESA.

The DEIS fundamentally misunderstands the requirements of the ESA and its relationship to hydroelectric projects. In several places, the DEIS states that NMFS cannot legally mandate drawdown or dam removal until project relicensing. *See, e.g.*, Table 2-8 at 2-57 or 4-29 & 2-45, respectively. This is
8 simply not the case. These projects currently hold licenses that contain reopener clauses that allow FERC to change or revoke the licenses due to fish and wildlife concerns. As a result, FERC retains ongoing authority and jurisdiction over these projects. Courts have found that this ongoing jurisdiction requires the federal agency with this authority to reinitiate consultation and to take whatever action necessary to protect the listed species. *See WaterWatch of Oregon v. U.S. Army Corps of Engineers*, Civ. No. 99-861-BR (D. Or. June 7, 2000) (finding that a reopener clause in a federal permit required the Corps to reinitiate consultation over a water withdrawal). NMFS' elimination of the dam removal alternative is simply inconsistent with federal law. We strongly urge the agency to reconsider its elimination of this alternative.

Additionally, the ESA requires NMFS to consider alternatives that are much more protective of fish than the HCPs proposed in Alternative 3 of the DEIS. The ESA requires that an HCP minimize and mitigate the taking of endangered and threatened species to the "maximum extent practicable." 16 U.S.C. § 1539(a)(2)(B)(ii). As discussed earlier, the DEIS fails to consider any alternative that would be more protective of fish, such as the installation of sluiceways at each project. NMFS' failure to consider this and other, more protective alternatives violates the ESA's "maximum extent practicable" requirement. As Courts have held, "the most reasonable reading of the 'maximum extent practicable' nonetheless requires the Service to consider an alternative involving greater mitigation . . . .'The Administrative Record must contain some analysis of why the level or amount [of take] selected is appropriate for the particular project at issue.'" *National Wildlife Fed'n. v. Babbitt*, 128 F.Supp.2d 1271, 1292 (E.D. Cal. 2000) (*citing Sierra Club v. Babbitt*, 15 F.Supp.2d 1274, 1279-82 (S.D. Ala. 1998). NMFS must not only show that the mitigation proposed in the HCPs is practicable, but must demonstrate that a higher level of mitigation would be impracticable. Just as NMFS cannot satisfy NEPA's range of alternatives requirement with the discussion of only 2 alternatives, such a narrow range of alternatives similarly fails to satisfy the requirements of the ESA.

Also disturbing is the manner in which the DEIS treats permit revocations. The ESA requires revocation of the permit if the permitee is not meeting the permit's terms and conditions. 16 U.S.C. § 1539 (a)(2)(C). However, the HCPs appear to limit this revocation authority in two significant ways. First, the HCPs only allow revocation after year 15. So, the PUDs could fail to meet the terms and conditions of the HCPs for 14 years without recourse. DEIS at S-16; 2-33. Second, the revocation at year 15 may be exercised only if NMFS is specifically seeking drawdown, dam removal, and/or a non-power operating action. Neither limitation is consistent with ESA requirements. We urge NMFS to review the law and the underlying HCP agreements to ensure consistency.

Finally, NMFS' failure to provide an adequate review of the HCPs' monitoring and evaluation programs undermines the very essence of the ESA. The monitoring and evaluation of the HCPs are critical for compliance with the ESA. Without accurate and adequate monitoring and evaluation mechanisms, NMFS and FSW will be unable to determine, in any scientifically or legally credible manner, whether the PUDs are complying with the HCPs and thus, with the ESA. The DEIS fails to adequately address the obvious limitations with the alternative's monitoring and evaluations processes. We urge the agency to do a more thorough analysis of the limitations of these processes and to articulate how the agency will be able to ensure compliance with federal law.

Federal Power Act

9 The DEIS specifically states that the HCPs would "supercede the existing FERC license articles and settlement agreements as they pertain to anadromous fish." DEIS at 1-9. It is also the intention of the PUDs that the HCPs satisfy NMFS' obligations pursuant to sections 18, 10(a), and 10(j) of the Federal Power Act. However, the DEIS falls far short of including the analysis and requirements necessary to supercede these statutory requirements.

Both the Federal Power Act (FPA) and NEPA obligate a hydroelectric licensee to incorporate pre-project conditions in the relicensing process. As currently written, the DEIS and HCPs limit these requirements. Section 10 of the FPA establishes two mechanisms for requiring the analysis of pre-project conditions. First, section 10(a) requires an assessment that ensures the "equal consideration" of non-power values, including fish, wildlife, recreation, and environmental quality, when relicensing a hydroelectric facility. 16 U.S.C. § 803(a). The FPA's legislative history further clarifies that the intent of the FPA's 50-year cap on hydroelectric licenses was to ensure that the commitment of a river to power production be reevaluated anew at the time of relicensing. *See, e.g.,* Statement of Theodore Roosevelt, H.R. Rep. No. 507, 99th Cong., 2nd Sess. 11 (1986) stating that "[t]he public must retain the control of the great waterways. It is essential that any permit to obstruct them for reasons and conditions that seem good at the moment should be subject to revision when changed conditions demand.") A proper assessment of giving equal consideration cannot be determined without first understanding how the project has impacted environmental resources and how these resources could be restored. The DEIS utterly fails to address those issues by ignoring the pre-project conditions. Including a dam removal alternative would help rectify this serious oversight.

Second, § 10(j) of the FPA also compels a pre-project analysis by requiring that relicensing be conditioned upon the inclusion of 'adequate and equitable" fish and wildlife protection, mitigation, and enhancement (PM&E) measures. 16 U.S.C. § 803 (j). This first step in determining the appropriate level of PM&E measures is to identify the historic conditions within which fish and wildlife existed prior to the hydroelectric project. The goal is to understand the key ecological conditions required for a healthy, self-sustaining fish and wildlife populations, and to strive to restore the physical, chemical, and physiological processes that create and maintain those conditions. However, reaching this goal is impossible without

first assessing the conditions of the ecosystem prior to dam construction. Again the DEIS is woefully lacking in this analysis.

Third, the DEIS provides no analysis of whether the HCPs at issue satisfy the FPA. It seems obvious that NMFS has blinded itself to these requirements. Certainly, by not analyzing the impacts to the FPA requirements, NMFS has failed to present the issues squarely for the public and decision-makers. The FPA grants certain authorities to NMFS to protect fishery resources, (listed and non-listed), affected by the hydroelectric project. The DEIS fails to analyze whether the HCPs' measures will satisfy such obligations. We urge the agency to complete a thorough analysis of how the proposed alternative will comply with the FPA requirements.

Finally, the very concept of the HCPs at issue in the DEIS circumvent the FPA requirements by including a "no surprises" assurances. As discussed earlier, the "no surprises" policy pre-supposes both the content and the term of years for the PUD FERC licenses. This is particularly disconcerting in terms of content where FERC has regularly inserted reopener clauses into its licenses in order to ensure "equitable treatment for fish and wildlife over the terms of the license agreement. The "no surprises" policy in the HCPs would eliminate FERC's ability to ensure compliance with this section of the FPA and many of its own license terms.

Clean Water Act

10 The CWA requires that all federal agencies "having jurisdiction over any property or facility . . . shall be subject to and comply with" all applicable federal, state, and local water quality laws. 33 U.S.C. § 1323. As a federal court has recently held, dams are no exception to this rule. See National Wildlife Fed'n v. U.S. Army Corps of Engineers, 92 F. Supp.2d 1072 (D. Or. 2000) (holding that the Corps' dams on the lower Snake River must comply with state water quality standards). As the permitting agency, FERC has jurisdiction over the operation of these dams. Nowhere in the DEIS, however, is there an analysis of whether any of the alternatives will comply with water quality standards. NMFS must analyze the water quality impacts of these projects and ensure that state water quality standards are met.

In addition, as a result of the actions analyzed in this DEIS, NMFS will issue an incidental take permit or an incidental take statement. However, both the ITP and the ITS require state certification under section 401 of the CWA. 33 U.S.C. § 1341. To the best of our knowledge, NMFS has not acknowledged receipt of such certification from the applicants. We ask the agency either to identify where in the DEIS this certification is discussed or to seek such certification prior to issuance. To issue one of these permits without a certification is a violation of section 401 of the CWA.

Inadequacy of HCP Provisions

11 The HCPs establish a no net impact standard for salmon and steelhead at the Rocky Reach, Rock Island, and Wells hydroelectric projects. The key components include a 91 percent total project survival rate, including an independent 95 percent juvenile passage rate, and 9 percent compensation through hatchery and tributary improvement programs. The DEIS clearly illustrates the shortcomings of the proposed standards and the unacceptable risk placed on the species as a result. Nonetheless, NMFS' analysis overlooks the serious shortcomings with the HCPs.

1. Adult and Juvenile Survival Standards Are Insufficient.

The DEIS must determine whether the adult and juvenile survival standards proposed in the HCPs are sufficient to recover the species and importantly, whether it is even possible to measure compliance with the proposed standards. The DEIS fails on both accounts.

Perhaps one of the most significant problems with Alternative 3 is the inability to accurately measure the key components of the HCPs – juvenile and adult survival standards. The DEIS makes clear that there is considerable uncertainty surrounding the available survival information for juvenile and adult salmonids passing the Mid-Columbia hydroelectric projects. Further, the DEIS states that (1) methodologies do not currently exist to measure total project survival for all species for juvenile migration, and (2) there are no specific plans to assess overall adult survival at the projects due to the lack of accurate methods to do so. Despite a lack of scientifically credible methods to determine whether the PUDs are meeting the proposed survival standards, NMFS relies on the standards when evaluating risks to the species of the proposed action. The DEIS fails to explain such reliance or evaluate the risk associated with standards that cannot be measured. NMFS cannot issue an incidental take permit while at the same time expressly acknowledging an inability to determine whether the applicant is in compliance with its terms.

Until such time as accurate assessment methods are developed, NMFS proposes to utilize representational studies of yearling spring chinook and steelhead to determine juvenile survival of all species and proposes nothing with regard to measuring total project survival, which includes adult survival. In the absence of adequate methods to measure whether the specified standards are being met for all of the life stages of all covered species, the standards are meaningless. Yet, the DEIS does not account for this considerable uncertainty in its analysis.

Compounding the risk to species is the provision that in the absence of methods to accurately determine unavoidable project mortality – defined as 5 percent juvenile dam passage mortality and 4 percent mortality from all other project effects, including adult mortality – NMFS assumes that the underlying estimates are correct. There is absolutely no data to justify such an assumption, and making this assumption runs counter to the fundamental principles of the ESA requiring that uncertainty be resolved in favor of the species. *See supra,* at 7-8. Therefore, until the PUDs accurately assess the specified survival standards, NMFS should assume non-attainment of the standards.

Moreover, the assumptions regarding the underlying mortality estimates serve as a disincentive for the PUDs to develop and implement studies of total project survival in a timely manner. The HCPs allow the
12 PUDs to transition from Phase I to Phase III based solely on attainment of the 95 percent juvenile survival standard. As a result, the PUDs can forego studying total project survival, relying instead on the unjustified assumptions in the HCPs. Again, this result runs afoul of the ESA's cautionary principles.

We acknowledge the difficulty in evaluating certain standards and that the HCPs call for such protocols to be developed at some future date. However, NMFS may not rely on survival standards for which there are no technologies available to evaluate when determining whether the proposed HCPs comply with the ESA. A promise of future assessments, coupled with assumptions that standards are being met in the absence of such assessments, falls far short of what the ESA requires, and cannot be used to support any conclusions as to the HCPs' adequacy. *See, e.g., Sierra Club v. Marsh,* 816 F.2d 1376 (9th Cir. 1987) (the
13 benefit of the doubt must be given to species not the action). There must be scientifically credible means to determine whether the standards set forth in the draft HCPs are being met *prior* to issuance of an incidental take permit. And, NMFS must consider the accuracy, reliability, and feasibility of the proposed measuring techniques in its analysis of the HCPs.

Recent actions undertaken by Chelan County PUD highlight the risk posed to the species by failing to develop agreed-upon methods for assessing whether survival standards are being met for all species prior to implementation of any HCPs. Despite lack of support from tribal, federal, and state fishery experts,

Chelan County PUD concluded that the Rocky Reach Hydroelectric Project was providing 95 percent juvenile dam passage survival and decided to forego the minimum spill requirement set forth in the HCPs. The PUD relied on inadequate analysis to support its conclusion, and ignored the requirement that all parties agree that the standard has been met prior to foregoing spill. Similar situations are likely to occur in the absence of measurable criteria.

Even if the 95 percent juvenile dam passage survival standard was measurable for all species, NMFS' analysis of the expected survival improvements and their adequacy in recovering the species is deficient in several respects. First, the HCPs call for the PUDs to maintain a 95 percent juvenile dam passage survival standard over only 95 percent of the run. NMFS fails to analyze the effect of protecting only 95 percent of the run and whether this approach is even legal under the ESA. Additionally, the HCPs allow for the exclusion of spring migrating chinook smaller than 50 mm in length from the 95 percent juvenile dam passage survival for the full run of that species in the event turbine intake screens are installed certain instances. The DEIS does not consider the effect of such exclusion on the species.

14

Finally, the PUDs, rather than NMFS, have the ultimate decision on what measures to implement during Phase I of the HCPs. The minimum required of the PUDs is that they demonstrate "steady progress" toward project survival standards throughout the duration of Phase I. However, the DEIS provides no criteria to determine adherence to steady progress, and importantly, states that such adherence will not be monitored until actual implementation of the HCPs. The result is that despite Phase I beginning in 1998, NMFS is not requiring the PUDs to comply with the steady progress requirement. Failure to provide steady progress delays implementation of critical protection measure and shifts the burden onto the species.

The insufficient analysis of the 95 percent standard, the lack of scientifically credible methods by which to determine whether the PUDs are achieving the HCP standards, and the lack of a requirement to provide the benefit of the doubt to the species of concern with respect to information gaps or disputes results in insufficient protection for the species.

We recommend that NMFS identify and evaluate feasible measurement protocols to assess compliance with all aspects of the survival standards. Such protocols should address all species and all life stages, including adult survival. In conjunction with development of study methodologies, NMFS should evaluate the potential impacts on the species that may result from implementation of such studies. Further, any uncertainties with regard to whether standards are being met must be resolved in favor of the species.

2. The DEIS Lacks Any Adequate Analysis of the Off Site Mitigation Proposals.

The DEIS notes that the ultimate goal of the HCPs is to achieve no net impact to each species covered by the HCPs. This standard requires a 9 percent compensation for unavoidable project mortality through two programs – 7 percent compensation to be provided through hatchery programs and 2 percent compensation provided through tributary habitat improvement programs. However, the DEIS fails to provide a detailed evaluation of either program, including the manner in which NMFS will assess the projected benefits. Rather, the DEIS acknowledges that there are no means to assess these benefits and then simply assumes that the funding and supplementation levels contained in the HCPs are adequate.

15

a. Tributary Improvements

A critical component of any salmon protection and recovery effort will involve the protection and restoration of salmon and steelhead habitat throughout the basin. Thus, while a tributary habitat improvement fund is a laudable goal, it must be accompanied by measurable actions and objectives. The

16

proposed tributary fund in the HCPs fails to meet that requirement and as a result, raises questions about the legality of such a program under the ESA.

The DEIS provides no analysis to support the proposed tributary habitat improvement fund levels established in the HCPs or to suggest that the fund will result in the 2 percent compensation for unavoidable project mortality as intended. The fund is defined in monetary terms, with no connection to specific habitat improvement measures or goals necessary to meet the habitat needs of salmon and steelhead. And, although the DEIS states generally that habitat conditions are expected to improve, there is no way to measure the actual benefits of such improvements or determine whether the PUDs are complying with the 2 percent compensation standard. Despite this inability to measure and the uncertainty surrounding the fund, the DEIS quantifies and relies upon expected survival increases for steelhead and spring chinook resulting from such improvements. The DEIS fails to support its finding that the fund will either provide 2 percent compensation or provide the projected survival benefits.

Additionally, the DEIS does not explain how the funding structure may affect when or whether improvements are made and survival benefits realized. Similarly, the DEIS fails to explain how the funding structure will actually achieve interim goals for recovery. The QAR analysis assumes that survival improvements from off site mitigation will be realized immediately, even though the funding for such improvements is spread out over the 50 years of the permit. NMFS clearly understands that the survival improvements cannot be immediately realized. And yet, the DEIS, while acknowledging this discrepancies, simply ignores the problem. NMFS' avoidance technique and lack of analysis presents an illegal burden of risk on the listed species and violates both the ESA and NEPA.

17 Finally, the DEIS fails to explain why Douglas County PUD's contribution to the tributary improvement fund would be reduced by half in the event that the PUD is achieving 95 percent juvenile dam passage survival or higher at the Wells dam. There is no justification for linking the tributary habitat fund solely to the juvenile dam passage survival standard. Such a reduction runs counter to the goal of attaining no net impact at the project and is not considered in the DEIS estimation of survival benefits. The projected benefits, although not supported by data or scientific analysis, are based on tributary improvements to mitigate for 2 percent of unavoidable project mortality. Changing the contribution level without scientific justification is irrational and contrary to law.

b. Hatchery Mitigation

18 The DEIS fails to adequately analyze the hatchery supplementation component of the HCPs. Not only does the QAR analysis fail to consider a long-term program, but NMFS also provides no analysis to support a program that compensates for 7 percent unavoidable project mortality. Although the HCPs rely on 7 percent compensation through hatchery programs to attain the underlying goal of no net impact, NMFS expressly states that it cannot guarantee a program at that level. The DEIS notes that any hatchery program must be designed and implemented in a manner consistent with recovery goals, but provides no information as to how that might be accomplished nor whether such consistency will prevent the PUDs from meeting the required 7 percent hatchery compensation. Nevertheless, the analysis fails to factor in the potential for non-attainment of 7 percent compensation through the hatchery program, and in turn, the no net impact standard. The failure of this analysis raises questions as to whether the HCPs and the no net impact standard meet the obligations of the ESA.

Although the DEIS identifies continued supplementation as an important factor to consider and clearly a key component of the HCPs, the QAR fails to analyze the impacts of a long-term supplementation program intended to provide the 7 percent compensation. In fact, the QAR analysis assumed a short-term supplementation program would be suspended upon attainment of certain goals, while supplementation under the HCPs would continue unless shown to have a negative impact to ESA listed species. 19

Insufficient information about the hatchery program, in combination with uncertainty surrounding both the survival standards and the tributary program, preclude NMFS from fully assessing the environmental impacts of the HCPs and drawing any conclusions as to its sufficiency under the ESA.

3. Inconsistencies between QAR & DEIS Call DEIS Analysis into Question

The DEIS relies on the Quantitative Analytical Report (QAR) to assess the impacts of implementing the survival standards and tributary habitat improvement measures in the HCPs. NMFS' reliance on the QAR analysis is misguided for several reasons. First, the QAR "assumed that the survival improvements called for at the hydroprojects, and through off-site mitigation, occur instantaneously," when in fact, as the DEIS notes, the survival benefits from the measures in the HCPs may not be realized for years. DEIS at 4-11. The QAR also assumes that Grant County PUD's Priest Rapids Project has achieved a 95 percent juvenile survival standard, similar to the juvenile dam passage survival standard called for in the HCPs. However, the DEIS provides no support for this assumption. As discussed above, the QAR also fails to adequately assess the proposed hatchery supplementation program. Finally, the QAR incorporates the survival improvements called for in the Federal Columbia River Power System Biological Opinion, even though such standards are not currently being met. The QAR relies upon unsupportable assumptions contrary to the requirement that NMFS articulate a rational connection between its findings and the available facts. Inconsistencies between the QAR and available facts call into question NMFS' reliance on the analysis to draw any conclusions about the adequacy of the HCPs. 20

Conclusion

The DEIS fails to demonstrate that the proposed HCPs provide sufficient protection of anadromous salmon and steelhead. It relies on immeasurable standards and too often places the risk of uncertainty associated with such standards on the species. A plan that is to govern salmon and steelhead protection measures at the Rocky Reach, Rock Island, and Wells hydroelectric projects must contain significantly more certainty with regard to attainment of standards, effectiveness of standards in light of all the impacts in the Columbia River Basin, and must be conservative in favor of ESA-listed species. The DEIS does not provide sufficient analysis of the environmental impacts of the alternatives to warrant adoption of the HCPs.

Thank you for the opportunity to comment. Please feel free to call if you have any questions regarding these comments.

Sincerely,

Pat Ford /aaw

Pat Ford, Save Our *Wild* Salmon
John Kober, National Wildlife Federation
Steve Gerritson, Chair, Cascade Chapter of the Sierra Club
Liz Hamilton, Northwest Sportfishing Industry Association

Glen Spain, Pacific Coast Federation of Fishermen's Associations &
Institute for Fisheries Resources
Shawn Cantrell, Friends of the Earth

cc: Susan Fruchter, NEPA Coordinator
Office of Policy and Strategic Planning
Room 6117
Herbert C. Hoover Bldg.
U.S. Department of Commerce
Washington D.C. 20230

Save Our Wild Salmon (SOWS)

Comment #	NMFS Reference #[1]
1	47
2	32
3	6
4	32
5	21, 23
6	51
7	47
8	24, 34
9	23, 25, 43
10	23
11	18
12	21, 22
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14	28
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16	12
17	14
18	27
19	16
20	16, 53

[1] see Appendix C

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FEB 20 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 NE Oregon St. #420
Portland, OR 97232-2737

Feb. 15, 2001

Dear Sirs:

We are residents of East Wenatchee, and have been involved in conservation issues for many years. We have worked through the Chelan/Douglas Land Trust, the Foster Creek Conservation District, and The Nature Conservancy of Washington to preserve riparian habitat and aid salmonid survival and restoration in the Mid-Columbia Region.

We heartily endorse the HCP as prepared by the Chelan County PUD. While we cannot comment with any authority on the specific recommendations and actions, we support the increased certainty re: future licensing and take issues that the HCP addresses. We don't feel that dam breaching or removal is a reasonable alternative, and therefore extensive mitigation measures need to be pursued as outlined in the HCP.

We look forward to working with the PUD in the near future regarding conservation easements on riparian lands on both the tributaries and the main stem of the Columbia. We have already met with the senior staff of the PUD and look forward to more meetings to plan ways that local conservation groups can work with the PUD to ensure healthy fish stocks into the future. We agree with the comment: "extinction is not an option," and we welcome the proactive approach as outlined in the HCP.

Thank you for the opportunity to submit these comments, and we look forward to seeing the implementation of the HCP.

Sincerely Yours,

Eliot W. Scull

Christine E. Scull

FEB 15 2001

Stemilt GROWERS, INC.

"Responsible Choice" *Apples • Pears • Cherries*

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N.E. Oregon St, Suite 420
Portland, Oregon 97232-2737

February 12, 2001

To Whom It May Concern:

As a resident of North Central Washington, a fruit grower and the President of Stemilt Growers, Inc., I want to comment on the Habitat Conservation Plan for salmon recovery in our area.

Like almost everyone I know I have a high interest in the salmon recovery success. I work with over four hundred fruit growers in Central Washington. We employ well over a thousand people in our packing plant and orchards. We rely on the natural resources of the mid Columbia region to support these family farms and to employ these hundreds and hundreds of people in production jobs. I would like to endorse enthusiastically the principles behind the Habitat Conservation Plan (HCP) now being reviewed by your agency for the fish resources of the Columbia River.

Ample water is necessary to irrigate our orchards. Reliable low-cost electricity is necessary to pump that water to the trees, to run the packing lines which process the fruit and enable the controlled atmosphere storage rooms to maintain their precise conditions for top marketing of the products. In an era when so many other pressures are squeezing the agricultural industry, cooperative approaches like this HCP help by providing more long-term certainty regarding water supplies and electric power. It would be a shame to remove yet one more cornerstone of our increasingly shaky foundation.

As we understand it, the HCP approach lets the knowledgeable people at the Chelan County PUD use their insight and understanding to achieve measurable results on fish issues. As a business owner, I can appreciate the approach. Regulatory burdens too often lead to nothing but long drawn out legal battles.

The region will best be served by allowing Chelan County PUD to match it's fish protection measure with other aspects of hydroelectric operation, especially with the guaranteed review of the results provided for in the HCP. Stemilt Growers adds its voice to those calling for implementation of the agreement as it has been presented.

Thank you,

Thomas K. Mathison
President – CEO
Stemilt Growers, Inc.

United States Department of Agriculture | Forest Service | Okanogan-Wenatchee National Forests | 215 Melody Lane
Wenatchee, WA 98801
TTY (509) 662-4396
Voice (509) 662-4335

File Code: 2770

Date: April 5, 2001

RECEIVED
APR 10 2001

OWNF

Mr. Bob Dach
NMFS, NWR, Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

Dear Mr. Dach:

The Okanogan & Wenatchee National Forest (OWNF) would like to submit the following comments on the *Anadromous Fish Agreements and Habitat Conservation Plans, Draft Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* which we received January 2, 2001. We have organized our comments in two categories; (1) general and (2) specific, according to page numbers from the DEIS. We hope this facilitates your review and response.

General Comments

1

The DEIS has been reviewed by OWNF Fishery Biologists, Hydrologists, District Rangers and other specialists from the following Ranger Districts: Leavenworth/Lake Wenatchee, Entiat/Chelan, Methow Valley, and Tonasket. The consensus of the reviewers is that the DEIS chapters covering Affected Environment and Environmental Consequences with respect to the associated tributaries tend to be overly general, out dated, and in some cases innaccurate. The developmental lifespan of the HCP/DEIS has been such that it does not reflect recent advances in a number of areas:

- Watershed Restoration: The DEIS hints at the possible effects of these ongoing activities but is short on specifics.
- Watershed Analyses: The DEIS utilizes USFS documents in an uneven manner, often overly generalized. More recent documents are unutilized.
- Watershed Monitoring: Aquatic habitat monitoring in the tributaries has intensified in recent years yielding new information (particularly regarding thermal and sediment regimes) that would increase the quality of the DEIS.
- Biological Assessments: The associated tributaries are now covered by analytical baselines completed according to the NMFS ESA-matrix for steelhead and spring chinook salmon and the USFWS ESA-matrix for bull trout. These BAs are typically updated annually and include a wealth of information and interpretation that is not reflected in the DEIS.

It is our opinion that sections of the DEIS that pertain to the associated tributaries are inadequate to serve as a basis for effective protection and restoration of Plan species habitat in the tributaries. Requiring the DEIS to be updated would serve little purpose other than to further delay implementation of the HCP. The OWNF is concerned that implementation of the HCP will not be timely enough to reverse the declining population

trends of Plan species. It is acknowledged that attempts to keep the DEIS up-to-date regarding the tributaries would continually lag behind. The process of watershed analysis is iterative by design to account for changes in the dynamic processes that shape watersheds and the advances in our knowledge of these processes. To solve this dilemma, we propose that the parties to the HCP add wording to the adaptive management sections of the DEIS that would require the following:

- Prior to selecting projects for the associated tributaries, the Tributary Committee conduct a thorough review of the current status of Plan species and habitat limiting factors within the associated tributaries.

- The PUDs become involved (technically and financially) in future watershed analyses of the associated tributaries.

The OWNF supports Alternative 3, particularly the Tributary Conservation Plan and the dam passage survival standards. The OWNF has some reservations regarding the Hatchery Compensation Plan. The policy and direction of the OWNF is to manage habitat for natural production; therefore, it is mandatory that Forest Fishery Biologists carefully review any HCP-driven proposals to artificially supplement salmonid populations within the National Forest. It is understood that artificial supplementation may be required to restore some anadromous species. The Forest's opinion is that artificial supplementation should be applied as a short-term stop-gap measure and phased out over time. Because of concerns about broodstock mining, appropriate release sites, and species interactions (competition, disease, genetic integrity) the OWNF expects to be directly involved in reviewing plans for hatchery supplementation.

The Forest is one of the principal aquatic habitat managers in the Wenatchee, Entiat, Methow, and Okanogan Subbasins. The Forest expects to be an integral part of the Tributary Committees proposed by the HCP.

Monitoring and adaptive responses will be keys to evaluating the success of the HCP. The Forest expects to be involved in reviewing monitoring results after the HCP is implemented. The Forest expects to make future recommendations based on HCP monitoring results.

Specific Comments

2 *Page S-40*: Vegetation impacts during drawdown should also disclose the increase of noxious weeds if drawdown occurs.

3 *Page 1-31*: "Any additional measures NMFS deems necessary for the permit would be detailed in the biological opinion." and *page 2-2* "If NMFS determines that the proposed measures are not adequate to ensure the continued existence of the species, a reasonable and prudent alternative to the proposed action would be developed". These statements give the appearance that NMFS has not disclosed all of the actions associated with the alternatives and consequently has not disclosed all of the effects. We cannot comment on the proposed action and effects unless they are disclosed in their entirety.

4 *Page 2-40*: Project Cumulative Effects appears incomplete. 40CFR1508.7 defines cumulative effects as: "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such action." This DEIS addresses neither impacts of past actions nor

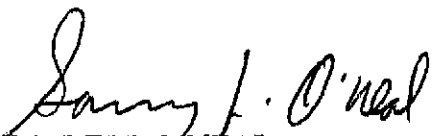
reasonably foreseeable actions. It is our opinion that reasonably foreseeable actions would include all actions proposed in each of the tributaries including cumulative effects of DEIS hatchery supplementation programs combined with current hatchery programs including coho re-introduction during implementation of alternatives 2 or 3 and actions proposed as restoration projects in the watershed analyses for each of the tributaries. What are the expected effects of all the smolt outplanting on wild fish, both in the tributaries and during migration out to the Columbia estuary?

Page 3-68: The reported Entiat River spring chinook salmon average escapement estimates (redds) based on dam counts (turnoff estimates) are clearly in error. The OWNF considers spawning ground surveys to produce more accurate estimates of escapement and population trends and suggest the use of redd count expansions as recommended by Carie (1996). For example: if Entiat steelhead escapement is 5 estimated by subtracting Wells Dam counts from Rocky Reach Dam counts and then subtracting Wells hatchery broodstock take, the resulting escapement estimates are often negative numbers (1982, 1983, 1984, 1991 & 1992). Chapman et al. (1994) concluded that steelhead escapement to the Entiat River cannot be accurately calculated.

Page 3-89: The reported average monthly flows in the lower Entiat River are incorrect and inconsistent 6 with the flows correctly depicted in Figure 3-9.

Section 4.1.3.2 identifies specific projects that would be implemented under alternative 3. The projects generally relate to reducing erosion, sedimentation and turbidity. These are worthy goals; however, none of these tributaries are on Washington Sate Department of Ecology's 303(d) list for sediment or turbidity. They are 303(d)-listed for instream flows. An action that would increase instream flows while 7 reducing the risk of landslides after catastrophic wildfires is captured in the OWNF dry site strategy. This strategy of reducing vegetative stocking and fuel levels in fire-prone landscapes would increase streamflows in the tributaries, especially during the critical base-flow time of year. This strategy has been subjected to a blind peer review. The OWNF has more than 500,000 acres of dry site in these four tributaries that could benefit from some form of stocking control and fuels reduction over the next 50 years.

Sincerely,



SONNY J. O'NEAL
Forest Supervisor

Cc
Susan Fruchter, U.S. Dept of Commerce
Mark Morris, Tonasket District Ranger
John Newcom, Methow Valley District Ranger
Karin Whitehall, Entiat District Ranger
Bob Sheehan, Chelan District Ranger
Glenn Hoffman, Leavenworth/Lake District Ranger

USDA - Okanogan-Wenatchee National Forests (OWNF)

Comment #	NMFS Reference #[1]
1	14
2	63
3	5
4	6
5	89
6	90
7	13

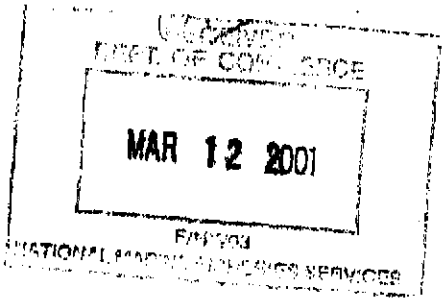
[1] see Appendix C

USDA United States Department of Agriculture

Animal and Plant Health Inspection Service

Wildlife Services

720 O'Leary St., NW
Olympia, WA 98502



March 8, 2001

National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Dear Sir/Ma'am:

The United States Department of Agriculture-Wildlife Services (WS) would like to thank you for the opportunity to review and comment on the DEIS regarding the proposed Anadromous Fish Agreements and HCP's for the Wells, Rocky Reach, and Rock Island hydroelectric projects.

After reviewing the document we have compiled a list of comments based on the context of the DEIS and how it relates to the Cooperative Service Agreements (CSA) we have with the Chelan and Douglas County PUD's.

The objectives and goals of the CSA at Rocky Reach and Rock Island dam are to reduce predation on downstream migrant salmonid smolt and steelhead fingerlings by populations of predatory gulls, cormorants, and other piscivorous birds. This includes the reduction of damage to electrical utilities/structures caused by nesting/roosting cormorants.

In Douglas County, the CSA with Wells Hatchery directs WS to reduce or alleviate predation on juvenile salmonids by piscivorous birds, primarily mergansers, cormorants, gulls, herons, and diving ducks. The CSA at Wells Dam is in place to maintain the integrity and function of the existing overhead wire exclusion system over the tailrace area, thus reducing predation on juvenile salmonids by piscivorous birds. This wire exclusion system is also in place over the rearing ponds at Wells Hatchery.

Our comments focus on the lack of information and discussion of piscivorous birds at each of the hydroelectric projects. Predation on salmonid species by fish-eating birds is well documented in the literature, and we find the omission of all piscivorous bird species but gulls to be a serious oversight of the DEIS.

COMMENTS

Section 2.2.4.3 Predation

WS

1 The last paragraph (p. 2-22) discusses bird predation and measures taken to reduce the damage. The methods listed include: *wires, propane cannons, and other pyrotechnic methods*. It is important to reveal that lethal methods are used to reinforce the nonlethal methods. Shooting in the direction of, but not at, target birds is sometimes augmented by intentional shooting of individual target birds. The intent of such shooting is to enhance the scaring efficiency of firearms and pyrotechnics by training the birds to anticipate injury when they hear explosions. Birds that learn to fly beneath the wires strung over the tailraces, at certain projects, are shot. The discussion of lethal measures should not be a red-flag issue.

Section 2.3.1.1. Wells Hydroelectric Project

2 ▫Measures Planned

2. Juvenile Passage

C. Predation

Part C under Juvenile Passage reads: *continue to refine and implement a northern pikeminnow removal program.* It is our understanding that Wells Hatchery is affiliated with Wells Dam. If Wells Hatchery is indeed a facility within the Wells Hydroelectric Project then mention must be made to the piscivorous bird program at the hatchery. As mentioned earlier, our CSA with Wells Hatchery includes a multitude of fish-eating birds. Similar wording used in section 2.3.1.2., paragraph 4, bullet 4 on avian predation would be suggested.

Section 2.3.1.3. Rock Island Hydroelectric Project

3 Unlike the two hydroelectric projects described prior to Rock Island, there is no mention in this section as to the piscivorous fish and bird programs in place, nor mention of their continuation in the future. We believe there should be mention made to these programs.

Section 2.3.3.8. HCP Conservation Plan and Compensation Measures

▫Wells Dam

4 Once again there is no mention of Wells Hatchery. Does the hatchery compliment the dam and are both operated by the Douglas PUD? Wells Hatchery is not combined under the proposed plan for Wells Dam, nor is it mentioned anywhere under section 2.3.3.8. We believe that Wells Hatchery needs to be included, either separately or under Wells Dam.

Section 3.2.9.2. Project Area Rearing

▫Predation

5 The lack of data, literature, and discussion of piscivorous birds is problematic. The DEIS has but one reference (Ruggerone, 1986) to the only piscivorous bird species mentioned. Gulls are only one of many fish-eating birds found at Wells, Rocky Reach, and Rock Island dams. WS is under agreement to control cormorants, herons, mergansers, diving ducks, and terns. A separate section discussing piscivorous birds and their associated damage is needed. Failure to address this issue could result in a forced cessation of bird control activities for Chelan and Douglas County PUD's due to insufficient NEPA. We would conclude that a deeper look at predator/pest management programs be taken.

Please let us know if we can be of assistance in providing information needed for this or other analyses.

I would like to thank you again for allowing Wildlife Services to review and comment on the DEIS regarding the proposed Anadromous Fish Agreements and HCP's for the Wells, Rocky Reach, and Rock Island hydroelectric projects. We hope our comments will be of some help in the completion of a thorough and complete Environmental Impact Statement.

Sincerely,

J. Gary Oldenburg
State Director, WA/AK

USDA Wildlife Services (WS)

Comment #	NMFS Reference #[1]
1	101
2	101
3	101
4	101
5	101

[1] see Appendix C

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

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IN REPLY REFER TO:

March 26, 2001

ER 01/82

Mr. Bob Dach
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Dear Mr Dach

The Department is currently reviewing the Draft Environmental Impact Statement (DEIS) for the Anadromous Fish Agreement and Habitat Conservation Plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects, Washington. We note in the letter accompanying DEIS that comments are due March 29, 2001.

I am currently working with the Fish and Wildlife Service and the Bureau of Indian Affairs to develop the Department's comments. Because of the magnitude of these issues the Department will need additional time to discuss and coordinate our concerns prior to submitting comments on the DEIS.

We therefore respectfully request a time extension until May 1, 2001 to provide comments. I appreciate your cooperation in this matter. If you have any questions or require any additional information you can contact me at (503) 231-6157 and preston_sleeger@ios.doi.gov.

Sincerely,

Preston A. Sleeger
Regional Environmental Officer

cc:
Terry Martin, OEPC
Estyn Mead, FWS
Bernie Burnham, BIA

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

IN REPLY REFER TO:

May 11, 2001

ER 01/0082

Mr. Bob Dach
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Dear Mr. Dach:

The U.S. Department of the Interior (Department), through its bureaus the Fish and Wildlife Service (Service) and the Bureau of Indian Affairs (BIA), has reviewed the Draft Environmental Impact Statement (DEIS) for the Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, Washington. In the DEIS, the National Marine Fisheries Service (NMFS) considers whether to authorize incidental take permits pursuant to the Endangered Species Act Section 10(a)(1)(B) for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs) operating three Federal Energy Regulatory Commission (FERC) licensed hydroelectric projects on the mid-Columbia River. The Department offers the following comments for your consideration in the development of a final environmental impact statement (FEIS). These comments were prepared under the authority of and in accordance with provisions of the National Environmental Policy Act (42 U.S.C. 4321 et seq.; 83 Stat. 852), as amended, the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.; 48 Stat. 401), as amended, the Endangered Species Act (16 U.S.C. 1531 et seq.; 87 Stat. 884), as amended, and the Federal Power Act (16 U.S.C. 791-828c et seq.; 41 Stat. 1063), as amended, and other authorities mandating our concern for environmental values.

GENERAL COMMENTS

We appreciate the document's candor in highlighting each alternative and noting those areas in which the alternative is or may be inconsistent with the requirements of Section 10 of the Endangered Species Act or current science and technology. Obviously, these inconsistencies are problematic for the NMFS and will require resolution before a final decision regarding permit issuance can be made. The Department fully supports the document's strategy of encouraging reviewers to comment on these inconsistencies and suggest potential solutions. Accordingly, these comments focus on those areas of the DEIS that do not adequately address or analyze the potential consequences of permit issuance on areas of special interest to the Department. These areas include the effect of the proposed action on Indian reserved rights and resources that are

subject to the Federal trust responsibility, and Columbia River bull trout, a listed threatened species for which consultation with the U.S. Fish and Wildlife Service may ultimately be required. We also provide comments regarding the need to modify certain terms of the HCPs to reflect current science and technology and align those plans with the requirements of the Endangered Species Act.

In the DEIS, NMFS discusses three alternatives including the proposed action. Alternative 1 is the "no action" alternative and describes baseline conditions and existing regulation of mid-Columbia operations. Alternatives 2 and 3 utilize different sections of the ESA to protect and recover fish species under the Act. Under Alternative 2, NMFS would enter into Section 7 consultations with the Federal Energy Regulatory Commission (FERC) and could require modifications of the projects' federally-licensed operations to protect and recover the listed stocks. Under the proposed action, Alternative 3, NMFS would issue 50-year incidental take permits for the affected species pursuant to conservation plans developed by the project operators and implemented under Section 10 of the ESA.

Tribal Resources and Federal Trust Responsibility

Overview of the Proposed Action's Trust Deficiencies

The projects at issue in this DEIS are located on the mid-Columbia River near lands that were aboriginally occupied by the Tribes of the Columbia River Basin, and the existence and operation of these projects impact and restrict the treaty-confirmed property rights of these and other Indian Tribes. In 1855 treaties with the United States, four Columbia Basin Tribes ceded millions of acres of land while specifically reserving the Basin's fisheries for cultural, ceremonial, subsistence and economic purposes. As the primary Federal agency responsible for protecting the trust property of Indian tribes, the Department has a strong interest in ensuring that these projects are operated in a way that protects tribal trust resources, and specifically, the anadromous fish of the Columbia River Basin.

USDOI

1 The Department is primarily concerned that many of the elements of the DEIS's proposed action, Alternative 3, would impair the ability of the Federal government to fulfill its trust responsibilities to the Columbia Basin Indian Tribes. To protect the Tribes' rights to their treaty reserved property and to avoid liability for a breach of the Federal government's trust obligations, it is essential that NMFS's management role in the basin ensures the maintenance and utilization of the reserved fisheries.

However, pursuant to Alternative 3, the Federal government's responsibility to manage mid-Columbia trust resources would be impermissibly transferred to non-federal entities who are not accountable for breaches of Federal trust and treaty obligations. The decision-making process described in Alternative 3 for implementing recovery measures severely constrains Federal authority. Under Alternative 3, the species' recovery and the management authority of the United States is relegated to Coordinating Committees which yield ultimate decision-making authority to

the non-federal commercial operators. Consequently, NMFS's role in the management of the mid-Columbia fisheries, including treaty trust fisheries, would be reduced to recommending mitigation
1 measures that the Coordinating Committees may reject. Despite the fact that its management authority would be severely constrained, the United States would still be liable for a breach of its trust responsibility should measures under Alternative 3 fail to recover the endangered fisheries.

Given the potential liability, NMFS should require actions that are able, on a sound scientific basis, to protect the endangered fisheries in exchange for the proposed incidental take permits that would be issued under Alternative 3. However, a recent quantitative analysis performed by NMFS to assess the conservation measures included in the proposed action concluded that "[e]ven under the most optimistic scenarios modeled regrading future survival rates and the effectiveness of supplementation, additional survival improvements beyond those projected for the draft HCP action [discussed in this DEIS] would be necessary to achieve extinction risk/recovery criteria." *See* NMFS, *Upper Columbia River Steelhead and Spring Chinook Salmon Quantitative Analysis Report*, Final Technical Review Draft, page ii (December 20, 2000) (*QAR Report*). Moreover, in the context of operations and planned conservation for the entire Columbia River system, the *QAR Report* determined that, "[t]he combined effect of meeting the HCP objectives at the mid-Columbia PUD projects and meeting the off-site mitigation targets [for the rest of the Columbia River] would be substantial but would fall short of meeting survival and recovery criteria under the assumption that 1980-present conditions will continue." *QAR Report* at iii. Thus, according to NMFS's own best science, whether the DEIS's proposed action does enough to protect trust resources is questionable.

In contrast, the provisions of Alternative 2 maintain the Federal government's and NMFS's trust responsibility role while providing NMFS with the authority to ensure a full range of measures to protect and ensure the continued existence of endangered mid-Columbia trust resources. In light of the constraints that Alternative 3 would impose on the United States' ability to manage resources subject to its trust responsibility to the Columbia Basin Tribes, and given the scientific uncertainties identified in the DEIS regarding the implementation of Alternative 3, the Department is gravely concerned about the merits of issuing 50-year incidental take permits under the terms described in the DEIS's proposed action. We offer the following comments in support of these concerns.

<u>The Proposed Action Impermissibly "Transfers" NMFS's Federal Trust Responsibility to Non-Federal Entities</u>

The DEIS's proposed action, Alternative 3, impermissibly transfers the Federal government's authority to ensure the maintenance and utilization of Indian trust resources to two non-federal entities, the PUDs, operating projects on the mid-Columbia. Under Alternative 3, NMFS would be subject to an implementation process that gives ultimate management authority to project operators for the 50-year term of the incidental take permits. Pursuant to the three phase decision-making process described in Alternative 3, NMFS would be unable to initiate recovery measures and would be subject to the ultimate decision-making authority of the project operators.

Moreover, should NMFS disagree with a project operator about recovery measures, NMFS would be required to carry the burden of proof in a dispute resolution process with time and
2 evidentiary limitations. By constraining and transferring NMFS's authority to manage threatened trust resources, Alternative 3's implementation process is contrary to common trust principles and may expose the Federal government to liability for failing to sufficiently manage and protect the Tribes' treaty-reserved resources.

As described in the DEIS, Phase I of this three-phase process requires NMFS to transfer its authority to manage the plan species to the project operators themselves. During this time, the PUDs will attempt to modify project operations to attain 91 percent overall project survival and
3 95 percent juvenile passage survival at each project. According to Alternative 3, a Coordinating Committee will be formed to ensure that the project operators are making "steady progress" toward survival goals.[1] This Coordinating Committee can recommend "parallel actions" to the project operators. *See* DEIS at 2-35. However, if a Coordinating Committee is unable to reach consensus as to mitigation procedures, or even whether a project is meeting survival standards, the project operators themselves are provided the "ultimate authority" for final decision-making under the Coordinating Committees. *See* DEIS at S-19 and 2-53.

If after five years the project operators are unable to attain the survival goals set forth in Alternative 3, the implementation process moves to Phase II. During this phase, the Coordinating Committee will evaluate the mitigation measures that were utilized by the project operators and may recommend additional measures to ensure that survival goals are achieved. NMFS, as a member of the Coordinating Committee, will be able to participate at this stage in the process and may recommend more stringent mitigation tools. However, if the Coordinating Committee is unable to reach consensus as to these additional measures, the project operators will retain the ultimate authority to determine the necessary mitigation measures unless a dissatisfied member of the Coordinating Committee is willing to submit itself to the dispute resolution process. *See* DEIS at 2-53.

Pursuant to Alternative 3's dispute resolution process, if NMFS desires to oppose a decision of the Coordinating Committee or to oppose the continued use of the project operators' mitigation tools, NMFS will be required to prove by a preponderance of the evidence that the operators' mitigation measures are insufficient. If NMFS purports that the mitigation provisions violate the ESA, NMFS must also overcome a presumption that favors the existing mitigation measures.[2] The expertise of NMFS will receive no deference in the dispute resolution process, and NMFS

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[1] This Coordinating Committee will be comprised of representatives of each signatory party. DEIS at 2-36. Because the Tribes have been unable to agree to the terms of the existing HCPs, and are not expected to be signatory parties, the Tribes will not be represented on this Committee.

[2] This is a presumption expressly built into the dispute resolution process and, more generally, the DEIS asserts that because Alternative 3's measures are consistent with "HCP agreements and protocols" by definition they cannot violate the ESA. *See* DEIS at S-17.

will have only five months to prove that the PUDs' mitigation tools are insufficient. Under such a dispute resolution process, NMFS's ability to ensure that trust resources are protected is severely constrained.[3]

Finally, if any of the project operators are able to demonstrate that they are meeting survival standards, the implementation process enters Phase III. Pursuant to Phase III, the three hydroelectric projects will be subject only to periodic review to assess whether they are meeting
4 Alternative 3's survival standards. During this phase, NMFS will not be able to require any additional mitigation actions. Even if, years later, the plan species require additional protective measures, Alternative 3 precludes NMFS from imposing such measures. Consequently, for the 50-year term of the HCPs NMFS's Federal responsibility and ability to ensure the survival and utilization of endangered trust resources is effectively and impermissibly transferred to non-federal parties.

The Tribes of the Columbia Basin will be depending on NMFS to ensure adequate protection of the river's tribal trust resources. If NMFS, pursuant to Alternative 3, is required to transfer its
5 management authority to project operators, which are private commercial entities, NMFS would be violating its trust responsibility to the Tribes and perhaps exposing the Federal government to liability for failing to properly manage treaty-reserved resources.

Moreover, the DEIS fails to discuss the implications that Alternative 3 has on NMFS's obligation to manage the mid-Columbia's resources in the best interests of the Columbia Basin Tribes. While Alternative 3 would displace NMFS's role as trustee for the Tribes' reserved fisheries, the
6 DEIS provides no general or specific discussion regarding the potential consequences or impacts that may result from this "transfer" of management authority of treaty reserved resources to non-Federal parties, or indeed, whether such a "transfer" is legally permissible.

In contrast, the provisions of Alternative 2 would allow NMFS, BIA, FWS, the Tribes, and all other interested stakeholders to consult with and/or appear before FERC to ensure that the
7 federally-licensed project operations account for the United States' trust responsibilities. Under the provisions of Alternative 2, NMFS would engage in Section 7 consultations with FERC and would retain the authority and responsibility to ensure that the projects' federally-licensed operations are consistent with the biological needs of the endangered trust resources. For example, Alternative 2 includes a range of specific recovery actions that NMFS has determined are necessary to improve biological conditions for the affected species, but not all of these actions

[3] The Department is concerned that the dispute resolution process has already proven to be an unsuccessful mechanism to protect trust property or to carry out the Federal government's trust responsibility. Specifically, the BIA notes that the project operators have been operating under the terms of the HCPs since 1998 and have been utilizing the dispute resolution process since then as well. Several disputes have arisen over the last three years, specifically disputes regarding timing and quantity of migration spill. The PUDs, Chelan in particular, have basically ignored the dispute resolution process and have made unilateral decisions on how to proceed on these issues despite repeated requests from NMFS and the Tribes. Such a track record does not bode well for future cooperation on implementing discretionary measures under Alternative 3.

are included in the measures proposed under Alternative 3. *See* DEIS at 1-14 to 1-16. Of the alternatives presented, only Alternative 2 ensures that NMFS is able to completely and responsibly fulfill its role as trustee for the treaty-reserved resources of the Columbia Basin Tribes. Accordingly, the Department maintains that NMFS should utilize the procedures described in Alternative 2.

The DEIS and the Proposed Action do not Adequately Consider Impacts on the Tribe's Treaty Reserved Fishing Economies

8 The DEIS's analysis of the proposed action's likely impacts on the Tribes' reserved harvests is inadequate and in key respects, absent. In place of such an analysis, the *QAR Report*, which assesses the survival and recovery requirements of listed upper-Columbia steelhead and spring chinook salmon, supposedly considers treaty harvests. However, harvest was modeled in the *QAR Report* under the assumption that recent harvest rates would continue into the future. The effect of assuming that treaty harvest rates for spring chinook would remain at the extremely low levels of the past two or more decades is that the adequacy of Alternative 3's project passage and
9 survival goals are overstated. While the DEIS, through the *QAR Report,* recognizes that additional survival gains will be needed, Alternative 3 does not examine the relationship between these additional survival needs and the needs of treaty harvest. The unfolding experiences of the 2001 drought indicate that it may not be prudent to assume that non-project survival would be stable, let alone improve for Upper Columbia listed stocks.

Had the DEIS accounted for the protection and recovery of the Tribes' trust property, the reasonableness and necessity for additional tribal conservation of the listed species would have been carefully analyzed, not assumed. In these circumstances, NMFS's analysis should
10 demonstrate that such conservation could not be achieved by reasonable regulation of non-Indian activities. It is not clear that the alternatives in the DEIS were ranked in their ability to achieve the required conservation purpose. Absent this ranking, an alternative may be selected that discriminates against future Indian harvest necessitating conservation measures the Tribes are not voluntarily willing to accept. Joint Secretarial Order 3206 states that when ESA listed species affect the exercise of tribal rights, the Department and NMFS will cooperate with affected tribes to develop and implement recovery plans in a manner that minimizes the social, cultural and
11 economic impacts on tribal communities, consistent with the timely recovery of listed species. The DEIS acknowledges that Alternative 3's proposed conservation measures were completed without the benefit of such tribal cooperation. Secretarial Order 3206 pledges the Services to working cooperatively with tribes to identify and implement the most effective measures to speed the recovery process. Alternative 3 neither identifies the actions needed to assure a speedy recovery, nor guarantees that such actions would be implemented.

Consequently, Alternative 3 is problematic due to its potential impact on the Tribes' treaty reserved harvests of mid-Columbia fisheries. The listing of ESA salmon populations which spawn
12 upstream from the subject projects currently restricts harvest in treaty fisheries at treaty reserved usual and accustomed fishing sites. This restrictive effect is detailed in the NMFS's 2001

Biological Opinion for spring and summer treaty harvest. *See* NMFS, *Biological Opinion, Impacts of the Interim Management Agreement for Upriver Spring Chinook, Summer Chinook and Sockeye on Salmon and Steelhead Listed Under the ESA* 2001. The DEIS does not quantitatively describe Alternative 3's future effects on harvest. This is especially important in light of the ramifications of underestimating ESA-permitted mortality of listed salmon. The cumulative effects of such underestimation have two predictable consequences -- dangerously low numbers of returning adult salmon and the continued curtailment of tribal fisheries. The hatchery mitigation component of Alternative 3 does not address this situation if present hatchery policies yield an incomplete replacement of wild fish killed by the PUD projects.

Furthermore, the DEIS generally does not consider the range of issues related to NMFS's trust responsibility to ensure the utilization of fishery resources reserved by the Tribes. For example, in
13 Section 3.7 of the DEIS, "Socioeconomics - Population, Employment, and Income," NMFS mentions the tribal population of the region, but fails to account for the impact of mid-Columbia of projects on the Columbia Basin Tribes' fishing economies. While the DEIS notes that in at least one county impacted by the projects "Native Americans constitute an important part of the County economy," there is no general or specific discussion of the projects' economic impacts on the Tribes' commercial and subsistence fishing economies. *See* DEIS at 3-132. Rather, the DEIS merely discusses project benefits to industry, tourism, and agriculture without contrasting these perceived benefits in light of the substantial detrimental impacts on the Tribes' fishing economy for which NMFS is a trustee.

A recent study assessing the economic impacts of the mid-Columbia projects found that tribal harvests on the mid-Columbia have dropped to less than 10 percent of traditional harvests. *See*
14 CH2MHILL, *Human Effects Analysis of the Multi-Species Framework Alternatives* 3-6 (1999) (prepared for the Northwest Power Planning Council). In addition, specifically assessing the broad social impacts on the Tribes, the study notes that such an economic and cultural loss powerfully impacts the material well-being and self-sufficiency of tribal members and negatively affects physical and psychological health. *Id.* at 3-7. Given NMFS's role as a Federal trustee, and considering that Native Americans constitute 11 percent of the population for one of the counties under discussion, it is incumbent on NMFS to weigh the impacts of the proposed action on the tribal fishing economies. Moreover, as the DEIS notes the region's depressed economy, NMFS should also include in its economic discussion the ways in which a profitable and self-sustaining salmon harvest could increase tribal self-sufficiency, alleviate unemployment and poverty, and improve the region's depressed economy. *See* DEIS at 3-130.

In passing, we note that the economic impacts that are not fully discussed in the DEIS have far-reaching consequences not only on the Tribes, but on non-Indians as well. The CH2MHILL
15 study also reported that the non-Indian catch has fallen to less than 1 percent of commercial catches in 1900. *See* CH2MHILL, Human Effects Analysis of the Multi-Species Framework Alternatives 3-6 (1999) (prepared for the Northwest Power Planning Council). The economic benefit of the power projects, as well as their economic detriments, need to be fully displayed in the DEIS.

The 50-Year Term of the Proposed Action is Inappropriate for the Management of Riverine Ecosystems Supporting Trust Resources

16 In light of the Federal government's trust responsibility and the dynamic ecological conditions of the Columbia River, the Department believes it is inappropriate and risky to constrain the Federal government's authority to manage endangered riverine species for the 50-year term of the proposed action. We strongly believe that the proposed action would be greatly improved by matching the term of the HCP with the licensing authority of FERC. Therefore, we recommend that if NMFS decides to issue incidental take permits for these projects, the permits should be for no longer than the term of the existing FERC licenses. Subsequent licenses could include identical provisions of the HCPs, if the HCPs are operating to protect and ensure the continued existence of endangered mid-Columbia trust resources.

17 Under Alternative 3, NMFS would issue incidental take permits that establish the measures through which the species' losses can be mitigated. As proposed, the HCPs would contain the only mitigation measures that NMFS would recommend to be employed for the next 50 years. The practical effect of a NMFS decision to select Alternative 3 is to predetermine the extent of the recovery measures at relicensing and to impose conditions on subsequent licenses many years before the relicensing process. This would seriously undermine the relicensing process and is beyond the scope of FERC's authority to implement.

18 The purpose of relicensing is to evaluate the hydropower project under the environmental conditions occurring at the time of licensing and to determine what changes are necessary to ensure the protection of important public resources into the future. As such, FERC regulations require the licensee to undertake a complete revaluation of their project and the impact on natural resources, water quality, recreation, flood control, navigation, power production, and many other factors. This would occur regardless of whether NMFS issues an HCP. Therefore, at the time of relicensing, there will be a complete reevaluation of the project and a considerable amount information in the administrative record outlining the continuing impact of the project on important fish and wildlife resources, including listed species. It is possible that the information may indicate unacceptable levels of impacts to listed species, or that the mitigation measures are ineffective. If NMFS issues an HCP for 50 years, they may find themselves in the difficult position of recommending mitigation measures that have been shown to be ineffective, counter-productive, or wasteful. The Department strongly believes that perpetuating such mitigation is not in the public interest, particularly when the relicensing process is intended to correct such problems.

19 The proposed action's 50-year time frame is especially problematic in light of the "no surprises" policy set forth in regulations implementing Section 10 of the ESA. The "no surprises" regulations were adopted to provide long-term assurances to landowners by allowing them to avoid additional mitigation measures during the term of an incidental take permit. However, constraining the Federal government's ability to protect listed species in the mid-Columbia River

for the next 50 years is inappropriate for the management of a fragile river habitat, particularly since it exceeds FERC's authority, and the action directly affects habitat that supports important Federal trust resources and treaty reserved fishing rights. Unlike private lands, the Columbia River is a public waterway and its biological health is essential to many stakeholders, including the Tribes of the Columbia River Basin.

The proposed action is especially troubling in light of FERC's responsibilities under section 7 of the ESA. When a listed species is affected by project operations, FERC is required to consult with NMFS (or FWS) pursuant to section 7 before issuing a new license. Such consultation usually results in a biological opinion that specifies the ways in which a project can be operated to avoid jeopardizing listed species. However, if NMFS selects Alternative 3 of the DEIS, NMFS may be unable to require FERC to include mitigation measures that go beyond those provided in Alternative 3. This would occur despite the possibility that substantial information may be in the record indicating significant impacts to listed species are occurring and may continue to occur with any new license issued. Consequently, by committing to the terms of Alternative 3 prior to section 7 consultation with FERC, NMFS effectively precludes the inclusion of additional mitigation measures in a subsequent FERC license, even though there may be substantial information indicating such measures are needed.

20

This is particularly problematic because the Wells' license will not expire until 2012 and Rock Island's current license will not expire until 2028. Thus, even if salmon and steelhead populations dramatically decline over the next several years, because of the projects' incidental take coverage under Alternative 3, NMFS may not be able to recommend additional mitigation measures for unavoidable mortality in any subsequent licenses. The effect of limiting additional mitigation measures is that under poor environmental conditions, there becomes an "over appropriation" of mortality with impacts on trust resources via otherwise avoidable fishery restrictions. Consequently, in contrast to the requirements of Secretarial Order 3206, the proposed action's use of the "no surprises" policy and its effect on FERC licensing may subject tribal use of treaty trust fisheries to long term diminishment depending on climatic conditions or improvements elsewhere in the Columbia Basin.

21

Instead, we suggest that NMFS limit the length of the incidental take permits to the term of each project's existing FERC license. By matching the length of the incidental take permits with limits of the FERC license, NMFS aligns their actions with FERC's authority plus they maintain the ability to revisit the HCPs' at relicensing. As such, NMFS would be able to ensure that, in the unlikely event that these mitigation measures are unsuccessful at protecting listed species as NMFS and the licensees expect, each new license could contain provisions that adequately protect endangered trust resources. Conversely, if the HCP is operating as NMFS and the licensees expect, we would not expect NMFS to recommend any further changes at relicensing. Under these circumstances, the provisions of the HCP could continue through the next licensing period. We believe this would be consistent with the "no surprises" policy.

22

In addition, we suggest that NMFS incorporate some of the provisions of Alternative 2 into its proposed action. Under Alternative 2, the project operators would seek new FERC licenses
23 pursuant to the Federal Power Act and FERC would consult with NMFS pursuant to section 7 of the ESA. It is current FERC policy to routinely insert re-opener clauses into new licenses which allow FERC to reconsider fish and other natural resource issues, if warranted. Thus, under Alternative 2, FERC and NMFS would be able to ensure that the projects would be operated in a way that is responsive to trust fishery needs. This is particularly important in a ecosystem as dynamic as a river basin, where aquatic species populations constantly fluctuate in response to the quality and quantity of water and habitat conditions.

Fish and Wildlife Resources

HCP Performance Standards

As the DEIS notes, both the NMFS and the U.S. Fish and Wildlife Service recommend that biological goals and objectives be incorporated into HCPs. The 95 percent juvenile dam passage
24 survival standard and the 91 percent total project survival standard incorporated into Alternative 3 (the proposed action) are examples of biologically-based standards. The 95 percent standard limits the direct mortality of dam passage while the 91 percent total project standard is intended to limit losses in the total project area, including the dam and reservoirs. We note, however, that actual total project mortality is a combination of direct and delayed adult and juvenile mortality attributable to project effects. Delayed mortality can and does occur outside the project area. Many fish are injured as they pass through the pool above each dam and the tailrace below each dam, but do not die until they are past the project boundary. Subsequently, by limiting the application of the 91 percent total project survival standard to the immediate vicinity of the dams, Alternative 3 fails to account for a potentially significant amount of incidental take. The issue of delayed mortality (project-related mortality occurring outside of the project area) needs to be addressed in greater detail. If necessary, the components of the total project survival standard should be reevaluated to be certain that all forms of project take are fully considered.

The *QAR Report* indicates an improved potential for in reach survival for spring chinook salmon
25 and some increase in the probability of meeting recovery criteria if Alternative 3's survival standards are combined with expected survival improvements at lower Columbia River Federal dams contingent upon environmental conditions observed since 1960. However, the ability of steelhead to meet recovery criteria is more problematic and is dependent on assumptions concerning the effectiveness of hatchery supplementation and whether environmental conditions would be similar to those seen since 1960. Although no one can predict exactly what future conditions might be, using a long term database should more accurately reflect a full range of environmental possibilities.

The QAR modeled a range of different survival (including the survival standards proposed in the HCPs), passage, and environmental conditions that could reasonably be expected to occur in the future. If met, the standards identified in Alternative 3 should offer improvements in long term survival for all plan species as compared to the current situation. Although the *QAR Report* did not model potential survival for species other than steelhead and spring chinook salmon, we expect that survival benefits would also accrue for sockeye, summer/fall chinook and coho as a result of the survival standards and mitigation.

An example of the improvement expected with Alternative 3 compared to Alternatives 1 or 2 would be the benefits accrued for non-listed sub-yearling summer/fall chinook by application of the survival standards during the summer juvenile migration at Rock Island Dam. Spill is the primary juvenile summer passage measure at this project, but the amount and duration of spill is based on the dollar value of the Conservation Account which is a component of Alternatives 1 and 2. As energy prices and demand rise, the spill program provides less fish protection over the summer period. Since summer migrants are not ESA listed species (with the possible exception of bull trout), the Conservation Account is the only passage measure providing assured protection for these fish. The limited protection inherent in the Conservation Account does not apply to Alternative 3. The HCP standards must be met regardless of the yearly cost of energy and are not limited by a predetermined dollar amount. In addition, Alternative 3 provides an increased level of juvenile fish protection because the 95 percent juvenile dam passage survival standard applies over 95 percent of the run. This likely provides more protection than juveniles currently receive via Alternative 1 spill and bypass programs at Rock Island Dam and Rocky Reach Dam for all plan species. It also provides improved passage benefits for summer migrants, not necessarily assured by Alternative 2. The current spill/bypass program at Wells Dam appears to be providing protection over 95 percent of the run for all species.

The Department interprets Alternative 3 as indicating that for all plan species, the HCP standards must be met regardless of the yearly cost of energy or drought. In addition, the projected improvements at the lower Columbia projects must not be impacted by cost or drought. If that is not the case, then the QAR analysis may be inadequate in modeling the future effects of this alternative. The FEIS should clarify this aspect of Alternative 3 and the QAR analysis. In addition, the DEIS should include data on the level of improvements needed to sustain tribal harvests well above recent severely restricted levels. Alternative 3 does not examine the relationship between additional survival needs and the needs of treaty harvests.

Verification of Standards

26 Verifying the biological standards of Alternative 3 would be of critical importance in determining whether this alternative actually meets its stated goal of no net impact (NNI) and contributes to the recovery of anadromous salmonids. Achieving and maintaining these survival standards is the element necessary to allow NNI attainment through hatchery compensation (7%) and tributary habitat improvements (2%).

Unfortunately, direct measurement of total project survival (91% standard) is not technologically feasible at this time. This is acknowledged in the DEIS. Key problems are estimating survival for subyearling summer/fall chinook (the primary fish migrating during the summer period), measuring juvenile sockeye spring migration survival, identifying project related adult survival independent of other non-project related impacts, and measuring cumulative indirect impacts for adults and juveniles. Moreover, Alternative 3 does not even attempt to measure adult mortality. Finally, the effect of delayed mortality on the ability of Alternative 3 to protect trust resources also remains to be clarified. These measurement problems exist for all alternatives, but under
27 Alternative 3, compensation programs may be adjusted up or down based on these survival studies.

The DEIS recognizes these problems but offers only the use of some indirect methods
28 ("representative survival studies") to assess survival and indirect losses. Such representative studies are an unacceptable way to measure the survival of all the species affected by the projects, species that contribute to treaty fisheries. Additionally, these "representative studies" are less likely to assure the broad protections that the DEIS claims because they do not measure all of the affected species at a variety of life stages and flows. Given these uncertainties, Alternative 3 cannot be considered to be protective of treaty trust fisheries unless it includes an established scientific methodology for measuring fish survival.

If the survival standards cannot be fully verified, the size of compensation programs necessary to
29 reach NNI cannot be fully identified. Until the uncertainty surrounding measurement of total project survival is resolved, it may be appropriate to develop an interim measurable standard such as 93 percent juvenile total project survival before moving to Phase 3 and triggering adjustments in hatchery/tributary compensation levels down from the 7 percent and 2 percent levels. Allowing a reduction in compensation without appropriate verification or an approved alternative would not be consistent with the intended goals of Alternative 3.

Adjusting Compensation

The DEIS notes that dam and project juvenile survival has been measured for the Douglas PUD project for steelhead, spring chinook, and fall chinook yearling migrants. These evaluations have
30 occurred over the spring migration season in one or several years, but have not occurred over the range of conditions that are expected to occur from year to year. According to the DEIS, Douglas PUD hopes to adjust its hatchery compensation levels and tributary habitat fund proposed in its HCP utilizing the survival studies that have been done to date. We surmise that Douglas PUD would adjust the hatchery component for steelhead and spring chinook salmon below the 7 percent compensation level based on these spring migration survival studies coupled with other indirect survival measurements. Given that under Alternative 3, total project survival is not based just on juvenile survival, we find it difficult to support reducing hatchery compensation levels below the 7 percent level for a species without a process to address at least some of the other uncertainties. As noted previously, this leaves Alternative 3's goal of NNI without any verifiable method of validation. In addition, we have concerns about reducing the tributary fund

component (2%) without a more systematic approach to defining what actual survival is occurring. Such a reduction of compensation without an agreed upon way of verification is inconsistent with the government's trust obligations to the Columbia Basin Indian Tribes and the goals and objectives of Alternative 3.

31 One means of correcting this inconsistency would be to revise Alternative 3 to preclude a reduction in hatchery compensation and tributary habitat improvement below the 7 percent and 2 percent levels without agreement on the appropriate measurement criteria for these critical uncertainties by the mid-Columbia Coordinating Committee or some similar technical group. It would be essential for tribal issues regarding the proposed action to be overcome and for the Tribes to be active participants in plan implementation. Alternatively, the total project survival standard could be revised to an interim juvenile total project survival standard of 93 percent. Measuring juvenile project survival is something that can be accomplished with current methods and technology. Once a method of measuring adult survival and indirect juvenile mortality is available, the total project survival standard could return to the 91 percent level and compensation levels adjusted as described in Alternative 3. Lastly, we note that Alternative 3 does not clearly indicate that achieving and maintaining the survival standards for one plan species does not mean that the survival standards have been reached for all plan species. Use of yearling chinook and/or steelhead as surrogates for doing survival studies of sockeye and subyearling chinook is not appropriate for these fish which demonstrate different behaviors and life histories. No reductions in compensation levels should occur for any plan species where components of the total project survival standard are unknown. It is hoped that full consideration of these suggested modifications will lead to an acceptance of the HCPs by all parties.

Maintaining 7 Percent Hatchery Compensation

32 ESA issues related to the potential impacts of hatchery supplementation on wild productions have the potential to limit attainment of the 7 percent hatchery compensation level, the goals for the recovery of listed species, and NNI. This is identified in the DEIS as a significant unresolved issue with respect to Alternative 3. This impact also has a direct bearing on the results of the QAR analysis and selection of the most appropriate alternative. For example, if hatchery steelhead are just as effective reproductively as wild fish, then Alternative 3 would not meet conservation criteria under any scenario. Additionally, the constraints imposed by the ESA also limit the potential expansion of hatchery programs to meet compensation requirements and NNI needs. These constraints include the potential short and long term negative genetic, behavioral interaction, and spawning fitness impacts of hatcheries and supplementation on the viability of naturally spawning populations of listed fish. These issues relate to all three alternatives, but most severely effect the potential expansion of hatchery production in Alternative 3 to reach NNI.

The DEIS states that NMFS can not commit to the 7 percent hatchery compensation goal. Because of NMFS concerns that hatchery fish may adversely affect wild fish populations, all fish produced from the hatchery program must come from local stocks. *See* DEIS at 2-43. The DEIS acknowledges that it will be difficult to produce the number of fish needed to ensure 7 percent

compensation from local stocks alone. *Id.* Lastly, the DEIS states that "if the 7 percent hatchery compensation level is not met due to NMFS's ESA concerns, neither the dam passage survival standard, the total project survival standard, nor the habitat compensation standard would be
32 adjusted." DEIS at 2-43. Consequently, reliance on Alternative 3's hatchery programs to compensate for the incidental take of listed species is problematic.

While we recognize that NMFS's concern with hatchery supplementation programs applies to all the alternatives considered in the DEIS, hatchery compensation is a significant factor for Alternative 3 because it is wedded to the attainment of NNI. Erosion of the hatchery compensation provisions of Alternative 3 would prevent NNI from being achieved. More so, given the absence of provisions in Alternative 3 to compensate for take through other means if the hatchery programs fail to produce the number of fish necessary to meet the 7 percent hatchery compensation standard. Furthermore, hatchery compensation is significant in light of the fact that the Columbia Basin Tribes have reserved the right to harvest the affected species. These Tribes have already faced significant restrictions in tribal harvest caused by the status of listed stocks, and a disconnection of the hatchery compensation program from continued losses of wild fish to the projects can only result in additional harvest restrictions.

Columbia River salmon and steelhead constitute important tribal trust property, and the right to fish at usual and accustomed fishing sites on the Columbia River, and to have a meaningful fishery there, is a property right that is protected through treaties with the Federal government. The mid-Columbia's stocks of salmon and steelhead are being depleted at alarming rates, and the ESA has forced the Federal government to seek severe restrictions on the number of fish available for tribal harvest. If the river's stocks continue to decline, the Tribes may face even tighter restrictions. Hatchery production is critical to the on-going harvesting needs of Tribes of the Columbia River Basin. Consequently, it is imperative that the hatchery compensation provisions of the selected alternative assure that there would be mitigation to fully compensate for the treaty fish lost through incidental take.

The effectiveness of hatchery compensation as a tool for achieving NNI might be strengthened by including in the HCPs studies to evaluate the effects of hatchery supplementation on the viability and restoration of self-sustaining, natural populations of salmon and steelhead. This should be done at a selected site or two in the upper Columbia River with an existing or new supplementation effort. We also recommend the Bonneville Power Administration(BPA) as a potential funding source because this issue is common to all supplementation programs, and BPA is funding offsite mitigation measures associated with operation of the Federal Columbia River Power System (FCRPS). Such a study would start answering uncertainties related to genetic interaction and reproductive fitness issues that are a major source of contention. These recommended studies are critical to recovery efforts, full mitigation compensation, and in satisfying the harvest needs of the Tribes.

Tributary Conservation Plan

33 Under Alternative 3, 2 percent of the fish lost through incidental take at each project would be compensated for through tributary habitat restoration. Tributary habitat restoration is a significant component of Alternative 3 because it is wedded to the attainment of NNI. The proposed action, however, does not provide for the monitoring of tributary contributions to ensure that this percentage is met. In addition, it is acknowledged that the 2 percent tributary compensation standard is a negotiated figure. This figure is not based on scientific analysis which predicts that tributary restoration would result in increased tributary compensation. Instead, this
34 figure is based upon the level of funding that the project operators are willing to set aside for tributary habitat restoration. The DEIS assumes that attainment of the 2 percent compensation level is reasonable because the selection of restoration projects would be controlled by a technical committee. If this assumption proves optimistic, there are no provisions in Alternative 3 that allow for this contribution to be increased or for other restoration measures to be implemented. Hence, the reliance on tributary habitat restoration to compensate for the incidental take of listed species and achieve NNI is problematic.

The DEIS acknowledges that there are "difficulties and uncertainties associated with monitoring and quantifying the effects of tributary habitat improvements." DEIS at S-18. The DEIS does
35 not propose a way to overcome these "difficulties and uncertainties" and construct a standard by which the percentage of tributary compensation would be accurately measured. The risk that NNI may not be met if the assumed benefits of habitat restoration are not realized must be fully disclosed. Still, disclosure of this risk is not a substitute for the mitigation of potential impacts on trust resources. At the very least, the FEIS should explain how Alternative 3 meets the criteria for issuance of an incidental take permit in the absence of a viable method for confirming tributary contributions to NNI or, lacking a measurable standard, a clearly specified alternative strategy for achieving this 2 percent compensation level.

We also note that Alternative 3 apparently limits the compensation that may be achieved through
36 habitat restoration by shifting the focus of habitat restoration activities to the tributaries and away from the mainstem river. The DEIS makes numerous references to locations where active mainstem spawning is occurring. While the mid-Columbia projects ultimately limit mainstem habitat productivity, these pockets of mainstem spawning habitat within the project boundaries provide models for increasing spawning and rearing habitat within the mainstem river. Therefore, mainstem habitat restoration should be considered to be within the scope of the this alternative's tributary habitat improvement program. Taking steps to conserve and protect existing mainstem spawning habitat should not be overlooked as a potential means of minimizing the impact of incidental take.

Water Quality and Water Temperature

37 Alternative 3 acknowledges that the Wells, Rocky Reach, and Rock Island Projects negatively impact water quality, and, most particularly, dissolved gas levels. The proposed action fails to

address mitigation of these negative impacts other than to indicate that the PUD's would meet state standards for water quality. Because spill appears to be a needed component for fish bypass at each of these projects, avoiding spill does not appear to be a long-term solution to resolving dissolved gas problems. Consequently, the discussion of alternatives in the DEIS should be expanded to include measures to address meeting water quality standards through the installation of gas abatement structures.

38 Water temperature is also a matter of concern. Water temperatures can be high in the surface waters of reservoirs in the Columbia River and in fish passage facilities. Under Alternatives 1 and 2, measures to improve thermal conditions at each project could be pursued through avenues such as FERC relicensing, Clean Water Act compliance, or ESA section 7 consultation. Alternative 3 proposes a specific set of measures to meet the NNI standard of the HCPs. However, the implementation of structural and operational modifications to improve the water temperatures at these dams does not appear to be specifically included. If an incidental take permit is issued incorporating the proposed terms of Alternative 3, the adoption of other measures to improve thermal conditions may be precluded. The FEIS's discussion of Alternative 3 should be expanded to include plans to monitor water temperature and, if problems are observed, implement structural and operational modifications to improve thermal conditions at these projects.

Bull Trout

39 The DEIS correctly acknowledges that bull trout occur in the mid-Columbia reach where the PUD projects operate and presents information from most available sources. Information on the distribution of bull trout in the mid-Columbia River area is limited. However, additional information may be available to augment the information presented in the DEIS. PUD ladder counts have noted the presence of adult bull trout for many years. The recent listing of bull trout has prompted additional vigilance at these counting stations during in the last two years. The PUDs have also recently initiated a research effort aimed at tracking the movements of bull trout in the Columbia River. Hence, additional recently developed information may be available. Other sources of information include the Washington State Salmonid Stock Inventory for bull trout/dolly varden.[4] With this information in hand, a more complete analysis by NMFS of the effects of permit issuance and HCP implementation on bull trout can and should be incorporated in the FEIS.

40 The effects of hydropower operations on bull trout in the mid-Columbia River are not specifically known, as indicated in the DEIS, but inferences may be suggested by comparing what is known about bull trout behavior and distribution with the effects that have been described for bull trout and other salmonids at other Snake and Columbia River hydropower projects and associated reservoirs (see the December 2000 NMFS and Fish and Wildlife Service biological opinions on the FCRPS operations). These effects include entrainment, turbine-associated mortality and

[4] Washington Department of Fish and Wildlife. 1996. Washington state salmonid stock inventory: bull trout/dolly varden. Draft Report.

injury, passage delays, habitat alteration, stranding, reduced prey base, and associated adverse effects on individuals and discrete populations. The effects of hydropower project operations on adult steelhead may be especially analogous to those affecting adult bull trout, as both species have the potential to migrate downstream as well as upstream (although fluvial bull trout generally survive spawning and return to the mainstem river as a rule, while this may be the exception for steelhead).

40

Except for a brief discussion of the potential effects of project operations and HCP implementation on adult migratory bull trout, no inferences are made in the DEIS regarding potential adverse effects on juvenile bull trout. Nor does the DEIS consider conservation measures to minimize the incidental take of bull trout that could be included in the proposed HCPs or stipulated as conditions in NMFS's section 10(a)(1)(B) incidental take permits. As the lead Federal action agency responsible for the development of the DEIS and the proper implementation of the proposed HCPs, NMFS has the primary responsibility to describe the effects of its proposed actions and to avoid or reduce adverse effects on bull trout.[5] Such information should be included in the FEIS.

Pending the development of any new information, bull trout conservation measures that should be incorporated in the HCPs and reflected in the FEIS to reduce potential adverse effects include, at a minimum, those identified in the December 2000 NMFS and Fish and Wildlife Service biological opinions on the FCRPS operations. In the NMFS biological opinion, those measures identified for steelhead are particularly germane to the conservation of bull trout. Implementation of these measures would partially fulfill section 7(a)(1) requirements of the respective Federal agencies, and enhance timely section 7(a)(2) consultation in the future. They are as follows:

- The PUDs should determine the extent of bull trout use of the middle Columbia River affected by the subject hydropower projects. This would include the river reach from the Chief Joseph Dam downstream to Wanapum Dam reservoir. This effort would include recording the occurrence of bull trout in the smolt monitoring facilities at the middle Columbia River dams and their use of adult ladders.

- The PUDs should include bull trout as a species of concern in their research efforts to determine the upstream and downstream passage requirements of salmonids at middle Columbia River dams. These investigations should address entrainment, both upstream and downstream adult passage, and juvenile passage. Consideration of spill, flow attraction, temperature and other issues affecting passage should be included.

- The PUDs should include observations of bull trout captured in field activities under their funding (e.g., research studies and northern pikeminnow reward program fisheries) and

[5] On page 4-48 and elsewhere, NMFS appears to suggest that consultation under section 7 of the ESA regarding the effects of permit issuance and HCP implementation on bull trout is a matter to be resolved between the Fish and Wildlife Service and the FERC.

report that information annually to the Fish and Wildlife Service.

40

- The PUDs should cooperate in studies to determine the movements of bull trout from tributaries into middle Columbia River reservoirs. Include the Service, Washington Department of Fish and Wildlife, Forest Service, and Native American Tribes, whenever appropriate, in development of research/study plans.

- The PUDs should initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout.

- Depending on the results of monitoring described above, the PUDs should, in consultation with the Fish and Wildlife Service, consider expanding the fish counting periods to include time periods outside the normal upstream migration periods for adult salmon and steelhead. It is important to note that if bull trout are seldom observed, it may mean they seldom use the fish passage facilities or migrate at different times than salmon and steelhead, and does not necessarily mean they seldom use the mainstem river and reservoirs.

- The PUDs should implement an adaptive management approach for designing and implementing actions, including performance standards, relative to bull trout that are similar to those being developed in the HCP for Permit species (salmon and steelhead).

- The PUDs should include consideration of bull trout in any studies addressing downstream movement of steelhead kelts and any subsequent operational or structural modifications aimed at improving the survival of adult salmonids migrating downstream through the dams.

- The Fish and Wildlife Service recommends that the PUDs participate in implementation (when completed) of the bull trout recovery plan.

Section 7 consultation requirements regarding the effects of implementing the proposed HCPs on listed species may be addressed by NMFS through several pathways: 1) internal ESA section 7 consultation analyzing the effects of issuing section 10(a)(1)(b) incidental take permits on listed salmon and steelhead; 2) external consultation with the Fish and Wildlife Service analyzing the effects of NMFS issuing section 10(a)(1)(b) incidental take permits on listed bull trout and other species not under NMFS's authority; and/or 3) concurrent section 7 consultation by both NMFS and the Fish and Wildlife Service with FERC analyzing the effects of amending existing licenses to implement the provisions of the proposed HCPs. The latter would be technically feasible if implementation of the HCP coincides with issuance of the required license amendments. Of these three pathways, the Fish and Wildlife Service views concurrent section 7 consultation with FERC as the approach most likely to assure the development of new information and expedite the consultation process. Consideration of all affected species in the planning process (e.g.,

finalization of the HCPs, FEIS, and FERC license applications) would effectively streamline the various potential elements of future consultation processes. The Fish and Wildlife Service will work with NMFS, the PUDs, and FERC to further identify bull trout biological information, potential effects related to hydroelectric project operations, and mechanisms to reduce or eliminate any potential adverse effects for inclusion in the FEIS and HCPs.

SPECIFIC COMMENTS

41 S.5.3.8, page S-22. Tributary Conservation Plan. It is our understanding that the Douglas PUD Tributary Program contribution could be reduced if total project survival is greater than 95 percent, not 95 percent dam passage survival as listed.

42 1.6.3, page 1-15. Alternative 3. Another unresolved matter in the HCP is the status of parties such as an agency or Tribe not signing the HCP. How would FERC deal with their Federal Power Act and other authorities concerning these projects if they remain outside of the agreement?

43 2.6.3.3, p.2-53. Alternative 3. According to this section, each of the signatories to the HCP agreement agrees not to institute any action under ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, or the Pacific Northwest Electric Power Planning Conservation Act. This statement should be altered to state that these restrictions pertain to plan species at these projects only.

44 3.2.8.1, p.3-50. Bull Trout. This section indicates that bull trout are only occasionally observed in adult and juvenile passage facilities of the mid-Columbia River Dams. More recent information provided by Douglas PUD and Chelan PUD indicates yearly observations of adult bull trout seen passing through fish ladders at Wells Dam and Rocky Reach Dam. This information should be included.

45 3.2.9.3, p. 3-63. Steelhead. This section should utilize more recent information generated by radio telemetry studies to describe migration patterns in the mainstem and tributaries. This information is available in the draft report, Assessment of Adult Steelhead Migration through the Mid-Columbia River using Radio-Telemetry Techniques, 1999-2000 by Karl English, Cezary Slinwinski, Bryan Nass and John R. Stevenson.

46 4.2.1.3, p. 4-10. Action Analysis. It is not clear in this discussion how having or not having the Grant PUD projects under the HCP standards or under situations similar to Alternatives 1 and 2 effect the outcome of the QAR analysis and the potential success of HCP measures in meeting recovery for the listed plan species. This needs to be clearly addressed.

47 4.2.1.10, p 4-15. Methow River Steelhead. If the assumptions (p.4-11) concerning low hatchery fish contribution to natural production are not valid, then steelhead would not likely meet recovery criteria under the HCP. Studies to evaluate the success of hatchery fish in natural

production are absolutely critical to determining if the HCP measures for this species would lead to recovery. These studies must be done as part of this HCP to determine the appropriate level of hatchery compensation for long term recovery.

Additional Data Needs

48 The 2001 water year is proving to be an extraordinary year. The Department believes that the FEIS should fully consider emerging scientific information and data that will result from the analysis of the 2001 juvenile outmigration season. The importance of fully utilizing the most recent data cannot be overemphasized, and is particularly significant when tribal trust property is at stake. See Seminole Nation v. United States, 316 U.S. 286, 296-97 (1942) (describes the exacting standards that must be followed by the United States in its trustee capacity). Pursuant to the ESA, an incidental take permit applicant is required to establish that the incidental take will not "appreciably reduce the likelihood of the survival and recovery of" the plan species. 16 U.S.C. § 1539(a)(2)(B)(iv). The results of this year's outmigration may alter some of the basic assumptions underlying the HCPs. Consideration of this year's extraordinary circumstances is consistent with NMFS's obligation to base its decisions on the best available scientific information. This information includes the effects of natural climatic variations such as drought, and the resultant increased juvenile mortality that is acknowledged to be an outcome of the current FCRPS emergency operations plan.

49 The presence and operation of the projects create many difficulties for adult salmon and steelhead that return upstream to spawn. For example, adult telemetry studies indicate that adult fish experience significant delays in the tailraces of the dams and in the trifurcation pool areas of the fishways. *See* Stuehrenberg, et al., *Migrational Characteristics of Adult Spring, Summer and Fall Chinook Salmon Passing Through Reservoirs and Dams of the Mid-Columbia River* (1994). These delays can cause adult fish to deplete their energy reserves and may lead to increased adult mortality. In addition, the process of traveling through the reservoirs and the fishways may cause increased stress to adult fish. Given these kinds of impacts and the uncertainties related to the measurement of delayed adult mortality and total project survival, the Department believes the HCPs should be modified to include specific actions to minimize delay and adult mortality at the dams and fishways. This could increase the likelihood of achieving the 91 percent total project survival standard. Improving passage conditions for adults is consistent with incidental take permit criteria that require applicant's to minimize and mitigate the impacts of incidental take to the maximum extent practicable. This issue should be addressed in the FEIS.

SUMMARY COMMENTS

The Department concurs with the DEIS's findings that certain portions of some of the alternatives considered are or may be inconsistent with the requirements of section 10 of the Endangered Species Act or current science and technology. Clearly, these inconsistencies require clarification and include issues related to HCP performance standards, verification of standards, adjusting and

maintaining hatchery compensation levels, and future consultation with the U.S. Fish and Wildlife Service regarding the effects of permit issuance and HCP implementation on bull trout. In addition, the Department is concerned that the DEIS does not adequately address the effects of the proposed action on Indian reserved rights and resources that are subject to the Federal trust responsibility. We are especially concerned that by implementing HCPs as presently proposed, the NMFS would transfer the Federal government's obligation as trustee for the Tribes fisheries to non-federal, commercial entities. We recommend that NMFS renew its efforts with the PUDs to address these issues and attain the support of the Tribes regarding implementation of the HCPs.

We appreciate the opportunity to comment on this draft environmental impact statement for the Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, Washington. If you have questions or require clarification regarding any of the fish and wildlife comments contained herein, please contact Mark Miller, Project Leader, U.S. Fish and Wildlife Service, Eastern Washington Ecological Services Office, 32 C Street NW, P.O. Box 848, Ephrata, Washington 98823 (509-754-8580). Questions or clarifications for the Bureau of Indian Affairs should be directed to Stan Speaks, Regional Director, U.S. Bureau of Indian Affairs, Northwest Regional Office, 911 NE 11th Avenue, Portland, Oregon 97232-4169 (503-231-6702). If you have any other questions please contact me at (503) 231-6157.

Sincerely,

Preston A. Sleeger
Regional Environmental Officer

U.S. Department of Interior (USDOI)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	37	31	57
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4	37	34	12, 30
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[1] see Appendix C

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
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Seattle, Washington 98101

RECEIVED
MAY 14 2001

Reply To
Attn Of: ECO-088

MAY 11 2001

01-001-NOA

Bob Dach
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, OR 87232-2737

Dear Mr. Dach:

We have reviewed the draft Environmental Impact Statement (EIS) for the proposed *Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (CEQ #000464) in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and §309 of the Clean Air Act. The draft EIS evaluates the decision to authorize incidental take permits for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs) to protect five species of Columbia River steelhead and salmon, two of which are currently listed as endangered under the Endangered Species Act.

We have rated the EIS, EO-2 (Environmental Objections- Insufficient Information). We base our environmental objections to the project on the selection of Alternative 3 as the preferred alternative. Our objections are primarily based on the lack of information and the lack of proposed measures that demonstrate that fish species of concern would be protected under the framework provided by the HCPs as described in the EIS. Specific sources of our objections are

- the failure to include listed Columbia River bull trout in the HCP;
- the lack of key biological information in the EIS that is presently slated for later development in the biological opinion;
- the lack of information on water quality impacts, namely total dissolved gas and temperature from the existence and operation of the three PUD dams;
- yet undeveloped or agreed upon methods of measuring compliance with standards established in the HCP; and
- an explicit statement that future interpretations of information will not favor protecting fish over other interests.

This rating and a summary of our comments will be published in the *Federal Register*. A copy of the rating system used in conducting our review is enclosed for your reference. Thank you for the opportunity to review this draft EIS. If you would like to discuss these issues, please contact Chris Gebhardt at (206) 553-0253.

Sincerely,

Judith Leckrone Lee, Manager
Geographic Implementation Unit

EPA Detailed Comments on the EIS
for the Proposed Anadromous Fish Agreements and Habitat Conservation Plans
for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

General Comments

The Environmental Protection Agency has environmental objections to adopting the preferred alternative (Alternative 3) which uses anadromous fish agreements and habitat conservation plans (HCPs) to address Endangered Species Act (ESA) concerns associated with the Wells, Rocky Reach, and Rock Island dams in the Mid-Columbia Rivers for the next 50 years. The primary reason for our objections is that information and proposed measures do not demonstrate that fish species of concern would be protected under the framework provided by the HCPs as described in the EIS. We are also concerned that the HCP does not include Columbia River bull trout and that the EIS lacks information on water quality impacts, namely that of total dissolved gas and temperature, caused by the operation of the dams.

HCP Framework and EIS Do Not Demonstrate Sufficient Protection of Salmon and Steelhead

Alternative 3 proposes using anadromous fish agreements and HCPs in lieu of adopting the no-action alternative and complying with ESA through Section 7(a)(2). ESA calls for the protection and restoration of listed species, however, the HCP, as it is currently written, does not provide assurances that populations of salmon and steelhead would be protected and restored in the mid-Columbia River for 50 years. The HCP is based on an adaptive management framework which accepts less front-end planning, greater gaps in understanding, and fewer commitments to do specific actions to protect and restore fish. This, in turn, exposes the listed fish species to more risk because the requirements to protect and restore fish, and to measure their status become subject to future interpretation.

The HCP proposal found in the EIS is additionally problematic because

- key biological information on salmon and steelhead is not in the EIS (instead it is slated for inclusion in the Biological Opinion (BiOp));
- another listed species, Columbia River bull trout, are not included in the HCP;
- technology to monitor compliance does not presently exist; and
- the EIS states that issues that arise (and with adaptive management, there are bound to be many) will not necessarily be resolved so that fish protection is favored over other interests.

In short, the EIS presents a HCP framework to protect listed species which we found to contain significant gaps, thus reducing assurances that fish will be protected with HCP implementation.

US EPA

1 Although it contains good information, the EIS is also not arranged in a manner that helps the reader understand the overall risks posed to salmon and steelhead throughout their life stages, the specific risks posed to the fish by the dams, the extent of those risks, ways to monitor those

risks, and ways to mitigate those risks. The EIS should clearly explain and illustrate the risks posed to salmon and steelhead in the mid-Columbia River. This discussion should begin broadly with a discussion of the life cycle of the different fish species, maps showing the range of their migrations, and a comprehensive list of sources of injury and mortality (ocean harvesting, natural predation, etc.). This would provide a context by which the reader could view the level of fish injury and mortality occurring in the mid-Columbia River dam complex.

2 The EIS should then contain photographs and diagrams of each dam facility with annotations showing migratory routes, the number of fish using each route, and sources of fish injury and mortality. Supplemental information should state the number or percentage of juvenile and adult fish that use individual migration routes, and the level of fish injury and mortality at specific locations in each dam, for each dam complex, and the overall injury and mortality rate for juveniles and adults that pass all three dams.

3 To better address the risks posed by the dam complex to salmon and steelhead, the HCP should include monitoring that continually assesses the level of salmon injury and mortality salmon as they are passing through the dams and mitigation measures that reduce those levels. Specifically, the EIS should:

- explicitly identify an available monitoring method that could be used to measure compliance and commit to using that method in the Record of Decision (ROD), and
- propose concrete actions that analyses demonstrates is sufficient to protect fish in lieu of basing success solely on fish protection standards.

4 The EIS should also contain biologic information that is planned to be issued in the BiOp so that the public and decisionmaker can review and comment on this key information. 40 CFR 1502.25(a) states that agencies shall prepare draft EISs concurrently with and integrated with environmental impact analyses required by the Endangered Species Act.

Compensating for Fish Loss

5 The EIS proposes to mitigate 7 percent of the 9 percent of salmon and steelhead losses due to dam existence and operation using hatchery supplementation and the remaining 2 percent by improving habitat in tributary reaches. We strongly believe that favoring habitat improvement over hatchery supplementation is a more sustainable practice that benefits other amenities (such as water quality) in addition to fish. At the same time, we understand that treaties entitle tribes to a harvest level of fish and that the only way of guaranteeing this harvest level in the short term (until habitat improvement activities result in increase numbers of fish) is through hatchery supplementation. The EIS should therefore propose to implement the majority of the habitat improvement projects soon after project adoption to maximize the benefits of habitat improvements as quickly as possible. The EIS should prioritize these reaches proposed for improvement and indicate the order by which those listed in the EIS should be restored. The EIS should predict the when and to what extent habitat improvement would result in additional fish numbers and prescribe a commensurate reduction in hatchery supplementation. Finally, the EIS should state the method used to translate 2 percent compensation into the type and level of habitat improvement.

Water Quality

The draft EIS has a good discussion of water quality in the mid-Columbia River, especially highlighting the effects of warm water and high total dissolved gas concentrations on juvenile and adult salmon. However, the EIS downplays the importance of the three dams on the
6 water temperature regime of the river and its potential effects on salmon. The conclusions on temperature have not been substantiated and we are concerned that the EIS underestimates the effects of the three dams on temperature and current in the reservoirs and therefore, the degree to which the dams "result in the destruction or adverse modification of critical habitat" of the plan species.

The DEIS states that the thermal regime of the mid-Columbia is controlled largely by water released at Grand Coulee and the three subject dams do not significantly affect water temperature because of the short water retention times in the reservoirs of each dam. These
7 statements are unsubstantiated. There is no information on travel time in the river without dams or in the reservoirs with dams. There is no temperature data provided that could be used to verify the statements. The EIS says the travel time through each reservoir is a few days. There are three reservoirs in the study and two more downstream, so a few days in each reservoir adds up.

In addition to increasing temperature or causing shifts in the temperature regime so that warm temperatures last longer into the late summer and fall, dams can reduce the diurnal fluctuation of temperature and dampen the cooling effects of short term weather fluctuations. Currently, temperature at all three dams exceeds 18 C at times. At temperatures over 19 C any decreases in temperature can be beneficial, so diurnal fluctuations and short term weather fluctuations might play a role in salmon migrations through these reaches. Further, by slowing down the river flow, dams can cause out-migrating juvenile salmon to be subjected to warm temperatures longer, cause them to expend more energy to migrate, and subject them to increased
8 predation and disease. We believe that these changes in the reservoirs could represent "destruction or adverse modification of critical habitat" by the dams and should be more thoroughly evaluated in the EIS so that actions to remedy the situation or off-site mitigation can be planned.

The EIS suggests that little can be done to offset elevated temperatures because Grand Coulee is not equipped to release cooler water from deep in the reservoir. There are some possible steps that can be taken both to remedy the effects directly and to provide off site mitigation that should be investigated in the EIS. Water to run Grand Coulee's turbines is from deep in the reservoir and is cool. Grand Coulee is rarely operated at its capacity. During the short critical period in the summer when temperatures are at critical levels, generation could be diverted to Grand Coulee to release as much cool water through its turbines as possible. This was done in 1961 to cool the Hanford Reach and resulted in temperatures up to 9 F cooler in that reach which is quite a distance downstream from the subject reach. This may require spill from the dams downstream of Grand Coulee, and if so, the trade off between cooler temperatures and increased gas would have to be evaluated.

An offsite measure that might mitigate the effects of the dams on critical habitat would be to augment or create cold water refugia primarily in tributaries (where they are already planned).

For example, creating shade at the mouths of some tributaries could augment the temperature benefits naturally obtained from cool water from ground water wells entering those tributaries.

Detailed Comments

9 Abstract. The EIS proposes 50 year anadromous fish agreements and habitat conservation plans. The EIS should explain the basis of the decision to select a 50 year time frame. The EIS should state whether other time frames would work equally well and whether the HCP is protective enough to ensure fish protection for the next 50 years.

10 Abstract and 1-3. The EIS states that the agreements would provide the PUDs with some degree of certainty for the long term operation of these projects. Please define "some degree of certainty" and explain what elements of the agreements and HCP are subject to future negotiations and which are not. Does the flexibility contained in the agreements and HCP compromise the stable operating environment that the PUDs are seeking or the long term protection of the five species of salmon and steelhead?

11 S-1. The EIS states that "fish protection measures of the HCPs are also intended to satisfy the PUD's obligations under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 Regulatory Code of Washington (RCW)." The EIS should also state that HCPs also intend to satisfy the Clean Water Act and State of Washington Water Quality Standards by operating dams in a manner that complies with total dissolved gas and temperature criteria which is also consistent with fish protection. The EIS should also state that the fish protection measures of the HCP are consistent with the Innovative Columbia River Basin Strategy (i.e., All-H Paper Strategy).

12 S-2. The EIS states that the purpose of the HCP is to "support a comprehensive strategy for protecting and recovering five Plan species of anadromous salmonids in the Mid-Columbia River, two of which are currently listed as endangered under the Endangered Species Act." The EIS contains a lot of good information on the fish species of concern, however, the EIS should comprehensively discuss the life cycle of the five species and the sources of mortality and injury during their life cycles. This information should be used to determine how to best protect and recover the species. Such a strategy might include increasing restoration and habitat improvement activities in tributaries or limiting the harvest of salmon on the Columbia River or in the oceans. This information could be elaborated on page S-11 after the statement that, "in addition to improved survival through the middle and lower Columbia River projects, and during early life states of the fish, improved environmental/climate conditions are necessary for the listed species to survive and recover."

13 S-6. The EIS states that the mid-Columbia River dams will continue to be operated to control total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent saturation. The EIS should explicitly state that the 120 percent saturation criteria is a special exemption that applies only when dams are spilling water to aid in fish passage and that the criteria at all other times is 110 percent.

14 S-6. At several places in the document, the EIS states that turbines will be operated at peak efficiency ratings, to the extent possible to protect juveniles. We recommend that the EIS define "efficiency" as it is used in the EIS. Does this mean that the turbines will be operated to maximize power production? In addition, the EIS should explain the connection between operating turbines efficiently and protecting juveniles.

15 S-11, Last paragraph. "Drawdown to minimum operating pool....has not been shown to increase juvenile survival.....Therefore it was not evaluated in this EIS." Has drawdown been tried or evaluated through some kind of modeling exercise? It hasn't been shown to increase survival but has it been shown that it doesn't increase survival? Or is the effect of drawdown an unknown?

16 S-16. The EIS states that prior activities are not considered an action subject to additional mitigation beyond license requirements unless they are considered to cause a continuing "take" of a listed species as defined under the Endangered Species Act. The EIS should clarify what is meant by this statement and use examples.

17 S-17, S.5.3.5, bullet 1. Does the 91% project survival include mortality of juveniles in the reservoir?

18 S-17. The HCP proposes to compensate the 9 percent loss of fish species by providing 7 percent compensation through fishery supplementation and 2 percent compensation through tributary habitat improvement programs. We are concerned that the proposed strategy heavily relies on the non-sustainable practice of habitat supplementation which additionally results in genetic erosion of native fish stocks (see page 2-47 of the EIS). The EIS should propose implementing the majority of habitat improvement projects soon after project implementation so that benefits to fish occur as quickly as possible. In addition, we recommend that the EIS predict when and to what extent habitat improvements result in increased fish numbers and propose a commensurate decrease in hatchery supplementation at that time. The EIS should also identify the method used to quantify the level of habitat improvement needed to provide 2 percent compensation.

19 S-18. The EIS states that the PUDs would use "best efforts" to evaluate, improve, maintain, and operate adult and juvenile fish passage systems to the meet the performance standards. We recommend that the EIS define "best efforts" to ensure that there is clear understanding about the PUDs commitments in the context of this HCP and to ensure that they are sufficient to effectively protect fish species.

20 S-18. The EIS describes HCP phases. We are concerned that the HCP relies extensively on an adaptive management strategy without having the benefit of a completed risk assessment which would evaluate the likelihood of meeting HCP performance standards.

21 S-21. The EIS proposes to create a tributary conservation plan which prescribes activities that would decrease bank erosion, sedimentation, channel scouring, and water quality problems. Restoration activities for the HCP should be matched up with water bodies identified as impaired under Section 303(d) of the Clean Water Act, and should be coordinated with TMDL development and implementation.

22 S-22, first paragraph second column. Will a tribal representative be asked to sit on the tributary committee?

23 S-23 and 1-12. The EIS states that bull trout are a threatened species in the Columbia River Basin and that they also occur in the project area, however, the extent of their occurrence and the project-related impacts are unknown. We are very concerned about the HCP's ability to provide sufficient protection to bull trout when there is a lack of knowledge about the presence of bull trout in the project area and the potential impacts of the project. We strongly recommend that NMFS invite the U.S. Fish and Wildlife Service to become a cooperating agency in the development of the EIS to facilitate adding bull trout as a fish species protected under the HCP. Protecting bull trout in the context of the HCP would likely need to begin with designating critical habitat for bull trout in the Columbia River and the development of ESA Section 4(d) recommendations. The EIS should also state whether dolly varden also occur in the project area, and whether protection would be extended to this fish species, because of the inability to tell this fish species and bull trout apart.

24 Table S-23. Under Water Quality, Project Area TDG, Alt 3: The PUD's agree to take measures to maintain Total Dissolved Gas levels at or below legal maximum levels. Is that referring to the 110% standard or the 120% waiver?

25 S-24. The EIS states that the PUDs would, to the maximum extent practicable, minimize and mitigate the impacts of takings. Please define and give examples of the "maximum extent practicable."

26 S-24. The EIS states that available technology is not sufficient to adequately conduct all of the evaluations proposed in the HCPs for each of the Plan species and there is currently no methodology that all parties support for determining the survival of adult fish through the projects. We object to the concept of employing an adaptive management strategy when technology is not available to evaluate whether the PUDs are successfully meeting HCP performance standards. Monitoring and evaluation are the key to ensuring that an adaptive management strategy is meeting performance standards. We recommend that the EIS characterize the importance of evaluation tools that are not currently developed in the context of this EIS. If these tools are sufficiently important, the EIS should propose using alternative methods of evaluation or, at a minimum, should demonstrate that these tools could be developed in a timely manner.

27 S-27. We recommend that the monitoring section include implementation monitoring, which would ensure that mitigation measures are in place and working.

28 S-33. The EIS states that there is no requirement to provide the benefit of the doubt to the species of concern with respect to gaps in the information base and NMFS has no authority to determine what constitutes the best available information to be utilized in support of any decisions. We believe that the framework proposed in the HCP does not provide sufficient protection to fish species of concern primarily due to an adaptive management approach coupled with methods of evaluation which have yet to be approved or developed. We believe that the loose framework of the HCP will require clarification and information in the future and that the

statement above about information precludes NMFS from providing adequate protection to fish species. We therefore, strongly recommend that the framework be tightened and the level of information in the EIS be bolstered to limit information gaps that would require clarification in the future.

29 S-35. We strongly recommend that all analyses planned for inclusion in the biological opinion be included in the EIS. Many of the analyses that we believe necessary to include in the EIS for adequate information disclosure and to ensure protection of fish species are listed as studies to be described in the biological opinion. The purpose and need of this proposed action is to protect and restore Columbia River salmon and steelhead species to comply with ESA and issues related to biological parameters should be discussed in the EIS. This information should have been presented in the draft EIS to be consistent with NEPA which requires that Federal agencies shall "to the fullest extent possible...prepare draft environmental impact statements concurrently and integrated with environmental impact analyses and related surveys and studies requested by Endangered Species Act (40 CFR 1502.25(a))."

30 S-36. Table S-3 states that if reservoir drawdown occurs, erosion and reservoir turbidity would initially increase over the short term and damage aquatic habitat conditions with the greatest damage occurring the first 4 to 7 years. The EIS should identify ways to mitigate these impacts if any exist.

31 S-38. Table S-3 states that although maximizing survival at each of the PUD dams will increase the return rates of spring-run chinook salmon and steelhead, populations will continue to decline without reductions in non-hydro system related impacts, although at a slower rate than Alternative 1. We strongly agree with this statement and therefore strongly recommend that the EIS describe the life cycles of the fish species of concerns and the souces of mortality and injury during different stages. We believe this information is critical to determine how to best protect and restore the species.

32 1-3. We were pleased to read that the purpose of the HCP is to protect fish in the Mid-Columbia River and not to merely satisfy ESA requirements. We, however, recommend that the EIS contain an objective that is less prescriptive than generating electricity, such as helping to provide electricity to meet local electricity needs. This broader purpose and need statement would allow options such as conservation if additional fish protection is needed and would also give priority to power production that served the needs of local people over that for exportation. The EIS should also discuss tensions that exist when operating the dams for power production versus fish protection and existing legal and policy requirements for fish protection and electricity production.

33 1-17. The EIS identifies activities significantly impacting salmon including hydroelectric and irrigation projects; commercial and sport fishing; logging; mining; livestock grazing; water use by farms, cities, and towns; and municipal and industrial pollution. We recommend that the cumulative effects section in the EIS describe in quantitative terms the extent that these activities impacts the fish species of concern. This will better allow the reader and decision-maker to understand how to protect and restore salmon and steelhead in the Mid-Columbia River.

34 1-17 and 2-7. The EIS contains a germane discussion of the power aspects of this project. It states that the Northwest Power Planning Council projects an energy deficit of 25 million megawatts by 2003. We recommend that the EIS state whether this is a net deficit, or in other words, does the Northwest produce 25 million megawatts less than they use or is the deficit partly attributable to exporting electricity. We believe that this is an important point in the context of the scope of the project (the Mid-Columbia River dams) and a statement in the following paragraph that these dams were developed primarily to serve customers in nearby areas and the statement on page 2-7 that the three dams produce 14 billion kilowatt-hours or 6 percent of the hydropower in the U.S.

35 1-18 and 1-32. The EIS identifies two additional Mid-Columbia River PUD dams, Priest Rapids and Wanapum, that are not covered in the scope of this EIS. The EIS should explain why these two facilities were not included as part of the EIS (i.e., why Grant County withdrew from the HCP development process) and should characterize how their absence from the HCP affects fish protection and restoration.

36 1-27. In the section describing EPA's responsibilities, the EIS should identify our Clean Air Act Section 309 responsibility to review the significant federal action described in this EIS.

37 1-31. The EIS correctly states that NMFS must identify critical habitat for listed species. The EIS should also state that U.S. Fish and Wildlife Service must identify critical habitat for Columbia River bull trout.

38 1-31. The EIS states that the biological opinion will determine whether the species can be expected to survive with an adequate potential for recovery under the proposed action. Again, we believe that this is critical information for inclusion in the EIS and that the EIS should state what the predicted potential for recovery is for all alternatives. This would better allow the public and decision-maker to understand this key issue and to allow the decision-maker to make the appropriate decision.

39 1-31. The EIS states that the biological opinion will identify reasonable alternatives to the proposed action if it is likely to jeopardize listed species. Because the biological opinion was not developed concurrent with the development of the draft EIS as required by NEPA (40CFR1500.2(c)), any reasonable alternatives identified would require a supplemental EIS to describe the new alternatives and the environmental consequences of adopting them. We recommend that NMFS develop the biological opinion prior to issuing the final EIS and include information and analyses developed for the biological opinion in the EIS. Finally, NMFS should issue a supplemental or revised EIS to fulfill NEPA requirements for all newly developed alternatives.

40 1-32. The EIS states that the original ecosystem based management approach was abandoned as overly ambitious in favor of HCPs that focus specifically on the five Plan species. The EIS should present this in chapter 2 as an alternative considered but eliminated from detailed evaluation. The EIS should describe in more detail why the ecosystem approach was abandoned? Was it economically or technically infeasible? Were there time restraints?

41 2-2. The EIS states that reasonable and prudent measures or alternatives and the terms and conditions of the biological opinion would remain in effect as long as new information did not indicate that the species' continued existence was in jeopardy. We are concerned that the HCP relies on new information for ensuring the protection of fish species of concern when the EIS indicates that evaluation methods are not universally accepted or are not technically feasible. We are also concerned that this criteria ignores the ESA requirement to restore listed species. We recommend that the appropriate evaluation techniques be developed for the HCP and identified in the EIS and that the above statement be changed to read that reasonable and prudent measures or alternatives and the terms and conditions of the biological opinion would remain in effect as long as new information did not indicate that the species continued existence was in jeopardy or was failing to recover.

42 2-4. The generic dam diagram helps the reader identify components and understand how a dam operates. To improve the document more, however, we recommend that the EIS include a number of diagrams and photos illustrating the existing and proposed layouts for each dams including mitigation measures, monitoring stations, etc. In other words, the EIS should contain diagrams that illustrate the information listed in table 2-3 for each dam.

43 2-8 and other pages. The EIS does a good job identifying locations where fish could become injured or die when passing through the three dams. We recommend that the EIS include diagrams for each mid-Columbia dam that shows passages, the number of fish that use each passage, and injury and mortality rates at each obstacle. We believe that our recommendation is consistent with a statement on page 2-9 that the proportion of fish passing through spillways and bypasses is essential information for estimating the overall survival of juvenile salmon and steelhead passing a project and a statement on page 2-12 that fish bypass systems are fairly complex systems that can include turbine intake screens, gatewell orifices, etc. These features vary by project, and all of them affect the survival rate of juvenile salmon and steelhead.

44 2-18. The EIS states that current natural anadromous salmonid spawning in the mainstem Mid-Columbia River is limited primarily to the Hanford reach and major tributaries. The EIS should contain an estimate of how much spawning area is lost due to the dams and, if necessary, how compensatory spawning areas could be created or enhanced.

45 2-22. The EIS discusses salmon predators and predator control programs. The EIS should estimate injury and mortality rates caused by predators and the effectiveness of predator control programs to reduce predation.

46 3-28. The EIS describes lower population numbers for the species of concern during the 1990s. The EIS should explain recent population declines in the last decades despite increased attention and effort being given to saving salmon and steelhead species.

47 3-37. The EIS identifies information gaps here and on pages 3-58 and 3-67 among others. The EIS should contain a table listing research needs. The table should also include a schedule indicating when studies need to be conducted or an indication of high and low priority projects.

48 3-37 and 3-47. The EIS states that it is not possible to differentiate between natural and

hydrosystem caused mortality at this time. We believe that this is a key question that demands research attention. The EIS should define sources of hydrosystem and natural mortality to better formulate the parameters of the question. For example, are factors attributed to dams, such as increased predation and habitat loss, considered natural or hydrosystem sources of mortality.

49 3-50. The EIS states that the effect of the projects on isolating populations and on the genetic fitness of bull trout is unknown. We recommend that NMFS consult with U.S. Fish and Wildlife Service about the proposed actions and their impacts to bull trout. The consultation process should help fill information gaps about bull trout in the project area and the impacts of the dams and their operation on bull trout. The EIS should contain this information. We believe that the best way to ensure the protection and restoration of Mid-Columbia bull trout is to include them as a species of concern in the HCP.

50 3-52. The EIS states that reservoir releases are typically cooler in the spring and summer and warmer in the fall and winter. The EIS should also state that dams releases have fewer temperature fluctuations with cool moments for salmon and steelhead to take refuge in during hot periods.

51 3-55. The EIS describes sediment deposition. The EIS should state whether sediment deposition behind the Mid-Columbia dams would require dredging, and if so, the frequency of the dredging and the impacts of the dredging to fish species of concern.

3-81. We found the key terms and definitions to be a useful addition for readers who are not familiar with terms associated with water resources.

52 3-87. The EIS states that Washington Department of Ecology is not permitting new water rights to withdraw water from several of the Mid-Columbia River tributaries to address dewatering. The EIS should describe the effectiveness of this mitigation measure and the extent that dewatering still affects fish species of concern.

53 3-89. The statement that the "Entiat River flows between the Entiat River and Chelan mountains" is confusing. Please clarify or rewrite the description.

54 3-95, Last paragraph, first column: "Total dissolved gas supersaturation is the foremost water quality concern in the mid-Columbia River." This statement has not been substantiated. We do not believe that the temperature impacts from these dams and from increasing the length of exposure of juveniles to these temperatures have been adequately evaluated. TDG waivers from water quality standards are granted because it is believed that the risks posed by gas at levels up to 120% are outweighed by the benefits of moving fish downstream. There are no benefits that outweigh the effects of subjecting fish to elevated temperatures with the concurrent hazards of predation for longer periods of time.

55 3-97, fourth paragraph, first column. "The very rapid flushing rates.....Water temperatures do not appear to be significantly warmed through the mid-Columbia projects." Neither the flushing rates nor the temperature statements are substantiated with data or analysis. These statements are very important and should be substantiated.

United States Environmental Protection Agency (USEPA)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	6	29	5
2	67	30	3
3	18	31	6
4	5	32	51
5	12, 28	33	100
6	1	34	65
7	1	35	55
8	1	36	66
9	49	37	12, 48, 84
10	71	38	5
11	23	39	5
12	6	40	34
13	2	41	5, 56
14	36	42	67
15	26	43	67
16	25	44	33
17	27	45	88
18	12, 28	46	35
19	72	47	68
20	64	48	36
21	13	49	48
22	14	50	69
23	48	51	79
24	2	52	70
25	73	53	99
26	18	54	1, 2
27	18	55	1
28	21		

[1] see Appendix C

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
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March 26, 2001

Mr. Robert Dach
U.S. Department of Commerce
National Oceanic & Atmospheric Admin.
National Marine Fisheries Service
525 NE Oregon Street, Suite 420
Portland, OR 87232-2737

Dear Mr. Dach:

WDOE

1 Thank you for the opportunity to comment on the draft environmental impact statement (EIS) for the Habitat Conservation Plan for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. As the state agency responsible for protecting the waters of Washington State for fish habitat and other uses, we support your ongoing efforts to find improved methods for fish. As you know, one of our responsibilities is to address water quality, and particularly, in this case, temperature.

The draft EIS does not evaluate measures for improving temperatures in the Columbia River. As you know, temperature has a significant impact on fish habitat, rearing and migration. It is possible that changes might be made to improve one or more of the following: the distribution of temperatures within the river, the timing and/or duration of temperatures at critical times and/or critical locations within the river, and the overall temperature of the river. The EIS should evaluate changes to dam operation and/or associated structures that might address this issue.

The main impacts to water temperature by dams in a river the size of the Columbia River are through increased solar radiation, caused by reduced speed of water movement down the river and increased overall surface area. Operation of the dam also has modified timing and patterns of water movement down the river. By ponding waters, dams also impact recharge of cooler groundwater to the river.

The EIS should consider modifications that might counter these negative impacts, especially during critical times. Some options to consider: 1) Reservoir drawdown, which might both increase the speed of water movement through the reservoir and reduce surface area exposed to the sun. 2) Modified patterns of turbine operation. 3) Change in the timing of water releases (by days or even by hours). 4) Increased recharge of cooler waters in areas impacted by fluctuating river levels.

Thank you for your considering our comments. If you have any questions, please contact Ms. Pat Irle with our Water Quality Program at (509) 454-7864.

Sincerely,

Rebecca J. Inman
Environmental Coordination Section

EIS #008657
cc: Steve Hayes, Chelan County PUD
Pat Irle, CRO
Jeff Marti, WR
Debbie Smith, CRO

Washington Department of Ecology (WDOE)

Comment #	NMFS Reference #[1]
1	1

[1] see Appendix C

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

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May 2, 2001

Susan Fruchter
NEPA Coordinator
Director, Office of Policy and Strategic Planning
Room 6117, Herbert C. Hoover Building
U.S. Department of Commerce
Washington, DC 20230

RE: Draft Environmental Impact Statement for Anadromaous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Dear Ms. Fruchter:

The Washington Department of Fish and Wildlife (WDFW) has reviewed the subject document and participated in the development of the proposed Habitat Conservation Plans (HCP) and associated appendices. The WDFW appreciates the efforts of the National Marine Fisheries Service (NMFS) and associated preparers to produce a comprehensive and concisely written Draft Environmental Impact Statement (DEIS).

Through our participation in the lengthy process which developed the proposed draft HCPs, we generally accept that the goals and framework of the proposed HCPs should be sufficient to meet our standard of No Net Impact (NNI) regarding the operational impacts of the Wells, Rocky Reach, and Rock Island hydroelectric projects to the anadromous salmonids of the Mid-Columbia River. However, there are specific issues which either were not resolved at the time the draft HCPs were submitted for environmental review or have been brought to light in the course of scoping meetings conducted during the preparation of the draft EIS for the HCPs.

The WDFW has the greatest concern regarding the following issues, and views the satisfactory resolution of these issues as essential for acceptance of the HCPs. These are issues that are germane to the implementation of the HCPs, and are not an attempt to re-negotiate the draft HCPs.

WDFW

Achievement of Survival Standards

1 Modification of project operations and/or structures to achieve specific juvenile and adult survival standards associated with passage of the projects during migration is the major objective of the proposed actions. The proposed HCPs are specific regarding the standards of 95% survival at the project for juveniles and 91% total project survival for both juveniles and adults, but there is lack of specificity regarding how to measure the achievement of the standards. In part this was intentional in order to allow for accommodation of new technologies as they might become available. However, to the extent that survival evaluation of specific species or life stages is not practicable in the time frames required under the proposed HCPs a specific methodology needs to be established for using surrogate data to estimate achievement of survival standards. This methodology needs to be developed by the parties to the proposed HCPs and incorporated prior to finalization of the proposed HCPs. Clarification is also necessary to specify that survival standard confirmation is required for each migrant life stage of each plan species. This confirmation must be provided through either direct evaluation or estimates based upon methods and data agreed to by the parties. In addition, the survival standards must be presumed to **not be met** until the specific confirmation as discussed above has been documented and certified by the coordination committee.

Hatchery Compensation Plan

2 Since the implementation of juvenile survival improvement measures at the dams is essentially capped at 95% juvenile passage survival, it is imperative that the 7% hatchery based compensation be provided to achieve the overarching goal of No Net Impact for each plan species. WDFW recognizes that there may be situations in specific years where abundance of broodstock and/or logistical constraints associated with broodstock collection preclude the full execution of programs for which the PUD's have provided the facilities and other resources to meet the production goals. However, discussions with NMFS during the coarse of this NEPA review process have made it clear that NMFS may limit hatchery based production to something less than the 7% levels specified in the Mid-Columbia River Hatchery Program, to avoid conflicts with the recovery of listed species. If such production limitations do occur and are of substantial duration, we need to provide a mechanism for an alternate form of meeting the hatchery based compensation obligation.

Dispute Resolution Process

3 Our concern regarding the dispute resolution process relates to the issue of the burden of proof when disputes are brought forward through the Alternative Dispute Resolution Process. We are concerned that there may be the opportunity to assert achievement of the survival goals

based upon inadequate scientific assessment. If other parties chose to dispute the assertion they would appear to have the burden of trying to provide proof without an adequate information having been developed to support the initial assertion. As discussed above, WDFW believes that survival goals should be assumed to **not be met** until confirmation is achieved via the coordination committee. This status would encourage all parties to work cooperatively to develop appropriate data and data gathering techniques to assure that the HCP measures are meeting the survival goals.

Adult Survival

4 Adult survival associated with passage at the dams is clearly included in the total project survival goal of 91%. However, there is no specific language requiring or specifying a mechanism for assessment of adult passage survival. Adult passage survival must be assessed either directly or indirectly to provide adequate assurance that the 91% total project survival goal is being achieved for each plan species. Assessment of adult passage survival should be added as an additional function of the Coordinating Committee.

System Survival

5 The Quantitative Analytical Report (QAR) as discussed on page 2-28 indicates that passage survival improvement is required at **all** Mid-Columbia projects as well as Lower Columbia federal projects to achieve an acceptable probability of achieving recovery for the listed populations. The lack of participation by Grant County Public Utility District (PUD) in the HCPs has been a concern to WDFW. We are currently working through the relicensing process for Grant County PUD's Priest Rapids Project to assure survival improvement comparable to the survival goals of the HCPs. We are also working with NMFS through the regional forums established in the 2000 Biological Opinion for operation of The Federal Columbia River Power System to achieve increased survival for plan species at McNary, John Day, The Dalles, and Bonneville Dams. If the survival improvements for these other portions of the system are not achieved, the adequacy of the survival goals of the HCPs may need to be reassessed.

Alternative Selection

6 Due to the substantial unresolved issues discussed above regarding the proposed HCPs and the extreme difficulty for successful implementation which these issues pose, the WDFW recommends that additional consultation and negotiation occur between the potential HCP

parties prior to NMFS selection of Alternative 3 for implementation.. If additional consultation and negotiation do not result in satisfactory resolution of these issues in a timely manner, WDFW will endorse Alternative 2.

Sincerely,

Jeff P. Koenings, Ph.D.
Director

cc: Bob Dach, NMFS, Portland
Dick Nason, Chelan PUD
Bob Clubb, Douglas PUD
Curt Smitch, Office of Financial Management
Bill Frymire, Assistant Attorney General
Mid-Columbia Coordinating Committee

Washington Department of Fish and Wildlife (WDFW)

Comment #	NMFS Reference #[1]
1	56
2	15, 40
3	21
4	58
5	30
6	19

[1] see Appendix C

WASHINGTON GROWERS CLEARING HOUSE ASSN.
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PHONE 509-662-6181; FAX 509-664-6670

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MAR 19 2001

March 15, 2001

National Marine Fisheries Service
Northwest Region---Hydro Program
525 N. E. Oregon Street, Suite 420
Portland Oregon 97232-2737

The Washington Growers Clearing House is a non-profit tree fruit grower association representing approximately 2,600 tree fruit growers in North Central Washington.

I am writing on behalf of our membership to express our strong support for the Mid-Columbia Habitat Conservation Plan.

This particular plan maximizes the opportunity to create a meaningful salmon and steelhead recovery and protection program while creating the certainty that is necessary to enable the region to remain economically viable.

The economic engine that drives the economy in North Central Washington is the Washington Tree Fruit Industry. The Tree Fruit Industry has been able to offset most of the advantages of our competition because of three factors: 1.) The excellent climate, 2.) Development of an efficient cost effective water delivery system, and 3.) Low electric rates. The low electric rates have enabled individuals to justify the expenditure of billions of dollars on industry and community infrastructure. A reliable supply of low-cost electricity is the key component in ensuring the future economic survival of the Washington Tree Fruit Industry and the economy of North Central Washington.

Far too much time, money and effort has been spent on a wide range of scientific based salmon recovery efforts with very little measurable results. This particular Habitat Conservation Plan takes a unique new approach, one that is based not only on local input from all stakeholders, but on measurable results. This Habitat Conservation Plan recognizes that one size does not fit all, and that to be effective a program must be flexible, comprehensive and results oriented. This plan gives the local Public Utility District the flexibility necessary to produce a successful outcome. As situations change it is important that the recovery plan has the flexibility and opportunity to change in an innovative and timely manner.

Another crucial component of this HCP is the creation of an invaluable source of funding to aid local citizen group efforts to protect and improve fish habitat on Columbia River tributaries.

The Habitat Conservation Plan ensures that fish and people can live together and that vital hydroelectric production can continue. The Chelan County Public Utility District has responded to the citizen's demands that they be a good steward of this valley's resources. The Habitat Conservation Plan is another example of the PUD's commitment to the citizens, the environment and the resulting quality of life so highly valued by the citizens of North Central Washington.

Sincerely,

Kirk B. Mayer, Manager

RECEIVED
FEB 26 2001

Washington
Public
Utility
Districts
Association

1411 Fourth Ave.
Suite 810
Seattle, WA 98101
206 682-3110
Fax 206 682-3913

February 22, 2001

Mr. Bob Dach
Hydro Division
National Marine Fisheries Service
525 NE Oregon St.
Portland, OR 97232-2737

Dear Mr. Dach:

We applaud NMFS, Chelan and Douglas PUDs for their efforts to develop long-term habitat conservation plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects. These plans are an important component in the state of Washington's continuing effort to recover listed anadromous salmonids.

The proposed Anadromous Fish Agreement and Habitat Conservation Plans are particularly timely given the Northwest's present short supply of renewable electric energy. Our region is presently struggling to maintain its economic viability, given recent developments in the wholesale power market. Solutions to these issues must be found through proactive planning and long-term solutions. The proposed HCP represents both of these ideals.

We support the proposed Wells, Rocky Reach and Rock Island HCPs as the preferred alternatives for salmon recovery in the Upper Columbia River. The selection of the long-term HCPs over the alternative of narrowly focused Section 7 consultations will ensure the future viability of anadromous salmonids while maintaining the benefits of clean, renewable hydroelectric power generation. We encourage the fisheries service to select and fully implement Alternative 3 as described in the Draft Environment Impact Statement for the proposed Wells, Rocky Reach and Rock Island Anadromous Fish Agreements and Habitat Conservation Plans.

Sincerely,

Steve Johnson
Executive Director

SJ/sw

WENATCHEE RECLAMATION DISTRICT
514 EASY STREET
WENATCHEE, WA 98801-9652
(509) 663-0002
FAX (509) 665-0341

RECEIVED
MAR - 5 2001

March 1, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 N E Oregon Street, Suite 420
Portland, OR 97232-2737

As members of the Wenatchee Reclamation District Board of Directors we are writing to support the Mid-Columbia Habitat Conservation Plan (HCP).

How the precious water resources of this valley are used to benefit people and fish is a major concern for us.

The hydropower produced at Chelan County PUD's dams is vital to the economy of the region. It is affordable, reliable and renewable. The Habitat Conservation Plan ensures that hydropower generation can continue while listed salmon and steelhead stocks are protected.

The parties to the HCP should be applauded for working cooperatively. All too often, the command-and-control approach has led to endless, costly court battles. When that happens, nobody wins.

Specifically, we note that the plan addresses unavoidable losses. The Chelan County PUD will provide both supplementation hatchery production and funding to improve habitat to achieve the "no-net-impact" standard. The fund will likely provide badly needed habitat improvements on the Wenatchee River, as overseen by a committee process. In addition, the habitat fund could provide money for partnership projects with communities and individuals throughout the river system. We wholeheartedly support this concept.

Thank you for the opportunity to comment in support of the Mid-Columbia Habitat Conservation Plan.

Sincerely,

WENATCHEE RECLAMATION DISTRICT

Alan H. Witte, President

Lynn O. Smith, Director

Donald E. VanWinkle, Director

Wenatchee Valley Clinic

(509) 663-8711
Fax (509) 664-4860
820 N. Chelan Ave.
P.O. Box 489
Wenatchee, WA 98807-0489

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FEB 22 2001

60th Anniversary
1940 - 2000

February 16, 2001

National Marine Fisheries Service
Northwest Region – Hydro Program
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Dear Sir or Madam:

On behalf of the 1200 physicians and employees of the Wenatchee Valley Clinic, we are writing to endorse the Habitat Conservation Plan of Chelan County PUD.

The Wenatchee Valley Clinic is a growing enterprise headquartered in Chelan County. We are a regional organization with eight clinic locations that offers a comprehensive array of medical and diagnostic services. We serve a geographic area that spans approximately 12,000 square miles; and care for over 125,000 unique individuals annually.

The Chelan County PUD is also a longstanding regional resource. They are a "Good Neighbor" to our region, and have an excellent power generation and delivery system. They are a linchpin in our region's infrastructure, and have been a strong advocate, and responsible steward, of our area's natural resources.

Medicine and energy are both industries operating under intense regulatory requirements and scrutiny. We see these parallels between our business and that of the PUD:

- The PUD is seeking cost-effective means, compatible with its other business needs, to meet regulatory requirements for resource protection
- The PUD knows the region and its business better than others from outside the region, and should be given the opportunity to apply that knowledge toward finding optimal solutions to salmon recovery issues
- The PUD (and the region) need assurances, provided in the Habitat Conservation Plan, that it can continue the business of maintaining an economical and reliable energy supply while working diligently to develop and institute mitigation and enhancement plans.

Chelan County PUD is regarded as an outstanding citizen, and as an integral component, of North Central Washington. The PUD has a long history of providing both a reliable energy supply and protecting our environmental resources. We urge you to continue toward quick adoption of the Habitat Conservation Plan.

Sincerely yours,

James W. Brown

James W. Brown, M.D.

Shaun Koos

Shaun Koos

RECEIVED
FEB 22 2001

Wenatchee Valley College

February 16, 2001

President's Office
1300 Fifth Street
Wenatchee, WA 98801-1799
(509) 664-2553
FAX (509) 664-2552

National Marine Fisheries Services
Northwest Region - Hydro Program
525 NE Oregon St., Suite 420
Portland OR 97232-2737

Gentlemen:

For the past 30 years I have been familiar with the Chelan County PUD stewardship of their three hydro electric projects here in central Washington. I am an avid recreationalist and very active in community development projects. One of those projects was the completion of our Columbia River Loop Trail. Citizens, through an organization known as Complete the Loop Coalition, raised money through private donations and grants to build a six-mile trail on the east shore of the Columbia River so it could be linked to the trails which were built by the Chelan County PUD in connection with the Exhibit R project in the late 1980s. The completed 11-mile loop trail, in my humble opinion, is the diamond in the crown of the many wonderful recreational opportunities created by the PUD here in central Washington.

It was because of the vision of Kirby Billingsly, a former commissioner and manager of Chelan County PUD, that a series of parks line the shore of the Columbia River where hydroelectric reservoirs have been created by the PUD's dams. The financial backing of the PUD and these hydro electric projects made that vision a reality. The PUD's subsequent stewardship through the operation of the parks that have been built has been complimented by museums, fish hatcheries, and educational programs that it has supported. Without question, the PUD has proven to be an excellent steward of the community's resources.

I am currently serving as the president of Wenatchee Valley College. The college looks forward to a close working relationship with the PUD for future educational programs. Some of our students are working on salmon habitat recovery efforts on the Icicle River. Much needs to be done on habitat recovery, and it is frustrating to hear the PUD respond that they cannot spend resources on securing habitat at the present time because the Habitat Conservation Plan (HCP) has not yet been finally approved. There was much fanfare in June of 1998 about the HCP and the recovery efforts, but precious little has been done in the intervening time to initiate the habitat recovery efforts because of the slow, laborious review process for the HCP. It seems to me that a rapid and positive approval of the HCP is exactly what is needed for salmon recovery. Quick action would clear up the confusing and conflicting views and agendas of the many stakeholders in the

salmon recovery process. We need natural habitat restored and protected as rapidly as possible if we, as a nation, are really serious about saving these threatened and endangered species. Acquisition of shoreline and conservation easements is in order.

The public is extremely frustrated with the consequences of legal gridlock, and the provisions of the HCP for dispute resolution and cooperative accountability are refreshing alternate solutions to the agonizing and counterproductive lawsuits that clog our system. I am pleased to see that HCP allows for midcourse corrections.

Please consider this an endorsement of the HCP approach and an urgent request for speedy implementation of the HCP. I believe that if the PUD had the confidence that the HCP will be favorably considered by NMFS and the FERC, as well as all the other signatories, they could speed up the process of securing salmon recovery habitat by purchasing options for select parcels of property that are currently for sale in the Wenatchee River and Entiat River tributaries. Please give this serious consideration as it is plain, from preliminary numbers being offered in Washington State legislature, that there will be a tight budget and a probable restriction of other funds available for securing habitat through the Washington Wildlife and Recreation Program.

There is one other unrelated matter that I wish to bring to your attention. As a citizen volunteer, I have been working for five years to get an extension built along the shoreline for the Columbia River Loop Trail referred to in the first paragraph of this letter. This trail extension is proposed to be operated by Washington State Parks and connects the Confluence State Park (built with PUD Exhibit R money) to Lincoln Rock State Park (also built with PUD Exhibit R money). This extension is approximately 4.5 miles long. I am told that all agencies have reviewed and approved the biological assessment prepared by Washington State Parks except for National Marine Fisheries Service. It seems to me to be fundamentally sound logic that a riverfront trail adjacent to the river would be far preferable for salmon habitat than the potential for sprays and fertilizer residue finding its way to the river from adjoining agricultural lands. The biological assessment for this trail has been in NMFS hands for several months. I cannot understand why NMFS has taken so long to review this project and would certainly hope that it would have a positive response when its review is complete.

Very truly yours

Robert L. Parlette
President

THE WENATCHEE WORLD

RECEIVED
FEB 21 200

February 16, 2001

National Marine Fisheries Service
Northwest Region Hydro Program
525 NE Oregon St., Suite 420
Portland, OR 97232-2737

To whom it may concern:

I am writing to offer my hearty support for the Habitat Conservation Plan for salmon. The plan, developed by Chelan and Douglas public utility districts, is the result of government agencies, tribes and environmental groups working together. It is proof that organizations with opposing views can collaborate to produce a compromise that is beneficial to the environment and that also protects a critical source of renewable energy.

I urge the National Marine Fisheries Service to approve the HCP. This collaborative effort will result in improved fish runs while preserving an important economic resource for the region.

Sincerely,

Wilfred R. Woods
Chairman of the Board

cc: Roger Braden, Chelan County PUD

THE WENATCHEE WORLD

RECEIVED
FEB 21 2001

February 16, 2001

National Marine Fisheries Service
Northwest Region — Hydro Program
525 NE Oregon St., Suite 420
Portland, OR 97232-2737

To whom it may concern:

I would like to offer my enthusiastic support for the Habitat Conservation Plan for salmon that has been developed by Chelan and Douglas public utility districts working in collaboration with various government agencies, tribes and environmental groups.

The plan is a model for demonstrating how organizations with opposing viewpoints can come together and develop a compromise that benefits the environment and protects an important source of renewable energy. The HCP is a landmark agreement that also demonstrates conclusively that these decisions can be made without lengthy, costly legal battles.

I would urge the National Marine Fisheries Service to approve the HCP as a step in encouraging collaborative efforts to balance the need for improving fish runs and at the same time preserving an important economic resource for the region.

Sincerely,

Rufus Woods
Editor & Publisher

cc: Roger Braden, Chelan County PUD

LAW OFFICES
OF
TIM WEAVER

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LEGAL ASSISTANT
PATTI McCOY

RECEIVED
MAY - 1 2001

May 1, 2001

Mr. Bob Dach
NMFS, NWR, Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

Re: Comments of the Yakama Nation on the Draft Environmental Impact Statement for the "Mid-Columbia Habitat Conservation Plans."

Dear Mr ~~Dach~~ Bob:

The Yakama Nation (hereinafter "YN" or "Tribe") hereby submits its comments on the Draft Environmental Impact Statement (DEIS) prepared by the National Marine Fisheries Service (NMFS) on the Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects (hereinafter "Mid-Columbia HCPs" or "HCPs"). We appreciate the opportunity to provide you with comments pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4322(2)(c).

The NMFS' analysis under this DEIS and the resulting Final Environmental Impact Statement, and its decisions regarding the HCPs, directly affect the Tribe and the Tribe's treaty-reserved rights. The geographic scope of the HCPs falls within the ceded territory of the YN and the operation of the hydroelectric projects at issue in the HCPs affects the treaty fish on which the Tribe relies. In the Treaty with the Yakima Tribe, 12 Stat. 951, Art. 3 (June 9, 1855), the YN reserved the right of "taking fish at all usual and accustomed places in common with citizens of the United States." Retaining the right to continue its traditional fishing practices was a primary objective of the Tribe during treaty negotiations. Tulee v. Washington, 315 U.S. 681, 684-85 (1942); Washington v. Washington State Commercial Passenger Fishing Vessel, 443 U.S. 658, 664-69 (1973).

The treaty guarantees to the Tribe an equitable share of the fish. See United States v. Oregon, 302 F. Supp. 899 (D. Or. 1969) and United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974). Anadromous fish and lamprey have significant cultural and religious significance to tribal members, provide members with subsistence for health and well-being, and contribute to a critical share of tribal commerce in an area of limited economic opportunity. Additionally, the YN actively co-manages the fishery resource along with federal and state authorities and is a party to the Mid-Columbia Proceeding before the Federal Energy Regulatory Commission involving the Chelan and Douglas County Public Utility Districts.

As described more fully below, the YN also participated in the negotiations of the HCPs at issue in the DEIS and thus is intimately familiar with the HCPs and issues of importance to the Tribe. The YN believes that the DEIS misrepresents the YN's participation and fails to identify for the public at large the status of the HCPs as being incomplete, the YN's lack of support for the HCPs at this time, and the real reasons for such a lack of support. We discuss this in further detail below.

Below the YN first sets forth its general comments about the DEIS and then provides specific comments related to specific sections of the DEIS. Please note that these are not necessarily set forth in the order of importance to the Tribe and thus all of the Tribe's comments should receive adequate and equal consideration.

GENERAL COMMENTS

YN

The HCPs Are Unfinished, Incomplete, and Thus Not Yet Ready for Environmental Review

1 As the DEIS recognizes, the negotiation of the HCPs was the subject of much debate and controversy. The DEIS is unclear in its explanation of the negotiation process, as it does not adequately discuss either the scope of, or ground rules for, the negotiation. However, these issues surrounding the negotiation process are important to understanding that the HCPs are incomplete and unfinished at this time.

2 The scope of the negotiations was much broader than that which normally occurs within a usual HCP process because the Public Utility Districts, together with NMFS and the United States Fish and Wildlife Service (USFWS), agreed to negotiate not only an HCP, but also a long-term licensing agreement for the Districts' hydroelectric projects under the Federal Energy Regulatory Commission. The ultimate agreement intended to come out of the negotiation was to be not only an HCP providing long-term ESA protection, but also an agreement that would provide the Public Utility Districts an opportunity to renew their hydroelectric dam licenses without opposition from the parties to the negotiation. Those agreements regarding the licenses were no less important to Public Utility Districts than the HCPs.

As a result of this aspect of the negotiation process, the NMFS, USFWS and the Public Utility Districts invited the YN and other non-agency parties to participate. As this was a long-term and potentially contentious negotiation, the Public Utility Districts hired a professional mediator/facilitator to work with the parties. There was one hard and fast rule of the negotiation to which the parties were expected to adhere: the concept of "Conditional Closure." Under

Conditional Closure, the negotiation was to proceed in such a way as to allow the parties to reach agreement on an issue-by-issue basis with the understanding that such issues were only "conditionally closed," such that there would be no binding effect or agreement on any single issue until everyone agreed on the total package. Conceptually, this general rule allowed a party to agree "conditionally" on one issue that it did not completely accept, but the acceptance would be conditioned on receiving a later agreement on other important issues. If the later agreement could not be made, then there was no agreement on any issue.

3 No one involved in the negotiation was mistaken as to the basis upon which it was being conducted. The Conditional Closure ground rule was echoed time and time again by the Director of NMFS and other NMFS staff, the USFWS representative and the facilitators/mediators. Throughout the course of the negotiations, many contentious points were "conditionally closed" only because the parties expected to come to agreement on other issues as well. All parties clearly understood that if one part of the agreement failed, the entire agreement would fail.

The Tribe entered into the negotiation only because of those assurances, and has scrupulously honored its part of the bargain. Until the negotiations simply stopped, with the Public Utility Districts receiving all of their consideration and YN and other non-agency parties receiving virtually none of the theirs, the Tribe relied on the assurances of the federal government and the Public Utility Districts that they would honor their part of the bargain as well. As we discuss further below, the YN has not agreed to the terms of the HCPs because the terms the YN requires to reach such an agreement have been rejected by the other parties. Accordingly, the negotiation—conducted under the Conditional Closure rule—is unfinished and incomplete. As such, the YN cannot support the HCPs as they are drafted.

It is both disheartening and somewhat shocking that the YN must file comments on the DEIS for the "completed" HCPs in light of the clear fact that there is no agreement on the terms of the HCPs and hence no document upon which the DEIS may be based. The YN participated in the HCP process only on assurances from its trustee, the United States, acting through NMFS and USFWS, that there "would be no deal unless everyone agreed to all aspects of the deal." The Tribe expected the United States to fulfill its best and highest fiduciary responsibility to it in making such promises. Unfortunately and shamefully, NMFS and USFWS have turned their backs on the Tribe in favor of the Public Utility Districts, to whom they owe absolutely no obligation.

There is no disagreement among the parties to the HCP negotiation that the YN has not received the benefits for which it bargained. Nevertheless, the representatives of United States and the parties who have received the benefit of their bargain at the expense of the Tribe, have decided in the interests of expediency to push forward regardless. This results in the DEIS being manipulated in the interests of making it appear that there is an agreement despite the fact that no such agreement exists. For instance, at the second scoping meeting on DEIS, held that the West Coast Sea-Tac hotel, a YN representative asked the NMFS representative why NMFS was going forward with environmental review of a non-existent HCP, particularly because NMFS and everyone else involved in the negotiation knew there was no agreement among the parties. The NMFS representative responded that the environmental review will never "see the light of day unless there is agreement" among all the parties. Currently, there is simply no agreement among

the parties, yet the DEIS is in place and the NMFS appears ready to move forward with choosing a preferred alternative.

An additional and related problem is that the DEIS implies that the HCPs are at least nominally in place and that the Public Utility Districts are currently operating under the HCPs. See, e.g., DEIS at 2-35, 2-41. However, there is no final agency action under which the Public Utility Districts can be allowed to operate. The DEIS is thus tremendously misleading in light of the fact that there are no agreed to HCPs in place and no awarded Section 10 permits. As a result, the Public Utility Districts are currently taking listed salmon without valid ESA protection in violation of Section 9 of the ESA. Instead of pretending that some sort of agreement exists, the NMFS and Public Utility Districts must face the circumstances as they truly exist and proceed to either finalize a valid HCP agreement or move forward with Section 7 consultations to cover the take of listed species. 4

Based solely on the circumstances surrounding the negotiations, the lack of closure on any agreement to the HCPs, and NMFS' promise that this document would not "see the light of day" without such agreement, the NMFS should immediately withdraw the DEIS and seek other means for supplying ESA coverage for current PUD operation. Additionally, notwithstanding the fact that there is no agreement, the comments that follow provide further reflection that the provisions of the HCPs are seriously broken and badly in need of repair prior to any finalization of such a concept. NMFS should withdraw the DEIS on that basis as well. 5

The DEIS Inaccurately Portrays the Tribe's Position

The DEIS portrays the YN's concern with the HCPs as being based solely on the lack of guarantee for hatchery production. As discussed below, the YN believes that the refusal to guarantee hatchery production has the potential to further depress runs in the mid-Columbia, which provides treaty fishermen with virtually no benefit from the HCPs while allowing the Public Utility Districts virtually unfettered generation at their dams. While hatchery production is an issue of extreme importance to the scientific validity of the entire agreement, particularly because the underlying principle of the HCPs' No Net Impact standard is impossible to achieve without a guaranteed and successful hatchery component, this is not the sole tribal issue to be ignored by the HCP parties and the DEIS drafters. 6 7

During the HCP negotiations, the Tribe also requested, in return for its agreement to the other provisions of the HCPs, that it would receive its own "no surprises" type assurance. Such a provision was intended to assure that if the HCPs fail to provide adequate protection and recovery of the fish, then tribal harvest or other tribal interests consistent with the YN's treaty rights would not be the first in line to bear the brunt of NMFS' and USFWS' responsibility to make up the difference. See discussion of No Surprises further below. The YN's proposal for such an assurance has been rejected by NMFS on numerous occasions, yet is nowhere mentioned in the DEIS. 8

Of equal importance is a tribal proposal that the HCPs would not be used by NMFS as a defense in any non-HCP related litigation between it and the Tribe. This is an issue of major importance to the YN, as the Tribe is concerned that NMFS will contend in future litigation that 9

the HCPs satisfy NMFS' treaty obligations to YN and that the YN is estopped from asserting otherwise. The Tribe's proposed language was only intended to make clear that any future litigation "playing field" between it and NMFS would remain level. NMFS rejected this proposal but fails to discuss it in the DEIS.

The DEIS ignores the fact that the rejection of these important issues to the YN results in there being no agreement on any of the provisions of the HCP. The YN's inability to obtain agreement on its proposals results in the Tribe withdrawing its agreement to other "conditionally closed" issues. The DEIS ignores the fact that all parties to the negotiation, including NMFS, agreed that this would be the basis on which the HCP was negotiated. The DEIS needs a fair and frank discussion of the rules and terms of the negotiation so that a reader may judge as to whether or not there is in fact any basis for claiming agreement at this juncture.

10

The DEIS treats the Yakama issues as somehow disjointed from the "overall agreement," implying that the other HCP parties may proceed with their part of the agreement while the YN receives nothing in return. Such a proposal has no basis in law, equity or simple justice for a party that negotiated in good faith for nearly three years but now receives nothing. Again, such an interpretation is both highly misleading and violates the understanding between the parties.

11

Despite the total lack of agreement, the DEIS contains several statements that misrepresent that there is tribal consent to certain terms of the HCPs. For example, the DEIS states that the No Net Impact concept was developed "with tribal biologists," DEIS at page 2-35, implying that there is tribal agreement on that concept. Of major importance is the fact that the No Net Impact concept requires that there be the guaranteed 7% hatchery production component. However, the No Net Impact concept has been effectively destroyed by NMFS' position on hatchery production. Accordingly, to imply that tribal scientists still agree with that vastly altered concept is improper.

12

Finally, the DEIS is devoid of any mention of the YN's efforts to resolve these issues. The DEIS should include information regarding tribal efforts to resolve outstanding issues, including numerous meetings with regional NMFS staff and, on at least three occasions, with high-level policy makers for NMFS and the Department of the Interior in Washington D.C. All of these meetings concluded without success. The DEIS should likewise note that the YN and the Confederated Tribes of the Umatilla Indian Reservation formally provided a written request that NMFS remove their names from the DEIS as parties to the HCP, and even that effort was unsuccessful.

13

14

The Proposed Action—Alternative 3—Fails to Fulfill Federal Trust Responsibilities

The NMFS and the USFWS, as federal agencies, have a fiduciary trust obligation to Indian tribes, which must be carried out according to a strict fiduciary standard. See United States v. Mason, 412 U.S. 391 (1973); Seminole Nation v. United States, 316 U.S. 286 (1942); Felix Cohen, HANDBOOK OF FEDERAL INDIAN LAW 225 (1982). These trust obligations apply to federal agency actions that affect trust resources. See, e.g., Covello Indian Community v. FERC, 895 F.2d 581, 586 (9th Cir. 1990). The agencies thus have a required duty to protect, maintain and enhance the YN's treaty fishing rights and the fish on which the Tribe rely.

The proposed alternative in the DEIS regarding the HCPs fails to meet this strict fiduciary duty for a number of reasons. For example, the HCPs lack certainty for the 7% hatchery compensation levels, which the Tribe believes is a necessary component for rebuilding
15 the Tribe's treaty fish resources. The YN bargained for such hatchery compensation in the negotiations and is unwilling to support the HCPs absent assurances of what the Tribe believes is critical for sustainable populations to fulfill the Tribe's treaty rights to fish. For further details of the Tribe's concerns about this issue, please see our discussion below.

Other examples where the agencies would fail to uphold their trust responsibility under
16 the proposed alternative include the No Surprises assurance (please see our specific discussion of this issue in greater detail below); the agencies' unwillingness to include provisions assuring the Tribe that nothing within the HCPs will be used against the Tribe in future litigation matters; and a general failure to guarantee the protection and enhancement of the Tribe's trust resources. Additionally, the proposed alternative requires that the agencies shift management authority to
17 the Public Utility District within the first five (5) years and also may prevent agencies from taking necessary recovery and rebuilding measures in the event that the fishery resource continues to dwindle despite the HCPs.

Alternative 3 thus frustrates the NMFS's and USFWS' ability to uphold its strict fiduciary duty to the Tribe, yet these factors are not addressed or weighed within the DEIS. The NMFS
18 must adequately discuss its trust responsibility and explain, in a comparison between the alternatives, the extent to which NMFS and the USFWS are able to completely fulfill their roles as trustees to the Tribe and the Tribe's treaty-reserved resources.

NMFS and USFWS Must Comply with the Secretarial Order

A related concern is that the NMFS and USFWS have to date failed to comply with the 1997 Secretarial Order of the Secretaries of Commerce and Interior titled "American Indian
19 Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act." The Secretarial Order requires the agencies to carry out the Endangered Species Act (ESA) in such a way that harmonizes the Tribe's sovereignty and rights with the Secretaries' duties under the ESA. Section 1. The Secretarial Order also requires that the agencies ensure that the Tribe not bear a disproportionate share of the conservation burden for listed species. Section 5, Principle 3.

The DEIS must take the requirements of the Secretarial Order into account. The Tribe
20 finds that the DEIS is deficient of a detailed discussion about how the HCPs and the other alternatives may now, and in the future, be consistent or inconsistent with the Tribe's treaty rights and tribal sovereignty. The DEIS likewise lacks a discussion of whether or not any of the particular alternatives may cause NMFS or USFWS to fail to fully uphold its trust responsibility. Furthermore, under the Secretarial Order, the Tribe has repeatedly asked for a consultation meeting that has not yet taken place. The YN therefore respectfully requests that the NMFS
21 immediately arrange a formal consultation meeting that can take place with the YN's governmental officials and legal counsel on a government-to-government basis. To be

meaningful, such an action must take place *before* the NMFS makes a decision about which alternative to choose as the preferred alternative.

The DEIS Neglects to Address Several Important Legal Issues

Discussion and analysis contained within the DEIS are inadequate or completely lacking on several legal matters that the YN believes deserve due attention. For example, the analysis in the DEIS is cast in terms of ESA recovery, but the nature of what Alternative 3 is meant to
22 legally satisfy is such that the analysis must go beyond mere ESA standards. As the DEIS recognizes, the HCPs would constitute long-term settlements under the Federal Power Act, the Fish and Wildlife Conservation Act, the Northwest Power Planning and Coordination Act, and Title 77 of the Revised Code of Washington. DEIS at S-15. However, the DEIS couches its review in ESA terms without analyzing whether the alternatives meet the requirement of these laws or other laws, such as the United States-Canada Pacific Salmon Treaty and tribal treaty rights.

As one example, the Public Utility Districts plan for the terms of the HCPs to be wrapped into at least one relicensing process for each of the three hydroelectric projects at issue, though this intent is based on an agreement of the parties to the HCPs that now does not exist. The
23 DEIS contains no discussion or analysis of whether the HCPs would independently satisfy the Federal Power Act (FPA) requirements for equal consideration, protection, mitigation and enhancement, which are all standards that would be need to be addressed at relicensing pursuant to the FPA. See 16 U.S.C. §§ 803(a), 803(j). Additionally, because each of the projects would be relicensed during the term of the HCPs if put into place, and thus would presumably be
24 incorporated into their license terms and conditions, the Public Utility Districts may believe that they will receive 50+ years of protection under the HCPs and similarly long-term licenses. The DEIS must address this with the understanding that the YN would likely insist on a traditional relicensing process and assert that the HCPs fail to satisfy FPA requirements.

The proposed HCPs also affect tribal trust resources over a long period of time, so the
25 analysis of impacts on species must also include compliance with treaty reserved rights – including rebuilding to sustainable, harvestable populations over and above what would be required for de-listing under the ESA. As NMFS' own salmon recovery policy provides, "It is our policy that the recovery of salmonid populations must achieve two goals: (1) Restore salmonid populations to the point where they no longer require the protection of the ESA, and
26 (2) restore salmonid populations to a level that allows meaningful exercise of tribal fishing rights. McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-42,156 p. 34 (hereinafter "NMFS VSP"), citing (Garcia 1998). The DEIS therefore must provide analysis of the alternatives under the laws referenced above and examine recovery and rebuilding consistent with the NMFS policy.

The Public Utility Districts also plan for the HCPs to constitute a settlement of the Mid-Columbia Proceeding, which is under the continuing jurisdiction of an administrative law judge of the Federal Energy Regulatory Commission, so the DEIS should take into consideration the opportunities, function and protection provided under the Proceeding and all settlements that

have been entered into (the Wells Settlement Agreement, the Rock Island Settlement Agreement, and the past stipulations for Rocky Reach). The existing status of interaction among the parties under the Mid-Columbia Proceeding make up part of the current situation, yet are not thoroughly addressed in the DEIS under the No Action alternative, nor under the other alternatives.

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The DEIS also neglects to provide sufficient consideration of Clean Water Act requirements for water quality and quantity. Though the DEIS recognizes that the hydroelectric projects at issue have negative impacts on water quality, mainly increased total dissolved gas levels, the DEIS contains minimal discussion of mitigation for such impacts. The only proposed solution that the Public Utility Districts offer is reduced spill. See DEIS at 2-46. The Tribe finds this to be an inadequate solution because spill is one of the most effective methods of safely passing juvenile fish through the projects. Other solutions should be fully explored and addressed across all of the alternatives. The DEIS also recognizes that the projects are exceeding Clean Water Act temperatures, see DEIS at 3-96—3-100, yet the DEIS contains little information about how this problem could be addressed under the alternatives. The DEIS must therefore address Clean Water Act requirements and how such requirements – for both quality and quantity – may be met under the parameters of the HCPs and under the other alternatives.

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Another legal issue not mentioned in the DEIS is whether or not Section 10 of the ESA is an available option to the Public Utility Districts for Section 9 takings protection or whether Section 7 of the ESA is instead the proper vehicle. When the YN first entered into negotiations with the Public Utility Districts on the HCPs, the Tribe had questions about whether or not Section 10 was an available option, but the Tribe's concern at the time was the substance of the negotiations. The parties never addressed the procedural issue. The YN assumed that if a deal could be negotiated, the parties could find the proper vehicle to make it work. We believe, however, that this stage of environmental review is the appropriate time for such an analysis to be completed.

29

The YN understands that the Section 10 permit process is available to non-Federal entities but is not available to Federal landowners such as the United States Forest Service. As the NMFS' and USFWS' HCP Handbook explains at page 1-4, the HCP process is "designed to address non-Federal land or water use development activities that *do not involve a Federal action* that is subject to section 7 consultation." (emphasis added). Furthermore, it provides, "Federal activities and non-federal activities that receive Federal funding or require a Federal permit (other than a section 10 permit) typically obtain incidental take authority through the consultation process under section 7 of the ESA. Id. Hydroelectric projects, though owned by a non-Federal entity, are intertwined with extensive federal actions, including licensing, conditions, rates, and generation. The YN believes that the DEIS must address the applicability of Section 10 to the Public Utility Districts' projects in order to determine whether Alternative 3 may even be chosen as the preferred alternative.

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The DEIS Lacks Meaningful Analysis of Survival, Recovery and Rebuilding

Under Section 10 of the ESA, an HCP must explain the impact that the proposed take will have on listed species. 16 U.S.C. § 1539(a)(2)(A)(i). See also 50 C.F.R. §§ 17.22(b)(1); 17.32(b)(1); 222.22. Under the National Environmental Policy Act (NEPA), agencies are

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required to take a "hard look" at the consequences of their actions before acting. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 249 (1989). This requires more than broad or general statements about risk, especially when more detailed information could be provided. See Neighbors of Cuddy Mountain v. United States Forest Service, 137 F.3d 1372, 1380 (9th Cir. 1998).

32 The YN believes that the DEIS fails to take the required hard look at impacts on anadromous fish and other trust resources. Neither the HCPs nor the DEIS present adequate quantitative detail of how listed species would be impacted by the HCPs. Furthermore, the DEIS does not do so under the other alternatives. The DEIS mentions the Quantitative Analysis Report (QAR) conducted by the NMFS, but does not incorporate the analysis into the alternatives. The
33 reviewer of the DEIS is left without any idea of how each of the alternatives actually compares in terms of survival and rebuilding benefits.

34 In the discussion of the No Action alternative, the DEIS states, "[e]xisting measures however, may not prevent the extinction of listed species." DEIS at 2-49. However, the discussion of the other alternatives fails to provide analysis of whether or not they will be an improvement and not also lead to extinction. The DEIS states that implementation of the HCPs would result in an increase in survival levels, but fails to explain what that means in terms of ESA standards or FPA requirements. DEIS at 4-39. According to NMFS's own data in the QAR, measures in addition to those set forth in the HCPs will be necessary for recovery, yet such information is not adequately addressed or analyzed in the comparison of alternatives. The
35 QAR report at ii states, "Even under the most optimistic scenarios . . . regarding future survival rates and the effectiveness of supplementation, additional survival improvements beyond those projected for the draft HCP actions would be necessary to achieve extinction risk/recovery criteria." This information should be analyzed in the DEIS.

36 The DEIS also does not account for the QAR's statement that meeting the HCP standards and off-site mitigation "would fall short of meeting survival and recovery criteria under the assumptions that 1980-present conditions will continue." QAR at iii. Therefore, according to the QAR, additional measures are going to be required for recovery, but such measures are not required or allowed by the HCPs. If something more than the HCPs is required, then Alternative 2 would be the only avenue for providing it. The DEIS must address this omission and include meaningful analysis across all of the alternatives.

37 As NMFS provides in the "Recovery" section of the NMFS VSP, the NMFS, States, Tribes and many other stakeholders have an interest in the recovery of salmon populations to the level that the populations can support "sustainable harvest or other 'broad sense' recovery goals." NMFS VSP at 34. NMFS provides that where a certain level of harvest may have an affect on the population's sustainability, NMFS could use VSP guidelines "to help determine the population abundance, productivity, diversity, and structure that would be required." Id. The YN would accordingly like to see the NMFS take into consideration the factors that led to the initial decline of the salmon and provide analysis that examines the impact that the various alternatives would have on the sustainability of the salmon populations and the ability of such populations to meet broad (beyond mere ESA) recovery goals.

The Geographic Scope of the DEIS is Inadequate

Use of the proper geographic scope in an environmental impact statement is paramount to assuring that the consideration of effects on the environment are adequately considered and addressed. The scope of environmental review is supposed to take into consideration three types of actions: (1) actions that may be connected (includes actions that are closely related, would
38 trigger other actions that require environmental review, or interdependent parts of a larger action); (2) cumulative actions; and (3) other similar actions (those that have reasonably foreseeable similarities, such as timing or geography). 40 C.F.R. § 1508.25. Under this requirement for determining scope, it is apparent that the scope of the DEIS is too limited.

Consistent with the concepts of aquatic systems and the operation of hydroelectric projects, the scope of the environmental review in the DEIS should at least include tributaries in the mid-Columbia Basin, upstream federal projects, the Lake Chelan Dam, downstream projects operated by Grant County Public Utility District, the Vernita Bar, and the Hanford Reach. The three hydroelectric projects at issue cannot be plucked out of the geography and their impacts on downriver systems ignored. Furthermore, power operation upstream of Wells, Rocky Reach and Rock Island affect anadromous fish survival, flow management and water quality at those projects.

In its scoping comments, the YN advocated that the scope of the review should include the entire mid-Columbia River Basin from the Yakima River to Roosevelt Lake. However, much of the benefit of salmon recovery in the Columbia Basin will accrue to the Columbia River
39 tribes in terms of expanded harvest opportunities at usual and accustomed fishing places in Zone 6 (Bonneville Dam to McNary Dam). Accordingly, the geographic scope of the DEIS should be expanded to account for the relative effects on the proposed alternatives on treaty fisheries in this area. See also discussion of Baseline below.

The DEIS Does Not Adequately Address or Analyze Cumulative Effects

Under NEPA, an environmental impact statement must contain consideration and analysis of cumulative effects. Cumulative impacts are effects from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." 40 C.F.R. § 1508.7.

The YN, in its Scoping Comments on the HCPs, asked for such consideration and
40 analysis, but the DEIS does not adequately accomplish this. See DEIS at 4-6—4-47. The Tribe believes that the NMFS should have considered factors for decline throughout the entire life histories of each species, including effects that fall outside of the geographic scope of Alternative 3. Furthermore, the analysis should have included cumulative and synergistic impacts from the
41 Federal Columbia River Power Systems operations and all five of the mid-Columbia Public Utility District Dams (Wells, Rocky Reach, Rock Island, Priest Rapids, and Wanapum).

Additionally, the results presented in the DEIS reinforce the YN's concerns that an inability to enforce operations at federal dams or to impose environmental conditions are assumed in the
42 QAR model. Therefore, we fear that the effectiveness of the HCP measures cannot be assured. In order to effectively give consideration to cumulative effects as required by NEPA, the Tribe believes that the NMFS must provide a review and analysis of no less than what we requested in our Scoping Comments.

The DEIS Lacks a "Reasonable Range of Alternatives."

The NEPA requires that environmental review contain a reasonable range of alternatives. See 40 C.F.R. §§ 1502.14. Agencies are required to "[s]tudy, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4322(2)(E). The discussion of the alternatives is the "heart" of the NEPA process. 40 C.F.R. § 1502.14.

The DEIS offers as its only alternatives a general Section 7 process and the HCPs (along
43 with the No Action alternative, which we address below). The YN does not find this to be a reasonable range of alternatives to meet NEPA requirements. The YN asked for additional alternatives in the Tribe's Scoping Comments, specifically that the NMFS include as alternatives three options that cannot realistically be pursued under the HCPs: drawdown, dam removal and non-power operations. The DEIS states that these alternatives do not merit further consideration,
44 but offers no satisfactory explanation for why these alternatives were not given analysis. DEIS at 2-45—2-48. This deficiency must be remedied and proper analysis be included in the environmental review, particularly in light of the NMFS' findings, as reported above, that the HCPs fall short of what would be required for ESA survival and recovery, let alone what is required under the United States' trust obligation to the Tribe.

The No Action Alternative Is Inadequate

The NEPA requires that a No Action alternative be included in an Environmental Impact
45 Statement. See 40 C.F.R. § 1502.14(d). However, the way in which the No Action alternative is presented in the DEIS misrepresents the existing situation and sets it up so that it cannot be given serious consideration. For example, the discussion of the No Action alternative completely omits statutory authorities at relicensing. This is particularly key relative to the Rocky Reach project, which is currently going through the relicensing process. In addition, Section 1.7.3.1 of the DEIS references the settlement agreements under the Mid-Columbia Proceeding, but the analysis of the No Action alternative does not fully describe the settlements, cross-reference
46 them throughout, or analyze the level of species protection provided through the settlement agreements and coordinating committees. NMFS should reframe the No Action alternative so that it accurately represents the actions that may be taken under the existing license, settlement agreements and statutory authorities.

By failing to take into consideration the activities of the coordinating committees under the settlement agreements, the No Action alternative and the DEIS in general also fail to adequately consider the interests of the Tribe, to which the NMFS has a trust responsibility. The

Tribe is a party to the Mid-Columbia proceeding and has a place in the coordinating committees, which allows the Tribe to exercise its involvement in co-management of the Tribe's trust resources. If the HCPs are put into place, with the idea that the HCPs will supercede these settlement agreements, the fishery-related signatories to the HCPs become a new coordinating
47 committee. See DEIS at 1-9, 1-15. However, if the Tribe is not able to sign the HCPs due to a lack of bargained-for consideration and assurances from the federal government, then the Tribe's participation in co-managing its trust resources may be affected. This should be addressed in the No Action alternative and factored into the comparison of the other alternatives.

The Comparison of Alternatives 2 and 3 Is Inadequate

The DEIS creates the illusion that Alternatives 2 and 3 are very much alike and neglects to highlight the very real and substantive differences between them. The DEIS also unfairly
48 downplays certain benefits of Alternative 2 in order to emphasize certain provisions of Alternative 3, making Alternative 3 seem like the better choice even though it may not be.

For example, the DEIS states that NMFS would require measures for tributary habitat
49 improvement under Alternative 2 just as such improvement would be required under Alternative 3. See DEIS at 4-32—4-33. (Note that elsewhere in the DEIS it states that tributary enhancement is only provided by Alternative 3. See, e.g., DEIS at 4-77). However, the DEIS provides no analysis of whether the tributary habitat improvements provided through Alternative 3 are even adequate, or whether the funding proposed is adequate to accomplish what is
50 necessary for ESA requirements. The DEIS also does not discuss whether greater protection could be provided under Alternative 2, as it most likely could were it needed to provide a measurable benefit to the fish.

The DEIS downplays Alternative 2 and underscores Alternative 3 by asserting that
51 Alternative 2 would only protect ESA-listed fish while Alternative 3 would provide additional protection for non-listed species. However, measurements under Alternative 3 are likely to use target species to represent the level of protection being provided to the other species. See DEIS at 2-41 (discussing the PUDs proposed use of "representative survival studies" on yearling Chinook and steelhead). Given the complications with measuring survival of listed as well as non-listed species, the level of protection provided under either alternative is likely to be gauged off of target species. See discussion of measurement and evaluation below. Furthermore, non-
52 listed species such as lamprey and sturgeon, which are not included in the HCPs, would need to be considered at relicensing under the Federal Power Act and are currently taken into account by members of the Mid-Columbia coordinating committees. Listed species, such as bull trout, are also not covered by the HCPs, but would have to be addressed under Alternative 2, and
53 Alternative 3 would most certainly affect USFWS' ability to meet its federal responsibilities for that and other listed species not covered by the HCPs. Therefore, it is not accurate to assume that Alternative 3 will provide a broader range of protection than the other alternatives.

Another concern that the Tribe has with the DEIS is that it repeatedly asserts that Alternative 2 would be thwarted by indefinite delays. See, e.g., DEIS at 1-15. Because the DEIS uses "the speed at which each alternative could be implemented" as criteria for comparing

Alternatives 2 and 3, DEIS at 2-49, it appears that the "indefinite delays" are used to weigh against Alternative 2 in favor of Alternative 3. However, the YN believes that "indefinite
54 delays" under Alternative 2 are theoretical and impracticable, and as such, should not be used to justify a decision in favor of Alternative 3. The absence of protection from the Section 9 takings prohibitions could be a significant motivator for the Public Utility Districts to seek Section 7 protection in the absence of a Section 10 permit. Furthermore, Alternative 3 may likewise suffer theoretical delays if the tools used by the Public Utility Districts in the HCP toolbox fail to provide improvement in survival and recovery or if the Public Utility Districts believe they have met a standard or wish to use a specific tool even though all others disagree,[1] yet such delays are not factored into the analysis of Alternative 3.

55 Finally, the Tribe believes that the DEIS improperly includes drawdown as an option under Alternative 3, which further attempts to blur the distinction between Alternatives 2 and 3, though drawdown is really only an option under Alternative 2. We discuss this further below.

Under Alternative 3, the DEIS Should Address Limits on Statutory Authorities and the Trust Responsibility.

56 The HCPs that make up Alternative 3 may place significant limits on the statutory authorities of federal agencies and on the ability of such agencies to comply with their trust responsibility to the Tribe, yet the DEIS fails to consider or assess these limitations. For example, under the dispute resolution provision of the HCPs, the NMFS's decision-making authority on scientific information is forfeited to a neutral third party. Furthermore, the No
57 Surprises assurance prohibits NMFS and other agencies from exercising authorities and responsibilities by pre-determining what measures are required and prohibiting the imposition of additional mitigation.

58 If NMFS chose Alternative 3 as its preferred alternative, NMFS would predetermine the operations of the hydroelectric projects before the FERC could determine whether the amended or new license it issues complies with the Federal Power Act and FERC's trust responsibility. At relicensing, all of the participating state and federal agencies, such as the Washington Department of Ecology, FERC, USFWS, and the Bureau of Indian Affairs, would be constrained from exercising their statutory authorities to require what they believe is necessary for protection, mitigation and enhancement under the Federal Power Act or for meeting their trust obligation to tribes. These limitations on the authorities and responsibilities of other agencies should be addressed in the DEIS.

[1] As a case in point, the Tribe's representatives (and others as well) on the Mid-Columbia Coordinating Committee (MCCC) are currently experiencing difficulty with Chelan Public Utility District, who asserted at an April 2001 MCCC meeting that it can meet a 95% survival rate by operating its bypass system, providing a $5 million habitat mitigation fund, and generating electricity with water that would otherwise be used for spill. The Tribe's representatives have been given very little to no input on the decision-making and have asserted that there is no scientific information being presented to demonstrate that Chelan has reached a reasonable conclusion. Thus, if history is any indication, Alternative 3 is likely to be thwarted by even greater delays than those imagined under Alternative 2.

The No Surprises Assurance Is Inappropriate for These HCPs

The No Surprises rule was adopted in order to provide certainty for landowners that additional land or other mitigation (financial resources) would not be required of them for the protection of listed species except in "extraordinary circumstances." Instead, the obligation for providing the necessary, additional mitigation would rest with the federal government or other non-federal landowners who lack their own similar assurances under the ESA. For example, if non-federal landowner "A" has an HCP that fails to provide adequate habitat for spotted owls, Landowner A's neighbors, the United States Forest Service and non-federal landowner "B," would have to keep their lands available for the habitat needed by the owls.

In the aquatic situation such as the Mid-Columbia HCPs, however, there are no "neighboring landowners" to be responsible for habitat or other protective needs. For example, even if the federal projects upstream and the non-federal and federal projects downstream of the Chelan and Douglas were required to provide 100% survival in order to make up for declines allowed by the HCPs, the fish and the water nevertheless must pass through the Chelan and Douglas projects. To roughly translate this to the land-based HCP as outlined above, it would be as if Landowner A's HCP allowed him not only to destroy owl habitat, but to shoot at all owls that flew over his property on their way to the habitat being preserved by the United States Forest Service and Landowner B.

59 The river and the hydroelectric system are so interconnected that there are not adequate "neighbors" to make up the difference if needed by the anadromous fish. The Tribe is concerned that the application of the No Surprises assurance to a river-based HCP may result in the NMFS seeking to restrict the Tribe's fisheries. However, the Tribe would view this as a breach of fiduciary duty and a violation of federal case law. Therefore, the DEIS should provide an analysis of the feasibility of the No Surprises assurance to the HCPs and the extent to which shortcomings in protective measures could be met, keeping in mind the federally recognized and protected resource rights of the Tribe and the United States' trust responsibility.

No Net Impact Under Alternative 3 is Misrepresented in the DEIS

60 The YN believes that the "100% No Net Impact" (NNI) standard of the HCPs in Alternative 3 is misrepresented in the DEIS, which fails to take into account recent scientific information. NNI represents 91% dam passage survival (which includes a 95% juvenile dam passage survival component) and 9% mitigation (7% via hatchery compensation and 2% via tributary improvements). .The 100% NNI concept was created with the idea of making the dams "invisible" to the fish. The concern that the Tribe expressed in its Scoping Comments is that the components of NNI do not add up to 100% because the gains in survival may be exponentially additive but not linearly additive, and the components consist of different "currency" by mixing juveniles with adults.

61 The 9% mitigation requirement fails to assure the benefits that it is presumed to provide. The parties to the HCPs are not even thinking about measuring the 2% habitat component, but instead plan to just assume that the funds will provide a 2% benefit. There has been no analysis

of whether the proposed funding levels will be capable of providing the presumed benefit. The 2% number is in fact pure fiction. The YN is very concerned that the funding levels are inadequate. The bulk of the funding for the tributary plan was to come from Grant County Public Utility District when it was involved in the HCP negotiations. Once Grant pulled out of the process, the total amount of the tributary fund was greatly reduced, even though it started out much lower than many of the fishery parties thought necessary to confer a 2% benefit. Subsequently, Douglas County Public Utility District's share of the funds may be reduced in half of what it originally proposed to provide. In the YN's opinion, the tributary fund is thus left much under-funded. In its Scoping Comments, the Tribe requested a watershed analysis to further explore this concern. The DEIS should provide such an analysis in order to determine whether the funding will provide the needed benefit.

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63 There also exists a lack of certainty regarding the 7% hatchery compensation level. If the Public Utility Districts are not allowed to meet the 7% component through hatcheries, then there will be a deficit in the required mitigation. NNI would not be achieved, but the HCPs would allow the hydroelectric projects to continue taking fish. The DEIS takes this in account in some places, but fails to address it in others, and the lack of obtaining the 7% is not factored into any analyses of Alternative 3 that we could locate. The DEIS also fails to provide evaluation of the adequacy of the proposed mitigation plan as the Tribe requested in its Scoping Comments.

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65 Further, there is reason to believe that adult losses are much greater than the 2% estimated, yet the HCPs require mitigation for only 2% through either habitat or hatchery, neither of which are guaranteed. The DEIS should provide analysis of actual adult losses, examine the adequacy of the adult passage plans, and address mitigation for adult losses under the various alternatives.

66 Despite the lack of analysis and the problems with the concept of 100% NNI, the DEIS frequently states that the HCPs "*guarantee* 100 percent no net impact for each of the Plan species." See, e.g., DEIS at 2-54 (emphasis added). The DEIS also lacks any analysis as to whether 95%, 91% and 100% NNI will meet ESA requirements and the requirements for protection, mitigation and enhancement under the Federal Power Act. These and other concerns about the NNI standard were set forth in the Tribe's Scoping Comments, but were not considered or analyzed in the DEIS as requested. The Tribe hereby reiterates its request that these NNI issues be addressed in the DEIS, as well as the following:

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- 68 Assess potential impacts on species within the first five years of the HCPs, during which time the NMFS and USFWS cannot prescribe or preempt the plans of the Public Utility Districts;
- 69 Analyze and explain the biological basis for the draft HCPs' assumption that 91% survival + 7% hatchery mitigation + 2% tributary mitigation are additive to guarantee zero impact on the species;
- 70 Examine the relationship between the NNI standard and long-term stock viability;

71 • Analyze whether or not the proposed measurement of the performance standard for 95% Juvenile Dam Passage Survival, by measuring juvenile survival over only 95% of the run, ensures a juvenile passage mortality of only 5% such that the draft HCPs address full mitigation for take;

72 • Examine passage impacts to anadromous fish and lamprey and descaling injuries (particularly on sockeye) if screens are installed and assess whether such impacts are accounted for within the NNI standard;

73 • Determine what impacts may occur during the time period that elapses before the Public Utility Districts actually meet the proposed survival requirements and analyze whether those impacts can or will be appropriately mitigated;

74 • Determine impacts on the species should the survival goals never be reached during the term of the HCPs;

75 • Assess impacts on spring migrating Chinook salmon if exempted from 95% Juvenile Dam Passage Survival as planned (See Wells Agreement at Sec. IV(1)(b)); and

76 • Provide an accurate evaluation of losses and determine whether the mitigation proposal is supported by adequate data to ensure no unmitigated take.

SPECIFIC COMMENTS

Drawdown

77 The YN is very concerned about the misrepresentative nature of the DEIS' references to drawdown in the comparison of the alternatives. The DEIS states that the Public Utility Districts, the NMFS and the USFWS can mutually agree to drawdown (or dam removal or non-power operations). See, e.g., DEIS at 2-33. This is true under the HCPs *only if* NNI has not been achieved and maintained after 20 years has elapsed but the Public Utility District is otherwise in compliance with the Section 10 permit. See, e.g., Wells Agreement at Sec. II(2)(a)(ii). Furthermore, the topic of agreement among the Public Utility District, the NMFS and USFWS is not to *implement* drawdown, but to allow the NMFS to pursue such a measure. See id. There is *no* ability to use drawdown even if, though NNI has been achieved, the anadromous fish resource is not rebuilding and the Public Utility Districts' hydroelectric projects are a significant factor in the failure to rebuild. See id. at Sec. II(2)(a)(i).

78 Instead, the HCPs provide, under the Assurances sections, that drawdown is precluded from consideration: "[E]ach Party during the term of this Agreement *will not advocate for or support* additional or different fish protection measures or changes in Project structures or operations other than those set forth in this Agreement. This Agreement *does not include* as Measures: partial or complete *drawdowns*, partial or complete dam removal, and partial or complete non-power operations." See, e.g., id. at Sec. IX(10) (emphasis added). Furthermore, the Public Utility Districts party to the HCP negotiations were adamant that none of the other parties to the HCP negotiations even breathe a word about drawdown, to the extent that the parties joked that they could not say the word "drawdown" at a cocktail party. Thus, based on the intent of the Utility Districts and the language of the HCPs, drawdown is not at all an option under Alternative 3.

79 By lumping drawdown into Alternative 3, even though the HCPs basically forbid its use, and pretending that Alternative 3 is no different on this issue than Alternatives 1 or 2, blurs one of the more substantive distinctions among the alternatives. The YN opposes the NMFS's approach on this issue.

80 Furthermore, the DEIS states that drawdown could not be required under Alternative 2 except at the time of relicensing. DEIS at 4-29. If the NMFS requires drawdown as a reasonable and prudent alternative under the Section 7 process, but the license is not amended to include the drawdown requirement, then the Public Utility Districts would be in violation of the ESA. Perhaps there is a reason why drawdown can be required only at relicensing, but the Tribe is not currently aware of such. The YN thus requests a detailed explanation. Even if the DEIS is correct, the possibility of drawdown exists for each of the three projects under Alternative 2 because all of them will be relicensed at some point during the next 50 years (which would be the term of the HCPs).

81 Drawdown must therefore be given serious consideration under Alternative 2 and should also be analyzed as its own alternative as the Tribe requested in its Scoping Comments. The YN understands that the DEIS finds drawdown to be an unrealistic alternative, DEIS at 2-48, yet such a blanket statement without any discussion or analysis is inadequate. Additionally, the emphasis that the DEIS places on the ability to use drawdown as a tool under Alternative 3 (though false) indicates that it is not as valueless as it is made to seem under the other alternatives. These problems with the approach to drawdown must be accurately resolved in the revisions to the DEIS.

Measurement and Evaluation of the HCP Permit Obligations

The YN believes that the measurement and evaluation provisions of the HCPs are key to determining whether the Public Utility Districts are meeting the permit obligations and what impacts the dams are having on the anadromous fish resource. However, there are no methods to which the parties agreed for measuring the standards or for what species and life histories to study. The DEIS states, "There is currently no methodology that all parties support for determining the survival of adult fish through the projects." DEIS at 2-41.

82 If measurement and evaluation cannot at least initially be decided, it could result in years of delay where the Public Utility Districts fail to actually meet the standard but are allowed to take species nonetheless. Similarly, there is no standard or method for measuring the "steady process" required within the first five years of the HCPs. Due to the uncertainties in measuring
83 the standards, and the assumption of certain components of NNI (see above), it could be next to impossible to determine whether or not the Public Utility Districts are achieving the proposed NNI standard on which the permit would be based. The DEIS should squarely address this issue.

Baseline

84 The YN believes that the DEIS must discuss the impacts that Alternative 3 would have on the Tribe's treaty resources. In order to do so, it is imperative that the baseline from which the improvements or impacts are measured is proper. However, the DEIS uses Alternative 1 as the

baseline condition, DEIS at 2-22, which fails to account for whether existing mitigation or compensation levels are adequate and presupposes that existing degraded conditions do not need to be considered.

The DEIS states,

> Mitigation measures for these impacts have already been implemented as part of the existing licenses. Prior activities are not considered an action subject to additional mitigation beyond license requirements unless they are considered to cause a continuing "take" of a listed species as defined under the [ESA]. Existing hatchery production levels are initially assumed to provide adequate compensation for original inundation by the projects. Therefore, the baseline is considered to be the existing conditions. These baseline conditions also form the basis for determining what effect continuation of the existing conditions would have on listed species. The baseline conditions that existed as of January, 1997, would be used to determine if progress were being made to increase the survival of the Plan species through the implementation of the HCPs.

DEIS at 2-23.

85 The YN disagrees with the DEIS's assumptions. Use of the currently degraded environment as the measuring stick for determining what harms and benefits the alternatives will have on treaty resources fails to take into consideration the fact that the development of the hydroelectric projects set in motion a decline in fish populations that is still being felt in the Basin and that is still negatively impacting tribal trust resources. Instead, the Tribe requested in its Scoping Comments that the DEIS use a natural river baseline. The 1995-1998 Biological Opinion on the Federal Columbia River Power System, drafted by NMFS, was of the opinion that an accurate baseline relative to considerations about hydroelectric dams examines continuing effects of previous degradations. It defines the environmental baseline as the effects of the proposed action as added to past and present impacts of all Federal, State, and private activities in the action area, which is itself defined as all areas directly or indirectly affected by the federal action and not merely the immediate area involved in the action. See Biological
86 Opinion at 12. As NMFS has done in the past, it should recognize in the DEIS that the nature and extent of ongoing impacts must be analyzed in a systematic way.

Lamprey and Sturgeon

87 The YN believes that lamprey and sturgeon should be given greater consideration in the DEIS. Comments about lamprey and sturgeon are sprinkled throughout the DEIS, but the analysis of the impacts or benefits to these species is inadequate.

88 For example, the DEIS states in general terms that lamprey and other species (trout) are "expected to benefit" from the tributary improvements that would take place under the HCPs, but the DEIS contains no data or analysis to support such an assertion. Though not a species listed under the ESA, Alternative 2 may have benefits or impacts on lamprey, which are not mentioned

in the Environmental Consequences discussion about Alternative 2. Because lamprey are an important part of tribal culture and a subject of the federal government's trust responsibility, the Tribe is very concerned that such a species receives so little attention in the analysis.

89 Sturgeon is likewise given very little attention in the DEIS. Though listed as a resident fish resource, DEIS at 3-47, it is not discussed under the life histories section, DEIS at 3-47—3-52, and is not even cross-referenced in the Environmental Consequences Sections that address
90 fishery resources under Alternatives 2 or 3. Though little may be known about lamprey and sturgeon, as the DEIS suggests, DEIS at 4-27—4-28, consideration of the impacts and benefits to these species, based on analysis, should be included under all of the alternatives.

Long-Term Risks

91 The YN is concerned that not enough deliberation has been given to the long-term risks of Alternative 3. See DEIS at 4-77. We believe that NMFS should place greater weight on the risk of uncertainty over the 50-year period of the proposed Section 10 permit, especially because the NMFS recognizes the "limits of existing information." Id. NMFS should also assess the lack of ability to apply greater protective measures relative to long-term risks given the No Surprises
92 assurance. Even though the HCPs contain adaptive management provisions, the framework of the HCPs is locked in for 50 years and the federal resource agencies will be prohibited from requiring higher survival levels if needed and if technology allows.

93 The DEIS also fails to assess the consistency of the alternatives under the concept of a normative river and multi-species restoration, determine risks posed through a probability of assumptions being mistaken over long periods of time, address how the alternatives may select against certain species and life histories, and examine opportunities for and feasibility of reintroducing Coho. The Tribe requested in its Scoping Comments that these risk issues be addressed in the DEIS and reiterates its request here.

Measures for Adult Fish

The HCPs fail to adequately address adult passage and survival standards and measures, which are in turn inadequately addressed in the DEIS. The adult anadromous fish issue was a significant sticking point during the HCP negotiations, with the result being inadequate provisions for adult in the HCPs. Though the HCPs take into account some adult losses (an assumed 2% that figures into the 9% mitigation component of No Net Impact), the actual amount
94 of adult losses has not been quantitatively measured. Such a lack of measurement is likely to allow the Public Utility Districts to ignore operational and structural fixes under Alternative 3 that could be made at their projects to benefit adults. This factor should be taken into account in the DEIS analysis and comparison of the alternatives, particularly because returning adults that make it to the spawning grounds contribute significantly to the next generation of juveniles. Adults must not be forgotten or ignored in the environmental review. Furthermore, under each
95 of the alternatives, the DEIS should provide a discussion and analysis of measures and standards that could increase adult passage survival, such as improved passage time, reduction of adult fallback rates, and limits on power peaking operations.

Summer/Fall Chinook

96 The Tribe believes that the DEIS should not lump the summer and fall Chinook together as one species. Under the HCPs, at the request of the tribes participating in the negotiations, the parties made a conscious decision to list the species separately. For example, the Wells Agreement defines "Plan Species" as "spring, summer and fall Chinook salmon." Wells Agreement at Sec. XIII(11). The Tribe has previously provided extensive comments to the NMFS on the proposed listing of summer Chinook demonstrating clear distinctions between summer and fall Chinook in run timing, spawning locations and flesh quality. Yakama Nation. 1993. Comments on the Proposed Listing of Mid-Columbia Summer Chinook Salmon Under the Endangered Species Act. Yakama Nation Fisheries Resource Management Program. p. 19. The YN thinks that the analysis contained in the DEIS regarding effects on the species should thus treat each race as independent of the other.

Evolutionarily Significant Units (ESU)

97 The DEIS fails to clearly identify the standard by which the status of the ESU is measured. We understand that NMFS has established by rule that the Upper Columbia River (UCR) spring Chinook ESU is comprised of naturally-spawning spring Chinook returning to
98 tributaries above Rock Island Dam, and UCR steelhead as those above Priest Rapids Dam. The DEIS appears to establish separate measures and standards for the recovery of three tributary populations in the Wenatchee, Entiat, and Methow rivers. The geographic place and biological terms that will be used to measure progress toward recovery of these ESUs should be clearly
99 described, along with any applicable law or policy. The YN also requests that the NMFS provide an explanation of its authority to manage units smaller than the ESUs.

Economic Impacts on Tribes

100 Section 3.7 of the DEIS addresses socioeconomic impacts on populations, employment and income. However, the Tribe believes that consideration should be given to the impacts on Tribes for loss of fishing due to reductions in the Tribe's treaty resource. The wealth of salmon that the Tribe used to enjoy has been redistributed to non-tribal persons or entities in the form of irrigation, navigation, and flood control, to name a few. This redistribution has resulted in significantly high poverty rates and death rates for tribal members above those of the non-Indian population or non-tribal communities. See CH 2 M Hill. 1999. Human Effects Analysis of the Multi-Species Framework Alternatives (prepared for the Northwest Power Planning Council).

Specific to the mid-Columbia hydroelectric projects, the dams have been recognized as taking away sustainable wealth from the tribal people. Id. The YN's tribal members now take less than 10% of the fish that they used to take in traditional salmon harvests, which significantly contributes to the YN's low per capita income (43% of that of the State of Washington) and high
101 poverty levels(42.8% compared to 10.9% in Washington). Id. Every juvenile salmon that survives the hydroelectric system and returns as an adult brings back to the Tribe some of the river's wealth for tribal economy and culture. The DEIS alternatives must therefore be evaluated

as to their effects on tribal culture and economics, and their ability to redistribute the river wealth back to tribal peoples.

Scoping Comments

The YN wishes to incorporate by this reference anything not specifically addressed in these comments, but addressed in the Tribe's Scoping Comments filed in conjunction with the Columbia River Inter-Tribal Fish Commission and the Confederated Tribes of the Umatilla Indian Reservation. The comments were filed on February 5, 1999 and are part of the Scoping record. We also point out that the Tribe has not yet received a response from the NMFS on its Scoping Comments, which were never specifically addressed in the scoping meetings. 102

CONCLUSION

Based on the above comments, the YN believes that the NMFS should immediately withdraw the DEIS. 103 The HCPs need finalization before environmental review should take place. At the least, the DEIS is in need of significant revisions and additions as described above. In the meantime, 104 the YN believes that the only option available is to immediately begin Section 7 consultation in order for the Public Utility Districts to receive protection under the ESA. Furthermore, the stakeholders in the region should be allowed to participate in the relicensing of the Rocky Reach project without the constraint of the HCP, 105 since there is a complete lack of closure and absence of an agreement.

We again thank you for the opportunity to present the comments of the Yakama Nation on the DEIS. If you have any questions, please contact Tim Weaver at 509/575-1500, Starla Roels at 503/242-1745, or Steve Parker or Bob Rose at 509/865-6262.

Sincerely,

Tim Weaver /by SKR

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Yakama Nation (YN)

Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]	Comment #	NMFS Reference #[1]
1	19	37	31, 41	73	22
2	49	38	6	74	22
3	19, 44	39	55	75	28
4	47	40	6	76	41
5	44	41	6	77	24
6	15	42	6, 52	78	24
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8	37	44	24	80	24
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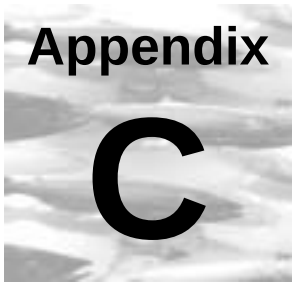
[1] see Appendix C



NMFS Responses to Comments

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Appendix C
Response to Comments

Water Quality

Comment 1 *Several commenters questioned the statement that the Mid-Columbia River projects have limited influence over water temperatures in the reach. They requested data to document the potential influence of the projects on water temperature and travel time, as well as monitoring requirements under the action alternatives to determine the potential effects on critical habitat and fish survival. It was also suggested that operational changes or changes to the water release schedule at Grand Coulee Dam could be used to regulate water temperatures.*

Response 1 Statements about the influence of Mid-Columbia River hydroelectric projects on water temperatures were based on literature cited in FEIS Section 3.3.2.1, Project Area. The spatial and temporal distributions of temperatures within the Mid-Columbia River were examined in the Rocky Reach reservoir during the critical period of August 2000 (Parametrix, Inc. and Thomas R. Payne & Associates 2002). Vertical profile measurements in different areas of the reservoir confirmed the absence of thermal stratification, as expected in these run-of-the-river reservoirs. Even in the forebay, the deep waters were no more than 0.3° C cooler than surface waters. Because the Mid-Columbia River reservoirs do not provide storage, the waters are well mixed and temperatures are relatively uniform. Also, the temporal differences between daily minimum and maximum temperatures were rarely more than 1° C. Because of the lack of temperature variability within the reservoirs, modifications to Mid-Columbia River dam operations would not have a substantive effect on the water temperature regime. Although the operation of Grand Coulee Dam is outside the scope of this EIS and the alternatives, revisions regarding Grand Coulee operations and cold water releases were made to FEIS Section 3.3.1.1, Project Area. The greatest degree of modifying dam operations, reservoir drawdown, is addressed under Alternative 2 (FEIS Section 4.3.2.2, Alternative 2), and measurable changes in water temperature were not expected to occur.

There are no reliable pre-dam temperature data to determine if the observed differences are a natural function of solar warming or are in some part attributable to the reservoir operations. Chelan County PUD has recently begun a project to model water temperature conditions in Rocky Reach reservoir to provide more information on this issue. Pre-project temperature conditions will be modeled by re-creating historic width-to-depth ratios for this Columbia River reach and examining the change in topographic shading effects from lower water levels. Water quality monitoring would be the same for all alternatives, as none of the alternatives would affect the requirements of meeting Federal or State water quality standards. Rocky Reach water temperature monitoring data has been added to FEIS Section 3.3.2.1, Project Area.

Flushing rate data were added to FEIS Section 3.2.10.2, Project Area Rearing. Beak Consultants, Inc. and Rensel Associates (1999) reported mean flushing rates of 1.5 days in the Wells Dam reservoir and 1.8 days in the Rocky Reach reservoir. Average travel time in the river without the dams is unknown; however, the increased size of the river cross-section resulting from raising water levels upstream from the dams reduces river velocities. Chelan County PUD (1991) estimated that a 3-foot increase in the Rocky Reach reservoir elevation would result in velocity reductions of 0.04 to 0.06 feet per second, depending on river flows. Therefore, increased travel times through each of the reservoirs since construction of the dams is likely on the order of hours rather than days.

Although there is no ability to spill colder deep waters at Grand Coulee, relatively cool water is released through the turbines, which reduces maximum summer temperatures. However, diverting generation to Grand Coulee is outside the scope of alternatives evaluated in this FEIS. Creating shade at the mouths of tributaries is an option for review by the tributary committees in identifying projects to fund through the Tributary Conservation Plan.

Although the DEIS included a discussion of critical habitat that was designated for spring-run chinook salmon and steelhead in the Mid-Columbia River region, Judge Colleen Kollar-Kelly of the D.C. District Court entered the consent decree resolving claims in the National Association of Homebuilders' litigation regarding critical habitat designations for 19 Evolutionarily Significant Units previously filed with the court. That decree vacated the critical habitat designations and remanded them to NMFS for new rulemaking. As a result, critical habitat designations no longer have independent legal significance. However, if critical habitat is redesignated prior to the full implementation of the HCPs, it will be included in the HCP biological opinions. Therefore, the adverse modification standard for essential features of critical habitat and the analysis of effects on critical habitat have been removed from the FEIS.

Regardless of the legal significance of critical habitat designations, NMFS must consider the effects on the listed species' habitat to determine whether an action is likely to jeopardize the species. In addition, the mainstem Columbia River is considered part of the Essential Fish Habitat for commercially harvested fish species covered by the Magnuson-Stevens Act. Therefore, the potential effects of the FEIS alternatives on anadromous fish habitat in the mainstem Columbia River are addressed in the FEIS.

Unlike the Snake River or lower reaches of the Columbia River, the middle reach of the Columbia River typically does not exceed 15º C prior to mid-June and rarely exceeds 20º C at any time during the summer (Columbia Basin Research 2002). Thus, any deleterious temperature effects on adult or juvenile anadromous fish or resident fish in the mainstem river resulting from the Douglas or Chelan County PUDs' projects are likely non-existent during the spring migration and negligible to extremely small during the summer and fall migrations.

Comment 2 *The EIS should explicitly state that the 120 percent saturation criterion is a special exemption for spilling water to aid in fish passage and that the criterion at all other times is 110 percent, and explain the implications. This waiver is granted because the benefits of moving fish downstream outweigh the potential impacts of total dissolved gas levels of up to 120 percent. Mitigation for the effects of spill on total dissolved gas levels or provisions for gas abatement efforts should be provided. The EIS should include upstream and downstream projects in relation to meeting the total dissolved gas water quality standards. The responsibilities and rights of the regulatory parties to enforce water quality standards under each alternative should be explained.*

Response 2 Pertinent sections of the FEIS were modified to explain the variable total dissolved gas standards (including FEIS Sections 2.3.2.1, Wells Hydroelectric Project; 2.3.2.2, Rocky Reach Hydroelectric Project; and 2.3.3.4, Rock Island Hydroelectric Project). FEIS Section 3.3.2, Water Quality of the FEIS provides more detail on water quality standards, including those for total dissolved gas. The effects of juvenile fish bypass requirements on total dissolved gas levels in the river are common to all alternatives. Neither action alternative relieves or alters any responsibility of the PUDs to meet State or Federal water quality criteria. Compliance with these laws is also a FERC license/relicensing issue, thereby providing other regulatory and management entities the ability to enforce water quality compliance issues under all the alternatives. The HCPs require the signatory parties to work together to address water quality issues (see Section 5 of the Wells HCP [Reservoir as Habitat and Water Quality] and Section 6.3

of the Rocky Reach and Rock Island HCPs [Reservoir Habitat and Water Quality), but do not establish the actions necessary to satisfy the Clean Water Act.

Upstream and downstream dams are considered in the cumulative effects of the alternatives provided in Chapter 5 of the FEIS, which includes total dissolved gas impacts. The PUDs have no control over the operation of upstream Federal projects.

Under the HCPs (Alternative 3), the HCP signatory parties recognize that total dissolved gas supersaturation is a cumulative effect of hydropower operations in the Columbia River and are committed to addressing these issues (see Section 5.3 of the Wells HCP [Reservoir as Habitat and Water Quality] and Section 6.3 of the Rocky Reach and Rock Island HCP s [Reservoir Habitat and Water Quality]). The PUDs and/or the coordinating committees would consider these restrictions when determining the appropriate measures for meeting the fish survival performance standards. Any impacts to fish survival related to exceeding water quality parameters would affect the ability to meet the total project passage survival standards set in the HCPs. In addition, any impacts to fish survival at downstream hydroelectric projects (for example, spill reductions due to increased total dissolved gas levels in the Wanapum Dam forebay) resulting from efforts to meet survival standards at the Douglas or Chelan County PUD projects would be similarly considered.

Turbidity and Erosion Mitigation

Comment 3 *Table S-3 states that if reservoir drawdown occurs, erosion and reservoir turbidity would initially increase over the short term and damage aquatic habitat conditions, with the greatest damage occurring during the first 4 to 7 years. The EIS should identify ways to mitigate these impacts if any exist. The EIS should discuss how the loss of natural turbidity due to the existence of the projects has contributed to the decline of salmon productivity.*

Response 3 The actual amount of erosion and resulting turbidity, and the consequent effects on aquatic habitat, are uncertain and were overstated in the DEIS. This has been revised in the FEIS. Moderate increases in turbidity may not have adverse effects on aquatic habitat in a river that was likely more turbid before upstream dams were built. Some areas of the shoreline are naturally or artificially armored with rock, and little erosion would be expected in those areas. More erosive shoreline areas would be seeded and/or treated with erosion control materials if drawdown occurred and excessive turbidity was predicted.

Although drawdown is identified as a potential option in the FEIS to improve fish survival rates, it is an option common to both action alternatives. As a result, a detailed evaluation of this option would not provide valuable information in the comparison of the alternatives. The FEIS also indicates that the environmental consequences related to a drawdown scenario are significant enough to require a more specific and detailed environmental review and NEPA analysis.

Comment 4 *The EIS should discuss plans to modify the projects or their operations to comply with water quality standards. Consideration of water quality effects, including opportunities for improvements, should be part of all bypass development plans.*

Response 4 None of the FEIS alternatives relieve or alter any responsibility of the PUDs to meet State or Federal water quality criteria. The use of spill may be restricted to meet the total dissolved gas criteria, to the extent necessary to achieve the HCPs' survival standards. Project operational or structural modifications made by the coordinating committees would likely consider potential water quality effects before implementation. Douglas County PUD has developed a bypass

system at the Wells Dam that reduces the amount of spill required to pass substantial numbers of fish and also meets the HCP juvenile project passage survival standard, thereby reducing the total dissolved gas levels downstream. Chelan County PUD is currently constructing a surface bypass system at Rocky Reach Dam that is expected to minimize the amount of spill needed to meet fish passage or fish survival criteria. Section 7 consultation with NMFS for this construction project was completed in 2002 (NMFS 2002a). However, evaluations at Rocky Reach Dam suggest that project operations typically result in little or no increases in total dissolved gas levels as water passes the project (Parametrix 2000b). Spill gate modifications are being evaluated at Rock Island Dam to improve fish passage efficiency while reducing spill volume requirements.

Biological Opinion and its Relationship to the EIS

Comment 5 *Several commenters suggested that the EIS should not be proceeding until the biological opinions are written for the projects. They expressed concern about being able to provide adequate review and comments on the proposed action and its effects unless the alternatives are disclosed in their entirety. If the biological opinion for the preferred alternative contains different or additional mitigation measures than what is provided in the EIS, commenters stated that a supplemental EIS would be required. It was also suggested that, if biological opinions were written for Rock Island and Rocky Reach dams, the framework of the alternatives would likely change.*

Response 5 Actions described in the FEIS represent the most likely measures to be implemented under Alternatives 1, 2, or 3 at this time. However, presupposing all potential measures or combinations of measures is not possible given the available information and the status of existing technologies. New technologies may be developed or a combination of measures not currently considered may eventually prove to be the most effective program for increasing survival of Endangered Species Act-listed or Plan species over the long-term. All of the information utilized by NMFS to reach a decision on issuance of the Section 10 permits has been disclosed in the FEIS.

Biological opinions will be issued for all dams regardless of which alternative is selected (although the biological opinions would be written at different times). The basic content would be similar for both action alternatives because the biological opinions would be based on the best available data. Many issues raised from comments on the DEIS were resolved through subsequent discussions amongst the PUDs, NMFS, and the other Joint Fisheries Parties during the fall/winter of 2001/2002. The resolution of these issues has been fully described in the revised HCPs and FEIS, and adequately identifies the most likely future alternatives for evaluation in both the FEIS and the biological opinions.

Although the additional negotiations did not result in substantial changes to the HCPs, the negotiations resulted in establishment and clarification of specific guidelines to assess and/or monitor the measures implemented at the projects to meet and maintain the standards identified in the HCPs. The negotiations also established additional and specific schedules for assessing the effectiveness of the HCPs for providing the necessary protection for all Plan species. The clarification of these issues was the direct result of comments received during the NEPA scoping meetings and the public comment period for the DEIS. The first page of each chapter in the FEIS provides a synopsis of the changes that were made and the rationale behind the changes.

Cumulative Effects

Comment 6 *The DEIS does not adequately address or analyze (1) connected actions, (2) cumulative actions, and (3) similar actions, as is required under the NEPA process. Some specific information*

requested for inclusion in the cumulative effects section was the effects of smolt outplanting on wild fish, entire life history of each species, navigational channel deepening project, a reach-based perspective, and inclusion of more fish species and more natural resources.

Response 6 The scope of the DEIS includes the three actions as described above in the comment. Connected actions occur within and between the projects. All the fish protection measures at each dam would be considered potentially connected actions and are addressed individually and collectively in the FEIS. Cumulative and similar actions (fish protection measures and environmental factors that could affect the listed species in the Columbia River system) are described in the Quantitative Analysis Report (QAR), a summary of which is included in Appendix E and Chapter 5 of the FEIS. The QAR incorporates the actions expected to occur in the Lower Columbia and Mid-Columbia River reaches (except for the hatchery supplementation provisions of the HCPs), as well as factors that affect the entire life cycle of the fish to assess cumulative and similar actions. Chapter 5 of the FEIS describes the cumulative effects analysis, which includes the hydropower projects throughout the Columbia River and the initiatives developed in the basin to address salmon and steelhead recovery.

Cumulative effects were shown for each resource in Chapter 4 of the DEIS (Environmental Consequences) under sections titled Columbia River System. To ease reader review of the cumulative effects, these individual sections have now been moved to Chapter 5 of the FEIS (Cumulative Effects). The QAR (Appendix E) includes survival through the total life history of the listed species and encompasses the overall geographic and environmental conditions that affect salmon and steelhead. This chapter includes discussions of harvest, hatchery production, habitat quantity and quality, and hydropower within the Columbia River Basin. Note that the mitigation proposed for the tributary habitat improvements represents program funding rather than specific projects. Therefore, a cumulative effects analysis for specific habitat restoration projects is not possible outside of its general benefit of improving overall fisheries habitat within the four tributaries.

Adequacy of HCPs

Comment 7 *The DEIS does not demonstrate that the HCPs are sufficient to protect anadromous fish in the Mid-Columbia River and that recovery will occur.*

Response 7 Text was added to FEIS Section 2.3.3.5, Adaptive Management, that includes a summary of how the projects affect overall survival for listed Upper Columbia River salmonids under Alternatives 1 and 2, and all Upper Columbia River anadromous salmonids under Alternative 3. The Quantitative Analysis Report (QAR) discussed in detail in Chapter 5 of the FEIS indicates that additional survival improvements in the Lower Columbia River, as well as improved egg-to-smolt and smolt-to-adult survival conditions, would be necessary to recover the species. However, QAR results also demonstrated an expectation that substantial survival improvements (16 to 25 percent for steelhead and 21 to 35 percent for spring-run chinook salmon) would occur as a result of meeting the performance standards in the HCPs. The analysis indicated an additional 6 to 10 percent survival benefit from tributary habitat improvements (assuming that the 2 percent mitigation level was achieved). Although the HCPs alone are unlikely to result in the recovery of either listed species, depending on the time period used in the model, the expected survival benefits would not appreciably reduce the likelihood of the survival and recovery of the species in the wild. The HCPs minimize and mitigate the impacts of the taking, to the maximum extent practicable.

Under Alternative 3, the HCP measures (including habitat improvement projects in tributary streams) would be implemented quickly with greater cooperation among the HCP signatory parties, and would additionally cover other unlisted anadromous species. The revised HCPs also establish specific methods that would be used to determine survival. The HCPs include a provision that the coordinating committees would decide on appropriate changes to these methods as assessment technology advances over the 50-year term of the agreements. The revised HCPs now require that a comprehensive analysis be prepared at the direction of the coordinating committees to (1) summarize the current status of each Plan species and (2) determine whether or not the no net impact standard is being achieved for each Plan species in 2013, and every 10 years thereafter (Section 6.9 of the Wells HCP [Progress Reports] and Section 4.9 of the Rocky Reach and Rock Island HCPs [Progress Reports]). If either of these conditions is not being met and the PUDs fail to implement agreed-upon measures to achieve or maintain the no net impact standard, NMFS may revoke the permit (after 2013 for Chelan County PUD and after 2018 for Douglas County PUD) to seek actions for achievement of the no net impact standard (see Section 2.2.1.2 of the Wells HCP [Elective Withdrawal Events Enough Already] and Section 2.1.2 of the Rocky Reach and Rock Island HCPs [Withdrawal From Agreement Enough Already]).

Some actions considered under Alternative 2 may provide similar or greater benefits than under Alternative 3. However, Alternative 2 has a much greater potential for litigation among interested parties, which would likely delay implementation of the measures, perhaps until (or even beyond) the expiration of the current project licenses. In addition, under Alternative 2 it is unlikely that unlisted species would receive the same level of protection as listed species or that tributary improvement projects would be funded.

Fisheries-Related Comments

Comment 8 *Summer and fall chinook salmon should not be considered a single species.*

Response 8 The chinook salmon status review (Myers et al. 1998) describes a variety of characteristics that support NMFS's Evolutionarily Significant Unit delineations for this species, including ecological and life-history parameters. NMFS also assessed available allozyme data for the proposed Evolutionarily Significant Unit and concluded that sufficient genetic similarities existed to include summer and fall chinook in the Upper Columbia River within a single Evolutionarily Significant Unit.

Comment 9 *What is the standard by which the status of the Evolutionarily Significant Unit is measured?*

Response 9 The standard by which the status of an Evolutionarily Significant Unit is measured is defined in law. The Endangered Species Act of 1973 as amended through the 100th Congress defines endangered as meaning "any species which is in danger of extinction throughout all or a significant portion of its range." Similarly, the Endangered Species Act defines threatened as meaning "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

In making its listing determination, NMFS must consider a large body of information relating to the naturally spawned and hatchery populations within an Evolutionarily Significant Unit, such as data on population abundance, recruitment, productivity, escapement, and reproductive success (e.g., spawner-recruit or spawner-spawner survivorship, smolt production estimates, fecundity, and ocean survival rates); historical and present data on hatchery fish releases, outmigration, survivorship, returns, straying rates, replacement rates, and reproductive success in the wild; data on age structure and migration patterns of juveniles and adults; meristic, morphometric, and

genetic studies; and spatial or temporal trends in the quality and quantity of freshwater, estuarine, and marine habitats. After full consideration of this body of evidence, NMFS must make a determination, "solely on the basis of the best scientific and commercial data available," whether an Evolutionarily Significant Unit should be listed and, if so, whether it should be listed as endangered or threatened, according to the applicable statutory definitions.

Comment 10 *The geographic place and biological terms that would be used to measure progress toward recovery of the chinook salmon Evolutionarily Significant Units should be described.*

Response 10 The scientific team responsible for developing the formal recovery criteria (the Interior Columbia Technical Review Team) was established in October 2001, and is working to provide draft recommendations for recovery criteria. However, adequate technical information is currently available for this Evolutionarily Significant Unit to provide sound preliminary abundance and productivity objectives. NMFS has provided interim targets for the Interior Columbia Recovery Domain to assist subbasin and watershed recovery planning already underway in the Columbia River Basin. NMFS's interim spawner abundance targets for Upper Columbia River steelhead are 2,500 fish in the Methow, 500 fish in the Entiat, and 2,500 fish in the Wenatchee River. NMFS's interim spawner abundance targets for Upper Columbia River spring-run chinook salmon are 2,000 fish in the Methow, 500 fish in the Entiat, and 3,750 fish in the Wenatchee River. In addition to these river basins, the potential for naturally spawning aggregations of both Upper Columbia River steelhead and chinook salmon in the Okanogan River will be evaluated by the Interior Technical Recovery Team.

Comment 11 *NMFS should provide an explanation of its authority to manage units smaller than Evolutionarily Significant Units.*

Response 11 The Endangered Species Act authorizes NMFS to regulate threatened and endangered species in a number of different contexts. NMFS's authorities under the Endangered Species Act are delegated from Congress to NMFS through the Secretary of Commerce. The Secretary's Endangered Species Act listing decisions are based on the status of distinct population segments (Evolutionarily Significant Units are the equivalent of this designation for Pacific salmon and steelhead). In addition, the Endangered Species Act prohibits the take of listed individuals within an Evolutionarily Significant Unit. Section 10 of the Endangered Species Act grants NMFS the authority to allow direct take of listed individuals for research purposes and the take of individuals incidental to otherwise lawful activities. When evaluating Federal actions pursuant to Section 7 of the Endangered Species Act, NMFS considers the impact of a proposed action on the viability of populations within an Evolutionarily Significant Unit. NMFS recognizes, based on a comprehensive review and synthesis of conservation biology and salmonid literature, that a key consideration in making a jeopardy determination pursuant to Section 7 is how many and which populations are necessary for a sustainable Evolutionarily Significant Unit. In the absence of information indicating which populations are necessary for survival and recovery, NMFS assumes that each population within a given Evolutionarily Significant Unit is essential.

Off-Site Mitigation Plans

Comment 12 *A number of commenters questioned the adequacy, appropriateness, and timing of the off-site mitigation plan. Others questioned the basis for the proposed 7 percent hatchery and 2 percent habitat mix. Data were requested to document that the 2 percent Plan Species Account was adequate, how the compensation could be verified, and how compliance could be assessed. Other commenters requested the identification of specific improvement projects to allow accurate assessments of the alternatives, how the funding process would work, and whether the Plan*

Species Account funding level could be increased with a corresponding decrease in the hatchery compensation level.

Response 12 The tributary and hatchery committees would be formed immediately following permit issuance and FERC orders modifying the project license. The Tributary Conservation Plans and the Hatchery Compensation Plans would occur simultaneously and independently to ensure that both processes are implemented as quickly as possible. Priority reaches would be determined by the tributary committees, following review and evaluation of the proposed restoration measures. The results expected from these efforts would be included in the evaluations.

The approach used to translate 2 percent mitigation into habitat improvements was determined by negotiation among the participants in the development of the HCPs, which included agencies, Tribes, and the applicants. The initial process to determine the appropriate amount of mitigation for the Plan Species Account was to evaluate the types and extent of habitat improvements that would mitigate for the presumed 2 percent adult project mortality, and then proceed to determine the overall cost to conduct these types of improvements. This amount was prorated to each project based on the estimated mortality rates. Therefore, the Plan Species Account funding levels represent compensation relative to the assumed loss of adults at each of the three projects.

Because the funding levels were a negotiated amount, there were no specific evaluations conducted to assess the exact benefits that would result from the funding. In addition, different types of expenditures are expected to have different results over different time periods. For example, buying properties to hold in trust might not show immediate or even short-term benefits, but would have long-term habitat protection benefits. At the same time, allocating money to remove or replace culverts that are partial or complete barriers to fish passage could have immediate benefits associated with opening new spawning and rearing habitat.

Because of the wide range of activities that could be funded by the Plan Species Account, it is not possible to determine the exact benefits that could be expected from the account as a whole. The negotiating parties also agreed that it is not practical or efficient to spend additional funds in an attempt to quantify the results of specific improvements, which often have subtle or long-term benefits. However, the revised HCPs provide additional funding ($200,000 per project) to assess the general benefits of various types of habitat improvement measures to aid the tributary committees when determining how the Plan Species Account would be used. The mitigation proposed in the FEIS for the tributary improvements is the funding, not the actual projects. Off-site mitigation proposed for the projects includes ongoing hatchery supplementation. The projects to be funded have not yet been identified. The FEIS describes the types of projects likely to be funded but does not select the specific projects. This would be the responsibility of the tributary committees. Therefore, the 2 percent mitigation level and the adequacy of the funding are assumed to be appropriate for the purpose of the HCP process. The revised HCPs also include a Tributary Assessment Program (Sections 7.5 and 7.6 of the Wells, and Rocky Reach and Rock Island HCPs, respectively) to monitor and evaluate the relative performance of projects approved by tributary committees to ensure that the dollars allocated are utilized in an effective and efficient manner. See FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures.

Hatchery compensation is based on an initial estimate of 7 percent juvenile mortality through each individual hydroelectric project. This compensation level can be reduced if evaluations clearly demonstrate that project mortality is less than 7 percent. Initial hatchery production objectives are based on agreed-upon numbers that represent baseline compensation levels for the Mid-Columbia River hatchery program. The *Biological Assessment and Management Plan, Mid-*

Columbia River Hatchery Program (NMFS et al. 1998b) provides a description of the methodology and baseline numbers. In general, the initial compensation levels rely on a formula that applies a 10-year baseline of adult returns from the mid 1970s to early 1980s and historical juvenile-to-adult survival rates to the Mid-Columbia River from existing salmon and steelhead hatcheries in the region. Juvenile-to-adult survival averages encompassed the release years 1980 through 1990 for chinook salmon, 1990 through 1991 for sockeye salmon, and 1984 through 1992 for steelhead (NMFS et al. 1998b, Table 2). Hatchery evaluations will be included to provide up-to-date juvenile-to-adult survival averages. This updated survival information will be applied during the periodic review of the hatchery program to recalculate the compensation level every 10 years, beginning in 2013.

Similarly, the Plan Species Account funding level is fixed at 2 percent, and there is no intention to increase the tributary funding to replace some of the hatchery supplementation. While the additional tributary habitat work would be beneficial, these benefits would likely result in a gradual long-term improvement in fish production and survival. On the other hand, removing funds from the hatchery programs would result in immediate loss of hatchery fish, thereby affecting harvest opportunities. Recent changes to the hatchery programs are expected to minimize the impacts of hatchery fish on wild populations, and possibly increase wild populations with the use of wild broodstock programs. Hatchery programs have a greater potential for achieving short-term gains, while tributary funding provides long-term habitat improvements. Therefore, an appropriate balance is needed to recover the species and also maintain harvest opportunities on hatchery and unlisted stocks.

Both NMFS's 2000 Federal Columbia River Power System biological opinion and the All-H Recovery Plan presume that habitat improvements are not only possible but that they are essential for the recovery of listed Evolutionarily Significant Units of salmon and steelhead. Similar to the HCP, these documents specify the amount of improvement necessary (increase in life-cycle survival) and the timeline to obtain this improvement. It is the best professional judgment of NMFS and the other signatory parties that the Plan Species Account will likely compensate for 2 percent of project-related mortality.

As presently proposed in the HCPs, a comprehensive progress report would be prepared by the PUDs, at the direction of the coordinating committees, assessing the overall status of achieving no net impact in 2013 (2018 for the Wells Project), and every 10 years thereafter. To ensure that the dollars allocated to the Plan Species Account are utilized effectively and efficiently, the tributary committees would oversee tributary assessment programs. Similarly, the hatchery committees would be tasked with developing 5-year monitoring and evaluation plans for the hatchery programs to be updated every 5 years. These additions are intended to ensure that the overall effectiveness of the HCPs (including the habitat conservation and hatchery compensation programs) is periodically evaluated and that the no net impact standard is being met by 2013 (2018 for the Wells Project) and will continue to be met throughout the life of the agreement.

Specific Tributary Habitat Plan Comments

Comment 13 *Several commenters suggested that habitat restoration work be coordinated with other agencies and be consistent with meeting objectives of the Clean Water Act Section 303(d) and total maximum daily load (TMDL) development. Others questioned how the Plan Species Account should be spent, including projects to improve mainstem habitat, and how the tributary committees would function.*

Response 13 The HCPs were not developed to meet requirements of Section 303(d) of the Clean Water Act. However, the proponents would be required to comply with the provisions of the Clean Water Act regardless of which alternative is selected. The primary objective of the tributary committees will be to improve fish habitat, which may simultaneously result in water quality improvements. For example, improving damaged riparian corridors could decrease peak summer water temperatures. However, the first priority for restoration projects will be to identify projects and areas where the greatest improvements can be made in preserving, enhancing, and/or restoring fish habitat, which may not necessarily occur in areas where water bodies are impaired due to water quality issues. See FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures.

It is expected that the tributary committees would work closely with the local entities to coordinate habitat restoration efforts and maximize overall benefits. The mainstem Columbia River is specifically included in the Tributary Conservation Plan (see FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures). However, most of the habitat improvement emphasis would be directed to tributary habitat because of the wider range of restoration and protection opportunities in these tributaries and the potential to specifically benefit the listed species, as well as a greater number of other species. However, this does not suggest that mainstem habitat restoration and protection measures are inappropriate activities to be funded by the Plan Species Account. The tributary committees would determine the projects that would be funded.

Comment 14 *Some commenters requested clarification of how mitigation funding could change for Douglas County PUD and whether this was scientifically justifiable or appropriate. Others questioned how the tributary committees would select projects to fund, how other entities could participate in this process, whether tributary habitat restoration could occur under both action alternatives, and if implementation monitoring will occur.*

Response 14 As currently proposed, Douglas County PUD funding of the Plan Species Account is intended to compensate for up to 2 percent unavoidable adult and/or juvenile project mortality. The account could be reduced only if the coordinating committees determine that the adult project survival rate is equal to or greater than 98 percent and the juvenile project passage survival rate is greater than 93 percent. The signatory parties have agreed that adult survival cannot be conclusively measured at this time. Based on the best available information, the signatory parties have also agreed that Douglas County PUD has achieved the 93 percent juvenile project passage survival rate for Endangered Species Act-listed Upper Columbia River spring-run chinook salmon and steelhead. Therefore, unless new technologies or methodologies become available that would allow for the measurement of adult mortality attributable to project effects alone, Douglas County PUD's funding of the Plan Species Account would remain at full levels.

Should future studies indicate that adult survival is greater than 98 percent and juvenile project passage survival is greater than 93 percent for a given species, mitigation could decrease proportionally. For example, if future studies indicate that the adult survival rate through the Wells Project is 99 percent for steelhead, but 98 percent (assumed level) for spring-run chinook salmon, summer/fall-run chinook salmon, and sockeye salmon (as well as coho salmon should they become established as a viable population), the Plan Species Account would be reduced from a full 8/8ths contribution (2 percent for each of four Plan species) to 7/8ths contribution (2 percent for each of three species and only 1 percent for steelhead) of the Plan Species Account. If a long-term program or threshold population of coho salmon become established within the Mid-Columbia River, then coho salmon will be considered in the reduction in the Plan Species Account (e.g., 10/10ths contribution reduced to 9/10ths based upon the example of 99 percent

adult steelhead survival) (see Section 8.4.5.1 of the Wells HCP [Hatchery Compensation Plan, Production Commitments, Adjust of Hatchery Compensation – Population Dynamics for Coho]).

The current HCPs clearly state that the tributary committees shall select projects based on guidelines set forth in the HCPs (see Section 7.3.7.3 of the Wells HCP [Tributary Conservation Plan Tributary Committee, Plan Species Account Selection of Projects and Approval of Budgets] and Section 7.7.1 of the Rocky Reach and Rock Island HCPs [Tributary Conservation Plan Project Selection Geographic Area and Types of Projects]). These guidelines are further defined in the HCP supporting documents (e.g., Supporting Documents D and A of the Wells HCP). The general principles of the Tributary Conservation Plan include an assessment of all proposed restoration and habitat improvement projects, which would include identifying the status and habitat-limiting factors for the Plan species. Projects could be proposed to the committees, or the committees could also identify projects on their own. All relevant information would be reviewed and used to assess the potential benefits from each project.

The HCPs also require that, whenever feasible, the tributary committees shall (1) take into consideration and be coordinated with other conservation plans or programs when selecting projects, and (2) cost-share with other programs, seek matching funds, and piggy-back programs onto other habitat efforts. All HCP signatory parties would have the opportunity to be represented on the tributary committees. Other entities could work through these representatives to bring potential enhancement projects to the committees for consideration. While non-signatory parties to the HCP have no voting rights in the selection of projects, the tributary committees may invite other expert entities, such as land and water trusts or conservancy groups, to serve as additional, non-voting members of the committees.

Under Alternative 3, the PUDs have committed to provide a specific level of funding immediately upon issuance of the incidental take permit and FERC license articles. Over the 50-year term of the HCPs, the combined funding provided by the PUDs to the Plan Species Account would be over $46.5 million (in 1998 dollars). PUD-funded tributary habitat improvements are not included in the actions analyzed under Alternative 2 in the FEIS.

Under Alternative 3, a Tributary Assessment Program will be supported by the PUDs separate from the Plan Species Account. This program will be utilized to monitor and evaluate the relative performance of tributary enhancement projects approved by the tributary committees and directly funded by the initial contributions to the Plan Species Accounts (see FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures). The PUDs will develop, in coordination with and subject to approval by the tributary committees, the measurement protocols for the Tributary Assessment Program. The tributary committees would prepare a comprehensive review of the tributary program that will be provided to the respective coordinating committees for inclusion in their comprehensive review report.

Although the Tributary Assessment Program will be funded by the PUDs to determine the relative benefits of the enhancement projects, these assessments are not intended to attempt to quantify the actual benefits of the projects in terms of species status or abundance. The purpose of the Tributary Assessment Program is to verify that appropriate enhancement projects are being funded. The signatory parties agree that, even if it were technically feasible, the cost and time associated with such quantification efforts would likely exceed the costs of actually implementing habitat enhancement projects.

Specific Hatchery Plan Comments

Comment 15 *If the 7 percent hatchery compensation is reduced, how will the no net impact performance standard be met? This appears to be a contradiction of terms.*

Response 15 NMFS has agreed to issue 10-year permits for the HCP hatchery programs. Hatchery compensation levels have been set through 2013. In 2013 or at subsequent 10-year points, should new information become available indicating that these hatchery compensation levels must be reduced (due to larger than expected impact of hatchery fish on wild fish), the coordinating committees will be required to determine which actions will be continued to meet the no net impact performance standard. If a reduction in the HCP hatchery program prevents the attainment of no net impact, a party is able to withdraw from an HCP.

Comment 16 *Explain why the Quantitative Analysis Report (QAR) assumes that the supplementation program would be short-term, while the HCPs assume that the supplementation program would be long-term. The EIS should confirm that the hatchery fish are treaty resources.*

Response 16 The stated purposes of the Endangered Species Act are "to provide a means whereby the ecosystems upon which endangered species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve (these) purposes" (see Section 2(b) of the Endangered Species Act). Over the long term, the ultimate goal of a recovery plan must be to achieve both abundance goals and the conditions necessary for natural production to be self-sustaining. The QAR was designed to provide decision makers with current assessments of the status (population trend, risk of extinction, etc.) of naturally produced Endangered Species Act-listed spring-run chinook salmon and steelhead runs returning to the Wenatchee, Entiat, and Methow River systems. The QAR was a retrospective analysis specifically designed to estimate (1) current extinction risks, (2) survival changes needed to meet alternative risk and recovery criteria, (3) sensitivity of population growth rate to survival changes in different life-history phases, and (4) potential survival changes from the HCP for the naturally produced populations. While NMFS (and the QAR results) recognizes that there is a potential role for carefully designed and monitored supplementation in recovery efforts, and that some level of hatchery production is likely to occur in the foreseeable future, assessing the status of artificially propagated fish in these basins was not the objective of the QAR.

Comment 17 *Hatcheries have not adequately compensated for the initial dam construction, and NMFS supplementation policies add additional blockages to full mitigation and compensation. Clarify how hatchery production for each Plan species will change from current production levels under each of the HCPs. The HCPs should guarantee that only wild broodstock would be used for hatchery production, and production levels should be established for coho salmon.*

Response 17 Current production levels were based on both inundation loss and about 14 percent passage loss. Hatchery production, compensating for inundation effects, is not subject to reduction at any time during the life of the HCPs. The HCPs require the PUDs to reach a combined adult and juvenile project survival level of 91 percent. The remaining 9 percent of unavoidable mortality is split between habitat improvement funding and hatchery compensation. Up to 7 percent mortality at each project would be compensated through hatchery programs. If the PUDs can demonstrate, using survival studies approved by the coordinating committees, that their passage mortality for specific species/life stage is less than 7 percent, then the hatchery production for that species may be reduced accordingly. Chelan County PUD has agreed to maintain the current production levels for ongoing hatchery programs at the 14 percent level (sockeye salmon production is at a

lower level because it is still at a feasibility level, and rearing strategies are being tested) until the first review in 2013. The programs will be reevaluated every 10 years after 2013. Funding for the existing 14 percent hatchery compensation for fish passage losses attributable to the Wells Project, provided by Douglas County PUD, would decrease to a maximum of 7 percent under the HCPs. Douglas County PUD has successfully demonstrated that passage survival for yearling chinook salmon and steelhead releases at Wells Dam is less than 7 percent and their production commitment will be adjusted accordingly. Refer to FEIS Section 4.2.3.1, Threatened and Endangered Species. The PUDs provide funding for the hatchery programs and are currently not directly involved in their operation, but could be in the future. However, because they have major responsibilities for the successful operation of the facilities, the PUDs will become co-permittees with WDFW for the operation of these facilities. The PUDs could also be the permittees for the hatcheries and their agent could operate the hatcheries under the terms and conditions of the permits issued to the PUDs.

The hatchery production levels for all Plan species (including coho salmon) will be based on average adult returns for a baseline period, a 7 percent compensation requirement, and baseline adult/smolt survival rates for existing Mid-Columbia River hatcheries. The hatchery production levels would be periodically evaluated, using these same parameters, to achieve and maintain the no net impact standard (although no more than 7 percent hatchery supplementation compensation would occur). Once this data is available for coho salmon, production levels will be set. As with the other Plan species, hatchery production levels will be reevaluated and adjusted as necessary to maintain the 7 percent compensation level.

The goals and objectives for each hatchery program will be established by the hatchery committees and may change over time depending on the success or failure of particular hatchery programs. To utilize only wild fish for hatchery broodstock may not meet the goals of the hatchery program.

Monitoring Requirements

Comment 18 *Several commenters suggested that the FEIS should explicitly identify the monitoring methods, that actions demonstrated to be sufficient to protect fish be used to measure compliance with the performance standards, and that specific operational criteria be used in lieu of basing success solely on performance standards. Others questioned the availability of methods to evaluate survival rates of all Plan species and life stages.*

Response 18 The methods currently available for monitoring compliance with the HCP (survival for all Plan species and life stages) are summarized in a supporting document to the proposed anadromous fish agreements and habitat conservation plans (see *Briefing Paper Estimating Survival of Anadromous Fish Through the Mid-Columbia PUD Hydropower Projects* by T. Cooney). NMFS readily acknowledges that, for some life-history stages of Plan species (most notably subyearling Upper Columbia River summer/fall chinook salmon and sockeye salmon), there are no technologies currently available to provide either juvenile project or juvenile dam passage survival estimates. Under Alternative 3, the coordinating committees would evaluate new technologies for use in determining the survival of Plan species through the reservoirs and dams.

Predetermining the questions that will need to be answered in the future is not appropriate because it may depend on how close the PUDs are to achieving the performance standards. For example, if the survival rates at a project were substantially lower than the performance standard, specific passage route assessments might be appropriate to determine where the greatest impacts are occurring. However, if the survival rates were close to the performance standard, then more

accurate estimates of total project survival would be suitable. Each of these assessments would use different methodologies. The coordinating committees would be responsible for determining what studies should be conducted at each of the projects.

Defining specific actions or measures (e.g., specific spill programs) to protect fish, in lieu of performance standards, has typically been used in the basin to provide interim levels of protection for anadromous fish. Examples of this approach include the Wells Interim Protection Plan biological opinion (expired), Rock Island Settlement Agreement, and Rocky Reach bypass biological opinion that the PUDs are operating under (e.g., specific spill programs). This general approach is now represented in the FEIS by Alternative 2. A similar approach is likely to be implemented under both action alternatives. For Alternative 3, based on available information, initial operations (e.g., spill levels) have been established that might achieve the pertinent juvenile survival standards for each Plan species. If Phase I studies indicate that performance standards are not being met, the coordinating committees would adjust the protection measures at the projects to meet appropriate survival levels (for example, increase spill levels to meet the juvenile dam survival standard for sockeye salmon). Therefore, both processes are very similar, with the primary differences being how and when the decisions are made. Under Alternative 3, the measures would be implemented immediately and would benefit all Plan species. Under Alternative 2, the measures would likely not be implemented until Endangered Species Act consultations were completed and FERC issued license orders (potentially after all appeal processes have been exhausted) for each project, and the non-listed species would likely not receive the same level of protection as those that are listed. Should litigation ensue, these measures may not be fully implemented for years or even decades.

The HCPs would establish coordinating committees to select and guide the appropriate monitoring and evaluation procedures. The committees are expected to use the best available data to determine if the HCP objectives are being met. However, even under optimal conditions, a number of assumptions are required to estimate project impacts. Due to the complexity of the issues involved, there are frequent disagreements over these assumptions or the results of the data analysis. The HCPs include committees and a dispute resolution process to facilitate appropriate and timely decisions on the adequacy of the data or the need for additional evaluations. In addition, the coordinating committees have the ability to select an independent third party for the purpose of providing an independent scientific review of any disputed survival study results and/or reports. Survival studies would be conducted for all Plan species, except where no appropriate methodology exists.

The provisions of the Endangered Species Act require the use of the best available scientific data. The monitoring and evaluation methods currently being used to evaluate survival at the projects provide the best available data. The same methods of evaluation would likely be used for both action alternatives, and are consistent with monitoring standards throughout the basin. In the future, should newly developed methods be found that provide more accurate results, these new methods would be implemented at the discretion of the coordinating committees during the reevaluation every 10 years (e.g., Rocky Reach HCP Section 5.3.3 [Phase III Standard Achieved]). Due to the considerable expense of conducting survival studies, the limited availability of test fish (particularly for depressed stocks), and the limitations of the assessment techniques, it is not feasible to acquire survival data throughout the entire migration period of all species passing the project. Therefore, it is sometimes necessary to use data from surrogate species or life stages to estimate survival for those species or life stages that cannot be directly evaluated. Although this might not be the ideal monitoring option, this method may provide the only information available.

HCP-Related Questions

Comment 19 *Several commenters requested a better description of the HCP negotiation process, including the number of outstanding issues that have not been satisfactorily resolved for all the parties. They questioned the appropriateness of proceeding with the NEPA review process until these issues are resolved. Some suggested reopener clauses be included in the HCPs to allow some intervention if the species were not recovering.*

Response 19 The original signatory parties began intensive negotiations to resolve outstanding issues raised in comments on the DEIS in September 2001. The outstanding issues were resolved to the satisfaction of NMFS, USFWS, WDFW, the PUDs, and the Colville Tribe, who signed the HCPs pending completion of the regulatory review process. These clarifications have been added to the HCPs for each of the three projects and added to Chapter 2 of the FEIS.

The two basic requirements of NEPA (the premise for preparation of this FEIS) are that (1) the agency considers significant aspects of the *environmental* impacts of a proposed action and (2) the agency informs the public that it has considered *environmental* concerns in its decision-making process. NMFS has encouraged all HCP applicants to invite and include other Federal and State agencies who can utilize their existing authorities, expertise, or lands in support of the HCP development and implementation process. Furthermore, NMFS considers whether the proposed plans might affect Tribal rights to trust and treaty resources. After careful consideration of Tribal concerns, NMFS will clearly state the rationale for the recommended final decision and explain how the decision relates to the government's trust responsibilities. In light of this obligation, it is important that during the planning process, NMFS identifies and evaluates the anticipated effects of a proposed HCP upon Indian treaty and trust resources as provided in the EIS.

In the FEIS, NMFS has indicated that the issuance of Incidental Take (Section 10) permits in support of the HCPs is the agency's preferred alternative. This FEIS constitutes an environmental review of the proposed project. The preferred alternative would then be subject to review in the preparation of a biological opinion. The biological opinion could include additional stipulations than those currently in the HCPs. Therefore, the FEIS does not presume that the HCPs are final, official, and suitable for implementation. However, if NMFS issues a permit with terms and conditions in addition to or different from those set forth in the HCPs, any party, including the PUDs, may withdraw from the agreements within 60 days of the effective date. The FEIS review process fulfills NMFS's NEPA compliance obligations as required for HCPs. Using the NEPA FEIS and biological opinion that would be prepared for the HCP, NMFS will evaluate whether the HCPs meet the requirements of Section 10 of the Endangered Species Act. Although NMFS would prefer that all parties involved in the HCP negotiation process sign the HCPs and participate in HCP implementation through the HCP committees, there is no mandated requirement that all parties sign the HCPs.

FERC has no mandate under the Endangered Species Act other than to consult with NMFS and USFWS (the Services) when their actions have the potential to affect listed species. Therefore, FERC cannot mandate reopener clauses in the HCPs or the incidental take permits. FERC can and has included reopener clauses in their licenses that allow opportunities to reconsider fish and other natural resource issues. However, only a non-signatory party could initiate (at relicensing) the reopener process for the Plan species under Alternative 3. Signing parties enforce compliance with the HCPs, or they may exercise their rights to withdraw from the HCPs. It is also important to note that even the signatory parties can petition FERC during the relicensing process to include

protection provisions for non-Plan species, which are not included in the HCP process. This would include fish species, such as lamprey and bull trout, that could be affected by the projects.

As stated in FEIS Section 2.6.2.3, Alternative 3, as a signatory party to the HCPs, NMFS would not institute any additional action for the Plan species beyond the HCP performance standards under provision of the Endangered Species Act. However, the HCPs have termination provisions (see FEIS Section 2.3.4.2, HCP Term) that allow NMFS to withdraw after 15 years (20 years for the Wells Project) if (1) the no net impact standard has not been achieved or has been achieved but has not been maintained, or (2) the Plan species are not rebuilding and the project is a significant factor in the failure to rebuild. In addition, NMFS may suspend or revoke the incidental take permit in the event that NMFS and the PUD cannot reach agreement on specific measures to remedy the PUD's failure to achieve or maintain the no net impact standard or if the PUD fails to promptly implement measures that are applicable to the PUD (see Section 2.2.1.2 of the Wells HCP [Termination, Elective Withdrawal Events, Enough Already]).

The NMFS "All H" initiative identifies harvest, hatcheries, habitat, and hydropower as the primary means for addressing species recovery in the basin. The HCPs address issues primarily related to hydropower, although there are some habitat and hatchery components in the plans. However, they do not affect NMFS's ability to address recovery through these other issues or processes that have also contributed to the decline of the species.

Effects of HCPs on Other Plans or Processes

Comment 20 *Several commenters requested clarification of how NMFS can satisfy their treaty trust responsibilities to provide Tribal harvest under the proposed HCPs. There were concerns over how NMFS could provide further protection for the listed species if the HCPs do not lead to recovery. Other concerns were that NMFS not use the HCPs as a defense in any non-HCP-related litigation between NMFS and the Tribes, or reduce the existing Tribal influence on management decisions through the Mid-Columbia Coordinating Committee.*

Response 20 These concerns are addressed in FEIS Section 4.12.17, Legislation Pertinent to Tribal Governments. Formal consultation between NMFS and the Tribes on a government-to-government basis will include discussions of these issues, and would occur prior to issuance of a record of decision (ROD) or a final biological opinion on the HCPs. NMFS and USFWS (the Services) can withdraw from the HCPs and revoke the permit even if the no net impact standard has been met, if the Plan species are not rebuilding and the project(s) are a significant factor in the failure to rebuild. The revised HCPs specify that no net impact standards must be achieved by 2013 or 2018 for the Wells Project (see Section 2.2.1.2 of the Wells HCP [Termination, Elective Withdrawal Events, Enough Already]). This allows adequate time to assess the project operation tools used to improve fish survival conditions and to evaluate these improvements over several fish population life cycles. These time periods include 5 years for the PUDs to reach the performance standards, 3 years of evaluation of the juvenile survival metrics (juvenile project survival or juvenile dam passage survival), and about two adult return cycles.

The HCPs by themselves are not recovery plans. In addition to the fish passage conditions at the Mid-Columbia River projects, species recovery is dependent on a number of other factors, including improvements in (1) fish survival conditions in the Lower Columbia River, (2) habitat, (3) hatchery programs, and (4) estuary and ocean survival rates. Fish passage survival rates in the lower river have improved substantially in recent years. Habitat restoration planning and implementation have also intensified, the hatchery programs have improved, and the efforts to reduce avian predation levels in the Columbia River estuary also have the potential to

substantially improve overall recovery. In addition to these improvements within the basin, ocean rearing conditions appear to be shifting to a more favorable status. These improvements will not result in instantaneous species recovery, and will require a number of years to fully evaluate and quantify the benefits. The overall fish survival conditions in the Columbia River Basin appear to be improving and it is unlikely that this trend would be reversed or substantially affected by the 15- or 20-year time period to fully evaluate survival improvements at the PUD projects.

The HCPs continue to include a provision with respect to Indian Tribal treaty or reserved rights claims. Section 12.11 [Indian Tribal Treaty or Reserved Rights] of the HCPs states that "nothing in this Agreement is intended to nor shall it in any way abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in any treaty, executive order, statute or court decree." In addition, the HCPs have been revised to state that "this Agreement will not be utilized against another Party in any manner whatsoever in any legal proceeding other than a legal proceeding to enforce or interpret this agreement" (see Section 12.11 [Indian Tribal Treaty or Reserved Rights] of the HCPs).

The outcome of FERC's final order approving the HCPs and incorporating them into the project licenses is as follows:

- For Wells: replacing the Wells Settlement Agreement with the HCP, replacing the Interim Protection Plan biological opinion (now expired) with the HCP, and replacing the Settlement Agreement's Coordinating Committee with the HCP committees.

- For Rocky Reach: settling the Rocky Reach portion of the pending Mid-Columbia Proceeding at FERC, replacing the Mid-Columbia Coordinating Committee with the HCP committees, and replacing the bypass order and biological opinion with the HCP.

- For Rock Island: replacing the Rock Island Settlement Agreement with the HCP, and replacing the Settlement Agreement's coordinating committee with the HCP committees.

At this point, the Yakama and Umatilla Tribes have not signed the HCPs, and therefore are not entitled to participate directly on the HCP committees, which are limited to signatory parties. While there remains some potential for non-signatory parties who participated in HCP development to participate in the committees as non-voting members, the influence of these non-voting Tribal parties would be exercised through coordination and possibly government-to-government consultation with Federal parties who participate on the HCP committees.

It should be noted that under Alternative 3, should the Permit species fail to rebuild and the projects be determined to be a significant factor in the failure to rebuild, NMFS could withdraw from the HCPs even though the PUDs are meeting the no net impact standard. This provision of the HCPs is consistent with the requirement in the Endangered Species Act that Section 10 permits be issued only if NMFS finds that any incidental taking of species "will not appreciably reduce the likelihood of survival and recovery of the species in the wild." The HCPs also describe the hatchery mitigation that will occur through 2013, and the process for modifying these mitigation levels thereafter (see Section 8 [Hatchery Compensation Plan] of the HCPs). Under Alternative 2, NMFS would continue to issue permits to the State of Washington for the continued operation of mitigation hatcheries. Both action alternatives would require periodic evaluations to ensure that hatchery mitigation is provided in a manner that minimizes adverse impacts to Endangered Species Act-listed salmon and steelhead. Thus, with respect to the

provision of harvestable fish populations through the term of the HCPs (50 years), there would likely be minimal difference between Alternatives 2 and 3.

Uncertainties Associated with the HCPs

Comment 21 *Several commenters expressed concerns that the risks and uncertainties associated with the HCPs are disproportionately balanced on the resource (salmon and steelhead). Some were concerned over the dispute resolution process in the HCPs, and how it decreases NMFS's regulatory authority by requiring them to provide a preponderance of evidence in a dispute over gaps in the information concerning fish passage and survival. Others suggested that, because the listed species are best suited for the existing survival evaluation methods, Section 7 consultation would provide the same protection level as the HCPs for listed and unlisted species, without having to commit to a 50-year agreement.*

Response 21 The HCPs establish specific survival rate standards for all the Plan species, thereby providing the same level of protection to unlisted species as to listed species. Thus, higher standards are established for the unlisted species than might otherwise be required. The HCP survival standards are also different from the measures required in the biological opinion for the Federal system (NMFS 2000a), which sets operational limits for the projects. These operational measures establish limits on factors such as river flow targets, fish passage efficiency levels, and turbine efficiency operating levels. The operational measures assume that survival benefits will occur, while the HCPs set specific survival standards that must be met by 2013 (2018 for the Wells Project).

The intent of the HCPs is to provide no net impact survival conditions for both listed and unlisted anadromous species through the use of on-site passage survival improvements, off-site production of hatchery fish, and off-site enhancement of tributary habitat. The signatory parties to the HCPs would participate on the coordinating committees and participate in the selection of appropriate monitoring methods for each of the Plan species. However, by signing the HCPs, the signatory parties would forfeit or substantially reduce their rights or authorities to gain additional protection measures for the listed or unlisted Plan species through other laws and statutes, without first withdrawing from the agreements. Under Alternative 3, the PUDs are required to show that the performance standards are met not only at the end of Phases I and II, but also periodically during Phase III. Therefore, as survival estimation techniques are developed over the 50-year HCP terms, these techniques would be incorporated into the monitoring process to demonstrate continued compliance with the performance standards.

The revised HCPs specify the methodologies by which the survival standards shall be measured. The HCP signatory parties have agreed that point estimates of survival measurements from 3 years of valid studies shall be averaged (arithmetic mean), and that this average will be used to compare against the pertinent survival standard. A valid study is one in which the study design, implementation, and criteria are determined to be acceptable by the appropriate coordinating committee, and one in which the study occurs during representative flow conditions and normal project operating conditions consistent with the approved study design (see Section 4.1.4 of the Wells HCP [Passage Survival Plan, Methodologies] and Section 5.2.3 of the Rocky Reach and Rock Island HCPs [Implementation of the Survival Standards, Methodologies]). In addition, NMFS developed a briefing paper that summarizes the strengths and weaknesses of existing technologies for estimating survival standards. This paper was developed to assist the coordinating committees in selecting study methodologies for each of the Plan species (see Supporting Document D of the Rocky Reach and Rock Island HCPs and Supporting Document C of the Wells HCP). The use of a simple average for determining compliance with the survival

standards, as opposed to a statistical mean with confidence intervals, eliminates any possibility of a party claiming that a standard had been met because it did not differ significantly from the survival study estimate.

The signatory parties agree that the HCPs are not intended to create jurisdiction in any court. Any dispute arising in the tributary or hatchery committees would be sent to the appropriate coordinating committee for resolution. Any unresolved disputes within the coordinating committees would be sent to a policy committee for resolution. If no resolution can be reached at the policy committee, then any party may pursue any other right that they might otherwise have. Thus, as revised, the HCP dispute resolution process itself is non-binding and does not significantly reduce NMFS's regulatory authority.

HCP Phases and Testing Criteria

Comment 22 *Several commenters expressed concerns as to whether all five Plan species could be evaluated during a 3-year period, and the potential impacts on a species in the first 5 years of the HCPs when the PUDs have essentially full authority to determine what measures are implemented. Others questioned what the impacts would be if the HCP standards are not met in the 5-year period, or if they are never met. There were requests for additional information concerning the process for moving out of Phase I, and how the different phases would be implemented in the HCPs. There were some concerns that NMFS's Federal responsibility and ability to ensure the survival and utilization of endangered trust resources are effectively and impermissibly transferred to non-Federal parties in the HCPs because the projects are only subject to periodic reviews and NMFS will not be able to require any additional actions.*

Response 22 The signatory parties modified the HCPs to resolve several issues brought to light from DEIS comments. The coordinating committees now have the authority to (1) establish the protocols and methodologies to determine whether or not the survival standards are being achieved for each Plan species, (2) determine the most appropriate standard to be measured for each Plan species (see Figure 2-4 of the FEIS), (3) approve all studies prior to implementation, and (4) provide input to the PUD's choice of measures during Phase I. Thus, while the PUDs maintain the final say over what suite of structural and operational measures will be tested in Phase I of the HCPs, the coordinating committees will determine which survival standard can be appropriately evaluated for each Plan species and the committees have final approval of study plans prior to implementation. The committee decisions will be guided by a white paper, developed by NMFS and incorporated into the HCPs, when making determinations. In addition, NMFS is represented in the coordinating committees, which require a unanimous vote of meeting representatives to make determination decisions. Therefore, the HCPs have been modified to ensure that NMFS's authority is not transferred to a non-Federal entity, and that additional review (and withdrawal/termination) provisions are included. In the event that Phase I studies indicate that a pertinent survival standard is not being met for any or all Plan species, the coordinating committees are authorized to periodically adjust the measures to address survival deficiencies (Phase II). Additional information is provided in FEIS Section 4.2.3.1, Threatened and Endangered Species pertaining to impacts to species within Phase I of HCP implementation.

The required HCP Phase I survival studies should be completed by 2002 at the Wells Project, by 2004 at the Rock Island Project, and by 2006 at the Rocky Reach Project, unless the coordinating committees determine that another year of study is required. The later dates for the Chelan County PUD projects were included in the HCPs for two reasons. First, Chelan County PUD is currently constructing a juvenile fish bypass facility at the Rocky Reach Project. This facility should become operational by April 1, 2003. After 1 year of shake-down studies to assess the

facility and help fine-tune operations, Phase I survival studies would be conducted between 2004 and 2006. Second, Chelan County PUD is coordinating with consultants, NMFS Science Center, and USGS Biological Research Division to design and develop an acoustic tag survival assessment methodology. If successful, this technology would allow for the measurement of the 95 percent dam passage survival standard at the projects, and would produce a better estimate of this survival standard than would a calculation (see Survival Standard Decision Matrix [Figure 2-4 of the FEIS]).

A Survival Standard Decision Matrix (see Figure 2-4 of the FEIS) was incorporated into the HCP to clarify the priority of Phase I survival standard measurements: (1) combined adult and juvenile project survival, (2) juvenile project survival, (3) juvenile dam passage survival, and (4) calculated juvenile dam passage survival. The matrix, along with the accompanying text, more clearly indicates the phase determination that would occur after Phase I studies have been completed (see Section 4.1 of the Wells HCP [Passage Survival Plan, Survival Standards] and Sections 5.1 and 5.2 of the Rocky Reach and Rock Island HCPs [Passage Survival Plan, Survival Standards Decision Matrix and Implementation of the Survival Standards]). This information is summarized in FEIS Section 2.3.4.4, HCP Performance Standards.

The HCPs now explicitly state that the no net impact standard will be met no later than 2013 and that representative species will be chosen by the coordinating committees for additional survival studies in each 10-year period thereafter to ensure that the no net impact standard continues to be met. In the event that the standard is not being met and the PUDs fail to implement agreed-upon measures to achieve or maintain the no net impact standard, or if the Plan species are not rebuilding populations, NMFS may revoke the permit (after 2013 for Chelan County PUD and after 2018 for Douglas County PUD) to seek actions to recover the species (see Section 2.2.1.2 of the Wells HCP [Termination, Elective Withdrawal Events, Enough Already] and Section 2.1.2 of the Rocky Reach and Rock Island HCPs [Withdrawal From Agreement, Enough Already).

Regardless of the alternative selected, the survival rates of listed and/or unlisted species are expected to improve over time as the PUDs attempt to meet the performance standards or other criteria established through the Endangered Species Act consultation process. If the performance standards are not met under Alternative 3, the PUDs will be required to apply additional species-specific protective measures (also referred to as tools in the HCP and FEIS) in an effort to meet the performance standards for all Plan species. If the performance standards cannot be met, and the permit is revoked, the procedures for improving survival rates would be similar to those described in Alternative 2.

Under Alternative 3, after Phase I testing is complete, the coordinating committees are authorized to adjust measures to increase survival for those Plan species that received a Phase II designation. Should a Plan species receive a Phase III (Provisional Review) designation, the PUDs would have a one-time 5-year period to implement additional measures or conduct additional survival studies to more accurately determine whether the pertinent survival standard is being achieved. Should a Plan species receive a Phase III (Additional Juvenile Studies) designation and the coordinating committees approve the use of a new survival methodology, the PUD would have 5 years to conduct the appropriate evaluations, after which the coordinating committees would make a new phase determination for that species, which might require additional measures to be implemented. Thus, both Alternatives 2 and 3 could require additional measures if the available information indicates that existing measures do not adequately meet survival standards. The primary difference is that Alternative 3 will likely generate more survival information in a shorter amount of time and for more species than would Alternative 2 because more species will be evaluated. In addition, because Alternative 3 requires survival standards to be achieved for all Plan species,

rather than just Endangered Species Act-listed species, listed species may actually receive higher protection than would otherwise occur under Alternative 2. For example, if higher spill levels are required to meet the juvenile project survival standard for sockeye salmon, spring-run chinook salmon and steelhead will likely enjoy higher survival than they otherwise may have received. For Alternative 2, refer to FEIS Section 2.3.3, Alternative 2. For Alternative 3, refer to Sections 2.3.4.5, HCP Phases, and 2.3.4.8, HCP Conservation Plan and Compensation Measures.

Compliance with Federal, State, and Local Laws

Comment 23 *Several commenters requested clarification of how the HCPs would satisfy requirements of the Federal Power Act, Clean Water Act, and other Federal and State laws to meet water quality standards and fish protection and Tribal treaty trust responsibilities.*

Response 23 The HCPs were developed as comprehensive settlements between those that sign the Wells, Rocky Reach, and Rock Island HCPs to protect five species of anadromous salmonids under the Endangered Species Act, Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, and Title 77 RCW.

Under Section 10 of the Endangered Species Act, the HCPs would result in incidental take permit applications for each project. If NMFS concludes that the HCPs satisfy the requirements of Section 10 of the Endangered Species Act, NMFS would issue the requested permits. While making this decision, NMFS would also consider the HCPs' effects on habitat under the Magnuson-Stevens Fishery Conservation and Management Act.

The HCPs also constitute the terms, conditions, and recommendations for Plan species under Sections 10(a), 10(j), and 18 of the Federal Power Act and the Fish and Wildlife Coordination Act of the parties that sign, and satisfy any obligations the projects have in relation to game fish under Title 77 of the Revised Code of Washington.

While the HCPs do not expressly settle issues surrounding the Clean Water Act, the parties that sign agree to work cooperatively to address water quality issues. The HCPs do not abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in any treaty, executive order, statute, or court decree. Nevertheless, NMFS would consult with the Tribes before taking action on the pending incidental take permit applications.

Refer to FEIS Section 3.3.2, Water Quality for a discussion of how the projects currently meet Clean Water Act requirements and FEIS Section 4.3.2, Water Quality for a discussion of the likelihood that these requirements would be met under the different alternatives. These responsibilities would be considered by the PUDs and the coordinating committees when implementing or recommending specific measures to meet the requirements outlined in the HCPs or Section 7 consultation.

See FEIS Sections 2.6.6.2, Alternative 2 and Section 2.6.6.3, Alternative 3 that discuss the application of the protection provisions of other laws and statutes for the two alternatives. These other laws and statutes would be available to non-signatory parties to the HCPs to seek additional protection for Mid-Columbia River fish stocks.

The HCPs do not mandate or guarantee compliance with laws that establish or mandate regulatory responsibilities to other non-signatory parties. Nor do they limit the discretion of or alter or affect the statutory and other legal rights of these non-signatory parties, including any

rights to legal remedies, or their authorities, responsibilities, or obligations under relevant laws or Federal processes. This includes their responsibilities and legal rights under the Endangered Species Act (outside of the Plan species), Magnuson-Stevens Fishery Conservation Act, Clean Water Act, Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Power Planning and Coordination Act, FERC relicensing process, Tribal treaty rights, Federal trust responsibility, and others. However, NMFS is the only agency with mandatory conditioning authority for the listed anadromous fish species under the Federal Power Act and the Endangered Species Act. Under both action alternatives, NMFS would issue a biological opinion that would identify the recovery measures and approaches to be used for species recovery. See FEIS Sections 1.1, Introduction and Section 4.12, Relationship to Laws and Policies. The action alternatives would conform to pertinent legislation of these laws regarding fish protection measures for the two listed Plan species relevant to the Endangered Species Act and the Magnuson-Stevens Fishery Conservation and Management Act.

Under Alternative 3, the HCPs would supercede the existing FERC license articles for Wells and Rock Island and settle the Mid-Columbia Proceedings for Rocky Reach. NMFS and the other signatory parties expect that FERC would amend the existing licenses to include the provisions outlined in the HCPs and/or the incidental take permit into each of the projects' FERC licenses. The fish protection measures and methodologies proposed under the HCPs would represent long-term settlement agreements under the Federal Power Act and other laws referenced above. As such, they are consistent with provisions in those statutes. However, at relicensing, the HCPs are not automatically reinstated, but the signatory parties to the HCPs have agreed to be supportive of the HCPs during relicensing. FERC is not obligated to incorporate all of the provisions in the HCPs, and can also specify additional mitigation requirements. However, if FERC does not incorporate the HCPs in their entirety or adds terms and conditions that are inconsistent with the HCPs, the parties are allowed to withdraw from the HCPs.

Drawdown, Dam Removal, Non-Power Operations, and Normative River Conditions

Comment 24 *Several commenters suggested that reservoir drawdown options were misrepresented in the DEIS as an available option under Alternative 3. In addition, drawdown, dam removal, and non-power operations should be independent alternatives in the FEIS. Some indicated that NMFS can require a dam removal alternative to be considered in the EIS, and they should also require an alternative that requires additional protection over that proposed under Alternative 3. Others sought clarification of why drawdown or dam removal could only be considered under relicensing if NMFS believed that these options were necessary to meet recovery standards, and why would there be a delay in the implementation of these measures?*

Response 24 Drawdown could be an option under both action alternatives, and the FEIS revisions clarify this point. Note that though the HCPs limit the use of drawdown options to protect the Plan species, the HCPs provide specific language under Section 2.2.1.2 of the Wells HCP Termination, Elective Withdrawal Events Enough Already and Section 2.1.2 of the Rocky Reach and Rock Island HCPs , Withdrawal From Agreement, Enough Already that allows NMFS and USFWS (the Services) to seek drawdown, dam removal, or non-power operations (with or without terminating the agreements or the permits) if the survival standards are not met after 15 years (20 years for the Wells Project). Drawdown can also occur under Alternative 3 by mutual agreement between the parties without requiring the termination of the agreements or the permits. However, the Services can also withdraw from the agreements to pursue drawdown or dam removal options. Although the HCP signatories agree to not advocate drawdown or dam removal during relicensing, non-signatory parties could still pursue these options, and FERC could order

drawdown and dam removal as an option. The environmental effects of drawdown are discussed in Chapter 4 of the FEIS for each resource.

The Services can withdraw from the HCP(s) and revoke the permit(s) (and therefore seek drawdown) even if the no net impact standard has been met, if the Plan species are not rebuilding and the project(s) are a significant factor in the failure to rebuild. This could happen even if the PUDs complied with all of the provisions of the HCP(s). If the Services withdraw from the HCP(s), then Section 7 consultation would be required before FERC takes action on proposals to replace the HCPs. Drawdown could also be an alternative during that consultation process. Therefore, drawdown (or dam removal or non-power operations) is a viable option under both action alternatives. In either case, the Services would need to demonstrate that the project(s) are a significant factor in both the decline and the failure of the species to recover.

Under the HCPs, if the PUDs are unable to achieve the performance standards (Phase II), the coordinating committees will jointly decide what measures must be taken to achieve the pertinent standard. Under Alternative 2, the PUDs would likely be required to meet Section 7 survival standards for Endangered Species Act-listed species only (spring-run chinook salmon and steelhead). The protection for sockeye, coho, and subyearling chinook salmon would likely be less under Alternative 2 because no Section 7 survival standards could be enforced. Any additional protection measures for unlisted species would likely only occur during relicensing or license reopener proceedings.

Under all alternatives, however, drawdown or other non-power options would not be pursued until all other reasonable options to recover the species were exhausted. Therefore, although the HCPs might initially commit the authority of the Services, the agency maintains its ability to pursue dam removal or drawdown over the long term.

The effects of drawdown have been analyzed in the FEIS, and these effects would be similar to a separate drawdown alternative as an additional action alternative. Because these options are available under both action alternatives, it would be redundant to also consider drawdown as an independent alternative because the environmental effects are already displayed in the analysis. Dam removal could be considered under project relicensing by FERC as described in FEIS Section 2.5.1, Dam Removal.

The Quantitative Analysis Report (QAR) analysis indicates that dam removal would not recover the species under all circumstances. Other additional factors (downstream hydroelectric projects, habitat, harvest, and hatcheries) are contributing to species impacts and are affecting the recovery process. Another factor that is suspected of being a substantial influence is ocean and climatic conditions. This is indicated by the near record returns of spring-run chinook salmon and steelhead to the basin in recent years, despite the fact that fish passage conditions have not substantially changed in this same period of time. Therefore, fish passage improvements in the overall hydro system in recent years are unlikely to fully account for these substantial increases in adult returns. Although the majority of these fish are of hatchery origin, they were subject to the same general fish passage conditions as wild fish as they migrated through the Columbia River system. Because there is no clear evidence to suggest that dam removal would substantially improve the recovery process or increase harvestable surpluses, dam removal or decommissioning is unlikely to occur in a timely manner. Even under the relicensing process, drawdown or other non-power options would likely not be exercised until all other reasonable options to recover the species were exhausted. Legal challenges to such an order would likely delay the implementation of these options indefinitely.

Use of Normative River Conditions as Baseline

Comment 25 *Normative river conditions are essential to long-term salmonid survival. Commenters suggested that the EIS should consider normative river and multi-species restoration, the risk of HCP assumptions being incorrect, the potential for the alternatives impacting other species or life stages, and the feasibility of introducing coho salmon. Others suggested that the EIS is speculative regarding the benefits that could occur from minimum operating pools, which haven't been studied at the Mid-Columbia River projects.*

Response 25 According to the *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (USFWS and NMFS 1996), the purpose of the habitat conservation planning process, and subsequent issuance of an incidental take permit, is to "authorize the incidental take of threatened or endangered species, not to authorize the underlying activities that result in the take." In this instance, the authorization for the activities that result in the take (continued operations of the project) is the responsibility of FERC during the relicensing process. FERC is not required to use normative river conditions as the baseline conditions for their evaluations. Refer to 55 Fed. Reg. 4:8-9 [Jan. 2, 1990]; FERC Stats. and Regs., Regulations Preambles 1986-1990, paragraph 30,869 at p. 31,613 (1989). Therefore, it is not appropriate to use normative river conditions as baseline conditions for the evaluation of the proposed HCPs.

The Mid-Columbia River projects are run-of-the-river facilities, which have limited capacity to change Columbia River flows. The large upstream storage projects are operated to capture spring run-off flows and release the water during otherwise lower flow periods. Therefore, these upstream projects control the ability to reestablish normative river flows in the basin. The normative river flow option available for the Mid-Columbia River projects is simply a drawdown option. (See response to Comment #24 for a discussion of drawdown options and Comment #74 for additional discussion on normative flows.)

Alternative 3 is consistent with the multi-species restoration approach because this alternative includes both listed and unlisted species as Plan species. This provides equal protection requirements for the Plan species (including coho salmon) through the establishment of consistent performance standards. Measures described in Alternative 2 would likely only provide additional protection for the listed species through the Section 7 consultation process (which could coincidentally provide a benefit to some unlisted species as well). Additional protective measures for unlisted species could only be obtained through other processes, such as FERC relicensing. Because of these differences, Alternative 3 is less likely to select for certain species or life stages than Alternative 2.

Although an analysis of the risks that the HCP assumptions are not correct has not been specifically assessed, the primary basis of the HCPs is to establish an adaptive management framework for protecting all of the Plan species. The adaptive management process is an iterative approach that relies on periodic assessments to determine if the existing conditions are improving survival and leading to the recovery of the species. This approach allows for modification to be made to the program to help ensure that adequate protection is provided to the Plan species.

In addition, the revised HCPs provide specific options for NMFS to withdraw from the HCPs if the species are not recovering and the projects are a significant factor in the failure to rebuild, even if the HCPs' no net impact standard has been achieved. This provides adequate protection against the HCP assumptions being wrong.

The Quantitative Analysis Report (QAR) analyzed Upper Columbia River spring-run chinook salmon and steelhead data from three periods: 1960 to 1994, 1970 to 1994, and 1980 to 1994. Because the shorter of these series resulted in the most pessimistic population trends, NMFS focused on this data series as the most conservative estimate of survival improvements that would be necessary to meet extinction risk and recovery metrics. The longer time series require less survival improvement to meet these same metrics. In the event that the HCP standards are not met (i.e., survival is lower than expected) for listed species during Phase I studies or at the 2013 check-in evaluations, extinction risks would increase and the likelihood of recovery would decrease compared to the estimates currently provided by the QAR. The extent of this impact would be dependent upon the size of the discrepancy and the length of time the discrepancy existed, and cannot be assessed at this time. However, the revisions to the HCPs that provide periodic evaluations (on a 10-year basis) are expected to minimize the risks of inadequate HCP standards or of the HCP assumptions being incorrect.

Compared to Alternative 1, actions implemented through Alternative 3 would immediately increase the survival rates of all Plan species. The same is true for Alternative 2. However, because implementation of measures described in Alternative 2 would likely occur only after litigation and appeals processes are exhausted, delays measured in terms of years or decades would be likely before the measures were fully implemented. It is also likely that these measures would be fully implemented to protect listed but not unlisted species or that only partial implementation would be provided for unlisted species (decreased amount or duration of spill programs, for example).

The primary benefit of the minimum operating pool concept is to reduce the cross-sectional area of the river, which would result in an increase in water velocity, and potentially increase juvenile migration speed. The assumption associated with this concept is that increased migration speed results in an increase in survival rate because the migrants would have less exposure time to predators or other river conditions (e.g., temperature) that have been shown to impact survival. However, the theory of increased migration speed with increased water velocities has not been consistently observed for the various anadromous species in the Columbia River Basin. Berggren and Filardo (1993) found a weak or non-existent relationship between migration travel time and river flow for yearling chinook salmon in the Mid-Columbia River reach. Giorgi et al. (1997) found that flow was the best single predictor of travel time for Mid-Columbia River sockeye salmon and steelhead, but not for yearling chinook salmon.

Giorgi et al. (2002) found little evidence supporting a flow survival relationship, based on PIT-tag evaluations conducted between 1993 and 2000. However, low flow conditions in 2001 resulted in a dramatic reduction in juvenile steelhead survival migrating through the Snake and Columbia Rivers (from a typical 90 percent per project survival rate to about a 63 percent survival rate per project). The slow migration speed observed in 2001 and the increased water temperatures during the migration period are considered the causative factors for the dramatic decrease in survival and increased residualization of steelhead.

In addition to inconsistencies in the flow to travel time relationships for different species and between years, there are inconsistencies in the relationship between flow (velocity) and survival. Given a constant flow, drawdown to minimum operating pool would increase water velocities, however slightly. While the benefits of drawdown to minimum operation pool have not been conclusively verified, NMFS continues to support this action in general as one likely to benefit juvenile outmigrants. Additional text was added to FEIS Section 4.2, Fisheries Resources to provide this information.

Comment 26 *What modeling efforts have occurred previously regarding drawdown and juvenile survival?*

Response 26 Although the concept of drawdown to natural river conditions is included as a possible option under the action alternatives, the EIS clearly indicates that a separate analysis would be required if drawdown were to be pursued because of the potential for extensive environmental impacts. Although extensive evaluations have been conducted for the Lower Snake River projects relative to drawdown, no clear-cut results have been produced. In addition, because drawdown is an option for all of the alternatives, it is not an adequate factor for distinguishing between the alternatives. As a result, extensive evaluations or assessments are not conducted as part of this EIS.

However, the Quantitative Analysis Report (QAR) assessed the potential for recovery of the listed species relative to the goals of the HCPs. This assessment indicated that although the HCPs alone would not be adequate to meet the extinction risk criteria, project removal alone would also not meet the criteria. See FEIS Section 4.1.2.1, Project Area.

No Net Impact Standard Elements

Comment 27 *Several commenters requested clarification of the biological and scientific justification for the components of the no net impact standard, and the assumption that these components were additive, even though they are comprised of compensation for impacts to different life stages, and various components are not quantifiable. Others questioned whether the no net impact standard would be feasible if the 7 percent hatchery component was not guaranteed, and whether the standard is consistent with other recovery efforts in the basin.*

Response 27 The performance standards were values negotiated during the HCP development process, which included representatives of the Joint Fisheries Parties. The standards were based on the best available scientific data. As a result, the standards represent the best professional judgment of the negotiating parties. Additional information regarding the biological basis for the overall survival, hatchery compensation, and tributary funding was included in FEIS Section 2.3.4.4, HCP Performance Standards.

These performance standards were evaluated through the Quantitative Analysis Report (QAR) to determine their effects on species recovery and are summarized in Chapter 5 of the FEIS. The report compares the survival benefits of the HCP measures with the survival improvements needed to satisfy long-term recovery risk criteria. The QAR is summarized in Appendix E of the FEIS.

The PUDs committed to provide adequate funding and support to meet the full hatchery supplementation requirement described in the HCPs. Although it is NMFS's intent to allow the PUDs to provide full hatchery production through 2013, this level of production cannot, for various reasons, be guaranteed for subsequent 10-year periods after 2013 and under all possible scenarios (e.g., limitations in broodstock). Because the primary purpose of the HCP process is to protect and lead to the recovery of listed species, this goal must take precedence over the no net impact standard. As such, NMFS may be required, due to concerns about possible negative impacts of hatchery production on the recovery of the natural populations of Endangered Species Act-listed species, to restrict hatchery production to levels that do not threaten the recovery of naturally reproducing listed fish in 2013 or at subsequent 10-year intervals. However, the no net impact standard remains a goal of the HCPs, and the PUDs have guaranteed the appropriate level of hatchery funding to meet the 7 percent hatchery supplementation component of the no net impact standard. The failure to achieve no net impact would be a basis for withdrawal under the

Agreements in 2013 (2018 for the Wells Project). Formal consultation between NMFS and the Tribes on a government-to-government basis would include discussions of the hatchery issue, and would occur prior to issuance of a Record of Decision (ROD) or a final biological opinion on the HCPs.

As revised, the HCPs specify the initial hatchery production levels that will be necessary to meet no net impact. In 2013, and every 10 years thereafter (at the time of the program review), NMFS may determine that the impacts of hatchery production to the wild populations are greater than expected and ultimately require reducing production to acceptable levels (see Section 8.7.1 of the Wells HCP [Hatchery Compensation Plan] Changed Hatchery Policies Under ESA, and Section 8.8.1 of the Rocky Reach and Rock Island HCPs [Hatchery Compensation Plan, Changed Hatchery Policies Under ESA]). Should this scenario occur, the coordinating committees would ascertain the measures required to meet the no net impact standard.

The HCPs are consistent with the other recovery plans in the basin, as they focus on the key components in the recovery process. NMFS has developed guidelines for basin-level, multi-species recovery planning, which encompasses habitat, harvest, hatcheries, and hydropower. This recovery planning analysis is contained in the document entitled *Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy* (Federal Caucus 2000). Three of these four components of the recovery planning are primary components of the HCPs (harvest is the exception). Also consistent with these basinwide programs, the HCPs are multi-species programs that encompass multiple life stages.

Comment 28 *Several commenters requested clarification of how a 95 percent survival goal over 95 percent of the migration period corresponds to only a 5 percent juvenile passage mortality. Others questioned the exclusion of spring-run chinook salmon, smaller than 50 mm in length, from the 95 percent juvenile dam passage survival for the full run of that species in the event turbine intake screens are installed. There were also some suggestions for a greater habitat component and a lesser hatchery component than that proposed in the HCPs.*

Response 28 The measurement of the no net impact standard is based on the entire run, although the protection measures implemented at the projects are targeted at 95 percent of the run. Compensation through hatchery and tributary funding measures is based upon calculations derived from the average adult counts effectively representing 100 percent of the runs. Thus, mitigation is provided for 100 percent of the migration periods, but the project operations concentrate on 95 percent of the spring and summer migration periods. Recognizing that some measures are costly per unit time, the signatory parties agreed that juvenile dam passage protective measures would encompass 95 percent of the migration as an objective that could be effectively managed. This applies to the 95 percent juvenile dam passage survival standard and not the 93 percent juvenile project survival measurement. In actuality, because the spring and summer migrations overlap significantly, the juvenile spill program under Alternative 3 will most often be a continuous operation between the spring and summer periods. The spill program will, in most years, actually provide protection to more than 95 percent of the spring and summer migrants. Other measures to improve juvenile survival through the projects (Rocky Reach fish bypass system, predator control programs) are expected to cover an even higher proportion of the migrants. Implementing measures to cover 95 percent of the spring and summer migrations is consistent with the provisions of the biological opinions for the Wells, Rocky Reach, and Federal projects on the mainstem Columbia River (NMFS 2000a,b, 2002a). While the full suite of dam survival improvement measures will not cover all juveniles migrating throughout the year, these protection measures should translate into a significant survival improvement for all Plan species compared to Alternative 1, and for all unlisted species compared to Alternative 2.

The revised HCP does not include a specific exemption for spring-run chinook salmon less than 50 mm in length. However, the signatory parties recognize that some species or life histories cannot be measured with the technologies available at this time. The signatory parties are committed to evaluating the survival of these fish after the technology becomes available. The coordinating committees would be responsible for making the determination and approving an appropriate study prior to implementation.

The approach used to translate 2 percent mitigation into habitat improvements was determined by negotiation among the participants in the development of the HCP, which included agencies, Tribes, American Rivers, the applicants, and the applicants' power purchasers. The tributary habitat improvements are not intended to result in a reduction of hatchery supplementation. The initial process to determine the appropriate amount of mitigation for the tributary habitat improvement fund (Plan Species Account) was to evaluate the types and extent of habitat improvements that would mitigate for 2 percent of project mortality, and then to determine the overall cost to conduct these types of improvements. Mortality was then appropriated by project (Wells, Rocky Reach, and Rock Island), based on the numbers of fish that would be affected by each project, to ensure the appropriate commitment of financial resources. The tributary funding provided by each project represents the tributary habitat improvement mitigation measures. See FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures.

Shifting to a larger compensation level for the habitat component in the no net impact standard could reduce the compensation provided through the hatchery programs. While the additional tributary habitat work would be beneficial, these benefits would likely result in a gradual long-term improvement in fish production and survival. On the other hand, removing funds from the hatchery programs would result in immediate loss of hatchery fish, thereby affecting harvest opportunities. Recent changes to the hatchery programs are expected to minimize the impacts of hatchery fish on wild populations, and possibly increase wild populations with the use of wild broodstock programs. Hatchery programs have a greater potential for achieving short-term gains, while tributary funding provides long-term habitat improvements. The combination of short- and long-term components provides a balanced approach to salmon recovery, which is similar to the approach provided in the biological opinion for the Federal Columbia River Power System (NMFS 2000a).

HCP Uncertainties

Comment 29 *Several commenters expressed concerns that some portions of the standards, particularly the tributary habitat mitigation or delayed mortality, cannot be measured with the existing sampling methods. This raised the issue of whether different standards should be developed, such as project operational criteria.*

Response 29 The stated intent of the HCPs is to achieve the no net impact standard no later than 2013 (2018 for the Wells Project), with the exception of the Tributary Conservation Plan, which is not monitored. The revised HCPs clearly indicate how and when the hatchery production levels will be evaluated and adjusted, as well as the priority of survival standards and the requirements by which survival is measured (see Figure 2-4 of the FEIS). The pertinent HCP definitions clearly note that the survival standards are intended to measure project effects "including direct, indirect, and delayed mortality wherever it may occur and can be measured (as it relates to the projects) given the available mark-recapture technology." It is NMFS's opinion that these standards are most likely to be measured with existing or developing technology.

With respect to the tributary programs, the signatory parties agree that funding-approved habitat restoration and protection projects will constitute compensation for 2 percent unavoidable adult project mortality. They also agree that no effort will be made to determine whether or not the Tributary Conservation Plan is, in fact, increasing the survival of Plan species by 2 percent. Rather, future assessments of this program will be designed to ensure that the Plan Species Account is being utilized in an effective and efficient manner. This agreement recognizes that any statistical estimate of a 2 percent survival increase relative to habitat improvements would be inconclusive. Under even the most exacting experimental design, fluctuations in the natural environment alone would result in error bounds many times larger than the metric to be estimated.

Although it is possible that the standards might not be met for some or all of the Plan species at one project or another, there would be no additional mitigation requirements for not meeting the standards prior to 2013 (2018 for the Wells Project), except as set forth in Phase II, as long as the PUDs comply with HCP permit conditions. In contrast, under Alternative 2, additional mitigation could be required for listed species if new information indicates that the mitigation measures established under the initial Section 7 consultation are not adequate to ensure the continued existence of the listed species. Refer to FEIS Section 2.3.3, Alternative 2 for Alternative 2 and Section 2.3.4.5, HCP Phases and Section 2.3.4.8, HCP Conservation Plan and Compensation Measures for Alternative 3.

Current survival estimates are provided in FEIS Sections 3.2.5, Adult Survival at the Projects and 3.2.6, Juvenile Survival at the Projects at each of the hydroelectric projects. Both action alternatives require, or are expected to require, additional improvements to these survival rates except at Wells Dam where project survival for listed species already exceeds 93 percent. The Endangered Species Act criteria specify that the issuance of a permit should not "appreciably reduce the likelihood of the survival and recovery of the species in the wild" (Section 10) or does not "jeopardize the continued existence of" any Federally listed species (Section 7). There are no provisions that require a net benefit to the affected species or that the proposed action must necessarily result in the recovery of the species.

The Quantitative Analysis Report analyses suggest that the HCPs would not only satisfy the Endangered Species Act requirements, but that the HCPs would increase the probability of the recovery of listed species. However, implementation of the HCPs would not, nor are the HCPs required to, recover these species by themselves. The mitigation requirements under Alternative 2 are expected to be similar to those outlined in the HCPs because the requirements for listed species in both instances would be based on the same baseline information. Under Alternative 2, new information indicating that the measures were inadequate to ensure the continued existence of the species would likely result in reinitiation of consultation to develop additional measures to increase survival of listed species. Under Alternative 3, failure to meet the performance standards (Phase II) would result in the coordinating committees developing measures to meet the HCP survival standards. In addition, in 2013 (2018 for the Wells Project) and every 10 years thereafter, should information indicate that the stocks are not rebuilding, NMFS (after meeting several conditions of the agreement) could withdraw the permit. Thus, while the processes have obvious differences, the outcome under both action alternatives is that listed species will receive adequate protection in the long term. Under Alternative 2, protective measures for unlisted species would be attained through license reopener clauses or through relicensing while under Alternative 3, these species would immediately receive a commensurate level of protection as listed species.

Specific project configuration and operational guidelines have been the standard means of protecting anadromous fish species in the Columbia River Basin in the past. However, such guidelines do not guarantee or mandate the achievement of specific survival rates. Setting a standard for fish passage efficiency (non-turbine passage rates), for example, provides an opportunity for greater survival but does not establish a survival goal. This approach assumes that a certain percentage of the fish will pass through a specific route each year, if the project is operated in a certain manner, and includes a survival rate for that passage route (see Table 3-4 in the FEIS). In addition, this approach often relies on data from various projects or various years (e.g., average turbine passage survival) to determine route-specific survival or passage efficiency rates. As a result, there does not appear to be any more species recovery certainty with that approach compared to having a fixed, results-oriented, project passage survival goal that is measured at each project.

The HCP signatory parties recognize that current methodologies cannot differentiate between sources of adult mortality (included in the 91 percent combined adult and juvenile survival standard) within the project area. Known adult mortalities within a project boundary could be due to natural mortality (i.e., mortalities occur even in fairly pristine river systems without dams), or due to delayed or cumulative effects (e.g., catch and release angling, injuries sustained while escaping commercial or tribal fisheries, downstream Federal project impacts). The HCP signatory parties, recognizing the limitations associated with the best available technology, developed three surrogate standards for assessing the survival of juvenile fish. These are, in order of priority: (1) measured juvenile project survival (93 percent), (2) measured dam passage survival (95 percent), and (3) calculated dam passage survival. The achievement of the HCP survival standards would be determined by averaging the estimates from 3 years of valid studies. Only the survival estimates for species that cannot be measured directly (e.g., sockeye or subyearling chinook salmon) would be based on the lowest priority route-specific methodology or surrogate species (see Figure 2-4 of the FEIS). In addition, as technology advances allow, verification of survival rates measured against a higher priority standard would be required.

Comment 30 *Several commenters requested an analysis to determine whether the proposed funding for off-site mitigation is adequate, particularly because Grant County PUD is no longer part of the HCP process. Others questioned whether Alternative 2 could potentially provide greater tributary habitat improvements than Alternative 3.*

Response 30 Only Alternative 3 includes PUD funding of tributary habitat improvement projects. Funding for tributary habitat improvements is assumed to compensate for 2 percent of unavoidable project mortality. Participatory parties in the development of the HCPs (as described in FEIS Section 1.1, Introduction) worked together in determining funding levels to be provided by each PUD. This effort included an analysis of the cost of habitat easements, property acquisitions, water rights purchases, and specific restoration projects to determine the specific level of funding needed over the next 50 years.

The total amount to be provided to the Plan Species Account was originally based on a compensation level for impacts associated with the five Mid-Columbia River dams. This total amount was allocated to the different projects based on the proportion of their impacts to the stocks. For example, the Wells Project was assigned a smaller proportion of the funding responsibilities than the Rocky Reach Project because the impacts associated with the Wells Project would affect only those fish migrating to or from the Okanogan and Methow Rivers. In addition to impacting these same stocks, the Rocky Reach Project would also impact the Entiat River stocks. Although the overall size of the fund was reduced when Grant County PUD elected to not pursue a Section 10 permit, the compensation level remains unchanged for the remaining

projects. It is assumed that mitigation alternatives resulting from the Section 7 consultation for the Grant County PUD projects will replace the compensation that was lost from the HCP Tributary Fund for the listed species. There is no basis under the Endangered Species Act for Chelan and Douglas County PUDs to be required to mitigate for impacts attributable to the Grant County PUD projects.

Note that hatchery compensation levels determined for each PUD are also independent of the other PUDs, including Grant County PUD. These compensation levels are based on estimates of impacts associated with each individual project and not on a region-wide basis. Therefore, Chelan and Douglas County PUDs would still provide up to 7 percent hatchery compensation for the unavoidable mortality associated with their projects.

An estimate of $100 million was originally established as the funding level to the Plan Species Account, assuming the participation of all three of the Mid-Columbia PUDs. This was allocated based on the degree of impacts to the species for each project. Because Grant County has opted not to pursue an HCP, the mitigation funding for impacts related to Wanapum and Priest Rapids dams are no longer included in the overall HCP funding. According to the HCP terms and assuming that the performance standards are met, Douglas County would make an initial payment of $1,982,000 plus $176,178 annually for 45 years. Chelan County would contribute $229,800 annually for 50 years for the Rocky Reach Project and $485,200 annually for 50 years for the Rock Island Project. In addition, the HCPs provide mechanisms for accelerating payments so that more funds are available in the early years of the HCPs. Total funding would be $46,660,010 in 1998 dollars and the annual payments will be adjusted for inflation. If adult survival through Wells Dam is assessed and determined to be less than 2 percent and the combined adult and juvenile project survival is greater than 91 percent, then the annual funding to the Plan Species Account for the Wells Project would be reduced proportionately (see Example 1, Wells HCP, 2002. Chelan County funding levels would not change whether or not the performance standards are met. Therefore, the current funding level represents a substantial source of habitat improvement funding even without the Grant County portions. Refer to FEIS Section 2.3.4.8, HCP Conservation Plan and Compensation Measures.

In addition, Endangered Species Act Section 7 consultations have been completed for the Lower Columbia River dams (NMFS 2000a) and are in the process of being completed for the Grant County PUD dams (NMFS expects to produce a final biological opinion prior to 2003). Therefore, these projects are, or soon will be, responsible for meeting survival levels to avoid jeopardizing listed species. Under Alternative 3, should the stocks fail to rebuild by 2013 (2018 for Douglas County), NMFS could take steps to withdraw the permit, and would undoubtedly request that Grant County PUD and the Federal operators reinitiate consultation on the other four Columbia River projects and four Snake River projects.

It is not practical or efficient to attempt to quantify a 2 percent compensation level for the habitat improvement projects. Even under the most exacting experimental design, fluctuations in the natural environment alone would result in error bounds many times larger than the metric to be estimated. This determination is based on the diversity of potential projects, the varying time frames for the maximum benefit to occur for these different projects, and the overall difficulty and expense of monitoring the benefits. However, each improvement project would be monitored to ensure that the site-specific goals and objectives are obtained. The revised HCPs each contain a Tributary Assessment Program in addition to the tributary funding discussed above. The Tributary Assessment Program will monitor and evaluate the relative performance of the tributary enhancement projects approved by the tributary committees.

Comment 31 *Please confirm that the HCPs and Quantitative Analysis Report require that the performance standards will be applied regardless of cost or drought, and that these factors will not impact improvements to the lower river projects. This should include an assessment of the 2001 water year. The EIS should also assess the level of survival improvement needed to sustain Tribal harvests well above recent restricted levels.*

Response 31 Only one section of the HCP notes conditions under which the PUDs might fail to implement HCP measures. In Section 12.7 of the HCPs [Miscellaneous, Force Majeure], "*force majeure*" is defined as "causes beyond the reasonable control of, and without the fault or negligence of, the PUD or any entity controlled by the PUD, including its contractors and subcontractors." The HCPs further stipulate that "economic hardship shall not constitute *force majeure* under this Agreement." Thus, *force majeure* would apply to events such as attacks due to war or terrorism, major equipment failure, or damage from earthquakes or floods; but would not apply to a conscious decision by a PUD to curtail HCP measures to realize economic benefits. This would be cause for withdrawal by the signatory parties. Furthermore, the HCPs are not connected to Endangered Species Act requirements at other hydroelectric projects on the Columbia River and therefore will not affect the implementation of measures at lower river projects to improve juvenile or adult salmon or steelhead survival.

The drought conditions in 2001 resulted in lower spill levels at a number of Columbia and Snake River hydroelectric projects than has been was generally stipulated or recommended to aid the downstream migration of anadromous fish in biological opinions. At that time, the Chelan and Douglas County PUDs voluntarily implemented some provisions of the agreements although they were not bound by the terms of the HCPs, although they have voluntarily implemented some provisions of the agreements to enhance the possibilities of meeting the HCP survival standards. The results in 2001 indicate the benefits of the HCPs as strong incentives to maintain fish protection programs. If In future years, should the PUDs fail to meet the requirements of the HCPs, it would provide Signatory Parties cause for withdrawing from the agreement and NMFS cause for withdrawing jeopardize their incidental take permits. Under the existing licenses and operational agreements, which include Section 7 consultations for most of the Columbia and Snake River projects, the incentives are not as strong, as evidenced by the reduced spill levels that were provided in 2001.

Refer to responses to Comments #40 and #52 concerning survival standards, Tribal harvest, and the role of hatchery supplementation in assuring Tribal harvest priorities. However, the provisions of the Endangered Species Act do not require the recovery of the species to harvestable levels. This applies to both action alternatives.

Range of Alternatives

Comment 32 *Several commenters indicated that the EIS does not analyze an adequate range of alternatives, or compares and contrasts these alternatives in a complete and unbiased manner. Others questioned the idea that Alternative 2 could take longer to implement than Alternative 3.*

Response 32 The FEIS includes (1) a no-action alternative (Alternative 1), (2) a hydropower conservation measures alternative (Alternative 2), and (3) proposed habitat conservation plan alternative (Alternative 3). Alternative 1 is based on existing conditions (Wells and Rock Island Settlement Agreements and the Rocky Reach Fourth Revised Interim Stipulation) representing the baseline of comparison for the action alternatives and the position that no action is taken either under Section 7 or Section 10. Alternative 2 represents measures that were considered during the development of the proposed action, as well as certain measures raised in public comments on the

DEIS. Alternative 3 represents measures contained in the proposed HCPs. Some alternatives raised in public comments were discussed but eliminated from detailed study. The three alternatives considered in detail represent the range of actions that could reasonably occur at the three hydroelectric projects. The EIS attempts to present the alternatives without bias; however, there is some overlap of both the protective measures used to lower mortality and their implementation in Alternatives 2 and 3, especially with respect to actions taken to protect listed Plan species. There is some regulatory duplication in the implementation processes of Section 7 and Section 10.

Both action alternatives include a variety of measures to be implemented at the projects for reducing Plan species mortality. The primary differences between the action alternatives are (1) the extent (proportion of juvenile migration covered) and level (percentage of spill) of the spill programs at each project, and (2) the choice of passage route (6,000 cfs sluiceway or juvenile collection and transport system) at Chelan County PUD's Rocky Reach Project. The description of the action alternatives also identifies relative differences with respect to regulatory procedures, the length of time that might be required to implement alternative measures, and the likelihood of implementing the protective measures for listed and unlisted Plan species. Procedural differences are described in FEIS Section 2.6, Alternative Comparison, in Tables 2-7 and 2-8, and in Chapter 4. Table 2-7 compares differences between the procedures for complying with the Endangered Species Act, while Table 2-8 illustrates the environmental differences that would occur from implementation of the alternatives, as well as the no-action alternative. Revisions to the DEIS have been included to more clearly display the differences among the alternatives. All alternatives were given equal weight, consideration, and review for selection of a preferred alternative.

The mitigation measures proposed at the dams under Alternatives 2 and 3 are expected to be similar and yield similar results for listed Plan species. Alternative 3 is expected to provide more protection, compared to Alternative 2, for unlisted Plan species.

The two primary mitigation measures proposed under Alternative 3 are hatchery supplementation (which represents mitigation for 7 percent project mortality), and funding for tributary habitat improvements (which represents mitigation for 2 percent project mortality). It is important to note that the majority of the hatchery production in the Upper Columbia River is designed to compensate for original inundation by the projects. This production is not subject to adjustment through the HCPs. The initial production levels are detailed in Section 8 of the HCPs, Hatchery Compensation Plan. Hatchery production under Alternative 2 would be addressed through the existing settlement agreements or during relicensing, and through the issuance of direct and incidental take permits to WDFW, which operates the PUD-funded hatcheries.

For the Wells Project and existing settlement agreements between FERC and the Douglas County PUD, ongoing hatchery production of spring and summer chinook salmon and steelhead currently mitigates for an assumed 14 percent level of mortality at the project (Alternative 1). Under both Alternatives 2 and 3, the production of yearling (spring) chinook salmon and steelhead would be reduced to 3.8 percent, based on the 3-year average of juvenile project survival studies (96.2 percent). Under Alternative 3, the remaining Permit species will be compensated at the 7 percent level. The need for coho salmon compensation will be assessed in 2006 and will be based upon the development of either a long-term coho salmon hatchery program and/or the establishment of a threshold population of naturally reproducing coho salmon in the Methow Basin. Should coho salmon compensation be warranted, Douglas County PUD would implement a program to provide the equivalent of 3.8 percent juvenile mortality. This level is based on the agreed-upon

interim value for juvenile project survival for coho salmon, which at this time is best estimated by the yearling average chinook salmon and steelhead survival estimates.

For the Rocky Reach and Rock Island projects, under the HCPs, Chelan County PUD would provide the funding and capacity to meet the 7 percent hatchery compensation level necessary to achieve the no net impact standard for all Plan species. However, Chelan County PUD has agreed to continue meeting their existing hatchery obligations through 2013, during which time they will evaluate options for the long-term production of sockeye salmon. Thus, the 7 percent HCP production requirement will be exceeded for some Plan species (steelhead, spring-run chinook salmon) through 2013, but will not be met for other Plan species (sockeye and coho salmon). Hatchery compensation levels for these projects would be adjusted in 2013, including 7 percent hatchery compensation for sockeye salmon (after options have been evaluated) and possibly for coho salmon (compensation timelines and decision points are identical to those identified above for Douglas County PUD).

In summary, for hatchery compensation, Alternatives 1, 2, and 3 are expected to be identical at least through 2013. After 2013, production levels for listed species would likely decrease from this baseline level for both Alternatives 2 and 3. Alternative 3 would provide 7 percent hatchery compensation for sockeye salmon and potentially for coho salmon, which is not contemplated in either Alternative 1 or 2.

The mitigation measures for the tributary habitat improvements under Alternative 3 are represented by the funding levels, rather than specific projects that would be funded. The tributary committees have the responsibility to select the projects to be funded by the Plan Species Account. The tributary committees will consist of representatives from the signatory parties (as voting members). In addition, the tributary committees may select other expert entities (such as land and water trusts or conservancy groups) to serve as additional, non-voting members of the committees. This format ensures that a wide range of perspectives are incorporated and biologically sound decisions are made. Alternative 2 does not include any off-site mitigation in the form of PUD-funded tributary habitat improvement projects (see FEIS Section 2.6.6.2, Alternative 2).

The length of time it has taken for Section 7 consultation from initiation to implementation of conservation measures has averaged over 5 years for Mid-Columbia projects owned by PUDs, due to FERC's current interpretation of their responsibilities under the Endangered Species Act and legal options open to the applicants. Some of these processes have resulted in a biological opinion on interim operations, resulting in consultation reinitiation prior to the expiration date of the interim operations. Section 7 consultation would also be required at relicensing or any license reopener proceedings. During these consultation proceedings, the existing mitigation programs would proceed until final resolutions were reached on additional conservation measures required. As described in FEIS Section 2.6.5, Implementation Schedule, the HCPs were developed to minimize legal options and expedite project actions that directly benefit the Plan species. Actions would be taken from the perspective of cooperation and coordination, rather than a series of independent actions and processes that would be subject to litigation. Compared to Alternative 2, the initial protection measures under Alternative 3 would be implemented immediately. Future implementation of any additional tools needed to meet the survival standards under the HCPs would likely be implemented, for the reasons stated above, in a more timely manner than would be the case under Alternative 2.

No-Action Alternative

Comment 33 *Several commenters questioned the appropriateness of the no-action alternative, particularly since it does not include the normative river as the baseline conditions, and that it omits statutory authorities at relicensing. Others questioned whether the existing mitigation and compensation levels are adequate to mitigate for dam construction and operations.*

Response 33 Alternative 1 (the no-action alternative) represents existing baseline conditions that would occur if neither action alternative were implemented, which is consistent with NEPA requirements. Alternative 1 is evaluated in Chapter 4 of the FEIS (which describes effects of the alternatives), similar to the evaluation of Alternatives 2 and 3. Relicensing is a separate independent action with FERC as the lead agency, and includes more than fish protection measures for listed species. Therefore, Alternative 1 was limited to existing FERC licenses and settlement agreements that govern current operations, with one exception. FERC has amended the Rocky Reach Project license to allow for the construction and operation of a juvenile bypass facility at that project. Since this measure is rightfully considered an element of the HCP, evaluation of the juvenile bypass facility occurs under Alternative 3 rather than under Alternative 1. Alternative 1 also provides a baseline for comparison with the action alternatives.

Long-term settlement agreements have been negotiated for the Wells and Rock Island dams that include the hatchery mitigation provisions as compensation for project inundation and existing ongoing impacts. Although a long-term agreement has not been reached for Rocky Reach, this dam has operated from 1979 to 1997 under various stipulations. Initial inundation losses were established from estimates of spawning habitat loss. The initial inundation compensation did not mitigate for passage loss of juveniles. The long-term settlement agreements at Wells and Rock Island Dams established passage loss rates, thus completing the mitigation package for project impacts to salmonids. Because of these relatively recent reevaluations of the mitigation programs at all three projects, it is reasonable to assume that existing mitigation or compensation levels are adequate to address project inundation, at least for the purposes of comparison within this FEIS.

Action Alternatives

Comment 34 *Several commenters requested clarification of the legal and management authorities associated with Alternative 2 that would not be available under Alternative 3. Several commenters suggested that adaptive management would be more effective under Alternative 2. Other commenters requested additional information in Table 2-8 of the DEIS summarizing the comparisons between alternatives, how the Quantitative Analysis Report (QAR) information is incorporated into the alternatives, and why the HCPs do not consist of an ecosystem approach to recover the species.*

Response 34 The HCPs would not affect the PUDs' responsibilities under other Federal, State, Tribal, or local statutes. In addition, parties that do not sign the HCPs can pursue these Federal, State, or local statutes if they are in disagreement with the PUDs' approach in implementing the mitigation measures associated with the HCPs. However, as a result of an agreement with USFWS, NMFS is the only agency with mandatory conditioning authority for the listed anadromous fish species under the Federal Power Act and the Endangered Species Act. FERC could require additional mitigation measures during relicensing procedures, although if these additional measures were inconsistent with the HCPs, the parties could withdraw from the agreements.

These comments were generally associated with the ability for resource agencies and Tribes to pursue reservoir drawdown, dam removal, or other viable non-power options to recover the

species. See FEIS Section 2.6, Alternative Comparison that discuss the application of the protection provisions of other laws and statutes for the two action alternatives. These other laws and statutes would be available to non-signatory parties to the HCPs to protect Mid-Columbia River fish stocks. See Table 2-8 of the FEIS to reflect the protection provisions of other laws. The results of the analyses conducted for this project indicate that dam removal would not meet the extinction risk criteria if recent environmental conditions continue.

The QAR analyzes the HCP fish protection measures combined with other foreseeable protection measures expected to occur at other Columbia River projects. Because fish protection measures are expected to be similar between Sections 7 and 10 for listed species, the report results describe long-term risks associated with both alternatives. The HCPs are an appropriate vehicle for supporting adaptive management. The HCPs are based on a results-oriented approach that requires an adaptive management approach to reach the survival goals. Alternative 3 provides a systematic and regular process for evaluating and reevaluating survival rates for all Plan species at the projects to facilitate adaptive management opportunities. Under Alternative 2, evaluations would likely be of a similar scope, but would focus primarily on listed species.

The decision not to use an overall ecosystem-based management approach in developing the HCP occurred in the early 1990s, and was not developed in further detail because it was determined to be too difficult and costly to obtain quantitative information on the effects of the projects on all of the fish and wildlife species that occur within the vicinity of the projects. The decision was then made to concentrate on a multi-species level as opposed to an ecosystem level with all species present in the project area. This resulted in focusing on Endangered Species Act-listed anadromous fish species that would be considered under Section 9 of the Endangered Species Act, as well as the unlisted species for which NMFS is the responsible reviewing agency.

Dam Operations-Related Questions

Comment 35 *Several commenters requested clarification on the fish bypass options that could occur under the different alternatives, their potential effectiveness, and their impacts to non-Plan species. These options include turbine intake screens, spill, and surface collection systems.*

Response 35 Bypass options (methods of passing fish using non-turbine routes of passage) include the construction and operation of structures specifically designed to provide safe routes of passage to migrating fish on one end of the spectrum and voluntary release of water through spillways at the other end. Structural remedies (including turbine intake screens and surface collectors) are typically limited by constraints resulting from the unique characteristics of each project, while spill is most often limited by total dissolved gas restrictions. At present, a combination of bypass systems and spill levels appear to provide the most effective fish bypass systems at mainstem Columbia River projects. Furthermore, until issues relating to water quality impacts and the overall effectiveness of spill are resolved and determined, there is no indication that spill will be the only measure to be used to aid in increasing survival rates of juveniles passing the dams.

Bypass systems, spill, or some combination of these measures are currently being used to aid fish passage at the Mid-Columbia River projects, and would therefore likely be required at the PUD projects under either Alternative 2 or 3. Douglas County PUD has already developed a spillway bypass system at the Wells Project that has been in operation for over a decade. Chelan County PUD has recently received a FERC order (issued after consulting with NMFS) allowing the construction and operation of a screened bypass system at the Rocky Reach Project, which is expected to be operational prior to the 2003 migration. Spill is expected to continue at the Rocky Reach Dam to supplement the bypass facility. No bypass system is currently under consideration

for the Rock Island Project, although bypass systems have been tested at both power houses at Rock Island in the past. A bypass system would likely be considered at the Rock Island Project should proposed measures (including a 20 percent spill rate) fail to meet survival requirements under either action alternative.

Protection of non-Plan species (e.g., lamprey, sturgeon, and bull trout) would occur in the same manner under both action alternatives. Section 7 consultation would occur for bull trout under both Alternatives 2 and 3 (as it is a listed species), while protection for other species would occur through compliance with the Federal Power Act.

The FEIS describes procedural differences between the alternatives and how these might differentially affect the Plan species. In addition, survival rates for the various fish passage routes at the projects are discussed, but the fish protection tools that may be used to achieve performance standards are not specified. Under Alternative 2, NMFS would issue FERC a biological opinion on a proposed Federal action. If NMFS determined that the proposed action would jeopardize the continued existence of the listed species, NMFS would provide a reasonable and prudent alternative that describes the fish protection measures necessary to avoid jeopardy. For Alternative 3, the PUDs would select the methods for achieving survival under Phase I. The coordinating committees would select the methods under Phase II. These decisions would likely change over time, depending on subsequent evaluations and the development of new technologies for measuring survival standards.

The benefits and disadvantages associated with installing screens are discussed in FEIS Section 4.2.3.2, Other Plan Species. For Alternative 2, specific protective measures for listed species would likely occur through Section 7 consultations and FERC license amendments. For unlisted species (salmon and other aquatic species), protective measures would be pursued primarily through Federal Power Act processes (relicensing procedures or amendments to the existing licenses). For Alternative 3, the Plan species would be protected by the same no net impact standard as the listed species. This would include satisfying the 95 percent juvenile dam passage, 93 percent juvenile project passage, or 91 percent combined adult and juvenile total project passage survival standards. Under Alternative 3, the protective measures would occur immediately for all species, while under Alternative 2, the protective measures could be delayed through litigation (this is particularly likely in the case of unlisted species). Under Alternative 2, it is also more likely that less protective measures (for example, lower spill levels or a shorter duration of spill) would be implemented for unlisted species than for listed species. Under both alternatives, other species would be protected through other processes, such as FERC relicensing and Endangered Species Act consultation (should the fish species become listed in the future).

Comment 36 *Several commenters requested additional information on recent estimates of juvenile mortality rates specific to passing the projects, as well as the effects of project operations on adult salmonids.*

Response 36 Project survival studies better estimate direct, indirect, and delayed effects than dam passage or passage route-specific studies, because the studies typically span a longer time period and account for some variability in passage conditions through the outmigration season. Passage route-specific evaluations rarely estimate indirect and delayed effects because the evaluations typically occur over a shorter time frame and test specific or limited operational conditions. As a result, these latter evaluations might not be as representative of the typical or average passage conditions experienced by the species. However, for some species it will not be possible to conduct project survival studies due to the limited number of fish available for the studies and their body size

relative to the tagging method required. In these cases, verification would likely be through studies with representative species.

The revised HCPs identify the calculation of dam passage survival (based on assumed passage and survival parameters) as a measurement of last resort. If at all possible, juvenile project survival or dam passage survival of Plan species would be measured through specific survival studies. Of these three options, only by meeting the 93 percent juvenile project survival standard can a PUD receive a Phase III (Standard Achieved) determination. The emphasis has been shifted from dam passage survival (measured or calculated) to project survival estimates (see Table 3-4 of the FEIS). Thus, the verification of survival under either action alternative would likely rely on project survival studies rather than passage route-specific studies.

Turbine survival data do not exist for all species at the PUD projects, and the available data are primarily estimates of direct mortality established through balloon-tag studies. These estimates do not fully take into account indirect or delayed mortality due to potentially increased predation susceptibility resulting from the effects of turbine passage. In addition, some of the data were collected before recent changes at the projects (turbine modifications to increase survival) were completed. Therefore, additional data from other sources were used to establish average baseline conditions. The numbers included in Table 2-4 represent a composite of relevant data for specific projects or similar projects in the basin.

The Federal Columbia River Power System biological opinion (NMFS 2000a) concluded that, although power peaking can affect spawning adults, egg incubation, and fry rearing stages, power peaking alone does not have a significant adverse effect on migrating salmon at the mainstem Federal projects.

Peak turbine efficiency refers to conditions that minimize the turbulence and cavitation of water passing through the turbines, resulting in greater power production. These conditions are believed to produce better conditions for fish passing through the unit by minimizing pressure differences caused by these factors, which can injure or kill fish. References were changed throughout the FEIS to refer to "peak power efficiency" and text was added to FEIS Section 2.2.2, Dam and Reservoir Operations explaining the concept.

Refer to Comment #58 for a discussion of adult passage, adult survival standards, and the effects of project operations on adult passage.

Tribal Issues – Legal Responsibilities

Comment 37 *The HCPs address the Endangered Species Act, but NMFS and other Federal agencies also have duties and obligations to fulfill trust responsibilities toward Tribal trust resources. In particular, the Secretarial Order 3206 also requires that the agencies ensure that the Tribes not bear a disproportionate share of the conservation burden for listed species (Section 5, Principle 3). In addition, the Federal Government's responsibility to manage trust resources would be transferred to non-Federal entities who are not accountable for breaches of Federal trust and treaty obligations.*

Response 37 The HCPs specifically recognize Federal obligations to protect Tribal treaty/trust resources, and state in the Miscellaneous sections (Section 12.11 [Miscellaneous, Indian Tribal or Treaty Rights] of the HCPs) that "[n]othing in this agreement is intended to nor shall it in any way abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in any treaty, executive order, statute or court decree. This Section shall be deemed to modify each and every

Section of this Agreement as if it is set out separately in each Section." Additional protections are also described in HCP Sections 12.12 and 12.13 [Miscellaneous, U.S. v Oregon and No Precedent/Compromise of Disputed Claims]. Formal consultation between NMFS and the Tribes on a government-to-government basis will include discussion of these issues, which would occur prior to issuance of a Record of Decision (ROD) or a final biological opinion on the HCPs. It is the intent of NMFS that the HCPs will aid in increasing the wild stock of anadromous fish over time, thereby allowing for an increased Tribal take of hatchery fish when the wild stocks reach minimum escapement levels necessary for recovery. The relationship between the proposed HCPs and the Federal Government's Tribal treaty trust responsibilities is discussed in FEIS Section 4.12.17, Legislation Pertinent to Tribal Governments.

During preparation of the HCPs, the Tribes have been continually informed and invited to participate. The Tribes participate directly and through the Bureau of Indian Affairs and the Columbia River Inter-Tribal Fish Commission. The five principles of the 1997 Secretarial Order #3206 (American Indian Tribes and the Endangered Species Act) have been followed in development of these agreements. These principles are (1) working directly with the Indian Tribes on a government-to-government basis to promote healthy ecosystems, (2) recognizing that Indian lands are not subject to the same controls as Federal public lands, (3) assisting Tribes in developing and expanding Tribal programs so that healthy ecosystems are promoted and conservation restrictions are unnecessary, (4) being sensitive to Indian culture, and (5) making available to Tribes information related to Tribal trust resources and Indian lands and to facilitate the mutual exchange of information.

Principle 3 of Secretarial Order 3206 also includes the following components: (A) the Departments shall take affirmative steps to assist Indian Tribes in developing and expanding Tribal programs that promote healthy ecosystems, (B) the Departments shall recognize that Indian Tribes are appropriate governmental entities to manage their lands and Tribal trust resources, and (C) the Departments, as trustees, shall support Tribal measures that preclude the need for conservation restrictions. Although the HCPs are not Tribal programs, the anadromous fish within the Columbia River are considered a traditional Tribal treaty resource. Implementation of the HCPs is intended to support a comprehensive strategy for protecting and recovering the five Plan species that pass through the three dams (Wells, Rocky Reach, and Rock Island), thereby promoting a healthy ecosystem. The conditional implementation strategy under Alternative 3 was developed to ensure a speedy recovery relative to Alternative 2 (refer to FEIS Section 2.6.5, Implementation Schedule), where lengthy legal proceedings may occur if FERC or the PUDs disagree with NMFS's decisions on the actions needed to ensure survival and recovery of listed species. Alternative 3 sets specific time limits on decision-making procedures and restricts the abilities of all the signatory parties to seek legal remedies to outstanding issues that may impede decision-making progress and implementation of needed conservation measures to improve survival.

Management of Columbia River Basin listed anadromous fish species would continue to be under the authority of NMFS under all alternatives. The HCPs (Alternative 3) are limited to meeting specific performance standards for the Plan species passing through the hydroelectric structures associated with the Wells, Rocky Reach, and Rock Island dams. As described in the Quantitative Analysis Report (QAR), the actions associated with Alternative 3 are a single component of a series of recovery actions planned by NMFS to recover listed fish species. Implementation of either Alternative 2 or 3, alone, is not expected to recover these fish. All other aspects of the trust responsibilities and treaty obligations are maintained by NMFS.

Comment 38 *If the Permit species continue to decline, and the PUDs are fulfilling their obligations under the HCPs, how will NMFS ensure that the agency fulfills its trust responsibility for providing harvestable fish populations? The EIS should include an analysis of this possibility and the effect of the No Surprises policy on NMFS's trust responsibility.*

Response 38 The revised HCPs acknowledge that the Services (NMFS and USFWS) could withdraw from the HCPs and NMFS could revoke a permit (even if the project has achieved and maintained the no net impact standard) if the Plan species are not rebuilding and the project is a significant factor in the failure to rebuild (see Section 2.2.1 of the Wells HCP [Termination Automatic Termination Events] and Section 2.1 of the Rocky Reach and Rock Island HCPs [Withdrawal From Agreement, Enough Already). This could occur after 2013 at the Rocky Reach and Rock Island projects and after 2018 at the Wells Project.

Comment 39 *Alternative 3 may expose the Federal Government to liability for failing to sufficiently manage and protect the Tribes' treaty-reserved resources because NMFS would be required to carry the burden of proof in a dispute resolution process with time and evidentiary limitations. Alternative 3 effectively and impermissibly transfers NMFS's management authority to project operators, thereby violating its trust responsibility to the Tribes and perhaps exposing the Federal Government to liability for failing to properly manage treaty-reserved resources.*

Response 39 In response to the Tribes' comments, the revised 2002 HCPs deleted the language that was contained in the 1998 HCPs where NMFS or any other party bringing an action to enforce the HCPs had the burden of proof. The entire dispute resolution provision of the revised HCPs was removed, with the exception of a requirement that disputes first be addressed at the technical level in the coordinating committees and then at a policy level in the policy committees prior to bringing forth any legal proceedings. The revised HCPs changed the approach used to make decisions under the HCPs. Decisions are subject to unanimous agreement by all parties to each of the various committees; thus, each party retains the authority to effectively veto any action or decision. If a resulting dispute cannot be resolved through technical and policy level meetings or voluntary, non-binding mediation, any party may exercise whatever right it may otherwise have under applicable law. Furthermore, NMFS has the discretion to enforce compliance with the HCPs and its permits. The HCPs do not limit any responsibility or obligations of NMFS to the Tribes. The revised HCPs state that the withdrawal and termination provisions are not subject to the No Surprises policy.

Tribal Issues – Harvest

Comment 40 *The HCPs lack assurances that the 7 percent hatchery compensation will be achieved or allowed, which is necessary to produce sustainable and harvestable fish populations.*

Response 40 Although the tools used to reduce salmon mortality through the dams under the HCPs (Section 10 [Endangered Species Act Compliance] 10) may be different than those used under Section 7, the overall goals of reducing mortality are the same. Therefore, there are no expected differences in the amount of harvestable fish available to Tribes between the action alternatives. The purpose of either a Section 7 or Section 10 consultation is to allow for the "incidental take" of endangered and threatened species so that an applicant is exempt from take prohibitions under Section 9 of the Endangered Species Act. The PUDs have voluntarily included in the HCPs a commitment to rebuild stocks of unlisted species to sustainable, harvestable populations; however, the utilities are not required to conduct this effort under either Section 7 or Section 10 of the Endangered Species Act.

The HCPs attempt to balance the conservation of Endangered Species Act-listed and unlisted anadromous Plan species with the Federal Government's treaty trust obligations to provide meaningful Tribal harvest, on both a short- and long-term timeframe. This includes the difficulties of providing these harvest opportunities under the harvest rate restrictions for Endangered Species Act-listed species in a mixed stock fishery. The harvest element of the Columbia River Basinwide Salmon Recovery Strategy (Federal Caucus 2000) states that there is "no more important harvest reform than discontinuing the former practice of overfishing natural fish to fully harvest hatchery fish." The strategy further states that, "Unless and until more effective selective fishing techniques are used, it will be difficult or impossible to fully realize the benefits of hatchery programs."

The Columbia River Basinwide Salmon Recovery Strategy recommends that the overall harvest rate of Upper Columbia River spring-run chinook salmon continues to be capped at 6 to 9 percent, depending on the run sizes of natural origin fish. This harvest rate is primarily intended to accommodate a base level fishery for the Tribes. Thus, under this recovery strategy, the Tribal harvest will continue to be limited by the abundance of naturally produced adult fish, unless effective selective harvesting techniques are developed. For example, the harvest of the relatively large runs of hatchery spring-run chinook salmon in the last 2 years has been limited by the relatively low abundance of naturally spawned fish.

The HCPs are intended to protect, enhance, and restore the populations and habitats of not only the Endangered Species Act-listed species but all Plan species for the purpose of establishing and maintaining naturally spawning populations that are capable of supporting a sustainable fishery. Establishing stable, naturally spawning populations capable of supporting a fishery will also allow greater harvest rates on hatchery stocks. Therefore, goals developed to maximize the opportunities to harvest hatchery fish and rebuild the naturally spawning populations are expected to enhance the harvest opportunities for both Tribal and non-Tribal fishers. These goals would satisfy both the specific provisions of the Endangered Species Act and the Federal trust responsibilities.

Balanced with the fundamental need to protect the naturally spawning populations, is the need to compensate for unavoidable mortality associated with the PUD hydroelectric projects. The HCPs propose hatchery supplementation to mitigate for 7 percent unavoidable mortality associated with each project. However, it is unknown at this time whether that level of supplementation will increase harvest opportunities or lead to the recovery of Endangered Species Act-listed species. It is also possible that 7 percent hatchery supplementation will result in the continued decline in natural spawning populations due to the negative influences that hatchery fish can have on wild stock. These negative influences may include competition for food and space, disease transmission, direct predation, and a decrease in genetic diversity.

Many Columbia River hatchery programs were originally started to replace natural production losses associated with hydroelectric development, but not necessarily to protect or rebuild natural populations. Recent changes in the goals and practices of these hatchery programs focus on producing fish that pose a lower risk to natural populations. This is accomplished by either minimizing the negative interactions with natural populations or using natural broodstocks. This has lead to an increased reliance on natural broodstocks to fulfill hatchery program needs. Nevertheless, it is recognized that the recovery of natural populations cannot be achieved simply by releasing more hatchery-produced fish, regardless of their ancestry or fitness.

Because of the wide range of scientific and policy opinions regarding the purpose and appropriate use of artificial production in specific circumstances, NMFS recommends a variety of hatchery

strategies, coupled with an adaptive management approach. Therefore, NMFS is unable to guarantee a 7 percent supplementation rate throughout the term of the 50-year agreement, although their goal is to achieve this rate whenever possible. To provide some level of assurance to the Tribes on this issue in the near future, the signatory parties revised several components of the Hatchery Compensation Plan. First, the parties detailed the initial production levels that must be obtained to meet the no net impact standard for each project. Second, the parties agreed that hatchery production commitments, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter to achieve and maintain no net impact. Thus, production levels, including those initially specified in the HCPs, shall be stable for 10-year intervals. This alteration was made to both provide greater assurances to the Tribes with respect to production levels (and harvest opportunities), and to allow sufficient amounts of time to pass (approximately 2 to 3 generations) to assess the effects of previous changes to the hatchery programs. Furthermore, the supplementation programs contained in the Rocky Reach and Rock Island HCPs through 2013 are double that which is necessary to contribute 7 percent toward no net impact. In addition, in response to requests from the Tribes, the revised HCPs expressly provide for supplementation programs for coho salmon and Okanogan Basin spring-run chinook salmon.

Comment 41 *NMFS should also take into consideration the factors that led to the initial decline of salmon and steelhead, and provide analyses that examine the impacts that the various alternatives would have on the sustainability of the salmon populations and the ability of such populations to meet broad (beyond mere Endangered Species Act) recovery goals. The EIS should include a quantitative analysis of take for listed species under the proposed alternatives and the probability of reaching sustainable populations that provide harvestable surpluses for treaty and non-treaty fisheries. The EIS should include survival, recovery, and delisting goals relative to sustainable and harvestable populations for anadromous fish.*

Response 41 NMFS must comply with NEPA and Council on Environmental Quality (CEQ) regulations in the preparation of this EIS on NMFS's decision to issue the requested permits under Section 10 of the Endangered Species Act. In the context of decisions before NMFS, there is no requirement to evaluate factors for the decline of salmon and steelhead. Such an analysis was conducted by NMFS in its status reviews of Upper Columbia River salmon and steelhead populations, and in its listing decisions for Upper Columbia River steelhead and spring-run chinook salmon.

When conducting the formal consultation on the issuance of the permits described in this FEIS, NMFS is required to analyze the effects of past and ongoing human and natural factors leading to the current status of the listed species, its habitat, and ecosystem, within the action area. In formal consultation pursuant to Section 7(a)(2) of the Endangered Species Act, NMFS must also determine whether or not the proposed action is likely to "jeopardize the continued existence of any listed species," defined as, "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR Part 402.02 – Definitions). The Quantitative Analysis Report (QAR) analysis was designed specifically to provide NMFS with the necessary information to make such an assessment. The analysis contained in the QAR exceeds the level of detail required by NEPA and CEQ's regulations. A summary of the QAR is attached to the FEIS (Appendix E) and was considered in its preparation.

Harvestable populations cannot be defined adequately for the purpose of conducting a quantitative analysis. Some might argue that, because some level of treaty and non-treaty harvest is currently allowed (varying by year, location, and adult return estimates) even while many populations in the Columbia River Basin are listed, the populations are currently harvestable.

Others might argue that harvestable populations are best defined by population levels equal to historic (pre-European) levels.

When making decisions to correct the decline of salmon and steelhead, NMFS will comply fully with all applicable Federal laws and executive orders. These include trust responsibilities applicable to the unique and longstanding relationship between the U.S. Government and the region's Federally recognized Indian Tribes. The QAR established interim recovery goals for the listed species and determined the probability of achieving these goals with the HCP performance standards (see Chapter 5 of the FEIS and Appendix E). These recovery goals included current harvest levels. NMFS views meeting these standards as a critical step in recovering the listed species to levels that will allow future increases in treaty and non-treaty harvest opportunities. Under Alternative 3, the same performance standards are set for both listed and unlisted Plan species.

Survival rates of juvenile and adult fish passing the projects are estimated in FEIS Section 2.2.3, How the Dams Affect Migrating Fish and Table 3-4 [Calculated Juvenile Fish Passage Survival Estimates by Passage Route], representing the baseline level of "take." Specific performance standards for reducing this take and the methodology for evaluating the level of take over time are set in Alternative 3.

Tribal Issues – No Surprises Policy

Comment 42 *The No Surprises policy should be extended to the Tribes, and provisions should be included in the HCPs to protect the Tribes if future litigation should arise.*

Response 42 The No Surprises policy applies specifically to an applicant who is issued an incidental take permit under Section 10 of the Endangered Species Act, and does not apply to Federal trust or treaty responsibilities. The Tribes have the option of participating in the HCPs as a signatory party. If the Tribes elect to sign the HCPs, then the Tribes directly receive the benefits of the HCPs. Even if a Tribe does not sign the HCPs, the Tribes nevertheless receive indirect benefits as a result of the commitments made by NMFS.

To provide some level of assurance to the Tribes on hatchery production and harvest issues in the near future, the signatory parties revised several aspects of the Hatchery Compensation Plan in the 2002 HCPs. First, the parties detailed the initial production levels that must be obtained to meet the no net impact standard for each project. Second, the parties agreed that hatchery production commitments, except for original inundation mitigation, shall be adjusted in 2013 (2018 for the Wells Project) and every 10 years thereafter to achieve and maintain no net impact. Thus, production levels, including those initially specified in the HCPs, shall be stable for 10-year intervals. This change was made to both provide greater assurances to the Tribes with respect to production levels (and harvest opportunities), and to allow sufficient amounts of time to pass (approximately 2 to 3 generations of fish) to assess the effects of previous changes to the hatchery programs.

NMFS believes that this level of assurance is roughly equivalent to the assurances provided to the applicants in the revised HCPs (i.e., that NMFS may withdraw from the agreements and revoke the permits after 2013 for the Chelan County PUD projects and 2018 for Douglas County PUD's Wells Project) if the stocks are not rebuilding and the projects are a significant factor in the failure to rebuild. Provisions were also included to indicate that the HCPs were not intended to create jurisdiction in any court (see HCP Section 11.3 [Dispute Resolution, No Intent to Create Jurisdiction]) nor in any way "abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian

right reserved or protected in any treaty, executive order, statute or court decree" (Section 12.11 [Miscellaneous, Indian Tribal Treaty or Reserved Rights]), that the HCPs do not change the jurisdiction of the court in U.S. vs. Oregon, 302 F. Supp. 899 (D. OR 1969) or the parties' positions therein (Section 12.13 [Miscellaneous, No Precedent/Compromise of Disputed Claims]), and that the HCPs are not intended to establish a precedent or be interpreted as the position of any party in any proceeding not dealing specifically with the terms of this agreement (Section 12.12).

Comment 43 *Several commenters questioned the appropriateness and legality of including a No Surprises policy in the HCPs, suggesting that such assurances are inappropriate for HCPs of this type, covering facilities on a public waterway that are inextricably interconnected with other facilities and activities not covered by the HCPs, all of which affect the anadromous fish populations at issue.*

Response 43 In response to the concerns expressed in comments on the DEIS, the withdrawal and termination provisions contained in the HCPs supercede application of the No Surprises policy. In addition, Section 2 (Termination under Wells and Withdrawal from Agreement for Rocky Reach and Rock Island) of the HCPs now define circumstances under which NMFS may withdraw from the agreement and revoke the permits after 2013 for the Rocky Reach and Rock Island projects and after 2018 for the Wells Project, should no net impact not be achieved or the stocks fail to rebuild (see Section 2 of the HCPs).

The HCP handbook (USFWS and NMFS 1996) states that "[t]he Section 10 process is an opportunity to provide species protection and habitat conservation within the context of non-Federal development and land and water use activities … allowing economic development that will not appreciably reduce the likelihood of the survival and recovery of the species in the wild." Therefore, an HCP can be proposed where a Federal agency is involved in a cooperative planning effort in which both Federal and private lands are addressed under a single HCP but the Federal agency is not the applicant or the primary partner in the plan. For the Wells, Rocky Reach, and Rock Island HCPs, the PUDs are the applicants and project owners.

The No Surprises policy applies to the HCPs for utility-owned dams, rather than the Columbia River. The actions that would be implemented under the HCPs can be implemented independently of actions that occur at other Columbia River dams, hatcheries, or tributary areas. The permits granted with the implementation of the HCPs would cover the incidental take of listed species as a result of project operations, including direct, indirect, and delayed effects wherever they occur. The No Surprises policy applies to the mitigation for that take and not to the overall condition of the resource, or the other factors that can affect the recovery process.

Tribal Issues – Not in Agreement with HCPs

Comment 44 *Several commenters requested that the FEIS clearly indicate that although the Tribes and other resource agencies were involved in the HCP development, it should not be inferred that they agree with the current HCP provisions. The Tribal comments specifically stated that they do not agree with the provisions of the HCPs, because the Tribes have reserved the right to accept the HCPs only if all outstanding issues have been resolved. In addition, the hatchery compensation component of the HCPs is not the only HCP issue that concerns the Tribes. Several commenters indicated that the NEPA review process should be halted until all the HCP issues are resolved to the satisfaction of all the parties involved in the process.*

Response 44 Between September 2001 and March 2002, the parties that developed the 1998 HCPs (including the Tribes) began a round of intensive negotiations to resolve outstanding issues, including those specifically raised from DEIS public comments. A number of additions and revisions were made to the HCPs to address all Tribal concerns brought to the table. All of the negotiating entities (NMFS, USFWS, WDFW, Colville, Chelan and Douglas County PUDs, and Douglas County PUD's power purchasers) (with the exception of the Yakama and Umatilla Tribes and American Rivers) have signed the revised HCPs, signifying that these issues were resolved to their mutual satisfaction. It is NMFS's understanding at this time that the Yakama and Umatilla Tribes have decided not to sign and that American Rivers is still considering whether or not to sign the revised HCPs.

USFWS and NMFS (the Services) encourage all HCP applicants to invite and include other Federal and State agencies who can utilize their existing authorities, expertise, or lands in support of the HCP development and implementation process. Furthermore, the Services will consider whether the proposed HCPs might affect Tribal rights to trust and treaty resources. After careful consideration of the Tribes' concerns, the Services will clearly state the rationale for the recommended final decision and explain how the decision relates to the Federal Government's trust responsibilities. In light of this obligation, it was important that during the planning process, the Services identified and evaluated any anticipated effects of a proposed HCP upon Indian treaty and trust resources.

The EIS review process fulfills NMFS's NEPA compliance obligations as required for HCPs. Using the NEPA FEIS and biological opinion that will be prepared for the HCPs, NMFS will evaluate whether the HCPs satisfy provisions of Section 10 of the Endangered Species Act. Although NMFS would prefer that all parties involved in the HCP negotiation process sign the HCPs and participate in their implementation through the HCP committees, there is no Section 10 requirement that all the resource managers sign the HCPs.

Comment 45 *The DEIS does not mention the Yakama Nation's effort to resolve HCP issues of importance to the Yakama Nation with NMFS.*

Response 45 Prior to issuing the DEIS, NMFS staff had many discussions with staff of the Yakama Tribe and the other Joint Fisheries Parties to better understand and attempt to resolve remaining issues in the HCPs. Since the issuance of the DEIS, NMFS has continued to work with the original parties that developed the HCPs to resolve these issues, as well as additional issues identified in DEIS public comments. This effort culminated in the revised HCPs, which were provided to all potential signatory parties in March of 2002 for their consideration and signature. NMFS believes that the revised HCPs satisfactorily resolve the important issues raised in DEIS public comments or through continued discussions with staff representing the Joint Fisheries Parties. NMFS is fully aware of its trust relationship with the affected Tribes and is committed to working with these entities to protect anadromous fish resources under either action alternative.

Comment 46 *Tribal biologists requested dual complementing components for the no net impact statement that included a fish passage efficiency standard.*

Response 46 The HCP survival standards and Survival Standard Decision Matrix contained in the revised HCPs (see Figure 2-4 of the FEIS) represent a process for measuring the survival of adults and juveniles passing the dams and projects to the greatest extent that available technology allows (see HCP definitions of survival standards). Fish passage efficiency, typically defined as the proportion of juvenile fish passing a project using a non-turbine passage route, is at best an indirect measure of juvenile survival. Intuitively, increasing fish passage efficiency (by

increasing spill for example) should increase juvenile survival rates by reducing the proportion of juveniles passing through turbines—which is often the route of passage having the highest mortality rates. However, many other factors must be considered: high rates of spill might result in (1) gas bubble disease in juvenile and adult anadromous or resident fish, (2) tailrace conditions that decrease juvenile survival and delay adult passage, and (3) increased rates of fallback for adults. Thus, while fish passage efficiencies might be useful in assessing the potential benefits of alternative project operations on juvenile migrants, NMFS believes that the survival standards are the most appropriate for measuring whether or not the no net impact standards are being achieved. Fish passage efficiency estimates were used in the revised Rocky Reach HCP to adjust and set fish spill for the 2004, 2005, and 2006 migrations (see Section 5.4.1.a. [Passage Survival Plan Phase I Plan to Achieve Survival Standards, Juvenile Measures, Adjustment Period] of the Rocky Reach HCP [2002]).

Section 7 Consultation and Endangered Species Act-Related Questions

Comment 47 *Several commenters suggested that Section 7 consultation and relicensing procedures (where appropriate) should not be initiated until the HCP process has reached a satisfactory conclusion. Some concern was also expressed that the "conditional implementation" of the HCPs is resulting in the illegal taking of listed species because there is no Section 7 biological opinion for this action. Full mitigation for both listed and unlisted species has not been provided. Therefore, the HCPs will continue the taking of the species and lead toward their extinction.*

Response 47 Under the FEIS process, different alternatives can be selected for each of the three Mid-Columbia River hydroelectric projects. As a result, the relicensing process for Rocky Reach Dam is continuing on a parallel course, pending the outcome of the HCP. If Alternative 2 is selected for Rocky Reach Dam, Section 7 consultation between NMFS, USFWS, and FERC will satisfy the Endangered Species Act requirements of the FERC relicensing process. Outside relicensing, Section 7 consultations have occurred as a result of Federal actions at the Wells and Rocky Reach projects. Biological opinions for the Wells (NMFS 2000b) and Rocky Reach (NMFS 2002a) projects have been completed, but the biological opinion for the Wells Project has expired. No formal consultation on the Rock Island Project is occurring at this time. Although both Section 7 and Section 10 consultations attempt to minimize or mitigate for take associated with a particular activity, there is no expectation that take will not occur.

Both the Wells and the Rock Island projects are providing full hatchery mitigation for their project impacts as provided under the terms of their respective long-term settlement agreements. These agreements include hatchery mitigation based on an estimated 14 percent fish passage mortality. Because the HCPs permit a maximum of 7 percent mitigation through hatchery production, the hatchery production under Alternative 3 would be decreased compared to existing conditions. However, the revised HCPs allow for greater than 7 percent hatchery mitigation until 2013. Refer to Table 4-1 of the FEIS for specific hatchery production levels under Alternative 3. Under the HCPs, Rock Island hatchery mitigation will continue as part of the Rocky Reach mitigation plan through 2013. Hatchery mitigation for the Wells Project would be adjusted based on survival study results to reflect actual survival for yearling chinook salmon and steelhead and will remain at a full 7 percent for subyearling chinook and sockeye salmon.

NMFS has identified that Alternative 3 is the preferred alternative. Assuming that the HCP meets Section 7 consultation requirements for listed anadromous fish, NMFS would issue the incidental take permits, and FERC would amend the project licenses accordingly. Any HCP-related effects on listed bull trout, bald eagles, and Ute ladies' tresses would be addressed through Section 7 consultations with USFWS. Regardless of the selected action alternative, a biological opinion

supporting either an incidental take statement to authorize any incidental take by the Federal action agency (Section 7) or an incidental take permit that authorizes any incidental take by the Section 10 permittee would be required. See FEIS Section 1.5.2, Overview of Federal Requirements for Species Conservation that explain the PUDs' and FERC's roles and responsibilities in the two permitting processes.

Other Species

Comment 48 *Several commenters requested that lamprey, sturgeon and bull trout be included as Plan species in the HCPs. They also indicated that the FEIS did not give adequate consideration to these species, or detail how one alternative might be better than another for protecting these species.*

Response 48 The decision to include or exclude any species for an HCP is an applicant decision, and there are no provisions in the Endangered Species Act that require that all species affected by an action be included in an HCP. Although NMFS and USFWS (the Services) typically suggest that all listed species that could be subject to a take be included in an HCP, this is not required. Although these species are not included as Plan species, they were discussed and their needs taken into consideration when developing the HCPs. USFWS participated in the development of the HCPs and evaluated the HCPs to ensure that the HCPs posed no obvious problems for the needs of bull trout. The HCPs' effects on bull trout will also be evaluated in a separate Section 7 consultation. The protection of these species is expected to be the same for both action alternatives.

There are limited data concerning the status of lamprey, sturgeon, and bull trout within the project area, including the potential impacts of the Mid-Columbia River projects on these species. Although the FEIS acknowledges that these species could be affected by the projects, there is no known quantitative data available. This lack of information is one reason that the species were not included as Plan species in the HCPs, because no performance standards could be developed. However, protection and mitigation measures for lamprey, sturgeon, and bull trout are expected to occur through FERC relicensing procedures. The PUDs could request an incidental take permit for bull trout from the USFWS once sufficient information is developed.

The potential measures that could be implemented at the projects to improve fish passage are limited. Alternative 2 evaluates alternative protective measures at the projects, including elevated spill levels. It is recognized that full implementation of Alternative 2 measures is less likely for non-listed Plan species and could be substantially delayed for all species through litigation or FERC's relicensing and rehearing processes. Under Alternative 3, the measures would be implemented immediately and should improve the juvenile fish passage conditions for downstream migrating Plan and non-Plan species alike. Other potential impacts to resident fish are expected to be similar for both action alternatives, and are not a significant factor in determining the preferred alternative.

Another difference between the action alternatives with regard to non-Permit or non-Plan species is the provision of a Tributary Conservation Plan under Alternative 3. The goal of the tributary committees is to select and fund ecologically sound tributary improvement projects with the Tributary Enhancement Fund. These projects will be selected by the tributary committees and would focus on Plan species, although the potential benefits and impacts to other species would be considered in any decision. Any project that would directly affect the tributary streams (e.g., culvert removal) would require environmental permits, which would provide another layer of protection for non-Plan species. The Tributary Plan is expected to benefit all native aquatic species that occur in the tributaries. Alternative 2 does not include PUD funding of tributary habitat projects.

Neither action alternative directly addresses lamprey, sturgeon, or bull trout. Under either alternative, the protection of these species would occur through relicensing and other statutes and laws. As a listed species, however, bull trout would be addressed through Section 7 consultation under both of the action alternatives at relicensing or at the time of a Federal action, unless they were addressed through a separate incidental take permit under Section 10.

Information about these species has been added to FEIS Section 3.2.8, Species of Concern. Additional discussions of the potential benefits or impacts to lamprey and sturgeon have also been added to Chapter 4 of the FEIS for each alternative. The HCPs and the FEIS identify specific project modifications and operations that would initially be implemented through 2006 at Rocky Reach to improve fish passage survival. Under Alternative 2, FERC (at the request of the licensees) would select the bypass options or project operations to protect unlisted species at the projects. Under Alternative 3, the HCPs address Plan species, but it is reasonable to assume that they would consider the effects of actions on other species. Note that the exact changes to long-term project operations or modifications under either action alternative cannot be specifically defined, nor the specific habitat improvement projects that might be selected by the tributary committees under Alternative 3. Therefore, the environmental consequences analysis for these species is more qualitative.

Relicensing Issues

Comment 49 *The stakeholders should be allowed to participate in the relicensing of the Rocky Reach Project without the constraint of the HCPs, and the HCPs should match the existing terms of the FERC licenses for the projects. The implementation of Alternative 3 would predetermine the extent of the recovery measures at relicensing and impose conditions on subsequent licenses many years before the relicensing process. Others questioned the 50-year term of the HCPs and whether the terms should be linked to the relicensing schedule.*

Response 49 The 50-year term of the HCPs was selected to coincide to the extent possible with a typical 30- to 50-year term of a FERC license. Chelan County PUD is currently proceeding with the relicensing of Rocky Reach Dam, and the terms of the HCP and the FERC license would likely be similar. The Wells and Rock Island licenses would expire prior to the 50-year term of the HCPs. When this occurs, the PUDs would be required to proceed with the relicensing process. Although the HCPs would form the basis for mitigation measures for anadromous fish during this process, FERC has an obligation to independently ensure that adequate protection of all natural resources is provided in the license terms. Parties that sign the HCPs also commit to supporting the PUDs in the relicensing process by not recommending mitigation measures that are different from those outlined in the HCPs. However, non-signatory parties can petition FERC to have specific measures included in the license terms. Signatory parties can also petition FERC to include license terms for non-Plan species, which might also coincidentally benefit Plan species. In addition, NMFS can terminate the agreements and revoke the permits in 2013 for Rocky Reach and Rock Island and in 2018 for Wells, if the HCPs are not leading to the recovery of the species, or if the PUDs fail to meet or maintain no net impact. At this time, NMFS could seek drawdown, dam removal, or non-power operations or actions for achievement of no net impact. The HCPs would not affect any stakeholder decision to be involved in the Rocky Reach relicensing effort, although the HCPs define the positions that the signatory parties would consider in any relicensing effort.

Other time frames may not be as effective over the long term because of the significant time and effort required to negotiate and consult with the various parties on successive HCPs. For example, these HCPs have been discussed and negotiated since 1993. During this negotiation

process, the HCPs were only conditionally implemented, and this was a voluntary action by the proponents. At a minimum, Alternative 2 would match the terms of the FERC licenses because Section 7 consultation would be required for the FERC action to relicense the projects. FERC has held that absent a Federal action before relicensing, a Section 7 consultation would not commence until each project was relicensed. While Rocky Reach relicensing is commencing, relicensing for Wells is a few years off and Rock Island will not expire until 2029. However, this is mitigated at the Rocky Reach and Wells projects, as their effects on salmon and steelhead are currently addressed through existing biological opinions (though the biological opinion for Wells has expired).

The purpose of Section 10 provisions of the Endangered Species Act is to provide an alternate avenue for addressing Endangered Species Act compliance while allowing some level of certainty to the proponent. If Alternative 3 were restricted to the same time periods for Federal Power Act processes and Endangered Species Act consultations as Alternative 2, there would be little incentive to apply for a Section 10 permit. The HCP process is extremely time-consuming and expensive, and should provide a correspondingly greater level of certainty and cover a longer time period than Section 7 consultation. Although the HCPs are all separate agreements, the intent is to provide a coordinated effort throughout the Mid-Columbia River reach to address recovery issues for the Plan species. Therefore, coordinating the time frames of the HCPs is likely to be more important to the recovery process than coordinating the HCPs to the FERC license schedule. This information has been added to FEIS Section 2.3.4.2, HCP Term.

Endangered Species Act compliance is only one aspect that should be considered during the FERC relicensing process. The action alternatives cover a limited number of species that are or could be affected by the projects. Protection measures for other species would occur through relicensing under all the alternatives. As a Federal agency, FERC is bound by the responsibility to "adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and habitat)" affected by the project (16 USC § 803(j)(1)). As such, FERC must weigh the opinions and recommendations of all of the resource agencies and stakeholders, as well as other interested parties. Non-signatory parties can raise any issue or concern during the relicensing process to document that the mitigation measures implemented as part of the HCP processes are not adequate to protect the species. The responsibilities of FERC to protect these resources would not be limited by the HCPs, and FERC would have an obligation to condition the license with appropriate mitigation measures. Before adopting the HCPs into the project licenses, FERC would determine if the HCP provisions fulfill their responsibilities, and that additional protection measures were not necessary. FERC is intending to use the FEIS to fulfill NEPA requirements and would consider all comments on the FEIS in their decision.

If salmon and steelhead populations dramatically decline in the future and the projects are determined to be a significant cause of the decline, NMFS would likely pursue significant changes to the projects (e.g., drawdown, dam removal, or non-power operations). NMFS could terminate the agreements and revoke the permits to pursue these types of options in 2013 (2018 for the Wells Project). Overall, the HCPs only affect the mitigation at three of the nine dams on the Columbia River that impact the listed species. Therefore, adequate opportunities are available to protect the species during this initial period, if the species are declining.

Other Existing Agreements

Comment 50 *Several commenters requested clarification on how the action alternatives would affect the ongoing Mid-Columbia Proceedings and agreements that are under jurisdiction of a FERC administrative law judge. There were also some concerns about how they would affect the ability*

of the Joint Fisheries Parties to regulate project operations to protect water quality and aquatic species. Others expressed concern that under Alternative 3, the Joint Fisheries Parties have the burden of proof in the dispute resolution process, while under Alternative 2 this responsibility is shared equally with the PUDs.

Response 50 FEIS Section 2.3.2, Alternative 1 (No-Action) provides detailed descriptions of the current operational requirements of the PUDs under the existing settlement agreements, which are the basis for Alternative 1. Long-term juvenile protection measures have not been established for Rocky Reach. These measures are the subject of a pending proceeding at FERC known as the Mid-Columbia Proceeding. The last interim stipulation to define the project's obligations expired in 1997. Until either a new stipulation is signed or FERC establishes license requirements, Chelan County PUD has agreed to and is currently conditionally implementing many of the agreed-upon provisions of the revised 2002 Rocky Reach HCP (Alternative 3). The Mid-Columbia Coordinating Committee has no jurisdiction absent a stipulation between the parties. The revised 2002 HCP will be presented to FERC as an offer to settle the Rocky Reach portion of the Mid-Columbia Proceeding, including a request that FERC incorporate the HCP as a special license article. The Rock Island and Wells dams have long-term settlement agreements in place, and the respective PUDs have agreed to conditionally implement many of the measures included in the revised 2002 HCPs (Alternative 3).

All three HCPs (Alternative 3) require the signatory parties to work together in addressing water quality issues. Chelan and Douglas County PUDs are also working directly with Ecology to resolve water quality issues. Alternatives 1 and 2 do not address water quality as a specific conservation measure to be implemented. However, analysis of possible spill levels in Alternative 2 does recognize the 120 percent total dissolved gas waiver granted each year at the Columbia River hydroelectric projects for the purpose of improving juvenile salmon and steelhead survival past the dams. (See response to Comment #39 for a discussion of how the burden of proof comments were addressed in the 2002 HCPs.)

FEIS Section 2.3.2, Alternative 1 (No-Action) indicates that the provisions of the existing settlement agreements would also apply under Alternative 2 for unlisted species. However, because the listed species have continued to decline under the framework of these provisions, NMFS would likely require that additional measures be implemented to protect and lead to the recovery of the listed species. In addition to potentially requiring additional measures to improve fish passage conditions at the projects, NMFS is expected to require changes to the hatchery compensation portions of the settlement agreements for spring-run chinook salmon and steelhead. These changes are expected to be similar to those that would occur under Alternative 3. Although additional measures might be required to protect and lead to the recovery of listed species under both action alternatives, the Services would likely continue to use the Mid-Columbia Proceeding's Mid-Columbia Coordinating Committee and the Wells Settlement Agreement's Coordinating Committee processes to solicit input for all major decisions under Alternative 2 (NMFS 2000b, 2002a).

NEPA/EIS-Related Questions

Comment 51 *Several commenters indicated that previous scoping comments were not specifically addressed, and the DEIS did not take a hard look at the environmental information and consequences of each alternative (particularly over the long term). Others requested changes to the Purpose and Needs section of the EIS to give greater importance to the recovery of the listed species than to the generation of electricity.*

Response 51 The purpose of scoping was to obtain information that focused the NEPA analysis on significant issues. Scoping is defined by NEPA regulations (40 CFR 1501.7) as "an early and open process for determining the scope of issues related to a proposed action." All comments provided during this process were considered in identifying the issues associated with the proposed action (Parametrix 1999b). Generally, letters received during scoping do not receive response letters from the lead agency unless there is a specific request in the comment letter.

Protection of listed species and compliance with the Endangered Species Act is included in the Purpose and Need section (see FEIS Section 1.3, Purpose and Need). The purpose includes ensuring stable power supplies and pricing for the utility's customers. An additional statement was added to FEIS Section 1.3, Purpose and Need regarding the need to operate for power production while protecting fish.

As a result of the DEIS public review process and subsequent 2002 HCP negotiations, the FEIS was revised to include additional mitigation measures raised during the DEIS public review process for the action alternatives. These two alternatives include a variety of mitigation measures for comparison. In addition, the FEIS notes that the timing and certainty of implementation varies between the two action alternatives. Under Alternative 3, the mitigation measures will be implemented immediately, while under Alternative 2, they might be implemented after several or many years have elapsed, depending upon the likelihood and length of litigation and FERC's decision and appeal process. Alternative 3 also immediately affords the same protection for unlisted as listed Plan species, which is less likely to occur under Alternative 2 for the same reasons as those mentioned above for listed Plan species.

The FEIS also includes a review of the Quantitative Analysis Report (QAR) (see Chapter 5 of the FEIS and Appendix E) that describes the long-term risks associated with Alternative 3 relative to the recovery of the listed species. Off-site mitigation in the form of PUD funding of tributary enhancement projects is not included under Alternative 2 (see FEIS Section 2.6.6.2, Alternative 2). Hatchery production under Alternative 2 is addressed through the existing settlement agreements or during relicensing, although specific changes to the allowable compensation level could result from the Section 7 consultation. Detailed information about the effects of the alternatives on anadromous fish is presented in FEIS Sections 4.2.2, Alternative 2 and 4.2.3, Alternative 3.

Quantitative Analysis Report

Comment 52 *The Quantitative Analysis Report (QAR) states that additional survival improvements beyond those projected for the draft HCP actions would be necessary to achieve extinction risk/recovery criteria. This information should be analyzed in the FEIS, as well as the potential for enforcing the necessary changes in the Lower Columbia River.*

Response 52 The purpose of the FEIS is to inform the public and decision-makers about the environmental effects of a reasonable set of alternatives. Final determination of whether the selected alternative meets the requirements of the Endangered Species Act or includes all of the necessary mitigation measures for species protection will occur with the issuance of a biological opinion. Under Alternative 2, NMFS would issue a biological opinion to FERC. Under Alternative 3, NMFS would issue a biological opinion to itself (in this instance NMFS would be the action agency proposing to issue a Section 10 permit to the PUDs) and make the finding required by Section 10 of the Endangered Species Act.

In either case, NMFS must ultimately issue a biological opinion determining whether or not the proposed action is likely to jeopardize the continued existence of the listed species. Also in either case, a jeopardy determination would require NMFS to provide the action agency with a reasonable and prudent alternative that includes measures necessary to avoid jeopardizing the listed species. These recommendations may not necessarily be those specified in the HCPs. The determination of Federal Power Act compliance will occur after Section 7 consultation with FERC and the resulting relicensing or license amendment process conducted by FERC.

Section 7 of the Endangered Species Act requires all Federal agencies, in consultation with NMFS and USFWS (the Services), to ensure that any action "authorized, funded, or carried out" by any such agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat. Under a jeopardy determination, the Services can specify "reasonable and prudent" alternatives, although the alternatives should be consistent with the intended purpose of the action and economically and technologically feasible. Conversely, Section 10 states that an incidental take permit can be authorized if the activity will not "appreciably reduce the likelihood of the survival and recovery of the species in the wild", and includes the development of a mitigation program that minimizes and mitigates take "to the maximum extent practicable." In either case, there is no criteria to recover the species, only a requirement to not "reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild" (50 CFR § 402.02). As indicated in the FEIS, Alternative 2 could potentially provide more opportunities to protect the species because it allows for the reinitiation of consultation at any time if new information indicates that the existing protection measures are not adequately protecting the species. Under Alternative 3, the permits could not be revoked until 2013 (2018 for Wells Dam) and every 10 years thereafter. Nevertheless, the HCPs and permits may be modified by agreement of the parties, consistent with the revised HCPs. The HCPs incorporate NMFS regulations that provide for changes to a permit. However, the HCPs will be adaptively managed by the coordinating committees to take into consideration newly available information—paying special attention to the results of the required survival studies. The revised HCPs clarify how additional measures would be instituted should the results of these studies indicate that the pertinent survival metrics are not being attained. Thus, there is likely to be little, if any, difference between the two action alternatives with respect to the timely implementation of protective measures in response to newly available information.

Revisions to the FEIS discussing the potential shortfall of the HCP measures at reaching the necessary survival levels are found in Chapter 5 and Appendix E. However, the additional measures identified in the QAR consist of lower river survival improvements and a shift in recent climate/environmental conditions, neither of which is under the control or responsibility of the PUDs. The QAR also indicates that, even if the dams were removed, these additional survival improvements would also be needed. The shortfall is more of a system-wide concern than a Mid-Columbia River concern. Therefore, it is unlikely that Alternative 2 would be more protective of listed species than Alternative 3, given the available provisions under the Endangered Species Act. The cumulative effects analysis (Chapter 5) can only project reasonable foreseeable future actions, but cannot enforce those actions that are outside the project applicant's purview. Therefore, the survival improvements called for in the Federal Columbia River Power System biological opinion (NMFS 2000a) are assumed to be achievable.

Comment 53 *The Quantitative Analysis Report (QAR) has several shortcomings that should be addressed in the FEIS: (1) survival improvements would occur instantaneously, (2) the Priest Rapids Project would achieve a 95 percent survival standard, (3) adequate assessment of the hatchery supplementation program, and (4) assumed survival improvements at other hydroelectric projects that are currently not being met.*

Response 53 Because the QAR is a modeling exercise, there are various constraints and assumptions that are inherent in the process. Some of the assumptions that were necessary were that the survival improvements were instantaneous (survival study information suggests that Rock Island, Wells, and some species at Rocky Reach may already be meeting or exceeding the survival levels assumed in the QAR; see Chapter 3 of the FEIS), and that the Priest Rapids Project would also achieve the same 93 percent project survival which was modeled. Other assumptions were also used that may not either be known or reflect the latest information, but were the best information available at the time of the modeling process. Assuming that the survival improvements were met at other projects was also necessary to determine whether the extinction risks, or the ability to meet the interim recovery levels, were possible with alternatives that are being considered or implemented.

Due to long-term uncertainty associated with the effectiveness of hatchery supplementation, the QAR analyses did not incorporate continued supplementation as envisioned under the proposed HCPs. However, other HCP actions, such as dam passage survival and tributary habitat enhancements, were considered in the QAR analysis. In addition, the QAR also assumed that the survival improvements expected at the three dams and the tributary enhancements would occur instantaneously. However, it may take several years or, in some cases, a decade or more before the survival benefits of certain actions (e.g., habitat improvements) are fully realized.

Comment 54 *The FEIS must discuss that the Quantitative Analysis Report (QAR) indicates a substantial risk of extinction without supplementation. Removal of Mid-Columbia dams would help to increase survival, critical fish habitat, and productivity.*

Response 54 Under NMFS guidelines, hatchery production is explicitly not included in the assessment of long-term sustainability of a stock. However, for Upper Columbia River steelhead, the QAR included an assessment of the relative risks of extinction under alternative assumptions regarding the effectiveness of hatchery origin spawners. NMFS agrees that, in some instances, hatchery supplementation can play a separate and important role in addressing particular Endangered Species Act-listed stock recovery issues.

The FEIS and QAR address extinction risks that would result from removal of the Mid-Columbia dams. Chapter 5 of the FEIS was revised to say: "… the risk of extinction and the probability of reaching the interim recovery goals are dependent on the assumption of future environmental conditions and consequently, which part of the existing data set is used. Also, under the most conservative view of future environmental conditions (using the 1980 to 1994 brood year data set), even dam removal would not allow the achievement of acceptable risk of extinction or meeting the interim recovery goals."

Project Area

Comment 55 *Several commenters suggested that the project area should be enlarged to include both upstream and downstream hydroelectric projects.*

Response 55 The project area defined for this FEIS is based on (1) the regulatory framework necessary for analyzing project effects under the Endangered Species Act, (2) the location of the proposed action (fish protection measures), and (3) the project applicants' ability to control and/or affect the subject of the proposed action. The PUDs do not have the authority to control or affect fish protection measures beyond the project boundaries. The tributary programs of the HCPs extend beyond the project boundaries, but specific programs will not be implemented without the voluntary support of property owners. The upstream projects are Federal projects outside of the

control of Chelan and Douglas County PUDs. The downstream projects (Wanapum and Priest Rapids dams) are owned by Grant County PUD, which has elected to use the Section 7 consultation process to satisfy Endangered Species Act requirements. The Lower Columbia River projects are Federal projects also outside of the control of Chelan and Douglas County PUDs. However, the upstream and downstream hydroelectric projects are considered in the Quantitative Analysis Report (QAR) and in the FEIS's cumulative effects analysis for those actions that can be predicted to occur over the life of the project. See Chapter 5 of the FEIS.

Representative Survival Studies

Comment 56 *Several commenters identified the lack of specific information regarding how performance standards will be measured. Survival evaluations are needed for each migrant life stage of each Plan species. In addition, survival standards must not be presumed to be met until certified by the coordinating committees. The use of surrogate species for survival evaluations was also questioned as inappropriate.*

Response 56 The revised HCPs now include a Survival Standard Decision Matrix (see Figure 2-4 of the FEIS), which identifies the priorities of HCP survival metrics and indicates which phase determinations would be made, given a particular result of the different Phase I survival studies that could be conducted. The HCPs clearly indicate that survival evaluations are required for each Plan species. An important amendment was the addition of 93 percent juvenile project survival measurement. The HCPs also specify that the coordinating committees are responsible for determining the most appropriate standard to be measured for each Plan species, approving studies prior to implementation, establishing the protocol(s) and methodologies to determine whether or not the survival standards are being achieved, and determining whether or not the no net impact standard is being achieved (see Section 6.7 of the Wells HCP [Reservoir as Habitat and Water Quality, Authority], and Section 4.7 of the Rocky Reach and Rock Island HCPs [Coordinating Committee, Authority]). Other clarifications made in the revised HCPs pertaining to the performance standards include explicit criteria (and flexibility around those criteria) for coordinating committee determinations regarding whether or not a study is valid (meets standards for representative flow conditions and statistical accuracy) and the use of an average (arithmetic mean) based on the point estimates from 3 years of valid studies to be used as the metric for comparison against the pertinent survival standard (see Section 4.1.4 of Wells HCP [Passage Survival Plan, Survival Standards, Methodologies] and Section 5.2.3 of the Rocky Reach and Rock Island HCPs [Passage Survival Plan Implementation of the Survival Standards, Methodologies]).

Two exceptions to these conditions pertain to Permit species at the Wells Project. Based on high survival estimates (averaging 96.2 percent) from 3 years of studies at the Wells Project (2 years for steelhead and 1 year for spring-run chinook salmon), the signatory parties have agreed that the project has achieved the 93 percent juvenile project survival standard for these species. After considering the unique design of the Wells Project and its proven ability to efficiently pass juvenile salmon through the modified spill bays, the signatory parties have also agreed that the calculated juvenile dam passage survival of sockeye and subyearling chinook salmon is probably greater than 95 percent (see Section 3.1 of the Wells HCP [Survival Standards and Allocation of Responsibility for No Net Impact]).

Under the revised agreements, Phase III (Standards Achieved) can only be designated for a Plan species if studies conducted in accordance with the approved methodologies and criteria (see above) indicate that either the 91 percent combined adult and juvenile survival standard or the surrogate standard of 93 percent juvenile project survival is being achieved at the project for that

species. The signatory parties recognize that for some species (such as sockeye and subyearling chinook salmon) where measurement of juvenile dam passage survival and juvenile project survival is not yet possible, the juvenile dam passage survival standard will be calculated based on the best available information (including route-specific passage rate and mortality estimates) as determined by the coordinating committees. Unlike the measured standards, however, the calculated standard might utilize off-site information where site-specific information is lacking.

If, at any time during Phase III (Additional Juvenile Studies), the appropriate coordinating committee approves the use of new survival methodologies (to measure a higher-priority survival standard according to the Decision Matrix), the PUD will have 5 years to conduct the appropriate evaluations. Based on the results of these studies, the appropriate coordinating committee will reevaluate the phase determination for the pertinent species. If the coordinating committee agrees (based on the results of these studies) that the applicable standard is met, Phase III (Additional Juvenile Studies or Standard Achieved) status will remain. If the applicable standard is not being met, a Phase II determination would be made and the coordinating committee would determine what additional tools would be implemented to achieve the applicable survival standard.

The methodologies utilized to measure the pertinent survival standards would be similar for both action alternatives (see HCP supporting document on survival estimating), except that these studies would likely only be conducted for listed species under Alternative 2, but would be required for all Plan species under Alternative 3. In addition, for listed species, the use of the juvenile project survival standard as the primary method of ensuring compliance would also be common to both alternatives.

Some methods would provide adequate data for certain species or life stages, but may not be as well suited for other species for a variety of reasons (see HCP supporting document on survival estimating). However, decisions must be made based on the best available scientific data. The methods currently being used to assess project impacts are the best available methods, although they might not provide conclusive results for all species, life stages, or potential project impacts. The survival studies conducted at the PUD projects under Alternative 3 will include the best available techniques and protocols as agreed to by the HCP coordinating committees. These same techniques are expected to be included under Alternative 2 to assess mitigation requirements or performance. However, due to the considerable expense of conducting survival studies, the limited availability of test fish (particularly for depressed stocks), and the limitations of the assessment techniques, it may not be feasible to acquire survival data for each species. Therefore, it may be necessary to use data from surrogate species, populations, or life stages to estimate survival for those species or life stages that cannot be effectively evaluated at the present time. For example, instead of using Endangered Species Act-listed spring-run chinook salmon and steelhead, hatchery or mixed-stock run-of-the-river fish would likely be used in survival evaluations.

Due to the uncertainties associated with any survival estimation technique, there are frequent disputes over the various aspects of the studies or the interpretation of the results. These disputes will likely continue under either action alternative. However, because criteria and methodologies have been substantively agreed upon by the signatory parties in the revised HCPs, the likelihood and magnitude of these disputes is expected to be less under Alternative 3 than under Alternative 2.

Survival Study Uncertainties

Comment 57 *There is a lack of commitment to conduct survival studies on any Plan species, except for those that are also listed. In addition, the practicality of marking large numbers of Plan or Permit species for either Phase I or II evaluation or Phase III monitoring efforts is questionable due to the scarcity of test animals. These limitations could affect the ability to verify meeting the standards. It is also unclear if all the Plan species could be evaluated in 3 years.*

Response 57 Under Alternative 3, the methods used to assess survival rates for each Plan species at the projects would be determined by the coordinating committees in accordance with the requirements of the revised agreements and in consideration of the supporting documents appended to the agreements. The coordinating committees are responsible for determining the most appropriate methodology for each of the Plan species, recognizing that one methodology may not be suitable or appropriate for all the species or life stages. Therefore, survival studies will be conducted for all the Plan species, except where no appropriate methodology exists (see Survival Standard Decision Matrix, Figure 2-4 of the FEIS).

The revised HCPs acknowledge that limitations on the number of fish needed to make accurate survival estimates are an important consideration in determining the most appropriate methodology for assessing the pertinent survival standard (see HCP supporting document on survival estimating). Some methodologies (radio or acoustic tags, for example) may be able to generate sufficiently accurate estimates with relatively small numbers of fish, but these tags have limited longevity, potentially limiting their ability to assess indirect and delayed mortality. In comparison, PIT tags have no longevity limitations, and are therefore more likely to completely assess indirect and delayed effects. However, using this methodology requires tens or hundreds of thousands of tagged fish to generate sufficiently accurate survival estimates. The coordinating committees will be responsible for assessing the available methodologies and determining which can best be used to assess the pertinent survival standard for each Plan species. The revised HCPs also require the coordinating committees to facilitate the availability of test fish for studies, which may include the rearing of additional hatchery fish (e.g., Section 4.10 of the Rocky Reach and Rocky Island HCPs [Coordinating Committee, Methodologies/Test Fish]).

The HCPs contain specific criteria for determining the statistical significance of survival test data. The point estimate should have a standard error of no more than ±2.5 percent (i.e., 5 percent error) at the 95 percent confidence level. If these criteria are not met, the study results would be rejected and an additional year of testing would be required. However, under conditions specified in the HCP and with unanimous agreement, the coordinating committees could accept the results of a less precise survival study for inclusion in the 3-year average if the standard error does not exceed ±3.5 percent. If the arithmetic mean (average) of the 3 years of studies is no more than 0.5 percent below the survival standard, the coordinating committees may decide whether an additional year of study is appropriate before making the final phase determination.

The HCPs state that point estimates from at least 3 years of valid studies would be averaged and compared against the pertinent survival standard to determine the phase designation for a Plan species. This does not necessarily require that the testing be conducted in 3 consecutive years or that all of the studies for each Plan species be conducted simultaneously. The phase determination would be identified for each Plan species individually. As such, the determination for one species does not necessarily affect the determination of any other species, unless the coordinating committee agrees that the survival rate for a monitored species likely represents the survival rate for a species that cannot be monitored effectively and accurately.

Under Alternative 3, to receive a Phase III (Standard Achieved) designation for a Plan species by the coordinating committees, the PUDs must achieve the 91 percent combined adult and juvenile survival standard or its surrogate, the 93 percent juvenile project survival standard. The measurement of these standards include direct, indirect, and delayed mortality wherever it may occur and can be measured (as it relates to each project) given the available mark-recapture technology for each Plan species. Under Alternative 2, only the listed species would likely receive this level of protection.

Adult Survival

Comment 58 *Adult passage and survival standards have not been quantitatively measured, and should be addressed in the EIS. A more thorough discussion of adult protection measures should be provided in the EIS analysis, as well as the effects of project operations (e.g., power peaking). The EIS should include recent results from adult radio telemetry studies.*

Response 58 The difficulties of quantifying adult mortality related to project operations are the same for all alternatives. These difficulties relate to the inherent inaccuracies in the available monitoring methods, and the inability to differentiate the cumulative impacts to adults from passing downstream projects with the direct impacts at any one particular upstream project. Furthermore, there is presently no available technology allowing the parties to differentiate hydro-related mortality from natural adult losses, which are known to occur in even the most pristine river systems. Recognizing these difficulties, and based on regional information, the signatory parties agree that adult fish survival is estimated to be 98 to 100 percent at each project. Analysis conducted as part of the 2000 Federal Columbia River Power System biological opinion (NMFS 2000a) and the Rocky Reach biological opinion (NMFS 2002a) provide additional evidence that total mortality rates are likely no more than 2.4 percent for spring-run chinook salmon and 3.2 percent for steelhead. Taking into account natural mortality, which undoubtedly occurs, it is likely that the 2 percent adult mortality resulting from project-related effects is currently being attained, at least for the listed species for which estimates are available. The assumed unavoidable mortality of adults is compensated through funding of the Plan Species Account.

The adult passage plans are similar to those required at downstream Federal projects on the Columbia River. The passage times at the projects covered by the HCPs are within the ranges of those observed at other mainstem hydroelectric projects on the Columbia and Snake Rivers. At other mainstem projects, NMFS has determined that, while delays may occur in passing mainstem projects, adults likely migrate faster in the pools than they did in the free-flowing river (NMFS 2000a). Because these project effects tend to offset each other, the potential effects of project passage delays are likely small and would be equivalent for either action alternative.

The difficulties of interpreting tagging results for adult fish are the primary reason that specific performance standards have not been identified in the HCPs for adult passage. There are a number of reasons for fish to delay passing a project that are not related to passage conditions. For example, fish may mistakenly migrate past their natal tributary stream or hatchery, and as a result, might be more reluctant to pass a project than those that are destined for upstream spawning areas or hatcheries. Passage delays might also be affected by life-history characteristics of Plan species, fish maturation, physical conditions related to the entire migration area, or the tagging and handling process. Note that there are little or no data that accurately estimate the effects of passage delays on spawning success. The estimates of delay provided in the FEIS were included to indicate overall fishway passage conditions and reflect median passage times**.**

The HCPs require the PUDs to use their best efforts to operate and maintain the adult fishways in accordance with approved Detailed Fishway Operation Plan criteria (or equivalently protective criteria in the case of Wells Dam), and any subsequent revisions to these criteria, which are a component of the provisions in existing settlement agreements and project licenses. These criteria are therefore likely to be part of the requirements under Alternative 2, at least initially. If the criteria are changed as a result of Section 7 consultation under Alternative 2, the criteria could result in a preference for listed species over unlisted species. However, until accurate estimates of impacts to adult fish can be quantified and related to specific project operations, there is no basis for altering the current ladder operating criteria for adult fishway operations at the projects.

In addition to meeting the various adult fishladder operating criteria under Alternative 3, the PUDs also have the 91 percent combined adult and juvenile project survival standard, which includes adults. Therefore, as monitoring methods improve over time, the results would be used to further refine the estimates of adult mortality that would be included in measuring survival against the performance standards. Not achieving the performance standards for all Plan species requires the PUDs to continue to implement tools in an effort to meet the standards.

The Federal Columbia River Power System biological opinion (NMFS 2000a) concluded that, although power peaking can affect spawning adults, egg incubation, and fry rearing stages, power peaking alone does not have a significant adverse effect on migrating salmon.

Comment 59 *The DEIS should include an analysis of adult losses, examine the adequacy of the adult passage plans, and address mitigation for adult losses under the alternatives.*

Response 59 See response to the previous comment.

Evolutionarily Significant Unit Issues

Comment 60 *What is the standard by which the status of the Evolutionarily Significant Unit is measured?*

Response 60 See answer to Comments #8 and #9.

Comment 61 *The geographic place and biological terms that would be used to measure progress toward recovery of the chinook salmon Evolutionarily Significant Units should be described.*

Response 61 See answer to Comment #10.

Conditional HCP Implementation

Comment 62 *Several commenters questioned various aspects of the conditional implementation of the HCPs, including (1) the lack of a signed implementation agreement, (2) the effects that this has on resolving outstanding issues at the projects, (3) whether the steady progress criteria applies during the conditional period, (4) how Chelan County PUD can continue to develop their juvenile bypass system without a signed agreement, and (5) why the PUDs can avoid meeting requirements in the existing settlement agreements. Others questioned how the PUDs could continue to "take" listed species without a Section 7 biological opinion.*

Response 62 Under the original HPCs, the PUDs conditionally implemented the HCPs without a signed implementation agreement and the parties agreed that the monitoring and evaluation components of the HCPs would not begin until the HCPs were signed and Phase I was completed. The primary reason for conditionally implementing the HCPs was because the time frame for Phase I

(1998 through 2003) had already begun, and might not have changed even with delays in approving the HCPs. Therefore, the PUDs would still need to demonstrate that they have achieved the HCP performance standards by the end of Phase I. Also during Phase I, the PUDs were allowed to use any tool or combination of tools in the pursuit of meeting the survival standards.

Discussions amongst the original HCP signatory parties regarding the resolution of outstanding issues nearly broke down in 2001, after the DEIS was released. Chelan County PUD chose, citing emergency conditions in the western energy grid and high costs of replacement energy, to reduce or eliminate spill at their Rock Island and Rocky Reach projects, respectively, to pre-HCP levels. While this almost certainly resulted in a negative impact to Plan species in 2001, Chelan County PUD's actions ultimately provided pressure on the signatory parties (including Chelan County PUD) to resolve outstanding HCP implementation issues as well as issues brought to NMFS's attention through public comments on the DEIS. The signatory parties to the revised HCPs believe that these issues have now been resolved to the mutual satisfaction of all the parties, and will likely provide greater benefits to all Plan species in a shorter period of time than would an Endangered Species Act Section 7 consultation. This is because under Alternative 3, the mitigation measures will be implemented immediately for all Plan species, while under Alternative 2, they might be implemented after several or many years have elapsed, depending upon the likelihood and length of litigation and FERC's decision and appeal process.

All references to "steady progress" have been removed from the revised HCPs. These documents now clearly indicate the signatory parties' expectation that the pertinent survival standards for all Plan species will be met by 2013. Should survival studies indicate that the pertinent survival standard is not being met for one or more Plan species at the end of Phase I, the coordinating committees would determine what additional measures (or tools) would be implemented to meet those standards (Phase II). Additional survival studies would be implemented to ensure that the protective measures were now achieving the pertinent survival standard.

Although the PUDs have voluntarily agreed to conditionally implement the provisions of the HCPs as a good faith effort, this does not minimize or replace their responsibilities established through their existing licenses and agreements, or those required under relicensing. Providing NMFS with Section 10 applications does not allow FERC (and their designated non-Federal representatives—the PUDs) to avoid compliance with the Endangered Species Act through Section 7 consultations. Since the DEIS was released, both the Wells and Rocky Reach projects have undergone Endangered Species Act Section 7 consultation for interim operations (and the construction of a juvenile bypass system at Rocky Reach Dam). Both Section 7 and Section 10 consultations attempt to minimize or mitigate for take associated with a particular activity; however, there is no expectation that take will not occur.

The Rocky Reach Fourth Revised Interim Stipulation states that the main goal is to develop a safe bypass system (less than 2 percent mortality), while the spill program is referred to as an interim protection measure due to its impact on water quality. The intent of the Fourth Revised Interim Stipulation was to develop a bypass system as an alternative to spill. The initial development of the prototype bypass system at Rocky Reach was to meet interim stipulation objectives. In 2002, FERC (and Chelan County PUD) consulted on the operation of Rocky Reach Dam and the construction and operation of a juvenile bypass system. NMFS determined through a Section 7 consultation that the proposed action would not jeopardize the listed species. Thus, the Rocky Reach juvenile bypass system should be considered an integral component of Chelan County PUDs efforts to minimize take under either action alternative. However, the bypass is specifically linked to the HCP. Alternative 2 of the FEIS now evaluates a sluiceway bypass system that could

be recommended by NMFS to protect listed species in the event that the bypass system proves ineffective.

Miscellaneous Comments

Comment 63 *Disclose the potential for an increase in noxious weeds under drawdown.*

Response 63 This discussion was added to FEIS Section 4.4.2.1, Project Area.

Comment 64 *A risk assessment should be completed for the HCPs because they rely too heavily on the adaptive management strategy.*

Response 64 A risk assessment is a quantification of the potential adverse effects that an action can have on a population of organisms. The studies the applicants are completing in determining salmonid mortality through the projects replicate the outcome of a risk assessment. The adaptive management strategy is not related to risk assessments. Adaptive management is a process used to ensure that mitigation measures will be effective in reducing mortality, and if the measures are not effective, then another approach that is more effective would be adopted.

Comment 65 *Provide more information on the amount of energy needed from the three projects, and whether the need is a deficit for the area or a deficit in meeting exporting needs.*

Response 65 **FEIS** Section 1.6, Background has been revised to include the most recent Federal energy surplus/deficit projections and a description of the energy production and customers for the three dams.

Comment 66 *Identify in the FEIS USEPA's Clean Air Act Section 309 responsibility to review the document.*

Response 66 This information was added in FEIS Section 1.6.2.10, U.S. Environmental Protection Agency.

Comment 67 *Additional diagrams or photos of each dam should be included to illustrate project features identified in Table 2-3 and passage routes with associated survival rates.*

Response 67 This information is provided in Figures 2-1, 2-2, and 2-3 and Table 3-4 of the FEIS. However, route-specific survival estimates are to be used as a last resort under Alternative 3 to assess compliance with the no net impact standard. They are also expected to be used as a last resort of listed species under Alternative 2, given NMFS's opinion that PIT-tag data provide the best estimate of survival because such studies provide a better assessment of direct, delayed, and indirect mortality.

Comment 68 *The EIS should include a table describing research needs and a priority and implementation schedule.*

Response 68 Under Alternative 2, the existing Mid-Columbia, Wells, and Rock Island Coordinating Committees would likely be responsible for assessing and prioritizing data needs. Also under Alternative 2, NMFS can require measures to minimize the incidental take of listed species and reporting and monitoring requirements necessary to ensure that the anticipated level of incidental take is not being exceeded. Under Alternative 3, the HCP coordinating, tributary, and hatchery committees would be responsible for assessing and prioritizing data needs for Plan species. Under Alternative 3, the survival studies would serve as the assessment for determining whether

or not the projects were complying with the anticipated level of incidental take, as well as the extent and nature of additional research needs.

Assessing the survival rates of juvenile and adult fish passing the projects is the most important research need for both action alternatives. The primary focus of the alternatives is to protect the salmon and steelhead species as they pass the projects, and to mitigate for unavoidable mortality. The mitigation goals are determined by the effects of the projects on fish survival. Therefore, to set appropriate mitigation levels, accurate survival estimates are needed. Much of the other research needs are related to the quality of the mitigation that would be used to fine-tune the amount of mitigation required to achieve the mitigation goal. Under Alternative 2, the PUDs would be required to provide the required mitigation, but not necessarily the assessments related to the adequacy of the mitigation. Although this is also the case for some aspects of Alternative 3 (e.g., assessing if the tributary conservation funding provides a 2 percent mitigation level), other aspects are included in the provisions of the HCPs (e.g., survival studies for 3 years for all the Plan species). Although there are a large number of unknowns related to biological functions in the basin, many of these are independent of direct or indirect project effects.

Comment 69 *The EIS should state that dam releases have fewer temperature fluctuations with cool moments for fish refuge during hot periods.*

Response 69 Because of their large reservoirs, mainstem hydroelectric facilities within the Columbia River Basin often act as a thermal buffer—decreasing maximum and minimum variations in water temperature on both a daily and yearly basis. The exact benefit, if any, of this effect to Plan species has not been determined. While a slight reduction of maximum daily temperatures could benefit Plan species that migrate during the summer or early fall, the corresponding increase in minimum daily temperatures could be detrimental. However, the Mid-Columbia River projects are run-of-the-river facilities that have limited ability to manipulate water temperatures in the basin. The large upstream storage reservoirs, which are outside the project area, are thought to have much greater influence over water temperatures in the river.

Comment 70 *The DEIS states that the Washington Department of Ecology is not permitting new water rights to withdraw water from several of the Mid-Columbia River tributaries due to dewatering concerns. The FEIS should describe the effectiveness of this mitigation measure and the extent that dewatering still affects fish species of concern.*

Response 70 Because water rights in the basin are generally over-allocated, not permitting new withdrawals effectively means that there are no changes to existing dewatering conditions. As a result, this restriction is not functioning as a mitigation measure. Conditions of dewatering and effects on fish species are addressed in FEIS Section 3.2.10, Aquatic Habitat.

Comment 71 *Define "some degree of certainty" regarding the long-term operation of the projects, and which elements are subject to future negotiations.*

Response 71 Based on comments on the DEIS, the phrase "some degree of certainty" does not occur within the revised HCPs. Uncertainties relating to long-term operations at the project have also been minimized to the extent practical in the revised HCPs. In addition, with the continued studies and mitigation measures in place at the projects since 1998, the PUDs have obtained a better understanding of which measures are needed to meet the HCP performance standards. The PUDs will be able to more easily track and budget for implementation of these measures over both the short and long term. Effort will be expended in implementing and developing mitigation measures that meet no net impact standards rather than the time-consuming process of negotiating

and consulting with agencies and other entities to develop standards that are agreeable to all parties involved. In the event that the PUD(s) fail to meet pertinent survival standards for Plan species (Phase II designation) after Phase I is complete, the coordinating committees would determine what additional measures are necessary to meet those standards. At this time, NMFS does not know what these measures would be, but the measures could include additional structural modifications (for example, surface collectors or fish bypass systems) or other operational measures (for example, increased spill or altered turbine usage and spill patterns).

Comment 72 *Define "best efforts" in terms of HCP compliance by the PUDs.*

Response 72 The DEIS misrepresented the use of this term. The HCPs only refer to "best efforts" in relation to maintaining and operating the adult fishways according to the current Detailed Fishway Operation Plan, not the performance standards (93 percent juvenile dam passage and 91 percent total project survival standards). The term means that the PUDs will maintain and operate the adult fishways to the established criteria, or a subsequent higher standard. The misuse of the term "best efforts" has been corrected in the FEIS.

Comment 73 *Define and provide examples of "maximum extent practicable" when referring to mitigating the impacts of takings.*

Response 73 This terminology is taken directly from Section 10 of the Endangered Species Act (Section 10(a)(2)(b)(ii)). No specific definition is provided in the Act, although it is assumed to include such factors as physical, economical, and legal constraints.

Comment 74 *The EIS should also consider normative river and multi-species restoration, the risk of HCP assumptions being incorrect, the potential for the alternatives impacting other species or species life histories, and the feasibility of introducing coho salmon.*

Response 74 The normative river concept was advanced by both the National Research Council (1996) and the Independent Scientific Group (1996). Simply put, this concept articulates that on a broad scale, river management strategies and mainstem habitat improvements should emphasize reestablishing key functions or functional attributes of a normative river. The Tribal Plan, Spirit of the Salmon (CRITFC 1996) agreed with this approach, stating that, "To support anadromous fish, mainstem habitat must be returned to natural conditions closer to those that existed prior to construction of the dams." NMFS also recognizes the importance of this concept, which has been included in the Endangered Species Act Implementation Plan for the Federal Columbia River Power System biological opinion (NMFS 2000a). Consistent with this concept, the fundamental strategy of this plan is to implement recovery actions broadly and comprehensively across all aspects of the salmon life cycle in recovering listed species.

The FEIS considers two action alternatives having different structural and operational measures, different procedural pathways, and different risks in terms of the likelihood or timing of protective measures being implemented. In either case, NMFS would consider the normative river concept when participating in the Mid-Columbia, Rock Island, and Wells coordinating committees (Alternative 2) or in the HCPs' coordinating committees (Alternative 3). Compared to Alternative 2 (which would primarily focus on listed species), Alternative 3 would likely provide greater opportunities for considering the normative river concept because it applies to all Plan species and establishes a Plan Species Account. These funds could be used to improve habitat conditions within both mainstem and tributary habitats—positively affecting life-history stages in addition to those actions taken at the projects to increase migration survival rates.

Alternative 3 is consistent with the multi-species restoration approach because it includes both listed and unlisted species as Plan species. This provides equal protection requirements for these species (including coho salmon) through the establishment of consistent, measurable performance standards. Alternative 2 would most likely provide a higher level of protection for the listed Plan species than for the unlisted Plan species because NMFS could only obtain protective measures for these unlisted species through litigation or other processes, such as FERC relicensing. Therefore, the potential for implementing protection measures that select only for certain species or life stages is likely greater under Alternative 2 than Alternative 3.

Comment 75 *If the HCPs set an initial 5-year period of evaluations, with up to 3 years of evaluations, then annual payments to the Plan Species Account may not begin until 8 years from the commencement of Phase I. To correct this decrease in funding, the initial payment should be increased.*

Response 75 The initial payment to the Plan Species Account would occur within 90 days of the effective date of the HCPs, and subsequent annual payments would be due on January 31 for each subsequent year. The tributary committees can also request that the PUDs contribute, in advance, any of the annual contributions during the first 15 years (for Chelan County PUD's projects) or 10 years (for Douglas County PUD's Wells Project) of the agreement.

Comment 76 *Missing on page 2-49 (Section 2.6) of the DEIS is a discussion of how the action alternatives lead to an improvement and not an extinction of the affected species.*

Response 76 Section 2.6, Alternative Comparison of the FEIS is a comparison of the affected species under each of the alternatives, and is not meant to be a comparison of the results of implementing any of the alternatives. A discussion of the survival improvements for each of the alternatives is located in FEIS Section 4.2, Fisheries Resources.

Comment 77 *Under Alternative 2, the EIS should discuss the requirement of NMFS and the Tribes to consult under the Secretarial Order. The EIS should confirm that NMFS and the Department of the Interior maintain their authorities under the Federal Power Act.*

Response 77 See FEIS Section 1.1, Introduction regarding other Federal laws, regulations, and statutes and their relation to the HCPs, as well as FEIS Section 4.12.17, Legislation Pertinent to Tribal Governments regarding consultation requirements between NMFS and the Tribes.

Comment 78 *The spill for Wells Dam is not clear; is it a step pool or cascade structure?*

Response 78 Table 2-2 of the FEIS provides a description of each of the projects. The spill gates at Wells Dam are a leaf-gate configuration. Although the gates open from the bottom, the water still plunges into the tailrace, which will result in an increase of total dissolved gas. However, the Wells Dam spillway has been modified into a juvenile bypass system, which is more efficient than an unmodified spillway at passing fish. Substantially greater numbers of fish can be passed at the project with a minimum amount of spill. The reduction in the spill volume also results in minimizing dissolved gas levels downstream when river flows and generation constraints result in involuntary spill.

Comment 79 *The EIS should state whether sediment deposition behind the dams would require dredging.*

Response 79 Text was added to FEIS Section 3.2.10.1, Reservoir Habitat explaining that dredging is not part of the routine maintenance at the projects, and reservoir dredging is not necessary to maintain a navigation channel.

Comment 80 *The EIS should further discuss whether the Rocky Reach bypass system can achieve a 98 percent survival rate, and whether spill should be increased to obtain the HCP performance standards.*

Response 80 This comment appears to confuse the statement that the Rocky Reach bypass could achieve a 98 percent survival rate, with an overall survival rate for all fish passing the project. The statement is specific to the bypass system, and the bypass survival rate would be factored with the survival rates for other passage routes to determine the calculated dam passage survival rate. Information in the FEIS does not suggest from this data that the performance standards for the HCPs could be achieved with only use of a bypass system. The revised HCPs specifically note that the calculated dam passage survival standard is a measurement of last resort (see Figure 2-4 of the FEIS). The prioritized survival standards for juveniles are measured project passage and measured dam passage. Studies utilizing paired releases of juvenile Plan species would most likely be necessary to measure these standards. In these studies, the overall survival estimate, not the estimated survival rate through a specific route of passage, would be applied to the applicable standard by the coordinating committees when making HCP phase determinations for Plan species.

Comment 81 *The alternatives were not ranked in their ability to achieve protection and recovery of the Tribal trust property.*

Response 81 The hydroelectric projects do not occur on Tribal trust property, with the exception of the Wells hydroelectric project. Effects of the alternatives on the Tribal treaty resources (salmon) are described in FEIS Section 4.2, Fisheries Resources regarding impacts and benefits of the action alternatives. Because there are benefits and disadvantages to all of the alternatives (refer to FEIS Section 2.6, Alternative Comparison), a ranking system is inappropriate. It is the responsibility of the reader to assess the information provided in the FEIS to make an informed decision as to the overall benefits of the alternatives.

Comment 82 *DEIS statements regarding Tribal rights to fish should be corrected.*

Response 82 See FEIS Section 3.11.3.3, Columbia River System for these changes.

Comment 83 *The DEIS infers that there was consent by Tribal biologists on the no net impact concept.*

Response 83 FEIS Section 2.3.4.4, HCP Performance Standards now omits the reference to Tribal biologists with regard to the no net impact concept. Also, see FEIS Section 4.12.17, Legislation Pertinent to Tribal Governments.

Comment 84 *The EIS should state that the USFWS must identify critical habitat for Columbia River bull trout.*

Response 84 This information was added in FEIS Section 1.5, Regulatory Framework.

Comment 85 *Section 7 and Section 10 have substantive and procedural differences that may not be adequately addressed in the DEIS.*

Response 85 See FEIS Section 2.6.2, Procedural Differences

Comment 86 *The hatchery compensation plan for Okanogan River sockeye salmon allows for substitution of summer/fall chinook salmon for sockeye salmon. The Colville Tribe opposes this action.*

Response 86 These substitution practices are provisions in the Wells Settlement Agreement, and will be phased out after 2005 under Alternative 3. Actually, spring-run chinook salmon are being raised as the substituted species by Douglas County PUD at this time, not summer/fall chinook salmon. After 2005, no net impact for Okanogan River sockeye salmon will be accomplished through implementation of a set of options identified in the Sockeye Enhancement Decision Tree (see Section 14 of the Wells HCP, Figure 3).

Comment 87 *The EIS should discuss the adult survival estimates presented by NMFS and the Idaho Cooperative Fishery Unit.*

Response 87 NMFS considered all of the available adult passage and survival information pertaining to listed Columbia River Basin salmon and steelhead in the preparation of its 2000 Federal Columbia River Power System biological opinion, including many studies conducted by the Idaho Cooperative Fish and Wildlife Research Unit. NMFS's best estimates of adult survival in the Columbia River Basin are generally summarized in Table 9.7-2 on page 9-189 of this document and in the 2002 Rocky Reach biological opinion (NMFS 2002a). Under the reasonable and prudent alternative, per project survival of Upper Columbia River spring-run chinook salmon and steelhead is estimated at 98.1 percent and 97.3 percent, respectively. Because of the general applicability of these numbers and NMFS's determination that they are the best numbers available, they were applied in the recent Rocky Reach biological opinion (NMFS 2002a). If the information cited above was available prior to 2001, it was considered by NMFS in the 2000 and 2002 biological opinions referred to above. However, this information may not have been included if NMFS determined that it was not the best scientific information available at that time.

Comment 88 *The EIS should discuss injury and mortality rates due to predation, and the effectiveness of predator control programs.*

Response 88 There are no estimates of losses due to predation at the projects. However, survival evaluations indicate a 6.1 percent and 2.5 percent loss of steelhead smolts passing through the Rocky Reach and Rock Island reservoirs, respectively. Predation probably constitutes a majority of these losses. The predator control program in the Rocky Reach and Rock Island project areas has removed about 75,000 northern pikeminnow between 1994 and 1999 (BioAnalysts 2000b). Over 17,000 northern pikeminnow were removed from the Wells Project area in 1998 and 1999 (Jerald 1999). Although an accurate estimate of survival benefits derived from these removals is unknown, the populations for northern pikeminnow appear to have declined since the start of the program. Since then, the average number of northern pikeminnow passing through the Rocky Reach fishways (April through November) has dropped from 6,508 to 3,151 fish; the counts at Rock Island have dropped from 24,016 to 7,666 fish.

Ruggerone (1986) documented substantial bird predation in the Wanapum Dam tailrace. He estimated the number of juvenile salmonids consumed ranged from 50 to 562 fish per hour. The number of salmonids consumed over a 25-day period during the peak salmonid outmigration was estimated to be between 111,750 and 119,250 fish, or about 2 percent of the estimated spring outmigration. Since that time, avian predator control measures have been started or enhanced at all projects. Although these measures have reduced bird predation in the project areas, no assessments were conducted to assess the exact survival benefits.

Substantial avian predation has been documented in the Columbia River estuary (NMFS 2000d). About 16,000 terns nesting on Rice Island consumed about 10.2 million (range: 7.4 to 13.2 million) outmigrating smolts during 1998, or approximately 11 percent (range: 8 to 14 percent) of the estimated 95 million outmigrating smolts (Roby et. al 2000). Following efforts to relocate the terns to other islands where the rate of salmonid consumption is lower, total consumption by Caspian terns in the Columbia River estuary in 2000 was reduced to 7.3 million (range: 5.7 to 9.3 million) smolts. This represents about a 38 percent reduction compared to the 1999 consumption rate.

Comment 89 *The Entiat River spring-run chinook salmon average escapement estimates (redds) based on dam counts (turnoff estimates) are in error and should alternatively rely on spawning ground survey redd count expansions for escapement and population trends.*

Response 89 The inaccuracies of the dam counts relative to expanded redd counts are presented in the FEIS. However, the relevance of this fact depends on the overall use of the data. For example, historical dam counts have been obtained through more uniform and consistent protocols than redd counts in the tributaries. Therefore, when comparing historical escapement trends, it is likely more appropriate to use only the dam counts rather than mixing the estimates.

Comment 90 *Entiat River average monthly flows are incorrect.*

Response 90 The written description of monthly flows in the Entiat River was incorrect in the DEIS. See FEIS Section 3.3.1.2, Associated Tributaries.

Comment 91 *Examine opportunities for coho salmon introductions.*

Response 91 Alternative 3 is consistent with the multi-species restoration approach because it includes both listed and unlisted species as Plan species. This provides equal protection requirements for these species (including coho salmon) through the establishment of consistent performance standards. Alternative 2 would provide additional protection measures for the listed species through the Section 7 consultation process, while other species would be protected through other processes, such as FERC relicensing. The Mid-Columbia River coho salmon are extirpated from the area, and are therefore not subject to protection under the Endangered Species Act. Although the PUDs have included coho salmon as a Plan species with respect to HCP coverage, this coverage would not be specifically required until a naturally producing population is reestablished. Protection for coho salmon under Alternative 2 would be through relicensing or license reopener proceedings, although the extent or mitigation requirements under these processes is unknown.

Comment 92 *The EIS should discuss the effects of elevated temperatures in the Okanogan River on adult sockeye salmon migration*.

Response 92 Although the inundation of the lower reach of the Okanogan River by the Wells Project can result in increased water temperatures in the reservoir, the majority of the temperature increases are the result of conditions in the Okanogan Basin. The naturally shallow lakes in the system, the low river gradient, and low summer flows accentuate the effects of solar radiation on water temperatures in the system. Adult fish have been observed holding in the Wells reservoir until water temperatures in the Okanogan River decrease to acceptable levels, but there is no evidence that suggests that they are holding downstream of the reservoir as a result of overall water temperatures in the reservoir. Water temperatures in the Okanogan River not only affect adult migration rates, but also severely restrict the use of the mainstem as juvenile rearing habitat. Mitigation for the effects of the Wells Project on sockeye salmon is identified in the revised

Wells HCP, which would focus on improving stream flow conditions in the Upper Okanogan watershed rather than hatchery production criteria used in the past.

Comment 93 *Monitoring is needed to address kelt passage and fallback guidance efficiency.*

Response 93 We agree that there are limited data on adult fallback and kelt passage at the projects. Although impacts from adult fallback would be included in the total project passage survival performance standard, there are no specific protocols for incorporating impacts to steelhead kelts in the overall passage survival estimates. However, the HCPs specify that the PUDs will identify adult fallback rates by the end of Phase I, and that the coordinating committees will determine the appropriate protection measures for steelhead kelts. These concerns will also be incorporated into the development and implementation of juvenile and adult passage measures, as well as project operation decisions.

Comment 94 *The juvenile holdover rate of summer chinook salmon is not adequately considered.*

Response 94 We agree that this is an unresolved outstanding issue with regards to the HCP performance standards. Although the subyearling (0-age) chinook salmon might be residualizing in the system, there are no data that suggest that this is a direct result of the Douglas or Chelan County PUD projects. As a result, there is no indication that the juvenile fish protection windows are not adequately protecting these fish. It is also unclear whether the operation of the projects incrementally impacts these fish during their holdover period over natural holdover conditions.

Comment 95 *The EIS should consider the socioeconomic needs of Indian Tribes for fishing and the benefits the Tribes obtain from harvest.*

Response 95 The information requested was added to FEIS Sections 3.7, Socioeconomics and 4.7, Socioeconomics.

Comment 96 *The FERC identifies three separate spring-run chinook salmon populations in the Methow, while the DEIS identifies the spring-run chinook salmon as a composite stock. Which is correct?*

Response 96 This EIS process is to address compliance with the Endangered Species Act. NMFS has determined through genetic evaluations that one Evolutionarily Significant Unit of spring-run chinook salmon occurs in the Upper Columbia River region. However, data for the individual river stocks are usually presented independently in the literature. The Quantitative Analysis Report also analyzed the runs separately.

Comment 97 *The EIS should analyze fish flows for the Columbia River.*

Response 97 As run-of-the-river projects, the PUD dams have limited control over flows in the Columbia River. Modified flows in the Columbia River are primarily the result of operations at large storage facilities in the Upper Columbia River and secondarily from operations to enhance migration conditions for listed fish as specified in the 2000 Federal Columbia River Power System biological opinion.

Comment 98 *The EIS should include steelhead radio-telemetry studies.*

Response 98 See FEIS Section 3.2.5.1, Upstream Migration of Adults that include the radio-telemetry studies.

Comment 99 *A sentence on page 3-89 of the DEIS is confusing.*

Response 99 The sentence has been corrected in FEIS Section 3.1.1.2, Associated Tributaries. The second reference to Entiat River should have been Entiat Mountains.

Comment 100 *Describe in quantitative terms the specific impacts to fish from hydroelectric and irrigation projects; commercial and sport fishing; logging; livestock grazing; water use by farms, cities, and towns; and municipal and industrial pollution.*

Response 100 It is not possible to quantify fish mortality attributable to irrigation projects; commercial and sport fishing; logging; livestock grazing; water use by farms, cities, and towns; and municipal and industrial pollution. However, this specific information is not needed to make an informed decision on selection of the project alternatives. For this FEIS, information that is needed pertains to the mortality through the three hydroelectric projects, and this information is provided in FEIS Sections 3.2.5, Adult Survival at the Projects and 3.2.6, Juvenile Survival at the Projects. For additional information on the effects of fish mortality from other impacts, please refer to *An Ecosystem Approach to Salmonid Conservation* (Spence et al. 1996), and the Federal Caucus's Basinwide Salmon Recovery Strategy (Federal Caucus 2000).

Comment 101 *The discussion of lethal measures used in avian control programs should not be a red-flag issue because shooting is conducted to enhance the scaring efficiency of firearms and pyrotechnics. The avian predator control programs at Wells Dam, Wells Hatchery, and Rock Island and Rocky Reach dams should be included in the EIS.*

Response 101 See FEIS Section 2.2.4.3, Predation. A discussion on shooting and lethal methods was added to this paragraph. Refer to FEIS Sections 2.3.2, Alternative 1 (No-Action) and 2.3.4.8, HCP Conservation Plan and Compensation Measures. Information was added concerning avian predator control programs at Wells Dam, Wells Hatchery, and Rock Island and Rocky Reach dams. Also see FEIS Section 3.2.10.2, Project Area Rearing to include other piscivorous birds; additional references on bird predation were added. Note that very little research on avian predation on fish in the Mid-Columbia River has been conducted, and no studies have quantified the exact amount of predation by birds, other than gulls, at the Wells, Rocky Reach, and Rock Island dams. Chelan County PUD (in conjunction with the University of Washington, WDFW, and NMFS) is currently assessing the impacts of piscivorous birds on juvenile migrating salmonids.

Comment 102 *The EIS does not address fish as a critical cultural resource.*

Response 102 Refer to FEIS Section 4.11, Cultural Resources regarding the importance of fish as a cultural resource.

Appendix

D

Chelan and Douglas County PUD Comments and NMFS Responses

Included in this appendix are letters received from the project applicants, Douglas and Chelan County PUDs. Following each letter are responses to their comments.

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NMFS Responses to Douglas County PUD (DCPUD) Comments

Comment 1 *Page S-15, S.5.3 Alternative 3 (Applicants' Proposed Action – Project HCPs), second Paragraph, last Sentence. We request further clarification regarding the following statement, "(EIS prepared by FERC including a separate Section 7 consultation with NMFS regarding the effects of the agreements on listed species)."*

This paragraph indicates that FERC needs to prepare a second EIS for implementation of the HCPs. The parties expended considerable effort prior to preparation of the Draft EIS to avoid this unnecessary duplication. There is no rationale for FERC to prepare a separate EIS to implement the HCP.

Response 1 The FEIS was edited to reflect the comment in Section 2.3.4, Alternative 3 (Proposed Action – Project HCPs) and the corresponding section in the summary chapter. Although NEPA compliance is required to issue an incidental take permit, it does not necessarily require an EIS. The NEPA process is intended to provide an understanding of the environmental consequences of the proposed action to help a Federal agency make decisions. Although a FERC license action is separate from the NMFS action of issuing the permit, as a cooperating agency, FERC intends to use this EIS to make decisions on subsequent license actions relevant to implementation of the HCPs. In addition, the State agencies intend to use the information generated by this process to satisfy State environmental requirements. See NMFS responses to DEIS public comments, Appendix C, Response #19.

Comment 2 *Page S-22, Paragraph 1, line 5 and line 11. Please change the following two statements, "If juvenile dam passage survival …" to "If juvenile project passage survival"*

Response 2 This language is no longer applicable due to changes in the revised HCPs.

Comment 3 *Page S-22, Paragraph. 1, line 5. "If juvenile dam passage survival after <u>three</u> years of evaluations remains…" The Wells Implementation Agreement specifically calls for three years of survival studies within the five-year period known as Phase I. Phase I began in 1998.*

Response 3 This was meant to indicate that 3 years of assessment were required, and not that 3 additional years of study were needed. However, this language is no longer applicable due to changes in the revised HCPs. See NMFS responses to DEIS public comments, Appendix C, Response #57.

Comment 4 *Page S-29, Table S-2 Alternative Comparisons (Alternative 1). In the section labeled, "Continued Studies to Assess Survival" please clarify that continued survival studies at Wells Dam toward the goal of determining passage survival conditions at Rock Island and Rock Reach dams is not the responsibility of the Wells Project owner.*

Response 4 Reference to Wells Dam was removed to avoid confusion. See NMFS responses to DEIS public comments, Appendix C, Responses #21 and #22.

Comment 5 *Page S-35, Second Column, second to last Bullet. "determine whether the species can be expected to survive with an <u>adequate potential</u> for recovery under the proposed action…" Please define "adequate potential" in terms of interim recovery goals and standards. Would a greater than 50 percent probability of recovery be sufficient? How does, "adequate potential for recovery" relate to the "not likely to jeopardize the continued existence" standard spelled out in Section 7(a)(2) of the Endangered Species Act?*

Response 5 Section 1.3.1.1 of the 2000 Federal Columbia River Power System biological opinion describes the general analytical approach that NMFS uses to apply the jeopardy standard in the implementing regulations (Section 402.02 – definition of "jeopardize the continued existence"). This general analytical approach states that, for an action to avoid jeopardy, the mortality of listed salmonids within the different Evolutionarily Significant Units attributable to the action must be low enough to meet the following condition:

> *When combined with mortality occurring in other life stages, there is a high likelihood of population survival and a moderate to high likelihood of population recovery.*

For anadromous fish in the Columbia River Basin, NMFS has chosen the probability that 8-year geometric mean abundance will be greater than or equal to recovery abundance level in 48 years as the most conservative recovery metric. NMFS approximates "moderate to high probability" in its modeling efforts as "50 percent or greater likelihood of meeting the recovery abundance level in the specified time period." See NMFS responses to DEIS public comments, Appendix C, Responses #41 and #52.

Comment 6 *Page S-38, Table S-3 Environmental Comparison of the Alternatives (Page 3 of 8). Under "Fisheries Resources: Other Plan Species – Adult Reservoir Spawning", Alternative 1, 2 and 3 are listed as being: "Same as discussed for threatened and endangered species above." However, under the T & E section (above) there is no discussion of Adult Reservoir Spawning.*

Response 6 The FEIS was revised to reflect that there would be no change from existing conditions for the three alternatives, but that reservoir spawning primarily refers to fall chinook.

Comment 7 *Page S-39, Table S-3 Environmental Comparison of the Alternatives (Page 4 of 8). Under "Tributary Habitat Improvements" for Alternative 1, 2, and 3. Given that this document is intended to evaluate three possible environmental alternatives related to future operation of PUD dams, we are confused by the following statement: "Habitat improvements would occur through the implementation of non-PUD funded projects through Federal, State and local agency funding." This statement misleads the reviewer to conclude that habitat improvements will take place regardless of the selected alternative. Simply stated, under Alternative 1 and 2 the PUDs would not fund off-site habitat improvements. Under Alternative 3 the PUDs would fund tributary enhancement toward a 2 percent increase in survival per project for Plan species covered by the HCP. Under all three alternatives the agencies may pursue habitat improvements.*

Response 7 The heading titled Tributary Habitat Improvements of Table S-3 has been revised in the FEIS to more clearly indicate that only under the HCP alternative (Alternative 3) are the PUDs expected to provide funding for tributary improvements. However, habitat improvement projects will continue to occur in the Mid-Columbia River area from a variety of sources (e.g., Salmon Recovery Funding Board). This is expected to occur under all three alternatives. The QAR analysis indicates that additional measures will be needed to recover listed species, even if the HCPs are implemented. Therefore, other activities are identified that would aid in the recovery process, as well as assessing the cumulative effects of Alternative 3. Deleting this information from the table would be more confusing because it would give the impression that the HCPs would be the only effort being implemented to recover the species. See NMFS responses to DEIS public comments, Appendix C, Responses #12 through #14 for discussion of off-site mitigation and the Tributary Habitat Plan.

Comment 8 *Page S-40, Table S-3 Environmental Comparison of the Alternatives (Page 5 of 8). Alternative 1, Water Quality, Tributary Water Quality. We suggest removing references to agency-funded*

habitat work. The inclusion of agency funding of habitat projects only confuses the three environmental options being evaluated. Under Alternative 1 and 2 the PUDs would not voluntarily fund improvements in water quality in the tributaries. Under Alternative 3, the PUDs would voluntarily provide direct funding toward the improvement of tributary water quality. This clear distinction needs to be drawn between the three Alternatives.

Response 8 Same as DCPUD Comment #7 (above).

Comment 9 *Page S-40 and S-43. Table S-3 Environmental Comparison of the Alternatives (Page 5, 6, 7 & 8). Actions common to all three alternatives and outside the control of the decision related to the EIS should not be presented in this table. Similarly, the actions referred to under DCPUD comment no. 8 should also be applied to statements contained under subsections: Vegetation (Project Area, Associated Tributaries), Wildlife (Threatened and Endangered Species), Land Use (Associated Tributaries), Economics (Tributary Habitat Improvement), Recreation (Tributary Habitat Improvements, Columbia River System) and Cultural Resources (Tributaries).*

Response 9 Same as DCPUD Comment #7 (above). The EIS must assess cumulative effects of the proposed project. This table summarizes information contained in the EIS, and even if there is no difference between the alternatives, we need to show that this topic was evaluated.

Comment 10 *Page 1-6 and 1-7. 1.5.2.1 Endangered Species Act Requirements for Non-Federal Actions. "The No Surprises Policy and Adaptive Management" These two policies appear to be in conflict when it comes to implementation under the proposed HCP. Please describe how conflicts between the two policies will be mediated during the implementation of Alternative 3.*

Response 10 The No Surprises Policy section states that the regulation means that, "as long as an HCP is being properly implemented, the Section 10 permit is valid and nothing more can be required." It further indicates that "mitigation will remain as agreed." Adaptive management is an integral part of the HCPs because some of the mitigation identifies response-based requirements or goals. These goals have been agreed to and will not change, but the measures needed to reach the goals are generally unspecified and will require an adaptive management approach to implement. Other mitigation levels are clearly identified in the HCPs, as well as specifications on how they could be adjusted in the future. The revised HCPs also identify contingency procedures for resolving disputes and define circumstances under which the parties could withdraw from the agreements and/or NMFS could revoke the Section 10 permits. NMFS's ability to withdraw in certain circumstances, such as a failure of the species to rebuild, is not limited by the No Surprises policy.

Comment 11 *Page 1-16. 1.6.3 Alternative 3 (Proposed Action), first Bullet on Page 1-16. Please modify the following statement: "evaluate project specific survival rates," to "evaluate project specific juvenile survival rates."*

Response 11 The text has been revised to be consistent with the revised HCPs and reads as follows: "Evaluate survival rates according to the HCP Survival Standard Decision Matrix."

Comment 12 *Page 1-32, 1.10 Background Summary, second Paragraph, second Sentence. "Therefore, this EIS is being developed for the purpose…whether or not to issue incidental take permits." This statement appears to conflict with the statement made on Page S – 15 and Page 2-32. The EIS purpose includes amendment of FERC licenses. For a further description of our concerns please see comment no. 1.*

Response 12 See response to DCPUD Comment #1.

Comment 13 *Page 2-14, Wells Dam, second column of text, last sentence of text in the first partial paragraph. We take issue with the following statement: "Therefore, the total direct and indirect mortality is likely similar to the 2 percent found at the Lower Snake River project bypass systems (NMFS 1998)." We disagree. The Wells bypass system is not similar to the Snake River screen bypass systems. The Wells system performance is superior to those found at the Lower Snake River projects. Survival assigned to this passage route should be similar to the estimated survival assigned to spillway passage routes.*

In contrast, the Snake River screen bypass systems utilize extensive turbine intake screens, small gatewell orifice passages, collection channel dewatering, dewatering in transport pipes, handling and delay in sampling facilities, and reintroduction back into the tailraces through low volume pipes located immediately adjacent to predator-plagued shorelines.

The Wells surface collection system does not utilize massive intake screens, orifice passageways, transportation pipes, handling facilities and low water tailrace discharges. The Wells surface collector guides fish away from the turbines and into the spillways where five high volume non-turbine passage routes are provided through the dam. Fish are introduced back into the tailrace turbine discharge where velocities are sufficiently high to prevent predator accumulation and where gull wires protect fish from avian predators.

We suggest using a combined estimate of direct and indirect mortality that ranges from 0 percent to 1 percent for the Wells surface bypass system.

Response 13 Because the Wells bypass system consists of a modified spillway design, NMFS believes that direct and indirect mortality rates through this route of passage are most likely to range between 1 and 2 percent (2 percent being the most conservative). The FEIS has been revised accordingly. See NMFS responses to DEIS public comments, Appendix C, Response #36 for additional discussion.

Comment 14 *Page 2-17, 2.2.3.2 Adult Passage, second full paragraph, first sentence. Please modify the following statement: "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River has not been estimated due to insufficient radio-telemetry data." to "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River have not been estimated due to an inability to differentiate tag loss, tag failure and fish loss." It is not presently possible to estimate adult survival in a statistically defensible manner with the present radio-telemetry technology.*

Response 14 The FEIS was modified to reflect the comment, as well as other comments in the DEIS.

Comment 15 *Page 2-23, Measures Planned, fourth Line. Please replace "negotiations" with "agreements."*

Response 15 The FEIS was modified as suggested.

Comment 16 *Page 2-23, Measures Planned. 1. Adult Passage.*

c. The Wells Settlement Agreement does not contain language that obligates the District to conduct modeling in the adult fishways.

e. The Wells Settlement Agreement does not include conditions to continuously operate the juvenile surface bypass system from April through August for adult fallback and adult downstream passage.

Response 16 At this time, NMFS agrees that because FERC never acted upon the Wells biological opinion (which expired in April of 2002), the Wells Settlement Agreement is the controlling document for the purpose of analyzing the no-action alternative (Alternative 1). The FEIS was modified accordingly. See NMFS responses to DEIS public comments, Appendix C, Response #50.

Comment 17 *Page 2-23, Measures Planned. 2. Juvenile Passage. a. The Wells Settlement Agreement does not contain requirements to operate the turbines at peak efficiency ratings.*

Response 17 We agree (see response to DCPUD Comment #16 above), and the FEIS was modified accordingly.

Comment 18 *Page 2-23 and 2-24, Measures Planned. 2. Juvenile Passage. b. Surface Bypass Operation – Please modify the following statement: "Operate at least one spillway bypass, 24-hours per day, throughout the juvenile downstream migration periods" to "Operate at least one spillway bypass, 24-hours per day, throughout 80 percent and 70 percent of the peak spring and peak summer juvenile downstream migration, respectively…"*

Response 18 We agree that the Wells Settlement Agreement requires Douglas County PUD to operate the bypass system 24 hours per day during 80 percent of the spring and 80 percent of the summer migration (see response to DCPUD Comment #16 above), and the FEIS was modified accordingly.

Comment 19 *Page 2-24, Measures Planned. 2. Juvenile Passage. c. Predators and d. Gas Abatement. Neither of these actions is outlined in the Wells Settlement Agreement. Please remove the statements from the EIS.*

Response 19 We agree (see response to DCPUD Comment #16 above), and the FEIS was modified accordingly.

Comment 20 *Page 2-25, 2.3.1.2 Rocky Reach Hydroelectric Project. Analogous sections are missing under Rocky Reach and Rock Island project descriptions that are present under the Wells Project description. Please add the following Section designations to the Rocky Reach and Rock Island project descriptions to allow a more rigorous comparison of actions proposed at different projects: Adult Fish Passage, Juvenile Fish Passage, Hatchery Based Compensation, and Monitoring and Evaluation.*

Response 20 These sections have been added to the FEIS as requested.

Comment 21 *Page 2-28, second full paragraph, fifth Line. The QAR analysis findings that, "even the removal of the Mid-Columbia River dams would not be sufficient to recover these species, if recent total life history survival rates continue," should be expressed in the Summary on Page S-16, S.5.3.2 HCP Baseline Conditions.*

Response 21 The summary section is developed by cutting and pasting information directly from Chapters 1 and 2 of the FEIS to maintain consistency. Detailed discussions concerning the QAR are in Chapter 5 of the FEIS and are not discussed in detail in Chapters 1 and 2.

Comment 22 *Page 2-29, 2.3.2.1 Wells Hydroelectric Project. 3. Hatchery Program – It is important to point out that under Alternative 1, 2 and 3, Douglas County PUD has the ability to reduce hatchery production (including summer and spring chinook, steelhead, and sockeye) based upon the results of survival studies. Also, under Alternative 2 and 3, NMFS has the authority to reduce or modify hatchery production of listed and non-listed species to remain consistent with their long-term recovery strategies for listed Upper Columbia River spring-run chinook and summer-run steelhead.*

Response 22 We agree that under Alternative 1, Douglas County PUD has the ability to reduce hatchery production based upon the results of juvenile survival studies. Hatchery production under Alternative 2 of the FEIS contemplates hatchery production levels similar to those defined in Alternative 1, except that hatchery production of all species may be modified or reduced to levels consistent with long-term recovery strategies for listed species. The same is true under Alternative 3, except that the revised HCP proposes to not change hatchery production levels until at least 2013. NMFS may require program modifications or reductions in 2013 and every 10 years thereafter.

Comment 23 *Page 2.35, 2.3.3.5 HCP Performance Standards, third full paragraph, last sentence. "In addition, the 91 percent survival standard also includes reservoir survival and the dam passage survival of returning adults." This statement is inaccurate as presented. The HCP was set up to measure 91 percent juvenile project passage survival. The 91 percent juvenile number was derived by assuming loss of adults (2 percent), assuming loss through the reservoir (2 percent) in addition to the 5 percent allowed loss at the dam. Further assumptions related to the 91 percent determination included an assumed 2 percent delayed mortality from hydro passage and a 2 percent credit for natural river fish loss.*

The agreement reached on the HCP does not include measurement of adult survival at a 95 percent CI +/- 5 percent. This is evident from the adult language in the implementation agreement, the timeline for completion of the Phase I studies (5 years) and based upon the knowledge that precise adult survival studies were not statistically or scientifically defensible at the time the Implementation Agreement was negotiated. The PUDs did not sign up to ensure adult survival from tailrace to tailrace at a rate of 98 percent irrespective of natural mortality.

It is important to point out that during the negotiations of the HCP, a 2 percent adult mortality figure was discussed. However, the final HCP Implementation Agreement was approved without referencing the measurement of the 2 percent adult mortality figure. The final agreement says "…and a net of 4 percent mortality from all other project effects (including but not limited to reservoir, juvenile delay, and adult mortality with credit for natural mortality)." Please remove all discussion that indicates the HCP has a 2 percent measurable adult mortality component.

Response 23 This language is no longer applicable due to changes in the revised HCPs. See NMFS responses to DEIS public comments, Appendix C, Responses #14 and #58.

Comment 24 *Page 2-41, Verification of Standards. We agree with the statements in the first and second paragraphs of this section related to the verification of standards.*

Response 24 Comment noted, although changes in the revised HCPs invalidate some of these statements.

Comment 25 *Page 2-56, Table 2-8 Environmental Comparison of the Alternatives (Pages 1 of 8). Please modify this table per similar concerns expressed in comment no. 7, 8 and 9. The DEIS is intended to compare actions related to the implementation of three environmental alternatives for*

fish mitigation at three FERC licensed projects (no-action, S. 7 and HCP). Descriptions of actions outside those proposed by the PUDs (agency-funded habitat enhancement actions) should be removed from the document.

Response 25 Agency-funded habitat enhancement projects are likely to occur in tributaries that will positively benefit Plan species under all three alternatives evaluated in the FEIS. The expected effects of these projects are discussed in the cumulative effects section (Chapter 5) of the FEIS and summarized in Table 2-8. Also, see responses to DCPUD Comments #7, #8, and #9.

Comment 26 *Page 2-56, Table 2-8 Environmental Comparison of the Alternatives (Pages 1 of 8), juvenile migration/survival standards. Please change, "project specific standards" under Alt. 1 to "Project specific fish passage standards."*

Response 26 Text was added to the FEIS to reflect the comment.

Comment 27 *Page 2-59, Table 2-8 Environmental Comparison of the Alternatives (Pages 4 of 8), Drawdown, Alt. 2. It should be mentioned that drawdown under Alternative 2 could only be considered during relicensing of the projects.*

Response 27 Text was added to the FEIS to reflect the comment. NMFS could also petition FERC to reopen the licenses and seek drawdown through a reopener proceeding. See NMFS responses to DEIS public comments, Appendix C, Response #24.

Comment 28 *Page 3-10, Figure 3-4 Geology of the Rock Island Dam Area. There are two identical categories for Grande Ronde Basalt. What is the difference between N2 and R2 Units? In the figure, there is no discernable difference between the two geological formations.*

Response 28 The figure was modified in the FEIS.

Comment 29 *Page 3-28, Steelhead, Line 2. Please modify the following statement: "Rock Island Dam averaged 2,600 to 3,700 fish" to "Rock Island Dam ranged from 2,600 to 3,700 fish." The same comment applies to Line 4 of this same paragraph.*

Response 29 Text was changed in the FEIS as requested.

Comment 30 *Page 3-28, Sockeye Salmon. Please standardize the years being compared to 10-year intervals. As presented, the intervals appear to be contrived to show a recent decline in numbers of sockeye passing Rock Island Dam.*

Response 30 Text was modified in the FEIS to reflect the comment.

Comment 31 *Page 3-29, Coho Salmon, Last sentence. This section should also note the release of millions of coho by Chelan County PUD at the Turtle Rock Hatchery. This facility continued to release coho through the mid-1980's.*

Note that coho ladder counts at Rock Island totaled only 475 fish between 1933 and 1943 (Mullan, 1983; Mullan et al., 1992). That is an average of less than 48 fish per year. The statement: "After completion of Priest Rapids Dam in 1960, peak escapement estimates probably never exceeded 10,000 fish" is misleading. The statement should be modified to indicate that few coho existed prior to the completion of Grand Coulee and Rock Island dams. The statement subtly implies a cause and effect relationship between the completion of Priest Rapids Dam and

the demise of the coho run. The Upper Columbia River coho salmon run had already been wiped out prior to construction of any mainstem Columbia River dams as is evident from fishway counts immediately following the completion of Rock Island Dam.

Response 31 Text was added to the FEIS to reflect the comment.

Comment 32 *Page 3-29, Table 3-1 Spawning Distribution of Anadromous Fish Species in the Mid-Columbia River Watersheds. Fulton (1968) appears to incompletely describe salmon and steelhead spawning in the Mid-Columbia Region. Please modify Table 3-1 to include the distribution of fish described below.*

Fall Chinook - Please add the Columbia and Methow Rivers to the watersheds utilized extensively by Fall Chinook.

Steelhead - Please add the Twisp and Chewuch Rivers and Libby Creek as being important Methow River tributaries for spawning steelhead. It should be noted that Salmon and Omak Creeks are not presently important steelhead habitats. "Simikameen" is spelled "Similkameen." Also note, steelhead do not have access to the Upper Similkameen River. Instead they only have access to the Lower Similkameen River. Enloe Falls blocks steelhead access to the Upper Similkameen River.

Sockeye – Extensive spawning ground surveys for sockeye have not resulted in documented sockeye spawning in the mainstem Okanogan River. Please remove the reference to the Mainstem Okanogan River as a tributary of the Okanogan River used by spawning sockeye. Please modify the sentence to state that the Osoyoos Lake sockeye population is almost entirely spawned in the Okanogan River, upstream of Osoyoos Lake.

Response 32 The title of the table in the FEIS was changed to indicate primary spawning areas. As such, we have no indication that the Methow River is a primary spawning area for fall chinook salmon. Radio-telemetry analyses (LGL 2001) indicate that less than 5 percent (2 of 44 fish) of the fall chinook salmon that passed Wells Dam were last detected in the Methow River. However, the mainstem Okanogan and the Similkameen Rivers were added for fall chinook salmon. The suggested changes were made for steelhead, although reference to the Salmon and Omak Rivers was deleted rather than modified. The sockeye salmon section was also modified, although the original text was meant to indicate that the primary spawning areas were upstream of Osoyoos Lake, in the Okanogan River and tributaries.

Comment 33 *Page 3-30, 3.2.3 Tributary and Mainstem Development, end of first Paragraph. The last statement in this paragraph is not entirely accurate. Hydroelectric facilities on the Cowlitz, Lewis and Willamette Rivers do not all contain adult fish passage facilities. Some transport fish by truck upstream of the projects and others are migrational blocks to migrating adult salmon and steelhead. Please modify the statement to read: "All mainstem Columbia and Snake river dams downstream of these projects are equipped with facilities to allow …"*

Response 33 Text was modified in the FEIS as suggested, to clarify the original intent of the statement.

Comment 34 *Page 3.2.4 Hatchery Programs, Page 3-31, First line on page 3-31. Please modify the percent of summer-run chinook salmon that are of hatchery origin in the Mid-Columbia River. 80 percent hatchery composition for this stock is not accurate. The following table indicates the best estimate of hatchery contribution for the watersheds covered by this EIS (Table 1). The hatchery contribution of fall chinook is also closer to 20-30 percent and not 50 percent.*

Table 1: Escapement to the Wenatchee, Methow and Okanogan Rivers of hatchery origin summer chinook (Table adapted from Murdoch and Petersen, 2000).

Return Year	*Wenatchee*	*Methow*	*Okanogan*
1991	*2.4*	*0.0*	*0.0*
1992	*1.5*	*0.0*	*3.5*
1993	*5.0*	*24.0*	*36.1*
1994	*12.0*	*45.0*	*48.7*
1995	*9.2*	*36.9*	*54.6*
1996	*4.9*	*15.8*	*59.3*
1997	*8.5*	*9.2*	*54.3*
1998	*10.7*	*22.2*	*29.9*

Murdoch, A. and K. Petersen. 2000. Survival of sockeye, spring chinook, and summer chinook salmon released from Rock Island Fish Hatchery Complex Facilities, 1989 through 1995 broods. Prepared for Public Utility District no. 1 of Chelan County. Washington Department of Fish and Wildlife, 600 Capitol Way N., Olympia, Washington 98501-1091.

Response 34 The original DEIS text was referring to the entire Columbia River Basin, not just the Mid-Columbia region. However, the requested information has been added to the FEIS to clarify the issue.

Comment 35 *Page 3-31, 3.2.4.2 Hatchery Compensation for Mid-Columbia Tributary Losses. There is no plan in place to compensate for Mid-Columbia Tributary Losses. Please replace, "Tributary Losses" with "Mainstem Passage Losses."*

Response 35 Text was changed in the FEIS as requested.

Comment 36 *Page 3-37, Rocky Reach, second Paragraph in section, last Line. There was no sockeye salmon passage study at Rocky Reach in 1993. The 1993 study was a chinook study. There was a sockeye passage study at Wells Dam in 1992. However, this study did not include any monitoring at Rocky Reach Dam. The 14 percent fallback estimate was derived from the 1997 sockeye monitoring effort only (English et al., 1998).*

Response 36 The between years comparison was intended to be for summer-run chinook salmon. Text was edited in the FEIS to clarify the findings.

Comment 37 *Page 3-38, Rock Island Dam, second Paragraph, first Line. There was no sockeye study at Rock Island Dam in 1993.*

Response 37 Text was changed in the FEIS to refer to the 1997 study.

Comment 38 *Page 3-42, 3.2.6.3 Juvenile Bypass Systems, <u>Wells Dam</u>, second Paragraph, last Sentence. We disagree with the assertion that the Wells bypass system likely has indirect mortality similar to the diversion screen bypass systems located at the Snake River projects. See DCPUD comment no. 13 for the rationale for not comparing the Wells Bypass system to the Snake River bypass systems.*

The Wells bypass system is a highly efficient <u>spill</u> bypass system. Indirect mortality resulting from passage through this system should be compared with indirect mortality estimates derived from spillway survival studies.

Response 38 See response to DCPUD Comment #13.

Comment 39 *Page 3-46, Rocky Reach, second Paragraph, last Sentence. The yearling fall-run chinook survival studies cited in this paragraph were conducted in 1998 not 1999. Also, the results from the Eppard et al. (1999) study were not accurately cited. Eppard et al. (1999) provides two estimates of Rocky Reach survival from yearling chinook release in 1998. Table 10, Page 38 of the report states Rocky Reach project survival, depending upon the model selected, as (0.867, $s\hat{E} = 0.065$) based upon the parallel SR Model and (0.859, $s\hat{E} = 0.042$) based upon the PR model.*

Response 39 Text was added to the FEIS to reflect the comment.

Comment 40 *Page 3-65, Icicle Creek. The 19 miles of historical habitat is disputed by USFWS personnel stationed in Leavenworth. Radio-telemetry studies conducted in 2000 by the USFWS indicated that a natural obstruction in the river restricted fish access into the upper watershed. The obstruction is located within the first 3 miles of river upstream of the existing barrier dam.*

Response 40 Text was added to the FEIS to reflect the comment.

Comment 41 *Page 3-72, Summer/Fall-Run Chinook Salmon, first Paragraph, eighth Line. We suggest the following modification to the defined spawning distribution of summer chinook in the Methow River. Summer chinook have been observed spawning downstream of French Creek near the mouth of the Methow River immediately upstream of the town of Pateros. This expands the spawning distribution from 38 to 42 miles of habitat.*

Response 41 Text was modified in the FEIS to reflect the comment.

Comment 42 *Page 3-72, Steelhead, ninth Line. Please modify the following statement, "Spawning occurs primarily in late March, but may extend into July." to "Spawning is initiated as early as late March and can extend into July." Based upon surveys conducted in 1999, peak steelhead spawning appears to be taking place in late April rather than late March.*

Response 42 Text was modified in the FEIS to reflect the comment.

Comment 43 *Page 3-74, Top of page, first partial Paragraph, last Sentence. The abandonment of planting catchable rainbow was intended to reduce incidental harvest on steelhead smolts although it likely also protects a lesser number of chinook salmon smolts. Please add steelhead smolts to the list of species whose incidental harvest has been reduced by the cessation of planting catchable rainbow trout.*

Response 43 Text was modified in the FEIS to reflect the comment.

Comment 44 *Page 3-74, Riparian and Stream Channel Condition, forth Paragraph, second sentence. Please modify the second sentence to state, "Ironically, the areas most susceptible to dewatering by low flow events are often the areas containing the highest…"*

Response 44 Text was modified in the FEIS to reflect the comment.

Comment 45 *Page 3-76, Fish Resources, line seven. Observations of bull trout in the Okanogan Watershed have been limited in recent history. We suggest removing bull trout as an "important" fish resource in the Okanogan Basin. This suggested change is consistent with surveys conducted by*

the USFS, Okanogan National Forest and conclusions reached in Washington State, Limiting Factors Analysis for the Okanogan River Watershed.

Response 45 Text was modified in the FEIS to reflect the comment.

Comment 46 *Page 3-77, Habitat Condition, first Paragraph, last Sentence. Please change, "The Wells Dam pool inundates the lower 17 miles of the Okanogan River." to "The Wells Project boundary includes the lower 17 miles of the Okanogan River."*

During normal operation, the Wells Project does not inundate the entire 17 miles of the Lower Okanogan River. The Wells Project boundary was drawn to encompass possible inundated lands during a worst-case scenario flood event. In effect Douglas County PUD has the right to inundate the lower 17 miles of the Okanogan River only during times when the Columbia and Okanogan Rivers experience a simultaneous 100-year flood event that for some reason might not be mitigated through storage at Grand Coulee and the Canadian Treaty Storage Projects.

Response 46 Text was modified in the FEIS to reflect the comment.

Comment 47 *3.3.1.1 Project Area, Page 3-83, Wells Dam, Rocky Reach and Rock Island Dam. Please standardize the months that average flows are compared between projects. We would recommend using June and September rather than using a mixture of months. Also note that average September flows referenced for Wells Dam (114,791 cfs) is much higher than the average September flows cited at Rock Island Dam (74,478 cfs). Given that Rock Island Dam is downstream of Wells Dam and that the Chelan, Entiat and Wenatchee Rivers all enter the Columbia River between Wells and Rock Island Dam, these averages appear to be incorrect. Average September flows at Wells Dam should be slightly less than the average September flows at Rock Island Dam.*

Response 47 Text was modified in the FEIS to reflect the comment.

Comment 48 *Page 3-84, Figure 3-5, Average Monthly Flows (cfs) in the Mid-Columbia River at Wells Dam. Average September flows at Wells Dam appear to be less than 80,000 cfs.*

Response 48 Text was modified in the FEIS to reflect the comment.

Comment 49 *Page 3-85 & Page 3-83, Figure 3-6, Average Monthly Flows (cfs) in the Mid-Columbia River at Rocky Reach Dam. According to the Figure, average June flows at Rocky Reach are in excess of 150,000 cfs not 136,147 cfs as cited on page 3-83.*

Response 49 Text was modified in the FEIS to reflect the comment.

Comment 50 *Page 3-87, Wenatchee River, first Paragraph, line 6. The Wenatchee River watershed drains 1,328 square miles not 1.328 square miles.*

Response 50 Text was modified in the FEIS to reflect the comment.

Comment 51 *Page 3-89, Entiat River, second Paragraph, line five. The maximum and minimum average monthly flows for the Entiat River are incorrect. Both numbers presented in the report do not match with USGS information and are highly unlikely given that the reported numbers exceed those of the Wenatchee and Methow Rivers.*

Please see Figure 3-9. The average monthly flows from this figure indicate that the Entiat River in June averages less than 1,800 cfs and in September averages less than 200 cfs. Please reconcile the text and Figure 3-9.

Response 51 Text and figures were modified in the FEIS to reflect the comment.

Comment 52 *Page 3-87, 3-89 & 3-91. Please standardize the average monthly flows being reported for the various tributary streams.*

Response 52 Text was modified in the FEIS to reflect the comment.

Comment 53 *Page 3-91, Okanogan River, second Paragraph, last Sentence. See DCPUD comment no. 46*

Response 53 Text deleted in the FEIS.

Comment 54 *Page 3-97, Wells Dam, first and second Paragraph. The temperature excursion cited at the Columbia River at the Wells Hatchery intake is in error. The water temperatures reported here were not collected at the hatchery intake but were collected from the hatchery spawning channel after water had been held in shallow ponds immediately downstream of the intake of the facility. Also, the readings were not collected from a systematic, calibrated subsurface monitor but were instead collected with a non-calibrated, hand-held thermometer, sporadically used to collect relative water temperatures by fish culture staff stationed at the Wells Fish Hatchery.*

Note that the mainstem Columbia River water quality data collected immediately downstream of Wells Dam (Chelan Falls) does not show water temperate excursions above the criteria established for state waters.

Response 54 The text in the FEIS was revised. See NMFS responses to DEIS public comments, Appendix C, Response #1 for a discussion of the influence of dams on water temperature.

Comment 55 *Page 4-1, 4.1.1.2 Associated Tributaries, first, second and third Paragraphs, (Alt. 1). This entire section should be deleted and re-written with emphasis on contrasting the three proposed environmental alternatives. Describing additional actions outside the three alternatives that may be funded regardless of the outcome of the HCP only confuses readers. This comment is similar to DCPUD comments no. 7, 8 and 9 (above).*

We suggest changing this section to describe the fact that under the No-Action alternative, no PUD tributary enhancement funds would be available. The agencies are free to spend money on habitat improvements common to all three alternatives so this entire section (4.1.1.2) provides no information related to the decision to select one of the three proposed alternatives.

This comment also applies to Page 4-3, 4.1.2.2 Associated Tributaries.

Response 55 See response to DCPUD Comments #7, #8 and #9 (above).

Comment 56 *Page 4-6, second full Paragraph, second Line. It is important to point out that drawdown is not an option under the no-action alternative (Alternative 1). It could be an option that is discussed through relicensing of the projects (Alternative 2) or by unanimous consent of the HCP signature parties under Alternative 3.*

Response 56 Drawdown is considered an option under Alternatives 2 and 3 because it could occur at relicensing. Text was modified in the FEIS to reflect this comment. See NMFS responses to DEIS public comments, Appendix C, Response #24.

Comment 57 *Page 4-17, Wells Dam, second bullet. Under Alternative 1, the District is not obligated in the Wells Settlement Agreement to operate the bypass system 24-hours per day during the period that encompasses 95 percent of the downstream migration.*

Response 57 Text was modified in the FEIS to reflect the comment (see response to DCPUD Comment #16 above).

Comment 58 *Off-Site Mitigation, Page 4-43, first Paragraph. Please add that the proposed Douglas HCP has a provision that if juvenile project survival is greater than 95 percent, the tributary funding package would be reduced from 2 percent to 1 percent. This comment also applies to the section titled: Tributary Habitat Improvements found on Page 4-43.*

Response 58 The comment no longer pertains to the revised HCP. The FEIS was modified to reflect the current HCP language. See NMFS responses to DEIS public comments, Appendix C, Response #14.

Comment 59 *Page 4-65. Please modify "4.9.2.1 Project Are" to "4.9.2.1 Project Area."*

Response 59 Text was corrected in the FEIS.

NMFS Responses to Chelan County PUD (CCPUD) Comments

Specific Comments

Comment 1 *Page S-15, 2-32, Alternative 3 (Applicants' Proposed Action – Project HCPs), 2nd paragraph. The text states that "the EIS required for implementing measures in the HCPs …" An EIS may not be needed in order to implement measures in the HCPs. In most cased an environmental checklist or an environmental assessment will be sufficient.*

Response 1 The FEIS text was changed to "NEPA compliance" instead of EIS. See NMFS responses to DEIS public comments, Appendix C, Response #19.

Comment 2 *Page S-15, 2-32, Alternative 3 (Applicants' Proposed Action – Project HCPs), 2nd paragraph. The text states that "implementing measures in the HCP would be undertaking by FERC with a separate Section 7 consultation with NMFS". It is the District's understanding that the HCPs will be presented to FERC with a request that they be incorporated into the project licenses. FERC's action many not require a new Section 7 consultation with NMFS and USFWS.*

Response 2 Consultation is required for all Federal actions. NMFS must consult with itself to ensure that its decision to issue an incidental take permit will not jeopardize the continued existence of the listed species. The amendment of existing licenses by FERC is a separate action from NMFS issuing a permit. Although the EIS is intended to satisfy NEPA compliance requirements for both actions, FERC must consult with NMFS and USFWS (the Services) concerning their action. Depending on the outcome of that consultation, FERC might need additional NEPA compliance documentation. See NMFS responses to DEIS public comments, Appendix C, Response #19.

Comment 3 *Page S-18, 2-35, last sentence before the start of Section S.5.3.6 and Section 2.3.3.6. The sentence reads "…to achieve 95 percent juvenile dam passage survival and 91 percent project survival." Replace the "and" between "juvenile dam passage" and "project survival rates" with an "or". While the word "and" is used in the HCPs, its use was an error. An errata sheet will be prepared for the final HCP on this issue. The intent of the parties was to require the measurement of 95 percent juvenile dam passage survival starting in 2003 as a default. However, the parties desired to leave the coordinating committee the discretion to forgo measurement of 95 percent juvenile dam passage survival and just measure the juvenile component of 91 percent project survival in 2003. There is not an obligation to measure 91 percent project survival in 2003. The coordinating committee will measure 91 percent project survival when a protocol can be developed.*

Response 3 Text was changed in the FEIS to reflect the comment. However, some of the language suggested in the comment is no longer relevant as a result of changes in the revised HCPs.

Comment 4 *Page S-23, 2.3.3.11, Project Cumulative Effects. This text attempts to summarize Section V "Reservoir As Habitat" of the HCPs. However, the summary omits an important concept. The District agrees to consider cumulative impacts as part of its land use decision making.*

Response 4 NMFS concurs that the PUDs agree to consider cumulative impacts as part of their land use decision making. This change has been included in Section 5.1 of the Wells HCP and Section 6.1 of the Rocky Reach and Rock Island HCPs, as well as in Section 2.3.4.11, Project Cumulative Effects of the FEIS.

Comment 5 *Page S-24, 2-41, "Term of the HCPs", first paragraph, first sentence. The text states that "the 50-year term of the HCPs would not begin until the incidental take permits are issued." While correct, this sentence is a bit misleading. The 50 year term of the HCPs starts when the "Agreement is executed by all Parties and regulatory approvals are received…" HCP, Section I "Term of Agreement". Issuance of the requested incidental take permit from NMFS is only one of the regulatory approvals that must be received in order for the HCPs to become effective.*

Response 5 This section was deleted from the FEIS. Also see NMFS responses to DEIS public comments, Appendix C, Response #49.

Comment 6 *Page S-24, 2-41, "Transition Period" mischaracterizes the current HCP activities. The PUDs are not conditionally implementing the HCPs. The PUDs have volunteered to perform activities that are consistent with the HCPs as a sign of good faith. The District is also implementing measures because even though the HCP is not in effect the 2003 deadline is approaching.*

Response 6 This section was deleted from the FEIS. See response to CCPUD Comment #7.

Comment 7 *Page S-24, 2-41, "Transition Period" mischaracterizes the interim protection plans. In 1997, with the full support of the NMFS and the USFWS, the PUDs voluntarily filed interim protection plans with the Federal Energy Regulatory Commission. The interim protection plans identified various portions of the HCPs that the District, NMFS and USFWS felt were worthwhile to implement in advance of completing the HCP negotiations. Measures were picked to assist the migration of newly listed Upper Columbia River steelhead. The interim protection plans proposed only a two year plan because the HCPs were expected to be in place within two years. The interim protection plans were informally expanded to include Upper Columbia spring-run chinook salmon upon their listing. The PUDs requested that FERC approve the measures contained in the interim protection plans. FERC initiated consultation with NMFS over this proposed action. The consultation has yet to be completed, and FERC has yet to take action on the plans. Due to the time taken to complete this consultation, the interim protection plans have expired.*

Response 7 Section 2.1 of the NMFS Biological Opinion on the Rocky Reach Juvenile Bypass System (dated March 11, 2002) provides a history of the interim protection plans. Although Chelan County PUD disagrees with a statement contained in the history indicating that Brian Brown's letter to Steve Hays (dated April 4, 2002) documented an agreement.

Comment 8 *Page S-26, 2-43, "Compensation for Unavoidable Project Mortality", first two sentences. The meaning of the first two sentences is not clear. The District has not modified any portion of the incidental take permit applications that were filed with NMFS.*

Response 8 This text is correct when referring to the negotiations leading up to the revised HCPs.

Comment 9 *Page S-26, 2-43, "Hatchery Compensation Plan Issue" and Page 1-12 Section 1.5.2.6 "Federal Trust Responsibilities to Indian Tribes" overstates the issue in dispute. The HCP requires that 7 percent of the "unavoidable project mortality" associated with each project be mitigated through hatchery supplementation. HCP Section III.1. The HCP goes on to define the initial hatchery production commitment (HCP Sections VIII.3. and 4). NMFS is in a position to evaluate the effects of the initial hatchery production commitment. However, hatchery production will vary over time depending upon the size of the runs. NMFS has been unwilling to opine that the hatchery program will always satisfy the Endangered Species Act. Since NMFS has been unwilling to define the hatchery levels that will satisfy the Endangered Species Act it is not*

possible to predict how the hatcheries will be utilized during the term of the HCPs. Hatchery production is a key incentive for the tribes' participation in and support of the HCPs as a comprehensive settlement. Without knowing how the hatcheries will be utilized during the term of the HCPs the tribes cannot effectively evaluate the benefits of the HCPs. As a result of this uncertainty the tribes are not supporting the HCPs.

Response 9 The FEIS text was modified to reflect the components of the revised HCPs and the agreed-upon solution to the dispute.

Comment 10 *Page S-29, 2-50, "Endangered Species Act Compliance." It is unknown whether the project's current licenses comply with the Endangered Species Act since they were issued prior to the adoption of the Endangered Species Act. Also, assuming the project licenses do not comply with the Endangered Species Act, under Alternative 1 the District could obtain incidental take permits addressing only listed species.*

Response 10 The statement is meant to indicate that there would be no future provisions under Alternative 1 to address the Endangered Species Act, and not that there is no compliance. Additionally, Alternative 1 has been changed to include the Rocky Reach biological opinion as existing conditions.

Comment 11 *Page S-30, 2-51, "Future Provisions for Other Aquatic Species". The table should acknowledge for all three alternatives that the District could submit incidental take permits under Section 10 of the Endangered Species Act as a means of addressing the Endangered Species Act.*

Response 11 NMFS concurs that, for non-Plan species listed (either currently or in the future) under the Endangered Species Act, the PUDs could, under any of the three alternatives, apply for incidental take permits under Section 10 of the Endangered Species Act as a means of addressing their effects on these listed species. This addition has been incorporated into the corresponding sections of the FEIS. See response to CCPUD Comment #10.

Comment 12 *Page S-31, 2-52, "Dispute Resolution." The table incorrectly includes "binding arbitration" as a means for resolving disputes. The text on Page S.17 paragraph 2 does a better job of explaining the HCP's dispute resolution process; but, does omit two of the exceptions to utilizing dispute resolution. See discussion above under "The Agreements" for more thorough overview of the HCP's dispute resolution process.*

Response 12 This comment is no longer relevant due to substantial changes in the dispute resolution process in the revised HCPs. See NMFS responses to DEIS public comments, Appendix C, Response #21.

Comment 13 *Page S-33, 2-53, Section S.7.2.3 "Alternative 3", first full paragraph, second sentence. The text reads that in part "there is no requirement to provide the benefit of the doubt to the species of concern with respect to gaps in the information base and NMFS has no authority to determine what constitutes the best available information to be utilized in support of any decisions." This sentence infers that the HCP dispute resolution process may not comply with law. Such an inference is not correct. In the HCP, NMFS has expressly reserved its authority to monitor, modify, suspend, revoke and re-instate, and enforce its incidental take permit outside the HCP dispute resolution process. HCP Section X.3-5, and Section XI.1.b. Furthermore, the dispute resolution process will not produce a result that is binding upon NMFS unless NMFS agrees. HCP Section XI.5.c. The dispute resolution process is mediation with a twist. The twist is that the mediator will issue a decision that can be entered into evidence in a later proceeding. HCP Section XI. 5.c. The reason for the decision is to facilitate settlement. No one knows what, if any,*

weight will be afforded the decision. Also, the parties' intent is that once the decision is rendered parties will not feel the need to proceed further. NMFS like any other agency has the authority to enter into dispute resolution processes. 5 USC Section 572(a), and 575(a)(1). Since a party may pursue any remedy available after exhausting dispute resolution it is in full compliance with the law. HCP Section XI. 3.c.

Response 13 This comment is no longer relevant due to substantial changes in the dispute resolution process in the revised HCPs.

Comment 14 *Page S-35, 1-31, Section S.8 "Decision to be Made", second to last paragraph, first sentence. The text states that "NMFS will prepare a biological opinion to determine if the implementation of the HCPs is likely to jeopardize the continued existence of listed species that are likely to occur in the Plan area. …" The text goes on to discuss issues NMFS will analyze in the biological opinion, and explains actions NMFS may take based upon the results of the biological opinion. The process NMFS describes in the DEIS for evaluating the incidental take permit applications filed by the District are not consistent with Section 10 of the Endangered Species Act. Section 10(a)(2) of the Endangered Species Act defines the process NMFS must follow to evaluate an incidental take permit application. 16 U.S.C. Section 1539(a)(2). This process does not require NMFS to consult with itself under Section 7 of the Endangered Species Act. Section 10 defines the complete process NMFS must follow to evaluate an incidental take permit application.*

Response 14 The Habitat Conservation Planning and Incidental Take Permit Processing Handbook 3.B.2.e (USFWS 1996) specifically states that, "In the case of issuance of a Section 10(a)(1)(B) permit, USFWS or NMFS must conduct an intra-Service (or internal) consultation to ensure compliance of permit issuance with the provisions of Section 7." It goes on to state in Section 3.B.4. that, "Although the provisions of Section 7 and Section 10 are similar, Section 7 and its regulations introduce several considerations into the HCP process that are not explicitly required by Section 10—specifically, indirect effects, effects on federally listed plants, and effects on critical habitat."

Comment 15 *Page S-35, 1-31, Section S.8 "Decision to be Made", second to last paragraph, first sentence. The text states that "if the NMFS' biological opinion finds that the proposed actions are not likely to jeopardize the continued existence of the listed species …, the permits can be approved." While true, NMFS must also make the findings required by Section 10 of the Endangered Species Act in order to issue the requested incidental take permits.*

Response 15 Text was deleted in the FEIS.

Comment 16 *Page S-41, 2-61, "Land Use, Project Area, Alternative 3". The text does not correctly reflect the HCPs. In the HCPs the PUDs will consider cumulative effects of land use decisions, provide the signatories to the HCPs with opportunity to provide comments on permitting decisions, and notify permit applicants that their proposed use or occupancy of may result in incidental take of listed species and require authorization of NMFS or USFWS. HCP Section V "Reservoir as Habitat".*

Response 16 Text was modified in the FEIS to reflect the comment.

Comment 17 *Page S-42, 2-63, "Economics, Project Area"; also, Page 4-61 Section 4.7 "Socioeconomic". Why is there no analysis of how spill and the other measures in each alternative reduce the generating capacity and energy generated from the projects? This is a very significant effect of all the alternatives given the energy emergencies facing the Western United States, the Northwest, and Chelan County. Reduced generating capacity and reduced energy output have a direct effect on the ability of the projects to meet peak load demands for the District's own loads,*

and to prevent or minimize energy emergencies in the Northwest and Western United States. The failure of the projects to meet peak load demands for the District's own loads exposes the District's loads to the extreme costs of energy in the Northwest and the West, and also to the risk that energy will not be available at any price. These issues vary dramatically between the three alternatives reviewed in the DEIS.

Response 17 Refer to the new Economics sections in Chapters 3 and 4 of the FEIS, Sections 3.8 and 4.8.

Comment 18 *Page 1-1, Key Terms, "No Surprises Policy". The District understands that the term "No Surprises policy" refers to the rules set forth in 50 CFR Section 222.303(g).*

Response 18 Text was modified in the FEIS to reflect the comment.

Comment 19 *Page 1-4, Section 1.5, "Regulatory Framework", third sentence. What does "other Federal laws and regulations" mean?*

Response 19 Although other Federal laws and regulations may require disclosure of the DEIS to the public, NEPA defines the public distribution and comment procedures. Therefore, the reference to "other Federal laws and regulations" was deleted from the FEIS.

Comment 20 *Page 1-9, continuation of Section 1.5.2.4, "FERC Regulatory Requirements", 3rd full paragraph, second sentence. Text reads "These measures will supercede any settlement agreements pertaining to Plan." Insert "Species" after "Plan."*

Response 20 Text was modified in the FEIS to reflect the comment.

Comment 21 *Page 1-10, Northwest Power Act, 1st paragraph, second sentence. The text reads "The Mid-Columbia utilities are subject to the Act ….". The term "Mid-Columbia utilities" is not defined in the DEIS. This DEIS relates to the projects operated by Chelan and Douglas County PUDs. Also, Chelan and Douglas County PUDs are not subject to the Northwest Power Act. FERC considers the plans developed pursuant to the Northwest Power Act when licensing the projects.*

Response 21 Text was modified in the FEIS to reflect the comment.

Comment 22 *Page 1-11, "Title 77 Revised Code of Washington", First sentence. The sentence addresses "wildlife". This reference is not correct for the purposes of the proposed agreements being reviewed in the DEIS. Relevant for these purposes is the State's responsibility to "preserve, protect, and perpetuate wildlife, fish, and wildlife and fish habitat." RCW 77.04.055(1).*

Response 22 Text was modified in the FEIS to reflect the comment.

Comment 23 *Page 1-13, Section 1.6.1 "Alternative 1 (no-action), 2nd paragraph, 2nd sentence. The text states "…the years to address engineering, bond, and resource related issues…". The inclusion of the term "bond" is not correct in this sentence. The project licenses have not been amended to address the issuing of bonds.*

Response 23 Text was deleted from the FEIS. Descriptions of alternatives are in Chapter 2.

Comment 24 *Page 1-16, 3rd paragraph, last sentence. Text reads "This allows the HCPs to be updated with information received during the comment period…". This sentence incorrectly explains the NEPA process. Comments received by NMFS on the DEIS will be considered by NMFS when*

preparing the FEIS. The HCPs are multiparty, negotiated settlement agreements. The fact that NMFS receives a comment on the DEIS does not mean that the HCPs will be modified.

Response 24 Text was deleted from the FEIS.

Comment 25 *Page 1-17, Section 1.7 "Background", 4th paragraph. The region faces economic hardship in 2001 as power shortfalls hit the region. The current January-through-July runoff forecast has the region's water supply at 55 percent of normal, assuming normal precipitation for the March-through-July period. If this year's water conditions match 1977's, the lowest on record, the council predicted 2001 shortfalls could approach 8000 MW-months, with the deficit in May reaching 3300 MW-months. If the conditions match 1944 conditions, a year with just slightly higher runoff than the current projection, the total energy deficit across the months of April through August is 5,600 MW-months, with the deficit in May reaching 2,700 MW-months. (The Northwest Power Planning Council, "Northwest Electricity Markets in 2001: Status and Proposed Actions", March 26, 2001). The report states "it is a virtual certainty that emergency operations will be necessary during spring and summer to keep the electricity system from suffering outages." (NWPPC, 2001)*

Response 25 Project economics are provided in new sections of the FEIS. Refer to Sections 3.8 and 4.8, Economics.

Comment 26 *Page 1-18, continuation of Section 1.7 "Background", 1st full paragraph, 1st sentence. Also, Page 6.5, definition of "Mid-Columbia River." On Page 1-18, the text defines the Mid-Columbia River as "the area of the river between the Chief Joseph Project and the confluence of the Yakima River." On Page 6.5, the text defines the Mid-Columbia River as "portion of the Columbia River that begins at its confluence with the Snake River up to the Chief Joseph dam." These two definitions are not consistent. The term "Mid-Columbia River" is not used in the HCPs. However, the HCP's Tributary Plan's, Plan Species Account can be spent only on projects "within the Columbia River watershed (from the Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat and Wenatchee River watersheds…". HCP Section VII.2.*

Response 26 Text was modified in the FEIS to reflect the comment and clarify "Mid-Columbia" and "Plan" areas.

Comment 27 *Page 1-14, Section 1.7.2.2 "National Marine Fisheries Service", 1st paragraph, 1st sentence. The text reads "Many of NMFS' past studies, listings, and rules are directly relevant to the Mid-Columbia hydroelectric projects. …". The term "directly" is not accurate. The documents discussed in this paragraph are "indirectly" relevant to Chelan and Douglas County PUD's hydroelectric projects. They are not "directly" relevant to Chelan and Douglas County PUD's hydroelectric projects because they do not relate to these projects. They relate to the Federal hydroelectric projects on the Columbia River.*

Response 27 Determinations of the direct relevance of data depends completely upon the question being raised, and not necessarily geographical proximity to the projects in question. For example, survival of fish through a large Kaplan turbine would likely be better estimated by studies at other projects with similar configurations (e.g., size of turbine, head, tailrace) no matter where they occur, than by looking at neighboring projects with similar sized Francis turbines or smaller, faster-revolving Kaplan turbines. The term "directly" has been replaced with "relevant" in the FEIS to clarify the intent.

Comment 28 *Page 1-29, Section 1.7.3.1 "Mid-Columbia PUD FERC Agreements", 3rd sentence. This sentence refers to the Rock Island Settlement Agreement. The tribes listed in the text are not the only signatories to this agreement. The parties to the Wells Settlement Agreement, while similar to those of the Rock Island Settlement Agreement, are not the same.*

Response 28 Text was modified in the FEIS to reflect the comment.

Comment 29 *Page 1-29, Section 1.7.3.2 "Major Bond and Sales Agreements for the Projects". This text is grossly incorrect. As of March 14, 2001, the District's total estimated bonds outstanding is $886,076,000.[1] This indebtedness is secured by the revenue generated by the District's consolidated hydro system.*

Response 29 Text was modified in the FEIS to reflect the comment.

Comment 30 *Page 1-33, continuation of Section 1.10 "Background Summary", 1st full paragraph, 2nd to last and last sentences. The text reads "Under the agreement, the utilities would have the ultimate authority in the decision making process, as long as the no net impact standards are being met. If all parties agree that the standards have not been achieved, the coordinating committees would have an increased role in the decision making process" These sentences do not correctly summarize the HCPs. For example: the District has the "ultimate decision on pursuit and implementation of Tools during Phase I" of the Juvenile Dam Passage Survival Plan. HCP Section IV.2.a.i. In Phase II of the Juvenile Dam Passage Survival Plan the coordinating committee has the decision making authority. HCP Section IV.a.6 – 8. In Phase III of the Juvenile Dam Passage Survival Plan the coordinating committee has the decision making authority related to continued measurement and evaluation. HCP Section VI.a.11. In the Adult Passage Plan, the agreement lays out the actions to be taken. HCP Section VI.b. With regard to the Hatchery Compensation Plan and the Tributary Compensation Plan the "JFP accepts the responsibility to develop plans and programs necessary to implement the Tributary Conservation Plan and the Hatchery Compensation Plan. HCP Section III.4.*

Response 30 The revised HCPs changed the roles of the PUDs and the coordinating committees. According to the revised HCPs, the coordinating committees would have the authority to determine the measures to be implemented under all phases of the HCPs. Although the hatchery and tributary committees would have primary responsibility for decisions relative to their respective areas, the coordinating committees would oversee the HCP implementation process.

Comment 31 *Page 2-2, Section 2.1 "Development of Alternatives". Throughout the development of the DEIS the District has and still expresses concern about the choice of alternatives in the DEIS. The DEIS has not chosen as alternatives measures or mixes of measures that seek to mitigate the effects of the projects on salmon and steelhead. NMFS chose as alternatives competing legal process for establishing the measures to mitigate the effects of the projects on salmon and steelhead. This is a very unusual, and questionable method for evaluating the environmental effects of the proposed HCPs. The DEIS should be amended to provide more traditional alternatives. Alternatively, the rational and legal authority for this decision is not clearly explained in the DEIS, and should be incorporated into the FEIS.*

Response 31 As a result of comments received on the DEIS, modifications were made to the HCPs, as well as the EIS alternatives. Alternative 2 now includes a broader range of activities that could be

[1] Official Statement, Public Utility District No. 1 of Chelan County, Washington $143,995,000 Chelan Hydro Consolidated System Revenue Bonds consisting of $65,620,000 Series 2001A and $78,375,000 Series 2001B, page iv (March 1, 2001).

implemented at the three projects, and is not a different legal process. The actions that could occur under each alternative have also been evaluated to determine costs per mitigation measure associated with each action alternative. Refer to Section 4.8, Economics of the FEIS.

Comment 32 *Page 2-2, Section 2.1 "Development of Alternatives", 5th paragraph, 4th sentence. Text reads "to be in compliance with the take prohibitions of Section 9, FERC would implement the measures …." FERC would be in compliance with Section 9 of the Endangered Species Act by implementing the provisions contained in NMFS biological opinion and incidental take statement. However, FERC is not obligated to do so. FERC may take other action as long as it is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is … critical…". 16 U.S.C. Section 1536(a)(2); Aluminum Company vs. BPA, 175 F.3d 1156, 4394-4395 (9th Cir. 5/10/99).*

Response 32 Chelan County PUD is correct that FERC or any other Federal agency formally consulting with NMFS or USFWS could disregard the provisions of a biological opinion and proceed with its proposed action, but it does so at its own peril because it will not be covered by the take provisions and may be subject to Section 9 enforcement actions (Bennett vs. Spear, 520 U.S. 154, 1997). A biological opinion provides the Federal agencies the Secretary of Interior or Commerce's expert "opinion, and a summary of the information on which the opinion was based, detailing how the agency action affects the species or its critical habitat. If jeopardy or adverse modification is found, the Secretary shall suggest those reasonable and prudent alternatives which [he] believes would not violate subsection (a)(2) and can be taken by the Federal agency or applicant in implementing the agency action." 16 USC § 1536(b)(3)(A). If a Federal action agency adopts and implements the Secretary's biological opinion and incidental take statement, the action agency would no longer be liable for take of listed species associated with the licensed activity.

Comment 33 *Page 2-7 Section 2.2.1.2 "Rocky Reach Dam", first paragraph, last three sentences. The text describing the rehabilitation work at Rocky Reach is outdated. The following edits are recommended so that the text is current:*

"…Units 1 through 7 are currently vertical shaft Kaplan turbines installed during the original construction in 1962, while fixed-blade propeller units were installed in Units 8 through 11 in 1971. Two of these fixed-blade propeller units have been rehabilitated and replaced with Kaplan turbines. A third unit is currently undergoing rehabilitation and the remaining unit is scheduled to be rehabilitated by June 2002. In addition, all but one of the original Kaplan units have been rehabilitated and replaced with more efficient Kaplan turbines. This turbine work is expected to increase juvenile fish passage survival."

Response 33 Text was modified in the FEIS to reflect the comment.

Comment 34 *Page 2-11, Table 2-4, and all text that incorporates or explains information conveyed in the table which includes but is not limited to the text in Section 3.2.6.4 and Table 3-3. The juvenile dam passage information included in the table does not take into account project specific information, and when project specific information is reviewed it is dismissed in favor of information developed from other hydroelectric projects without explanation. Set forth in Attachment A is the most project-specific survival information available for both the Rocky Reach and Rock Island projects. This information is primarily based on information collected at these projects through the various studies identified in the references. Copies of the studies are available upon request.*

Response 34 Table was updated in the FEIS with the most recent data.

Comment 35 *Page 2-12, 1st paragraph, last sentence. The text reads "the information also indicates that survival is higher through the spillway and bypass system than through the turbine units." What is the citation for this statement? The statement does not logically flow from the materials cited in the paragraph.*

Response 35 Text was deleted in the FEIS.

Comment 36 *Page 2-14, Rocky Reach Dam, 3rd sentence. The text reads "Passage efficiency tests … and 52 percent of the PIT-tagged steelhead…". "PIT-tagged" is not correct. These were "radio tagged" steelhead.*

Response 36 Text was modified in the FEIS to reflect the comment.

Comment 37 *Page 2-14, Rocky Reach Dam, 5th sentence. The text reads "In 1999, guidance … 32 percent of the chinook and 53 percent of the steelhead passed …". In both cases, these were radio tagged fish.*

Response 37 Text was modified in the FEIS to reflect the comment.

Comment 38 *Page 2-15, Rocky Reach Dam, 2nd paragraph, 1st sentence. Text reads "Studies at the dam have shown that between 8 and 18 percent …" This text is not consistent with the text on page 4-18 which uses 19 percent and not 18 percent. Nineteen percent is the correct number.*

Response 38 Text was modified in the FEIS to reflect the comment.

Comment 39 *Page 2-16, Rock Island Dam, 3rd paragraph, 3rd sentence. The text reads "the spill passage rates for other species were estimated at 20, 33, and 35 percent for sockeye, fall chinook and coho salmon in 1998." What is the citation for this information?*

Response 39 Text was deleted in the FEIS.

Comment 40 *Page 2-16, Rock Island Dam, 4th paragraph, 1st sentence. The text reads "A subsequent study indicated that survival rates through modified bay with deeper stilling basins may be near 100 percent …." What is the citation for this information?*

Response 40 Citation was added to the FEIS.

Comment 41 *Page 2-16, Section 2.2.3.2 "Adult Passage", 1st paragraph, 5th sentence. The text reads "The delay and stress that adults experience during passage through multiple dams may reduce their spawning success." Please explain the scientific bases for this information, and provide a citation for the studies relied upon to make this statement.*

Response 41 The referenced passage does not state that passage through multiple dams reduces spawning success, but that it ***may*** reduce spawning success. The available technologies cannot directly partition amongst individual hydroelectric projects the effect of passage through multiple dams on the spawning success of salmon and steelhead. However, based on other available information, it is reasonable for NMFS to hypothesize that (1) passage and/or delays through adult fishways can increase stress levels, (2) these stress levels may negatively affect adult fish, and (3) these stresses

are cumulative in nature and could ultimately affect the spawning success of adult salmon and steelhead.

That delayed migration can result in large numbers of pre-spawning mortalities for anadromous fish has been well documented (Godfrey et al. 1954; Gilhousen 1960). Similarly, a large body of scientific information indicates that juvenile fish are stressed while migrating past hydroelectric projects, and that these stresses are cumulative in nature and can result in reduced survival (NMFS 2000a,d). It is therefore reasonable to believe that adults may be similarly stressed while migrating through multiple hydroelectric facilities and that this could ultimately affect pre-spawning mortality rates or spawning success.

Comment 42 *Page 2-17, continuation of Section 2.2.3.2 "Adult Passage", 3rd paragraph, 1st sentence. The text reads "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River have not been estimated due to insufficient radio-telemetry data." This is not correct. Currently, technology does not exist to measure adult survival. Therefore a technology limitation, not an insufficiency of radio-telemetry data, is the reason for no survival information.*

Response 42 Text was modified in the FEIS to reflect the comment.

Comment 43 *Page 2-17, Section 2.2.3.3 "Adult Reservoir Passage", 1st paragraph, 4th sentence. The text reads "However, the reservoirs can increase the potential for wandering or straying (lost orientation), that could lead to higher pre-spawning mortality or reduced spawning success (Volkman 1995)." This conclusion is not contained in Volkman 1995 and cannot be inferred from the radio telemetry data contained in Volkman 1995. No evidence exists to support these statements.*

Response 43 Text was deleted in the FEIS.

Comment 44 *Page 2-27, Section 2.2.3.3 "Adult Reservoir Passage", 1st paragraph, 5th sentence. The text reads "Higher water temperatures as a result of project reservoirs may also lead to higher prespawning mortality." What is the citation for this information?*

Response 44 The Environmental Protection Agency summarized a large body of scientific information on the effects of temperature in its 1999 report titled *A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to chinook salmon*. This report clearly indicates that prolonged exposure of adults to temperatures in excess of 18 degrees Centigrade is likely to result in some level of pre-spawning mortality or other negative effects such as loss of equilibrium, higher levels of pre-hatch mortality, and higher rates of developmental abnormalities. Temperatures in the Mid-Columbia River often exceed 18 degrees Centigrade during the late summer months when adult summer/fall chinook salmon, sockeye salmon, and steelhead are migrating. A determination with regard to how much the Mid-Columbia hydroelectric projects, Federal projects, and other factors have contributed to this situation is the subject of a total maximum daily load (TMDL), which is expected to be completed in 2002 or early 2003.

Comment 45 *Page 2-27, continuation of Section 2.3.2 "Alternative 2 (Section 7 Consultation)", 6th paragraph, 2nd sentence. The text reads "Evaluations conducted as part of the Quantitative Analytical Report (QAR) (NMFS 2000b) …" The QAR is also discussed in detail in Section 4.2.1 "Quantitative Analytical Report". The QAR has not yet produced a final, peer reviewed document. Furthermore, the document cited at NMFS 2000b is a draft internal NMFS document. NMFS has yet to produce a copy of this document after numerous requests. The District objects to NMFS citing QAR results anywhere in this document or in any other document (yet alone devoting 10*

pages to it in Section 4.2.1, pages 4-6 through 4-16) until the QAR results are made public, finalized and peer reviewed. This comment relates to all references to the QAR in the DEIS. Without a copy of the QAR the District has no way to comment on portions of the DEIS related to the QAR. The District reserves the right to submit comments on the QAR until it receives a copy of the QAR and has had sufficient opportunity to review the QAR. Nevertheless, based upon the information provided in the DEIS and the District's limited knowledge of the QAR, the District objects strongly to NMFS's use of the QAR results. Most of the conclusions relied upon the DEIS are drawn from the portion of the database that dates back to only 1980 (p. 4-7) while the entire database dates back to the 1960s. This misrepresents the long term database. Conclusions based upon long term database shows dramatically different outcomes when compared to the conclusions based upon the short term database. While NMFS acknowledges the existence of data going back to the 1960s, it is dismissed as potentially too "optimistic" without a thorough explanation. (p. 5-11) The best scientific information available is the entire database which takes into consideration ocean cycles that were known to be more productive than the ocean conditions in the 1980's and 1990's. During the 50 year term of the proposed HCPs ocean conditions are likely to cycle back to more productive periods similar to the 1960s. This rational is supported by the current 2000 and 2001 improvement in runs that is attributed to greatly improved ocean conditions.

Response 45 Comment noted. See NMFS responses to DEIS public comments, Appendix C, no. 25.

Comment 46 *Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 1st full paragraph. This paragraph was re-written from its mirror paragraph on page S-18. The text on page S-18 provides a clearer explanation.*

Response 46 Text was modified in the FEIS to reflect the comment.

Comment 47 *Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 2nd full paragraph, 2nd sentence. The text cites to the 1995 Federal Columbia River Power System biological opinion for the Lower Snake and Columbia River projects (NMFS 1995). NMFS 1995 biological opinion has been superceded by its 2000 biological opinion. In 2000, USFWS also issued a biological opinion for bull trout. Therefore, this text should be updated to refer to the current biological opinions.*

Response 47 NMFS's 1995 Federal Columbia River Power System biological opinion has been superceded by the 2000 Federal Columbia River Power System biological opinion. Concurrently, USFWS issued a biological opinion on the Federal Columbia River Power System for Kootenai River white sturgeon and bull trout. The FEIS text was updated accordingly.

Comment 48 *Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 6th full paragraph, last sentence. The text reads "…to achieve 95 percent juvenile dam passage survival and 91 percent project survival." As explained in earlier comments, the coordinating committee will measure only 95 percent Juvenile Dam Passage survival. However, the coordinating committee may elect to measure the juvenile component of 91 percent project survival. If the results of the standard that was measured was not achieved, then the coordinating committee would identify the tool for the District to implement by the next migration. It may be necessary to revise the HCP text to clarify this process.*

Response 48 Text was modified in the FEIS to reflect the comment and based on changes in the revised HCPs.

Comment 49 *Page 2-49 Section 2.6.1 "Alternative 1 (No-Action)". The text under this heading is introductory to all the alternatives, not specific to Alternative 1.*

Response 49 Text was moved in the FEIS to be located ahead of the Alternative 1 description.

Comment 50 *Page 3-27, Section 3.2.2.2 "Abundance". This section should be updated with 2000 fish counts and with projected fish counts for 2001. Fish counts showed a dramatic increase in 2000 and are projected to be even better in 2001. This information is very significant. Without this information the text is misleading.*

Response 50 Additional information has been included in the FEIS.

Comment 51 *Page 3-37, Rocky Reach, 3rd paragraph 2nd sentence. The text reads "the cumulative delay at nine dams on the Columbia River likely decreases spawning success." What is the citation for this information?*

Response 51 See response to CCPUD Comment #41. The FEIS text was modified to read as follows: "Although any delay related to passage at one dam may not be significant, cumulative delays (should they exist) at nine dams on the Columbia River may decrease spawning success."

Comment 52 *Page 3-39, Rocky Reach, 3rd paragraph, 1st sentence. The text reads "Based on juvenile radio-telemetry evaluations conducted in 1998, approximately 49 percent of the radio-tagged steelhead and 61 percent of the radio-tagged spring-run chinook salmon passed the project via the powerhouse (English et al. 1999)." This data is not correct. The correct citation should be English et al. 1998, not English et al. 1999. Also, 49 percent should be 34 percent, and 61 percent should be 51 percent.*

Response 52 Text was modified in the FEIS to reflect the comment.

Comment 53 *Page 3-39, Rocky Reach, footnote 2. Footnote 2 reads "Radio-tagged fall chinook obtained from the East Bank Hatchery … in 1997 and 1998 (e.g., approximately 81 percent powerhouse passage in … via the powerhouse at significantly higher rates than the …" The reference to 1997 is not correct and should be deleted. English et al. 1998 related to 1998 and 1997. Also, the use of the term "significantly" is not correct in this sentence. The term "significantly" has a meaning in statistics. The term infers that statistics were used to test a hypothesis. The statement made in the sentence is not the result of a statistical test. Therefore, use of the term "significantly" infers a level of credibility to the sentence that is not correct.*

Response 53 Text was modified in the FEIS to reflect the comment.

Comment 54 *Page 3-40 continuation of Rocky Reach Dam, 1st paragraph, 1st sentence. The text reads "Lady et al. (2000) … and English et al. (1999) estimated that 58 and 40 percent of the radio-tagged…" The estimates of 58 and 40 are not correct. They should be 50 and 30.*

Response 54 Figure 22 in English et al. (1999) indicated that the 58 and 40 percent values provided in the DEIS are correct.

Comment 55 *Page 3-40, continuation of Rocky Reach Dam, 2nd paragraph, last sentence. The text reads "Although neither evaluation was able to … the pilot level survival evaluation conducted using radio-tagged steelhead in 1999 estimated direct and indirect survival at 89.7 percent (Lady et al. 2000), suggesting that the indirect effects associated with turbine passage are more significant than those seen at the bypass system or spillway." The radio tag study cited in this sentence indicates a lower than desired direct and indirect survival at the project. NMFS should clearly explain why it is appropriate to use the results of a radio-tag study in this instance when the study*

shows low levels of survival, and not use the results of radio tag studies in other instances when the results of radio tag studies show high levels of survival. The District continues to object to NMFS's inconsistent use of study results, and failure to acknowledge the results of studies that show survival levels favorable to the District.

Response 55 The survival data are used to the extent that their proven reliability will allow. The primary uncertainties related to radio-telemetry survival evaluations are associated with tag detectability, battery life of the tags, and tag failure rates. As a result, these uncertainties might not provide the accuracy level necessary to estimate overall survival, but do allow relative comparisons to be made between groups of fish for which the potential inaccuracies are less important. In this instance, the discussion concerned the relative differences in survival between fish passing the project through the powerhouse units, compared to those passing through the spillway or the juvenile bypass system. Because tag detectability, battery life, and tag failure rates are not expected to vary substantially at particular downstream detection points, based on the passage route of the fish, such comparisons are appropriate. Also see response to CCPUD Comment #34.

Comment 56 *Page 3-43 Rocky Reach, 1st paragraph 2nd sentence. The text reads: "Passage efficiency tests conducted … yearling chinook salmon and 51 percent of the PIT-tagged steelhead passed the project via this route (English et al. 1998a)." This sentence is not correct. 51 percent should be 52 percent, and PIT-tagged should be radio tagged.*

Response 56 Text was modified in the FEIS to reflect the comment.

Comment 57 *Page 3-43 Rocky Reach, 1st paragraph 4th sentence. The text reads: "Passage efficiencies in 1999 … 32 percent for chinook salmon, and 11 percent for sockeye salmon (Mosey et al. 2000)." This sentence is not correct. 11 percent should be 16 percent.*

Response 57 Text was modified in the FEIS to reflect the comment and included additional data.

Comment 58 *Page 3-43 Rocky Reach, 1st paragraph 5th sentence. The text reads "Radio telemetry evaluations in 1999 also indicated that about 57 percent of steelhead passed the project through the bypass." What is the citation for this information? The District is not aware of any study that produced this information.*

Response 58 Text was deleted in the FEIS.

Comment 59 *Page 3-43 Rocky Reach, 1st paragraph, last sentence. The text reads "The combined spillway and bypass … and between 62 and 64 percent for steelhead (Lady et al. 2000)." This information is not correct. 62 should be 72, and 64 should be 74.*

Response 59 Text was modified in the FEIS to reflect the comment and included additional data.

Comment 60 *Page 3-43 Rocky Reach, 2nd paragraph, 1st sentence. The text reads "In both 1997 and 1998…". This is not correct. The evaluation was done only in 1998. The evaluation was not done in 1997.*

Response 60 Text was modified in the FEIS to reflect the comment.

Comment 61 *Page 3-43 Rocky Reach, 2nd paragraph, 2snd sentence. The text reads "In 1998, the bypass efficiency for naïve chinook salmon was substantially lower (19 percent) … (English et al. 1998a)." This is not correct. 19 percent should be 22 percent.*

Response 61 Page 28 in English et al. 1998a indicates the overall guidance efficiency for East Bank Hatchery chinook salmon at 19 percent.

Comment 62 *Page 3-43, Rocky Reach, 5th paragraph, 3rd sentence. The text reads "The temporary bypass outfall site, located in front of the turbine unit four upwelling, …" This is not correct. Unit four upwelling should be replaced with unit three upwelling.*

Response 62 Text was modified in the FEIS to reflect the comment.

Comment 63 *Page 3-44, Section 3.2.6.4 "Total Project Survival – Juvenile Migrants". The discussion of project survival is not correct. The obligation is that "The District shall also achieve and maintain 91 percent project survival … which means that 91 percent of each Plan Species, juvenile and adult combined, survive project effects, including delayed mortality wherever it may occur." HCP Section IV.1.a. The first sentence in this section of the DEIS fails to account for the fact that project survival includes "delayed mortality wherever it may occur." Also, the HCP does not define a protocol for measuring project survival as inferred from the DEIS. The HCP leaves it to the Coordinating Committee to establish the measurement protocols. HCP Section IV.3.c.*

Response 63 See NMFS responses to DEIS public comments, Appendix C, Responses #29, #36, and #57.

Comment 64 *Page 3-47 Section 3.2.7 "Overall Fish Passage Survival". 1st paragraph, 3rd sentence. The text reads "Based on the small amount of information that is available, the average survival of adult spring-run chinook salmon and steelhead is estimated at between 77.8 percent and 88.9 percent for the entire Mid-Columbia River reach…". What is the cite for this information? The District is not aware of any methodology to measure adult survival.*

Response 64 The DEIS reports survival estimates derived from adult radio-telemetry studies in the Columbia River upstream of Priest Rapids Dam conducted by Steuhrenburg et al. (1995) in 1993. This information was used to provide survival estimates of 77.8 to 88.9 percent (equating to an average per project survival rate of 95.1 to 97.7 percent) for adult Upper Columbia River spring-run chinook salmon across the five FERC-licensed Mid-Columbia River projects. However, these results are likely biased low because of problems associated with the tags, receivers, and software used at the time (Wainwrite et al. 2001).

Analysis conducted as part of the 2000 Federal Columbia River Power System biological opinion estimated total (natural and project-related) per project survival rates (current and under the reasonable and prudent alternatives outlined in the biological opinion) ranging between 97.6 and 98.1 percent for adult Upper Columbia River spring-run chinook salmon and 96.8 to 97.3 percent for adult Upper Columbia River steelhead. NMFS believes these are the best available estimates and are generally applicable to the FERC-licensed projects on the Columbia River.

NMFS again reviewed the available adult survival and radio-telemetry information pertaining to Upper Columbia River spring-run chinook salmon and steelhead in the 2002 Rocky Reach biological opinion. NMFS concluded that, "due to the limited amount of radio-telemetry information available for the Mid-Columbia River system, the pitfalls associated with utilizing radio-telemetry data to assess site-specific survival, and the environmental and species differences of the natural and impounded river systems evaluated, it is not possible to differentiate between natural and hydrosystem caused mortality at this time" (2002 Rocky Reach biological opinion – Section 6.2.3). Thus, taking into account natural mortality, which

undoubtedly occurs, it is likely that the adult mortality resulting from project-related effects in the Mid-Columbia River is currently less than 2 percent for listed species.

The FEIS text was modified accordingly.

Comment 65 *Page 3-96, continuation of Section 3.3.2 "Water Quality", 1st full paragraph, 1st sentence. The text reads "Although extensive evaluations have been conducted under controlled or laboratory conditions, the effects of specific total dissolved gas levels on fish in a river environment is relatively unknown." This statement is not correct. The effects of total dissolved gas on fish has been extensively studied in the Mid-Columbia as part of the 2000 Federal Columbia River Power System biological opinion.*

Response 65 NMFS did summarize the total dissolved gas-related physical and biological monitoring studies conducted since 1995 in Appendix E of the 2000 Federal Columbia River Power System biological opinion. The FEIS text was modified accordingly.

Comment 66 *Page 3-109, Section 3.4.4 "Rare Plants". The text states that Ute ladies' tresses (Spiranthes diluvialis) do not occur in or near the immediate project area of the dams. This is not correct. Recently, a Ute ladies'-tresses was determined to be present in the Rocky Reach reservoir shoreline area. This hydrophilic orchid would be affected by drawdown or other actions that would remove its water source. P. Fielder, pers. comm.*

Response 66 Text was modified in the FEIS to reflect this new data.

Comment 67 *Page 4-18, continuation of Section 4.2.2.1 "Rocky Reach Dam", 2nd paragraph, 2nd sentence. The text reads "Survival estimates for steelhead ranged from 87.0 percent to 111.9 percent …" This is not correct. 111.9 percent should be 101.0 percent.*

Response 67 Text was modified in the FEIS to reflect the comment.

Comment 68 *Page 4-18, continuation of Section 4.2.2.1 "Rocky Reach Dam", 3rd paragraph, 2nd sentence. The text reads "Under Alternative 1 however, there is no requirement to implement these additional measures." This is not correct. Under alternative 1 fish protection and enhancement measures can be implemented through the pending Mid-Columbia proceeding at FERC, and during relicensing.*

Response 68 NMFS concurs that, under Alternative 1, some protection and enhancement measures could be implemented through the pending Mid-Columbia Proceeding at FERC and during relicensing. The FEIS text was modified accordingly.

Comment 69 *Page 4-18, continuation of Section 4.2.2.1 "Rock Island Dam", 2nd paragraph, 2nd sentence. The text reads "Between 1995 and 1998, over 26,000 predatory …" This should be updated by replacing 1998 with 2000, and 26,000 with 34,000. West, T. 2001. Northern Pikeminnow (Ptychocheilus oregonensis) Population Reduction Program Rocky Reach and Rock Island Dams.*

Response 69 Text was modified in the FEIS to reflect the comment and more recent data.

Comment 70 *Page 4-20 continuation of "Adult Migration/Survival", 2nd full paragraph, 2nd sentence. The text reads "It is reasonable to assume that some portion of the adult bull trout populations pass through the turbines and spillways, either voluntarily or involuntarily, given their presence in the project area and use of project fishways." What is the citation for this information? Why is it*

reasonable to assume a correlation between presence of bull trout in the fishway and bull trout passing through turbines and spillways? The District is aware of no evidence supporting this statement.

Response 70 The draft report *Movements of Bull Trout Within the Mid-Columbia River and Tributaries 2001-2001* by Stevenson and Hillman (2002) supports the assumptions made in the EIS.

Comment 71 *Page 4-26, "Rocky Reach Dam", 2nd sentence. The text reads "As with the fishways at the Wells Dam, there is evidence to suggest that sockeye and summer-run chinook salmon experience passage delays in the fishway entrance pools of the Rocky Reach fishway." What is the citation for this information? The District is not aware of this information.*

Response 71 The FEIS was changed to cite Stuehrenberg et al. (1994) to support these statements.

Comment 72 *Page 4-27, Section 4.2.2.3 "Pacific Lamprey", 3rd sentence. The text reads "The only screens that are currently in operation at the Mid-Columbia River dams are at turbine units one through three at the Rocky Reach Dam." This is not correct. Screens are used only at turbine units one and two at the Rocky Reach Dam.*

Response 72 Text was modified in the FEIS to reflect the comment.

Comment 73 *Page 4-27, Section 4.2.2.3 "Pacific Lamprey", 4th sentence. Delete the phrase "although additional screens are currently not planned for future installation."*

Response 73 Text was deleted in the FEIS.

Comment 74 *Page 4-31, "Adult Migration/Survival", 2nd paragraph last sentence. The text reads "Although the radio-telemetry technique is problematic for addressing adult passage survival, the study results are the best available data for determining potential project related affects." This sentence is not correct. Radio-telemetry is not a technique for addressing adult passage survival. It is a technique for addressing locations of adult fish. Currently, no protocol exists to measure adult survival. There is no data available to evaluate adult survival.*

Response 74 See response to CCPUD Comment #64.

Comment 75 *Page 4-31, "Adult Migration/Survival", 4th paragraph, 2nd sentence. The text reads "Based on their presence at the project and their migratory behaviors, it is likely that some portion of the population passes through the turbines and spillways, either voluntarily or involuntarily." What is the citation for this information? Why is it reasonable to assume a correlation between presence of bull trout in the fishway and bull trout passing through turbines and spillways? The District is aware of no evidence supporting this statement.*

Response 75 The draft report *Movements of Bull Trout Within the Mid-Columbia River and Tributaries 2001-2001* by BioAnalysts, Inc. supports the assumptions made in the EIS.

Comment 76 *Page 4-34, "Rock Island Dam", 1st paragraph, 1st sentence. Delete "chiwawa hatchery". Rock Island's hatchery is referred to as the Eastbank Hatchery Complex.*

Response 76 Text was modified in the FEIS to reflect the comment.

Comment 77 *Page 4-40 "Rocky Reach Dam", 2nd paragraph, 3rd sentence, and Page 4-41 "Rock Island", 2nd paragraph 3rd sentence. The text reads "For Alternative 3, the PUD would have the ultimate authority for determining the appropriate protection measures implemented in Phase I, while the Coordinating Committee would have a greater role during Phase II." As explained above in relation to other sections, the Coordinating Committee is the decision maker in Phase II. NMFS has retained the authority to enforce the incidental take permit outside the HCPs.*

Response 77 This comment is no longer relevant with the language in the revised HCPs. See NMFS responses to DEIS public comments, Appendix C, Responses #18 and #22.

Comment 78 *Page 4-59, Section 4.6.3.1 "Project Area". This text is not correct. Section V of the HCP titled "Reservoir as Habitat" clarifies the manner in which land use and permitting decisions on project lands occurs.*

Response 78 Text was added to the FEIS to clarify.

Comment 79 *Page 4-72, Section 4.10.7 "Indian Trust Assets", 3rd paragraph, 5th sentence. The text reads "This would then affect whether the 9 percent no net impact would continue over the 50 year HCP terms." Reduction in use of the hatchery facilities means that the hatcheries would not produce fish to compensate for the full 7 percent of Unavoidable Project Mortality. HCP Section III.1. Nevertheless, No Net Impact can still be achieved as long as the PUDs provide the funding and capacity for the hatcheries. HCP Sections III.3. and 4.*

Response 79 Text was modified in the FEIS to reflect the comment. See NMFS responses to DEIS public comments, Appendix C, Response #17.

Comment 80 *Page 4-74, Section 4.10.14.1 "Wild and Scenic River Act". This section needs to be updated. On June 9, 2000, the Hanford Reach was declared a National Monument. 65 Federal Register 37253 (June 13, 2000).*

Response 80 Text was added to the FEIS.

Comment 81 *Page 5-6, Chelan County PUD 2000 reference. The District objects to reference to comments provided to the "Pre-Decisional Review Draft, Biological Opinion, Interim Protection Plans for Operation of the Mid-Columbia River Hydroelectric Projects and Related Activities." These comments were provided to assist in editing a confidential, pre-decisional review document.*

Response 81 Text was deleted from the FEIS.

Comment 82 *Page 6-1 "Glossary". It is the District's understanding that the glossary contained in the DEIS is not in any way intended to modify terms that are defined in the Endangered Species Act, NMFS's regulations, or the HCPs. The District has not reviewed the glossary, and reserves the right to latter object to the manner in which terms are defined in this DEIS.*

Response 82 Comment noted.

Comment 83 *Page 7-2, Section 7.3. Add the following local agencies: East Wenatchee Chamber of Commerce, Mayor of the City of Wenatchee, Chelan County Commissioners, and the Douglas County Commissioners.*

Response 83 The listed local agencies were added to the FEIS.

Comment 84 *Page 7-2, Section 7.4. Replace "Confederated Tribes of the Colville Reservation" with "Confederated Tribes and Bands of the Colville Indian Reservation." In the Umatilla name add "Indian" between "Umatilla" and "Reservation." Replace "Yakama Indian Nation" with "Confederated Tribes and Bands of the Yakama Indian Nation."*

Response 84 Text was modified in the FEIS to reflect the comment.

Commissioners:
MICHAEL DONEEN
T. JAMES DAVIS
LYNN M. HEMINGER

Chief Executive Officer/Manager:
WILLIAM C. DOBBINS

Public Utility District No.1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553

RECEIVED
MAY - 2 2001

April 30, 2001

Mr. Bob Dach
NMFS, NWR, Hydro Program
525 NE Oregon Street, Suite 420
Portland, Oregon 97232-2737

Re: Draft Environmental Impact Statement regarding the proposed Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach and Rock Island Hydroelectric Projects.

Dear Mr. Dach:

Public Utility District No.1 of Douglas County, Washington (Douglas PUD) has reviewed the Draft Environmental Impact Statement regarding the proposed Anadromous Fish Agreement and Habitat Conservation Plans (HCPs) for the Wells, Rocky Reach and Rock Island Hydroelectric Projects and provides the attached comments for your consideration.

Douglas PUD appreciates the NMFS collaborative effort to accurately describe the complex set of guidelines established in the Wells Habitat Conservation Plan (HCP) Implementation Agreement. In general, the Draft Environmental Impact Statement (EIS) for the proposed Anadromous Fish Agreements and Habitat Conservation Plans, released on December 29, 2000, is a fair and adequate presentation of the negotiated Wells HCP. Due to the complex nature of this and related documents, it is no surprise that additional comments and suggested revisions are being submitted prior to the adoption of the final Environmental Impact Statement.

If you have any questions concerning Douglas PUD's comments, please feel free to contact me at (509) 884-7191.

Sincerely,

Robert W. Clubb, Ph.D.
Chief of Environmental and Regulatory Services

c. Susan Fruchter, NEPA Coordinator

Public Utility District No.1 of Douglas County
Comments to Draft Environmental Impact Statement
April 30, 2001

GENERAL COMMENTS

Douglas PUD appreciates the NMFS collaborative effort to accurately describe the complex set of guidelines established in the Wells Habitat Conservation Plan (HCP) Implementation Agreement. In general, the Draft Environmental Impact Statement (EIS) for the proposed Anadromous Fish Agreements and Habitat Conservation Plans, released on December 29, 2000, is a fair and adequate presentation of the negotiated Wells HCP. Due to the complex nature of this and related documents, it is no surprise that additional comments and suggested revisions are being submitted prior to the adoption of the final Environmental Impact Statement. Specific comments related to the draft EIS are included below.

SPECIFIC COMMENTS

1. **Page S-15, S.5.3 Alternative 3 (Applicants' Proposed Action – Project HCPs), second Paragraph, last Sentence.** We request further clarification regarding the following statement, "(EIS prepared by FERC including a separate Section 7 consultation with NMFS regarding the effects of the agreements on listed species)."

   This paragraph indicates that FERC needs to prepare a second EIS for implementation of the HCPs. The parties expended considerable effort prior to preparation of the Draft EIS to avoid this unnecessary duplication. There is no rationale for FERC to prepare a separate EIS to implement the HCP.

2. **Page S-22, Para. 1, line 5 and line 11.** Please change the following two statements, "If juvenile dam passage survival ..." to "If juvenile project passage survival ..."

3. **S-22, Para. 1, line 5.** "If juvenile dam passage survival after <u>three</u> years of evaluations remains..."

   The Wells Implementation Agreement specifically calls for three years of survival studies within the five-year period known as Phase I. Phase I began in 1998.

4. **Page S-29, Table S-2 Alternative Comparisons (Alternative 1).** In the section labeled, "Continued Studies to Assess Survival" please clarify that continued survival studies at Wells Dam toward the goal of determining passage survival conditions at Rock Island and Rock Reach dams is not the responsibility of the Wells Project owner.

5. **Page S-35, Second Column, second to last Bullet.** "determine whether the species can be expected to survive with an adequate potential for recovery under the proposed action,..." Please define "adequate potential" in terms of interim recovery goals and standards. Would a greater than 50% probability of recovery be sufficient?

   How does, "adequate potential for recovery" relate to the "not likely to jeopardize the continued existence" standard spelled out in Section 7 (a) (2) of the Endangered Species Act?

6. **Page S-38, Table S-3 Environmental Comparison of the Alternatives (Page 3 of 8).** Under *Fisheries Resources: Other Plan Species - Adult Reservoir Spawning,* Alternative 1, 2 and 3 are listed as being: "Same as discussed for threatened and endangered species above." However, under the T & E section (above) there is no discussion of Adult Reservoir Spawning.

7. **Page S-39, Table S-3 Environmental Comparison of the Alternatives (Page 4 of 8).** Under *Tributary Habitat Improvements* for Alternative 1, 2 and 3. Given that this document is intended to evaluate three possible environmental alternatives related to future operation of PUD dams, we are confused by the following statement: "Habitat improvements would occur through the implementation of non-PUD funded projects through Federal, State and local agency funding." This statement misleads the reviewer to conclude that habitat improvements will take place regardless of the selected alternative. Simply stated, under Alternative 1 and 2 the PUDs would not fund off-site habitat improvements. Under Alternative 3 the PUDs would fund tributary enhancement toward a 2% increase in survival per project for plan species covered by the HCP. Under all three alternatives the agencies may pursue habitat improvements.

8. **Page S-40, Table S-3 Environmental Comparison of the Alternatives (Page 5 of 8). Alternative 1, Water Quality, Tributary Water Quality.** We suggest removing references to agency-funded habitat work. The inclusion of agency funding of habitat projects only confuses the three environmental options being evaluated. Under Alternative 1 and 2 the PUDs would not voluntarily fund improvements in water quality in the tributaries. Under Alternative 3, the PUDs would voluntarily provide direct funding toward the improvement of tributary water quality. This clear distinction needs to be drawn between the three Alternatives.

9. **Page S-40 and S-43. Table S-3 Environmental Comparison of the Alternatives (Page 5, 6, 7 & 8).** Actions common to all three alternatives and outside the control of the decision related to the EIS should not be presented in this table. Similarly, the actions referred to under **Comment #8** should also be applied to statements contained under subsections: Vegetation (Project Area, Associated Tributaries), Wildlife (Threatened and Endangered Species), Land Use (Associated Tributaries), Economics (Tributary Habitat Improvement), Recreation (Tributary Habitat Improvements, Columbia River System) and Cultural Resources (Tributaries).

10. **Page 1-6 and 1-7. 1.5.2.1 Endangered Species Act Requirements for Non-Federal Actions. "The No Surprises Policy and Adaptive Management"** These two policies appear to be in conflict when it comes to implementation under the proposed HCP. Please describe how conflicts between the two policies will be mediated during the implementation of Alternative 3.

11. **Page 1-16. 1.6.3 Alternative 3 (Proposed Action), first Bullet on Page 1-16.** Please modify the following statement: "evaluate project specific survival rates," to "evaluate project specific juvenile survival rates."

12. **Page 1-32, 1.10 Background Summary, second Paragraph, second Sentence.** "Therefore, this EIS is being developed for the purpose...whether or not to issue incidental take permits." This statement appears to conflict with the statement made on **Page S - 15** and **Page 2-32.** The EIS purpose includes amendment of FERC licenses. For a further description of our concerns please see Comment No. 1.

13. **Page 2-14, Wells Dam, second column of text, last Sentence of text in the first partial paragraph.** We take issue with the following statement: "Therefore, the total direct and indirect mortality is likely similar to the 2 percent found at the lower Snake River project bypass systems (NMFS 1998)." We disagree. The Wells bypass system is not similar to the Snake River screen bypass systems. The Wells system performance is superior to those found at the lower Snake River projects. Survival assigned to this passage route should be similar to the estimated survival assigned to spillway passage routes.

    In contrast, the Snake River screen bypass systems utilize extensive turbine intake screens, small gatewell orifice passages, collection channel dewatering, dewatering in transport pipes, handling and delay in sampling facilities, and reintroduction back into the tailraces through low volume pipes located immediately adjacent to predator-plagued shorelines.

    The Wells surface collection system does not utilize massive intake screens, orifice passageways, transportation pipes, handling facilities and low water tailrace discharges. The Wells surface collector guides fish away from the turbines and into the spillways where five high volume non-turbine passage routes are provided through the dam. Fish are introduced back into the tailrace turbine discharge where velocities are sufficiently high to prevent predator accumulation and where gull wires protect fish from avian predators.

    We suggest using a combined estimate of direct and indirect mortality that ranges from 0% to 1% for the Wells surface bypass system.

14. **Page 2-17, 2.2.3.2 Adult Passage, second full Paragraph, first Sentence.** Please modify the following statement: "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River has not been estimated due to insufficient radio-telemetry data." to "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River have not been estimated due to an inability to differentiate tag loss, tag failure and fish loss." It is not presently possible to estimate adult survival in a statistically defensible manner with the present radio-telemetry technology.

15. **Page 2-23, Measures Planned, fourth Line.** Please replace "negotiations" with "agreements."

16. **Page 2-23, Measures Planned. 1. Adult Passage.**

    c. The Wells Settlement Agreement does not contain language that obligates the District to conduct modeling in the adult fishways.

    e. The Wells Settlement Agreement does not include conditions to continuously operate the juvenile surface bypass system from April through August for adult fallback and adult downstream passage.

17. **Page 2-23, Measures Planned. 2. Juvenile Passage. a.** The Wells Settlement Agreement does not contain requirements to operate the turbines at peak efficiency ratings.

18. **Page 2-23 and 2-24, Measures Planned. 2. Juvenile Passage. b. Surface Bypass Operation -** Please modify the following statement: "Operate at least one spillway bypass, 24-hours per day, throughout the juvenile downstream migration periods" to "Operate at least one spillway bypass, 24-hours per day, throughout 80% and 70% of the peak spring and peak summer juvenile downstream migration, respectively..."

19. **Page 2-24, Measures Planned. 2. Juvenile Passage.**

    c. **Predators and d. Gas Abatement.** Neither of these actions are outlined in the Wells Settlement Agreement. Please remove the statements from the EIS.

20. **Page 2-25, 2.3.1.2 Rocky Reach Hydroelectric Project.** Analogous sections are missing under Rocky Reach and Rock Island project descriptions that are present under the Wells Project description. Please add the following Section designations to the Rocky Reach and Rock Island Project descriptions to allow a more rigorous comparison of actions proposed at different projects: Adult Fish Passage, Juvenile Fish Passage, Hatchery Based Compensation, and Monitoring and Evaluation.

21. **Page 2-28, second full Paragraph, fifth Line.** The QAR analysis findings that, "even the removal of the Mid-Columbia River dams would not be sufficient to recover these species, if recent total life history survival rates continue," should be expressed in the Summary on **Page S-16, S.5.3.2 HCP Baseline Conditions.**

22. **Page 2.29, 2.3.2.1 Wells Hydroelectric Project. 3. Hatchery Program -** It is important to point out that under Alternative 1, 2 and 3, Douglas PUD has

the ability to reduce hatchery production (including summer and spring chinook, steelhead, and sockeye) based upon the results of survival studies. Also, under Alternative 2 and 3, NMFS has the authority to reduce or modify hatchery production of listed and non-listed species to remain consistent with their long-term recovery strategies for listed Upper Columbia River spring-run chinook and summer-run steelhead.

23. **Page 2.35, 2.3.3.5 HCP Performance Standards, third full Paragraph, last Sentence.** "In addition, the 91 percent survival standard also includes reservoir survival and the dam passage survival of returning adults." This statement is inaccurate as presented. The HCP was set up to measure 91% juvenile project passage survival. The 91% juvenile number was derived by assuming loss of adults (2%), assuming loss through the reservoir (2%) in addition to the 5% allowed loss at the dam. Further assumptions related to the 91% determination included an assumed 2% delayed mortality from hydro passage and a 2% credit for natural river fish loss.

    The agreement reached on the HCP does not include measurement of adult survival at a 95% CI +/- 5%. This is evident from the adult language in the implementation agreement, the timeline for completion of the Phase I studies (5 years) and based upon the knowledge that precise adult survival studies were not statistically or scientifically defensible at the time the Implementation Agreement was negotiated. The PUDs did not sign up to ensure adult survival from tailrace to tailrace at a rate of 98% irrespective of natural mortality.

    It is important to point out that during the negotiations of the HCP, a 2% adult mortality figure was discussed. However, the final HCP Implementation Agreement was approved without referencing the measurement of the 2% adult mortality figure. The final agreement says "...and a net of 4% mortality from all other project effects (including but not limited to reservoir, juvenile delay, and adult mortality with credit for natural mortality)." Please remove all discussion that indicates the HCP has a 2% measurable adult mortality component.

24. **Page 2.41, Verification of Standards.** We agree with the statements in the first and second paragraphs of this section related to the verification of standards.

25. **Page 2-56, Table 2-8 Environmental Comparison of the Alternatives (Pages 1 of 8).** Please modify this table per similar concerns expressed in comment No. 7, 8 and 9. The DEIS is intended to compare actions related to the implementation of three environmental alternatives for fish mitigation at three FERC licensed projects (No action, S. 7 and HCP). Descriptions of actions outside those proposed by the PUDs (agency-funded habitat enhancement actions) should be removed from the document.

26. **Page 2-56, Table 2-8 Environmental Comparison of the Alternatives (Pages 1 of 8), juvenile migration/survival standards.** Please change, "project specific standards" under Alt. 1 to "Project specific fish passage standards."

27. **Page 2-59, Table 2-8 Environmental Comparison of the Alternatives (Pages 4 of 8), Drawdown, Alt. 2.** It should be mentioned that drawdown under Alternative 2 could only be considered during relicensing of the projects.

28. **Page 3-10, Figure 3-4 Geology of the Rock Island Dam Area.** There are two identical categories for Grande Ronde Basalt. What is the difference between N2 and R2 Units? In the figure, there is no discernable difference between the two geological formations.

29. **Page 3-28, Steelhead, Line 2.** Please modify the following statement: "Rock Island Dam averaged 2,600 to 3,700 fish" to "Rock Island Dam ranged from 2,600 to 3,700 fish." The same comment applies to Line 4 of this same paragraph.

30. **Page 3-28, Sockeye Salmon.** Please standardize the years being compared to 10-year intervals. As presented, the intervals appear to be contrived to show a recent decline in numbers of sockeye passing Rock Island Dam.

31. **Page 3-29, Coho Salmon, Last sentence.** This section should also note the release of millions of coho by Chelan PUD at the Turtle Rock Hatchery. This facility continued to release coho through the mid - 1980's.

Note that coho ladder counts at Rock Island totaled only 475 fish between 1933 and 1943 (Mullan, 1983; Mullan et al., 1992). That is an average of less than 48 fish per year. The statement: "After completion of Priest Rapids Dam in 1960, peak escapement estimates probably never exceeded 10,000 fish" is misleading. The statement should be modified to indicate that few coho existed prior to the completion of Grand Coulee and Rock Island dams. The statement subtly implies a cause and effect relationship between the completion of Priest Rapids Dam and the demise of the coho run. The Upper Columbia River coho run had already been wiped out prior to construction of any mainstem Columbia River dams as is evident from fishway counts immediately following the completion of Rock Island Dam.

32. **Page 3-29, Table 3-1 Spawning Distribution of Anadromous Fish Species in the Mid-Columbia River Watersheds.** Fulton (1968) appears to incompletely describe salmon and steelhead spawning in the Mid-Columbia Region. Please modify Table 3-1 to include the distribution of fish described below.

Fall Chinook - Please add the Columbia and Methow rivers to the watersheds utilized extensively by Fall Chinook.

Steelhead - Please add the Twisp and Chewuch rivers and Libby Creek as being important Methow River tributaries for spawning steelhead. It should be noted that Salmon and Omak creeks are not presently important steelhead habitats. "Simikameen" is spelled "Similkameen." Also note, steelhead do not have access to the Upper Similkameen River. Instead they only have access to the Lower Similkameen River. Enloe Falls blocks steelhead access to the Upper Similkameen River.

Sockeye - Extensive spawning ground surveys for sockeye have not resulted in documented sockeye spawning in the mainstem Okanogan River. Please remove the reference to the Mainstem Okanogan River as a tributary of the Okanogan River used by spawning sockeye. Please modify the sentence to state that the Osoyoos Lake sockeye population is almost entirely spawned in the Okanogan River, upstream of Osoyoos Lake.

33. **Page 3-30, 3.2.3 Tributary and Mainstem Development, end of first Paragraph.** The last statement in this paragraph is not entirely accurate. Hydroelectric facilities on the Cowlitz, Lewis and Willamette rivers do not all contain adult fish passage facilities. Some transport fish by truck upstream of the projects and others are migrational blocks to migrating adult salmon and steelhead. Please modify the statement to read: "All mainsteam Columbia and Snake river dams downstream of these projects are equipped with facilities to allow ..."

34. **3.2.4 Hatchery Programs, Page 3-31, First line on page 3-31.** Please modify the percent of summer-run chinook salmon that are of hatchery origin in the Mid-Columbia River. 80% hatchery composition for this stock is not accurate. The following table indicates the best estimate of hatchery contribution for the watersheds covered by this EIS (Table 1). The hatchery contribution of fall chinook is also closer to 20-30% and not 50%.

Table 1: Escapement to the Wenatchee, Methow and Okanogan rivers of hatchery origin summer chinook (Table adapted from Murdoch and Petersen, 2000).

Return Year	Wenatchee	Methow	Okanogan
1991	2.4	0.0	0.0
1992	1.5	0.0	3.5
1993	5.0	24.0	36.1
1994	12.0	45.0	48.7
1995	9.2	36.9	54.6
1996	4.9	15.8	59.3
1997	8.5	9.2	54.3
1998	10.7	22.2	29.9

Murdoch, A. and K. Petersen. 2000. Survival of sockeye, spring chinook, and summer chinook salmon released from Rock Island Fish Hatchery Complex Facilities, 1989 through 1995 broods. Prepared for Public Utility District No. 1 of Chelan County. Washington Department of Fish and Wildlife, 600 Capitol Way N., Olympia, Washington 98501-1091.

35. **Page 3-31, 3.2.4.2 Hatchery Compensation for Mid-Columbia Tributary Losses.** There is no plan in place to compensate for Mid-Columbia Tributary Losses. Please replace, "Tributary Losses" with "Mainstem Passage Losses."

36. **Page 3-37, Rocky Reach, second Paragraph in section, last Line.** There was no sockeye salmon passage study at Rocky Reach in 1993. The 1993

study was a chinook study. There was a sockeye passage study at Wells Dam in 1992. However, this study did not include any monitoring at Rocky Reach Dam. The 14% fallback estimate was derived from the 1997 sockeye monitoring effort only (English et al., 1998).

37. **Page 3-38, Rock Island Dam, second Paragraph, first Line.** There was no sockeye study at Rock Island Dam in 1993.

38. **Page 3-42, 3.2.6.3 Juvenile Bypass Systems, Wells Dam, second Paragraph, last Sentence.** We disagree with the assertion that the Wells bypass system likely has indirect mortality similar to the diversion screen bypass systems located at the Snake River projects. See Comment No. 13 for the rationale for not comparing the Wells Bypass system to the Snake River bypass systems.

    The Wells bypass system is a highly efficient spill bypass system. Indirect mortality resulting from passage through this system should be compared with indirect mortality estimates derived from spillway survival studies.

39. **Page 3-46, Rocky Reach, second Paragraph, last Sentence.** The yearling fall-run chinook survival studies cited in this paragraph were conducted in 1998 not 1999. Also, the results from the Eppard et al. (1999) study were not accurately cited. Eppard et al. (1999) provides two estimates of Rocky Reach survival from yearling chinook release in 1998. Table 10, Page 38 of the report states Rocky Reach project survival, depending upon the model selected, as (0.867, $\hat{SE} = 0.065$) based upon the parallel SR Model and (0.859, $\hat{SE} = 0.042$) based upon the PR model.

40. **Page 3-65, Icicle Creek.** The 19 miles of historical habitat is disputed by USFWS personnel stationed in Leavenworth. Radio-telemetry studies conducted in 2000 by the USFWS indicated that a natural obstruction in the river restricted fish access into the upper watershed. The obstruction is located within the first 3 miles of river upstream of the existing barrier dam.

41. **Page 3-72, Summer/Fall-Run Chinook Salmon, first Paragraph, eighth Line.** We suggest the following modification to the defined spawning distribution of summer chinook in the Methow River. Summer chinook have been observed spawning downstream of French Creek near the mouth of the Methow River immediately upstream of the town of Pateros. This expands the spawning distribution from 38 to 42 miles of habitat.

42. **Page 3-72, Steelhead, ninth Line.** Please modify the following statement, "Spawning occurs primarily in late March, but may extend into July." to "Spawning is initiated as early as late March and can extend into July." Based upon surveys conducted in 1999, peak steelhead spawning appears to be taking place in late April rather than late March.

43. **Page 3-74, Top of page, first partial Paragraph, last Sentence.** The abandonment of planting catchable rainbow was intended to reduce incidental harvest on steelhead smolts although it likely also protects a lesser number of chinook salmon smolts. Please add steelhead smolts to the list of species whose incidental harvest has been reduced by the cessation of planting catchable rainbow trout.

44. **Page 3-74, Riparian and Stream Channel Condition, forth Paragraph, second sentence.** Please modify the second sentence to state, "Ironically, the areas most susceptible to dewatering by low flow events are often the areas containing the highest..."

45. **Page 3-76, Fish Resources, line seven.** Observations of bull trout in the Okanogan Watershed have been limited in recent history. We suggest removing bull trout as an "important" fish resource in the Okanogan Basin. This suggested change is consistent with surveys conducted by the USFS, Okanogan National Forest and conclusions reached in *Washington State, Limiting Factors Analysis for the Okanogan River Watershed.*

46. **Page 3-77, Habitat Condition, first Paragraph, last Sentence.** Please change, "The Wells Dam pool inundates the lower 17 miles of the Okanogan River." to "The Wells project boundary includes the lower 17 miles of the Okanogan River."

During normal operation, the Wells Project does not inundate the entire 17 miles of the lower Okanogan River. The Wells Project boundary was drawn to encompass possible inundated lands during a worst-case scenario flood event. In effect Douglas PUD has the right to inundate the lower 17 miles of the Okanogan River only during times when the Columbia and Okanogan rivers experience a simultaneous 100-year flood event that for some reason might not be mitigated through storage at Grand Coulee and the Canadian Treaty Storage Projects.

47. **3.3.1.1 Project Area, Page 3-83, Wells Dam, Rocky Reach and Rock Island Dam.** Please standardize the months that average flows are compared between projects. We would recommend using June and September rather than using a mixture of months. Also note that average September flows referenced for Wells Dam (114,791 cfs) is much higher than the average September flows cited at Rock Island Dam (74,478 cfs). Given that Rock Island Dam is downstream of Wells Dam and that the Chelan, Entiat and Wenatchee rivers all enter the Columbia River between Wells and Rock Island Dam, these averages appear to be incorrect. Average September flows at Wells Dam should be slightly less than the average September flows at Rock Island Dam.

48. **Page 3-84, Figure 3-5, Average Monthly Flows (cfs) in the Mid-Columbia River at Wells Dam.** Average September flows at Wells Dam appear to be less than 80,000 cfs.

49. **Page 3-85 & Page 3-83, Figure 3-6, Average Monthly Flows (cfs) in the Mid-Columbia River at Rocky Reach Dam.** According to the Figure, average June flows at Rocky Reach are in excess of 150,000 cfs not 136,147 cfs as cited on page 3-83.

50. **Page 3-87, Wenatchee River, first Paragraph, line 6.** The Wenatchee River watershed drains 1,328 square miles not 1.328 square miles.

51. **Page 3-89, Entiat River, second Paragraph, line five.** The maximum and minimum average monthly flows for the Entiat River are incorrect. Both numbers presented in the report do not match with USGS information and are highly unlikely given that the reported numbers exceed those of the Wenatchee and Methow Rivers.

    Please see Figure 3-9. The average monthly flows from this figure indicate that the Entiat River in June averages less than 1,800 cfs and in September averages less than 200 cfs. Please reconcile the text and Figure 3-9.

52. **Page 3-87, 3-89 & 3-91.** Please standardize the average monthly flows being reported for the various tributary streams.

53. **Page 3-91, Okanogan River, second Paragraph, last Sentence.** Please see Comment No. 46.

54. **Page 3-97, Wells Dam, first and second Paragraph.** The temperature excursion cited at the Columbia River at the Wells Hatchery intake is in error. The water temperatures reported here were not collected at the hatchery intake but were collected from the hatchery spawning channel after water had been held in shallow ponds immediately downstream of the intake of the facility. Also, the readings were not collected from a systematic, calibrated subsurface monitor but were instead collected with a non-calibrated, hand-held thermometer, sporadically used to collect relative water temperatures by fish culture staff stationed at the Wells Fish Hatchery.

    Note that the mainstem Columbia River water quality data collected immediately downstream of Wells Dam (Chelan Falls) does not show water temperate excursions above the criteria established for state waters.

55. **Page 4-1, 4.1.1.2 Associated Tributaries, first, second and third Paragraphs, (Alt. 1).** This entire section should be deleted and re-written with emphasis on contrasting the three proposed environmental alternatives. Describing additional actions outside the three alternatives that may be funded regardless of the outcome of the HCP only confuses readers. This comment is similar to Comments No. 7, 8 and 9.

    We suggest changing this section to describe the fact that under the No-Action alternative, no PUD tributary enhancement funds would be available. The agencies are free to spend money on habitat improvements common to all three alternatives so this entire section (4.1.1.2) provides no information related to the decision to select one of the three proposed alternatives.

    This comment also applies to **Page 4-3, 4.1.2.2 Associated Tributaries.**

56. **Page 4-6, second full Paragraph, second Line.** It is important to point out that drawdown is not an option under the No Action Alternative (Alternative 1). It could be an option that is discussed through relicensing of the projects (Alternative 2) or by unanimous consent of the HCP signature parties under Alternative 3.

57. **Page 4-17, Wells Dam, second bullet.** Under Alternative 1, the District is not obligated in the Wells Settlement Agreement to operate the bypass system 24-hours per day during the period that encompasses 95% of the downstream migration.

58. **Off-Site Mitigation, Page 4-43, first Paragraph.** Please add that the proposed Douglas HCP has a provision that if juvenile project survival is greater than 95%, the tributary funding package would be reduced from 2% to 1%. This comment also applies to the section titled: **Tributary Habitat Improvements** found on **Page 4-43**.

59. **Page 4-65.** Please modify "4.9.2.1 Project Are" to "4.9.2.1 Project Area."

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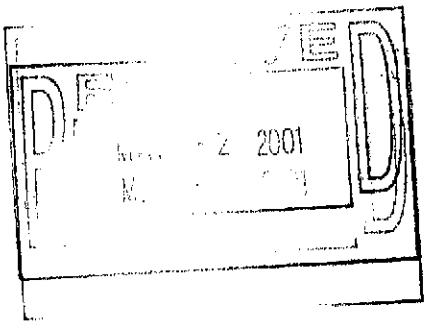

April 30, 2001

National Marine Fisheries Service
Northwest Region, Hydro Program
525 NE Oregon Street, Suite 420
Portland, OR 97232-2737

Re: Draft Environmental Impact Statement (DEIS) for the Habitat Conservation Plans proposed for Public Utility District No. 1 of Douglas County, Washington, and the Public Utility District No. 1 of Chelan County, Washington, 65 *Federal Register* 82976 (Dec. 29, 2000), as amended by 66 *Federal Register* 2903 (Jan. 12, 2001)

Dear NMFS:

Public Utility District No. 1 of Chelan County, Washington (the "District") appreciates this opportunity to comment on the Draft Environmental Impact Statement for the Habitat Conservation Plans proposed for Public Utility District No. 1 of Douglas County, Washington, and Public Utility District No. 1 of Chelan County, Washington (the "DEIS").[1]

We appreciate this first major step in the regulator review of the District's incidental take permit applications.[2] However, we have a number of concerns. First, we are very disappointed in the amount of time it has taken to reach this step. The District's incidental take permit applications were filed with NMFS on July 30, 1998. At NMFS instance, the District along with Public Utility District No. 1 of Douglas County have funded Parametrix, Inc. since 1998 to expedite NMFS' regulatory review of the incidental take permit applications. The District promised a two-year regulatory review

[1] 65 *Federal Register* 82976 (Dec. 29, 2000), as amended by 66 *Federal Register* 2903 (Jan. 12, 2001).
[2] Application for Individual Incidental Take Permit for the Rocky Reach Hydroelectric Project, FERC No. 2145 (July 30, 1998); Application for Individual Incidental Take Permit for the Rock Island Hydroelectric Project, FERC NO. 945 (July 30, 1998).

process in consideration for funding NMFS' contractor. We have not received expedited treatment.

Second, the DEIS does provide a clear explanation of the Anadromous Fish Agreements and Habitat Conservation Plans (the "Agreements") upon which the incidental take permit applications are based. As a result the Agreements cannot be fully compared with the other alternatives, and the analysis of the Agreements is not complete or accurate. To address the second problem, the District's comments start with a summary and interpretation of the Agreements. In this section the District provides, for the benefit of NMFS and the general public, a general summary of how the Agreements should be interpreted.

Third, as pointed out in the Specific Comments, there are several instances where NMFS misstates data. This provides a skewed view of how the Agreements will work, and how the Agreements compare with other alternatives. Of greatest concern is NMFS continued reliance upon the Quantitative Analytical Report (the "QAR"). The QAR is another processes the District and Public Utility District No. 1 of Douglas County, Washington were forced to fund to expedite review of the Agreements. In consideration for funding the QAR, NMFS promised that the QAR would be a fair, open and scientific process.

The QAR should not be included in the DEIS. NMFS has kept the QAR internal to NMFS. The QAR is not final or peer reviewed. The District has not had an opportunity to view the QAR, yet NMFS heavily relies upon the QAR throughout the DEIS. As a result, neither the District nor the public can evaluate the DEIS with the QAR. Furthermore, based upon the District's limited knowledge of the QAR the QAR is severely mischaracterized in the DEIS.

Fourth, again as pointed out in the Specific Comments, the District continues its objection to NMFS' choice of alternatives. NEPA requires an environmental impact statement to review the proposed action with other measures. It is not appropriate for NMFS to compare regulatory review processes as alternatives in a DEIS.

It is the District's hope that NMFS will address the concerns we raise in these comments and amend the DEIS accordingly.

Summary of the Agreements

On July 30, 1998, the District submitted incidental take permit applications to NMFS for the Rocky Reach and Rock Island Hydroelectric Projects (the "Projects"). The incidental take permit applications are based upon proposed Anadromous Fish Agreements and Habitat Conservation Plans (the "Agreements"). The Agreements are

"intended to constitute a comprehensive and long term adaptive management plan for Plan Species[3] and their habitat as affected by the Projects."[4] They are unlike any other habitat conservation plan ever filed with the United States Fish and Wildlife Service or the National Marine Fisheries Services.

The Agreements are revolutionary due to their scope and management plan. The Agreements are titled Anadromous Fish Agreements and Habitat Conservation Plans and not just habitat conservation plans because they address more than just the Endangered Species Act. They also address Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning and Conservation Act, the Clean Water Act and Title 77 of the Revised Code of Washington in one comprehensive agreement for each Project.

Because the Agreements are comprehensive settlements, they propose a standard greater than that required under the Endangered Species Act. The Agreements establish a survival standard of 100% No Net Impact ("NNI") which means that the Projects appear invisible to the species migrating past the Projects. There are two basic components of NNI. First, to protect the species migrating past the Projects, the Agreements establish a series of performance standards based upon the actual survival of the species, not simply measures to be implemented regardless of their actual benefit to the species. Second, all unavoidable mortality is mitigated. This occurs though tributary habitat improvements and through state of the art hatchery supplementation. Central to the Agreements are the processes for making decisions and resolving disputes. All the stakeholders that sign the Agreements make the decisions, and disputes can be resolved in as little as 16 days. These Agreements actually protect the survival of the salmon and restore their habitat.

The level of protection afforded in the Agreements is provided to not just listed Upper Columbia River steelhead and Upper Columbia River spring chinook. It also protects all other species of salmon migrating past the Projects; even coho salmon which are extinct from the Upper Columbia River, but are being re-introduced by the Confederated Tribes and Bands of the Yakama Indian Nation (the "Yakama Indian Nation").

The Agreements are the result of an extensive collaborative process dating back to 1993, and represent the collective wisdom and professional judgment of the scientists and regional policy makers of the NMFS, the United States Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Confederated Tribes and Bands of the

[3] Plan Species are defined as spring, summer and fall chinook salmon (*Oncorhynchus kisutch*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*). Rocky Reach at Section XII.11; Rock Island at Section XII.11.

[4] Rocky Reach, Introduction, Paragraph A.; Rock Island, Introduction, Paragraph A.

Colville Indian Reservation, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, and American Rivers, Inc. participating in the process.

The Agreements

To assist in understanding the Rocky Reach and Rock Island Anadromous Fish Agreements and Habitat Conservation Plans, the District provides the following summary and interpretation of the Agreements.

What species are protected?

The Agreements apply to anadromous salmonids, known as the "Plan Species."[5] Plan Species are defined as spring, summer and fall chinook salmon (*Oncorhynchus kisutch*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*).[6] However, since coho salmon are extinct in the portion of the Columbia River affected by the Projects, the District did not request that the incidental take permit apply to coho salmon. The sub-set of the plan species for which the incidental take permits are requested are referred to in the Agreement as the "Permit Species."

What is the biological plan? (the standards)

The Survival Standards. The objective of the Agreements is to achieve 100% No Net Impact for each Plan Species affected by the Projects.[7] NNI consists of two components: (1) 91% Project Survival achieved within the geographic area of each Project by project improvement measures, including an independent standard of 95% Juvenile Dam Passage Survival; and (2) 9% compensation for Unavoidable Project Mortality provided through hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs.[8] NNI will be maintained for the duration of the Agreement for each Plan Species affected by the Project. A coordinating committee composed of each entity that signs the Agreements will ensure the NNI is achieved and maintained by: (1) overseeing monitoring and evaluation, and (2) periodically adjusting the measures being implemented to address actual project survival and compensate for all unavoidable project mortality.[9]

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[5] Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project, FERC No. 2145 (Rocky Reach), Section XII.1; Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project, FERC No. 943 (Rock Island), Section XII.1.
[6] Rocky Reach at Section XII.11.; Rock Island at Section XII.11.
[7] Rocky Reach, Introduction, Paragraph B; Rock Island, Introduction, Paragraph B.
[8] Rocky Reach at Section III.1.; Rock Island at Section III.1
[9] Rocky Reach at Section III.2.; Rock Island at Section III.2.

To achieve NNI, the District is obligated to achieve and maintain 91% Project Survival, which means that 91% of each Plan Species, juvenile and adult combined, survive Project effects, including delayed mortality wherever it may occur.[10] However, recognizing that the impacts associated with hydroelectric projects are focused at the concrete (the Dam) the Agreements require the District to achieve and maintain 95% Juvenile Dam Passage Survival, which means that 95% of the juvenile Plan Species over 95% of each species' migration survive the journey through the forebay, dam, and tailrace of each Project.[11]

There is one exception to the 95% Juvenile Dam Passage Survival standard. Provided that turbine intake screens are installed at the Dam, spring-migrating chinook salmon (*Oncorhynchus tshawytscha*) smaller than 50 mm in length will be excluded from 95% Juvenile Dam Passage Survival, but not from 91% Project Survival for the full run of that Plan Species.[12] This exception is necessary to account for the competing needs between species and choosing a way to best protect all the species.

The Project Survival standard must be achieved for juvenile and adult Plan Species. However, current technology does not exist to measure adult survival. But, during the term of the Agreements, the parties that developed the Agreements felt very comfortable that technology would be developed, sooner rather than later, to measure adult survival. Since the District was obligated to achieve and maintain the standard, all signatories to the Agreements have the incentive to develop the technology and have it implemented as soon as possible

Until adult survival can be measured, to insure that adults received the maximum protection practicable in a way that can be measured, the Agreements' Adult Passage Plan defines actions to be taken by the District to protect adults. The Agreements give high priority to adult survival in the achievement of 91% Project Survival for each Plan Species.[13] This means that the District must provide for adult as well as juvenile survival. The District has a variety of tools it may use to achieve the targeted survival rate. These tools include, but are not limited to, a requirement that adult passage systems at the Project will be maintained and operated according to the detailed fishway operating plan identified in the Agreements or to criteria developed through the coordinating committee.[14] Spill and turbine units will be operated in a manner that provides for adult passage while meeting the 95% Juvenile Dam Passage Survival rate.[15] Areas within the adult fish passage system which are identified by the coordinating committee as either

[10]Rocky Reach at Section IV.1.a.; Rock Island at Section IV.1.a.
[11] Rocky Reach at Section IV.1.a.; Rock Island at Section IV.1.a.
[12] Rocky Reach at Section IV.1.b.; Rock Island at Section IV.1.b.
[13] Rocky Reach at Section IV.2.b.; Rock Island at Section IV.2.b.
[14] Rocky Reach at Section IV.2.b.i.; Rock Island at Section IV.2.b.i.
[15] Rocky Reach at Section IV.2.b.ii.; Rock Island at Section IV.2.b.ii.

consistently out of criteria or where significant delay occurs will be modified as soon as feasible by the District.[16] The District will use best efforts to eliminate identified sources of adult injury and mortality during adult migration through the Dam.[17] In addition, the District will identify adult fallback rates at the dam, and the coordinating committee will identify a method to protect steelhead kelts at the Dam, and a reduction in fallback rates, mortalities, and protection of kelts will be factored into juvenile bypass and adult passage development and implementation and into Project operation decisions.[18]

If the District is unable to achieve 91% Project Survival, including achievement of 95% Juvenile Dam Passage Survival, then the District is obligated to consult with the coordinating committee to jointly seek a solution.[19] If a solution cannot be identified to achieve the standards, then any Party may take action to withdraw from the Agreements on the basis that it is impossible to achieve the standards in the Agreement, or take action under any other provision of the Agreement.[20]

Unavoidable Project Mortality. Since hydroelectric projects obstruct the waterways the salmon use to migrate there is some mortality that just cannot be eliminated. This mortality is addressed in the Agreements as "Unavoidable Project Mortality." Unavoidable Project Mortality is initially assumed to be 9%, based on several assumptions regarding Project impacts.[21] The word "initially" is very important. It is currently not possible to measure Unavoidable Project Mortality. The biologists and policy makers that developed the Agreements', in their best professional judgment, assumed juvenile dam passage mortality to be 5% and a net of 4% mortality for all other project effects. These include, but are not limited to, reservoir, juvenile delayed, and adult mortality with credit for natural mortality.[22] Since Unavoidable Project Mortality is an assumption, it is implicit within the Agreements that once technology is developed to measure these numbers it will be accurately established.[23] Since the Agreements do not assign responsibility to any one party to take on this responsibility, the responsibility lies with the coordinating committee as a whole. Since the Agreements provide for the assumption to be verified all signatories to the Agreements have the incentive to develop the technology and have it implemented as soon as possible. In the event Unavoidable Project Mortality is proven to be something other than 9%, then the coordinating committee must decide what action should be taken.[24]

[16] Rocky Reach at Section IV.2.b.iii.; Rock Island at Section IV.2.b.iii.
[17] Rocky Reach at Section IV.2.b.iv.; Rock Island at Section IV.2.b.iv.
[18] Rocky Reach at Section IV.2.; Rock Island at Section IV.2.
[19] Rocky Reach at Section III.3.; Rock Island at Section III.3.
[20] Rocky Reach at Section III.3.; Rock Island at Section III.3.
[21] Rocky Reach at Section XII.19.; Rock Island at Section XII.19.
[22] Rocky Reach at Section XII.19.; Rock Island at Section XII.19.
[23] Rocky Reach at Sections III.2. and XII.19.; Rock Island at Section III.2. and XII.19.
[24] Rocky Reach at Section III.; Rock Island at Section III.

Until Unavoidable Project Mortality can be established, 9% Unavoidable Project Mortality is assumed to be correct.[25] Unavoidable Project Mortality is addressed through hatchery and tributary compensation, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs[26]

Hatchery Compensation Plan. Hatchery compensation is provided by the Agreements' Hatchery Compensation Plan. The District will provide the necessary funding and capacity to meet the 7% hatchery compensation level set by the NNI, and operate the hatchery according to the terms developed by the other signatories to the Agreement (the "JFP" or "Joint Fisheries Parties"), the NMFS Section 10 incidental take permit, and in consultation with the Hatchery Committee.[27] The JFP are responsible for developing the plans and programs necessary to implement the Hatchery Compensation Plan.[28] This allocation of responsibility is significant in that NMFS's policy decisions regarding management of "wild" fish under the Endangered Species Act may not allow full utilization of the hatchery capacity provided by the District. If this occurs, then as long as the District has provided the hatchery capacity and remains able to fund hatchery operations, the District will be in full compliance with the Agreement and its incidental take permit. However, under the Agreement, hatchery production will never be reduced to zero without action by the Federal Energy Regulatory Commission because the Agreement allows for the production of hatchery fish to compensate for original Project inundation.[29]

The fact that NMFS can reduce hatchery capacity is the reason the tribes do not currently support the Agreements. This is where it is important to recognize the fact that the Agreements are comprehensive settlement agreements. The tribes' current position is that they require a guarantee from NMFS that throughout the term of the Agreements the hatcheries will be fully utilized before they are willing to resume support of the Agreements. It is only through increased numerical abundance of the Plan Species that the tribes can fully realize the value of their fishing rights. The tribes dispute NMFS' policy decision to treat hatchery fish differently from wild fish. In addition, the tribes argue that the numbers of fish to be produced by the Projects' hatcheries is so small they will not appreciably reduce the likelihood of the survival and recovery of the Plan Species in the wild. This view is shared by the District and many other parties that developed the Agreements. Nevertheless, since NMFS and the other parties that developed the Agreements are situated differently than the tribes, they can continue to support the Agreements in light of this objection.

[25] Rocky Reach at Section XII.19.; Rock Island at Section XII.19.
[26] Rocky Reach at Sections III.1. and III.2.; Rock Island at Section III.1. and III.2.
[27] Rocky Reach at Section VIII.2.; Rock Island at Section VIII.2.
[28] Rocky Reach at Section III.4.; Rock Island at Section III.4.
[29] Rocky Reach at Section VIII.3.; Rock Island at Section VIII.3.

The initial estimated hatchery production capacities for Plan Species needed to provide compensation for Unavoidable Project Mortality are based on a variety of factors. Those include average adult returns of plan species for a baseline period, a 7% compensation requirement, and baseline adult/smolt survival rates for existing mid-Columbia River hatcheries. The estimated initial production capacity will be adjusted over time to help achieve and maintain NNI. As changes occur in the average adult returns of Plan Species, and in adult/smolt survival rate from the hatchery production facilities the production capacity will change. However, as described above, the original inundation mitigation will not be reduced.[30]

Tributary Conservation Plan. The Tributary Plan will compensate for 2% of Unavoidable Project Mortality.[31] The Tributary Conservation Plan consists of the Agreement and Exhibit B "Tributary Compensation Plan Species Account Project Selection, Implementation, and Evaluation Plan."[32] Under the Tributary Plan, the District will provide a Plan Species Account to fund projects for the protection and restoration of Plan Species' habitat within the Columbia River watershed, and the Okanogan, Methow, Entiat and Wenatchee River watersheds.

The Tributary Plan will be managed by a Tributary Committee composed of one representative from each party that signs the Agreement. In order to achieve minimum costs and maximize the monies in the Plan Species Account, there will be one Tributary Committee that manages the Tributary Plans for the Wells, Rocky Reach and Rock Island Hydroelectric projects.[33] In addition, to assure that the maximum amount of money will be spent on actual projects, committee overhead costs cannot exceed $80,000 without the unanimous vote of the Tributary Committee.[34] Whenever feasible, projects selected by the Tributary Committee shall "take into consideration and be coordinated with other conservation plans or programs", and "whenever feasible, the Tributary Committee shall cost-share with other programs, seek matching funds, and 'piggy-back' programs onto other habitat efforts."[35] The District has spoken with the staff of the Northwest Power Planning Council and the Governor's Locke's Salmon Recovery Task force, and many other entities. All are eager to coordinate their habitat programs with the Agreements' Tributary Programs.

Land Use Decisions. When the District makes land use or related permit decisions on Project lands that affect reservoir habitat, the District must consider the cumulative

[30] Rocky Reach at Section VIII.3.; Rock Island at Section VIII.3.
[31] Rocky Reach at Section VII.2.; Rock Island at SectionVII.2.
[32] Rocky Reach at Section VII.1.; Rock Island at Section VII.1.
[33] Rocky Reach at Section VII.3.; Rock Island at Section VII.3.
[34] Rocky Reach at Section VII.4.a.; Rock Island at Section VII.4.a.
[35] Rocky Reach at Section VII.3.e.; Rock Island at Section VII.3.e.

impact effects in order to meet the conservation objectives of the Agreement, requirements of the FERC license, and other applicable laws and regulations. The District will also notify and consider comments from the Parties to the Agreement regarding land use permit application on Project owned lands.[36] Applicants to use or occupy Project lands or waters must be informed by the District that such use or occupation may result in an incidental take of an endangered or threatened species under the ESA, and may require advance authorization from NMFS or USFWS.[37]

Early Termination Mitigation. Lastly, if the incidental take permit issued by NMFS is terminated early, NMFS may require the District to mitigate for any past incidental take that has not been sufficiently mitigated prior to the termination of the permit. NMFS would require the District to continue relevant mitigation measures of the Agreement for some or all of the time period covered by the permit as originally issued.[38]

Thus, the combination of the Juvenile Dam Passage Survival and Project Survival standards coupled with the required spill for juveniles and the required measures for adults, the standards that must be satisfied for land use and permitting decisions on Project lands, and the requirement to mitigate for any past incidental take that was not sufficiently mitigated in the event the incidental take permit is terminated early provides each Plan Species with the maximum protection practicable and minimizes and mitigates the impacts of any taking as is required by Section 10 of the Endangered Species Act. Furthermore, in order to make sure that everything is being done to protect, restore and increase the abundance of the Plan Species and their habitat, the Agreements mitigate for all the unavoidable mortality associated with the Projects through the Tributary Conservation Plan and the Hatchery Compensation Plan. Therefore, the 100% No Net Impact standard of the Agreements is truly revolutionary in salmonid management on the Columbia River.

How are the standards measured?

Survival Standards. Measurement and evaluation of the 95% Juvenile Dam Passage Survival will commence by the 2003 juvenile migration unless agreed to otherwise by the coordinating committee. However, the 2003 date was established under the assumption that the regulatory review process for the Agreement would take no more than 18 months from the date the Agreements were filed with NMFS in 1998. Due to the fact that regulatory review process has taken longer than anyone ever expected, it may be necessary to revisit the 2003 date.

[36] Rocky Reach at Section V.1.; Rock Island at Section V.1.
[37] Rocky Reach at Section V.2.; Rock Island at Section V.2.
[38] Rocky Reach at Section X.6.; Rock Island at Section X.6.

The completion of measurement and evaluation is expected to take three years.[39] The 91% Project Survival measurement may also occur by 2003 juvenile migration should the coordinating committee elect.[40] The intent of the language addressing "95% Juvenile Dam Passage Survival and 91% Project Survival"[41] is to expressly allow the coordinating committee to measure juvenile survival through the reservoir, forebay, dam, and tailrace as opposed to just measuring juvenile survival through the forebay, dam, and tailrace. The parties wanted to allow this option because it is easier to measure survival through the reservoir, forebay, dam and tailrace, than just through the forebay, dam, and tailrace. The parties intended to require only the measurement of 95% Juvenile Dam Passage Survival by the 2003 juvenile migration.

The parties did not intend to require the measurement of 91% Project Survival on any certain date. The reason is that technology does not currently exist to measure the adult component of 91% Project Survival. This is explained in greater detail above in the section "What is the biological plan? (the standards), *The Survival Standards*."

The Agreements do not contain the protocol to be used to measure 95% Juvenile Dam Passage survival because in 1998, when the Agreements were developed, the parties thought that the regulatory approval process would be completed within 18 months of filing. The parties felt that this level of detail was not necessary for the Agreements and would simply slow down the implementation process. Therefore, the parties established a process to create the protocol, with general parameters for the protocol.[42] The Agreements required the coordinating committee to develop the protocol by March 1, 2001. This provided a grace period of two years before the protocol would be needed to work out any disagreements. Since March 1, 2001 has arrived before regulatory review process for the Agreements has been completed the parties need to revise this date.

Tributary Conservation Plan. The purpose of the Tributary Plan is to create and fund projects for the restoration and protection of Plan Species habitat. This will provide 2% compensation for the Unavoidable Project Mortality. The Tributary Plan, however, does not require the Parties to actually measure whether the Tributary Plan compensates for exactly two percent Unavoidable Project Mortality.[43] The parties that developed the Agreements made this decision based upon the fact that it was unlikely that measurement could occur, and that if it could occur, the cost and time associated with measurement would outweigh any benefit it could possibly produce. However, the individual tributary projects and budgets that make up the Tributary Plan will be evaluated by the Tributary

[39] Rocky Reach at Section IV.3.b.; Rock Island at Section IV.3.b.
[40] Rocky Reach at Section IV.3.b.; Rock Island at Section IV.3.b.
[41] Rocky Reach at Section IV.3.b.; Rock Island at Section IV.3.b.
[42] Rocky Reach at Section IV.3.c.; Rock Island at Section IV.3.c.
[43] Rocky Reach at Section VII.2.; Rock Island at Section VII.2.

Committee.[44] The Tributary Committee will select projects that work toward furthering the purpose of the Tributary Plan for Plan Species.[45]

Hatchery Compensation Plan. The Hatchery Compensation Plan will provide 7% compensation for the Unavoidable Project Mortality. Measurement and evaluation of the Hatchery Program is explained above in the section "What is the biological plan? (the standards), *Hatchery Compensation Plan.*"

Unavoidable Project Mortality. The measurement and evaluation of Unavoidable Project Mortality is explained above in the Section ""What is the biological plan? (the standards), *Unavoidable Project Mortality.*"

What happens if juvenile survival results fall short of expectations?

Measurement and evaluation of 95% Juvenile Dam Passage Survival or the juvenile component of 91% Project Survival at the end of Phase I will begin by the 2003 juvenile migration unless this date is revised. The process is expected to take three years. Thus, there is a three year window where the parties do not know whether or not the survival standard has been achieved. In order to insure the protection of the Plan Species the Agreements contain a process which can be used to provide an interim evaluation of the Projects' survival and, as necessary, require the implementation of additional interim measures.[46]

If measurement and evaluation of 95% Juvenile Dam Passage Survival or the juvenile component of 91% Project Survival at the end of Phase I of the Juvenile Passage Survival Plan has not been achieved, then the coordinating committee will decide on additional "tools"[47] to implement to achieve the survival standard. The District will implement the tools selected by the coordinating committee before the next migration period. These tools, which could include Trading[48] and additional spill, will be selected by the coordinating committee based on technical feasibility, availability, and adherence

[44] Rocky Reach at Section VII.3.a.; Rock Island at Section VII.3.a.
[45] Rocky Reach at Section VII.4.c.; Rock Island at Section VII.4.c.
[46] Rocky Reach at Section IV.3.a.iii.; Rock Island at Section IV.3.a.iii.
[47] The term "tools" is a defined term in the Agreements to mean "any action, structure, facility or program (on-site only) at the Project, except those prohibited in Section IX.10 'Drawdowns/Dam Removal/Non-Power Operations' that are intended to improve the survival of Plan Species migrating through the Project. Tools do not include fish transportation unless otherwise agreed by the Coordinating Committee. This term is a sub-set of Measures". Rocky Reach at Section XII.17; Rock Island at Section XII.17.
[48] The term "trading" is a defined term in the Agreements to mean "the allocation of the net survival benefits in excess of 95% Juvenile Dam Passage Survival and 91% Project Survival from a downstream Dam or Project to an upstream Dam or Project, or on a stock specific basis, from an upstream Dam or Project to a downstream Dam or Project in lieu of offsite compensation measures for the affected stocks." Rocky Reach at Section XII.18; Rock Island at Section XII.18.

to the total dissolved gas requirements.[49] The coordinating committee must jointly decide which additional tools will allow the District to achieve 95% Juvenile Dam Passage Survival or 91% Project Survival. The following criteria will be used: likelihood of biological success; time required to implement; and cost-effectiveness of solutions. The balancing of a tool's cost-effectiveness will only take place where two or more alternatives are comparable in their biological effectiveness.[50]

A cycle of implementation of additional tools and measurement is repeated until the survival standards are achieved.[51] If a solution cannot be identified to achieve the standards, then any Party may take action to withdraw from the Agreements on the basis that it is impossible to achieve the standards in the Agreements, or take action under any other provision of the Agreements.[52]

How do disagreements get resolved?

Rule. A central feature of the Agreements is the process for resolving disputes. All disputes under the Agreements are resolved according to the Agreements' dispute resolution process. This includes those disputes involving the Passage Survival Plan, the Hatchery Plan, the Tributary Plan, and compliance with the NNI standard and its component survival standards for the Dam, Project, and Unavoidable Project Morality.[53]

Exceptions. There are three circumstances were disputes are not required to be resolved through the Agreements' dispute resolution process. NMFS has reserved the right to use its enforcement powers and remedies of the ESA without first resorting to the Agreements' dispute resolution process. [54] While NMFS intends to utilize the Agreements' dispute resolution process and has the authority to agree to alternative dispute resolution, NMFS' reserved this right to insure that it was not delegating away its authority.

In addition, neither the Agreement nor the dispute resolution process can be used to abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in a treaty, executive order, statute or court decree.[55]

Lastly, any Party can require the matter to be decided at FERC or in a court of competent jurisdiction. However, disputes must proceed through Stage 1 and 2 of the

[49] Rocky Reach at Section IV.6.; Rock Island at Section IV.6.
[50] Rocky Reach at Section IV.7.a-c.; Rock Island at Section IV.7.a-c.
[51] Rocky Reach at Section IV.3.10.; Rock Island at Section IV.3.10.
[52] Rocky Reach at Section III.3.; Rock Island at Section III.3.
[53] Rocky Reach at Section XI.1.a.; Rock Island at Section XI.1.a.
[54] Rocky Reach at Section XI.1.b.; Rock Island at Section XI.1.b.
[55] Rocky Reach at Section XI.1.c.; Rock Island at Section XI.1.c.

dispute resolution process before a Party invokes the jurisdiction of FERC or a court.[56] The Agreement, however, is not intended to create jurisdiction in any court.[57]

Dispute Resolution Process:

Stage 1: Coordinating Committee

Any matter, which involves compliance with the Agreement, is first referred to the respective committee dealing with that issue. That committee has twenty days to resolve the dispute. If there is no resolution within twenty days the matter may proceed to the next stage in the dispute resolution proceeding.[58]

Stage 2: Policy Committee

Any Party may refer the dispute to the Policy Committee, who shall have thirty days to convene and consider the dispute. If there is no resolution at the end of thirty days any Party may either proceed to the next stage or invoke FERC jurisdiction.[59] If a Party decides to invoke the FERC process or proceed to a court of competent jurisdiction then the dispute resolution procedure is terminated.[60] Provided a Party wishes to continue the dispute resolution proceeding, a party may seek to have the issue mediated by the Third Stage.

Expedited Process. If an issue must be resolved within 30 days, and does not involve a total estimated cost of $325,000 in 1998 dollars, then an expedited procedure is used. All Parties are given notice that the coordinating committee will have the matter finally resolved at an identified coordinating committee meeting.[61] If the coordinating committee does not reach a consensus, then any Party may refer the matter to dispute resolution under Stage 3 by giving notice.[62] The mediator has 15 days from the date selected to hear and resolve the dispute.[63] While the mediation decision is not binding, it may be admitted as evidence in any action to resolve the dispute.[64] The mediator's decision, however, must be implemented immediately.[65]

[56] Rocky Reach at Section XI.3.c.; Rock Island at Section XI.3.c.
[57] Rocky Reach at Section XI.1.d.; Rock Island at Section XI.1.d.
[58] Rocky Reach at Section XI.3.a.; Rock Island at Section XI.3.a.
[59] Rocky Reach at Section XI.3.b.; Rock Island at Section XI.3.b.
[60] Rocky Reach at Section XI.3.c.; Rock Island at Section XI.3.c.
[61] Rocky Reach at Section XI.7.a.; Rock Island at Section XI.7.a.
[62] Rocky Reach at Section XI.7.b.; Rock Island at Section XI.7.b.
[63] Rocky Reach at Section XI.7.d.; Rock Island at Section XI.7.d.
[64] Rocky Reach at Section XI.7.d.; Rock Island at Section XI.7.d.
[65] Rocky Reach at Section XI.7.e.; Rock Island at Section XI.7.e.

Standard Mediation Timing. Under the standard mediation procedure, the Parties shall agree on a mediator within 10 days of the date mediation was first requested.[66] The mediator shall have control over the process of mediation, however, it must be completed within 30 days of the date the mediator is selected.[67] If the Parties do not come to an agreement, then the mediator may prepare, within 45 days, an opinion on how the decision should be resolved.[68]

Expedited Dispute Resolution Timing. The expedited procedure can result in the issuance of a mediation decision sixteen days from a coordinating committee impasse.[69] This assumes that the Chief Judge can be contacted in one day, and the Chief Judge appoints the mediator that day. According to the expedited procedure, if the Parties are unable to agree on a single mediator within ten days of the mediation request, then the Chief Judge of the United States District Court for the Eastern District of Washington shall appoint the mediator.[70]

Dispute Resolution Twists. If the Parties do not select a mediator within ten days of the date that mediation is requested, the Chief Judge of the U.S. District Court for the Eastern District of Washington appoints the mediator.[71] While mediation is non-binding, the mediator will issue a decision. This decision can be introduced as evidence at FERC or Court.[72] The purpose of the mediation decision is to create a dynamic where the parties will stop fighting. The Parties have found after working together for many years that there are times when they just want to argue the merits of their position to a neutral third party and have a decision rendered. Once the decision is rendered it will not likely be appealed. As an incentive not to appeal, and to make sure that the dispute resolution process was not a waste of time, the Parties agree that they will allow the mediation decision to be entered into evidence upon appeal. The Parties intentionally did not decide the weight that should be given to the decision. This way each side could argue for or against the opinion without knowledge of the weight FERC will give to the decision. This dynamic coupled with the fact that the Party bringing the issue to dispute resolution must prove their case by a preponderance of the evidence should prevent most appeals.[73]

What is the term of the Agreements?

[66] Rocky Reach at Section XI.3.d.i.(1).; Rock Island at Section XI.3.d.i.(1).
[67] Rocky Reach at Section XI.3.d.i.(4).; Rock Island at Section XI.3.d.i.(4).
[68] Rocky Reach at Section XI.3.d.ii.; Rock Island at Section XI.3.d.ii.
[69] Rocky Reach at Section XI.7.d.; Rock Island at Section XI.7.d.
[70] Rocky Reach at Section XI.3.d.2.; Rock Island at Section XI.3.d.2.
[71] Rocky Reach at Section XI.3.d.2.; Rock Island at Section XI.3.d.2.
[72] Rocky Reach at Section XI.7.; Rock Island at Section XI.7.
[73] Rocky Reach at Section XI.1.e.; Rock Island at Section XI.1.e.

The Agreements will remain in effect 50 years from the date the Agreements are executed by all Parties and regulatory approvals are received.[74]

How do people get out of the Agreements?

Triggers

There are several ways the Agreements will terminate automatically. The first way is at the end of the fifty-year term of the Agreements, as seen in Section I. The second way is if the FERC issues the District a non-power license for the Project. The third option is in the event the FERC orders removal of the Project. The fourth reason is if FERC orders drawdown of the Project. If the District's FERC license is terminated or transferred to another entity than the District's obligations under these Agreements are terminated. The Parties agree, however, that the terms of these Agreements are binding on their respective successors and assigns.[75]

A party may withdraw from the Agreements when fifteen years have elapsed from March 1, 1998 provided that NNI has not been achieved and maintained, or the Project has achieved and maintained NNI but the Plan Species are not rebuilding and the Project is a significant factor in the failure to rebuild.[76] The reason for this provision is that the Juvenile Passage Plan requires a cycle of implementing and testing measures to achieve 95% Juvenile Dam Passage Survival. As long as the District implements the measures required by the coordinating committee it is not in violation of the Agreements if 95% Juvenile Dam Passage Survival is not achieved. Since this process could go on throughout the term of the Agreements, an opportunity was provided to allow a Party to withdraw; hence the section is titled "Enough Already". Since the only restrictions on the measures the coordinating committee can recommend are drawdown, non-power operations, or dam removal, theoretically the only reason to withdraw would be to advocate for the implementation of one of these measures. But, a Party will hopefully feel that the Agreements provide the best process possible for managing salmon issues at the Projects, and not choose to withdraw from the Agreements.

This "Enough Already" provision applies to NMFS and USFWS differently than any other Party to the Agreements. NMFS or USFWS may not elect to withdraw unless they intend to explicitly seek drawdown, dam removal, or non-power operations. But, under these circumstances NMFS and the District may agree to allow NMFS to pursue

[74] Rocky Reach at Section I.; Rock Island at Section I.
[75] Rocky Reach at Section II.1.; Rock Island at Section II.1.
[76] Rocky Reach at Section II.2.a.i.; Rock Island at Section II.2.a.i.

drawdown, dam removal, or non-power operations and keep NMFS in the Agreements and keep NMFS from terminating the incidental take permit.[77]

A Party to the Agreements, other than the District, may withdraw at any time based on non-compliance of the District to the provisions of the Agreements. The District cannot use its own failure to comply with the Agreements as a basis for withdrawal. However, out of fairness the District may withdraw from the Agreements if another Party to the Agreements is failing to comply with the Agreements.[78]

A Party may withdraw from these Agreements if a regulatory entity takes action that is detrimental to the achievement of the obligations each Party is given by these Agreements, and the regulatory entity's actions materially alter or are contrary to the terms of these Agreements.[79] For example, if NMFS revokes the incidental take permit required to implement the Agreements, then a Party may withdraw from the Agreements.[80]

In the event that all Parties agree in writing that the obligations imposed by these Agreements are impossible to achieve, then a Party may withdraw from the Agreements.[81]

Because a Party may withdraw from the Agreements, the Parties created a process to try to resolve their issue so that they would not withdraw. In the event a Party decides to withdraw from the Agreements, it shall provide all other Parties with notice, unless it is withdrawing due to non-compliance. After receipt of a notice to withdraw, the other Parties shall have 120 days from the date of the notice to provide notice of their intention to withdraw or the right to withdraw will be deemed waived. The notices are required to be in writing and either served in person or provided by U.S. Mail with a return receipt requested.[82] The Party seeking to withdraw must make itself available for at least one policy meeting where other Parties may attempt to persuade the Party not to withdraw. The policy meeting will take place within the sixty days after notice is given or the right is waived.[83]

In the event a Party does withdraw from the Agreements, there are no further restraints placed upon the withdrawing Party. Thereafter the withdrawing Party is not bound by the Agreements, and all rights and remedies of a non-Party are available to the

[77] Rocky Reach at Section II.2.a.ii.; Rock Island at Section II.2.a.ii.
[78] Rocky Reach at Section II.2.b.; Rock Island at Section II.2.b.
[79] Rocky Reach at Section II.2.c.; Rock Island at Section II.2.c.
[80] Rocky Reach at Section II.2.e.; Rock Island at Section II.2.e.
[81] Rocky Reach at Section II.2.d.; Rock Island at Section II.2.d.
[82] Rocky Reach at Section II.f.; Rock Island at Section II.f.
[83] Rocky Reach at Section II.3.; Rock Island at Section II.3.

withdrawing Party. The rights of a withdrawing Party is modified as set forth in Section II.5, Section IX.3.a and c, and Section X.5.[84]

In the event the Agreements are terminated, voided, or determined to be unenforceable then the District shall continue to implement the last measures agreed upon until FERC orders them to behave differently. The Parties, however, are not restrained from advocating to FERC measures to replace the Agreements. The exceptions to this rule are set forth in Section VII.4.f, Sections IX.3.a and c, Section X.5 and Section X.6.[85]

Specific Comments

1. Page S-15, 2-32, Alternative 3 (Applicants' Proposed Action – Project HCPs), 2nd paragraph. The text states that "the EIS required for implementing measures in the HCPs ..." An EIS may not be needed in order to implement measures in the HCPs. In most cased an environmental checklist or an environmental assessment will be sufficient.

2. Page S-15, 2-32, Alternative 3 (Applicants' Proposed Action – Project HCPs), 2nd paragraph. The text states that "implementing measures in the HCP would be undertaking by FERC with a separate Section 7 consultation with NMFS". It is the District's understanding that the HCPs will be presented to FERC with a request that they be incorporated into the project licenses. FERC's action many not require a new Section 7 consultation with NMFS and USFWS.

3. Page S-18, 2-35, last sentence before the start of Section S.5.3.6 and Section 2.3.3.6. The sentence reads "...to achieve 95 percent juvenile dam passage survival and 91 percent project survival." Replace the "and" between "juvenile dam passage" and "project survival rates" with an "or". While the word "and" is used in the HCPs, its use was an error. An errata sheet will be prepared for the final HCP on this issue. The intent of the parties was to require the measurement of 95% juvenile dam passage survival starting in 2003 as a default. However, the parties desired to leave the coordinating committee the discretion to forgo measurement of 95% juvenile dam passage survival and just measure the juvenile component of 91% project survival in 2003. There is not an obligation to measure 91% project survival in 2003. The coordinating committee will measure 91% project survival when an protocol can be developed.

4. Page S-23, 2.3.3.11, Project Cumulative Effects. This text attempts to summarize Section V "Reservoir As Habitat" of the HCPs. However, the summary omits an

[84] Rocky Reach at Section II.4.; Rock Island at Section II.4.
[85] Rocky Reach at Section II.5.; Rock Island at Section II.5.

important concept. The District agrees to consider cumulative impacts as part of its land use decision making.

5. Page S-24, 2-41, "Term of the HCPs", first paragraph, first sentence. The text states that "the 50-year term of the HCPs would not begin until the incidental take permits are issued." While correct, this sentence is a bit misleading. The 50 year term of the HCPs starts when the "Agreement is executed by all Parties and regulatory approvals are received..." HCP, Section I "Term of Agreement". Issuance of the requested incidental take permit from NMFS is only one of the regulatory approvals that must be received in order for the HCPs to become effective.

6. Page S-24, 2-41, "Transition Period" mischaracterize the current HCP activities. The PUDs are not conditionally implementing the HCPs. The PUDs have volunteered to perform activities that are consistent with the HCPs as a sign of good faith. The District is also implementing measures because even though the HCP is not in effect the 2003 deadline is approaching.

7. Page S-24, 2-41, "Transition Period" mischaracterize the interim protection plans. In 1997, with the full support of the NMFS and the USFWS, the PUDs voluntarily filed interim protection plans with the Federal Energy Regulatory Commission. The interim protection plans identified various portions of the HCPs that the District, NMFS and USFWS felt were worthwhile to implement in advance of completing the HCP negotiations. Measures were picked to assist the migration of newly listed Upper Columbia River steelhead. The interim protection plans proposed only a two year plan because the HCPs were expected to be in place within two years. The interim protection plans were informally expanded to include Upper Columbia spring chinook upon their listing. The PUDs requested that FERC approve the measures contained in the interim protection plans. FERC initiated consultation with NMFS over this proposed action. The consultation has yet to be completed, and FERC has yet to take action on the plans. Due to the time taken to complete this consultations, the interim protection plans have expired.

8. Page S-26, 2-43, "Compensation for Unavoidable Project Mortality", first two sentences. The meaning of the first two sentences is not clear. The District has not modified any portion of the incidental take permit applications that were filed with NMFS.

9. Page S-26, 2-43, "Hatchery Compensation Plan Issue" and Page 1-12 Section 1.5.2.6 "Federal Trust Responsibilities to Indian Tribes" overstates the issue in dispute. The HCP requires that 7 percent of the "unavoidable project mortality" associated with each project be mitigated through hatchery supplementation. HCP Section III.1. The HCP goes on to define the initial hatchery production commitment. HCP Sections

VIII.3. and 4. NMFS is in a position to evaluate the effects of the initial hatchery production commitment. However, hatchery production will vary over time depending upon the size of the runs. NMFS has been unwilling to opine that the hatchery program will always satisfy the Endangered Species Act. Since NMFS has been unwilling to define the hatchery levels that will satisfy the Endangered Species Act it is not possible to predict how the hatcheries will be utilized during the term of the HCPs. Hatchery production is a key incentive for the tribes' participation in and support of the HCPs as a comprehensive settlement. Without knowing how the hatcheries will be utilized during the term of the HCPs the tribes cannot effectively evaluate the benefits of the HCPs. As a result of this uncertainty the tribes are not supporting the HCPs.

10. Page S-29, 2-50, "Endangered Species Act Compliance." It is unknown whether the Project's current licenses comply with the Endangered Species Act since they were issued prior to the adoption of the Endangered Species Act. Also, assuming the Project licenses do not comply with the Endangered Species Act, under Alternative 1 the District could obtain incidental take permits addressing only listed species.

11. Page S-30, 2-51, "Future Provisions for Other Aquatic Species". The table should acknowledge for all three alternatives that the District could submit incidental take permits under Section 10 of the Endangered Species Act as a means of addressing the Endangered Species Act.

12. Page S-31, 2-52, "Dispute Resolution." The table incorrectly includes "binding arbitration" as a means for resolving disputes. The text on Page S.17 paragraph 2 does a better job of explaining the HCP's dispute resolution process; but, does omit two of the exceptions to utilizing dispute resolution. See discussion above under "The Agreements" for more thorough overview of the HCP's dispute resolution process.

13. Page S-33, 2-53, Section S.7.2.3 "Alternative 3", first full paragraph, second sentence. The text reads that in part "there is no requirement to provide the benefit of the doubt to the species of concern with respect to gaps in the information base and NMFS has no authority to determine what constitutes the best available information to be utilized in support of any decisions." This sentence infers that the HCP dispute resolution process may not comply with law. Such an inference is not correct. In the HCP, NMFS has expressly reserved its authority to monitor, modify, suspend, revoke and re-instate, and enforce its incidental take permit outside the HCP dispute resolution process. HCP Section X.3-5, and Section XI.1.b. Furthermore, the dispute resolution process will not produce a result that is binding upon NMFS unless NMFS agrees. HCP Section XI.5.c. The dispute resolution process is mediation with a twist. The twist is that the mediator will issue a decision that can be entered into evidence in a later proceeding. HCP Section XI. 5.c. The reason for the decision is to facilitate

settlement. No one knows what, if any, weight will be afforded the decision. Also, the parties' intent is that once the decision is rendered parties will not feel the need to proceed further. NMFS like any other agency has the authority to enter into dispute resolution processes. 5 USC Section 572(a), and 575(a)(1). Since a party may pursue any remedy available after exhausting dispute resolution it is in full compliance with the law. HCP Section XI. 3.c.

14. Page S-35, 1-31, Section S.8 "Decision to be Made", second to last paragraph, first sentence. The text states that "NMFS will prepare a biological opinion to determine if the implementation of the HCPs is likely to jeopardize the continued existence of listed species that are likely to occur in the Plan area. ..." The text goes on to discuss issues NMFS will analyze in the biological opinion, and explains actions NMFS may take based upon the results of the biological opinion. The process NMFS describes in the DEIS for evaluating the incidental take permit applications filed by the District are not consistent with Section 10 of the Endangered Species Act. Section 10(a)(2) of the Endangered Species Act defines the process NMFS must follow to evaluate an incidental take permit application. 16 U.S.C. Section 1539(a)(2). This process does not require NMFS to consult with itself under Section 7 of the Endangered Species Act. Section 10 defines the complete process NMFS must follow to evaluate an incidental take permit application.

15. Page S-35, 1-31, Section S.8 "Decision to be Made", second to last paragraph, first sentence. The text states that "if the NMFS' biological opinion finds that the proposed actions are not likely to jeopardize the continued existence of the listed species ..., the permits can be approved." While true, NMFS must also make the findings required by Section 10 of the Endangered Species Act in order to issue the requested incidental take permits.

16. Page S-41, 2-61, "Land Use, Project Area, Alternative 3". The text does not correctly reflect the HCPs. In the HCPs the PUDs will consider cumulative effects of land use decisions, provide the signatories to the HCPs with opportunity to provide comments on permitting decisions, and notify permit applicants that their proposed use or occupancy of may result in incidental take of listed species and require authorization of NMFS or USFWS. HCP Section V "Reservoir as Habitat".

17. Page S-42, 2-63, "Economics, Project Area."; also, Page 4-61 Section 4.7 "Socioeconomic". Why is there no analysis of how spill and the other measures in each alternatives reduce the generating capacity and energy generated from the projects? This is a very significant effect of all the alternatives given the energy emergencies facing the Western United States, the Northwest, and Chelan County. Reduced generating capacity and reduced energy output have a direct effect on the ability of the projects to meet peak load demands for the District's own loads, and to

prevent or minimize energy emergencies in the Northwest and Western United States. The failure of the projects to meet peak load demands for the District's own loads exposes the District's loads to the extreme costs of energy in the Northwest and the West, and also to the risk that energy will not be available at any price. These issues vary dramatically between the three alternatives reviewed in the DEIS.

18. Page 1-1, Key Terms, "No Surprises Policy". The District understands that the term "no surprises policy" refers to the rules set forth in 50 CFR Section 222.303(g).

19. Page 1-4, Section 1.5, "Regulatory Framework", third sentence. What does "other Federal laws and regulations" mean?

20. Page 1-9, continuation of Section 1.5.2.4, "FERC Regulatory Requirements", 3rd full paragraph, second sentence. Text reads "These measures will supercede any settlement agreements pertaining to Plan." Insert "Species" after "Plan."

21. Page 1-10, Northwest Power Act, 1st paragraph, second sentence. The text reads "The Mid-Columbia utilities are subject to the Act ....". The term "Mid-Columbia utilities" is not defined in the DEIS. This DEIS relates to the projects operated by Chelan and Douglas PUDs. Also, Chelan and Douglas PUDs are not subject to the Northwest Power Act. FERC considers the plans developed pursuant to the Northwest Power Act when licensing the projects.

22. Page 1-11, "Title 77 Revised Code of Washington"., First sentence. The sentence addresses "wildlife". This reference is not correct for the purposes of the proposed agreements being reviewed in the DEIS. Relevant for these purposes is the State's responsibility to "preserve, protect, and perpetuate wildlife, fish, and wildlife and fish habitat." RCW 77.04.055(1).

23. Page 1-13, Section 1.6.1 "Alternative 1 (No Action), 2nd paragraph, 2nd sentence. The text states "...the years to address engineering, bond, and resource related issues...". The inclusion of the term "bond" is not correct in this sentence. The project licenses have not been amended to address the issuing of bonds.

24. Page 1-16, 3rd paragraph, last sentence. Text reads "This allows the HCPs to be updated with information received during the comment period...". This sentence incorrectly explains the NEPA process. Comments received by NMFS on the DEIS will be considered by NMFS when preparing the FEIS. The HCPs are multiparty, negotiated settlement agreements. The fact that NMFS receives a comment on the DEIS does not mean that the HCPs will be modified.

25. Page 1-17, Section 1.7 "Background", 4th paragraph. The region faces economic hardship in 2001 as power shortfalls hit the region. The current January-through-July runoff forecast has the region's water supply at 55 percent of normal, assuming normal precipitation for the March-through-July period. If this year's water conditions match 1977's, the lowest on record, the council predicted 2001 shortfalls could approach 8000 MW-months, with the deficit in May reaching 3300 MW-months. If the conditions match 1944 conditions, a year with just slightly higher runoff than the current projection, the total energy deficit across the months of April through August is 5,600 MW-months, with the deficit in May reaching 2,700 MW-months. (The Northwest Power Planning Council, "Northwest Electricity Markets in 2001: Status and Proposed Actions", March 26, 2001). The report states "it is a virtual certainty that emergency operations will be necessary during spring and summer to keep the electricity system from suffering outages." (NWPPC, 2001)

26. Page 1-18, continuation of Section 1.7 "Background", 1st full paragraph, 1st sentence. Also, Page 6.5, definition of "Mid-Columbia River." On Page 1-18, the text defines the Mid-Columbia River as "the area of the river between the Chief Joseph project and the confluence of the Yakima River." On Page 6.5, the text defines the Mid-Columbia River as "portion of the Columbia River that begins at its confluence with the Snake River up to the Chief Joseph dam." These two definitions are not consistent. The term "Mid-Columbia River" is not used in the HCPs. However, the HCP's Tributary Plan's, Plan Species Account can be spent only on projects "within the Columbia River watershed (from the Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat and Wenatchee River watersheds...". HCP Section VII.2.

27. Page 1-14, Section 1.7.2.2 "National Marine Fisheries Service", 1st paragraph, 1st sentence. The text reads "Many of NMFS' past studies, listings, and rules are directly relevant to the Mid-Columbia hydroelectric projects. ...". The term "directly" is not accurate. The documents discussed in this paragraph are "indirectly" relevant to Chelan and Douglas PUD's hydroelectric projects. They are not "directly" relevant to Chelan and Douglas PUD's hydroelectric projects because they do not relate to these projects. They relate to the Federal hydroelectric projects on the Columbia River.

28. Page 1-29, Section 1.7.3.1 "Mid-Columbia PUD FERC Agreements", 3rd sentence. This sentence refers to the Rock Island Settlement Agreement. The tribes listed in the text are not the only signatories to this agreement. The parties to the Wells Settlement Agreement, while similar to those of the Rock Island Settlement Agreement, are not the same.

29. Page 1-29, Section 1.7.3.2 "Major Bond and Sales Agreements for the Projects". This text is grossly incorrect. As of March 14, 2001, the District's total estimated bonds

outstanding is $886,076,000.[86] This indebtedness is secured by the revenue generated by the District's consolidated hydro system.

30. Page 1-33, continuation of Section 1.10 "Background Summary", 1st full paragraph, 2nd to last and last sentences. The text reads "Under the agreement, the utilities would have the ultimate authority in the decision making process, as long as the no net impact standards are being met. If all parties agree that the standards have not been achieved, the coordinating committees would have an increased role in the decision making process" These sentences do not correctly summarize the HCPs. For example: the District has the "ultimate decision on pursuit and implementation of Tools during Phase I" of the Juvenile Dam Passage Survival Plan. HCP Section IV.2.a.i. In Phase II of the Juvenile Dam Passage Survival Plan the coordinating committee has the decision making authority. HCP Section IV.a.6 – 8. In Phase III of the Juvenile Dam Passage Survival Plan the coordinating committee has the decision making authority related to continued measurement and evaluation. HCP Section VI.a.11. In the Adult Passage Plan, the agreement lays out the actions to be taken. HCP Section VI.b. With regard to the Hatchery Compensation Plan and the Tributary Compensation Plan the "JFP accepts the responsibility to develop plans and programs necessary to implement the Tributary Conservation Plan and the Hatchery Compensation Plan. HCP Section III.4.

31. Page 2-2, Section 2.1 "Development of Alternatives". Throughout the development of the DEIS the District has and still expresses concern about the choice of alternatives in the DEIS. The DEIS has not chosen as alternatives measures or mixes of measures that seek to mitigate the effects of the projects on salmon and steelhead. NMFS chose as alternatives competing legal process for establishing the measures to mitigate the effects of the projects on salmon and steelhead. This is a very unusual, and questionable method for evaluating the environmental effects of the proposed HCPs. The DEIS should be amended to provide more traditional alternatives. Alternatively, the rational and legal authority for this decision is not clearly explained in the DEIS, and should be incorporated into the FEIS.

32. Page 2-2, Section 2.1 "Development of Alternatives", 5th paragraph, 4th sentence. Text reads "to be in compliance with the take prohibitions of Section 9, FERC would implement the measures ...." FERC would be in compliance with Section 9 of the ESA by implementing the provisions contained in NMFS biological opinion and incidental take statement. However, FERC is not obligated to do so. FERC may take other action as long as it is not likely to jeopardize the continued existence of any

[86] Official Statement, Public Utility District No. 1 of Chelan County, Washington $143,995,000 Chelan Hydro Consolidated System Revenue Bonds consisting of $65,620,000 Series 2001A and $78,375,000 Series 2001B, page iv (March 1, 2001)

endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is ... critical...". 16 U.S.C. Section 1536(a)(2); Aluminum Company v. BPA, 175 F.3d 1156, 4394-4395 (9th Cir. 5/10/99).

33. Page 2-7 Section 2.2.1.2 "Rocky Reach Dam", first paragraph, last three sentences. The text describing the rehabilitation work at Rocky Reach is outdated. The following edits are recommended so that the text is current:

"...Unites 1 through 7 are currently vertical shaft Kaplan turbines installed during the original construction in 1962, while fixed-blade propeller units were installed in Unties 8 through 11 in 1971. ~~One~~ Two of these fixed-blade propeller units ~~has~~ have been rehabilitated and replaced with ~~a~~ Kaplan turbines~~ unit,~~. A third unit is currently undergoing rehabilitation and the ~~other three~~ remaining units ~~are~~is scheduled to be ~~replaced~~ rehabilitated by June ~~2003~~2002. In addition, all but one of the original Kaplan units have been rehabilitated and replaced with more efficient Kaplan turbines~~, which~~. This turbine work is ~~are~~ expected to increase juvenile fish passage survival."

34. Page 2-11, Table 2-4, and all text that incorporates or explains information conveyed in the table which includes but is not limited to the text in Section 3.2.6.4 and Table 3-3. The juvenile dam passage information included in the table does not take into account project specific information, and when project specific information is reviewed it is dismissed in favor of information developed from other hydroelectric projects without explanation. Set forth in Attachment A is the most project-specific survival information available for both the Rocky Reach and Rock Island Projects. This information is primarily based on information collected at these Projects through the various studies identified in the references. Copies of the studies are available upon request.

35. Page 2-12, 1st paragraph, last sentence. The text reads "the information also indicates that survival is higher through the spillway and bypass system than through the turbine units." What is the citation for this statement? The statement does not logically flow from the materials cited in the paragraph.

36. Page 2-14, Rocky Reach Dam, 3rd sentence. The text reads "Passage efficiency tests ... and 52 percent of the PIT-tagged steelhead...". "PIT-tagged" is not correct. These were "radio tagged" steelhead.

37. Page 2-14, Rocky Reach Dam, 5th sentence. The text reads "In 1999, guidance ... 32 percent of the chinook and 53 percent of the steelhead passed ...". In both cases, these were radio tagged fish.

38. Page 2-15, Rocky Reach Dam, 2nd paragraph, 1st sentence. Text reads "Studies at the dam have shown that between 8 and 18 percent ..." This text is not consistent with the text on page 4-18 which uses 19 percent and not 18 percent. Nineteen percent is the correct number.

39. Page 2-16, Rock Island Dam, 3rd paragraph, 3rd sentence. The text reads "the spill passage rates for other species were estimated at 20, 33, and 35 percent for sockeye, fall chinook and coho salmon in 1998." What is the citation for this information?

40. Page 2-16, Rock Island Dam, 4th paragraph, 1st sentence. The text reads "A subsequent study indicated that survival rates through modified bay with deeper stilling basins may be near 100 percent ...." What is the citation for this information?

41. Page 2-16, Section 2.2.3.2 "Adult Passage", 1st paragraph, 5th sentence. The text reads "The delay and stress that adults experience during passage through multiple dams may reduce their spawning success." Please explain the scientific bases for this information, and provide a citation for the studies relied upon to make this statement.

42. Page 2-17, continuation of Section 2.2.3.2 "Adult Passage", 3rd paragraph, 1st sentence. The text reads "Survival rates of adult salmon and steelhead passing through the Mid-Columbia River have not been estimated due to insufficient radio-telemetry data." This is not correct. Currently, technology does not exist to measure adult survival. Therefore a technology limitation, not an insufficiency of radio-telemetry data, is the reason for no survival information.

43. Page 2-17, Section 2.2.3.3 "Adult Reservoir Passage", 1st paragraph, 4th sentence. The text reads "However, the reservoirs can increase the potential for wandering or straying (lost orientation), that could lead to higher pre-spawning mortality or reduced spawning success (Volkman 1995)." This conclusions are not contained in Volkman 1995 and cannot be inferred from the radio telemetry data contained in Volkman 1995. No evidence exists to support these statements.

44. Page 2-27, Section 2.2.3.3 "Adult Reservoir Passage", 1st paragraph, 5th sentence. The text reads "Higher water temperatures as a result of project reservoirs may also lead to higher prespawning mortality." What is the citation for this information?

45. Page 2-27, continuation of Section 2.3.2 "Alternative 2 (Section 7 Consultation)", 6th paragraph, 2nd sentence. The text reads "Evaluations conducted as part of the Quantitative Analytical Report (QAR) (NMFS 2000b) ..." The QAR is also discussed in detail in Section 4.2.1 "Quantitative Analytical Report". The QAR has not yet produced a final, peer reviewed document. Furthermore, the document cited at NMFS 2000b is a draft internal NMFS document. NMFS has yet to produce a copy of this

document after numerous requests. The District objects to NMFS citing QAR results anywhere in this document or in any other document (yet alone devoting 10 pages to it in Section 4.2.1, pages 4-6 through 4-16) until the QAR results are made public, finalized and peer reviewed. This comment relates to all references to the QAR in the DEIS. Without a copy of the QAR the District has no way to comment on portions of the DEIS related to the QAR. The District reserves the right to submit comments on the QAR until it receives a copy of the QAR and has had sufficient opportunity to review the QAR. Nevertheless, based upon the information provided in the DEIS and the District's limited knowledge of the QAR, the District objects strongly to NMFS' use of the QAR results. Most of the conclusions relied upon the DEIS are drawn from the portion of the database that dates back to only 1980 (p. 4-7) while the entire database dates back to the 1960s. This misrepresents the long term database. Conclusions based upon long term database shows dramatically different outcomes when compared to the conclusions based upon the short term database. While NMFS acknowledges the existence of data going back to the 1960s, it is dismissed as potentially too "optimistic" without a thorough explanation. (p. 5-11) The best scientific information available is the entire database which takes into consideration ocean cycles that were known to be more productive than the ocean conditions in the 1980's and 1990's. During the 50 year term of the proposed HCPs ocean conditions are likely to cycle back to more productive periods similar to the 1960s. This rational is supported by the current 2000 and 2001 improvement in runs that is attributed to greatly improved ocean conditions.

46. Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 1st full paragraph. This paragraph was re-written from its mirror paragraph on page S-18. The text on page S-18 provides a clearer explanation.

47. Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 2nd full paragraph, 2nd sentence. The text cites to the 1995 Federal Columbia River Power System biological opinion for the lower Snake and Columbia River projects (NMFS 1995). NMFS 1995 biological opinion has been superceded by its 2000 biological opinion. In 2000, USFWS also issued a biological opinion for bull trout. Therefore, this text should be updated to refer to the current biological opinions.

48. Page 2-35, continuation of Section 2.3.3.5 "HCP Performance Standards" 6th full paragraph, last sentence. The text reads "...to achieve 95 percent juvenile dam passage survival and 91 percent project survival." As explained in earlier comments, the coordinating committee will measure only 95% Juvenile Dam Passage survival. However, the coordinating committee may elect to measure the juvenile component of 91% Project Survival. If the results of the standard that was measured was not achieved, then the coordinating committee would identify the tool for the District to

implement by the next migration. It may be necessary to revise the HCP text to clarify this process.

49. Page 2-49 Section 2.6.1 "Alternative 1 (No-Action)". The text under this heading is introductory to all the alternatives, not specific to Alternative 1. See page S-28.

50. Page 3-27, Section 3.2.2.2 "Abundance". This section should be updated with 2000 fish counts and with projected fish counts for 2001. Fish counts showed a dramatic increase in 2000 and are projected to be even better in 2001. This information is very significant. Without this information the text is misleading.

51. Page 3-37, Rocky Reach, 3rd paragraph 2nd sentence. The text reads "the cumulative delay at nine dams on the Columbia River likely decreases spawning success." What is the citation for this information?

52. Page 3-39, Rocky Reach, 3rd paragraph, 1st sentence. The text reads "Based on juvenile radio-telemetry evaluations conducted in 1998, approximately 49 percent of the radio-tagged steelhead and 61% of the radio-tagged spring-run chinook salmon passed the project via the powerhouse (English et al. 1999)." This data is not correct. The correct citation should be English et al. 1998, not English et al. 1999. Also, 49 percent should be 34 percent, and 61% should be 51%.

53. Page 3-39, Rocky Reach, footnote 2. Footnote 2 reads "Radio-tagged fall chinook obtained from the East Bank Hatchery ... in 1997 and 1998 (e.g., approximately 81% powerhouse passage in ... via the powerhouse at significantly higher rates than the ..." The reference to 1997 is not correct and should be deleted. English et al. 1998 related to 1998 and 1997. Also, the use of the term "significantly" is not correct in this sentence. The term "significantly" has a meaning in statistics. The term infers that statistics were used to test a hypothesis. The statement made in the sentence is not the result of a statistical test. Therefore, use of the term "significantly" infers a level of credibility to the sentence that is not correct.

54. Page 3-40 continuation of Rocky Reach Dam, 1st paragraph, 1st sentence. The text reads "Lady et al. (2000) ... and English et al. (1999) estimated that 58 and 40 percent of the radio-tagged..." The estimates of 58 and 40 are not correct. They should be 50 and 30.

55. Page 3-40, continuation of Rocky Reach Dam, 2nd paragraph, last sentence. The text reads "Although neither evaluation was able to ... the pilot level survival evaluation conducted using radio-tagged steelhead in 1999 estimated direct and indirect survival at 89.7 percent (Lady et al. 2000), suggesting that the indirect effects associated with turbine passage are more significant than those seen at the bypass system or

spillway." The radio tag study cited in this sentence indicates a lower than desired direct and indirect survival at the project. NMFS should clearly explain why it is appropriate to use the results of a radio-tag study in this instance when the study shows low levels of survival, and not use the results of radio tag studies in other instances when the results of radio tag studies show high levels of survival. The District continues to object to NMFS's inconsistent use of study results, and failure to acknowledge the results of studies that show survival levels favorable to the District.

56. Page 3-43 Rocky Reach, 1st paragraph 2nd sentence. The text reads: "Passage efficiency tests conducted ... yearling chinook salmon and 51 percent of the PIT-tagged steelhead passed the project via this route (English et al. 1998a)." This sentence is not correct. 51 percent should be 52 percent, and PIT-tagged should be radio tagged.

57. Page 3-43 Rocky Reach, 1st paragraph 4th sentence. The text reads: "Passage efficiencies in 1999 ... 32 percent for chinook salmon, and 11 percent for sockeye salmon (Mosey et al. 2000)." This sentence is not correct. 11 percent should be 16 percent.

58. Page 3-43 Rocky Reach, 1st paragraph 5th sentence. The text reads "Radio telemetry evaluations in 1999 also indicated that about 57 percent of steelhead passed the project through the bypass." What is the citation for this information? The District is not aware of any study that produced this information.

59. Page 3-43 Rocky Reach, 1st paragraph, last sentence. The text reads "The combined spillway and bypass ... and between 62 and 64 percent for steelhead (Lady et al. 2000)." This information is not correct. 62 should be 72, and 64 should be 74.

60. Page 3-43 Rocky Reach, 2nd paragraph, 1st sentence. The text reads "In both 1997 and 1998...". This is not correct. The evaluation was done only in 1998. The evaluation was not done in 1997.

61. Page 3-43 Rocky Reach, 2nd paragraph, 2snd sentence. The text reads "In 1998, the bypass efficiency for naïve chinook salmon was substantially lower (19 percent) ... (English et al. 1998a)." This is not correct. 19 percent should be 22 percent.

62. Page 3-43, Rocky Reach, 5th paragraph, 3rd sentence. The text reads "The temporary bypass outfall site, located in front of the turbine unit four upwelling, ..." This is not correct. Unit four upwelling should be replaced with unit three upwelling.

63. Page 3-44, Section 3.2.6.4 "Total Project Survival – Juvenile Migrants". The discussion of project survival is not correct. The obligation is that "The District shall

also achieve and maintain 91% Project Survival ... which means that 91% of each Plan Species, juvenile and adult combined, survive Project effects, including delayed mortality wherever it may occur." HCP Section IV.1.a. The first sentence in this section of the DEIS fails to account for the fact that project survival includes "delayed mortality wherever it may occur." Also, the HCP does not define a protocol for measuring project survival as inferred from the DEIS. The HCP leaves it to the Coordinating Committee to establish the measurement protocols. HCP Section IV.3.c.

64. Page 3-47 Section 3.2.7 "Overall Fish Passage Survival". 1st paragraph, 3rd sentence. The text reads "Based on the small amount of information that is available, the average survival of adult spring-run chinook salmon and steelhead is estimated at between 77.8 percent and 88.9 percent for the entire Mid-Columbia River reach...". What is the cite for this information? The District is not aware of any methodology to measure adult survival.

65. Page 3-96, continuation of Section 3.3.2 "Water Quality", 1st full paragraph, 1st sentence. The text reads "Although extensive evaluations have been conducted under controlled or laboratory conditions, the effects of specific total dissolved gas levels on fish in a river environment is relatively unknown." This statement is not correct. The effects of total dissolved gas on fish has been extensively studied in the Mid-Columbia at as part of the 2000 Federal Columbia River Hydro-System biological opinions.

66. Page 3-109, Section 3.4.4 "Rare Plants". The text states that Ute ladies' tresses (*Spiranthes diluvialis*) do not occur in or near the immediate project area of the dams. This is not correct. Recently, a Ute ladies'-tresses was determined to be present in the Rocky Reach reservoir shoreline area. This hydrophilic orchid would be affected by drawdown or other actions that would remove its water source. P. Fielder, pers. comm.

67. Page 4-18, continuation of Section 4.2.2.1 "Rocky Reach Dam", 2nd paragraph, 2nd sentence. The text reads "Survival estimates for steelhead ranged from 87.0 percent to 111.9 percent ..." This is not correct. 111.9 percent should be 101.0 percent.

68. Page 4-18, continuation of Section 4.2.2.1 "Rocky Reach Dam", 3rd paragraph, 2nd sentence. The text reads "Under Alternative 1 however, there is no requirement to implement these additional measures." This is not correct. Under alternative 1 fish protection and enhancement measures can be implemented through the pending Mid-Columbia proceeding at FERC, and during relicensing.

69. Page 4-18, continuation of Section 4.2.2.1 "Rock Island Dam", 2nd paragraph, 2nd sentence. The text reads "Between 1995 and 1998, over 26,000 predatory ..." This

should be updated by replacing 1998 with 2000, and 26,000 with 34,000. West, T. 2001. Northern Pikeminnow (*Ptychocheilus oregonensis*) Population Reduction Program Rocky Reach and Rock Island Dams.

70. Page 4-20 continuation of "Adult Migration/Survival", 2nd full paragraph, 2nd sentence. The text reads "It is reasonable to assume that some portion of the adult bull trout populations pass through the turbines and spillways, either voluntarily or involuntarily, given their presence in the project area and use of project fishways." What is the citation for this information? Why is it reasonable to assume a correlation between presence of bull trout in the fishway and bull trout passing through turbines and spillways? The District is aware of no evidence supporting this statement.

71. Page 4-26, "Rocky Reach Dam", 2nd sentence. The text reads "As with the fishways at the Wells Dam, there is evidence to suggest that sockeye and summer-run chinook salmon experience passage delays in the fishway entrance pools of the Rocky Reach fishway." What is the citation for this information? The District is not aware of this information.

72. Page 4-27, Section 4.2.2.3 "Pacific Lamprey", 3rd sentence. The text reads "The only screens that are currently in operation at the Mid-Columbia River dams are at turbine units one through three at the Rocky Reach Dam." This is not correct. Screens are used only at turbine unites one and two at the Rocky Reach Dam.

73. Page 4-27, Section 4.2.2.3 "Pacific Lamprey", 4th sentence. Delete the phrase "although additional screens are currently not planned for future installation."

74. Page 4-31, "Adult Migration/Survival", 2nd paragraph last sentence. The text reads "Although the radio-telemetry technique is problematic for addressing adult passage survival, the study results are the best available data for determining potential project related affects." This sentence is not correct. Radio-telemetry is not a technique for addressing adult passage survival. It is a technique for addressing locations of adult fish. Currently, no protocol exists to measure adult survival. There is no data available to evaluate adult survival.

75. Page 4-31, "Adult Migration/Survival", 4th paragraph, 2nd sentence. The text reads "Based on their presence at the project and their migratory behaviors, it is likely that some portion of the population passes through the turbines and spillways, either voluntarily or involuntarily." What is the citation for this information? Why is it reasonable to assume a correlation between presence of bull trout in the fishway and bull trout passing through turbines and spillways? The District is aware of no evidence supporting this statement.

76. Page 4-34, "Rock Island Dam", 1st paragraph, 1st sentence. Delete "chiwawa hatchery". Rock Island's hatchery is referred to as the Eastbank Hatchery Complex.

77. Page 4-40 "Rocky Reach Dam", 2nd paragraph, 3rd sentence, and Page 4-41 "Rock Island", 2nd paragraph 3rd sentence. The text reads "For Alternative 3, the PUD would have the ultimate authority for determining the appropriate protection measures implemented in Phase I, while the Coordinating Committee would have a greater role during Phase II." As explained above in relation to other sections, the Coordinating Committee is the decision maker in Phase II. NMFS has retained the authority to enforce the incidental take permit outside the HCPs.

78. Page 4-59, Section 4.6.3.1 "Project Area". This text is not correct. Section V of the HCP titled "Reservoir as Habitat" clarifies the manner in which land use and permitting decisions on project lands occurs.

79. Page 4-72, Section 4.10.7 "Indian Trust Assets", 3rd paragraph, 5th sentence. The text reads "This would then affect whether the 9 percent no net impact would continue over the 50 year HCP terms." Reduction in use of the hatchery facilities means that the hatcheries would not produce fish to compensate for the full 7 percent of Unavoidable Project Mortality. HCP Section III.1. Nevertheless, No Net Impact can still be achieved as long as the PUDs provide the funding and capacity for the hatcheries. HCP Sections III.3. and 4.

80. Page 4-74, Section 4.10.14.1 "Wild and Scenic River Act". This section needs to be updated. On June 9, 2000, the Hanford Reach was declared a National Monument. 65 *Federal Register* 37253 (June 13, 2000).

81. Page 5-6, Chelan County PUD 2000 reference. The District objects to reference to comments provided to the "Pre-Decisional Review Draft, Biological Opinion, Interim Protection Plans for Operation of the Mid-Columbia River Hydroelectric Projects and Related Activities." These comments were provided to assist in editing a confidential, pre-decisional review document.

82. Page 6-1 "Glossary". It is the District's understanding that the glossary contained in the DEIS is not in any way intended to modify terms that are defined in the Endangered Species Act, NMFS' regulations, or the HCPs. The District has not reviewed the glossary, and reserves the right to latter object to the manner in which terms are defined in this DEIS.

83. Page 7-2, Section 7.3. Add the following local agencies: East Wenatchee Chamber of Commerce, Mayor of the City of Wenatchee, Chelan County Commissioners, and the Douglas County Commissioners.

84. Page 7-2, Section 7.4. Replace "Confederated Tribes of the Colville Reservation" with "Confederated Tribes and Bands of the Colville Indian Reservation." In the Umatilla name add "Indian" between "Umatilla" and "Reservation." Replace "Yakama Indian Nation" with "Confederated Tribes and Bands of the Yakama Indian Nation."

Conclusion

The District appreciates the opportunity to comment on the Draft Environmental Impact Statement for the incidental take permit applications proposed for the District's Rocky Reach and Rock Island Projects. The District encourages NMFS to expedite its processing of the incidental take permit applications, and authorize the issuance of the requested permits

Sincerely,

Malcolm C. McLellan
Attorney for
Public Utility District No. 1 of Chelan County

Attachments

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ATTACHMENT A

SURVIVAL ESTIMATES

FOR THE

ROCK ISLAND HYDROELECTRIC PROJECT

AND THE

ROCKY REACH HYDROELECTRIC PROJECT

Rock Island
Estimate of Juvenile Dam Passage Survival

FORMULA: The formula to estimate Juvenile Dam Passage Survival equals the route specific survival rate multiplied by the route specific passage rate for each passage route past the project.

Calculation of Juvenile Dam Passage Survival

Species	Powerhouse #1		Powerhouse 2		Spill		JDPS
	Survival Rate Of Turbines[1]	% of Fish using Turbines	Survival Rate Of turbines[1]	% of Fish using turbines	Survival Rate Of Spill	% of Fish using Spill	
Steelhead	.927	.051 (2 yr avg)	.942	.655 (2 yr avg)	.99	.295 (2 yr avg)	.956
Yearling Chinook[2]	.927	.087	.942	.671	.99	.242	.952
Sub-yearling Chinook[3]	.927	.091 (2 yr avg)	.942	.482 (2 yr avg)	.99	.437 (2 yr avg)	.971
Sockeye	.927	.134 (2 yr avg)	.942	.599 (2 yr avg)	.99	.269 (2 yr avg)	.955

Authority for Data

Species	Powerhouse 1		Powerhouse 2		Spill		JDPS
	Survival Rate Of turbines	% of Fish using turbines	Survival Rate Of turbines	% of Fish using turbines	Survival Rate Of Spill	% of Fish using Spill	
Steelhead	Tab 1	Tab 2	Tab 3	Tab 4	Tab 5	Tab 6	Tab 7
Yearling Chinook[2]	See Tab 1	Tab 8	See Tab 3	Tab 9	See Tab 5	Tab 10	Tab 11
Sub-yearling Chinook[3]	See Tab 1	Tab 12	See Tab 3	Tab 13	See Tab 5	Tab 14	Tab 15
Sockeye	See Tab 1	Tab 16	See Tab 3	Tab 17	See Tab 5	Tab 18	Tab 19

Turbine survival adjusted to include 2% indirect mortality and is based upon Muir et al as cited in the Biological Assessment submitted by FERC to NMFS as part of Sec. 7 consultation

[2] Yearling chinook means wild and hatchery spring chinook, and hatchery summer/fall chinook

[3] Sub-yearling means wild and hatchery summer/fall chinook

Index of Authorities

Tab	Reference
Tab 1	.946*.98=.927. .946 is based upon the average of PH 1 estimates from Turbine passage survival of chinook salmon smolts (Normandeau and Skalski, 1997). .98 is based upon Muir et al as cited in the Biological Assessment submitted by FERC to NMFS as part of Sec. 7 consultation
Tab 2	A pilot study to estimate route specific survival and passage probabilities of Steelhead smolts at RR and RI, 1999. (Lady et al. 2000) A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep)
Tab 3	.961*.98=.942 .961 is based upon the estimate of turbine passage survival of chinook salmon smolts at RI PH 2 (Normandeau and Skalski, 1997). .98 is based upon Muir et al as cited in the Biological Assessment submitted by FERC to NMFS as part of Sec. 7 consultation
Tab 4	A pilot study to estimate route specific survival and passage probabilities of Steelhead smolts at RR and RI, 1999. (Lady et al. 2000) A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep).
Tab 5	1999 Spillway survival investigation of juvenile chinook salmon at Rock Island Dam. Normandeau et al in prep
Tab 6	A pilot study to estimate route specific survival and passage probabilities of Steelhead smolts at RR and RI, 1999. (Lady et al. 2000) A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep).
Tab 7	Calculation based on information from Tab 1 through Tab 6 ((.927*.051)+(.942*.655)+(.990*.295))=.956
Tab 8	A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep.)
Tab 9	A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep.)
Tab 10	A study to estimate route specific survival and passage probabilities of Chinook and Steelhead at RR and RI. (Skalski et al in prep.)
Tab 11	Calculation based on information from Tab 8 through Tab 13 ((.927*.087)+(.942*.671)+(.990*.242))=.952
Tab 12	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 13	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 14	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 15	Calculation based on information from Tab 12 through Tab 14. ((.927*.091)+(.942*.482)+(.990*.437))=.971
Tab 16	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 17	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 18	Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at RI, 1997. (Iverson and Keister, 1997) Hydroacoustic evaluation of spill effectiveness at Rock Island Dam spring and summer, 1998. (Iverson and Birmingham, 1998)
Tab 19	Calculation based on information from Tab 16 through Tab 18. ((.927*.134)+(.942*.599)+(.990*.269))=.955

Literature Cited

Iverson, T. K., and J. E. Keister, 1997. Hydroacoustic evaluation of notched surface flow spill gates and overall fish passage at Rock Island Dam in 1997. Report to Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Iverson, T. K., and A. G. Birmingham, 1998. Hydroacoustic evaluation of spill effectiveness at Rock Island Dam during spring and summer, 1998. Report to Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

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Muir, W. D., S. G. Smith, R. N. Iwamoto, D. J. Kamikawa, K. W. McIntyre, E. E. Hockersmith, B. P. Sanford, P. A. Ocker, T. E. Ruehle, J. W. Williams and J.R. Skalski. 1995. Survival estimates for the passage of juvenile salmonids through Snake River dams and reservoirs, 1994. Annual report to Bonneville Power Administration, Portland, Oregon and U. S. Army Corps of Engineers, Walla Walla, Washington. 187 pp.

Normandeau Associates, Inc., and J. R. Skalski. 1998. Turbine Passage survival of chinook salmon smolts at the Rock Island Dam Powerhouse I and II, Columbia River, Washington. Report to Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Normandeau Associates, Inc., and J. R. Skalski. In prep. 1999 spillway passage survival investigation of juvenile chinook salmon at Rock Island Dam, Washington. Report to Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Rocky Reach
Estimate of Juvenile Dam Passage Survival

FORMULA: The formula to estimate Juvenile Dam Passage Survival equals the route specific survival rate multiplied by the route specific passage rate for each passage route past the project.

Calculation of Juvenile Dam Passage Survival

Species	Bypass		Turbine		Spill		JDPS
	Survival Rate Of Bypass	% of Fish using Bypass	Survival Rate Of turbines[4]	% of Fish using turbines	Survival Rate Of Spill	% of Fish using Spill	
Steelhead	0.980	0.523 (3 yr avg)	0.931	0.357 (3 yr avg)	0.990	0.120 (3 yr avg)	0.964
Yearling Chinook[5]	0.980	0.310 (3 yr avg)	0.931	0.550 (3 yr avg)	0.990	0.140 (3 yr avg)	0.954
Sub-yearling Chinook[6]	0.980	0.240 (2 yr avg)	0.931	0.625 (2 yr avg)	0.990	0.135 (2 yr avg)	0.951
Sockeye	0.980	0.090 (3 yr avg)	0.931	0.697 (3 yr avg)	0.990	0.213 (3 yr avg)	0.948

Authority for Data

Species	Bypass		Turbine		Spill		JDPS
	Survival Rate Of Bypass	% of Fish using Bypass	Survival Rate Of turbines	% of Fish using turbines	Survival Rate Of Spill	% of Fish using Spill	
Steelhead	Tab 1	Tab 2	Tab 3	See Tab 2	Tab 4	See Tab 2	Tab 5
Yearling Chinook[2]	See Tab 1	See Tab 2	See Tab 3	See Tab 2	See Tab 4	See Tab 2	Tab 6
Sub-yearling Chinook[3]	See Tab 1	Tab 7	See Tab 3	See Tab 7	See Tab 4	See Tab 7	Tab 8
Sockeye	See Tab 1	See Tab 2	See Tab 3	See Tab 2	See Tab 4	See Tab 2	Tab 9

[4] Turbine survival adjusted to include 2% indirect mortality and is based upon Muir et al. (1995) as cited in the Biological Assessment submitted by FERC to NMFS as part of the Section 7 consultation.
[5] Yearling chinook means wild and hatchery spring chinook, and hatchery summer/fall chinook
[6] Sub-yearling means wild and hatchery summer/fall chinook

Index of Authorities

Tab	Reference
Tab 1	Survival estimates for the passage of yearling chinook salmon and steelhead through Snake River dams and reservoirs, 1995. (Muir et al. 1996)
Tab 2	Evaluation of juvenile spring chinook, steelhead, and sockeye migratory patterns at Rocky Reach Dam using radio-telemetry techniques, 1998-2000. (English et al. 1998; English et al. 1999; English et al. in prep)
Tab 3	0.950 * 0.980 = 0.931. 0.950 is based upon 1996 measured survivals of 0.950 and 0.958 for new (unit 6) and original (unit 5) Kaplan turbines, respectively. (Normandeau and Skalski, 1996). 0.980 is based upon Muir et al. (1995) as cited in the Biological Assessment submitted by FERC to NMFS as part of the Section 7 consultation.
Tab 4	Survival of juvenile coho salmon passing through the spillway at Rocky Reach Dam. (Heinle and Olson, 1981)
Tab 5	(0.980 * 0.523) + (0.931 * 0.357) + (0.990 * 0.120) = 0.964
Tab 6	(0.980 * 0.310) + (0.931 * 0.550) + (0.990 * 0.140) = 0.954
Tab 7	Evaluation of juvenile sub-yearling chinook migratory patterns at Rocky Reach Dam using radio telemetry techniques, 1998 – Technical memorandum to Mid-Columbia Coordinating Committee (Mosey and Murdoch, 1999). Evaluation of juvenile spring chinook, steelhead, and sockeye migratory patterns at Rocky Reach Dam using radio-telemetry techniques, 1999. (English et al. 1999)
Tab 8	(0.980 * 0.240) + (0.931 * 0.625) + (0.990 * 0.135) = 0.951
Tab 9	(0.980 * 0.090) + (0.931 * 0.697) + (0.990 * 0.213) = 0.948

References

English, K. K., T. C. Nelson, C. Sliwinski, J. R. Stevenson, and T. R. Mosey. 1998. Evaluation of Juvenile Spring Chinook, Steelhead, and Sockeye Migratory Patterns at Rocky Reach Dam Using Radio-telemetry Techniques, 1998. Report prepared by LGL Limited for Public Utility District No. 1 of Chelan County, Wenatchee, WA.

English, K. K., R. C. Bocking, C. Sliwinski, J. R. Stevenson, and T. R. Mosey. 1999. Evaluation of Juvenile Spring Chinook, Steelhead, and Sockeye Migratory Patterns at Rocky Reach Dam Using Radio-telemetry Techniques 1999. Report prepared by LGL Limited for Public Utility District No. 1 of Chelan County, Wenatchee, WA.

English, K. K., C. Sliwinski, J. J. Smith, J. R. Stevenson, and T. R. Mosey. In prep. Evaluation of Juvenile Spring Chinook, Steelhead, and Sockeye Migratory Patterns at Rocky Reach Dam Using Radio-telemetry Techniques, 2000. Report prepared by LGL Limited for Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Heinle, D. R. and F. W. Olson. 1981. Survival of juvenile coho salmon passing through the spillway at Rocky Reach Dam. Prepared for Chelan County Public Utility District.

Muir, W. D., S. G. Smith, R. N. Iwamoto, D. J. Kamikawa, K. W. McIntyre, E. E. Hockersmith, B. P. Sanford, P. A. Ocker, T. E. Ruehle, J. W. Williams, and J. R. Skalski. 1995. Survival estimates for the passage of juvenile salmonids through Snake River dams and reservoirs, 1994. Annual report to Bonneville Power Administration, Portland, Oregon and U.S. Army Corps of Engineers, Walla Walla, Washington. 187 pp.

Muir, W. D., S. G. Smith, E. E. Hockersmith, S. Achord, R. F. Absolon, P. A. Ocker, B. M. Eppard, T. E. Ruehle, J. G. Williams, R. N. Iwamoto, and J. R. Skalski. 1996. Survival estimates for the passage of yearling chinook salmon and steelhead through Snake River dams and reservoirs, 1995. Annual report to Bonneville Power Administration, Portland, Oregon and U.S. Army Corps of Engineers, Walla Walla, Washington. 150 pp.

Normandeau Associates and J. R. Skalski. 1996. Relative survival of juvenile chinook salmon (Oncorhynchus tshawytscha) in passage through a modified Kaplan turbine at Rocky Reach Dam, Columbia River, Washington. Report prepared by Normandeau Associates for Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Quantitative Analysis Report Executive Summary

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Executive Summary

The Upper Columbia Quantitative Analysis Report (QAR) process was established to provide decision makers with current assessments of the status of spring-run chinook salmon and steelhead runs returning to the Wenatchee, Entiat, and Methow River systems. Production of spring-run chinook salmon and steelhead from these three tributaries, along with the Okanogan River, constitutes the Upper Columbia River spring-run chinook salmon and the Upper Columbia River summer steelhead Evolutionarily Significant Units, respectively.[1] Upper Columbia River steelhead and spring-run chinook salmon were listed as endangered in 1997 and 1998, respectively. The purpose of this report is to provide hypothetical estimates of the relative risks of extinction under a range of alternative management and climatic/environmental scenarios and to estimate the survival gains necessary to meet interim recovery levels (IRLs) and reduce the risk of extinction to acceptable levels.

Simple population dynamics models were developed for Upper Columbia River spring-run chinook salmon (Wenatchee, Entiat, and Methow populations) and summer-run steelhead (Wenatchee/Entiat and Methow populations). Reconstructed spawner to spawner return ratios for historical years, estimated age at return data, and estimates of recent spawning escapements were used as input into a stochastic cohort run reconstruction (CRR) statistical model. The model was designed to generate hypothetical time trends in return levels and the effect of survival changes on those trends. Alternative assumptions regarding the effects of alternative future environmental conditions are analyzed for spring-run chinook salmon and the effectiveness of hatchery origin spawners are considered in the analysis for steelhead. Model development, assumptions, and simulations were reviewed by an analytical team consisting of representatives from Chelan, Douglas, and Grant County Public Utility Districts (PUDs); Bonneville Power Administration; Washington Department of Fish and Wildlife; Columbia River Inter-Tribal Fish Commission; and Columbia Basin Fish and Wildlife Authority.

The proposed Mid-Columbia Habitat Conservation Plan (HCP) incorporated a framework designed to address project impacts on migrating salmon and steelhead through the objective of no net impact.[2] The focus of the analyses described in this report is on identifying levels of life cycle survival improvements necessary for the two Endangered Species Act-listed stocks to be self-sustaining. The report includes specific assessments of the potential benefits of meeting the passage survival and habitat objectives of the proposed HCP for each of the five Mid-Columbia projects.[3] In the longer term, achieving conditions that result in survival levels high enough to support self-sustaining natural production is an important objective under the Endangered Species Act. The hatchery mitigation component of the HCP is

[1] The QAR Biological Requirements Workgroup identified three independent, viable populations of spring-run chinook salmon and steelhead in the Upper Columbia Basin (Wenatchee, Entiat, and Methow populations). Because of data limitations, Entiat and Wenatchee steelhead were modeled as a single group. Recovery goals for steelhead in the Okanogan system are deferred to the Upper Columbia Recovery Team.

[2] No net impact consists of two components: (1) 91% combined adult and juvenile project survival achieved by project improvement measures implemented within the geographic area of the project, and (2) 9% compensation for unavoidable project mortality provided through hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs.

[3] While Grant County PUD is not part of the HCPs, for the purposes of assessing cumulative effects for this model, similar survival assumptions were made for each of the two Grant County PUD dams.

essential for achieving the mitigation objective of no net impact as a result of the Mid-Columbia hydropower projects.

Under National Marine Fisheries Service (NMFS) guidelines, hatchery production is explicitly not included in the assessment of long-term sustainability of a stock. However, hatchery supplementation can play a separate and important role in the overall approach to addressing particular Endangered Species Act-listed stock recovery issues. In the short term, hatchery supplementation can bolster weak stocks while survival improvement measures are implemented and play a major role in speeding up the rebuilding process.

The population models of Upper Columbia River spring-run chinook salmon and steelhead were used to explore five basic questions:

1. What are the relative risks of extinction to Upper Columbia River spring-run chinook salmon under alternative assumptions about future environmental conditions?

2. What are the relative risks of extinction to Upper Columbia River steelhead under alternative assumptions about the effectiveness of hatchery origin spawners?

3. How much improvement in survival across the life history of a particular run is necessary to meet extinction risk criteria and interim recovery levels?

4. What benefits in terms of life cycle survival would be gained by meeting the specific survival improvement goals in the Mid-Columbia HCP?

5. Assuming that the survival objectives set forth in the proposed Mid-Columbia HCP and the Federal Columbia River Power System Biological Opinion are met, would the cumulative improvement in survival meet or exceed population-specific survival improvement needs?

It is important to note that although the proposed Mid-Columbia HCP is intended to improve the survival of Upper Columbia River chinook salmon and steelhead, it is not intended, by itself, to be the only action responsible for meeting Evolutionarily Significant Unit recovery objectives. In determining whether or not a particular action jeopardizes the continued existence of a listed Evolutionarily Significant Unit, NMFS determines "…whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages."[4]

Because future environmental/climatic conditions cannot be accurately predicted, information was used from three different sets of years within the chinook salmon data series to capture a possible range of future conditions. Spawner-return data for the Upper Columbia River spring-run chinook salmon runs date back to about 1960. Annual spawner return rates were generally higher for broods originating in the 1960s than in later years. Return levels for broods originating in the early 1990s included several of the lowest rates in the historical time series. Model runs using three different sets of spawner return data

[4] 2001 Federal Columbia River Power System Biological Opinion, Section 1.3.

from the historical series were used to characterize the relative extinction risks and survival needs under alternative environmental conditions.

Model runs incorporating the average and variance in spawner return rates across the entire historical series (1960 to 1994 brood years) represent an assumption that future environmental conditions are best represented by the longest historical series that can be generated and will result in some good survival years (similar to those observed in the 1960s) and some poor survival years (similar to the 1980s through the mid-1990s). This scenario would encompass assumptions that salmon survivals are strongly influenced by long-term (30- to 50-year) cycling in ocean/climatic conditions. Model runs incorporating the 1980 to 1994 period capture a time of relatively poor environmental/climatic conditions. If one assumes that these poor environmental/climatic conditions will continue into the future (a conservative view), then results based on the time series 1980 to 1994 would be most applicable. The period 1970 to 1994 may reflect an average condition that falls between the poor conditions represented by the 1980 to 1994 data series and the better conditions of the 1960 to 1994 series. The spawner-return data series for Upper Columbia River steelhead is relatively short (1976 to 1994); therefore, no attempt to generate alternative future survival and extinction risks for steelhead was made for spring-run chinook salmon.

The results from these simulations should not be viewed as specific predictions of future conditions or stock status. Rather, these models are tools intended to illustrate the potential response of the population to a range of future scenarios given a set of assumptions regarding population dynamics. While those assumptions are based on the best available information, there is considerable uncertainty associated with many of the estimates. This report includes sensitivity analyses designed to illustrate the influence of uncertainty in selected key assumptions on model results.

Current Extinction Risks

The CRR model estimated the relative risk of extinction of spring-run chinook salmon populations at 24, 48, and 100 years and for steelhead at 25, 50, 75, and 100 years.[5] The majority of the extinction risk assessments described in this report are expressed in terms of absolute extinction—defined as the probability that chinook salmon or steelhead populations fall to one or fewer spawners in 5 or more consecutive years. Given the uncertainty associated with productivity at extremely low levels of escapement, quasi-extinction risk assessments were also applied to chinook salmon model populations. Quasi-extinction risk was estimated as the probability that chinook salmon runs would fall to 50 or fewer spawners in the Methow and Wenatchee Basins and 30 or fewer in the Entiat Basin for 5 or more consecutive years.[6] For each scenario analyzed, the model was run for 1,000 iterations. Relative extinction risk at each of the selected time intervals was expressed as the percentage of 1,000 runs projected to be at or below the selected extinction level.

Extinction risk assessments based on simple population models are sensitive to assumptions regarding the average and distribution of spawner return rates and to the starting population size. Spawner return

[5] Estimated returns of chinook salmon to the Upper Columbia tributaries were based on annual redd counts dating back to the late 1950s and early 1960s. Estimated returns of steelhead were based on dam counts.

[6] The risk criteria are described in the QAR Biological Requirements Report (Ford et al. 2001).

rates (geometric mean and variances) were calculated for the alternative time series described above. Two alternative estimates of starting population size were used. Under the first approach, recent (1995 to 1999) average spawning escapement estimates were used as the basis for starting population size. Projections of the trend in spawning escapements from the initial level were generated by the simple population model using the spawner return rate estimates as a basis for generating production from each spawning year. A second starting point was used to simulate extinction risks given initial achievement of recovery abundance levels as a result of supplementation, but without long-term improvement in mean spawner to spawner return levels. Under this set of scenarios, the starting point for the analyses were initial spawning escapements at the IRLs recommended for each of the listed Upper Columbia River populations.[7]

Spring-Run Chinook Salmon Extinction Risks

Extinction risks varied among the three Upper Columbia River spring-run chinook salmon population areas. In general, the modeling analysis indicated that the Wenatchee River population has the highest current risk of extinction of the three populations analyzed. Extinction risk levels were sensitive to the time period used to derive survival/production characteristics.

Annual return rates since 1980 have been highly variable, and until brood year 1995, have included the lowest estimated return per spawner rates in the record. Assuming that conditions into the future will continue at levels associated with the 1980 to 1994 brood year data series results in high probabilities of extinction in 50 to 100 years for all Upper Columbia River spring-run chinook salmon stocks (Table 1).

TABLE 1. PROBABILITY OF EXTINCTION (ZERO FISH) FOR UPPER COLUMBIA RIVER SPRING-RUN CHINOOK AT 24-, 48-, AND 100-YEAR INTERVALS[1]

POPULATION	BASE PERIOD	EXTINCTION RISK AT:		
		24 YEARS	48 YEARS	100 YEARS
Wenatchee	1960-1994	0%	0%	2%
	1970-1994	1%	19%	73%
	1980-1994	15%	57%	98%
Entiat	1960-1994	0%	0%	0%
	1970-1994	2%	10%	47%
	1980-1994	16%	83%	99%
Methow	1960-1994	0%	0%	5%
	1970-1994	2%	24%	72%
	1980-1994	1%	15%	50%

[1] This analysis assumed that environmental conditions would be similar to those experienced during three base periods (1960-1994, 1970-1994, and 1980-1994).

[7] Interim Recovery Levels are described in the QAR Biological Requirements Report (Ford et al. 2001).

Assuming that future conditions are best represented by the historical series extending back to brood year 1970 generally reduces extinction risks in the Wenatchee and Entiat analyses. For the Methow analysis, extending the series back to 1970 did not substantially change the projected extinction risk. Spawning escapements for spring-run chinook salmon in years 2000 and 2001 indicated relatively high return rates for the 1995 and 1996 brood years. Incorporating these brood years into the extinction analysis resulted in projections similar to those of the 1970 to 1994 data set. Assuming future conditions would include survivals like those observed in the early 1960s results in a large decrease in extinction risks relative to the assumption that survivals will remain at the lower levels seen since 1980. However, to meet extinction risk criteria, improvements in average population growth rate would still be necessary.

The extinction risk projections described above were generated assuming that the geometric mean return per spawner and the observed level of year to year variation about that mean for each historical series would continue to apply into the future. There is uncertainty associated with the estimates of trend. A simple modeling analysis using the Wenatchee spring-run chinook salmon data series was conducted to assess the effect of uncertainty in the trend estimate on the projected extinction risk. Assuming that the estimated geometric mean trend continues, the point estimate of extinction risk using the 1980 to 1994 Wenatchee data series was 98 percent at 100 years. Incorporating uncertainty in the historical trend estimate generated a range about that point estimate, but a high proportion of the results projected relatively high risks of extinction. For example, 90 percent of the runs based on the 1980 to 1994 data set incorporating uncertainty projected 100-year extinction probabilities of 31 percent or higher. Using the 1970 to 1994 data set, approximately 75 percent of the runs projected 100-year extinction rates of 31 percent or higher.

Steelhead Extinction Risks

As described above, more limited trend data are available for Upper Columbia River steelhead. The parameters for the steelhead extinction risk model were derived from the 1986 to 1992 brood year data sets for the Wenatchee/Entiat and Methow steelhead runs. A significant proportion of returns to these areas are of hatchery origin. The relative effectiveness of hatchery origin spawners is a key scientific uncertainty. Extinction risk estimates were generated for a range of possible relative effectiveness values for naturally spawning fish of direct hatchery origin. As was the case with spring-run chinook salmon, the extinction risk assessments for steelhead were designed to evaluate the potential for runs to sustain production if hatchery supplementation were to be discontinued. The level of extinction risk was substantially influenced by assumptions regarding the historical effectiveness of hatchery contributions relative to spawners of natural origin. Extinction risk projections at 100 years were estimated to be approximately 28 to 35 percent under the assumption of low (25 percent) relative effectiveness of spawners. Under the assumption that the relative effectiveness of hatchery spawners is 50 percent or greater relative to wild fish, the projected extinction risks at 100 years for both groups was 99 to 100 percent (Table 2).

TABLE 2. PROBABILITY OF EXTINCTION (ZERO FISH) FOR UPPER COLUMBIA RIVER SUMMER-RUN STEELHEAD AT 25-, 50-, 75-, AND 100-YEAR INTERVALS[1]

POPULATION	THEORETICAL SPAWNER EFFECTIVENESS	EXTINCTION RISK AT:			
		25 YEARS	50 YEARS	75 YEARS	100 YEARS
Wenatchee/Entiat	25%	0%	0%	8%	35%
	50%	0%	26%	99%	100%
	75%	0%	80%	100%	100%
	100%	0%	99%	100%	100%
Methow	25%	0%	3%	11%	28%
	50%	0%	60%	97%	99%
	75%	3%	96%	100%	100%
	100%	10%	99%	100%	100%

[1] This analysis assumes that (1) hatchery augmentation is immediately discontinued, (2) survival conditions experienced during the 1976-1992 base period continue for the next 100 years, and (3) theoretical hatchery spawner effectiveness was 25, 50, 75, or 100 percent of naturally produced spawners.

Supplementation Scenarios

Simplified supplementation scenarios for Upper Columbia River spring-run chinook salmon were evaluated with the CRR model. Supplementation has the potential to accelerate the return of spawning numbers to IRLs. Under the assumption that the Evolutionarily Significant Units should be capable of sustaining themselves without supplementation, model runs were made under the assumption that run sizes were boosted to the IRL through the use of supplementation and then supplementation was discontinued and the risk of extinction was calculated as described above. Under the conservative assumption that population survival rates similar to those observed in the 1980 to 1994 data set continues, longer-term (e.g., 100-year) risks were nearly as high for the Wenatchee and Entiat populations as for the runs starting from recent averages. However, the long-term (100-year) risks for the Methow populations were substantially reduced (less than 21 percent) when starting the population at the IRL.

Survival Changes Needed to Meet Extinction Risk and IRL Criteria

The CRR model was also used to generate estimates of the average change in survival over the life cycle[8] needed to meet specific extinction risk criteria (e.g., less than a 5 percent risk of extinction as a result of year to year environmental variability and meeting IRL escapement objectives). Meeting the recommended IRL escapement criteria requires a larger increase in survival than meeting the direct

[8] Changes necessary to meet particular risk criteria are expressed in terms of survival in this paper. These increments can be translated into changes in population growth rate, λ, using an estimate of average generation time for the particular population of interest.

extinction risk criteria for all of the populations. The objective of maintaining average escapements at IRL or above is to provide protection against demographic, environmental, and genetic risk factors.

Spring-Run Chinook Salmon

Assuming that background survival rates were to continue at the relatively poor rates observed during the 1980 to 1994 period (the most conservative assumption), the modeled Wenatchee spring-run chinook salmon population would need a survival improvement of 75 percent to reduce the projected extinction risk at 100 years to below 5 percent. The necessary survival improvement using the 1970 to 1994 data series is 35 percent, and no improvement is necessary to meet this metric using the 1960 to 1994 data series. To meet the recovery escapement criteria (IRL) at 48 years, a survival improvement of 170 percent would be needed for this population using the 1980 to 1994 data series. Meeting the IRL criteria at 100 years would require a survival increase of 155 percent under the 1980 to 1994 assumptions. If long-term background survivals are similar to the 1970 to 1994 series, the requirements would drop to 92 percent and 110 percent to meet IRL criteria at 48 and 100 years, respectively. Assuming that the distribution of future survival is represented by the longest time series (the range observed since 1960), required survival increases of 40 percent and 15 percent would be needed to meet IRL criteria for the 48-year and 100-year time periods (Table 3).

Model runs based on the Methow spring-run chinook salmon data set indicated that similar levels of improvement would be required. Assuming that the long-term series of spawner/return estimates (1960 to 1994 brood years) represents future conditions, a 19 percent increase in life cycle survival would be required to reduce the projected extinction risk at 100 years to below 5 percent. A 48 percent increase in survival would be needed to meet and maintain IRL criteria within 100 years, and a 52 percent increase would be needed to meet IRL criteria within 48 years. Assuming that the relatively poor survival conditions indicated by the 1980 to 1994 data series are representative of the future, meeting the 100-year extinction risk criteria would require a 32 percent increase in life cycle survival, and meeting the IRL levels would require an increase of 95 percent (within 100 years) or 105 percent (within 48 years). Results for the Methow using the intermediate 1970 to 1994 time series were similar to the 1980 to 1994 results (see Table 3).

Projections based on the Entiat spring-run chinook salmon data set followed similar patterns. Under the assumption that the longer-term data set (1960 to 1994 brood years) is representative of future environmental conditions, no additional survival improvements would be required to reduce the projected extinction risk to 5 percent. IRL levels would be achieved with increases of 22 percent (48-year target) or 17 percent (100-year target). Assuming that the 1980 to 1994 data series is most representative of future conditions, model projections indicate that a survival improvement of 57 percent is needed to reduce the 100-year extinction risk to 5 percent. Survival improvements of 95 percent or 105 percent would be required to meet IRL objectives at 100 years or 48 years, respectively. Using the 1970 to 1994 data to represent future conditions results in a projected survival improvement requirement of 18 percent to meet extinction risk criteria at 100 years. Meeting IRL levels under this scenario requires life cycle survival improvements of 52 percent (100-year target) or 62 percent (48-year target) (see Table 3).

TABLE 3. PROJECTED CHANGE IN SPAWNER TO SPAWNER SURVIVAL RATES FOR UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON NEEDED TO REDUCE THE PROBABILITY OF EXTINCTION TO LESS THAN 5 PERCENT AND TO HAVE A GREATER THAN 50 PERCENT PROBABILITY OF EXCEEDING THE INTERIM RECOVERY LEVEL WITHIN 100 YEARS[1]

POPULATION	BASE PERIOD	SURVIVAL INCREASE REQUIRED TO REDUCE EXTINCTION RISK TO LESS THAN 5% AT:		SURVIVAL INCREASE REQUIRED TO HAVE A GREATER THAN 50% PROBABILITY OF EXCEEDING IRL AT:	
		24 YEARS	100 YEARS	48 YEARS	100 YEARS
Wenatchee	1960-1994	0%	0%	40%	15%
	1970-1994	0%	35%	110%	92%
	1980-1994	7%	75%	170%	155%
Entiat	1960-1994	0%	0%	22%	17%
	1970-1994	0%	18%	62%	52%
	1980-1994	12%	57%	112%	100%
Methow	1960-1994	0%	19%	52%	48%
	1970-1994	0%	34%	100%	95%
	1980-1994	0%	32%	105%	95%

[1] This analysis assumed that environmental conditions would be similar to those experienced during three base periods (1960-1994, 1970-1994, and 1980-1994) and that the population started at recent average (1980-1994) escapement levels.

The improvement levels necessary to meet short-term risks to extinction due to the compound effects of year to year environmental variation are less then the levels required to meet IRLs for each model population. In general, the survival improvements to meet 48-year and 100-year extinction risk criteria are approximately one-third to one-half of the improvement levels required to meet IRL criteria.

Steelhead

The CRR model was used to estimate the improvement in life cycle survival needed to meet the basic extinction risk criteria described above. The results were substantially influenced by assumptions regarding the effectiveness of hatchery spawners in contributing to natural production. Model runs incorporating the Methow steelhead data series required the highest levels of improvement in life cycle survival to meet the extinction risk criteria.

Under the assumption that hatchery steelhead spawners have been contributing equally with natural returns to production, the Methow model runs indicated that an increase of 152 percent in survival over the life cycle would be required to meet the 100-year extinction risk criteria, and an improvement of 265 percent[9] would be needed to achieve the IRL criteria at 100 years. Assuming that hatchery spawners

[9] For the steelhead model runs, recent average escapement levels (including hatchery fish) have been relatively high. There was little difference in the projected survival increases to meet IRL levels at 48 years versus 100 years.

were 25 percent as effective as returning adults of natural parentage, the survival change needed to meet the 100-year direct extinction risk criteria was 15 percent, and the change needed to meet IRL objectives was 55 percent. The survival changes needed to meet the 100-year risk criteria under the 50 percent and 75 percent effectiveness assumptions were 70 percent and 115 percent. Meeting the IRL targets under the 50 percent and 75 percent effectiveness assumptions required improvements of 135 percent and 200 percent, respectively (Table 4).

TABLE 4. PROJECTED CHANGE IN SPAWNER TO SPAWNER SURVIVAL RATES FOR UPPER COLUMBIA RIVER STEELHEAD NEEDED TO REDUCE THE PROBABILITY OF EXTINCTION TO LESS THAN 5 PERCENT AND TO HAVE A GREATER THAN 50 PERCENT PROBABILITY OF EXCEEDING THE INTERIM RECOVERY LEVEL WITHIN 100 YEARS[1]

POPULATION	THEORETICAL SPAWNER EFFECTIVENESS	SURVIVAL INCREASE REQUIRED TO REDUCE EXTINCTION RISK TO LESS THAN 5% AT:		SURVIVAL INCREASE REQUIRED TO HAVE A GREATER THAN 50% PROBABILITY OF EXCEEDING IRL AT:	
		24 YEARS	100 YEARS	48 YEARS	100 YEARS
Wenatchee/ Entiat	25%	0%	12%	50%	50%
	50%	0%	45%	95%	95%
	75%	0%	67%	120%	120%
	100%	0%	87%	160%	160%
Methow	25%	0%	15%	55%	55%
	50%	0%	70%	140%	135%
	75%	0%	115%	210%	200%
	100%	0%	152%	265%	265%

[1] This analysis assumed that (1) hatchery augmentation is immediately discontinued, (2) survival conditions experienced during the 1976-1992 base period continue for the next 100 years, and (3) theoretical hatchery spawner effectiveness was 25, 50, 75, or 100 percent of naturally produced spawners.

Projected survival improvements for the Wenatchee/Entiat population grouping were lower, but were still substantial. Meeting the direct extinction risk criteria of 5 percent risk or less by 100 years required 87 percent improvement in life cycle survival under the assumption that hatchery spawners were equally effective as naturally produced spawners. Meeting the IRL targets with this assumption required a 160 percent improvement in survival. Under the assumption that hatchery spawners were only 25 percent as effective as naturally produced spawners, the survival improvements needed to meet the 100-year extinction risk criteria and the IRL level were 12 percent and 50 percent, respectively. Assuming intermediate hatchery effectiveness assumptions of 50 percent and 75 percent, an additional survival improvement of 45 percent and 67 percent would be necessary to meet the 100-year risk criteria and improvements of 95 percent and 120 percent would be necessary to meet the IRL targets, respectively (see Table 4).

Upper Columbia River steelhead returns have been predominantly of hatchery origin since at least the late 1970s. The relative reproductive effectiveness of hatchery spawners versus returning adults from

naturally spawning parents is unknown for Upper Columbia River steelhead. Results of the modeling exercise support the contention that the relative effectiveness of hatchery spawners is a key scientific uncertainty relative to the level of survival improvements necessary to meet extinction risk and recovery criteria for the wild populations.

Sensitivity Analyses

The spring-run chinook salmon version of the CRR model was used in a series of analyses to probe the sensitivity of results (extinction risks and the life cycle survival improvement necessary to meet IRL criteria) to key assumptions.

Incorporating Preliminary Estimates of 1999 to 2001 Returns

Preliminary estimates of 1999 to 2001 returns were used to expand the 1980 to 1994 brood year data series to include brood years 1995 and 1996 for the Wenatchee and Methow spring-run chinook salmon data sets. Returns from these two brood years were significantly higher than for the recent series. The expanded data sets were analyzed with the CRR model. Extinction risks and the incremental improvements in survival necessary to meet survival and IRL criteria were reduced to approximately the same levels as were indicated by analyses of the 1970 to 1994 data sets. This analysis supports the idea that the results of the 1980 to 1994 data series analysis should be viewed as the most conservative of the three data series analyzed.

Carrying Capacity

The estimated increase in survival is sensitive to assumptions regarding carrying capacity of the systems. If carrying capacity is substantially higher than the IRL level, the survival improvement required to rebuild from recent average escapements to IRL would be lower. For example, the requirement to meet the IRL escapement criteria for the Wenatchee (assuming future survivals are represented by the conservative1980 to 1994 data series) would be 170 percent assuming that maximum smolt production is reached at an escapement of 4,000 (approximately equal to the IRL level of 3,750). The survival improvement necessary to reach IRL criteria would drop below 100 percent if the carrying capacity is roughly double the IRL level (7,500). If the carrying capacity (spawning level producing maximum smolt output) is very high relative to the IRL, the required survival improvement would be reduced to approximately 75 percent.

Stock-Recruit Model

The population modeling described in this paper was based largely on a simple 'broken stick' model relating productivity to spawning population size. Under this approach, production per spawner is constant up to a carrying capacity threshold. At escapements above that threshold, average production is constant. An alternative population function, the Ricker spawner/recruit function, has been fit to historical data from the Upper Columbia stocks (Schaller et al. 2000). The CRR model was modified to implement the Ricker function derived from the 1970 to 1994 brood year spawner/return series. Using the Ricker function resulted in lower projected extinction risks relative to the broken stick model assuming the 1970 to 1994 average survivals would continue. Reducing survivals to the equivalent of the more conservative 1980 to 1994 levels resulted in high extinction risk probabilities, similar to the broken stick model. Achieving the IRL levels took higher increments of survival improvements than were required using the broken stick model.

Survival Changes at Different Life History Phases

The sensitivity of average annual population growth rate to changes in mortality at specific phases in the life cycle showed a similar pattern to Snake River analyses, with a couple of exceptions. The Snake River populations and the Upper Columbia populations exhibit high mortality rates in the egg to smolt and the estuary to ocean adult phases. Shift of 10 percent mortality to survival could theoretically increase survival rates 2 to 3 times. However, the resulting survivals would be higher than smolt production rates that are associated with relatively healthy stocks. The feasibility of particular actions to achieve survival increases that are mathematically and biologically possible is a third important consideration.

Potential Survival Change from HCP

Projecting survival changes associated with achieving the HCP survival goals depends on assumptions regarding historical passage survival through the projects. Little direct information on historical reach survival is available. Study groups released in the mid-1980s were used to calibrate a simple model of passage survival to estimates of annual arrival timing and spill at each project. Assuming base period survival rates similar to those reported during the system survival studies conducted in the 1980s resulted in estimates of per project survival of 86 to 88 percent. Achieving the HCP goals (91 percent combined adult and juvenile project survival) would increase average juvenile passage survival to 93 percent per project, or 16 to 25 percent for steelhead and 21 to 35 percent for spring-run chinook salmon (range is for three to five projects).[10]

Potential Survival Change from Dam Removal

For comparison purposes, an estimate of what juvenile survivals may have been through the Mid-Columbia reach in the absence of the hydroelectric dams was generated (assuming that dams were either not built in the first place or were removed without any negative environmental consequences). Passive integrated transponder (PIT) tag survival data from Snake River studies (e.g., Smith et al. 1998) were used to estimate downstream migration mortality rates for juvenile spring-run chinook salmon and steelhead migrating through free-flowing reaches within the Snake River system. The results were applied to each population grouping by multiplying the number of kilometers from the tributary of origin to the Priest Rapids Dam site against the per kilometer survival rate from the Snake River studies. Estimated survivals to a point below the present Priest Rapids Dam varied from a low of 93 percent (Methow steelhead) to a high of 97 percent (Wenatchee River spring-run chinook salmon). This range represents a 40 to 84 percent increase in survival over the base periods used in this analysis.

Under the assumption that the 1980 to 1994 survival conditions continue, achievement of the survival improvements, up to the level estimates for free-flowing conditions (i.e., if the dams were removed), would not meet the IRL criteria for any of the three spring-run chinook salmon stocks. Assuming that the equivalent of free-flowing passage through the Mid-Columbia reach is achieved and that the 1970 to 1994 survival conditions continue, the IRL criteria would be met for the Entiat spring-run chinook

[10] Upper Columbia River Evolutionarily Significant Units are more responsive to changes in passage survival at the series of mainstem dams due to the reliance on in-river migration since barging from McNary was curtailed in 1995.

salmon population but not for the Wenatchee and Methow spring-run chinook salmon populations. Assuming that the 1960 to 1994 survival conditions continue, the 100-year IRL criteria would be met for all populations of Upper Columbia River chinook salmon.

Summary: Potential Survival Improvements Versus Requirements

The estimated improvements in passage survival associated with achieving the objectives expressed in the proposed Wells, Rocky Reach, and Rock Island HCPs are directly comparable to the projected life cycle survival improvement requirements generated by the historical analyses described above.

Spring-Run Chinook Salmon

For spring-run chinook salmon, achieving the HCP objectives would result in sufficient survival improvements to meet the projected needs under the assumption that future return per spawner patterns are represented by the 1960 to 1994 brood year series, with the possible exception of meeting IRL criteria for the Wenatchee (0 to 14 percent projected improvement needed after HCP contribution).

Projections based on the Wenatchee spring-run chinook salmon data set indicate that even under the most optimistic scenarios modeled regarding future survival rates and the effectiveness of supplementation, additional survival improvements beyond those projected for proposed HCP actions would be necessary to achieve extinction risk/recovery criteria if the conditions observed during the 1980 to 1994 data series continue. Under these assumptions, an additional increase in life cycle survival of approximately 37 percent would be required to meet the 5 percent extinction risk threshold at 100 years. Increasing geometric mean escapements to IRL levels would require an additional survival improvement of 30 to 54 percent, depending upon assumptions and time frames.

Model runs based on the Methow spring-run chinook salmon data sets projected that the estimated survival improvements attained by meeting the proposed Mid-Columbia HCP objectives exceeded the required improvements to reduce direct extinction risks below the 5 percent level at 100 years under all three assumptions about future conditions. If future conditions are represented by the 1960 to 1994 data series, achieving the survival improvements associated with the HCP criteria would also cover the improvements needed to meet IRL objectives. However, meeting the longer-term IRL criteria at 48 or 100 years would require additional survival improvements beyond those associated with meeting the Mid-Columbia HCP passage objectives under the remaining future scenarios. Under the assumption that the relatively low return rates observed for 1980 to 1994 broods are representative of the future, additional survival improvements of 31 to 38 percent would be needed. Similar improvement levels would be required if the 1970 to 1994 data series is assumed to be representative of future conditions (Table 5).

For the Entiat spring-run chinook salmon population, achieving the potential survival improvements associated with meeting the proposed HCP objectives would cover the projected improvements required to reduce direct extinction risks to below 5 percent at 100 years under the 1960 to 1994 and the 1970 to 1994 future scenarios. An additional improvement in life cycle survival of approximately 12 percent would be required to meet the 5 percent extinction risk criterion under the more conservative 1980 to 1994 projections. Achieving the survival improvements associated with the proposed HCP objectives would also meet IRL requirements under the assumption that 1960 to 1994 population return per spawner rates are representative of the future. Using the 1970 to 1994 series, an additional survival increment of 9 to 16 percent would be required to meet IRL levels. If the 1980 to 1994 data series is

TABLE 5. PROJECTED CHANGE IN SPAWNER TO SPAWNER SURVIVAL FOR UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON REMAINING TO REDUCE THE PROBABILITY OF EXTINCTION TO LESS THAN 5 PERCENT AND TO HAVE A GREATER THAN 50 PERCENT PROBABILITY OF EXCEEDING THE INTERIM RECOVERY LEVEL WITHIN 100 YEARS[1]

		SURVIVAL INCREASE REQUIRED TO REDUCE EXTINCTION RISK TO LESS THAN 5% WITH:			SURVIVAL INCREASE REQUIRED TO HAVE A GREATER THAN 50% PROBABILITY OF EXCEEDING IRL WITH:		
POPULATION	BASE PERIOD	NO ACTION	HCP	HCP + FEDERAL BIOLOGICAL OPINION	NO ACTION	HCP	HCP + FEDERAL BIOLOGICAL OPINION
Wenatchee	1960-1994	0%	0%	0%	15%	0%	0%
	1970-1994	35%	5%	0%	92%	48%	36%
	1980-1994	75%	37%	31%	155%	99%	83%
Entiat	1960-1994	0%	0%	0%	17%	0%	0%
	1970-1994	18%	0%	0%	52%	9%	0%
	1980-1994	57%	12%	7%	100%	43%	31%
Methow	1960-1994	19%	0%	0%	48%	0%	0%
	1970-1994	34%	0%	0%	95%	31%	20%
	1980-1994	32%	0%	0%	95%	31%	20%

[1] This analysis assumed that (1) environmental conditions will be similar to those experienced during three base periods (1960-1994, 1970-1994, and 1980-1994), (2) the population started at recent average (1980-1994) escapement levels, and (3) delayed mortality from Federal transportation would be 20 percent (D = 0.8). Three action alternatives were evaluated, including (1) No Action, (2) HCP, and (3) HCP plus Federal biological opinion actions.

more representative of the average and range of future conditions, improvements of approximately 43 percent and 51 percent would be required to meet IRL targets at 100 years and 48 years, respectively (see Table 5).

In summary, if future environmental conditions resemble the longer 1960 to 1994 or 1970 to 1994 data sets rather than the more conservative 1980 to 1994 data set, then the levels of additional survival needed for recovery metrics are reduced substantially or eliminated in certain scenarios. For spring-run chinook salmon, the addition of 2000 and 2001 adult returns (1995 and 1996 brood years) to the 1980 to 1994 brood year data yielded mean spawner/return rates similar to those of the 1970 to 1994 data series. This suggests that the 1970 to 1994 data set may best represent future environmental conditions for predicting extinction risks and the probability of achieving IRL criteria.

Steelhead

For both of the modeled steelhead populations (the Wenatchee/Entiat and the Methow), gaining the survival improvements associated with meeting the proposed HCP objectives would cover the required changes for the 100-year extinction criteria only under the assumption that hatchery effectiveness was 0.25 or less. Model runs incorporating the 0.5, 0.75, and 1.0 effectiveness assumptions all predict that

additional improvements in survival would need to be realized to meet the 100-year risk criteria. Additional survival improvements would also be required to meet IRL levels under any of the assumptions regarding hatchery effectiveness (Table 6).

TABLE 6. PROJECTED CHANGE IN SPAWNER TO SPAWNER SURVIVAL FOR UPPER COLUMBIA RIVER SUMMER STEELHEAD REMAINING TO REDUCE THE PROBABILITY OF EXTINCTION TO LESS THAN 5 PERCENT AND TO HAVE A GREATER THAN 50 PERCENT PROBABILITY OF EXCEEDING THE INTERIM RECOVERY LEVEL WITHIN 100 YEARS[1]

Population	Theoretical Hatchery Effectiveness	Survival Increase Required to reduce extinction risk to less than 5% with:			Survival Increase Required to have a greater than 50% probability of exceeding IRL with:		
		No Action	HCP	HCP + Federal Biological Opinion	No Action	HCP	HCP + Federal Biological Opinion
Wenatchee/ Entiat	25%	12.0%	0.0%	0.0%	50.0%	22.0%	23-20%
	50%	45.0%	18.0%	24-21%	95.0%	59.0%	61-54%
	75%	67.0%	36.0%	58-51%	120.0%	79.0%	82-72%
	100%	87.0%	52.0%	86-76%	160.0%	111.0%	116-102%
Methow	25%	15.0%	0.0%	0.0%	55.0%	12.0%	13-11%
	50%	70.0%	23.0%	19-16%	135.0%	70.0%	73-64%
	75%	115.0%	56.0%	33-37%	200.0%	117.0%	122-108%
	100%	152.0%	83.0%	54-48%	265.0%	164.0%	171-151%

[1] This analysis assumed that (1) hatchery augmentation is immediately discontinued, (2) survival conditions experienced during the 1976-1992 base period continue for the next 100 years, and (3) historical hatchery spawner effectiveness was 25, 50, 75, or 100 percent of naturally produced spawners. Three action alternatives were evaluated, including (1) No Action, (2) HCP, and (3) HCP plus Federal biological opinion actions. The latter is expressed as a range reflecting alternative assumptions regarding the relative survival of transported fish (D = 1.0 or 0.8).

Meeting Mid-Columbia HCP and Federal Columbia River Power System Objectives

The draft Federal Columbia River Power System Biological Opinion calls for implementation of an aggressive set of improvements to in-river survival at lower river projects affecting the Upper Columbia River. The extent to which those improvements in survival represent a net increase in survival over the average for the base periods used in these assessments is dependent upon assumptions regarding delayed mortality of transported fish.[11] The draft Federal Columbia River Power System Biological Opinion also characterizes the level of off-site mitigation by the Federal action agencies given the continuing survival impacts of operating the hydropower system.

[11] Before 1995, a portion of the smolt run arriving at McNary was collected and transported to below Bonneville Dam.

Spring-Run Chinook Salmon

Achieving the combined survival improvement increments associated with the proposed HCP and the Federal Columbia River Power System Biological Opinion (direct and off-site mitigation changes) would exceed the changes needed to meet the 100-year extinction risk criteria for all three stock groupings with two exceptions. Under the most conservative data set (1980 to 1994 brood years), the Wenatchee and Entiat spring-run chinook salmon populations are projected to need an additional 31 percent and 7 percent increase, respectively, in survival to meet this criteria. The combination of improvements would similarly exceed the projected requirements to meet IRL objectives for each of the populations assuming that 1960 to 1994 environmental conditions persist into the future. Under the assumption of 1970 to 1994 conditions, an additional 0 to 36 percent increase in survival would be required to meet the 100-year IRL criteria. Under the most conservative assumption of future environmental conditions (1980 to 1994 brood years), an additional 20 to 83 percent improvement in survival would be required to meet the criteria for each of the modeled populations.

Steelhead

Again, assumptions regarding the relative effectiveness of hatchery origin fish in contributing to natural production have a significant impact on the results. The combined improvements from achieving the proposed HCP and Federal Columbia River Power System objectives would exceed the requirements to meet the 100-year extinction risk criteria for both stock groupings if hatchery spawner effectiveness has been 0.25 that of naturally produced spawners. Additional survival improvements would be necessary to reduce the risk to 5 percent or less if hatchery effectiveness is assumed to be 0.5 to 1.0. The additional survival needed to meet these criteria for Wenatchee/Entiat and Methow steelhead ranges from 21 to 86 percent and from 16 to 54 percent, respectively.

Model runs representing both of the stock groupings indicate that, even with the assumption that the HCP and Federal Columbia River Power System survival improvements are fully realized, additional survival improvements would be needed to achieve the 48- and 100-year IRL criteria for any of the hatchery spawner effectiveness scenarios. For Wenatchee/Entiat steelhead, additional survival improvements of 20 percent to 116 percent would be necessary to achieve the 100-year IRL criteria. An additional survival improvement of 11 percent to 171 percent would be required to achieve the 100-year IRL criteria (see Table 6).

Economic Figures

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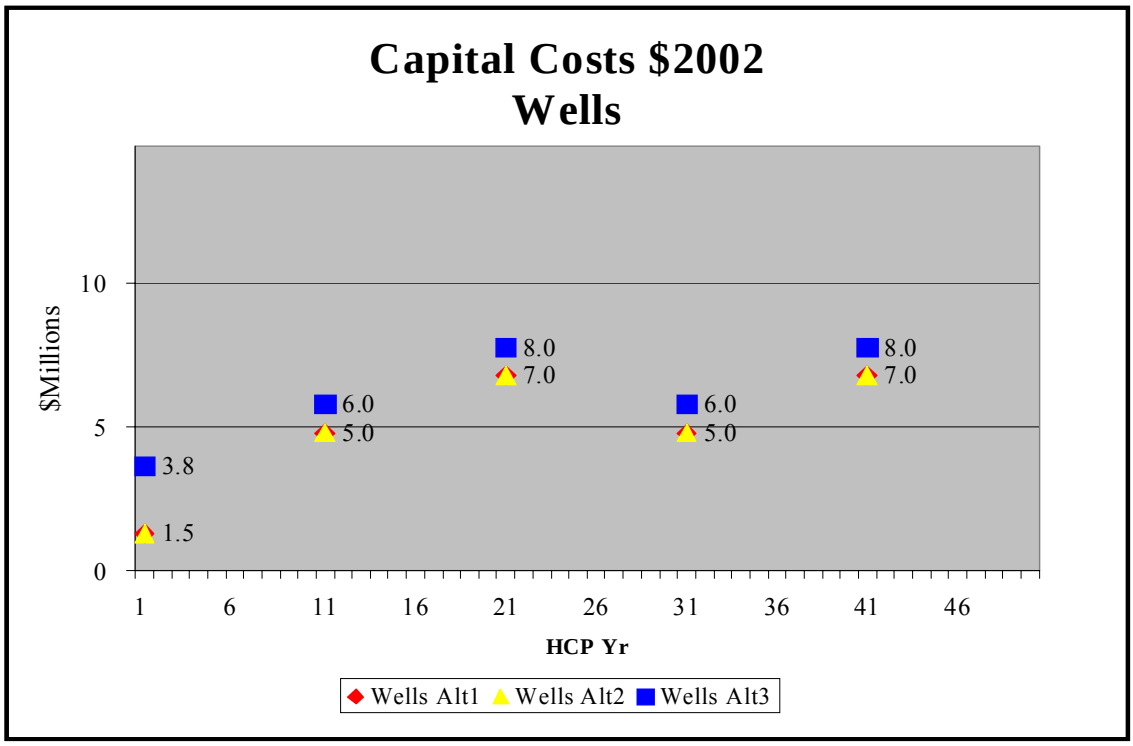

Figure F-1. Capital Costs – Wells Project

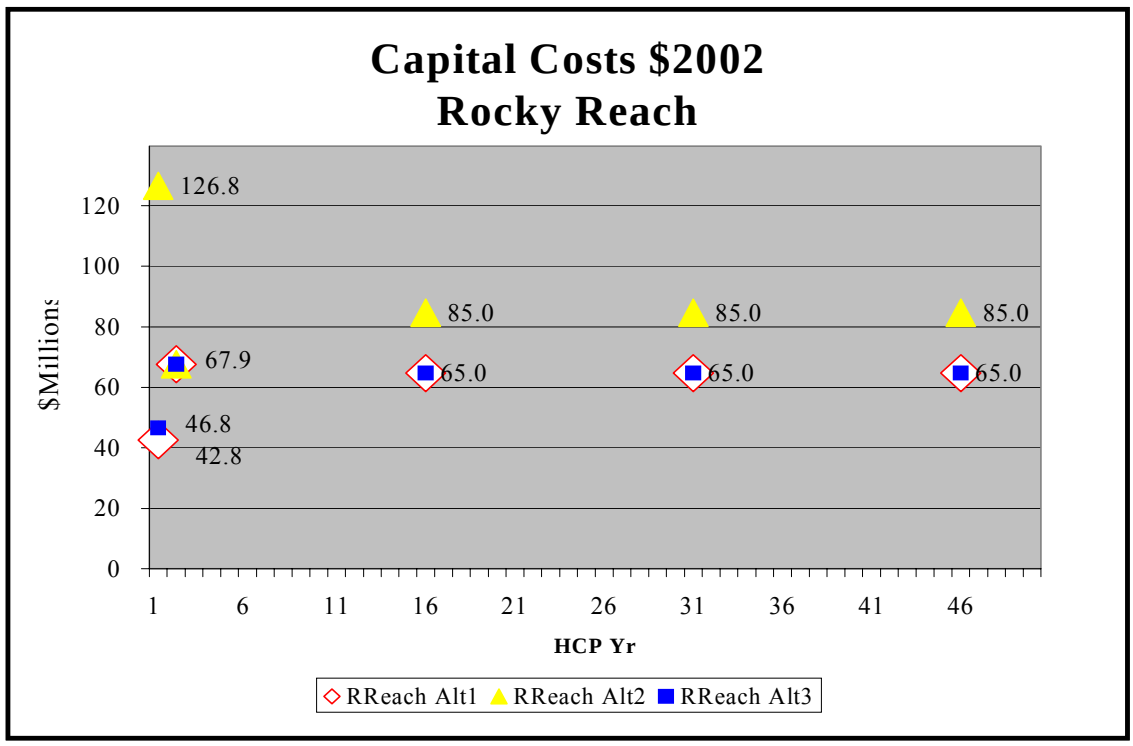

Figure F-2. Capital Costs – Rocky Reach Project

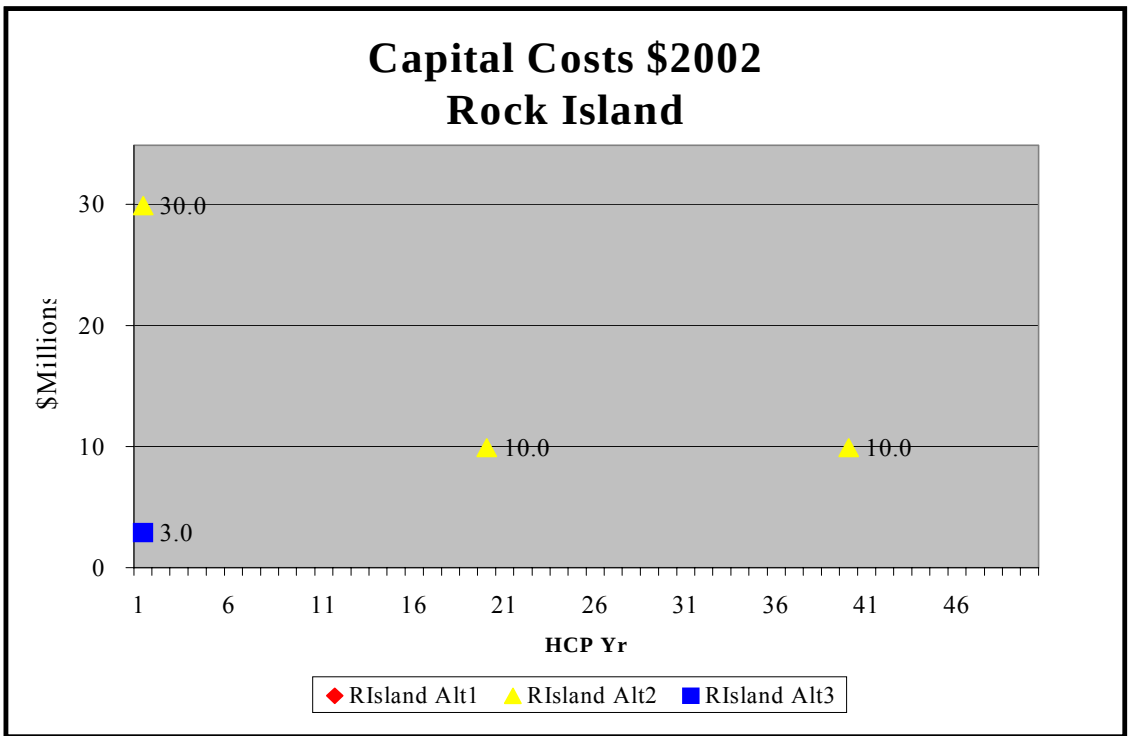

Figure F-3. Capital Costs – Rock Island Project
Note: There are no capital costs associated with Alternative 1.

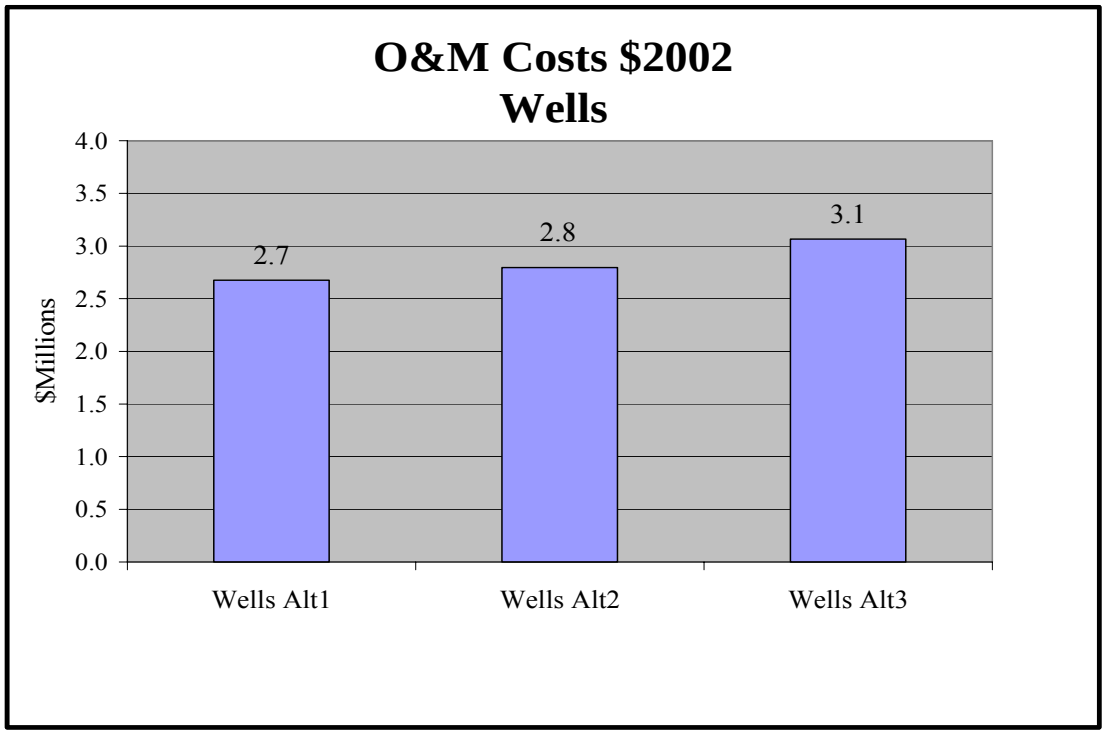

Figure F-4. Annual Operation and Maintenance Costs – Wells Project

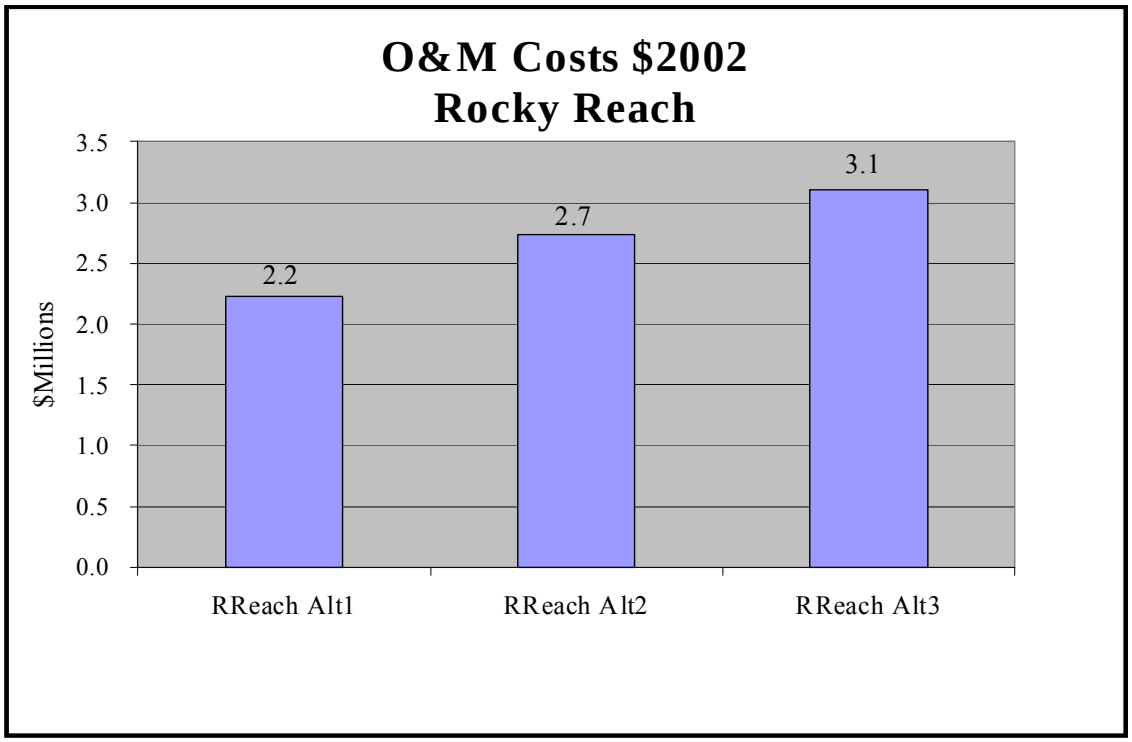

Figure F-5. Annual Operation and Maintenance Costs – Rocky Reach Project

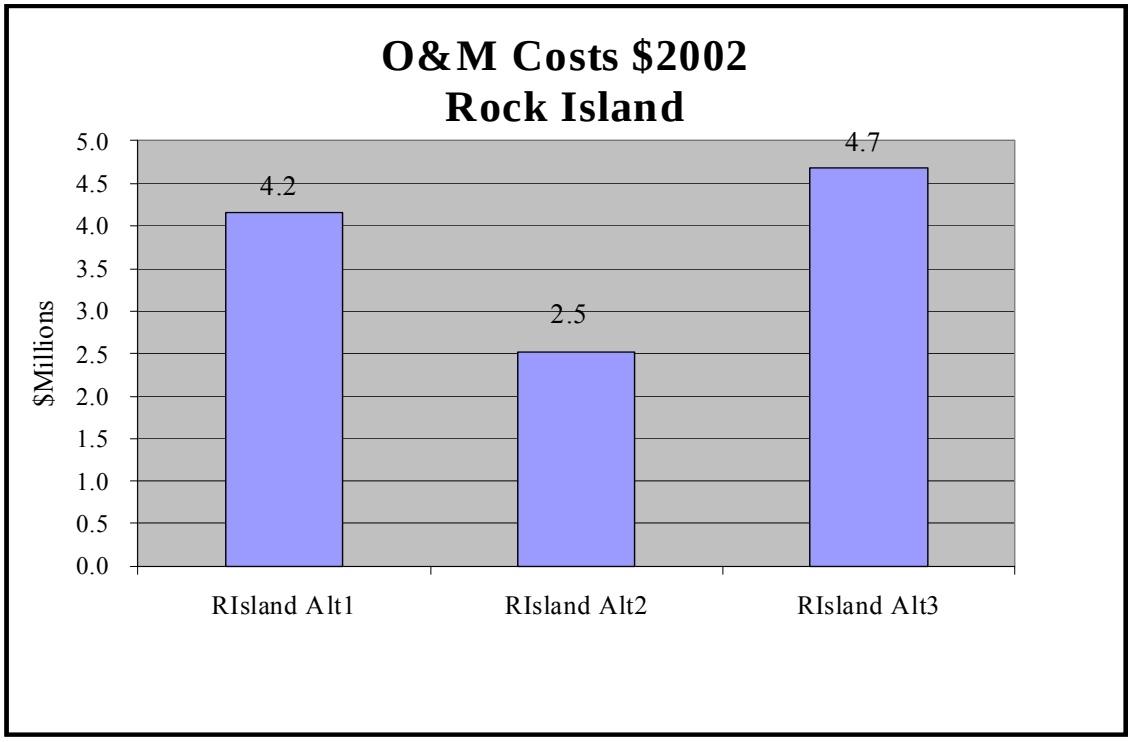

Figure F-6. Annual Operation and Maintenance Costs – Rock Island Project

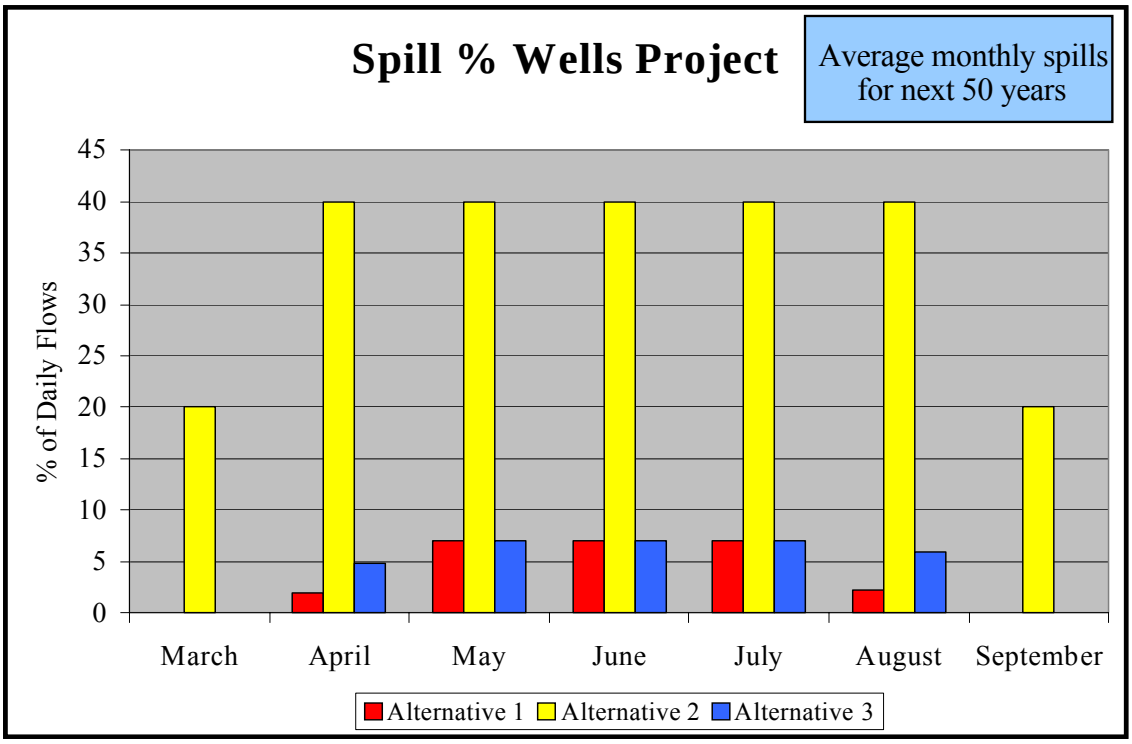

Figure F-7. Spill Percentage at Wells Project on a Monthly Basis

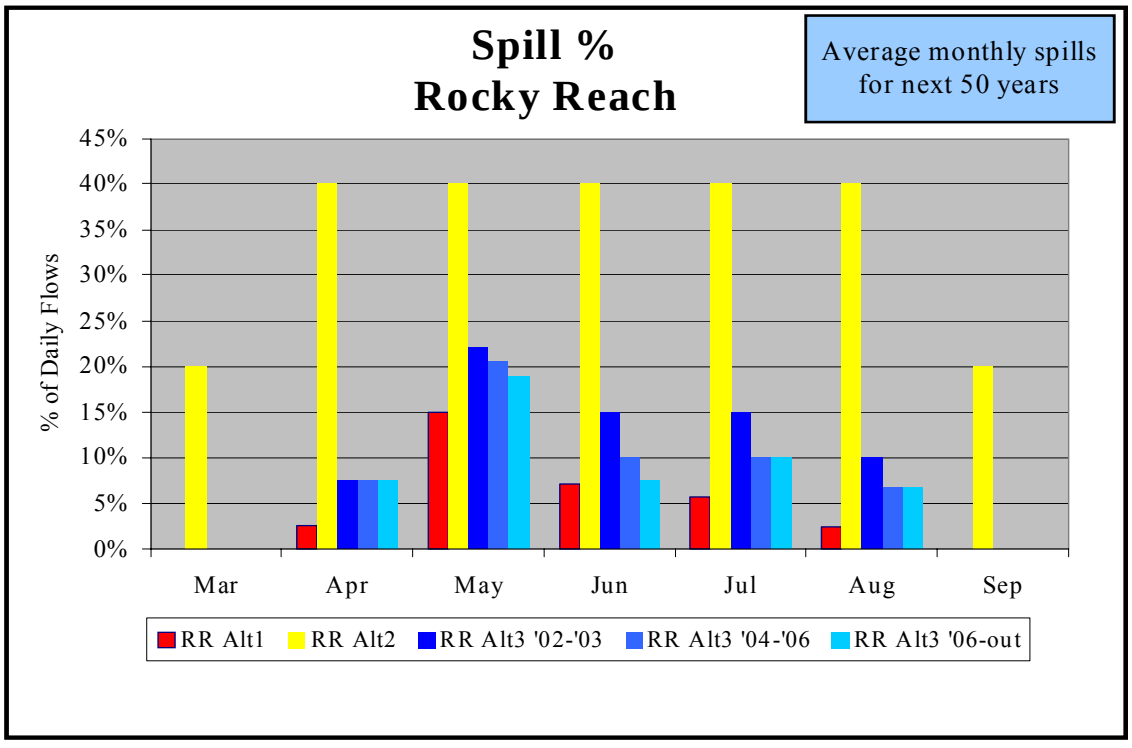

Figure F-8. Spill Percentage at Rocky Reach Project on a Monthly Basis

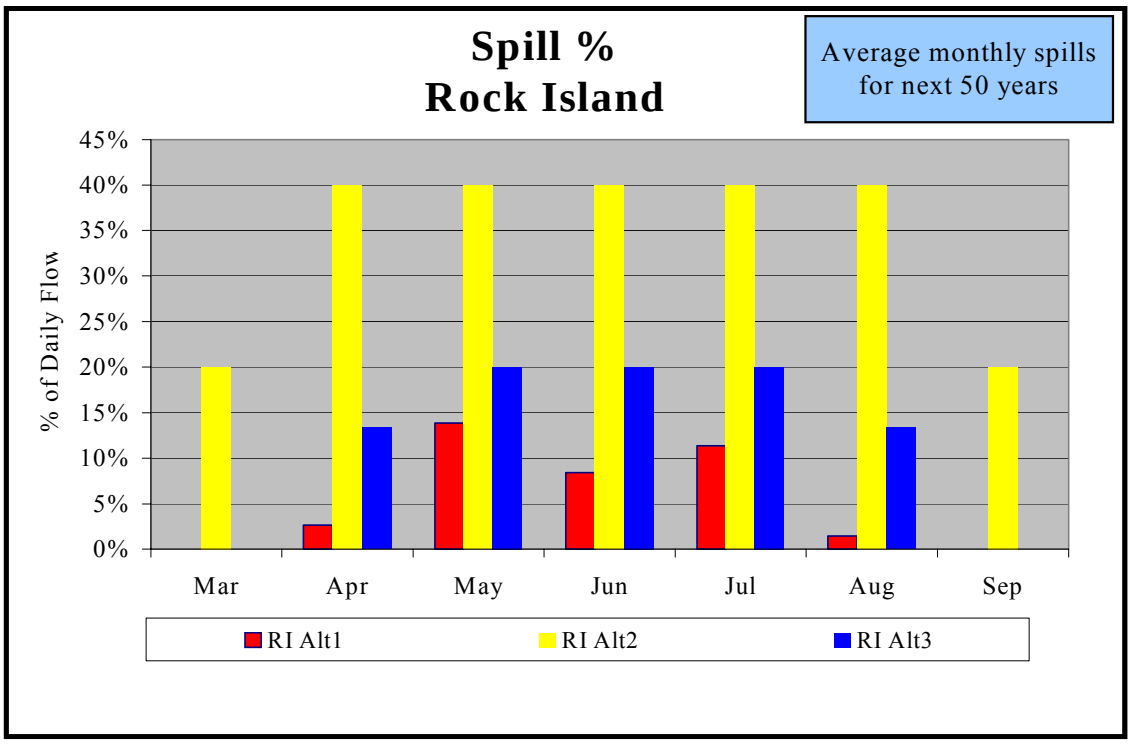

Figure F-9. Spill Percentage at Rock Island on a Monthly Basis

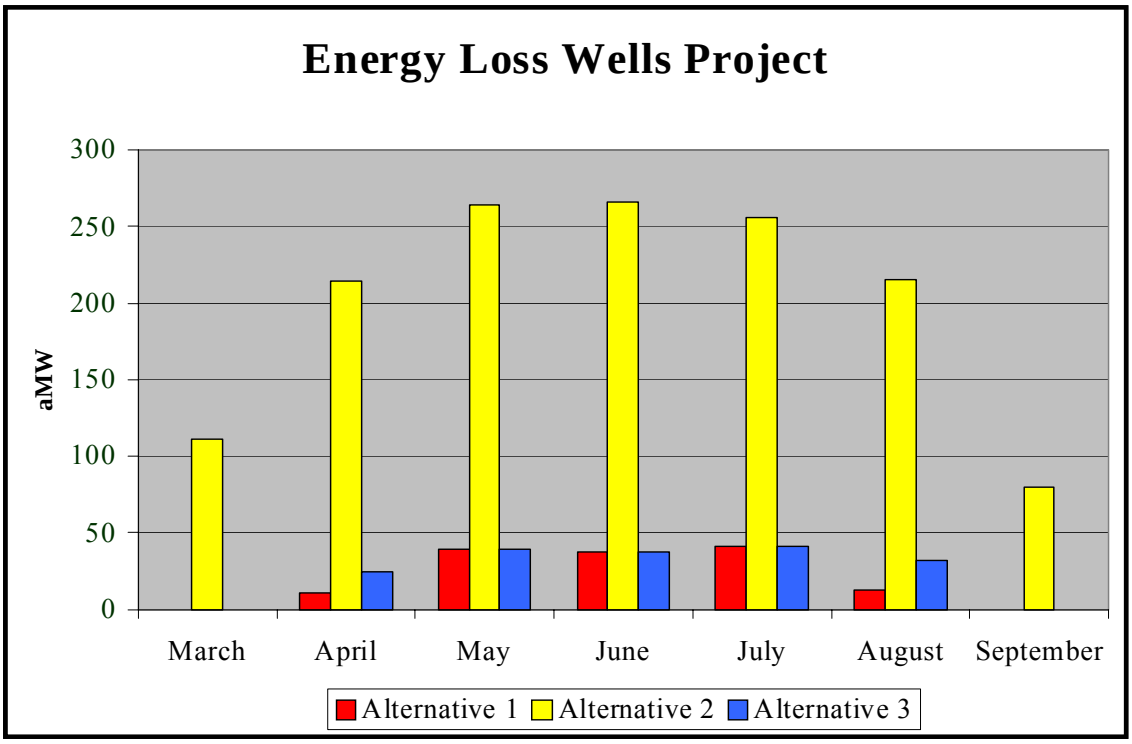

Figure F-10. Energy Loss on a Monthly Basis – Wells Project

Given the forecasted relatively flat spill characteristics throughout the day, lost capacity is approximately equal to the lost energy in aMWs. For example, it would require 100 megawatts of capacity generating 100 percent of the time to generate a block of energy of 100 aMW. The average spill for Alternative 2 for Wells, Rocky Reach, and Rock Island represents a 40 percent spill from March 15 through September 15.

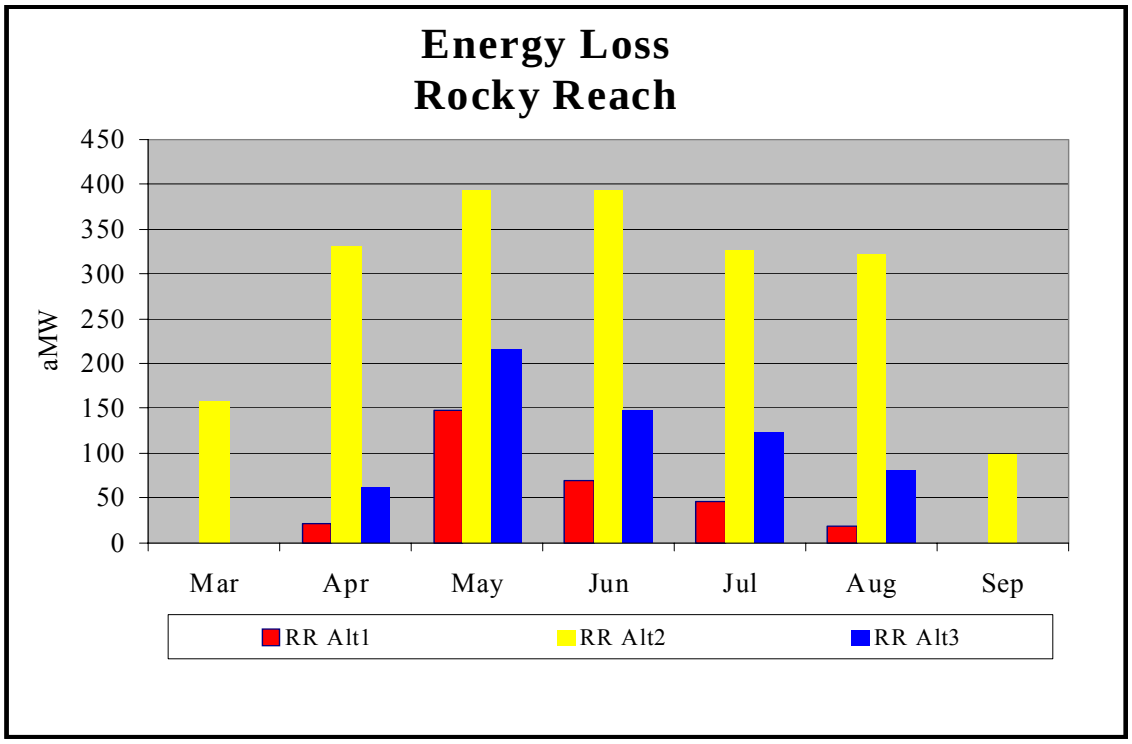

Figure F-11. Energy Loss on a Monthly Basis – Rocky Reach Project

By 2006, the energy due to spill for Alternative 3 decreases by 14 percent in May, 50 percent in June, and 33 percent for July to September. Given the forecasted relatively flat spill characteristics throughout the day, lost capacity is approximately equal to the lost energy in aMWs. For example, it would require 100 megawatts of capacity generating 100 percent of the time to generate a block of energy of 100 aMW. The average spill for Alternative 2 for Wells, Rocky Reach, and Rock Island represents a 40 percent spill from March 15 through September 15.

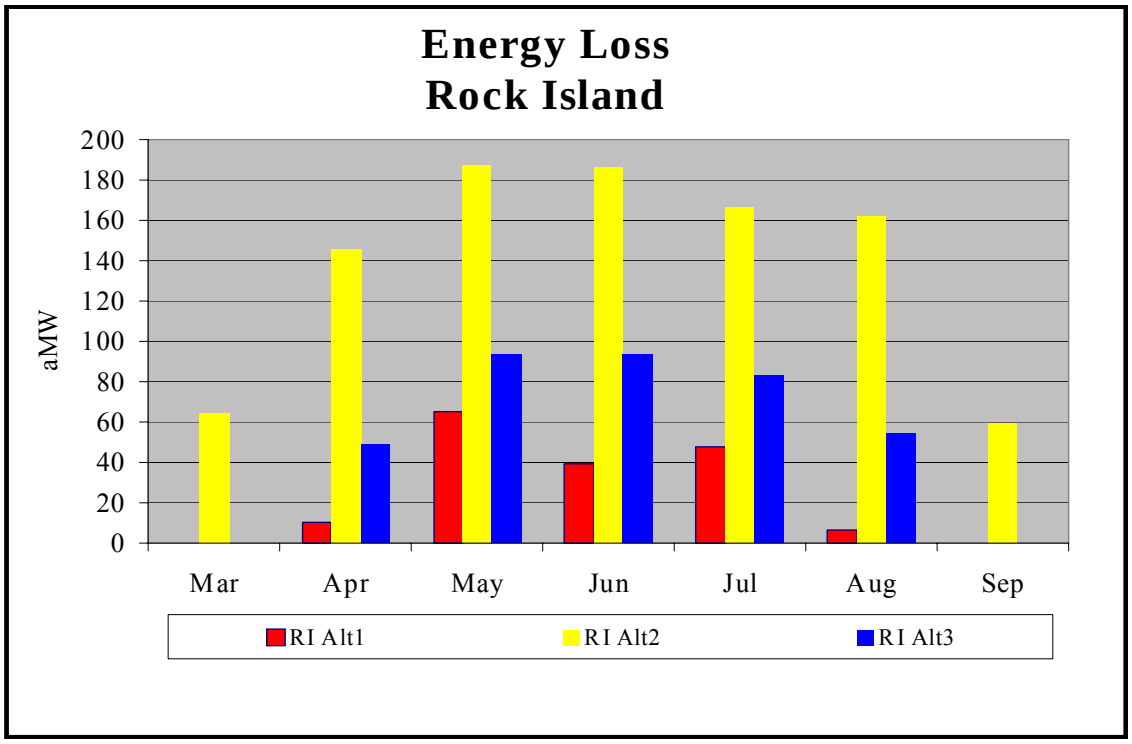

Figure F-12. Energy Loss on a Monthly Basis – Rock Island Project

Given the forecasted relatively flat spill characteristics throughout the day, lost capacity is approximately equal to the lost energy in aMWs. For example, it would require 100 megawatts of capacity generating 100 percent of the time to generate a block of energy of 100 aMW. The average spill for Alternative 2 for Wells, Rocky Reach, and Rock Island represents a 40 percent spill from March 15 through September 15.

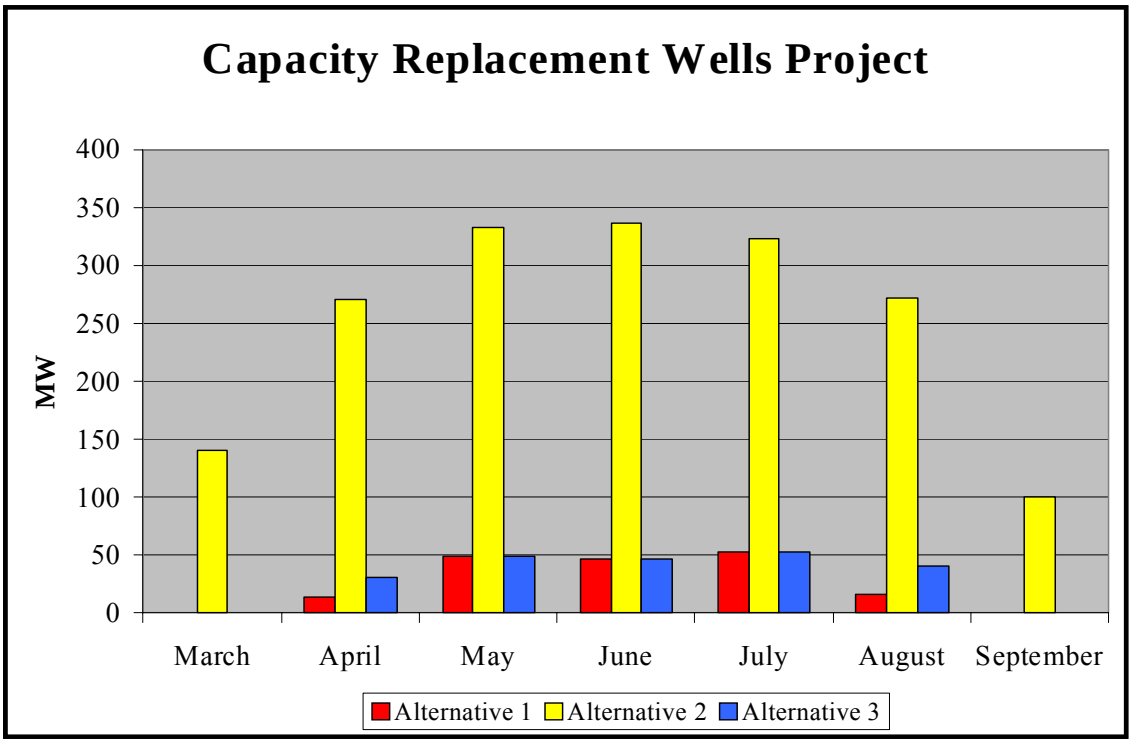

Figure F-13. Capacity Replacement – Wells Project

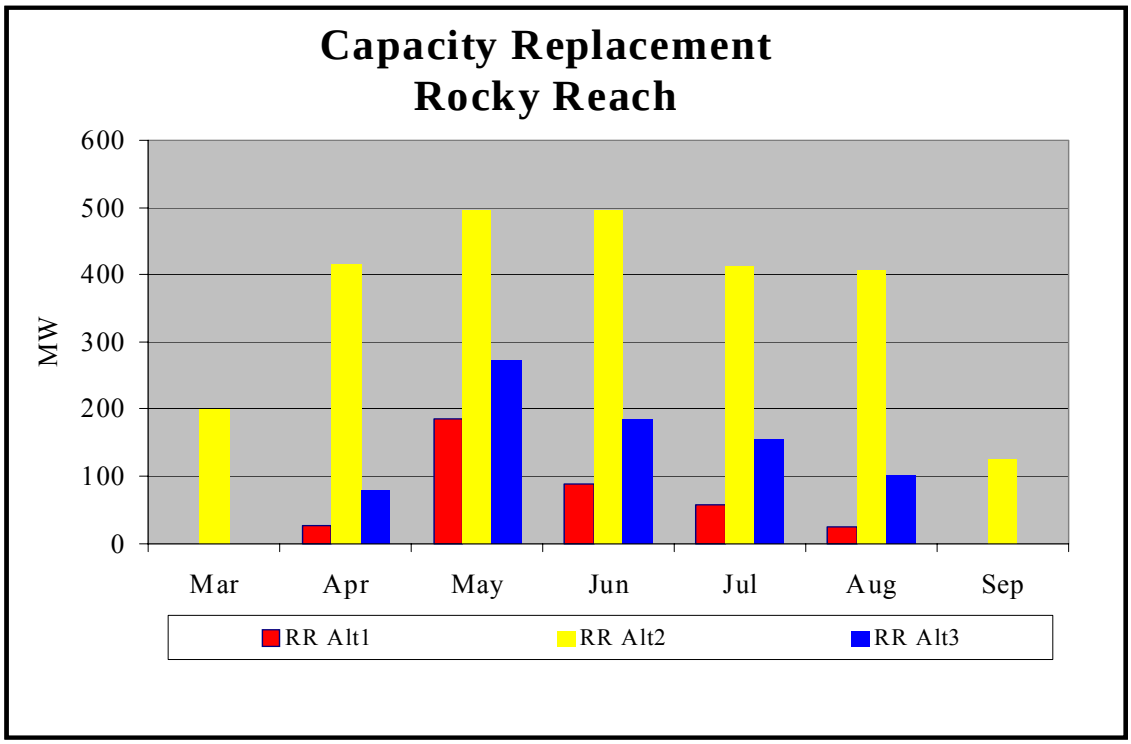

Figure F-14. Capacity Replacement – Rocky Reach Project

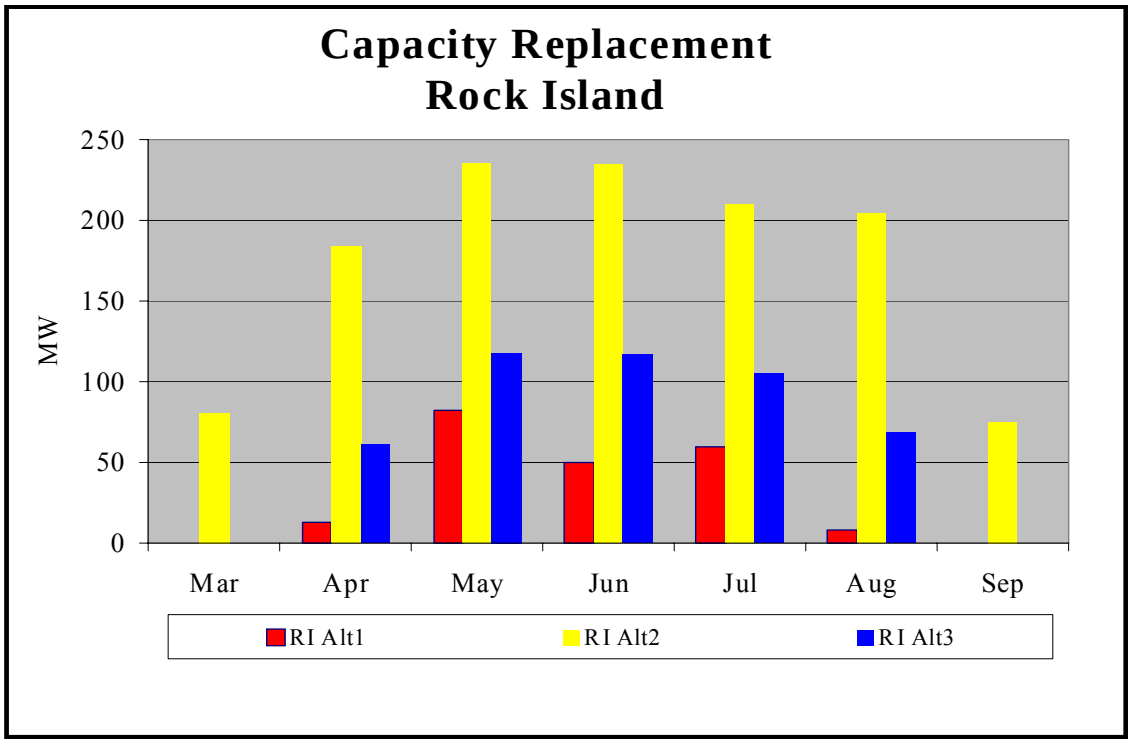

Figure F-15. Capacity Replacement – Rock Island Project

Biological Opinions Supporting Incidental Take Permits

Biological Opinion for Permit No. 1395 (2003)

National Marine Fisheries Service Endangered Species Act (ESA)
Section 7 Consultation Biological Opinion and Magnuson-Stevens Act
Essential Fish Habitat Consultation

Action Agencies: National Marine Fisheries Service (NMFS)
U.S. Fish and Wildlife Service (USFWS)
U.S. Bureau of Reclamation (BOR)

Species/Evolutionarily Significant Units (ESUs) Affected: Upper Columbia River (UCR) Steelhead (*Oncorhynchus mykiss*)
UCR Spring Chinook Salmon (*O. tshawytscha*)

Essential Fish Habitat Affected: Chinook Salmon

Activities Considered:
1. Issuance of Permit 1395 jointly to the Washington Department of Fish and Wildlife (WDFW), the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD)
2. Issuance of Permit 1396 to the USFWS
3. Issuance of Permit 1412 to the Confederated Tribes of the Colville Reservation (Colville Tribes)

Consultation Conducted By: Salmon Recovery Division (SRD), Northwest Region
Consultation Number 2002/000981

This Biological Opinion (Opinion) constitutes NMFS' review of three section 10(a)(1)(A) permit actions that may affect UCR steelhead and UCR spring chinook salmon. It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided in the applications for the proposed permits, published and unpublished scientific information on the biology and ecology of endangered steelhead in the action area, and other sources of information. A complete administrative record of this consultation is on file with the SRD in Portland, Oregon.

Approved by: _____ **Date Issued:** 11/2/03
D. Robert Lohn, Regional Administrator **(Expires ten years from signing)**

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1. CONSULTATION HISTORY

This Biological Opinion (Opinion) constitutes the review of NOAA's National Marine Fisheries Service (NMFS) proposed approval of three Endangered Species Act (ESA) section 10(a)(1)(A) permits for artificial propagation programs for the enhancement of upper Columbia River (UCR) steelhead.

On June 12, 2002, NMFS received an application for a new ESA section 10(a)(1)(A) permit from the Washington Department of Fish and Wildlife (WDFW) (WDFW 2002). This application requested authorization for annual take of endangered UCR steelhead and UCR spring chinook salmon associated with artificial propagation research and enhancement programs of steelhead in the UCR basin. Notice of the receipt of this permit application was published in the Federal Register on August 1, 2002 (67 FR 49906), and a public informational meeting was held on August 28, 2002, in Wenatchee, Washington to inform the public of the receipt of this permit application. This new permit 1395 is to replace the expired permit 1094.

Permit 1094 was issued to the WDFW on February 4, 1998 to carry out artificial propagation programs intended to enhance and conduct research on listed UCR steelhead (63 FR 8435). Following issuance, three modifications to permit 1094 were considered and enacted. Modification 1 includes authorization of incidental take of spring chinook salmon, additional measures to enhance WDFW's ability to manage adult returns, and a one-time-only increase in authorized hatchery releases effective in 1999 (March 25, 1999; 64 FR 14431). The WDFW requested modification 2 for take of ESA-listed species associated with a radiotelemetry study – this modification was addressed as Modification 3 of research permit 1114 (July 25, 2001; 66 FR 38641). The WDFW requested modification 3 for an increase in take of listed steelhead as part of a study of potential hatchery-origin fish survival benefits at Wells Hatchery (May 13, 1999; 64 FR 25873). Permit 1094 expired on May 31, 2003. The proposed permit 1395 would replace permit 1094.

In April 2002, negotiations on three Habitat Conservation Plans (HCPs) were concluded; *Anadromous Fish Agreement and Habitat Conservation Plan Wells Hydroelectric Project FERC[1] License No. 2149* with the Public Utility District No. 1 of Douglas County (Douglas PUD) for the operation of Wells Dam (DPUD 2002), and *Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project FERC License No. 2145* (CPUD 2002a) with the Public Utility District No. 1 of Chelan County (Chelan PUD) for the operation of Rocky Reach Dam, and *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b). These HCPs[2] are long term agreements that at the time of this

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[1] *Federal Energy Regulatory Commission*

[2] *Each HCP agreement is subject to a separate Biological Opinion. This Opinion addresses the artificial propagation of UCR steelhead required in each HCP. Separate Biological Opinions also address artificial*

Opinion, have as signatories to each agreement NMFS, the PUDs, the WDFW, the U.S. Fish and Wildlife Service (USFWS), and the Confederated Tribes of the Colville Reservation (Colville Tribes). They provide the PUDs with some degree of certainty for the long-term operation of these projects and require the PUDs to provide mitigation in the form of a tributary fund for habitat improvement projects, and artificial propagation programs to mitigate for unavoidable loss of natural fish production due to habitat inundation and passage mortality at the projects. The HCPs were developed to protect five species of anadromous salmonids, including endangered UCR steelhead. The HCP related UCR steelhead programs would be intended as a conservation measure to ensure the persistence of the species. The HCP agreements restrict the PUDs and NMFS from changing the artificial propagation production levels during the period of this permit. The HCPs require Hatchery Committees[3] that may adjust the operation or implementation strategy of the programs based on new scientific data, changes in NMFS hatchery policy, or recommendations of the HCP Hatchery Committees.

Additionally, on June 11, 2002, NMFS received an application for a ESA section 10(a)(1)(A) permit from the USFWS (USFWS 2002), requesting multi-year authorization for annual take of UCR summer steelhead and UCR spring chinook salmon associated with UCR steelhead artificial propagation research and enhancement program. Notice of the receipt of this permit application was published in the Federal Register on August 1, 2002 (67 FR 49906), and a public informational meeting was held on August 28, 2002, in Wenatchee, Washington to inform the public of the receipt of this permit application. The USFWS was previously authorized to carry out an UCR steelhead enhancement program under permit 1118 which expired on May 31, 2003. The proposed permit 1396 would replace the expired permit 1118.

Thirdly, on October 29, 2002, NMFS received an application for ESA a section 10(a)(1)(A) permit from the Colville Tribes (CCT 2002), requesting multi-year authorization for annual take of UCR summer steelhead and UCR spring chinook salmon associated with UCR steelhead artificial propagation research and enhancement program. Notice of the receipt of this permit application was published in the Federal Register on January 14, 2003 (68 FR 1826). The Colville Tribes permit 1412 UCR steelhead artificial propagation program is a newly proposed research and enhancement program and has not been considered under previous ESA permitting actions.

NMFS has proposed and evaluated the action of issuing incidental take statements (ITSs) in relation to the National Environmental Policy Act (NEPA) for the three HCPs as its preferred alternative in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (FEIS) (NOAA Fisheries 2002). An Environmental Assessment (EA) was prepared and

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propagation programs of other anadromous fish species.

[3] *Each HCP agreement specifies the formation of a Hatchery Committee which consists of one representative of each signatory entity to the specific HCP. In general the HCP Hatchery Committee representation is likely to be similar for all three HCPs.*

opened for public comment on April 17, 2003 (68 FR 18952) which assessed the potential impacts of the issuing permits 1395, 1396, and 1412 on the environment. A finding of no significant impact (FONSI) was signed on July 10, 2003, following consideration and incorporation of public comments received on the EA (NMFS 2003).

NMFS is initiating a new consultation with itself on approval of these three section 10(a)(1)(A) permits for research and enhancement programs in the UCR summer steelhead evolutionarily significant unit (ESU). The Salmon Recovery Division decided to group these action together in a single consultation pursuant to 50 CFR §402.14(c) because they are similar in nature and will affect the same listed species. This Opinion will consider the impacts of these UCR steelhead artificial propagation enhancement programs in the Methow, Okanogan, and Wenatchee basins on anadromous salmonid species listed under the ESA.

An early product of HCP negotiations was the *Biological Assessment and Management Plan* (BAMP) (1998) developed by technical representatives from the co-managers[4] and signatory entities of the HCPs. The BAMP included review and recommendation for all artificial propagation programs in the UCR basin, HCP related and otherwise. Although the BAMP does not create legal obligations as a stand-alone document, it does provide guidance for program management and monitoring and evaluation of UCR artificial propagation programs. The HCPs define the commitment by the PUDs for implementation of hatchery propagation programs for steelhead, summer/fall chinook salmon, spring chinook salmon and sockeye salmon for the middle and UCR region. The proposed actions addressed in this Opinion are derived from the HCP agreements, the WDFW permit application, the USFWS permit application, and the Colville Tribes permit application, which together constitute a comprehensive plan for steelhead artificial propagation in the UCR basin.

In developing this Opinion, NMFS considered the information presented in the documents mentioned above, including the three HCPs; the Biological Opinion on 1995 to 1998 Hatchery Operations in the Columbia River Basin (NMFS 1995); information in the NMFS report, *Pacific Salmon and Artificial Propagation Under the Endangered Species Act* (Hard *et al.* 1992); the *Biological Opinion on Effects on Upper Columbia River Spring Chinook Salmon Supplementation Program and Associated Scientific Research and Monitoring Conducted by the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service* (NMFS 2002a), information provided in reports requires by previous permits; and information from the best scientific and commercial data available.

[4] *Anadromous fisheries resource co-managers in the UCR basin include the WDFW, the USFWS, NMFS, the Colville Tribes, and the Yakama Nation.*

1.1 Analysis Framework

Over the course of the last decade and hundreds of ESA section 7 consultations, NMFS developed the following approach for applying the ESA Section 7(a)(2) standards as defined by 50 CRF §402.02 when determining what effect a proposed action is likely to have on a given listed species. In conducting analyses of the actions under Section 7 of the ESA, NMFS uses the following steps:

1. Define the biological requirements and current status of each listed species and the relevance of the environmental baseline to the species' current status in the action area (Section 3).

2. Determine the effects of the proposed or continuing action on listed species and their habitat and evaluate any cumulative effects within the action area (Section 4).

3. Evaluate whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species or is likely to destroy or adversely modify their designated critical habitat (Section 5).

2. PROPOSED ACTIONS

NMFS proposes to issue three section 10(a)(1)(A) enhancement permits: Permit 1395 jointly to the WDFW, the Chelan PUD, and the Douglas PUD for artificial propagation programs required under the HCP agreements; permit 1396 to the USFWS; and permit 1412 to the Colville Tribes. These permits would authorize direct take of endangered, naturally-produced and artificially propagated UCR steelhead and incidental take of UCR spring chinook salmon.

This Opinion considers artificial propagation activities which include the (1) biological sampling and release of adult UCR steelhead for annual run evaluation, (2) management of adult returns of UCR steelhead from artificial propagation programs, (3) collection, holding, and artificial spawning of adult UCR steelhead, (4) transfers of UCR steelhead eggs and/or juveniles to appropriate locations, (5) incubation and rearing of UCR steelhead fertilized eggs through the smolt stage, (6) release of propagated UCR steelhead juveniles into the UCR basin, and (7) monitoring and evaluation of the UCR steelhead artificial propagation program. Artificial propagation programs of UCR steelhead have been ongoing since the 1960's. Improvements, hatchery reform measures, and a focus on recovery of natural environment populations have occurred since the UCR steelhead ESU was listed under the ESA in August 1997. The location of the UCR steelhead ESU, the artificial propagation facilities, and the dam locations pertinent to this Opinion are presented in Figure 1. Terms and conditions that NMFS would include in each permit to ameliorate potential negative effects are listed below and additional permit specific terms and conditions follow the specific operating agency activities. These terms and conditions and proposed activities by each agency together constitute the proposed actions.

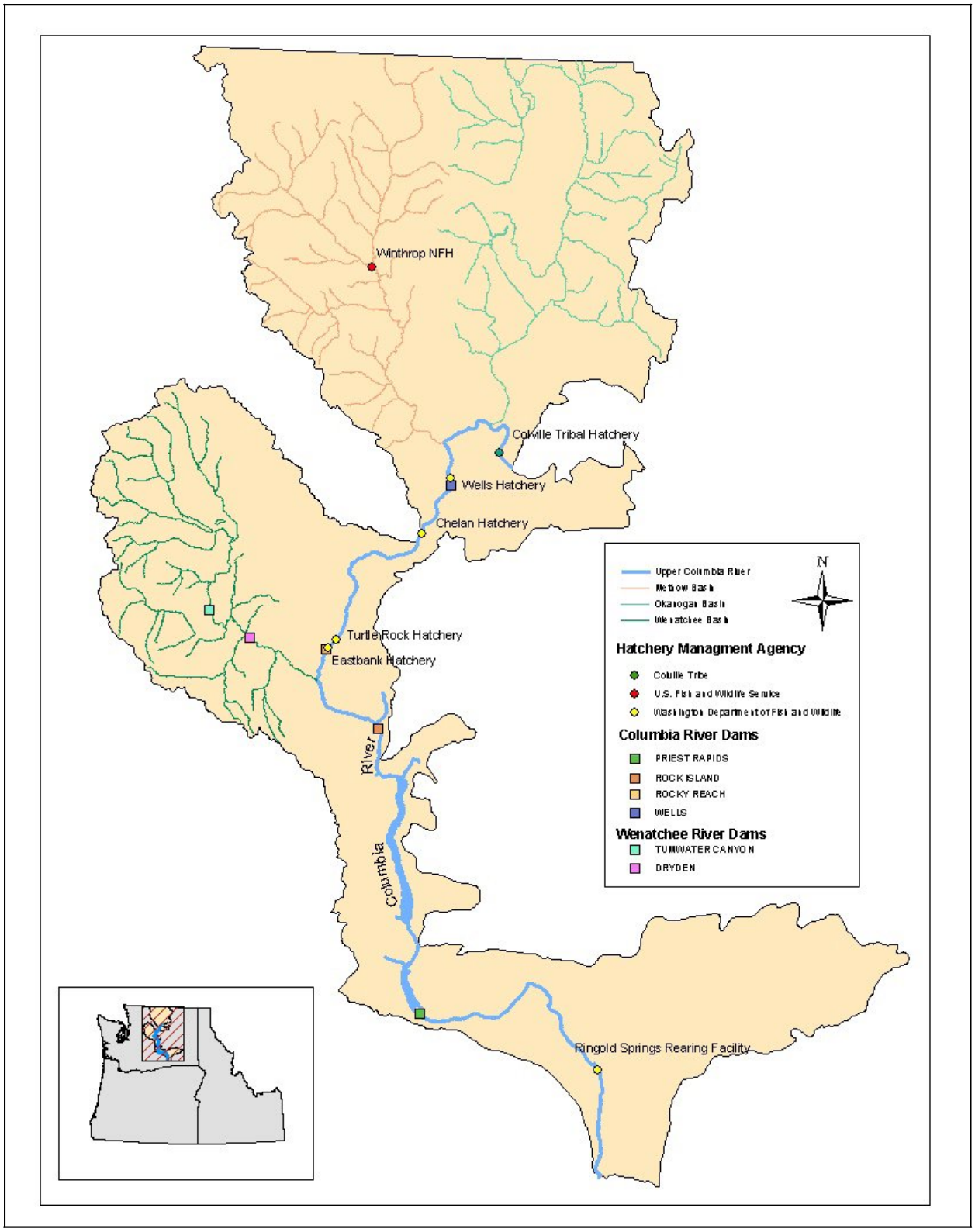

Figure 2. Map of the upper Columbia River steelhead ESU with hatchery facilities and dams relevant to the proposed artificial propagation programs identified.

2.1 General Conditions

The following conditions would be common to all three permits consulted upon in the Opinion. In all cases, the permit holder(s) must:

1. The permit holder(s) are responsible for the actions of any individual operating under the authority of this permit. Such actions include capturing, handling, releasing, transporting, maintaining, and caring for any ESA-listed species authorized to be taken by this permit.

2. The permit holder(s) must ensure that all ESA-listed species are handled carefully. Should NMFS determine that a procedure provided for under this permit is no longer acceptable, the Permit Holders must immediately cease such activity until an acceptable substitute procedure is identified and approved by NMFS.

3. Measures shall be applied to ensure that artificially propagated UCR steelhead juveniles released will be ready to actively migrate to the ocean. To meet this condition, fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay after release. Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism, that necessitates early release of ESA-listed steelhead to prevent catastrophic mortality. Any emergency steelhead releases made by the action agencies shall be reported immediately to the NMFS Salmon Recovery Division in Portland.

4. The permit holder(s) must allow any NMFS employee or representative to accompany field personnel while they conduct authorized activities.

5. The permit holder(s) are responsible for obtaining all other federal, state, and local permits/authorizations needed for the proposed activities.

6. Each ESA-listed fish handled out-of-water for the purpose of recording biological information must be anesthetized. Anesthetized fish must be allowed to recover (e.g., in a recovery tank) before being released. Fish that are simply counted must remain in water but do not need to be anesthetized.

7. ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. When using methods that capture a mix of species, ESA-listed fish must be processed first. The transfer of ESA-listed fish must be conducted using equipment that holds water during transfer.

8. The permit holder(s) shall ensure that water intakes into artificial propagation facilities be properly screened in compliance with 1995 NMFS screening criteria and as per the 1996

addendum to those criteria (NMFS 1996). As an alternative, they shall comply with transitional criteria set forth by NMFS in 1999 for juvenile fish screens constructed prior to the establishment of the 1995 criteria (NMFS 1996), to minimize risks to listed salmon and steelhead. The permit holder(s) shall inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility; the results of this monitoring shall be included in annual reports.

9. The permit holder(s) shall implement the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998) and Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) guidelines to minimize the risk of fish disease amplification and transfer, and to ensure that artificially propagated fish would be released in good health.

10. The permit holder(s) shall conduct hatchery operations and monitor hatchery effluent in compliance with applicable National Pollutant Discharge Elimination System (NPDES) (EPA 1999) permit limitations.

11. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates, lead to the inadvertent possession of steelhead substantially in excess (>110 %) of program production levels specified above, then surplus eggs or fish shall be culled from the population in a manner consistent with achieving program goals.

12. Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish.

13. The permit holder(s) are responsible for any biological samples collected from listed species, which shall only occur if they are valuable for research purposes. The permit holder(s) may not transfer biological samples to anyone not listed in the application without prior written approval from NMFS.

14. The permit holder(s) must coordinate with other co-managers and researchers to ensure that no unnecessary duplication and/or adverse cumulative effects occur as a result of the permit holder's activities.

15. All artificially propagated UCR steelhead juveniles shall be externally marked (i.e., visual implant elastomer tag or adipose fin clipped) prior to release.

Reports and Annual Authorization

NMFS contact for all reports: NMFS - Salmon Recovery Division
525 NE Oregon Street, Suite 510
Portland, Oregon 97232
Phone: (503) 230-5407
Fax: (503) 872-2737

16. The permit holder(s) must notify NMFS as soon as possible, but no later than two days after, any authorized level of take is exceeded or if such an event is likely. The permit holder(s) must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

17. The permit holder(s) shall update and provide to NMFS by December 15th of each year, the projected hatchery releases by age class and location for the coming year.

18. The permit holder(s) shall provide annual reports that summarize numbers, pounds, dates, tag/mark information, locations of artificially propagated fish releases, and monitoring and evaluation activities that occur within the hatchery environment, and adult return numbers to the UCR basin for each program. The permit holder(s) shall ensure collection and reporting of the coefficient of variation around the average (target) steelhead release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status. Reports shall also include any preliminary analyses of scientific research data, any problems that may have arisen during conduct of the authorized activities, a statement as to whether or not the activities had any unforeseen effects, and steps that have been and will be taken to coordinate the research or monitoring with that of other researchers. Unless otherwise noted in the specific terms and conditions, the reports shall be submitted by January 31st, of the year following release (i.e., brood year 2002, release year 2003, report due January 2004) to NMFS.

19. The permit holder(s) must provide plans for future projects and/or changes in sampling locations or enhancement/research protocols and obtain approval from NMFS prior to implementation of such changes.

Penalties and Sanctions

20. The persons actually doing the activity must have a copy of this permit while conducting the authorized activities.

21. The permit holder(s) may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

22. If a permit holder violates any permit term or condition, they will be subject to any and all penalties provided by the ESA.

23. The permit holder(s), in effectuating the take authorized by this Permit, are considered to have accepted the terms and conditions of this permit and must be prepared to comply with the provisions of this permit, the applicable regulations, and the ESA.

24. The Salmon Recovery Division, NMFS, may amend the provisions of this permit after reasonable notice to the permit holder.

25. 50 CFR Section 222.23(d)(8) allows NMFS to charge a reasonable fee to cover the costs of issuing permits under the ESA. The fee for this permit has been waived.

26. Any falsification of annual reports or records pertaining to this permit is a violation of this permit.

27. Under the terms of the regulations, a violation of any of the terms and conditions of this permit will subject the permit holder(s), and/or any individual who is operating under the authority of this permit, to penalties as provided for in the ESA.

2.2 Permit 1395

NMFS proposes to issue permit 1395 jointly to the WDFW, the Chelan PUD, and the Douglas PUD. The activities undertaken by each of these entities varies based on their permit applications, program operational roles, and resource management responsibilities. The WDFW is generally the lead co-manager of the fisheries resources of the state of Washington and is also the operator of the hatchery facilities at which the proposed activities would occur. The activities proposed by WDFW include adult return monitoring, management of returning hatchery-origin steelhead adults, general hatchery operations associated with the UCR steelhead enhancement programs. Responsibility for research, and monitoring and evaluation of the UCR steelhead artificial propagation program activities overlap between the WDFW and the PUDs. At this time, monitoring and evaluation, and research activities are proposed to be conducted by the WDFW, however, in the future, some monitoring and research activities may be funded by the PUDs and conducted by other entities as described in the three HCP agreements. The PUDs propose to provide funding and implementation support for the WDFW managed programs. A description of activities proposed by each applicant is provided below, followed by the additional terms and conditions that would be included in the permit. Permit 1395 would replace permit 1094 which expired in May 2003.

2.2.1 WDFW Proposed Activities

The WDFW proposes to collect annual run composition data, manage the resultant artificial propagation adult UCR steelhead returning to the middle and UCR basin, operate UCR steelhead artificial propagation programs in hatchery facilities, and conduct research, monitoring, and evaluations relating to artificially propagated steelhead in the UCR basin. Reports will be submitted to NMFS annually to summarize all activities associated with each element described below.

2.2.1.1 Adult Steelhead Stock Assessment

The WDFW proposes to collect, anesthetize, biologically sample, and return to the river adult listed UCR steelhead in the east ladder of the Priest Rapids Dam on the Columbia River at river mile (rm) 397. Sampling would occur 16 to 32 hours per week during the migration period in order to achieve a minimum sample rate equal to 10 percent of the run. The purpose of this sampling is to (1) determine upriver population size, (2) estimate hatchery to natural (wild) fish ratios, (3) determine age class contribution, and (4) evaluate the need for managing returning hatchery steelhead consistent with ESA recovery objectives which include fully seeding spawning habitat with naturally produced UCR steelhead supplemented with artificially propagated enhancement steelhead. The WDFW also proposes to externally tag adipose fin-clipped sampled steelhead at Priest Rapids Dam after September 9th as a means to exclude them from harvest in years when fisheries would be allowed in areas above the dam. In some years, up to 400 of the steelhead sampled at Priest Rapids Dam would be radio-tagged or tagged with some other active-transmitting tag to investigate dam passage, migration, and spawning characteristics.

To minimize potential adverse effects on listed UCR steelhead, the following measures will be used and defined in the permit as terms and conditions by NMFS:

- No more than six fish will be in the trap box at one time;
- Fish will be removed from the trap as quickly as possible;
- Steelhead will be processed first;
- Nets will be 1-inch soft nylon mesh;
- Stock solution of 500 grams tricaine methanesulfonate (MS-222) powder to 2.5 gallons of water will be used to achieve proper anesthesia;
- Temperature and dissolved oxygen in the anesthetic bath will be monitored continuously;
- Anesthetic bath will be changed when the bath warms 2°C above river water temperature.
- Trap operations will cease if river water temperature exceeds 21°C (69.8°F).

2.2.1.2 Management of Returning Adult Hatchery Steelhead

These programs would be intended to enhance the naturally reproducing UCR steelhead populations in the UCR region. The number of natural origin and artificially propagated UCR steelhead that return to the UCR region is influenced by a variety of factors including the number of artificially propagated UCR steelhead released and the environmental conditions they experience after release, such as during their downstream migration out of tributaries and the Columbia River and conditions in the ocean environment. The uncertainty of those conditions can result in years of low returns of UCR steelhead, both naturally and artificially propagated or in high returns. The WDFW has identified several tools for managing returning adult UCR steelhead particularly in high return years. These tools include harvest fisheries directed on externally identifiable artificially propagated UCR steelhead and removal of artificially propagated UCR steelhead at dam ladders and other fish trap sites. The WDFW identifies harvest fisheries as the preferred tool to manage artificially propagated adult UCR steelhead. Furthermore, the WDFW separates harvest activities into reaches below Priest Rapids Dam and reaches above Priest Rapids Dam.

Below Priest Rapids Dam: The WDFW proposes to open a recreational harvest fishery below Priest Rapids Dam (in the vicinity of Ringold Springs Rearing Facility) for hatchery steelhead when the run size above Priest Rapid Dam is sufficient to meet interim abundance targets, which based on current information requires at least 8,300 steelhead at Priest Rapids Dam (WDFW 2002). The area encompasses waters below Priest Rapids Dam in the downstream portion of the Hanford Reach from the Highway 395 bridge at Pasco to the old Hanford town site power line towers, a distance of 32 miles. In the proposed fishery, anglers may retain adipose fin-clipped and/or adipose fin-clipped plus ventral fin-clipped steelhead. All unmarked steelhead must be released. The dates for the proposed fishery vary according to fishing method. Anglers may fish from the bank in addition to floating devices from September 16th through March 31st. From April 1st through June 15th anglers may only fish from the bank at the Ringold Springs site and all floatation devices would be prohibited. Bait would be allowed throughout the fishing period. The starting date for the fishery may be postponed until October 15th if pre-season or in-season evaluation of the steelhead run indicates that the migration over Priest Rapids Dam is delayed or below levels needed to meet recovery objectives. Additionally, the WDFW proposes to remove hatchery steelhead captured in the Ringold Springs ladder that would be in excess of broodstock and recovery needs. These fish would be transported and released in landlocked ponds and lakes to provide additional harvest opportunities on the excess hatchery steelhead.

Above Priest Rapids Dam: The WDFW propose to manage the number of artificially propagated adult steelhead on the spawning grounds in the Wenatchee, Methow, and Okanogan basins. On an annual basis, the run composition information gathered through sampling conducted at Priest Rapids Dam (described above in Section 2.2.1.1) will be assessed on or shortly after September 15th. The components of the run (naturally produced steelhead, adipose fin-clipped hatchery steelhead, and adipose fin-present hatchery steelhead) will be considered in decided whether or not removal of adipose fin-clipped steelhead is warranted.

If the natural component of the run is predicted to be below 1,300 steelhead, no steelhead fishery would be proposed, regardless of total run size. If the natural component is expected to exceed 1,300 steelhead and the total run size is predicted to exceed 9,550, then the WDFW proposes to open a recreational fishery. The fishery would be open from about October 1st through about March 31st, by emergency rules. Excess adipose fin-clipped steelhead may also be removed at the Wells Dam and Wells Hatchery for placement in local lakes or ponds for recreational angling opportunity.

The specific locations and retention limits of recreational harvest opportunity would be determined based on the results of a fishery model designed to estimate the effects of removing adipose fin-clipped steelhead from the population. The model considers the following elements; total steelhead run size, percentage of natural origin steelhead, percentage of adipose present artificially propagated steelhead, the percentage of adipose fin-clipped steelhead, and the effects of hooking mortality. Mark and tag identification at Priest Rapids Dam combined with known artificially propagated juvenile release group information would result in estimates of the number of steelhead returning to each tributary basin. The model would then be run using the calculated run estimates for each tributary basin (Okanogan, Methow, and Wenatchee).

If a fishery directed on surplus hatchery produced steelhead is authorized, the gear regulations would allow the use of bait in the mainstem Columbia River above Priest Rapids Dam. Any proposed tributary basin (Methow, Okanogan, and Wenatchee) fisheries would open under "selective gear rules," which are defined as follows: Only unscented artificial flies or lures with one barbless single hook, bait is prohibited; fish may be released until the daily limit is retained; If any fish has swallowed the hook or is hooked in the gill, eye, or tongue, it should be kept if legal to do so. Regulations requiring the release of adipose-present steelhead would be in place on all waters. Regulations may also limit the retention of steelhead with any external tags that may be associated with the Priest Rapids sampling project or other studies in the basin.

2.2.1.3 Artificial Propagation Program

The WDFW proposes to enhance the UCR steelhead ESU using artificial propagation techniques that include the collection of broodstock, spawning of adults, incubation of eggs, rearing, acclimation, and release of juvenile steelhead. A general description of the programs is provided here; for additional detail, please see the permit application (WDFW 2002). The WDFW proposes to collect, hold, and spawn adult steelhead broodstock and incubate, rear, and release the progeny of the broodstock in various hatchery facilities. The current yearling steelhead smolt release goals, general release area, and stock are provided in Table 1.

Table 1. Yearling smolt release targets for WDFW operated artificial propagation programs of UCR steelhead by general release area and broodstock collection location.

Release Area	Smolt Production Target	Broodstock Collection
Above Wells Dam (Methow and Okanogan River basins)	349,000	Wells Dam
Wenatchee River basin	400,000	Wenatchee River
Below Priest Rapids Dam (Ringold Springs area of Columbia River)	180,000	Wells Dam

Broodstock collection is proposed at: (1) Wells Dam (rm 516) and Wells Hatchery on the Columbia River, and (2) Dryden (rm 16) and Tumwater (rm 33) Dams on the Wenatchee River. Future broodstock collections would be proposed for the Methow and Okanogan Rivers, however no locations or facilities have been identified yet. The WDFW proposes to develop annual broodstock collection and spawning protocols in coordination with NMFS, and the HCP Hatchery Committees to allow for consideration of annual variation in run sizes, ages, and origins (natural and hatchery). Further details for each collection facility are provided in the WDFW application.

Broodstock collection protocols will include limits on the number of days and hours of trap operation. Specific handling procedures and reporting requirements will also be defined. In general, broodstock collection activities would occur with the following sideboards:

- Broodstock would be collected throughout the duration of the run;
- Traps would be checked and all fish removed at least daily;
- Trapping at Wells Dam would occur no more that 3 days a week, if both east and west ladder traps are utilized they would operate concurrently not to exceed 16 hours per day;
- Up to 373 steelhead would be collected at Wells Dam;
- Up to 123 or 33 percent, whichever is lower, of the broodstock could be natural origin steelhead;
- Passive trapping in the Wenatchee River at Dryden Dam would occur 24 hours a day at both the left and right bank traps;
- Trapping at Tumwater Dam would generally be limited to three days per week and 16 hours per day if actively operated;
- Hook and line collection of steelhead broodstock would be utilized as a last resort and only if traps were not effective;
- Up to 208 steelhead would be collected from the Wenatchee River;
- Up to 50 percent of the broodstock would be natural origin steelhead.

Following collection, the WDFW proposes to hold, humanely kill, and manually spawn steelhead at Wells and Eastbank Hatcheries. The Wells program will maximize matings of hatchery to natural origin steelhead. The Wenatchee program at Eastbank Hatchery will initially maximize the contribution of natural origin (wild) steelhead in creating rearing crosses of hatchery to natural (H × W) and natural to natural (W × W) matings for comparison and evaluation to hatchery to hatchery (H × H) mating progeny. Based on mating studies results, adjustments in spawning protocols may be made to improve program efficacy.

The WDFW proposes to initially incubate steelhead eggs at Wells and Eastbank Hatcheries. Up to 125,000 eyed eggs may be transferred from Wells Hatchery to Winthrop National Fish Hatchery (NFH) for continued incubation, rearing and eventual release (see Section 2.3 below). Wells Hatchery proposes to transfer up to 240,000 eyed eggs for the Ringold Springs program to other WDFW facilities for incubation and early rearing. These eggs will be from the earliest spawn dates. Eastbank Hatchery may transfer eyed eggs to Chelan Hatchery for incubation and early rearing to achieve specific rearing strategy goals of producing the highest quality smolts.

Juvenile rearing would occur at Wells Hatchery for fish destined for release in the Methow and Okanogan basins. Juvenile rearing would occur at Eastbank, Turtle Rock, and Chelan Hatcheries for fish destined for release in the Wenatchee River basin. Juvenile steelhead will be externally marked (e.g., adipose fin clipped) or tagged (e.g., visual elastomer tag) prior to release and at least a portion of the annual release will be internally tagged with a coded-wire tag (CWT) or passive integrated transponder (PIT) tagged prior to release.

Wells Hatchery proposes to release 349,000 smolts per year as specified in the HCP agreement with Douglas PUD, of which, 300,000 would be production to compensate for habitat loss due to inundation from Wells Dam pool. Smolts that volitionally migrate to a collection raceway downstream of the rearing ponds will be collected and directly scatter planted into the Methow and Okanogan basins. Juveniles that do not voluntarily exit the pond will be forced into the collection area for direct stream release in lower river areas because these fish may have a higher tendency to residualize. Final rearing and acclimation may occur in the Methow or Okanogan basin for some release groups, in some years, if appropriate sites are identified and available. No sites have been identified for acclimation at the time the application was received. The annual allocation of smolts released into the Methow and Okanogan Rivers would be determined by the HCP Hatchery Committees.

Releases into the Wenatchee River basin are proposed at 400,000 smolts as specified in the two HCP agreements with Chelan PUD. Releases would occur as direct stream plants, volitional release from Chiwawa Ponds, or potentially other acclimation sites in the Wenatchee basin which have not yet been developed. Release from Ringold Springs proposed at 180,000 smolts annually into the Columbia River as funded by the Mitchell Act.

The WDFW proposes to implement the following measures into the artificial propagation program operation to minimize potential negative impacts on ESA-listed species:

- Conduct routine water monitoring to ensure that the levels of total suspended solids, settleable solids, and water temperature at each facility to remain compliant with NPDES permits issued by Washington Department of Ecology;
- Follow fish disease control guidelines developed by IHOT (1995) and the PNFHPC (1989) to reduce the incidence of fish diseases;
- Conduct routine, generally monthly, fish growth monitoring during rearing at each facility;
- Dispose of juvenile and adult carcasses via the local solid waste management system, on-station burial, or distributing carcasses into the river system of origin for nutrient enhancement after appropriate fish health certification.

2.2.1.4 Research, Monitoring, and Evaluation Activities

Research, monitoring, and evaluation plans will be developed by the HCP Hatchery Committees as described in Section 2.2.2 (Chelan PUD and Douglas PUD Proposed Activities). Additional details of the monitoring and evaluation plan development time lines and responsibilities are provided in the three HCP agreements. Tasks proposed for consideration at this time, which will be included in the plans developed by the HCP Hatchery Committees, include monitoring within the hatchery facilities and monitoring of artificially propagated steelhead in the natural environment.

2.2.1.4.1 Within-Hatchery Environment Monitoring

Monitoring and evaluation activities will be conducted on all of the steelhead life stages that occur within the hatchery facility environment. The HCP Hatchery Committees are expected to fine-tune the evaluation activities through time to improve the knowledge base and success of the artificial propagation programs. The following tasks would be required as part of the monitoring plans:

Juvenile Steelhead

Growth rate and general health will be monitored monthly.

Green egg-to-eyed egg, eyed egg-to-fry, and fry-to-smolt survival rates will be determined.

Numbers, size, and health condition of all steelhead juveniles will be determined prior to or at the time of any transfers among facilities, and prior to release.

Adult Steelhead

Broodstock (and mortalities at trap locations) would be sampled for stock composition analysis including determination of sex, age, and stray rates.
Biological sampling may include meristic, morphometric, tissue samples (for genetic stock identification or DNA (deoxyribonucleic acid) analysis), and scale sampling.
Snouts of CWT steelhead would be collected.
Annual determination of average fecundity will be conducted for a representative sample of spawned females in each program using an electronic egg counter.

2.2.1.4.2 Natural Environment Monitoring

Natural environment monitoring of juvenile artificially propagated steelhead is proposed to be conducted using a variety of standard techniques such as angling, trapping, snorkeling. In general, these population sampling techniques would be used to identify both external marks and tags and internal tags. Residualism of hatchery reared steelhead in the Wenatchee and Methow rivers will be evaluated by sampling of the resident river population during August using standard angling techniques. Migration characteristics and tributary productivity would be monitored using juvenile fish traps. Traps are proposed to be operated in the Chiwawa River, the upper and lower Wenatchee River, the Twisp River, and the Methow River. These traps would form a comprehensive juvenile monitoring program investigating the productivity of artificially propagated and natural origin UCR steelhead in the tributary environment. The trapping efficiency would be expected to vary from below four percent up to 30 percent depending on tributary conditions such as discharge and debris load. The capture of artificially propagated UCR steelhead in the juvenile traps would also vary based on release location in relation to trap site and method of release. For example UCR steelhead smolts released volitionally over a period of four to six weeks may be captured at a higher rate overall compared to a direct stream release at a single point in time. In the case of the latter release, the traps would not be operated as the large pulse of artificially propagated UCR steelhead migrate past the trap site. In the former situation, a relatively small number of released fish could be captured daily throughout the volitional release period.

Monitoring of adults in the natural environment that is additional to the Priest Rapids Dam sampling previously described in Section 2.2.1.1 (Adult Steelhead Stock Assessment), will include collection of biological data, such as scale samples and CWT recoveries, in fisheries, at trap sites, spawning ground surveys, and in carcass surveys. Spawning and carcass surveys are proposed to be conducted by WDFW staff in coordination with PUD, Tribal, USFWS, and U.S. Forest Service personnel. Surveys would be done on foot, from an airplane, or from a boat, depending on survey area.

The WDFW proposes to develop a study to assess the relative reproductive success between hatchery-reared and naturally produced steelhead using DNA micro-satellite technology. This study will provide valuable information concerning the effectiveness of the artificial propagation programs in contributing to the recovery of UCR steelhead. The study design will be subject to approval by the HCP Hatchery Committee as described in the Chelan PUD HCPs (CPUD 2002a, 2002b). The preliminary study design proposes to allow up to 120 adult steelhead, of which no more than 60 would be of natural origin, to spawn in a controlled waterway, potentially the Wells Hatchery spawning channel. Progeny of these steelhead would be sampled for DNA analysis and a portion would be PIT tagged and subsequently released into their parental origin river. Migrating smolts would be identified by the PIT tag code at downstream locations. As study fish return to the region and would be identified (via the PIT tags), comparison to the previous sample groups would be conducted.

2.2.2 Chelan PUD and Douglas PUD Proposed Activities

The Chelan PUD and the Douglas PUD propose to provide the funding and implementation support for UCR steelhead as provided by the HCPs (CPUD 2002a, 2002b; DPUD 2002). Please see the three HCP agreements for additional details of their proposed actions and obligations which would be incorporated by reference into permit 1395.

The PUDs propose to implement the specific elements of the steelhead programs consistent with overall objectives of rebuilding natural populations and compensating for unavoidable inundation and project mortality that results from the operation of Rock Island, Rocky Reach, and Wells Dams. Implementation includes fully funding the hatchery facilities, operations and evaluations of the artificial propagation programs. Program objectives will be developed by the Joint Fisheries Parties[5] (JFP) and include contributing to the rebuilding and recovery of naturally reproducing populations of UCR steelhead in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. Specific actions needed to implement the artificial propagation programs may be altered and modifications to program implementation may be made through the HCP Hatchery Committees as described in the HCPs (CPUD 2002a; 2002b; DPUD 2002).

The PUDs or their designated agents propose to operate the hatchery facilities according to the terms of Section 8 "Hatchery Compensation Plan" of the HCPs, the ESA section 7 and 10 permit(s), and in consultation with the HCP Hatchery Committees. The total number of artificially propagated steelhead that Chelan PUD and Douglas PUD would provide funding is initially set at 400,000 smolts for Chelan PUD and 349,000 for Douglas PUD. An annual increase of up 150,000 steelhead smolts could be proposed in some years if needed to conduct survival studies at Rock Island, Rocky Reach or Wells dams. This production level increase

[5] *For the purposes of this Opinion the Joint Fisheries Parties are the co-manager agencies who have signed the three HCP agreements. At the time of developing this Opinion they include NMFS, the WDFW, the USFWS and the Colville Tribes.*

would require the collection of about 55 adult steelhead broodstock. The production increase and the survival study design must be recommended and approved by the HCP Hatchery Committees and the HCP Coordinating Committees prior to retention of UCR steelhead. Outside of this potential annual adjustment for a few years, the production level of steelhead smolts supported by the two PUDs in the UCR basin will not increase during the duration of this Opinion. Reduction of production level could occur following survival studies and consensus of the HCP Coordinating Committee. The PUDs propose to potentially use some of the artificially propagated steelhead juveniles for dam passage survival studies pending recommendation and approval by the HCP Committees.

The PUDs propose to utilize agreements with other entities to implement hatchery obligations for the rearing, release, monitoring and evaluation, and research. The HCP Hatchery Committees must approve any proposed agreements or trades of production. However, it is the PUDs' responsibility to ensure that their obligations under Section 8 of the HCPs (Hatchery Compensation Plan) are satisfied.

The HCP Hatchery Committees will develop five-year monitoring and evaluation plans for the hatchery programs and update them every five years. The PUDs will fund the implementation of the monitoring and evaluation plans. The first monitoring and evaluation plan shall be developed by the HCP Hatchery Committees within one year of the issuance of the FERC order incorporating the HCPs into the PUDs' licenses. The monitoring plans will include data collection and analysis of all life stages of steelhead within the hatchery environment as well as data collection activities outside the hatchery facilities such as spawning ground surveys, juvenile fish traps, and adult traps and monitoring sites. Programs specific monitoring activities necessary to evaluate the programs will be determined by the HCP Hatchery Committees.

At this time, the ability to hold adult UCR steelhead in river water or water of appropriate temperature for maturation has been identified and the ability to rear juveniles on river water to produce the highest quality smolt has been identified as measures that the Chelan PUD need to address in the near term as program improvements in the two HCP agreements with Chelan PUD.

In the HCP agreements, the PUDs acknowledge that over the duration of the HCPs, new information and technologies that are developed will be considered and utilized in the monitoring and evaluation of the hatchery programs, where appropriate. The PUDs shall implement monitoring and evaluation of the hatchery programs consistent with the HCPs, the general objectives and guidelines listed for each Plan Species in the BAMP (1998), as determined by the HCP Hatchery Committees, and as analyzed in this Opinion. Monitoring and evaluation or research activities not considered here may require re-initiation of consultation depending on the potential effects of the activities.

2.2.3 Additional Terms and Conditions

The following additional terms and conditions will be incorporated into permit 1395 in order to minimize the potential adverse impacts associated with the proposed artificial propagation programs and are therefore part of the proposed action:

1. The Chelan PUD and Douglas PUD shall provide artificially propagated compensation of 400,000 and 349,000 yearling UCR steelhead smolts, respectively, as described in the three HCP agreements (CPUD 2002a; 2002b; DPUD 2002).

2. The Chelan PUD and Douglas PUD shall fund the specific elements of the artificial propagation programs objectives developed by the HCP Hatchery Committee, which may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

3. The Chelan PUD and Douglas PUD, in coordination with the HCP Hatchery Committees, shall develop five-year monitoring and evaluation plans for the hatchery programs that are updated every five years. The first monitoring and evaluation plans shall be completed within one year of the issuance of the FERC order incorporating the HCPs into the hydroproject operation licenses. Existing monitoring and evaluation programs shall continue until replaced by the HCP Hatchery Committees.

4. The Chelan PUD and Douglas PUD shall be responsive to new information and technologies that are developed, and approved by the HCP Hatchery Committees, which may be considered and utilized in the monitoring and evaluation of the artificial propagation programs, where appropriate.

5. The Chelan PUD and Douglas PUD shall fund artificial propagation program monitoring and evaluation consistent with the HCPs, the general objectives and guidelines listed for each Plan Species in the BAMP, this Opinion, and as determined by the HCP Hatchery Committees.

6. The Chelan PUD and Douglas PUD shall assume the lead, and work in coordination with the HCP Hatchery Committees, in developing the ten-year hatchery program reviews and directing the development of annual summary reports. The program reviews will determine if egg-to-fry, adult-to-smolt and smolt-to adult survival rates, and other appropriate hatchery program goals and objectives of the HCPs and the ESA section 10 permits have been met or sufficient progress is being made towards their achievement. This review shall include a determination of whether artificially propagated production objectives are being achieved.

7. The WDFW shall limit annual production of Wenatchee summer steelhead for release into the Wenatchee River to not exceed 400,000 juveniles at approximately 6 fish per pound released in April or May.

8. The WDFW shall limit annual production of steelhead for release into the Methow or Okanogan Rivers to not exceed 349,000 juvenile at approximately 6 fish per pound released in April or May.

9. The WDFW shall limit annual production of steelhead for release into the Columbia River from Ringold Springs Rearing Facility to 180,000 juveniles at approximately 6 fish per pound.

10. The WDFW may collect and retain 125,000 eggs for transfer to the U.S. Fish and Wildlife Service for eventual release into the Methow River as authorized in permit 1396.

11. The WDFW may retain eggs to meet a 150,000 steelhead juvenile production level in addition to the production levels identified above, following approval and recommendation of the production for use as dam passage survival study fish by the HCP Hatchery Committees.

12. The WDFW shall operate and manage the UCR steelhead artificial propagation programs including following impact minimization measures as proposed in section 2.1 of this Opinion.

13. To the extent possible without imposing increased risk to listed species, Chelan PUD, Douglas PUD, and WDFW shall enumerate and identify marks and tags on all anadromous species encountered at adult and juvenile trapping sites. This information should be included in either an annual brood program report or a monitoring and evaluation report submitted to NMFS.

14. In trapping operations directed at the collection of broodstock, the Permit Holders shall apply measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of migrating listed fish through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

15. All artificially propagated UCR steelhead smolts shall be externally marked (i.e., visual implant elastomer tag or adipose fin clipped) prior to release.

16. At least a representative portion of the artificially propagated UCR steelhead smolts shall be internally tagged (e.g., CWT, PIT tag) prior to release to allow monitoring and evaluation of fish performance and contribution rates, including straying levels to natural spawning areas and to other hatcheries. The appropriate level of tagging shall be based in the investigational or management objectives and shall be reviewed by a trained statistician or biometrician.

17. ESA-listed juvenile fish must not be handled if the water temperature exceeds 21°C (69.8°F) at the capture site. Under these conditions, ESA-listed fish may only be identified and counted.

18. If water temperature at adult trapping sites exceeds 21°C (69.8°F), the trap the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species.

19. When radio or active tags or Petersen disk tags are applied, recreational harvest regulations will clearly and specifically identify these fish as not available for retention. Information concerning the application, tracking, and final disposition of fish with these tags shall be included in annual reports.

20. In years when harvest activities are implemented, the WDFW shall conduct regular enforcement patrols and include a summary of enforcement actions, including regulation compliance statistics, in the annual report described below.

21. The Permit Holders may conduct spawning ground and carcass surveys to assess the distribution and impact of artificially propagated UCR steelhead on the natural-origin steelhead populations.

22. The Permit Holders may capture, handle, and release up to 20 percent of the natural-origin steelhead juveniles in a tributary basin using standard juvenile fish trapping techniques such as rotary screw traps. Lethal take may not exceed two percent of the fish captured.

23. The WDFW shall develop annual broodstock collection and spawning protocols for the UCR Region ESA-listed steelhead artificial propagation programs. Protocols should be coordinated with the co-managers and HCP Hatchery Committee which must be submitted to NMFS Salmon Recovery Division by June 15th of the collection year.

24. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. The WDFW shall carefully handle and immediately release upstream incidentally captured listed UCR spring chinook salmon adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs.

25. If enabled by identification of artificially propagated fish through external marking, measures should be applied to cull surplus hatchery-origin fish returning to a watershed in excess of program objectives.

26. The WDFW shall limit operation of Wells Dam east and west ladder traps to no more than three days per week from July through November. If both traps are operated, they shall be operated concurrently, operating on the same three days each week. When operating, active trapping may occur up to 16 hours per day. The ladder shall be open to passage at night to allow passage to listed steelhead.

27. Prior to opening any fishery targeting surplus artificially propagated UCR steelhead, the WDFW shall provide the proposed regulations to NMFS. The proposed regulations should include definition of the fishing areas, steelhead retention limits, anticipated encounter rate of natural-origin steelhead, estimated mortality impacts on natural-origin steelhead, monitoring plan, enforcement plans, and potential fisheries adjustments that would be made if impacts exceed authorized levels.

28. In years when harvest activities are implemented, the WDFW shall provide monthly reports by the 10th working day of the following month to NMFS. The report shall summarize the fishery activities, including angler effort, number of steelhead harvested, number of encounters with natural-origin UCR steelhead by tributary fishery area, and estimated UCR steelhead mortality impact; these reports shall include low enforcement information, particularly an estimate of illegal harvest and degree of regulation compliance. A final report detailing the fishery impacts by month and fishery area as described above shall be submitted to NMFS by August 31st of the year the fishery was concluded.

29. The WDFW shall manage artificially propagated steelhead returning to the Wenatchee River, Methow River, and Okanogan River basin tributary spawning areas in a manner consistent with recovery goals to enhance natural-origin populations. To reduce the number of artificially propagated UCR steelhead in the spawning areas in excess of full habitat seeding levels and to increase the proportion of the natural-origin steelhead in the tributary spawning populations, the WDFW may employ two methods. They may remove artificially propagated steelhead at dams or other trapping sites and they may use recreational fisheries to reduce the number of adipose fin-clipped hatchery-reared steelhead that may spawn naturally if the conditions described below are met:

i. Tier 1: When the natural origin UCR steelhead run is predicted to exceed 1,300 fish at Priest Rapids Dam and the total UCR steelhead run is predicted to exceed 9,550 steelhead, then a harvest fishery may be considered as an option to remove excess adipose fin clipped hatchery reared steelhead. For a fishery to be authorized in the tributary areas, the tributary escapements must be predicted to meet the minimum targets listed in Table 2, Tier 1. The mortality impact on natural origin UCR steelhead must not exceed the limits specified for Tier 1 in each tributary area.

ii. Tier 2: When the natural origin UCR steelhead run is predicted to exceed 2,500 fish at Priest Rapids Dam, the total UCR steelhead run is predicted to exceed 10,035 steelhead, and the tributary escapements meet the minimum targets listed in Table 2, Tier 2, then the natural origin UCR steelhead mortality impacts must not exceed the limits specified for Tier 2 for each tributary area.

iii. Tier 3: When the natural origin UCR steelhead run is predicted to exceed 3,500 fish at Priest Rapids Dam, and the total UCR steelhead run is predicted to exceed 20,000 steelhead, and the tributary escapements meet the minimum targets listed in Table 2, Tier 3, then the natural origin UCR steelhead mortality impacts must not exceed the limits specified for Tier 3 in each tributary area.

iv. The WDFW may remove artificially propagated steelhead at dams or other trapping sites to reduce the number of artificially propagated UCR steelhead in the spawning areas in excess of full habitat seeding levels to increase the proportion of the natural origin steelhead in the spawning population.

Table 2. Natural origin UCR steelhead run size criteria for recreational harvest fisheries in the Wenatchee River, Methow River, and Okanogan basin tributary spawning areas and mortality take limit of natural origin UCR steelhead. Catch and release mortality is estimated at 5 percent.

Tributary Area	Priest Rapids Dam Count	**Estimated Escapement to Tributary Area**	Mortality Impact
Wenatchee River and Columbia River above Rock Island Dam to below Rocky Reach Dam			
	<837	<599	0%
Tier 1	838	600	2%
Tier 2	2,146	1,700	4%
Tier 3	3,098	2,500	6%
Methow River and Columbia River above Wells Dam			
	<908	<499	0%
Tier 1	804	500	2%
Tier 2	2,224	1,600	4%
Tier 3	3,386	2,500	6%
Okanogan basin upstream of the Highway 97 Bridge			
	<175	<119	0%
Tier 1	176	120	5%
Tier 2	180	120	7%
Tier 3	795	600	10%

30. Adult return information shall include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. If a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31st, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 2004) to NMFS Salmon Recovery Division, Portland, Oregon.

31. In years when harvest fisheries are implemented, the WDFW shall provide monthly reports by the 10th working day of the following month to NMFS Salmon Recovery Division in Portland, Oregon. The report shall summarize the fishery activities including angler effort, harvest, encounters with natural origin UCR steelhead by tributary fishery area, and estimated UCR steelhead mortality impact. A final report detailing the fishery

impacts by month and fishery area shall be submitted to NMFS Salmon Recovery Division in Portland Oregon by August 31st of the year the fishery was concluded.

32. In years when harvest fisheries are implemented, the WDFW shall conduct regular enforcement patrols and include a summary of enforcement actions, including regulation compliance statistics in the annual report described above.

2.3 Permit 1396 - U.S. Fish and Wildlife Service

NMFS proposes to issue permit 1396 to the USFWS to carry out a program artificially propagating endangered UCR steelhead in the Methow River. Program details were provided in a permit application (USFWS 2002) and are summarized below, followed by additional terms and conditions to be included in permit 1396.

2.3.1 Proposed Activities

The USFWS at Winthrop NFH proposes to obtain 125,000 eyed-eggs or fry from the WDFW Wells Hatchery for rearing and release into the Methow River annually. Two transfer options are proposed: (1) Eyed eggs taken from throughout the run would be transferred to Winthrop NFH in egg transport containers loaded in a covered truck in March, or (2) fry from eggs taken from throughout the run would be transported to Winthrop NFH in July at a size of 180 to 300 fish per pound. Fish would be transported from Wells Hatchery using fish transportation trucks equipped with aeration devices, oxygen tanks, air stones, and recirculating pumps.

At the beginning of September of each year, under both of the above scenarios, the fish will be reared to maintain a density index at or below established criteria. Water source is screened Methow River water, pumped ground water, or a combination of both. The fish remain in the six ponds until their April release into the Methow River when they average 5 to 8 fish per pound. The USFWS proposes to externally mark all smolts with an adipose fin-clipped to identify them as hatchery origin. The proposed release of 100,000 smolts would occur as a volitional release from the raceways, from which smolts would migrate into a channel fed by a spring and overflow hatchery water and enter the Methow River about 1/4 mile downstream from the hatchery facility.

2.3.2 Additional Terms and Conditions

The following additional terms and conditions will be incorporated into permit 1396 in order to minimize the potential adverse impacts associated with the proposed artificial propagation program:

1. The USFWS may receive up to 125,000 eggs from the WDFW as authorized in permit 1395

2. The USFWS shall limit annual production of steelhead for release into the Methow River to not exceed a total of 100,000 juveniles at approximately 6 fish per pound release in April or May.

3. The USFWS shall externally mark artificially propagated steelhead groups released into the Methow River with an adipose fin clip. All marking programs shall be coordinated with other fish production agencies within the Columbia River Region.

4. The USFWS shall internally tag (e.g., CWT, PIT tag) at least a representative sample of artificially propagated steelhead groups released into the Methow River to allow monitoring and evaluation of fish performance and contribution rates, including straying levels to natural spawning areas and to other hatcheries. All tagging programs shall be coordinated with other fish production agencies within the Columbia River Region.

2.4 Permit 1412 - Confederated Tribes of the Colville Reservation

NMFS proposes to issue permit 1412 to the Colville Tribes to carry out an artificial propagation research and enhancement program to enhance the natural origin UCR steelhead in the Okanogan River basin. Program details were provided in the permit application (CCT 2002) and are summarized below, followed by additional conditions that will be included in the permit.

2.4.1 Proposed Activities

The Colville Tribes propose to install a temporary picket weir in Omak Creek in mid-March through April 30th annually at approximately rm 0.5 to collect about 16 adult steelhead for broodstock. The Colville Tribes further proposed to install a permanent trap in Omak Creek in the future pending additional funding and submittal of a Biological Assessment. The permanent trap will not be analyzed at this time. If the picket weir is not successful, then trap nets or angling would be used to collect broodstock. The broodstock would be transported approximately 35 miles in a tank truck to the Colville Tribal Trout Hatchery, near Bridgeport, Washington.

Adult steelhead would be spawned and biologically sampled according to standardized fish health practices following fish disease control guidelines developed by IHOT (1995) and the PNFHPC (1989). Fin tissue and other biological data would be collected from the broodstock to monitor the program impacts.

Eggs would be incubated and juvenile fish reared at the tribal facility until the yearling smolt stage. Fish health would be monitored routinely, generally on a monthly schedule, and the rearing facility would be operated to be in compliance with "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" standards (NWIFC and WDFW 1998).

Juvenile fish would be biologically sampled in the hatchery facility including collection of fin tissue for genetic monitoring, and growth monitoring.

Juvenile steelhead would be externally marked with visual implant elastomer tags for identification purposed but not adipose fin-clipped. Juveniles may also be PIT tagged for identification purposes. Steelhead smolts with a demonstrated preparedness for downstream migration would be released into Omak Creek from a Natural Rearing Enhancement System (NATURES)-type acclimation pond, which is in development with a completion target date of spring 2004, or scatter-planted from a tank truck in April or May.

2.4.2 Additional Terms and Conditions

The following additional terms and conditions will be incorporated into permit 1412 in order to minimize the potential adverse impacts of the proposed artificial propagation programs:

1. The Colville Tribes shall limit annual production of steelhead for release into the Okanogan River basin to not exceed 40,000 yearlings to be released in April or May.

2. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, and high egg to fry survival rates, lead to the inadvertent possession of steelhead substantially in excess (>110 %) of program goal levels, surplus eggs or fish shall be culled from the population in a random manner.

3. To the extent possible without imposing increased risk to listed species, the Colville Tribes shall enumerate, and identify marks and tags on, all anadromous species encountered at adult trapping sites. This information should be included in the either an annual brood program report or a monitoring and evaluation report submitted to NMFS, Salmon Recovery Division, Portland, Oregon.

4. The Colville Tribes shall apply measures in trapping operations directed at the collection of broodstock that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding and careful handling and release of listed fish; and allowance for free passage of migrating listed fish through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

5. Traps to collect or monitor UCR steelhead must be checked, and all fish removed at least daily.

6. The Colville Tribes shall externally mark artificially propagated steelhead groups released into Omak Creek. All marking programs shall be coordinated with other fish production agencies within the Columbia River Region.

7. The Colville Tribes shall, if funding can be secured, periodically internally tag (e.g., CWT, PIT tag) at least a representative sample of artificially propagated steelhead groups released into the UCR basin to allow monitoring and evaluation of fish performance and contribution rates, including straying levels to natural spawning areas and to other hatcheries. All tagging programs shall be coordinated with other fish production agencies within the Columbia River Region.

8. If water temperature at adult trapping sites exceeds 21°C (69.8°F), the trap operating entity shall notify NMFS to determine if continued trap operation poses substantial risk to ESA-listed species.

9. The Colville Tribes shall provide an annual report that summarizes numbers, pounds, dates, tag/mark information, locations of artificially propagated fish releases, monitoring and evaluation activities that occur within the hatchery environment, and adult return to the UCR basin for each program. The Colville Tribes shall collect and report the coefficient of variation around the average (target) steelhead release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status. Unless otherwise noted in the specific terms and conditions, the reports shall be submitted by January 31st of the year following release (i.e., brood year 2001, release year 2002, report due January 2003) to NMFS Salmon Recovery Division, Portland, Oregon.

10. Adult return information should include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. Unless otherwise noted in the specific terms and conditions, if a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31st, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 2004) to NMFS.

2.5 Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02).

Direct effects of the proposed action of the issuance of all three permits would occur within the UCR basin and includes areas primarily in Chelan, Douglas, and, Okanogan counties; more specifically, the Columbia River at and above Priest Rapids Dam, the Wenatchee River, Methow River, and Okanogan River basins and artificial propagation facilities along the mainstem Columbia River (Figure 1).

The effected area in the Wenatchee River basin includes the Chiwawa River, Nason Creek, Dryden and Tumwater Dams, and all tributaries accessible to anadromous steelhead. The effected area in the Methow River basin includes the Methow River, Twisp River, Chewuch River, the Methow Hatchery, the Winthrop NFH, and various smaller tributaries that are accessible to steelhead. The effected area in the Okanogan River basin includes the Okanogan River, Similkameen River, Omak Creek, and Salmon Creek, and other small tributaries that are accessible to steelhead. The effected area in the Columbia River basin includes the Wells, Ringold, Eastbank and Chelan hatcheries and the ladder traps at Wells and Priest Rapids dams.

Critical habitat was designated for UCR steelhead in 2000 when NMFS published a final rule in the Federal Register (65 FR 7764). However, the critical habitat designation for UCR steelhead was vacated and remanded to NMFS for new rulemaking pursuant to a court order in April 2002. The designation of critical habitat for the UCR steelhead ESU will trigger a reinitiation of ESA consultation.

3. STATUS OF SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered. UCR steelhead and spring chinook salmon are just such DPSs and, as such, are for all intents and purposes considered "species" under the ESA.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group populations is referred to as an evolutionarily significant unit (ESU) of the species. Hence, UCR steelhead constitute an ESU of the species *O. mykiss,* and UCR spring chinook salmon are an ESU of *O. tshawytscha*.

On March 24, 1999, NMFS listed UCR spring chinook salmon as an endangered species under the ESA (64 FR 14308). In its final listing determination, NMFS concluded that the UCR spring chinook salmon ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that six hatchery stocks in the UCR Basin (Chiwawa, Methow, Twisp, Chewuch, and White Rivers and Nason Creek) should be considered part of the ESU because they are currently essential for the recovery of the ESU. The WDFW operates most of the artificial propagation programs for listed UCR spring chinook salmon.

On August 18, 1997, NMFS listed UCR steelhead as an endangered species under the ESA (62 FR 43937). NMFS concluded that the UCR steelhead ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that one hatchery stock in the UCR basin, the Wells Hatchery stock, should be considered part of the ESU because it is currently essential for the recovery of the ESU. All artificial propagation programs rearing steelhead in the UCR were derived from the Wells Hatchery stock and natural origin UCR steelhead and are considered part of the ESU.

The UCR spring chinook salmon and steelhead were listed because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to become extinct within the foreseeable future. These factors for decline affect UCR chinook salmon and steelhead biological requirements at every life stage and they arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place.

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at that time and in that action area. For the purposes of this consultation, UCR spring chinook salmon and steelhead biological requirements are expressed in two ways: Population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, stream substrates, and food availability. Clearly, these two types of information are interrelated. That is, the condition of a given habitat has a large impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so provides a more complete picture of all the factors affecting UCR spring chinook salmon and UCR steelhead survival. Therefore, the discussion to follow will be divided into two parts: Species Distribution and Trends; and Factors Affecting the Environmental Baseline.

3.1 Species Distribution and Trends

3.1.1 Chinook Salmon

Chinook salmon are the largest of the Pacific salmon. The species' North American distribution historically ranged from the Ventura River in California to Point Hope, Alaska. In northeastern Asia, the species range from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991).

Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit the most diverse and complex life-history strategies. Healey (1986) described 16 age categories for chinook salmon, seven total ages at maturity with three possible freshwater ages. Gilbert (1912) initially described two general freshwater life-history types: "stream-type" chinook salmon reside in fresh water for a year or more following emergence; "ocean-type" chinook salmon migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. This racial approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations. The generalized life history of Pacific salmon includes freshwater phases of incubation, hatching, emergence, migration to the ocean, rearing in marine waters, and subsequent initiation of maturation and return to fresh water for completion of maturation and spawning. Juvenile rearing in fresh water can be minimal or extended. Additionally, some male chinook salmon mature in fresh water, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to varying degrees of genetic and environmental determinants and interactions thereof. Chinook salmon may spend one to six years in the ocean before returning to their natal streams to spawn.

Ocean distribution differs between ocean- and stream-type chinook salmon (Healey 1983, 1991). Ocean-type chinook salmon tend to migrate along the coast, and stream-type chinook salmon migrate far from the coast in the central North Pacific. Chinook salmon populations can be characterized by their time of freshwater entry as spring, summer, or fall runs. Spring chinook salmon tend to enter freshwater and migrate far upriver, where they hold and become sexually mature before spawning in the late summer and early autumn. Fall chinook salmon enter freshwater in a more advanced stage of sexual maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of their natal rivers and spawn within a few days or weeks of freshwater entry (Fulton 1968, Healey 1991). Summer chinook salmon are intermediate between spring and fall runs, spawning in large and medium-sized tributaries, and not showing the extensive delay in maturation exhibited by spring chinook salmon (Fulton 1968).

3.1.1.1 UCR Spring Chinook Salmon

The UCR spring chinook salmon ESU, listed as endangered on March 24, 1999 (64 FR 14308), includes all natural-origin stream-type chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River basins (Myers *et al.* 1998). All chinook salmon in the Okanogan River are apparently ocean-type and are considered part of the UCR summer/fall run ESU. Nine stocks have been identified within the UCR spring chinook salmon ESU (WDF *et al.* 1993). All stocks, with the exception of the Methow stock, were considered by WDF *et al.* (1993) to be of native origin, of natural production type, and as depressed in status. The WDFW considers the Methow spring chinook salmon stock to be a composite in production type, but of native origin, and depressed in status.

When listing the UCR spring chinook salmon as endangered NMFS included six hatchery populations as part of the ESU: Chewuch River, Methow River, Twisp River, Chiwawa River, White River and Nason Creek. These six hatchery populations were considered to be essential for recovery and were therefore listed as part of the ESU. Hatchery populations at Winthrop NFH, Entiat NFH, and Leavenworth NFH were not included as part of the ESU because they were derived from Carson NFH spring chinook salmon.

The UCR spring chinook salmon have a stream-type life history. Adults return to the Wenatchee River during late March through early May, and to the Entiat and Methow Rivers during late March through June. Most adults return after spending 2 years in the ocean, although 20 to 40 percent return after three years at sea. The UCR spring chinook salmon experience very little ocean harvest. Peak spawning for all three populations occurs from August to September. Smolts typically spend one year in freshwater before migrating downstream. There are slight genetic differences between this ESU and others containing stream-type fish, but more importantly, the ESU boundary was defined using ecological differences in spawning and rearing habitat (Myers *et al.* 1998). The Grand Coulee Fish Maintenance Project (1939 through 1943) may have had a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the UCR region. A more detailed discussion of UCR spring chinook salmon is provided in the Biological Opinion concerning spring chinook salmon artificial propagation programs (NMFS 2000a).

NMFS recently proposed Interim Recovery Abundance Levels and Cautionary Levels (Ford *et al*. 2001). *Cautionary Levels* were characterized as abundance levels that the population fell below only about 10 percent of the time during a historical period when it was considered to be relatively healthy. The three independent populations of spring chinook salmon identified for the ESU include those that spawn in the Wenatchee, Entiat, and Methow basins (Ford *et al.* 2001).

All three of the existing UCR spring chinook salmon populations have exhibited similar trends and patterns in abundance over the past 40 years. The 1998 status review (Myers et al. 1998) reported that long-term trends in abundance were generally negative, ranging from -5 to +1 percent. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. Based on redd count data series, spawning escapements for the Wenatchee, Entiat, and Methow rivers have declined an average of 5.6, 4.8, and 6.3 percent per year, respectively, since 1958. In the most recent five year geometric mean (1997-2001), spawning escapements were 273 for the Wenatchee population, 65 for the Entiat population, and 282 for the Methow population, only 8 to 15 percent of the interim abundance recovery targets, although escapement increased substantially in 2000 and 2001 in all three river systems. Based on 1980-2000 returns, the average annual growth rate for this ESU is estimated as 0.85. Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent).

Summary

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for very guarded optimism, NMFS finds that there has been no genuine change in the species' status since they were listed as endangered, and the biological requirements are not being met with respect to abundance, distribution, or overall trend.

3.1.2 Steelhead

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water and the duration of the spawning migration (Burgner *et al*. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns relatively shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, others only have one run type. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do so are females (Nickelson *et al.* 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Multiple spawnings for steelhead range from three percent to 20 percent of runs in Oregon coastal streams. Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973).

Based on catch data, juvenile steelhead tend to migrate directly offshore during their first summer, rather than migrating nearer to the coast as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986). Available fin-mark and coded-wire tag data suggests that winter steelhead tend to migrate farther offshore but not as far north into the Gulf of Alaska as summer steelhead (Burgner *et al.* 1992). Maturing Columbia River steelhead are found off the coast of Northern British Columbia and west into the North Pacific Ocean (Busby *et al.* 1996). At the time adults are entering freshwater, tagging data indicate that immature Columbia River steelhead are out in the mid-North Pacific Ocean.

3.1.2.1 UCR Steelhead

The UCR steelhead ESU, listed as endangered on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River, Washington, to the U.S./Canada border. The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing.

The Wells hatchery stock is considered part of the UCR ESU because it was founded from a mixture of native populations and retains genetic resources of steelhead populations above Grand

Coulee Dam that are now extinct. Since 1997, the WDFW has been developing a Wenatchee River stock for the juvenile released into the Wenatchee basin. Currently, there is probably a close resemblance between the natural and hatchery populations in this ESU because of the incorporation of naturally-spawning adults into the hatchery program and the large number of hatchery fish that have been spawning in the natural environment (65-80 percent of the spawning population in the Methow basin; Busby *et al.* 1996). Since natural replacement rates of UCR steelhead are low (0.3:1), the hatchery supplementation programs were determined to be essential for recovery and included in the endangered listing under the ESA. These hatchery fish could be used to reduce the short-term risk of extinction and aid in the recovery of the UCR steelhead ESU.

Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest on the west coast (up to 7 years old), probably due to the ubiquitous cold water temperatures (Mullan *et al.* 1992). Adult steelhead from this ESU enter the lower Columbia between May and September with fish arriving at Wells Pool in early July. Fish enter the Wenatchee and Methow Rivers in mid-July and peak between mid-September and October. During winter, adult steelhead generally return to the warmer Columbia River and re-enter the Methow to begin spawning in mid-March after the ice has thawed. Spawning continues through May and many fish seek out higher reaches in the tributaries. Fry emergence occurs that summer and juveniles rear for two to four years prior to spring downstream migration.

On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Lohn 2002). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Lohn 2002).

Returns of both hatchery and naturally produced steelhead to the UCR basin have increased in recent years. The average 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g., hatchery/natural fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 15 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003).

In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003). A 5-year geometric mean (1997-2001) of

approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4 percent per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35 to 29 percent, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9 percent per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of natural origin spawners dropped from 19 percent for the period prior to the 1998 status review to 9 percent for the 1997 to 2001 returns.

Naturally produced steelhead made up an average of 17.8 percent of the steelhead run at Priest Rapids Dam during the 18-year period from 1986 to 2001 (Table 3). These natural origin steelhead are not equally distributed among the UCR tributary basins. Mullen *et al*. (1994) reported annual escapement to the Methow basin at only 10 percent natural origin steelhead; however, in recent years the WDFW (2002) report natural origin steelhead composition of 5 to 11 percent in 1998 through 2000 at Wells Dam (Table 4). The escapement to the Wenatchee basin from 1998 to 2000 averages 430 natural origin steelhead.

Table 3. Upper Columbia River steelhead run at Priest Rapids Dam from 1986 to 2002.

	Artificially Propagated		Naturally Produced		
Year	Total	Percent	Number	Percent	Total Run
1986	20,022	90%	2,342	10%	22,364
1987	9,955	71%	4,058	29%	14,013
1988	7,530	74%	2,670	26%	10,200
1989	8,033	75%	2,685	25%	10,718
1990	6,252	80%	1,585	20%	7,837
1991	11,169	80%	2,799	20%	13,968
1992	12,102	88%	1,618	12%	13,720
1993	4,538	84%	890	16%	5,428
1994	5,880	87%	855	13%	6,735
1995	3,377	77%	993	23%	4,370
1996	7,757	90%	843	10%	8,600
1997	8,157	91%	785	9%	8,942
1998	4,919	84%	928	16%	5,847
1999	6,903	83%	1,374	17%	8,277
2000	9,023	79%	2,341	21%	11,364
2001	24,174	81%	5,670	19%	29,844
Average	**9,362**	**82.2%**	**2,027**	**17.8%**	**11,389**

Table 4. Upper Columbia River steelhead run composition at Wells Dam (Methow and Okanogan basins) (Letter from Kirk Truscott, WDFW, July 9, 2003).

	Artificially Propagated		Naturally Produced		
Year	Number	Percent	Number	Percent	Total Run
1998	2,849	92%	234	8%	3,083
1999	3,511	89%	447	11%	3,958
2000	6,142	92%	541	8%	6,683
2001	18,034	95%	889	5%	18,923
2002	9,098	93%	706	7%	9,804

Artificially propagated steelhead have been released into tributary areas with good quality habitat to encourage their return and eventual spawning in the natural environment. In recent years artificial propagation has focused on incorporating natural origin fish into the broodstock populations.

Upper Columbia River steelhead migration and dam passage characteristics were evaluated using radio tags implanted at Priest Rapids Dam in 1999 and 2001 (English *et al*. 2001, 2003). Radio tagged fish were subsequently released 7.9 rm downstream of the dam. Of the steelhead tagged in 1999 and 2001, 75 and 81 percent were identified by marks and tags and originating from artificial propagation programs, respectively.

The distribution of radio tagged steelhead provides insight into the migration characteristics and spawning site selection. Based on marks and tags identified on and in steelhead at the time of tagging, 201 steelhead that were expected to return to the Methow or Okanogan basins remained in the system to spawn naturally. Of these, 72 percent actually went to the Methow or Okanogan, 5 percent strayed to rivers below Wells Dam, and 22 percent were last tracked in the Columbia River. A total of 32 radio-tagged steelhead were expected to return to the Wenatchee River basin, based on marks and tags. Of these, 66 percent (21 fish) went to the Wenatchee, 19 percent (6 fish) went to the Methow or Okanogan, and 16 percent (5 fish) were last tracked in the Columbia River (English *et al*. 2001, 2003).

The radio telemetry study also indicated that 56 to 73 percent of the steelhead that spawned attempted to return to the ocean in 2002 (tagged in 2001) as kelts. Of the 170 tributary spawners that were subsequently tracked as kelts, 18 percent (30 fish) were detected at or below Coyote Rapids in the Hanford Reach area below Priest Rapids Dam.

Radio tagged steelhead, both hatchery origin and natural origin, were tracked through the spawning season into the Wenatchee, Methow, Okanogan river basins as well as the Entiat,

Yakima, Snake river basins. In 2001-2002, a total of 77 and 61 percent of the hatchery and natural origin steelhead tagged were tracked through spawning, respectively. Both hatchery and natural origin steelhead were located in each of the major basins of the UCR. Distribution of hatchery and natural origin steelhead was similar. Natural origin fish returns were most frequently observed in the Wenatchee basin (37 percent) and Methow basin (35 percent).

Summary

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels of natural origin UCR steelhead. Therefore, while there is some cause for very guarded optimism, there has been no genuine change in the species' status since they were listed as endangered, and based on the best available science, NMFS finds that the biological requirements are not being met with respect to abundance, distribution, or overall trend.

3.2 Factors Affecting the Environmental Baseline in the Action Area

Environmental baselines for biological opinions are defined by regulation at 50 CFR §402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for this biological opinion is therefore the result of the impacts a great many activities (summarized below) have had on UCR steelhead and spring chinook salmon survival and recovery. Put another way, the baseline is the culmination of the effects that multiple activities have had on the species' biological requirements and, by examining those individual effects, it is possible to derive the species' status in the action area.

The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. These factors are well known and documented in dozens—if not hundreds—of scientific papers, policy documents, news articles, books, and other media. It is therefore unnecessary to detail in this opinion the many ways in which human activities and natural factors have affected the UCR steelhead's and chinook salmon's habitat-related biological requirements; thus the following paragraphs constitute a brief summary of what the most recent accepted science has to say about how human action and natural processes have degraded essential steelhead habitat features in the UCR subbasin.

Some factors in the action area (e.g., hydropower and agricultural development—particularly irrigation diversions) have had adverse effects on the habitat-related biological requirements of UCR spring chinook salmon and UCR steelhead, while other factors have only affected some of those essential habitat features. For example, road building in the UCR subbasin has had a sizeable effect on stream substrates and water quality (through siltation), and road culverts have blocked fish passage, but such activities have not had much of an effect on water velocity. In another instance, timber harvest and grazing activities have affected—to greater or lesser

degrees—all the factors except space. And urban development has affected them all, but generally to a small degree in the largely rural UCR subbasin. In short, nearly every widespread human activity in the basin has adversely affected some or all of the habitat features. And by disrupting those habitat features, these activities—coupled with past hatchery and fishery effects and occasional natural disturbances such as drought and fire—have had detrimental impacts on UCR steelhead and spring chinook salmon health, physiology, numbers, and distribution in virtually every subpopulation and at every life stage. For detailed information on how various factors have degraded essential habitat features in the UCR subbasin, please see any of the following: NMFS (1991), NMFS (1997), NMFS (1998), NMFS (2000a), and, in particular, NMFS (2000b).

Summary

In conclusion, the picture of whether UCR steelhead and spring chinook salmon biological requirements are being met is more clear-cut for habitat-related parameters than it is for population factors: given all the factors for decline, it is clear that the UCR steelhead and spring chinook salmon biological requirements are currently not being met under the environmental baseline. Thus their status is such that a substantial improvement in the environmental conditions of their habitat is needed (over those currently available under the environmental baseline). Any further degradation of the environmental conditions could have a large impact because the species is already at risk of going extinct. In addition, there must be efforts to minimize impacts caused by dams, harvest, hatchery operations, habitat degradation, and unfavorable natural conditions.

4. ANALYSIS OF THE EFFECTS

NMFS analyzes the direct and indirect effects on an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated action are those that are part of a larger action and depend on the larger action for the justification. Inter dependent actions are those that have no independent utility apart from the action under consideration (50 CFR §402.02).

The proposed actions can be divided into four categories, with specific activities in each category summarized in Table 5. Each of these activity categories has potential to effect ESA-listed UCR spring chinook salmon and UCR steelhead. The ESA section 10(a)(1)(A) process includes applicant proposed measures, and terms and conditions proposed by NMFS which function together to be protective of listed species. This section considers the potential effects of the proposed actions in the four activity categories above on the two ESA-listed ESUs that occur in the action area.

ble 5. Summary of activities that would be conducted if Permits 1395, 1396, and 1412 are issued.

e of Activity	Permit 1395	Permit 1396	Permit 1412	Potential Effects
lt Return nitoring	Intercept and collect biological data (length, scales, marks, tags, etc.) on 10 percent of run Externally tag sampled steelhead Summarize, assess, and report data collected	Not applicable	Not applicable	Mortality due to stress fro capture, handling, release Injury or mortality from tagging
lt Return agement	Ensure the run can fully seed the habitat in each basin Develop broodstock collection protocols Determine if excess hatchery steelhead should be removed from spawning populations in each basin	Not applicable	Not applicable	Swamping impacts on natural origin UCR steelhead Mortality from capture an release in fisheries
ficial pagation	Collect up to 373 broodstock fish at Wells Dam on the Columbia River for Methow and Okanogan basin releases Collect up to 208 broodstock fish at Dryden and Tumwater Dams for Wenatchee basin releases Collect up to 55 broodstock fish for PUD survival studies is some years Holding and artificial spawning of broodstock at Wells and Eastbank Hatcheries Transfer of 125,000 eyed-eggs or fry from W ells Hatchery to Winthrop National Fish Hatchery annually	Receive up to 125,000 eggs or fry from WDFW annually	Collect up to 16 adult steelhead for broodstock from Omak Creek or Okanogan River Holding and artificial spawning of broodstock at Colville Trout Hatchery	Numeric reduction of natural origin UCR steelhead spawners becau they are collected for broodstock

e of Activity	Permit 1395	Permit 1396	Permit 1412	Potential Effects
	Transfer up to 225,000 eyed-eggs from Wells Hatchery to WDFW facilities for release from Ringold Springs Rearing Facility annually			
	Incubation and rearing to smolt	Incubation and rearing to smolt	Incubation and rearing to smolt	
	Rear juveniles following routine fish culture methods to an average size of 5 to 8 fish per pound	Rear juveniles using routine fish culture methods to an average size of 5 to 8 fish per pound	Rear juveniles using routine fish culture methods to an average size of 5 to 8 fish per pound	
	Externally mark or tag all fish prior to release	Adipose fin clip all fish prior to release	Externally mark or tag all fish prior to release	
	Internally tag some smolts prior to release			Competition for food and space with natural origin UCR spring chinook salmon and UCR steelhea juveniles
	Release up to 180,000 smolts into the Columbia River from Ringold Springs Rearing Facility			
	Release of 350,000 smolts into the Methow and/or Okanogan basins annually and release of 400,000 smolts into the W enatchee basin annually	Release of up to 100,000 smolts in the Methow River annually	Release of up to 40,000 smolts into the Okanogan basin annually	
	Release of up to 150,000 smolts into the Columbia River for dam passage survival studies in a few years			
earch, nitoring and luation	Investigate the factors that affect and the extent of residualism of juveniles from release groups		Investigate the efficacy of hatchery programs in rebuilding self-sustaining populations	Visual observation, harassment of UCR steelhead and spring chinook salmon

e of Activity	Permit 1395	Permit 1396	Permit 1412	Potential Effects
	Determine the relative success of program steelhead in the natural environment Investigate the efficacy of hatchery programs in rebuilding self-sustaining populations Monitor the affect of artificial propagation on the genetic profile of the stocks		Cap a portion of the redds deposited in Omak Creek to determine spawning success of artificially propagated fish in the natural environment Monitor the affect of artificial propagation on the genetic profile of the stocks	Numeric reduction of natural origin UCR steelhead spawners Mortality of juvenile UCR steelhead

4.1 Effects of Proposed Action on UCR Spring Chinook Salmon

The potential effects in the form of incidental take of the proposed action on UCR spring chinook salmon is evaluated in this section. Organized by the four categories listed above. Where appropriate, the applicants propose minimization techniques to reduce incidental impacts on UCR spring chinook salmon.

4.1.1 Adult Return Monitoring

Monitoring of adult steelhead returns to the UCR basin at Priest Rapids Dam (rm 397), which is below the four steelhead production tributaries of the UCR basin will impact the target UCR steelhead, and potentially impact ESA-listed UCR spring chinook salmon. The migration timing of steelhead at Priest Rapids begins in late June and continues through November 15th when adult counting at the facility is terminated for the season (http://www.fpc.org/). Spring chinook salmon migration at Priest Rapids Dam occurs between about April 15th and June 15th. Adult steelhead return monitoring activities at Priest Rapids Dam generally begin the second week of July and ends about November 15th, which encompasses 95% of the run (Figure 2). The temporal separation between the two ESA-listed species run timing results in no anticipated effects on spring chinook salmon from steelhead adult monitoring at this location.

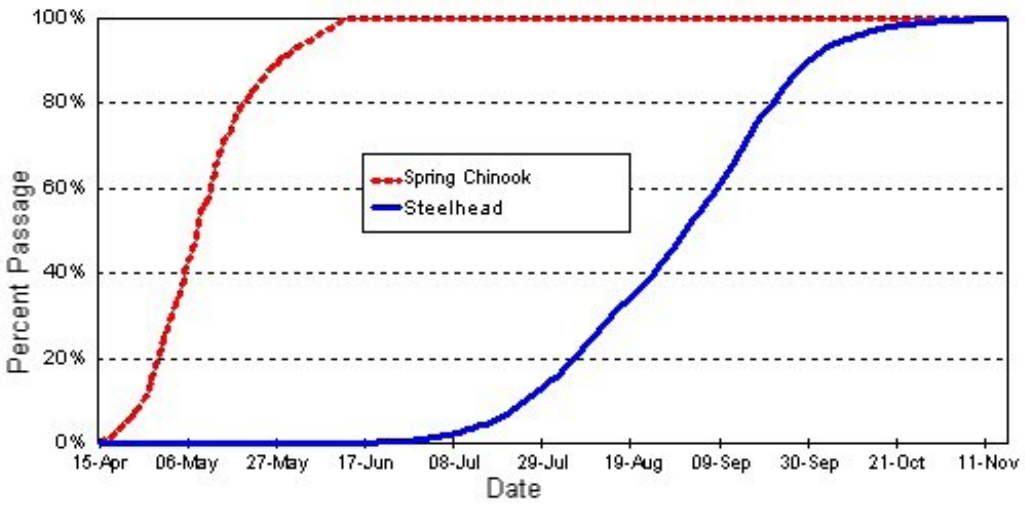

Figure 3. Ten year average cumulative passage of spring chinook salmon and steelhead at Priest Rapids Dam.

4.1.2 Adult Return Management

Management activities such as removal of excess artificially produced adult steelhead at trap sites or via recreational harvest fisheries could occur from October through March. Spring chinook salmon adults return to the UCR beginning in late March and complete spawning by the

end of September. The temporal separation in life history strategies result in no anticipated impacts of adult steelhead management or broodstock collection activities. Additionally, fishing gear used to target adult steelhead would be too large to catch juvenile spring chinook salmon, leading NMFS to determine that potential management actions and broodstock collection activities associated with the artificial propagation programs are not likely to adversely effect UCR spring chinook salmon.

4.1.3 Artificial Propagation Activities

The WDFW, the Chelan PUD, the Douglas PUD, the USFWS, and the Colville Tribes propose to operate artificial propagation enhancement programs for ESA-listed UCR steelhead. The *Biological Opinion on Artificial Propagation in the Columbia River* (NMFS 1999a) and the *Biological Opinion for 1995-1998 Hatchery Operations in the Columbia River Basin* (NMFS 1995) identify nine general types of potential adverse effects of hatchery operations and production on natural fish populations. These are: (1) operation of hatchery facilities, (2) broodstock collection, (3) genetic introgression, (4) density-dependent effects of hatchery production, (5) disease, (6) competition, (7) predation, (8) residualism, and (9) migration corridor/ocean. Adverse impacts on UCR spring chinook salmon resulting from UCR steelhead artificial propagation programs could only result from a few of the nine general types because of differences between the two species.

Physical operation of hatchery facilities impacts could occur from water withdrawal, release of hatchery effluent and facilities failure (NMFS 1999a). Water withdrawal for hatcheries located within the spawning and/or rearing areas can diminish stream flow from points of intake to outflow and, if great enough, can impede migration and affect spawning behavior. Effluent from the hatchery may change water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the receiving stream's mixing zone (Kendra 1991).

Hatchery facilities operating to carry out the proposed programs rely largely on ground water withdrawal, although an important aspect of the two HCP agreements with Chelan PUD require the ability to hold steelhead adults and rear/acclimated juvenile steelhead on river water. Hatchery operators are required to comply with water right permits administered by Washington Department of Ecology established for each hatchery or acclimation site. This is intended to prevent over-appropriation of surface water needed for natural fish production and migration. Hatcheries facilities are also required to maintain all screens associated with water intakes in surface water areas to NMFS screening criteria (NMFS 1996). All hatcheries associated with the proposed action operate under NPDES permits that regulate water quality impacts. Reporting of hatchery effluent and water quality monitoring activities are part of the annual report to NMFS. Potential impacts of hatchery facility operation for the proposed programs were evaluated in an Environmental Assessment and determined to not be significant (NMFS 2003) . NMFS finds that adherence to water right limits, water quality NPDES permits, and NMFS screening criteria (NMFS 1996) are sufficient measures to protect the UCR spring chinook salmon ESU.

The release of steelhead smolts may cause displacement of rearing natural UCR spring chinook salmon from occupied stream areas, leading to abandonment of advantageous feeding areas or premature out-migration (Pearsons *et al*. 1994). The presence of large numbers of hatchery produced steelhead may also alter natural fish behavior patterns, which may increase their vulnerability to predation (NMFS 1995).

The release of only volitionally migrating smolts into the upper tributary reaches will contribute to a decrease in density-dependent effects on natural fish, by limiting interactions between natural and hatchery fish. Releases of hatchery smolts coincident with managed releases of water (flow augmentation) will also help accelerate downstream migration of artificially propagated steelhead, further reducing spatial and temporal overlaps with listed fish and potential adverse behavioral effects. When possible, release of juveniles which may residualize will occur into the lower tributary areas to minimize the potential adverse impacts on the naturally produced populations.

Artificially propagated steelhead smolts may prey upon other fish. Due to their location, size, and time of emergence, newly emerged chinook salmon fry are likely to be most vulnerable to predation by hatchery released fish. Their vulnerability is believed to be greatest as they emerge and decreases somewhat as they move into shallow, shoreline areas (USFWS 1994). Emigration out of release areas and foraging inefficiency of newly released smolts may minimize the degree of predation on chinook salmon fry (USFWS 1994).

Predation by artificially produced steelhead smolts on natural origin smolts is less likely to occur than predation on fry. The USFWS (1994) presented information indicating salmonid predators are generally thought to prey on fish approximately 1/3 or less their own length (see also Witty *et al.* (1995) citing Parkinson *et al.* (1989)). Consequently, predation by hatchery fish on listed salmon smolts in the migration corridor is believed to be low.

Large numbers of artificially propagated steelhead may attract predators (birds, fish, pinnipeds) and, consequently, contribute indirectly to predation of naturally produced fish. On the other hand, a mass of hatchery fish moving through an area may confuse or distract predators and may provide a beneficial effect to naturally produced fish. Both effects may be occurring to some extent. The presence of large numbers of hatchery fish may also alter the listed species' behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994). Considering the measures to protect UCR steelhead, the impacts of predation will not be substantial.

4.1.4 Research, Monitoring, and Evaluation

Research that may be conducted on artificially propagated UCR steelhead under the proposed permits will be evaluated by regional scientific and technical committees that have the responsibility to identify activities important for advancing the survival and recovery of ESA-listed anadromous fish populations. The three HCPs previously described require both HCP

Hatchery Committee and a HCP Coordinating Committee to address issues relating to programs funded by Chelan and Douglas PUDs. A representative of NMFS is on each committee. Federal and State agencies have the additional responsibility pursuant to their agencies mandates to protect and conserve the natural resources to coordinate research and monitoring actions with other co-managers that may or may not be represented on the HCP committees. This technical and scientific scrutiny is expected to ensure that research and monitoring activities that occur in the natural environment minimize adverse impacts on ESA-listed species while maximizing the survival and recovery of anadromous fish populations. Additionally, newly initiated research projects not considered in this Opinion will have to be evaluated for potential impacts to listed species pursuant to the ESA. The UCR steelhead program monitoring will likely over lap or be combined with UCR spring chinook salmon monitoring and provide a benefit to the UCR spring chinook salmon ESU.

The monitoring elements that are identified in this Opinion that may impact UCR spring chinook salmon are restricted to natural environment monitoring (Section 2.1.1.4.2). Natural environment monitoring of adult UCR steelhead includes redd and carcass surveys activities. Adult UCR spring chinook salmon spawn in August and September, while UCR steelhead spawn from January through May. This separation in spawn timing results in no impact on adult UCR spring chinook salmon. Juvenile UCR spring chinook salmon could be present in redds or occupying rearing habitat. Any impacts would be minor, transitory, and temporary.

Monitoring of juvenile UCR steelhead in the natural environment will be done using standard angling techniques and juvenile fish traps (i.e., rotary screw traps). These activities could encounter UCR spring chinook salmon. In previous years, no UCR spring chinook salmon have been encountered during sampling using standard angling techniques for residual UCR steelhead (Andrew Murdoch, WDFW personal communication, August 27, 2003).

The WDFW juvenile fish traps are generally operated to achieve a sample efficiency of four to 20 percent of the total brood production of the target species, depending on the river size. In the Wenatchee River basin, two juvenile fish traps are currently authorized under ESA permit 1203 to monitor natural production of UCR spring chinook salmon. In general, these traps result in mortality of less than two percent on target species and less than one percent on non-target species. In the Biological Opinion for permit 1203 (NMFS 1999b), the WDFW assumed mortality of listed UCR spring chinook salmon would not exceed three percent. Based on experience since that time, the WDFW has revised the mortality impact to be less than two percent on target species. The incidental mortality of UCR spring chinook salmon would not exceed one percent of the UCR spring chinook salmon captured. Using the larger of the two estimates of UCR basin natural production capacity for UCR spring chinook salmon of 753,168 smolts (Ford *et al.* 2001) and assuming trap efficiency of 20 percent and incidental mortality of one percent equals an impact of 1,506 smolts. Converting this to adult equivalents (1.3 percent survival smolt-to-adult, Ford *et al.* 2001) results in a maximum loss of up to 20 adult UCR spring chinook salmon. Considering that juvenile fish traps will likely not be operated in all tributary basins and not all traps will achieve an efficiency of 20 percent (for example the lower

Wenatchee River trap has previously achieved only about a two percent efficiency), the numeric impact will likely be much less and the impact to the ESU as whole is not substantial.

4.2 Effects on UCR Steelhead

Quantitative impacts estimated for the program on the natural population of UCR steelhead are provided below (Table 6 and Table 7), followed by a discussion of the relative effects of the numerical impacts. To address the potential impacts, the applicants propose minimization techniques and research, monitoring, and evaluation activities to assess the affects of the proposed programs, and a mechanism to adjust the programs consistent with the adaptive management approach adopted within the three HCPs. NMFS will place additional limits in the section 10(a)(1)(A) permits which will include facility operational sideboards, limits to the number of natural origin steelhead collected, and reporting requirements in order to reduce and monitor the direct take of UCR steelhead. Overall, the artificial propagation programs provide a benefit to the endangered UCR steelhead ESU by boosting the population abundance, while maintaining or increasing the genetic diversity, and spatial distribution.

Table 6. Estimated numerical or proportional non-lethal and lethal take of naturally produced and artificially propagated ESA-listed Upper Columbia River (UCR) steelhead adults.

Permit - Holder	Non-lethal	Lethal	Non-lethal	Lethal	Lethal Total
Proposed Activity	Naturally produced adult		Artificially propagated adult		
Permit 1395 - WDFW, Chelan PUD and Douglas PUD					
Adult Monitoring at Priest Rapids Dam [a]					
Proportional Take	10% of run	1% of sample	10% of run	1% of sample	1% of sample
1978-2002 Average	226	2[a]	1,104	11 [a]	13 [a]
Radio/Active Tag Study	80 [b]	4	320 [b]	16	20 [b]
Disk Tag Application					
Proportional Take	not applied	not applied	3.8% of run	5% of tagged	5% of tagged
9 Years Triggers Met	0	0	485	24	24 [c]
Recreational Harvest	See Table 9 below				
Artificial Propagation		216	500 [d]	525 [e]	581
Dam Survival Studies				55	55
Research and Monitoring	95	3	230	10	13
Permit 1396 - USFWS					
Artificial Propagation	No broodstock collection, eggs received from WDFW and is included in permit 1395				
Permit 1412 - Colville Tribes					
Artificial Propagation		16	50 [d]	16 [f]	16

[a] *Priest Rapids Dam 1978-2002 average count equals 13,306 steelhead., of which 17 percent were of natural origin (2,262 fish).*

[b] *Assumes 1 percent mortality of steelhead captured, handled, and released when water temperature exceeds optimal maximum of 58°C, which on average is 58 percent of the sampling days. The WDFW has not observed a mortality in the previous 16 years.*

[c] *Total radio/active tag application would not exceed 400 fish, natural and hatchery origin component would depend on run composition, would only occur in years of high returns of both natural and artificially propagated steelhead.*

[d] *Capture, handle, release of non-target adult steelhead during broodstock collection activities.*

[e] *If natural origin steelhead are not available artificially produced steelhead would be collected up to the 581 total limit.*

[f] *If natural origin steelhead are not available artificially produced steelhead could be collected up to the 16 total limit.*

Table 7. Estimated numerical or proportional non-lethal and lethal take of naturally produced and artificially propagated ESA-listed Upper Columbia River (UCR) steelhead juveniles.

Permit - Holder	Non-lethal	Lethal	Non-lethal	Lethal	Lethal
Proposed Activity	Naturally produced juvenile		Artificially propagated juvenile		Total
Permit 1395 - WDFW, Chelan PUD and Douglas PUD					
Adult Monitoring at PRD	0	0	0	0	0
Steelhead Management	0	0	0	0	0
Artificial Propagation	0	0	0	0	0
Research and Monitoring [a]	25%	2%	15%	2%	2%
Permit 1396 - USFWS					
Artificial Propagation	0	0	0	0	0
Permit 1412 - Colville Tribes					
Artificial Propagation	0	0	0	0	0
Research and Monitoring [b]	30%	5%	0	0	5%

[a] *Wenatchee and Methow Basin populations.*

[b] *Omak Creek population.*

4.2.1 Adult Return Monitoring

The WDFW requests authorization to capture 10 percent of the annual steelhead run at Priest Rapids Dam for sampling. Biological sampling would include length measurements, collection of scales, visual examination for external marks and tags, and scanning with a coded-wire tag detector for presence of internal tags. The 10-year average run (1992-2001) is 10,383 steelhead, of which an average of 17.7 percent were naturally produced. Based on this average, about 1,038 steelhead total and about 184 naturally produced steelhead could be sampled annually. The range of natural-origin steelhead at Priest Rapids Dam is large (8.8 to 29.0 percent) and in some years could result in handling a higher proportion of natural-origin steelhead compared to the average. Previous sampling at Priest Rapids Dam has intercepted approximately 8-10 percent of the passing adult steelhead population (246 to735 adults; WDFW 1997). The potential benefit of this activity is the information which will allow for the active management of artificially produced steelhead on the spawning grounds, improved knowledge of the timing and distribution of natural and artificially propagated steelhead throughout the UCR basin which, combined with other data such as redd counts may be used to estimate the productivity of UCR steelhead. In the WDFW's and NMFS' judgement these benefits outweigh the potential adverse effects of collecting, handling, sampling, and releasing 10 percent of the run.

Radiotelemetry studies in 1999 and 2001 indicate a delay at Priest Rapids Dam of approximately 2.5 and 5.4 hours, respectively, when the trap is operated (English *et al*. 2001, 2003). Considering that the median travel time from Priest Rapids Dam tailrace to Wells Dam exit was 20.1 days in 1999 and 9.5 days in 2001, the few hours of delay for a small portion of the run is not substantial.

The WDFW indicates that no direct mortalities have been observed during the previous 16 years of sampling. The time from capture to release of steelhead at Priest Rapids Dam is generally less than five minutes, and after release above the trap into the fish ladder it is unlikely that delayed mortality steelhead would be observed. Groot *et al*. (1995) concede that the mechanisms connecting stress with disease induction in fishes are not fully understood. It is however, generally accepted that elevated plasma cortisol concentration caused by stress, is a key factor in increasing the susceptibility to disease. Water temperatures above the optimal range add an additional stressor. Optimal temperature range for steelhead is 45 to 58°F (7.2 to 14.4°C) (FPDEP 1991). In August through October, average daily Columbia River water temperatures at Priest Rapids Dam range between 52.8 and 69.2°F (11.6-20.7°C) (10-year average scroll case temperature from http://www.cqs.washington.edu/dart/dart.html, March 20, 2003) and 58 percent of the average daily temperatures are above the optimal range for steelhead (Figure 3). The experience level of samplers and the measures to reduce stress lead NMFS to assume that delayed mortality would not exceed one percent of the fish sampled during the warm water period. In an average run year, this would total 10 steelhead, 2 of which would be expected to be of natural origin.

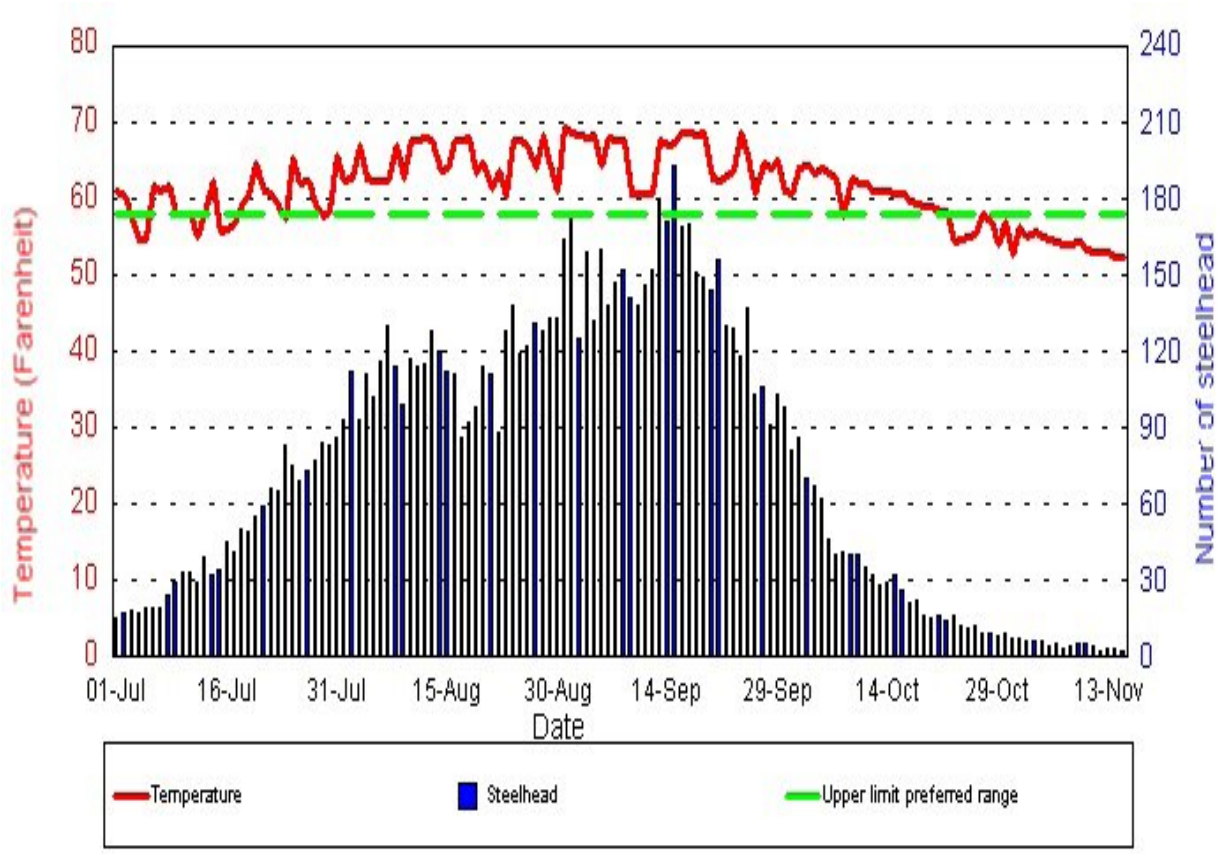

Figure 4. Ten year average upper optimal water temperature and daily passage of steelhead at Priest Rapids Dam.

The WDFW proposes to apply Petersen-type disk tags to the dorsal fin of adipose fin-clipped hatchery origin steelhead after September 9th in years where the run size is likely to exceed 1,300 natural origin steelhead and the total run is likely to exceed 9,550 steelhead. These run sizes are the initial triggers identified for considering additional actions such as recreational fisheries to manage returning hatchery origin steelhead. They reflect a minimum run that exceeds the 10-year average return of natural origin steelhead (years 1991 to 2000) and a starting point for recovery of the natural populations. The September 9th date is 21 days prior to October 1st, which is the earliest a recreational fishery would be opened. The anesthetic, tricaine methanesulfonate (sold under the brand names of Finquel or Tricane-S), commonly know as MS-222, used during sampling has a required 21-day withdrawal period set by the Food and Drug Administration, during which time the fish should not be available for human consumption.

The WDFW believes the application of this tag is necessary to identify steelhead that have been subjected to anesthetic to exclude them from harvest in a recreational fishery (see Section 4.2.2 below). The application of a Petersen disk tag involves the insertion of a wire that holds a 22mm diameter bright orange disk on both sides of the fish through the base of the dorsal fin. As

described above, the environmental conditions at Priest Rapids Dam are outside the optimal range for maintaining optimal steelhead health. The additional stress and injury of applying this type of tag could be expected to increase delayed mortality. Empirical data is lacking concerning the impacts of this specific activity on survival to spawning. The WDFW reports that steelhead with disk tags have been captured in recreational fisheries and that the tag and fish were both in good condition. No information on direct or delayed mortality resulting from application of this type of disk tag was found during a literature search. McFarlane *et al.* (1990) in their review of the development of external tags and marks summarized that this type of tag was first used in 1895 and continues to be a popular tag.

NMFS, based on the data cited above, concludes that the type of injury inflicted during the application of a disk tag is no greater than the injury sustained during hooking and releases steelhead in a recreational fishery under warm water conditions. Therefore, the delayed mortality would be expected to be no greater than 10 percent of the fish receiving a Petersen-disk tag. Run sizes exceeded the above triggers in nine of the last 17 (1978-2002) return years. Utilizing run sizes for those nine years and assuming that all artificially propagated steelhead smolts were adipose fin clipped NMFS calculated the following impact. Tag application would be limited to hatchery origin, adipose fin clipped steelhead, trapped after September 9th when, on average 62 percent of the run has passed Priest Rapids Dam (Figure 4), and only applied during relatively high run size years, on a portion of the fish sampled, the number of steelhead that would receive a disk tag would be about 485 and an estimated 49 steelhead would die. Currently, not all releases are adipose fin clipped and the number of tagged steelhead would be smaller than in this estimate. Since no adipose present natural-origin steelhead would be tagged, no impact to this component of the population would occur.

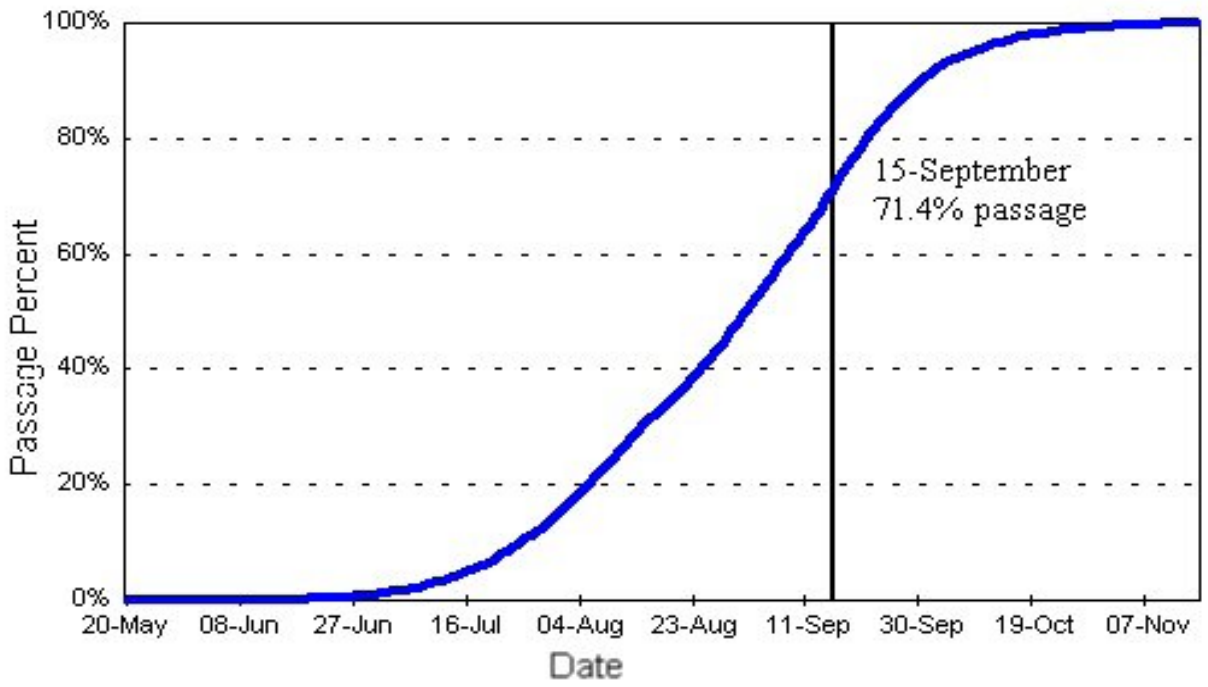

Figure 5. Ten year average cumulative run timing of steelhead at Priest Rapids Dam and the proposed September 15th date for adult steelhead management option assessment.

Additionally, the WDFW proposes to radio/active tag or up to 400 steelhead at Priest Rapids Dam in some years. Radio/active tags would be used to assess migration timing, route, survival, as well as tributary migration and spawning distribution. Radio tag studies conducted by the PUDs have indicated that stray rates of artificially propagated steelhead are higher than expected (English *et al*. 2001, 2003). Considering the current uniformity of the Wenatchee and Wells steelhead stocks in terms of both genetic identity and hatchery program management the stray rates are not entirely surprising. Radio tagged steelhead have been captured and retained during broodstock collection activities. In NMFS' judgement, in years when radio/active tracking is conducted in tributary areas that it would be beneficial to leave radio/active tagged steelhead in the natural environment to collect information on spawning distribution, timing and kelting. Additionally, some radio/active tagged steelhead have been harvested during recreational fisheries; again; potential spawning information is lost when radio/active tagged steelhead are removed from the river. As the tributary oriented programs continue to develop, radio/active tag studies will likely be a very useful measurement tool to determine if tributary oriented artificial propagation strategies are effective. Prior to initiating a radio/active tag study for a given year, the HCP Hatchery Committees will review and approve the study design. Delayed mortality that result of radio/active tagging is assumed to occur at a rate of about 5 percent. Therefore, the ten-year average run size mortality from the telemetry study would be about 20 steelhead, of which only about 20 percent would be of natural origin, resulting in a mortality estimate of four natural origin steelhead.

The cumulative effects of the basic stock assessment activities, and the additional application of a disk tag, and/or a radio/active tag would be expected to result in some occurrence of delayed mortality. A steelhead run consistent with the 1978-2002 average run and all activities occurring would result in a capture, handling, tagging and release mortality impact range of about six natural origin and 48 artificially propagated steelhead. Take in the form of capture, handle, release will not exceed 10 percent of the total run, with mortality from the take not expected to exceed one percent. Take from these monitoring and evaluation activities is not expected to exceed 3.8 percent of the total run and mortality is not expected to exceed 0.2 percent of the total run. This mortality would be limited to years of high returns of both natural and artificially propagated steelhead. In an average run, the take is equal to about 20 steelhead, of which 4 fish (20 percent) would be of natural origin. Given that the average run size is 13,306 (1978 to 2002), the total potential loss of 20 steelhead, predominately artificially propagated steelhead is not a substantial impact considering the potential benefit of the data collection. The data collected is potentially very valuable for future recovery and management actions in the UCR basin as well as other salmon and steelhead populations.

In order to minimize the potential impacts on UCR steelhead from the monitoring activities, the WDFW proposes specific trap operation and fish handling measures adherence to which will be a condition of the permit (see Section 2.2.1.1). NMFS finds these measures are adequate to minimize the adverse impacts on ESA-listed UCR steelhead and that these activities provide a net benefit to the recovery of ESA-listed steelhead in the UCR basin.

4.2.2 Adult Return Management

The ESA intends to ensure the protection and restoration of species in their native habitats. In some years the return of adult UCR steelhead is higher than what is needed to fully seed the habitat which is not surprising since much of the artificial propagation program is produced as mitigation for inundation of habitat. Priority in conservation is afforded to naturally produced steelhead to ensure the highest potential for successful natural production. NMFS in the ESU determination has recognized that the artificially produced steelhead in the UCR are an important component of the recovery effort. However, in years of high survival and return of naturally produced steelhead, the individuals that were the products of the natural environment should be given priority to spawn naturally to perpetuate the species. In years of large returns of artificially produced steelhead to the UCR, the WDFW seeks to reduce the potential negative effects of excess artificially propagated escapement by several methods.

The WDFW proposes to purposefully manage artificially propagated UCR steelhead adults returning to the UCR basin to provide adequate escapement to fully seed the spawning habitat. Artificially produced steelhead have been an important component of the spawning escapements to the Wenatchee and Methow basins. Recent hatchery reforms and recovery strategies include the development of a Wenatchee basin steelhead stock and incorporation of naturally produced adults into the hatchery programs in both basins. Please see the WDFW application for a full

discussion of hatchery program strategies (WDFW 2002). Below are brief descriptions of the different strategies that WDFW will use to manage UCR adult hatchery steelhead.

The Ringold Springs steelhead program serves several purposes. First it provides a genetic reserve for the UCR steelhead ESU in case of catastrophic crash of the upper basin population. Second, it allows managers to remove the earliest spawning component of the Wells Hatchery stock which historically was artificially selected for by well intentioned hatchery managers. This action is one hatchery reform measure intended to help reverse previous adverse impacts of hatchery program management. It provides these benefits to the recovery of the population and an additional benefit of recreational angling in an area that has minimal adverse impacts on the natural steelhead populations. The WDFW proposal to open recreational harvest fisheries in the area adjacent to Ringold Springs would be expected to remove excess artificially propagated steelhead and result in the hook and release of few natural origin steelhead.

In areas above Priest Rapids Dam, several methods have been used to estimate the number of steelhead spawners and juveniles that the available habitat may be capable of supporting. These estimates for the UCR basin range from 1,603 to 8,281 depending on the estimation method (Ford *et al*. 2001). The Interior Columbia Basin Technical Recovery Team (TRT) is reviewing the available data and is expected to provide escapement recommendations for recovery of all ESA-listed UCR species. The WDFW proposes to manage artificially propagated steelhead at levels above the interim abundance targets developed by NMFS (Lohn 2002) until the TRT recommendations are available. NMFS has not developed abundance targets for the Okanogan basin or other smaller tributaries. The WDFW proposes abundance levels for these tributaries for management purposes as well (Table 8).

Table 8. Interim abundance targets of naturally produced steelhead by basin and approximate natural origin broodstock collection goal.

Basin	Interim Abundance Target	Broodstock Goal
Wenatchee	2,500	at least 104 [a]
Entiat	500	- -
Methow	2,500	maximum 123 [b]
Okanogan	600	16
Small Tributaries	200	- -
Total	**6,300**	**243**

[a] *Proportional to run-at-large in years when run is composition is 50% or greater natural origin steelhead, otherwise goal is 50% naturally produced steelhead. Total broodstock collection goal is generally about 208 steelhead..*

[b] *Combined WDFW Methow/Okanogan programs will not exceed 30% natural origin steelhead in the broodstock. Up to 373 steelhead may be collected for broodstock total.*

Artificially produced steelhead released into the UCR basin have three potential parental backgrounds: two natural origin parents, two hatchery origin parents, or one parent of each.

Currently artificially propagated steelhead are externally marked either with a uniquely colored visual implant elastomer (VIE) tag behind the eye or by removing the adipose fin. Artificially propagated steelhead may also receive internal tags such as coded-wire tags or passive integrated transponder (PIT) tags. Based on these marks and tags observed during adult monitoring at Priest Rapids Dam, the WDFW proposes to estimate the composition of the run, including the proportion of natural origin steelhead, and the proportions of artificially propagated steelhead by release location, release group, and parental background. This information will be used to determine if actions to manipulate the proportion of hatchery steelhead in each of the populations in the Wenatchee, Methow, and Okanogan river basins to improve the potential for successful reproduction of naturally produced steelhead are appropriate for a given year.

Utilizing several methods, the WDFW proposes to manage adult steelhead returns to increase the proportion of natural origin steelhead in the spawning populations in each tributary basin. One method is to remove steelhead at trap sites such as the Wells Dam ladders, Ringold Springs ladder, hatchery traps and fishways. Collected hatchery steelhead can then be transported to landlocked lakes for subsequent recreational harvest opportunities. The WDFW believe the stress to individual steelhead being removed will be no more than what currently occurs when steelhead are captured, examined, and released during the currently-authorized activities (WDFW 2002).

Artificially propagated steelhead surplus to program objective can also be removed through recreational harvest, and the WDFW includes this in their proposal. The WDFW summarize that the literature concerning mortality of adult steelhead following release by trout anglers occurs at a rate of less than 5 percent. The WDFW reports (WDFW 2002) that hooking mortality on natural steelhead adults caught during winter conditions (in cool [<50°F] water), including those caught with bait, sustain a hooking mortality of 1.1 percent, while year-round fisheries sustained a hooking mortality of 3.7 percent. The WDFW assumes a 5 percent mortality for adult steelhead caught in UCR fisheries from September through March. Columbia River temperature at Wells Dam in September exceeds 58°F until November 2nd (10-year average, http://www.fpc.org/). Most angling is expected to occur in the tributary areas and after water temperature begins to decrease.

NMFS proposes take limits, specifically mortality limits, based on the natural origin UCR steelhead tributary population escapement to spawning. These limits are defined in Table 10 and assume a catch and release mortality rate of 5 percent. The potential adverse impact in the form of dead natural origin UCR steelhead ranges from 2 to 10 percent of the natural origin steelhead in each tributary spawning area (Table 9) depending on the natural origin UCR steelhead run size and total (natural plus hatchery) run size.

Table 9. Proportional natural-origin UCR steelhead mortality take limit for recreational harvest fisheries in the Wenatchee River, Methow River, and Okanogan River basin tributary areas by run size. Catch and release mortality is assumed to be five percent.

Tributary Area	Priest Rapids Dam Count	Escapement to Tributary Area	Mortality Impact	
			Proportion	Count
Wenatchee River and Columbia River above Rock Island Dam to below Rocky Reach Dam				
	<837	<599	0%	0
Tier 1	838	600	2%	12
Tier 2	2,146	1,700	4%	68
Tier 3	3,098	2,500	6%	150
Methow River and Columbia River above Wells Dam				
	<803	<499	0%	0
Tier 1	804	500	2%	10
Tier 2	2,224	1,600	4%	68
Tier 3	3,386	2,500	6%	150
Okanogan Basin upstream of the Highway 97 Bridge				
	<175	<119	0%	0
Tier 1	176	120	5%	6
Tier 2	180	120	7%	8
Tier 3	795	600	10%	60

The constraints on the impact are designed such that the highest risk is taken in the Okanogan River basin which has been identified as having the least suitable spawning and rearing habitat for steelhead and less risk in the Methow and Wenatchee River basins. Also, no interim abundance target has been define by NMFS for this basin. When the minimum natural origin run size at Priest Rapids Dam of 1,300 steelhead is met, and the tributary run size criteria are met in a particular basin, recreational fisheries could occur in each basin which meets the criteria. For example at the minimum Priest Rapids Dam run size of 1,300, it is not possible to meet the 176 Okanogan basin level and both minimum criteria in the Methow and Wenatchee river basins because the secondary tributary criteria could not be met (838+804+176=1,818). Take limits increase as progress toward recovery is made in the form of increasing natural origin UCR steelhead run sizes. At the minimum Tier 1 criteria, the proportional mortality limit is two percent in the Wenatchee River area or Methow River area and could result in the loss of up to ten or 12 natural origin steelhead from the spawning population in the Methow or Wenatchee basin and up to six natural origin UCR steelhead from the Okanogan River basin. At the maximum end of Tier 1 impacts - 1,699 natural origin steelhead returning to the Wenatchee River and 1,599 returning to the Methow River basin for spawning, which would require at total

natural origin steelhead run of 4,415, fisheries could occur in both basins and a two percent impact would result in up to 34 and 32 natural origin steelhead adults being killed in the Wenatchee and Methow River basins, respectively. At Tier 3 criteria levels the tributary populations have met the currently identified interim abundance targets and the risks associated with the loss of relatively few natural origin steelhead is not substantial. Under this two criteria strategy (Priest Rapids Dam run size and tributary escapement size), if recovery in the Wenatchee and Methow River basins is disproportionate, that is one basin approaches recovery levels of natural origin steelhead and a much greater rate than the other, recreational fisheries could occur in each basin at different impact levels.

Additionally, the WDFW proposes to employ the following measures to minimize the potential adverse impacts of these activities on natural origin UCR steelhead. These will be included as additional conditions in the permit:

- The mandatory release of all adipose fin-present steelhead;
- Fishery openings are established to protect important spawning and outmigration periods;
- Fisheries are selective for adipose fin-clipped or otherwise externally marked hatchery origin steelhead;
- Selective gear regulations will be in effect for fisheries authorized in the tributaries;
- Sanctuary areas in the tributary basins will be established and maintained to protect important production areas;
- Provide information on natural origin fish release requirements and selective gear regulations in the annual Washington Sport Fishing Rules pamphlet, in periodic media news releases, and with signs posted in the fishing areas;
- The WDFW Enforcement Program will enforce these regulations by conducting periodic random and special emphasis patrols;
- Managers must have assurance that the abundance of returning adult UCR steelhead is sufficiently high to meet escapement objectives and achieve hatchery broodstock goals before fisheries will occur.

Benefits to removing excess artificially produces UCR steelhead include increasing the proportion of natural origin steelhead on the spawning grounds. This also reduces the genetic risks to natural populations such as swamping, masking, and density dependant effects created when the habitat is fully seeded and an over abundance of hatchery reared steelhead are on the spawning grounds. NMFS finds that once the minimum UCR steelhead abundance criteria are met, that the benefits of removing surplus artificially propagated UCR steelhead outweigh the small numeric reduction of natural origin UCR steelhead of the recreational fisheries.

4.2.3 Artificial Propagation Activities

The WDFW, Chelan PUD, Douglas PUD, USFWS, and Colville Tribes propose to operate artificial propagation enhancement programs for ESA-listed UCR steelhead. The *Biological Opinion on Artificial Propagation in the Columbia River* (NMFS 1999a) and the *Biological Opinion for 1995-1998 Hatchery Operations in the Columbia River Basin* (NMFS 1995) identify nine general types of potential adverse effects of hatchery operations and production on natural fish populations. These are: (1) operation of hatchery facilities, (2) broodstock collection, (3) genetic introgression, (4) density-dependent effects of hatchery production, (5) disease, (6) competition, (7) predation, (8) residualism, and (9) migration corridor/ocean.

The take of endangered UCR steelhead requested by the applicants will result from proposed artificial propagation enhancement programs designed to benefit ESA-listed UCR steelhead. The primary objectives of these efforts are to preserve extant steelhead populations in the region, and to boost the abundance of remaining stocks. There are risks of ecological and genetic impacts on the ESA-listed juvenile and adult steelhead resulting from the proposed programs. However, the risk of extinction to natural populations is high enough that aggressive intervention is proposed. Strategies are proposed to minimize potential impacts on endangered steelhead that may be associated with these programs.

4.2.3.1 Operation of Hatchery Facilities

Potential adverse impacts identified with the physical operation of hatchery facilities include impacts from water withdrawal, release of hatchery effluent and facilities failure (NMFS 1999a). Hatchery effluent may transport pathogens (disease) out of the hatchery and infect natural-origin fish. Aside from the potential impacts on water flow and quality, operational failures due to power/water loss, flooding, freezing, vandalism, predation and disease may result in catastrophic losses to rearing adults and juveniles.

Flow reductions, flooding and poor fish culture practices may all cause hatchery facility failure or the catastrophic loss of listed fish under propagation. To protect endangered steelhead, all efforts should be made to ensure that the survival of adult steelhead held for broodstock at the hatchery facility be maximized. The applicants propose a variety of measures to address risks associated with operational failures, including:

- Protection of fish from vandalism and predation is provided by fencing, locks, and security lights at all hatchery facilities;
- Rapid response in the event of power and water loss or freezing is provided by a combination of staffing and automated alarm paging systems;
- Equipping hatchery facilities to ensure reliable power to provide water to rearing fish during power outages;

- Rearing juveniles at lower pond loading densities to minimize the risk of loss due to disease; and
- Ensuring staff are adequately trained in proper fish handling, rearing, and biological sampling techniques, and that all activities will be conducted in accordance with the WDFW Fish Health Manual (WDFW 1996) and/or Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) disease prevention and control standards.

NMFS finds operational measures proposed which will be included as additional terms and conditions in the permit will adequately protect ESA-listed UCR chinook salmon and UCR steelhead. The proposed measures are in accordance with standard scientific protocols for operating hatchery facilities (IHOT 1995). Further, staff implementing these programs will be sufficiently trained and will be qualified to exercise professional judgement should unforeseen circumstances arise.

4.2.3.2 Broodstock Collection

Broodstock collection typically involves a weir or barrier that forces migrating adults to enter a ladder and trap. This effectively blocks their upstream migration and the trapped steelhead are counted and either retained for use in the hatchery or released upstream of the collection facility to continue their migration and spawn naturally. Potential adverse effects to adults include delaying upstream migration, rejection of the weir or fishway structure resulting spawning downstream of the trap, falling back downstream after passing upstream of the collection facility, being injured or killed as adults attempt to jump the barrier, and inducing stress by handling. These impacts are due to the physical presence and operation of the trap, other potential impacts of broodstock collection including the numerical reduction of the donor population (mining), and selection effects.

Collection of steelhead for broodstock will occur at various dams, hatchery ladders, or using temporary weirs. Hook and line capture of broodstock may be used in some years if other methods are not successful in collecting steelhead. When in operation, trap facilities will be checked and emptied daily with adults to be used as broodstock transported to a hatchery facility for holding and spawning, and all other fish released upstream of the trap. Direct mortality from broodstock collection activities has been low (WDFW 1997). Hook and line collection of broodstock is the least preferred technique that would be employed when other collection options had been thoroughly considered. Handling stress of adult steelhead captured by hook and line will be minimized.

The proposed actions include the development of annual site-based broodstock collection protocols by the Hatchery Committee as described in the three HCPs. A representative from NMFS is on each of the HCP Hatchery Committees to ensure the collection protocols employed will not be detrimental to the persistence and recovery of ESA-listed species. The objectives and protocols may be adjusted in season to meet changes in the abundance and location of adult

returns, and minimizing impacts on non-target fish. The total broodstock collection will not exceed 208 steelhead in the Wenatchee basin and 389 for areas above Wells Dam.

Historically, the trapping of adult steelhead for broodstock in the Wenatchee River generally occurs from July to November at Dryden and Tumwater Dams. Both of these facilities may be operated for concurrent broodstock collections of non-ESA-listed species (summer chinook salmon, sockeye salmon, or coho salmon) consistent with ESA permit 1347 and section 7 consultation with BOR. Dryden Dam was specifically engineered to intercept less that 100% of the migrating adult salmonids. In years of very low run sizes broodstock collection of steelhead can be problematic. Therefore, hook and line collection of steelhead adults may be necessary in those years of low returns. Utilization of these trapping locations is for the purpose of developing a locally-adapted broodstock for the Wenatchee River basin. Historically, all steelhead releases into the Wenatchee River were offspring of steelhead collected at Wells Dam and Wells Hatchery. However, since 1996 steelhead broodstock for the Wenatchee basin have been collected from these facilities.

The WDFW and Colville Tribes will employ the following procedures to minimize potential adverse impacts on salmon and steelhead associated with broodstock collection activities:

- All species will be held for a minimal duration in the traps – less than 24 hours;
- Traps and holding areas will be locked or secured against tampering or vandalism;
- All species including steelhead in excess of broodstock goals will be released upstream immediately without harm;
- Steelhead transfers will be done using water-to-water techniques;
- Hook and line technique will be last collection option employed.

The removal of adults from the naturally spawning population has potential adverse impacts. These include numerical reduction of the natural population (mining) and selection effects. Selection is the intentional and unintentional collection of adults for broodstock based on one or more of the life history characteristics such as run timing, age, morphology and sex ratio, that do not fully represent the natural (or target) population. The effects of selection or selection effects can change the characteristics of the natural population as well as cause the hatchery-produced fish to diverge genetically or demographically from the naturally produced population.

The proposed supplementation program is designed to preserve and rebuild naturally producing steelhead populations in the UCR Region. Natural steelhead in the UCR ESU are not replacing themselves and extinction appears likely without the proposed program. Risks to the donor natural populations, including numerical reduction and selection effects, are therefore viewed by the permit applicants and NMFS as subordinate to the need to expeditiously implement the supplementation program that will prevent extinction of the ESU (BAMP 1998). To preserve the

remaining natural populations and to address the numerical reduction and selection effects the following measures will be implemented and included in the permit additional conditions:

- Broodstock removals will be limited to a maximum of 104 natural origin steelhead from the Wenatchee basin and 289 for areas above Wells Dam; and
- Removal of adult broodstock at traps for the enhancement programs shall be consider the composition of the run-at-large with respect to migration timing, age class, and morphology, collection decisions made to maximize the natural population recovery efforts.

NMFS finds that the proposed broodstock collection strategies and that the numerical collection limits will protect naturally produced ESA-listed UCR steelhead.

4.2.3.3 Genetic Introgression

Hatchery fish straying into UCR steelhead natural production areas can potentially lead to long-term deleterious effects on natural steelhead populations. The genetic risks to natural populations from hatchery propagation include loss of fitness, reduction in genetic variability within and between populations, genetic drift, selection and domestication (Hard *et al.* 1992; Cuenco *et al.* 1993; NRC 1996; and Waples 1996). Because of these risks, it is recommended that straying of hatchery fish be minimized to reduce the effects of genetic introgression on natural populations (Hard *et al.* 1994). Campton (1995) provides a discussion of what is known about the genetic effects of hatchery reared fish on natural populations and concludes that most of the observed or suspected effects are due to management decisions rather than biological factors intrinsic to hatcheries or hatchery fish.

It is likely that UCR steelhead have been adversely impacted by previous management actions concerning artificial propagation programs. Substantial genetic mixing of populations within this ESU has occurred from fish being stocked into non-local sub-basins as a result of the Grand Coulee Fish Maintenance Project and from the Wells Hatchery steelhead program. The proposed actions may continue to adversely affect natural steelhead in the future if the number of hatchery fish straying into natural steelhead production areas is in excess of the desired number and/or development of locally-adapted broodstock is not accomplished in the tributary basins.

Historically, steelhead broodstock have been held on pathogen free well water which is warmer than river water. This combined with historic selection of the earliest maturing component of the run has resulted in the acceleration of sexual maturation. Due to this developmental acceleration, hatchery fish spawn from January through March whereas natural fish spawn in April and May. During the previous few years hormone treatment of natural-origin steelhead broodstock and experiments with artificial light have been used in attempts to align the maturation schedules of both hatchery and natural origin steelhead. In addition, the eggs from the earliest spawning hatchery origin steelhead have been utilized in the Ringold Springs program. This action is intended to be one step toward correcting previous hatchery management actions that likely had

an adverse impact on the natural population. Radio telemetry data in 2001-2002 indicate that some of the steelhead released into the Columbia River from the Ringold Springs program migrate back to the UCR area. In order to limit this straying, the Ringold Springs program should be maintained at the 200,000 smolt release level until monitoring indicate that the fish are no longer straying upstream and posing an increased risk to the recovery efforts.

In the two HCP agreements with Chelan PUD there is a requirement that the hatcheries have the ability to hold Wenatchee steelhead broodstock on river water. This measure is one step toward creating the best environment for holding maturing adult UCR steelhead.

Additionally, the long term strategy for steelhead artificial propagation programs in the UCR includes limiting the percentage of hatchery reared steelhead on the spawning grounds following achievement of recovery goals. NMFS expects the resource managers to take steps to reduce the potential adverse impacts on the natural reproducing population such as altering release locations to modify adult return behavior and modifying external marking strategies of juveniles released to increase management options for removal of excess adult steelhead. NMFS at this time includes a long term target of no more than 20 percent of the spawners being of hatchery origin in the Wenatchee River and Methow River basins and no more than 50 percent in the Okanogan River basin once recovery goals are achieved (Figure 5 and Figure 6).

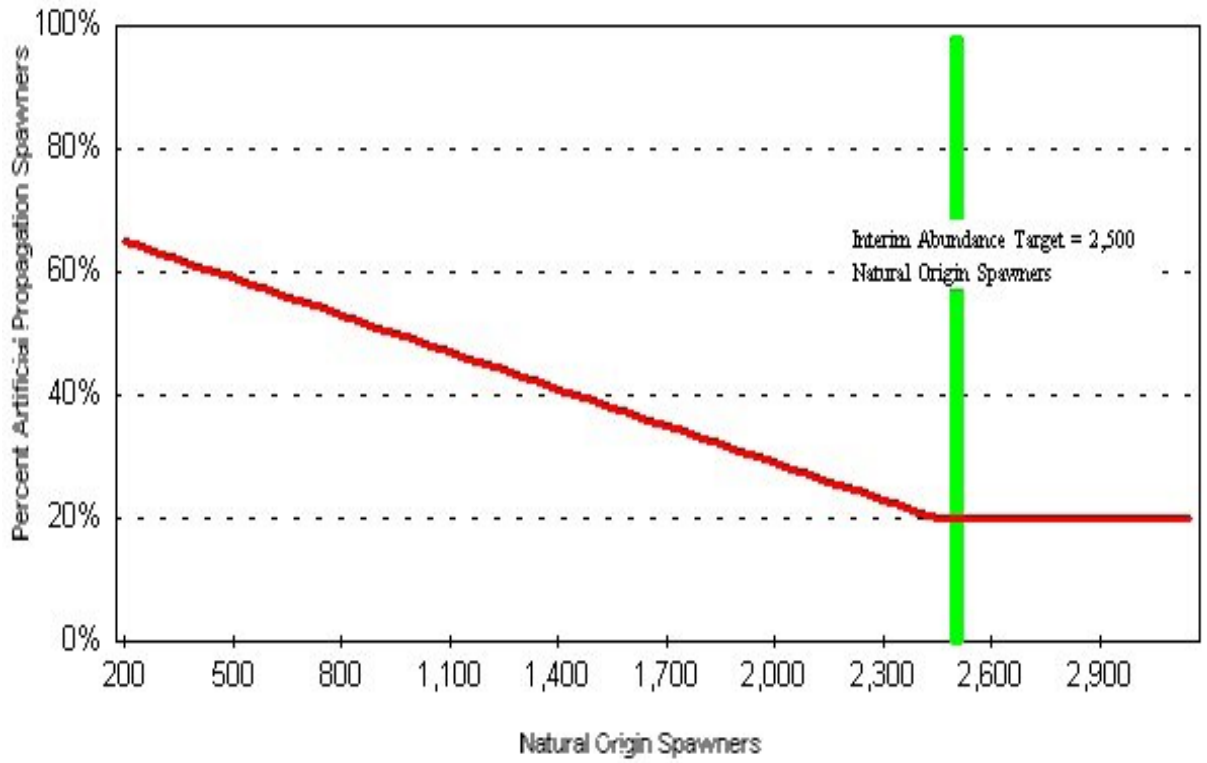

Figure 6. Wenatchee and Methow River Basin management objective for limiting artificially propagated steelhead on spawning grounds as natural origin steelhead population increases.

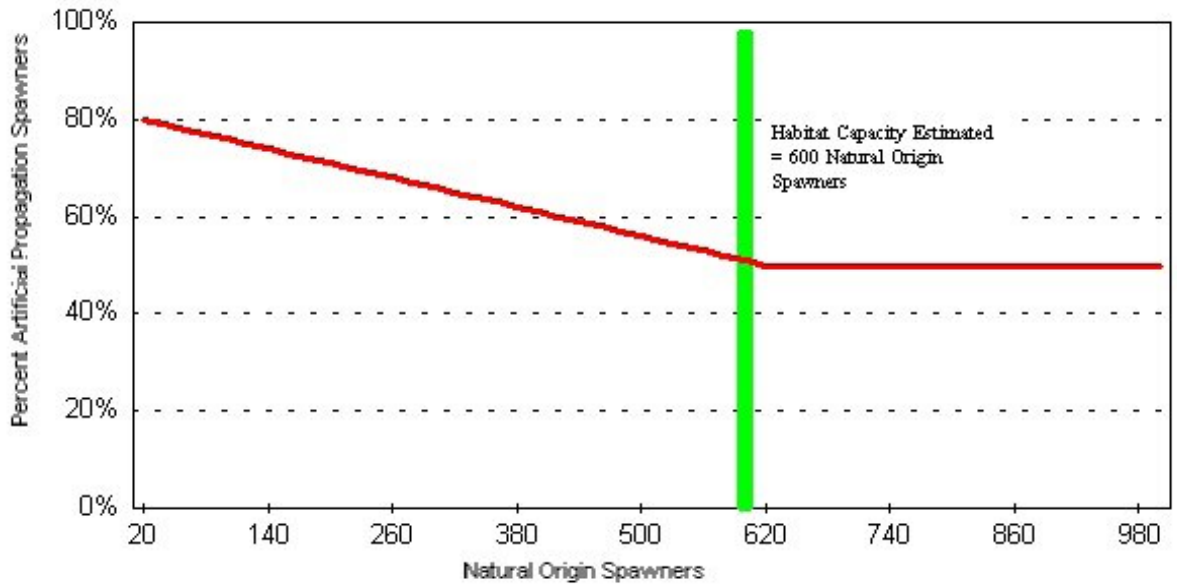

Figure 7. Okanogan Basin management objective for limiting artificially produced steelhead on spawning grounds as natural origin steelhead populations increase.

4.2.3.4 Density-Dependent Effects

Steelhead smolt releases may cause displacement of rearing natural steelhead juveniles from occupied stream areas, leading to abandonment of advantageous feeding areas or premature out-migration (Pearsons *et al*. 1994). The presence of large numbers of newly released steelhead may also alter natural fish behavior patterns, which may increase their vulnerability to predation (NMFS 1995).

The release of only volitionally migrating smolts into the upper tributary reaches will contribute to a decrease in density-dependent effects on natural fish, by limiting interactions between natural and hatchery fish. Releases of smolts coincident with managed releases of water (flow augmentation) will also help accelerate downstream migration of artificially propagated steelhead, further reducing spatial and temporal overlaps with listed fish and potential adverse behavioral effects. Release of juveniles that have an increased tendency to residualize into the lower tributary areas, when possible, will minimize the potential adverse impacts on the naturally produced populations.

4.2.3.5 Disease

Interactions between hatchery fish and listed fish in the natural environment may be a source of pathogen transmission. This impact is probably occurring in headwater spawning and/or rearing areas and throughout the entire migration corridor. Because the pathogens responsible for diseases are present in both hatchery and natural-origin populations, there is some uncertainty associated with determining the extent of disease transmission from hatchery fish (Williams and Amend 1976; Håstein and Lindstad 1991). However, hatchery populations are potential reservoirs of disease pathogens because of the high rearing densities and resultant stress. Under natural conditions, which usually involve rearing at low density, most pathogens are held in check. When an epizootic event occurs, it is often triggered by increased population density and unusual changes in the environment (Saunders 1991). Consequently, it may be possible that release of large numbers of smolts may be responsible for some loss of natural steelhead from disease.

Although hatchery populations can be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to natural fish (Steward and Bjornn 1990). Chapman et al. (1994) concluded that disease transmittal from hatchery to natural populations is likely not a major factor negatively affecting natural steelhead in the Columbia basin.

To address concerns of potential disease transmission from hatchery to natural fish, the Pacific Northwest Fish Health Protection Committee (PNFHPC) has established guidelines to ensure hatchery fish are released in good condition, thus minimizing impacts on natural fish (PNFHPC 1989). Also, the IHOT (1995) developed detailed hatchery practices and operations designed to prevent the introduction and/or spread of any fish diseases with the Columbia River basin. Hatchery facility operators in the UCR basin follow fish health protocols in accordance with PNFHPC and IHOT recommended guidelines.

The WDFW, USFWS, and Colville Tribes will implement both disease prevention and disease control techniques to maximize production of healthy fish. Spawned adults are evaluated for the presence of viral and bacterial pathogens following accepted standard procedures set forth by the Salmonid Disease Control Policy of the Fisheries Co-managers of Washing State (NWIFC and WDFW 1998 and the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989). NMFS finds that following these practices in the hatchery environment will adequately protect listed naturally produced UCR steelhead from impacts from the transmission of disease.

4.2.3.6 Competition

Direct competition for food and space between artificially propagated and naturally produced fish may occur in spawning and/or rearing areas, the migration corridor, and ocean habitat. These impacts are assumed to be greatest in the spawning and nursery areas and at points of highest fish density (release areas) and to diminish as hatchery smolts disperse (USFWS 1994). Competition

continues to occur at some unknown, but probably lower, level as smolts move downstream through the migration corridor. Release of large numbers of pre-smolts in a small area is believed to have greater potential for competitive effects because of the extended period of interaction between hatchery fish and listed species. Release of smolts that are physiologically ready to migrate is expected to minimize competitive interactions because they are more likely to quickly migrate out of the spawning and nursery areas.

When artificially propagated steelhead smolts are released into the UCR basin, a potential exists for inter-specific competition with naturally produced steelhead. These effects are likely to be greatest near the point of release and decrease as the smolts disperse and migrate seaward. Release of artificially propagated steelhead may adversely impact natural steelhead especially if hatchery fish are larger and food and space are limited. However, competition should be minimized because only smolts demonstrating migratory behavior and/or smolting characteristics will be released. In most years, releases will be scatter planted to reduce instantaneous densities of hatchery fish in natural production areas (WDFW 1997). Monitoring of residualization is provided for in Section 2.2.1.3 (Research, Monitoring, and Evaluation).

Competition for prime spawning habitat could occur in years of high survival to adult of both natural and artificially produced steelhead. As recovery plans are implemented, the number of natural origin steelhead should increase. The utilization of artificially propagated steelhead to supplement natural spawning should be reduced as natural populations rebound. NMFS has identified an approximate long-term management sliding scale to assist hatchery managers to make appropriate decisions concerning release strategies of artificially propagated steelhead smolts. As the number of natural origin spawners increases the number of hatchery reared smolts released high in tributary systems should decrease to reduce the potential for competition and genetic swamping of the natural population. Artificially propagated steelhead could then maintain recreational harvest opportunities particularly in lower tributary areas without posing substantial risk to the UCR steelhead ESU.

4.2.3.7 Predation

Predation by hatchery fish on natural-origin smolts is less likely to occur than predation on fry. The USFWS (1994) presented information indicating salmonid predators are generally thought to prey on fish approximately 1/3 or less their own length (see also Witty *et al.* (1995) citing Parkinson *et al.* (1989)). Consequently, predation by hatchery fish on listed salmon smolts in the migration corridor is believed to be low.

Large numbers of artificially propagated steelhead may attract predators (birds, fish, pinnipeds) and, consequently, contribute indirectly to predation of naturally produced fish. On the other hand, a mass of hatchery fish moving through an area may confuse or distract predators and may provide a beneficial effect to naturally produced fish. Both effects may be occurring to some extent. The presence of large numbers of hatchery fish may also alter the listed species' behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994).

Impacts from predation by hatchery-produced steelhead released into the UCR are not likely to be a substantial risk to ESA-listed naturally produced UCR steelhead because of their size at release and because they tend to migrate out of the basin quickly.

4.2.3.8 Residualism

Artificially propagated steelhead have the potential to residualize after release in the freshwater environment. The degree of residualism can vary greatly, but is thought to typically average between 5 and 10 percent of the number of fish released (USFWS 1994). Hatchery steelhead residuals can compete for food and space, prey upon, and/or transfer disease to other salmonids.

Volitional or scatter planted release strategies will be used to reduce the residualization of hatchery fish. In addition, acclimation sites are currently being researched and developed. These techniques help promote rapid downstream migration of released smolts and reduce interactions of hatchery and natural fish. The WDFW is proposing to release only juvenile steelhead with demonstrated readiness for seaward migration into the upper tributary areas where feasible. Smolt releases will also be timed with water budget releases from upstream dams to further accelerate rapid downstream movement (WDFW 1997). Investigations of the propensity and the causes of residualism of artificially propagated steelhead will be part of the research, monitoring, and evaluation program developed by the HCP Hatcheries Committees (see Section 4.2.4). When monitoring indicates that a hatchery population may have a tendency to residualize at a higher than expected rate, the group will be released into lower tributary areas or hatchery management changes will be implemented.

4.2.3.9 Migration Corridor/Ocean

Considerable speculation, but little scientific information, is available concerning the overall effects to listed salmon and steelhead from the combined number of hatchery fish in the Snake/Columbia River migration corridor. In a review of the literature, Steward and Bjornn (1990) indicated that some biologists consider density-dependent mortality during freshwater migration to be negligible; however, they also cited a steelhead study that indicated there may have been a density-dependent effect (Royal 1972, cited in Steward and Bjornn 1990). Hatchery and natural populations have similar ecological requirements and can potentially be competitors where critical resources are in short supply (LGMSC 1993).

A total of about 1.1 million steelhead smolts will be released into the Wenatchee, Methow and Okanogan River basins. The artificial propagation programs will be managed to produce only juvenile steelhead ready for seaward migration. Proposed maximum production for these facilities is the same as when the Columbia basin annual production ceiling was established in 1995 (NMFS 1995; WDFW 1997).

The Columbia basin annual production ceiling was based on the information on the effects of hatchery fish on listed fish in the migration corridor and ocean. Reviews of the potential effects

of hatchery fish in the migration corridor and ocean are provided by Hard (1994), NMFS (1995) and CBFWA (1996). Currently, the only way to address potential ecological interactions between hatchery and natural fish in the Columbia River basin is through the production ceiling (NMFS 1995), which limits the number of hatchery fish released into the basin. A total of about 72 million anadromous salmonid smolts are released from artificial propagation programs annually. The effects of the 1.1 million steelhead smolts cannot be separated from all other smolt releases, nor can the effects of the entire release be determined at this time. NMFS concludes that the production ceiling protects ESA listed species and finds that based on the best available information of adverse impacts in the migration corridor and ocean that the proposed programs have only minor transitory effects.

4.2.4 Research, Monitoring, and Evaluation

Research, monitoring, and evaluation are a critical component of the three HCP agreements. The adaptive management strategy relies on three hatchery committees (one for each HCP agreement) to provide oversight and recommendations for the artificial propagation programs specified in the HCPs. The enhancement programs will be monitored and evaluated within the hatchery environment and in the natural environment, and will involve both adult and juvenile UCR steelhead components.

4.2.4.1 Hatchery Environment Monitoring

Monitoring activities that occur within the hatchery environment will include biological sampling of both adult and juveniles steelhead. Sampling will be conducted in a manner to extract as much information from as small a sample size as possible to meet the research or investigative needs. No impact to the naturally produced component of the species would occur as a result of the within-hatchery facility research and monitoring activities.

4.2.4.1.1 Juvenile Monitoring

Juvenile monitoring will include routine growth and health sampling on about a monthly basis. This activity will likely result in handling stress, but is not expected to alter the long-term survival of the population. Occasional lethal sampling will occur for health monitoring and to collect tissue samples. This type of sampling will be conducted in a manner to maximize the information collected from each individual killed. For example, juveniles killed for organosomatic index health monitoring, and tissue samples can be used for DNA analysis, thus only one sample group would be collected for both activities. NMFS finds that such sampling provides a net benefit to the ESA-listed artificially propagated population.

4.2.4.1.2 Adult Monitoring

Adult sampling will be coordinated with spawning activities where fish are humanly killed as part of the spawning process. Morphometric samples, sex, mark, tag data, and biological samples such as scales, kidney, spleen and other tissues may be collected. The sampling of adult steelhead after spawning will not increase the level of take or adverse impacts on the species because the steelhead are already dead.

4.2.4.2 Natural Environment Monitoring

The enhancement program will also be monitored outside of the hatchery environment. The monitoring and evaluation program will help identify problems or deviations from the criteria established to measure the expected performance of the supplementation program. The monitoring and evaluation programs will also provide invaluable data on the use of supplementation to conserve and recover ESA-listed salmon species. The proposed action includes the intent to modify the production implementation protocols based on input from these research, monitoring, and evaluation activities.

4.2.4.2.1 Juvenile Monitoring

Monitoring of artificially propagated juvenile steelhead after release will be done using a variety of techniques depending on the investigative objective. Extent and impact of residualizism would be assessed using standard angling and non-lethal sampling techniques and migration rate and tributary productivity would be monitored using juvenile fish traps.

The capture and handling process is likely to cause some stress on ESA-listed fish. Typically, fish recovery rapidly from handling procedures. The primary factors that contribute to stress and mortality from handling are excessive doses of anesthetic, differences in water temperature, dissolved oxygen conditions, the amount of time that fish are held out of water, and physical trauma. Stress on salmonids increases rapidly from handling of the water temperature exceeds 18°C (64.4°F) or dissolved oxygen is below saturation. Also, stress can occur if there are more than a few degrees difference in water temperature between the stream/river and the holding tank. The potential for unexpected injuries or mortalities to ESA-listed fish will be mitigated in a number of ways. Wet hands and keeping fish submerged while measuring will minimize scale and slime removal. Study protocols would include only handling fish during appropriate water temperatures to avoid adding any additional stress and ensuring revival prior to release. The use of sanctuary nets when transferring fish to holding containers will avoid potential injuries. Appropriate anesthetics will be used to calm fish subjected to collection of biological data, captured fish will be allowed to fully recover before being released back into the stream and will be released only in slow water areas. Tagging, such as PIT tagging, of natural origin UCR steelhead juveniles would be used to determine trap efficiency and to assess juvenile seaward migration rate and survival to adult would be determined based on tag detections at dam or recoveries on spawning grounds or in broodstock. The information gained is expected to be very

valuable in increasing our understanding to UCR steelhead populations and life strategies. NMFS finds the measures above to minimize the impacts of the proposed activities adequate to protect the UCR steelhead ESU.

As discussed above in the effects on UCR spring chinook salmon, the WDFW juvenile fish traps are generally operated to achieve a sample efficiency of four to 20 percent of the total run, depending on the river size and the mortality impact would be expected to be less than two percent on target species. Using the largest of the estimates of UCR basin natural production capacity for UCR steelhead of 276,048 (Ford *et al.* 2001) and assuming trap efficiency of 20 percent and mortality of two percent equals an impact of 1,104 smolts. Converting this to adult equivalents (three percent survival smolt-to-adult, Ford *et al.* 2001) results in a maximum loss of up to 33 adult UCR steelhead. Considering that juvenile fish traps will likely not be operated in all tributary basins and will not all achieve an efficiency of 20 percent (for example the lower Wenatchee River trap has previously achieved only about a two percent efficiency), the numeric impact will likely be much less. Based on the highest adult capacity estimate of 8,281 (Ford *et al.* 2001), or the interim abundance target of 5,000 (Lohn 2002), the loss of 33 adult steelhead is not likely to substantially impact the ESU as whole. Again, it is likely mortality from juvenile fish trapping would be much less than this estimate.

4.2.4.2.2 Adult Monitoring

Monitoring of artificially propagated adult steelhead on the spawning grounds will be conducted by air, foot, or float surveys is expected to result in minimal take of UCR steelhead in the form of harassment and collection of tissues from dead steelhead. Potential research or monitoring activities also includes in-water observation of steelhead (i.e., snorkeling). Direct observation is the least disruptive and simplest method of determining presences/absence of the species and can be used to estimate the relative abundance. During some activities redds may be visually inspected, but no redds would be walked on. Potentially, UCR steelhead could experience take in the form of harassment as defined above. However, most activities would not disrupt or injure UCR steelhead. These primarily observational activities will not result in additional mortality of UCR steelhead because carcasses are already dead. The proposed observation, collection of biological data, and tissue samples from carcasses of ESA-listed fish will benefit the species as a whole because of the information gained through these activities will be used in the future to protect, recover, and manage UCR and other steelhead ESUs.

4.3 Cumulative Effects

Cumulative effects are defined in 50 CFR §402.02 as "those effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area considered in this biological opinion." Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities, are not considered within the category of cumulative effects for ESA purposes because they require separate consultations pursuant to Section 7 of the ESA after which they are considered part of the environmental

baseline. Future State, tribal, local, or private actions within the action area are described for NEPA purposes in the EIS (NMFS 2003) regarding the implementation of the three HCP agreements. NMFS evaluated these actions to determine whether or not they would meet the requirements of its implementing regulations. Those actions which are most notable include Washington State TMDL (total maximum daily load) development and implementation, Washington State legislation to enhance salmon recovery through tributary enhancement programs, and recent human population trends in the action area. However, after considerable review, NMFS has determined that these actions cannot be deemed reasonably likely to occur based on its ESA implementing regulations.

The Endangered Species Consultation Handbook describes this standard as follows:

> "Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."

There are, of course, numerous non-Federal activities that have occurred in the action area in the past, which have contributed to both the adverse and positive effects of the environmental baseline. This step of the analysis for application of the ESA Section 7(a)(2) standards requires the consideration of what of those past activities are "reasonably certain to occur" in the future within the action area.

First of all, any of these actions that involve Federal approval, funding, or other involvement are not considered "cumulative effects" for this analysis (see ESA definition, above). This Federal involvement will trigger ESA Section 7(a)(2) consultation in the future. Once the consultation on those actions is completed the effects may be considered part of the environmental baseline, consistent with the ESA regulatory definition of "effects of the action" (50 CFR §402.02). Thus, for example, state efforts to improve water quality in compliance with the Federal Clean Water Act would not be considered because of the involvement of the EPA, until separate ESA consultations are completed. Others examples include irrigation water withdrawals involving the

USFS (right-of-way permits for irrigation canals) or agricultural practices that receive Federal funding through the U.S. Department of Agriculture.

Next, actions that do not involve Federal activities must meet the "reasonably certain to occur" test for NMFS to consider their effects in this Opinion. Recognizing that this is a narrower standard than used for NEPA purposes, not all of the actions identified in the EA may be considered as "cumulative effects" for this ESA Section 7(a)(2) consultation. In reviewing the

actions identified in cumulative effects analysis of the EA, after eliminating from consideration those with Federal involvement, NMFS finds that currently few, if any, of the future adverse or beneficial State, tribal or private actions qualify for consideration in this analysis as "cumulative effects."

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NMFS concludes that most of the factors for the decline of these species are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon, against which the effects of this action are considered, are likely to be improved, although to an unknown or possibly minor extent, over those reflected by the historical trends under the environmental baseline.

4.4 Integration and Synthesis

The proposed UCR steelhead artificial propagation programs pose minimal risk to the UCR spring chinook salmon ESU. Operation of the hatchery facilities in which UCR steelhead are reared is not likely to substantially affect the water quality characteristics or water quantity, because of minimization measures in place and NPDES permit requirements and water right restrictions. Adult UCR spring chinook salmon and UCR steelhead return and spawn at different times of the year and therefore UCR spring chinook salmon adults are not expected to be affected by returning adult artificially propagated UCR steelhead. Juvenile UCR spring chinook salmon could be minimally impacted by the release of artificially propagated UCR steelhead smolts. The proposed actions include measures to minimize impacts which include releasing only migration ready steelhead smolts. Capture, handling, and release of UCR spring chinook juveniles could occur during some monitoring and evaluation activities. The mortality impacts to the ESU would be small in comparison to the total UCR spring chinook smolt production capacity of the UCR basin. Furthermore, juvenile fish traps used to monitor UCR steelhead are likely to be used to monitor UCR spring chinook salmon as authorized in permit 1203.

The proposed actions of the enhancement programs involve the direct taking of up to 581 UCR steelhead, of which only up to 216 would be natural origin UCR steelhead. The collection of five percent of the average UCR steelhead run for the production of up to 889,000 smolts released in the UCR basin and 180,000 smolts released from Ringold Springs Rearing Facility is intended to facilitate recovery of the ESU by enhancing natural reproduction of UCR steelhead in the Wenatchee, Methow and Okanogan basins.

The permit applicants identified specific artificial propagation program impact minimization measures which NMFS further defines through section 10 permit terms and conditions, which together provide substantial protection to the UCR steelhead ESU. The monitoring and evaluation, and research projects will provide more information on the reproductive success of artificially propagated steelhead and program implementation changes to ensure the programs

achieve the enhancement objective. Juvenile monitoring could result in a maximum, but likely substantially less than, a lethal take of two percent of the UCR steelhead smolts. This translates into a numeric reduction of about 33 adult steelhead for the entire ESU. Annual reporting requirements for each permit holder provides NMFS with a mechanism to ensure that the assumptions of the analysis and the impact limits are not violated.

NMFS must weigh the potential benefits with the potential adverse effects when deciding whether the contemplated actions will appreciably reduce the likelihood of the UCR spring chinook ans steelhead survival and recovery - the critical determination in issuing any biological opinion.

5. CONCLUSION

NMFS has determined, after reviewing the current status of UCR steelhead, the environmental baseline for the action area, the effects of the proposed section 10(a)(1)(A) actions, and the cumulative effects, that the issuance of the multi-year section 10(a)(1)(A) permits to the WDFW, the Chelan PUD, and the Douglas PUD (permit 1395), the USFWS (permit 1396), and the Colville Tribes (permit 1412) for an annual take of endangered UCR steelhead for scientific research and enhancement of UCR steelhead is not likely to jeopardize the continued existence of UCR steelhead and UCR spring chinook salmon. Furthermore, the supplementation programs covered by the permits are expected to provide a survival benefit to UCR steelhead by increasing the natural production of Wenatchee, Methow and Okanogan basins.

6. INCIDENTAL TAKE STATEMENT

Section 9 and rules promulgated under subsection 4(d) of the ESA prohibit the take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is defined as "an act that may include significant habitat modification or degradation where it actually kills or injures fish by impairing breeding, spawning, rearing, migration, feeding or sheltering." Harass is defined as " actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is take of listed species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this ITS. [50 CFR §402.14(I)(3)]

An ITS specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the effect of incidental

take and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

6.1 Amount or Extent of Take Anticipated

The measures described in this section are non-discretionary and must be included in the ITS issued by NMFS. NMFS' proposed action of issuing a section 10(a)(1)(A) permit is designed to minimize incidental take of listed species. The proposed UCR steelhead artificial propagation programs are reasonably certain to result in incidental take of UCR spring chinook salmon because juvenile UCR spring chinook salmon are known to occur in the action area.

Adult UCR spring chinook salmon are not expected to be impacted during any of the activities associated with the proposed programs because they are generally not in the action area at the same time as adult steelhead, nor are they present during the spring months when juvenile steelhead would be released from hatchery facilities.

No incidental takes of ESA-listed species are expected to occur as a result of within-hatchery monitoring and evaluation associated with the proposed programs. Incidental takes of listed species associated with monitoring and evaluation outside of the hatchery environment may occur depending on the monitoring activity.

Visual Observation techniques employed in the natural environment such as redd counts and snorkeling do not involve collection or physical contact with UCR spring chinook salmon or other species. These activities may result in temporary displacement of juvenile UCR spring chinook salmon from local habitats for brief periods of time. The impacts of this type of activities are currently unquantifiable but are expected to be small.

Monitoring of juvenile steelhead released from hatchery facilities or that are progeny of hatchery origin steelhead that spawned in the natural environment using techniques such as juvenile fish traps may result in the capture, handling, and release of juvenile UCR spring chinook salmon. It is expected that such monitoring activities would be conducted to minimize potential adverse impacts on UCR spring chinook salmon and likely included spring chinook salmon monitoring as a study objective. If a monitoring activity such as juvenile fish trapping does not included collection of UCR spring chinook salmon as an objective authorized under a separate ESA consultation the mortality impact on UCR spring chinook salmon juveniles should not exceed one percent of the UCR spring chinook salmon encountered in the trap.

6.2 Effects of the Take

In the accompanying biological opinion, NMFS determined that the level of anticipated take described above is not likely to result in jeopardy to the listed species.

6.3 Reasonable and Prudent Measures

Reasonable and Prudent Measures (RPMs) are non-discretionary measures to minimize take, that may or may not already be part of the description of the proposed action. They must be implemented as binding conditions for the exemption in section 7(o)(2) to apply. NMFS has the continuing duty to regulate the activities covered by this ITS. If NMFS fails to require the applicants to adhere to the terms and conditions of this ITS through enforceable terms that are added to the permits or grant documents, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the WDFW, the Chelan PUD, and the Douglas PUD, the USFWS, and the Colville Tribes must report the progress of their actions and the respective impacts on the species to NMFS as specified in this ITS. NMFS believes that activities carried out in a manner consistent with these reasonable and prudent measures, except those otherwise identified, will not necessitate further site-specific consultation. Activities which do not comply with al relevant reasonable and prudent measures will require further consultation.

In order to issue the multi-year section 10(a)(1)(A) permits for the proposed actions, NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take of ESA-listed species associated with the UCR steelhead artificial propagation programs and the monitoring and evaluation efforts:

1. The applicants should minimize the incidental take of ESA-listed species associated with the artificial propagation programs by using observational techniques whenever possible to meet monitoring and evaluation objectives.

2. The applicants should have as a long-term management target no more than 20 percent of the spawners being of hatchery origin in the Wenatchee and Methow basins and no more than 50 percent in the Okanogan basin once recovery goals are achieved.

6.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the program operating entities must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are not discretionary and are valid for the duration of the respective permits:

1. The WDFW, the USFWS and the Colville Tribes shall monitor the incidental take of ESA-listed species, including endangered, naturally produced, UCR spring chinook salmon and UCR steelhead, as a result of juvenile fish releases from the artificial propagation program. As part of the monitoring effort, the program operating entities shall attempt to determine the extent to which artificially propagated juvenile steelhead released from the program interact positively or negatively with the UCR spring chinook salmon's natural production in the region.

2. Annual reports shall be provided to the Salmon Recovery Division, NMFS, documenting the incidental take of ESA-listed species associated with the endangered UCR steelhead artificial propagation programs by January 31st of each year the permit is in effect.

7. REINITIATION OF CONSULTATION

This concludes formal consultation of the actions outlined in the applications for section 10(a)(1)(A) permits. As provided in 50 CFR §402.16, reinitiation of formal consultation is required if: (1) the amount or extent of annual take, either intentional take or incidental take, is exceeded or is expected to be exceeded; (2) new information reveals effects of the agency action that may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect to listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the operation that resulted in exceeding take must cease, and consultation must be reinitiated.

8. MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

8.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NMFS must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));
- Federal agencies must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH:

Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR §600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR §600.810).

Consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

8.2 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook; and coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

8.3 Proposed Action and Action Area

For this EFH consultation, the proposed actions and action area are as described in this Opinion above. The actions are the issuance of scientific research/enhancement permits pursuant to section 10(a)(1)(A) of the ESA for the implementation of artificial propagation programs rearing ESA-listed UCR steelhead. The proposed action area is the UCR basin, including all river reaches accessible to salmon in the Wenatchee, Methow, and Okanogan River basins in Washington and is part of the EFH for chinook salmon and coho salmon. The proposed actions may also affect EFH in the lower Columbia River and near ocean areas; however, NMFS does not believe it is possible to meaningfully measure, detect or evaluate the effects of those actions in these areas, and, consequently, NMFS will not include EFH subject to these effects in the

action area. Assessment of the impacts on these species' EFH from the above proposed action is based on this information.

8.4 Effects of the Proposed Action

As described in detail above of this Opinion, the proposed action may result in adverse effects to EFH. These adverse effects are:

- Water quality impacts from water withdrawal and hatchery effluent.
- Adult passage impediments due operation of weirs used for broodstock collection.
- Predation of natural juvenile salmonids by artificially propagated fish.
- Competition for resources between artificially propagated and natural salmonids.
- Exchange of disease pathogens between artificially propagated and natural salmonids.

8.5 Conclusion

NMFS concludes that the proposed action would adversely affect designated EFH for chinook salmon.

8.6 EFH Conservation Recommendation

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. NMFS understands that the conservation measures described in the Permit Applications, this Opinion are applicable to designated salmon EFH and address the adverse effects. Therefore, NMFS recommends that those same Conservation Measures and Terms and Conditions be adopted as the EFH Conservation Recommendations for this consultation.

8.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR §600.920(j), Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

8.8 Consultation Renewal

The NMFS must reinitiate EFH consultation if the proposed actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR §600.920(k)).

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Biological Opinions Supporting Incidental Take Permits

Environmental Assessment for Permit No. 1395 (2003)

COVER SHEET
MAY 2003

Title of Environmental Review:		Environmental Assessment of a National Marine Fisheries Service Action To Issue Three Research and Enhancement Permits Under Section 10(a)(1)(A) of the Endangered Species Act for Artificial Propagation of ESA-listed Upper Columbia River Steelhead
Evolutionarily Significant Units Affected:		Upper Columbia River Steelhead and Upper Columbia River Spring Chinook Salmon
Responsible Agencies and Officials:		D. Robert Lohn Regional Administrator NOAA - National Marine Fisheries Service 7600 Sand Point Way NE Seattle, WA 98115-0070 (206) 526-6150
Contacts:		Kristine Petersen Salmon Recovery Division NOAA - National Marine Fisheries Service 525 NE Oregon St., Suite 510 Portland, OR 97232-2737 (503) 230-5409
Legal Mandate:		Endangered Species Act of 1973, as amended and implemented 50 CRF Part 223
Location of Proposed Activities:		Middle and Upper Columbia River Basin in the State of Washington
Action Considered:	1.	Issuance of Permit 1395 jointly to the Washington Department of Fish and Wildlife (WDFW), Public Utility District No. 1 of Chelan County (Chelan PUD), and Public Utility District No. 1 of Douglas County (Douglas PUD)
	2.	Issuance of Permit 1396 to the U.S. Fish and Wildlife Service (USFWS)
	3.	Issuance of Permit 1412 to the Confederated Tribes of the Colville Reservation (Colville Tribes)
Related Documents:		National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Consultation Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation on Artificial Propagation Research and Enhancement Programs of ESA-listed Upper Columbia River Evolutionarily Significant Unit (ESU) Steelhead Number F/NWR/2002/000981

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1 PURPOSE, SCOPE, AND AREA OF THE PROPOSED ACTION

1.1 Introduction

The U.S. Department of Commerce, NOAA' National Marine Fisheries Service (NMFS), is evaluating the decision to authorize, in accordance with the Endangered Species Act (ESA), section 10(a)(1)(A) direct take research/enhancement permits, numbers 1395, 1396, and 1412. These three permits would authorize take of listed salmon and steelhead during operation of steelhead artificial propagation programs and associated research activities in the upper Columbia River by the Washington Department of Fish and Wildlife (WDFW), the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD), the U.S. Fish and Wildlife Service (USFWS), and the Confederated Tribes of the Colville Reservation (Colville Tribes) (permit applicants). Of these applicants, the WDFW, the USFWS, the Colville Tribes, in additional to NMFS and the Tribes and Bands of the Yakima Nation, are considered co-managers of the fishery resources in the upper Columbia River Basin.

The Upper Columbia River steelhead (*Oncorhynchus mykiss*) Evolutionarily Significant Unit (ESU) was listed as endangered on August 18, 1997 (62 FR 43937) (Figure 1). Potential environmental effects come as a result of adult monitoring and management of artificially propagated returning adult Upper Columbia River steelhead, the artificial propagation activities, and associated research requested by the permit applicants. These activities include random sampling of returning adult Upper Columbia River steelhead, collecting adult ESA-listed Upper Columbia River steelhead, spawning adults in a hatchery environment, rearing juveniles to the smolt stage, releasing the smolts in the respective basin of origin, conducting propagation program specific scientific research and monitoring activities, and managing the returning adult hatchery steelhead. Initial program implementation is based on continued use, and modification as necessary, of existing hatchery facilities built in the middle and upper Columbia River Region for steelhead production. Progeny derived from the Upper Columbia River steelhead ESU, even when artificially propagated, remain listed under the ESA (April 5, 1993, 58 FR 17573). Permit issuance actions are expected to directly affect only the Upper Columbia River steelhead ESU. However, endangered Upper Columbia River spring chinook salmon (*O. tshawytscha*) and threatened bull trout (*Salvelinus confluentus*) may be indirectly taken during the proposed activities.

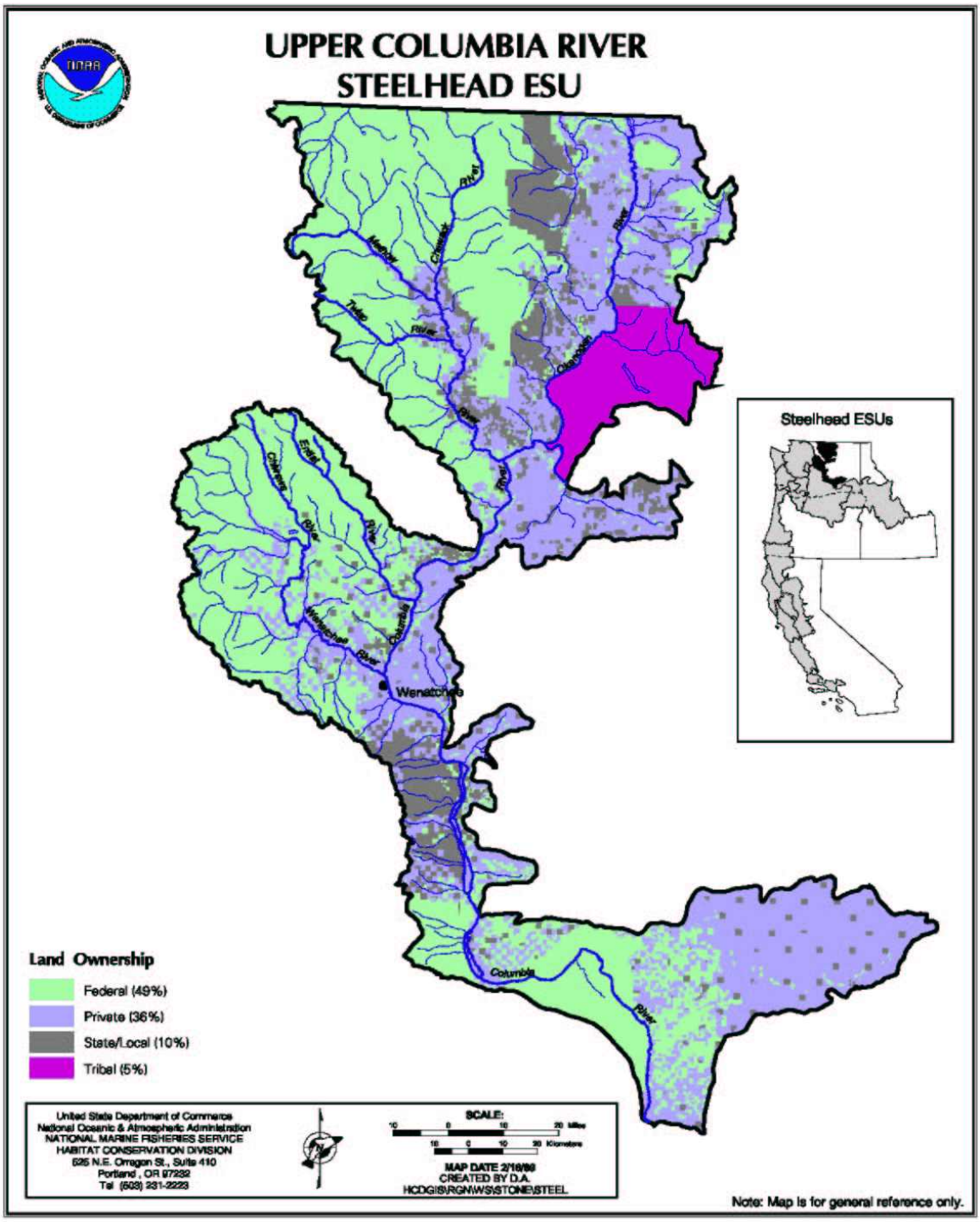

Figure 1. Upper Columbia River Steelhead ESU.

1.2 Background

On June 12, 2002, NMFS received an application for an ESA section 10 permit from the WDFW (WDFW 2002) requesting a multi-year authorization for an annual take of Upper Columbia River steelhead and Upper Columbia River spring chinook salmon associated with proposed steelhead artificial propagation programs intended to enhance the natural production of ESA-listed Upper Columbia River steelhead.

In April 2002, negotiations on the *Anadromous Fish Agreement and Habitat Conservation Plan for Rocky Reach Hydroelectric Project* (Federal Energy Regulatory Commission (FERC) License Number 2145), the *Anadromous Fish Agreement and Habitat Conservation Plan for Rock Island Hydroelectric Project* (FERC License Number 943), and the *Anadromous Fish Agreement and Habitat Conservation Plan for Wells Hydroelectric Project* (FERC License Number 2149), hereafter referred to as the three HCPs, were completed relating to the re-licensing of Wells Dam with Douglas PUD (DPUD 2002), and Rocky Reach Dam, and Rock Island Dam with Chelan PUD (CPUD 2002a; 2002b). These long-term agreements between NMFS, the PUDs, the WDFW, the USFWS, the Colville Tribes, and other stake holders that elect to sign the agreements, provide Chelan and Douglas PUDs with hydropower project operational certainty into the future in exchange for mitigation in the form of a tributary fund for habitat improvement projects and artificial propagation programs to replace unavoidable losses to natural fish production. The artificial propagation component of each HCP specifies the number and species to be reared. Each of the three HCP agreements specifically require artificial propagation of steelhead as a mitigation action. The HCP agreements stipulate that the Chelan and Douglas PUDs would be issued the ESA permits necessary to implement the artificial propagation programs.

In addition, on June 11, 2002, NMFS received a similar application for an ESA section 10 permit from the USFWS, requesting a multi-year authorization for an annual take of Upper Columbia River steelhead and Upper Columbia River spring chinook salmon associated with a steelhead artificial propagation program in the Methow River Basin (USFWS 2002). This program has long-term stable funding from the Bureau of Reclamation (BOR) with production goals set by the Columbia River Fisheries Management Plan under the *U.S. v. Oregon* decision of 1969. The program would be operated in a manner consistent with enhancing the natural steelhead population.

Lastly, on October 23, 2002, NMFS received an application for a section 10 permit from the Colville Tribes, requesting a multi-year authorization for an annual take of Upper Columbia River steelhead and Upper Columbia River spring chinook salmon associated with a steelhead artificial propagation program in the Okanogan River Basin (CCT 2002). Funding for this program has been allocated through the Pacific Salmon Coastal Recovery Fund administered by NMFS, and is consistent with BOR steelhead recovery efforts ongoing in the Okanogan Basin. The program would be operated in a manner consistent with enhancing the natural steelhead population.

1.3 Purpose of and Need for the Proposed Action

NMFS proposes to issue three ESA section 10(a)(1)(A) permits for annual takes of Upper Columbia River spring chinook salmon and Upper Columbia River steelhead: permit 1395 would be issued jointly to the WDFW, Chelan PUD, and Douglas PUD to carry out activities associated with the steelhead artificial propagation programs funded by Chelan and Douglas PUDs and operated by WDFW, permit 1396 would be issued to the USFWS to carry out activities associated with a steelhead artificial propagation program in the Methow River, and permit 1412 would be issued to the Colville Tribes to carry out activities associated with a steelhead artificial propagation program in Omak Creek, a tributary of the Okanogan River.
The purpose of and need for the issuance of these section 10 permits is to ensure the continuation of the programs and their implementation as well as compliance with the ESA. Actions that may affect listed species are reviewed by NMFS through section 7 or section 10 of the ESA. Under section 10 of the ESA, non-federal entities may apply for permits from NMFS to take ESA-listed species under the jurisdiction of NMFS if such taking is for scientific purposes or to enhance the propagation or survival of the affected species.

Issuance of the three permits is needed to fulfill NMFS' obligations outlined in the three HCPs, which include the requirement to use artificial propagation techniques to replace unavoidable steelhead losses associated with operation of Wells Dam, Rocky Reach Dam, and Rock Island Dam, and meet Federal court mandates. Permit conditions would help ensure that the proposed programs are operated to protect and enhance the endangered Upper Columbia River steelhead ESU and remain compliant with the ESA.

1.4 Scope of Action

The action considered here includes only issuance of the three section 10 permits to implement the artificial propagation research/enhancement programs as requested and their affect on the environment within the action area. Other activities in the Columbia River Basin, and other harvest activities outside the Columbia River Basin, might have impacts on the abundance and survival of the ESA-listed species. NMFS does not expect that the proposed action would measurably impact listed salmonid populations outside of the action area because artificially propagated steelhead associated with the proposed programs would be in the migration corridor for less than a month, and would entail a small fraction of the total number of artificially propagated anadromous fish released in the Columbia River Basin. In addition, several hatchery reform measures have been implemented to limit interactions between natural and hatchery salmonids while in the migration corridor (NMFS 1999).

NMFS has proposed and evaluated the action of issuing incidental take statements for the three HCPs as its preferred alternative in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002).

1.5 Action Area

The action area of this EA is within the upper Columbia River Basin and includes areas primarily in Chelan, Douglas, and Okanogan Counties. More specifically, the action area includes the Columbia River at and above Priest Rapids Dam, the Wenatchee River, Methow River, and Okanogan River Basins and artificial propagation facilities along the mainstem Columbia River. Figure 2 identifies the primary hatchery facilities, trap locations, and hydropower projects pertinent to this EA.

The action area in the Wenatchee River Basin includes the Chiwawa River, Nason Creek, Dryden and Tumwater Dams, and all tributaries accessible to anadromous steelhead. The watershed encompasses approximately 1,327 square miles, with 230 miles of major streams and rivers and enters the Columbia River at river mile (RM) 468.

The action area in the Methow River Basin includes the Methow River, Twisp River, Chewuch River, the Methow Fish Hatchery, the Winthrop National Fish Hatchery, and various smaller tributaries that are accessible to steelhead. The Methow River watershed encompasses about 1,800 square miles and enters the Columbia River at RM 524. The Methow Fish Hatchery is located at approximately RM 44 on the Methow River, and the Winthrop National Fish Hatchery is located at about RM 43.5 on the Methow River.

The action area in the Okanogan River Basin includes the Okanogan River, Similkameen River, Omak Creek, and Salmon Creek, and other small tributaries that are accessible to steelhead. The Okanogan River watershed encompasses about 8,900 square miles and is located in north central Washington with its source on the eastern slopes of the Cascade Mountains in Canada, and flows southward to enter the Columbia River at RM 535.

The Wells, Rocky Reach, and Rock Island hydropower projects are part of an 11-dam system on the mainstem Columbia River within the continental United States. Most of the projects on the mainstem Columbia River are federally operated, although local PUDs operate five of the projects in the Mid-Columbia River segment. In addition to the three projects operated by the Chelan and Douglas County PUDs, the PUD No. 2 of Grant County operates the Priest Rapids and Wanapum Dams (Priest Rapids Project).

The Douglas County PUD operates the Wells Project located at RM 516 on the Columbia River, north of the City of Wenatchee. Wells began commercial operations on August 22, 1967, and is operated under a license issued by FERC, which expires in the year 2012.

Chelan County PUD operates the Rocky Reach and Rock Island hydroelectric projects. Rocky Reach Dam is located about 8 miles upstream from the City of Wenatchee, at RM 475. The Federal Power Commission issued the original operating license for Rocky Reach on July 11, 1957. The license expires in 2006. Rock Island, which was the first hydroelectric project to span the Columbia River, is located about 13 miles downstream from the City of Wenatchee at Rock Island began operating in 1933, and its operating license expires in the year 2028.

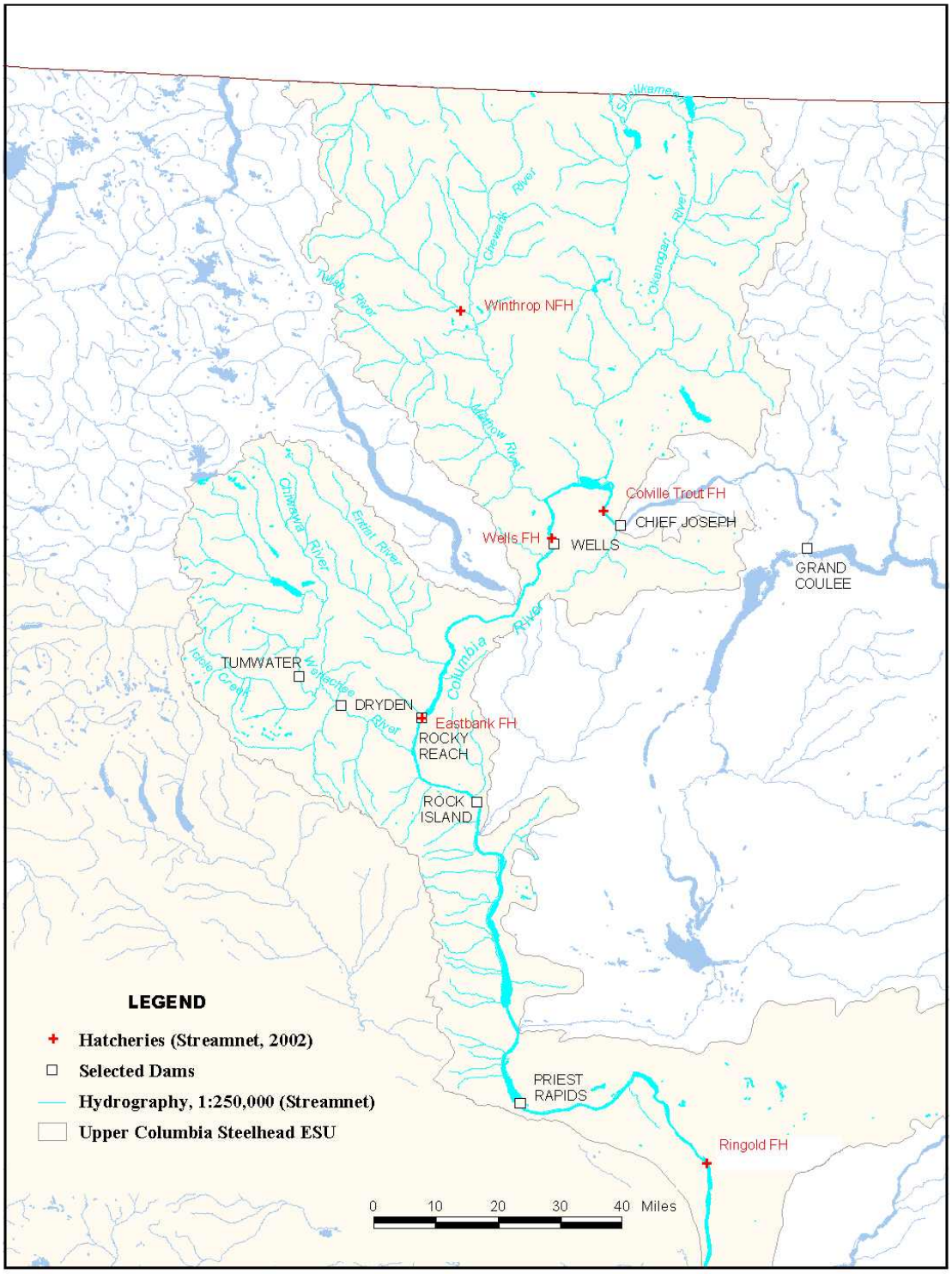

Figure 2. Location of dams and hatchery facilities that rear ESA-listed steelhead in the upper Columbia River Basin.

The project boundaries include the forebay (from the dam to approximately 500 feet upstream), tailrace (from the dam to approximately 1,000 feet downstream), and reservoir associated with each dam. The Wells reservoir extends approximately 30 miles upstream of the dam to the Chief Joseph Dam tailrace, the Rocky Reach reservoir extends approximately 41 miles upstream of the dam to the Wells tailrace, and the Rock Island reservoir extends approximately 20 miles upstream of the dam to the Rocky Reach tailrace. Considering all components of the three projects, the entire project area extends from the tailrace of the Rock Island Dam upstream to the tailrace of Chief Joseph Dam (approximately 92 miles).

Interactions between fish released from the proposed artificial propagation programs and other anadromous species in the Columbia River downstream of the proposed action area were considered by NMFS. Determining the nature of these transient interactions that occur during migration are difficult due to the biological attributes of salmon and steelhead, the dimensions and variability in the Columbia River system, and the cycles in the ocean environment. Based on the large scale of the Columbia River, the level of proposed artificial propagation relative to the artificial propagation programs in the Columbia River Basin, and the limited period of interaction during active migration, NMFS has determined that impacts on anadromous fish below the action area are not likely to occur at a magnitude requiring analysis at the level of this assessment. For example, at the mouth of the Columbia River, artificially propagated steelhead associated with the proposed programs would comprise only about 1.5 percent of artificially propagated anadromous fish released annually (less than 1.1 million steelhead of 71 million total salmonid releases in 2001) and would be expected to be in the estuary for only a few weeks. In addition, several hatchery reform measures have been implemented to limit interactions between natural and hatchery salmonids while in the migration corridor (NMFS 1999).

1.6 Relationships to Other Plans and Policies

This EA was prepared pursuant to regulations implementing the NEPA (42 USC 4321), and in compliance with federal regulations for preparing an EA (40 CFR 1502). Please refer to the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002) for an in depth discussion of the other plans and policies that could be affected by the Proposed Actions analyzed in this EA, which would be identical.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The proposed action and two alternatives considered in this EA are: (1) to not issue the permits (no action), (2) to issue the permits without conditions, and (3) to issue the permits with conditions (proposed action). The following describes the alternatives.

2.1 Alternative 1 - Do Not Issue the Permits (No Action)

Under a No Action alternative, NMFS would not issue the ESA section 10(a)(1)(A) permits authorizing direct take of ESA-listed species associated with the requested activities. This alternative would effectively prohibit the sampling of adult steelhead, collection of ESA-listed fish for broodstock, rearing of juvenile steelhead to the smolt stage, release of yearling age smolts, purposeful management of returning propagated adult steelhead for the enhancement of naturally spawning population, and further research on the utility of artificial propagation to enhance and assist in the recovery of the ESA-listed population in the action areas because the activities would likely be in violation of the ESA. Take limit regulations under ESA section 4(d) are not available to the permit applicants because the Upper Columbia River steelhead are listed as Endangered rather than Threatened. The programs could be terminated or altered to rear non-listed species, although neither of these options would satisfy the stated purpose and need as described above because the artificial propagation of steelhead is a specific requirement of the three HCPs and is likely necessary for recovery of the ESA-listed species. For the purpose of this analysis NMFS assumes that the steelhead programs would be discontinued in the absence of these section 10 permits.

2.2 Alternative 2 - Issue Permits Without Conditions

Alternative 2 would encompass the issuance of permits under section 10(a)(1)(A) of the ESA unconditionally based strictly on the applications and the three HCPs submitted. The permits would authorize the take of listed species, but no special conditions would be imposed. The applications and HCPs describe activities for co-manager program oversight, large scale monitoring, program operational detail, and purposeful management of adult artificially propagated steelhead returning to the upper Columbia River Basin. The application reflects the adoption of protocols for artificial propagation of ESA-listed species that are risk-averse and include the most current science on management of hatchery facilities and genetic impacts of artificial propagation. With the exception that special conditions would not be imposed by NMFS, the description of this alternative mirrors the description of the proposed action (Section 2.3, Alternative 3, below) and does meet the ESA section 10 criteria for a permit application.

2.3 Alternative 3 - Issue Permits With Conditions (Proposed Action)

The action proposed is to issue three permits under section 10(a)(1)(A) of the ESA based on the applications and the three HCPs, including attachments, submitted by the WDFW, the Chelan and Douglas PUDs, the USFWS, and the Colville Tribes as modified by the conditions that NMFS may require as being necessary and appropriate. The NMFS conditions would ensure that the annual take of ESA-listed anadromous fish would be for the propagation and enhancement of

the ESA-listed steelhead population, the associated scientific research and monitoring activities, and the purposeful management of adult artificially propagated steelhead returns in excess to natural production needs. The conditions imposed by NMFS would also help to ensure that the annual take would not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Pursuant to section 10, the permit would contain terms and conditions necessary to the propagation or survival of listed steelhead, including reporting requirements for determining whether such terms and conditions are being complied with.

2.3.1 Permit 1395 Proposed Activities

The WDFW permit application (WDFW 2002) and the three HCPs (DPUD 2002; CPUD 2002a; 2002b) include activities associated with the management of ESA-listed steelhead artificial propagation programs. These activities are proposed for a 10-year period commencing in 2003. Through these programs, adult steelhead broodstock within the Upper Columbia River ESU would be intentionally taken for the purpose of determining annual run composition, to assist managers in decision making, and for broodstock in order to artificially propagate the progeny to the yearling smolt stage and release them into the Wenatchee, Methow, and Okanogan River Basins for the purpose of enhancing the natural population. The resultant returning adult steelhead would be purposely managed to ensure adequate spawning escapements into each basin with an emphasis on the perpetuation of natural-origin steelhead. The co-managers would develop plans each year for utilizing the returning steelhead, based on desired proportions of artificially propagated fish on natural spawning grounds, using any of a variety of mechanisms for managing the proportions, such as removal at dams or in selective recreational fisheries. Proposals for harvest activities in any year in which they occur would be subject to review and approval by NMFS. Proposed activities that would lead to the take of the ESA-listed species are described below and summarized in Table 1.

2.3.1.1 Adult Return Monitoring

The WDFW proposes to conduct random sampling of the annual adult steelhead run returning to the Upper Columbia River Basin at Priest Rapids Dam to enable informed decisions to be made concerning the management of ESA-listed Upper Columbia River steelhead. The sampling activities that would affect ESA-listed species are provided in Table 1.

2.3.1.2 Adult Return Management

The WDFW proposes to purposely manage artificially propagated adult steelhead returning to the upper Columbia River Basin. Based on the monitoring at Priest Rapids Dam recommendations concerning broodstock collection strategies and the potential for other actions to utilize any excess hatchery steelhead would be made each year. Recommendations concerning management of hatchery steelhead proportions on spawning grounds and a means by which to remove excess hatchery steelhead would be made individually for the Wenatchee, Methow, and Okanogan Basins. Activities that would affect ESA-listed species are provided in Table 1.

2.3.1.3 Artificial Propagation

Two hatchery facility complexes are operated by the WDFW within the middle and upper Columbia River Basin for the propagation of steelhead: Wells Fish Hatchery Complex and Eastbank Fish Hatchery Complex. The proposed artificial propagation programs are funded by Chelan and Douglas PUDs as mitigation for hydropower project operation impacts to the naturally spawning steelhead populations present in the Wenatchee, Methow, and Okanogan River Basins. The Wells Fish Hatchery Complex uses returning steelhead adults collected at Wells Dam on the Columbia River to supplement steelhead populations in the Methow and Okanogan River Basins. The Eastbank Fish Hatchery Complex uses steelhead broodstock collected at Dryden and Tumwater Dams on the Wenatchee River to supplement steelhead populations in the Wenatchee River Basin. Activities that would affect ESA-listed Upper Columbia River steelhead are provided in Table 1.

2.3.1.4 Research, Monitoring, and Evaluation

Research, monitoring, and evaluation are critical components of the proposed programs. The three HCP agreements specifically require the formation of Hatchery Committees consisting of representatives from each signatory entity to each HCP. These HCP Hatchery Committees are charged with oversight of the artificial propagation programs to ensure that the programs are effective in meeting co-manager defined goals and objectives. The Upper Columbia River steelhead programs are intended to support naturally-spawning steelhead populations and to increase basin-wide steelhead productivity by ensuring adequate spawning escapements of the appropriate localized stocks. Specific research activities would be subject to approval of the HCP Hatchery Committees prior to implementation of the research. A representative from NMFS is on each HCP Hatchery Committee to ensure the activities conducted are consistent with steelhead recovery and do not impose substantial risks to protected species. Studies, either ongoing and currently covered under existing permits, or newly proposed studies may include the investigations provided in Table 1.

Table 1. Proposed activities that would be conducted if Permits 1395, 1396, and 1412 are issued.

Type of Activity	Permit 1395	Permit 1396	Permit 1412
Adult Return Monitoring	Intercept and collect biological data (length, scales, marks, tags, etc.) on 10 percent of run Externally tag sampled steelhead Summarize, assess, and report data collected	Not applicable	Not applicable
Adult Return Management	Ensure the run can fully seed the habitat in each basin Develop broodstock collection protocols Determine if excess hatchery steelhead should be removed from spawning populations in each basin	Not applicable	Not applicable
Artificial Propagation	Collect up to 442 broodstock fish at Wells Dam on the Columbia River for Methow and Okanogan Basin releases Collect up to 208 broodstock fish at Dryden and Tumwater Dams for Wenatchee Basin releases		Collect up to 16 adult steelhead for broodstock from Omak Creek or Okanogan River
	Holding and artificial spawning of broodstock at Wells and Eastbank Fish Hatcheries		Holding and artificial spawning of broodstock at Colville Trout Hatchery
	Transfer of 125,000 eyed-eggs or fry from Wells Fish Hatchery to Winthrop National Fish Hatchery annually	Receive up to 125,000 eggs or fry from WDFW annually	
	Transfer up to 225,000 eyed-eggs from Wells Fish Hatchery to WDFW facilities for release from Ringold Springs Rearing Facility annually		
	Incubation and rearing to smolt	Incubation and rearing to smolt	Incubation and rearing to smolt
	Rear juveniles following routine fish culture methods to an average size of 5 to 8 fish per pound	Rear juveniles using routine fish culture methods to an average size of 5 to 8 fish per pound	Rear juveniles using routine fish culture methods to an average size of 5 to 8 fish per pound
	Externally mark or tag all fish prior to release	Adipose fin clip all fish prior to release	Externally mark or tag all fish prior to release

Type of Activity	Permit 1395	Permit 1396	Permit 1412
	Internally tag some smolts prior to release Release up to 180,000 smolts into the Columbia River from Ringold Springs Rearing Facility Release of 350,000 smolts into the Methow and/or Okanogan Basins annually and release of 400,000 smolts into the Wenatchee Basin annually	Release of up to 100,000 smolts in the Methow River annually	Release of up to 40,000 smolts into the Okanogan Basin annually
Research, Monitoring and Evaluation	Investigate the factors that affect and the extent of residulization of juveniles from release groups Determine the relative success of program steelhead in the natural environment Investigate the efficacy of hatchery programs in rebuilding self-sustaining populations Monitor the affect of artificial propagation on the genetic profile of the stocks		Investigate the efficacy of hatchery programs in rebuilding self-sustaining populations Cap a portion of the redds deposited in Omak Creek to determine spawning success of artificially propagated fish in the natural environment Monitor the affect of artificial propagation on the genetic profile of the stocks

2.3.2 Permit 1395 Terms and Conditions

NMFS proposes to issue section 10(a)(1)(A) permit 1395 jointly to the WDFW, the Chelan PUD, and the Douglas PUD with terms and conditions. Specifically, the conditions are designed to minimize ESA-listed fish mortalities and adverse impacts during: the interception and release of Upper Columbia River steelhead adults at Priest Rapids Dam, collection of broodstock from the Columbia River and its tributaries, rearing of juveniles in a hatchery environment, and release of smolts into the Upper Columbia River Basin to enhance the naturally spawning population. Of primary concern in the development of the conditions for the proposed permit is the necessity to take special measures to avoid adverse impacts from artificially propagated returning adult steelhead in years when adequate numbers of natural-origin steelhead escape to the spawning grounds. In years of low natural-origin steelhead returns, the primary objective would be to fully utilize the available habitat while maintaining the genetic integrity of the populations and rebuilding the steelhead resources throughout the ESU. A summary of the terms and conditions that would be placed in the permit is provided in Table 2 (for a complete list of conditions see the draft Permit #1395 and draft Opinion (NOAA Fisheries 2003)).

Table 2. Terms and conditions that would be included in Permits 1395, 1396, and 1412 if issued.

Type of Activity	Permit 1395	Permit 1396	Permit 1412
Adult Return Monitoring	Biological sampling of steelhead at Priest Rapids Dam would be conducted on a random sample targeting 10 percent of the total run. ESA-listed fish handled out of water must be anaesthetized and allowed to recover before release External tags may be applied only to adipose fin clipped steelhead sampled after September 9th Data would be summarized, assessed and reported weekly including direct and indirect mortalities	Not applicable	Not applicable
Adult Return Management	Priority would be given to fully seeding the habitat with natural origin steelhead in each basin Broodstock collection protocols would be developed annually and submitted to NMFS Determination of potential benefits of removing excess hatchery steelhead from the spawning population would be done separately for the Wenatchee, Methow, and Okanogan Basins	Not applicable	Not applicable
Artificial Propagation	The permit holders would reduce potential negative impacts to listed salmon and steelhead in the upper Columbia River Basin from physical operation of their respective artificial propagation facilities, including associated trapping locations		
	Steelhead captured for broodstock would be removed from traps daily	Not applicable	Steelhead captured for broodstock would be removed from traps daily
	Fish not retained for broodstock would be released upstream of the trap immediately after enumeration	Not applicable	Fish not retained for broodstock would be released upstream o the trap immediately after enumeration
	Artificial propagation production levels would not exceed those in the application documents without further consultation with NMFS		

Type of Activity	Permit 1395	Permit 1396	Permit 1412
	Incidental mortalities associated with capturing, handling, and transporting broodstock would not exceed 5 percent of the total number of steelhead retained	Not applicable	Incidental mortalities associated with capturing, handling, and transporting broodstock would not exceed 5 percent of the total number of steelhead retained
	If total eyed egg-to-release mortality exceeds 20 percent or a single mortality event exceeds10 percent of the population, then NMFS would be notified within 48 hours of the mortality event		
	Steelhead smolts would be released at an average size of 5 to 8 fish per pound with a length coefficient of variation not to exceed 10 percent		
	Juvenile steelhead would be externally marked prior to release (for example adipose fin clip or visual elastomer tag)	Juvenile steelhead would be adipose fin clipped prior to release	Juvenile steelhead would be externally marked prior to release (for example adipose fin clip or visual elastomer tag)
	A portion of the juvenile steelhead may be internally tagged prior to release (for example coded-wire tag (CWT) or passive integrated transponder (PIT) tag		
	Up to 180,000 smolts would be released into the Columbia River from Ringold Springs Rearing Facility		
	Up to 350,000 smolts would be released into the Methow and/or Okanogan Basins annually	Release of up to 100,000 smolts in the Methow River annually	Release of up to 40,000 smolts into the Okanogan Basin annually
	Up to 400,000 smolts would be released into the Wenatchee Basin annually		
	Annual reports would be submitted to NMFS that include a summary of artificial propagation program activities including broodstock characteristics (for example natural or hatchery origin, sex, age, length, fecundity, mating strategy), rearing conditions (for example water temperature and sources), biological data collected (for example growth rates, health condition monitoring), numbers and types of external and internal mark and tags, description of studies and/or rearing comparisons, release summaries, and other information pertinent the evaluation of the specific broods year or group artificially propagated at each facility		
Research, Monitoring, and Evaluation	The permit holders would monitor and report the contribution of adult salmon from the artificial propagation programs authorized in this permit. Adult return information should include the most recent estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas		

Type of Activity	Permit 1395	Permit 1396	Permit 1412
	Visual observation protocols would be used instead of intrusive sampling methods whenever possible Each ESA-listed fish handled out-of-water would be anesthetized when necessary to prevent injury or mortality. Anesthetized fish would be allowed to recover (e.g., in a recovery tank) before being released. Fish that are simply counted would remain in water but would not need to be anesthetized The permit holders would be responsible for any biological samples collected from ESA-listed species as long as they are useful for research purposes. The terms and conditions concerning any samples collected under this authorization would remain in effect as long as the permit holders maintains authority and responsibility of the material taken. The permit holders may not transfer biological samples to any persons, agencies, organizations or any other entity not listed in the application without obtaining prior written approval from NMFS		

2.3.3 Permit 1396 Proposed Artificial Propagation Activities

Winthrop National Fish Hatchery is located near Winthrop, Washington on the Methow River, above its confluence with the Columbia River. Total distance from the hatchery to the Pacific Ocean is 568 river miles, and nine hydroelectric dams are located within the migration corridor. Production goals at Winthrop National Fish Hatchery were set by the Columbia River Fisheries Management Plan under *U.S. v. Oregon* (USFWS 2002). The current steelhead program at Winthrop National Fish Hatchery of 100,000 summer steelhead smolts annually started in 1995 with eyed eggs being transferred and fry brought to the station from Wells Fish Hatchery in 1996.

This permit application, proposed for a 10-year period commencing in 2003, addresses listed steelhead artificial propagation at Winthrop National Fish Hatchery. Adult steelhead within the Upper Columbia ESU would be intentionally taken at Wells Fish Hatchery by WDFW and eyed eggs or fry transferred to Winthrop National Fish Hatchery to be reared and released by the USFWS for the purpose of enhancing the population status of the species through artificial propagation at this facility. Activities that would lead to the take of the ESA-listed species are listed in Table 1.

2.3.4 Permit 1396 Terms and Conditions

NMFS proposes to issue section 10(a)(1)(A) permit 1396 to the USFWS with conditions. Specifically, NMFS' conditions are designed to minimize ESA-listed fish mortalities incidental to the rearing and release of artificially propagated steelhead smolts into the Methow River to enhance the naturally spawning population, and associated scientific research and monitoring activities. Of primary concern in the development of the conditions for the proposed permit is the necessity to take measures to avoid adverse impacts from artificially propagated returning adult steelhead in years when adequate natural-origin steelhead escape to the spawning grounds in order to preserve the genetic and life history characteristics of the ESA-listed species. A summary of the terms and conditions that would be placed in the permit is in Table 2 (for a complete list of conditions see the draft permit 1396 and Opinion (NOAA Fisheries 2003)).

2.3.5 Permit 1412 Proposed Artificial Propagation Activities

NMFS proposes to issue section 10(a)(1)(A) permit 1412 to the Colville Tribes to carry out a artificial propagation program of endangered Upper Columbia River steelhead. The Colville Tribes request a 5-year authorization to utilize artificial propagation techniques to enhance the natural origin Upper Columbia River steelhead in the Okanogan River Basin. Program details were provided in the permit application (CCT 2002) and are summarized in Table 1.

The Colville Tribes propose to install a temporary picket weir in Omak Creek in Mid-March through April 30th annually at approximately RM 0.5 to collect about 16 adult steelhead for broodstock. If the picket weir is not successful, then trap nets or angling would be used to collect

broodstock. The broodstock would be transported approximately 35 miles in a tank truck to the Colville Tribal Trout Hatchery, near Bridgeport, Washington.

Adult steelhead would be spawned and biologically sampled according to standardized fish health practices following fish disease control guidelines developed by Integrated Hatchery Operations Team and the Pacific Northwest Fish Health Protection Committee. Fin tissue, and other biological data would be collected from the broodstock to monitor the program impacts.

Eggs would be incubated and juvenile fish reared at the tribal facility until the yearling smolt stage. Fish health would be monitored routinely, generally on a monthly schedule and the rearing facility would be operated to be in compliance with "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" standards (NWIFC and WDFW 1998). Juvenile fish would be biologically sampled in the hatchery facility including collection of fin tissue for genetic monitoring and growth monitoring.

Juvenile steelhead would externally marked with visual implant elastomer tags for identification purposed but not adipose fin-clipped. Juveniles may also receive passive integrated transponder (PIT) tags for identification purposes. Steelhead smolts with a demonstrated preparedness for downstream migration would be released into Omak Creek from a Natural Rearing Enhancement System (NATURES) type acclimation pond, which is in development with a completion target date of spring 2004, or scatter planted from a tank truck in April or May.

2.3.6 Permit 1412 Terms and Conditions

NMFS proposes to issue section 10(a)(1)(A) permit 1412 to the Colville Tribes with conditions. Specifically, NMFS' conditions are designed to minimize ESA-listed fish mortalities incidental to the capture, handing, transport, spawning, juvenile rearing, and release of artificially propagated steelhead smolts into Omak Creek to enhance the naturally spawning population, and associated scientific research and monitoring activities. Of primary concern in the development of the conditions for the proposed permit is the necessity to take measures to avoid adverse impacts from artificially propagated returning adult steelhead in years when adequate natural-origin steelhead escape to the spawning grounds in order to preserve the genetic and life history characteristics of the ESA-listed species. A summary of the terms and conditions that would be placed in the permit is in Table 2 (for a complete list of conditions see the draft permit 1412 and Opinion (NOAA Fisheries 2003)).

2.3.7 Incidental Take

In addition to direct take, incidental takes of ESA-listed species other than targeted steelhead associated with broodstock collection activities, hatchery operations, and juvenile fish releases from the program would be authorized under the proposed action. Because of the inherent biological attributes of aquatic species such as salmon and steelhead, the dimensions and variability of the Columbia River system and tributaries, and the operational complexities of hatchery actions, determining precise incidental take levels of ESA-listed species attributable to hatchery activities are not possible at present. In the absence of quantitative estimates of incidental take, NMFS would monitor fish release numbers/locations and hatchery operations to assure that incidental takes do not operate to the disadvantage of ESA-listed species. If NMFS determines that incidental take due to the hatchery activities have the potential to operate to the disadvantage of ESA-listed species, the activities that result in the incidental takes must be suspended until a reasonable solution is achieved, the permit is amended, and/or the program is reevaluated under Section 7 of the ESA.

3 AFFECTED ENVIRONMENT

The alternatives identified above can potentially affect the physical, biological, and socioeconomic resources within the action area. The following is a summary of the major components of the environment that would be affected by any of the alternatives and the current baseline condition organized by the type of environment. A full discussion of the environmental baseline can be found in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002).

3.1 Physical Environment

The proposed action of permitting artificial propagation activities can effect the physical environment by impacting the water quantity, water quality, and the riparian habitat.

3.1.1 Water Quantity

Water quantity can be altered by water withdrawals from a river or stream for use in the artificial propagation facility. The Columbia River average annual flow at Rock Island Dam is 117,737 cubic feet per second (cfs). The artificial propagation programs at Wells and Chelan Fish Hatcheries utilize about 24 and 11 cfs from the Columbia River, respectively. The Wenatchee River watershed is the third largest mid-Columbia River tributary and has an annual discharge of 2.3 million acre-feet (NOAA Fisheries 2002). Average annual flow of the Wenatchee River is 3,304 cfs (years 1963 to 2000) measured at Monitor, Washington. A total of 420 cfs have established water rights, with 3 percent utilized by artificial propagation facilities. Average annual flow from the Methow River at Pateros is 1,579 cfs (years 1963 - 2000). The Washington Department of Ecology estimates that irrigation ditches remove about 50 percent of the river flow in late summer and fall, with 90 percent of that withdrawal being utilized for irrigating agricultural land. The USFWS Winthrop National Fish Hatchery uses up 50 cfs of Methow

River water for both the spring chinook and steelhead artificial propagation programs. Average annual flows in the Okanogan River at Malott, Washington is 3,134 cfs (years 1966 -2000).

3.1.2 Water Quality

Current water quality classification by the Ecology following water quality standards as defined by Chapter 173-201A of the Washington Administrative Code (WAC), indicates that the Columbia River in the action area is relatively unpolluted and has few sources of wastewater or other pollution. However, based on the Army Corp of Engineers and Ecology monitoring, the middle Columbia River region was placed on the 303(d) list for total dissolved gas, water temperature, pH, and a water column bioassay (NOAA Fisheries 2002). Water quality in the Wenatchee River is generally good; however, the river was placed on the 303(d) list for temperature, pH, and dissolved oxygen. The Methow River water quality is also generally good; however, the river was placed on the 303(d) list for temperature and instream flow. The Okanogan River is on the 303(d) list for dissolved oxygen, temperature, and fecal coliform organisms. A thorough discussion of the water quality of the middle and upper Columbia River and the tributaries are described in Chapter 3 of the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002).

3.1.3 Riparian Habitat

The Upper Columbia River Basin flood plain and the foothills of the Cascade Mountains are primarily within the big sagebrush/blue bunch wheat grass or shrub-steppe vegetation zone, which is characteristic of the driest portions of the Columbia Basin physiographic province (NOAA Fisheries 2002). Tributaries in the action area pass through a variety of vegetation zones including forested low-montane zones - dominated ponderosa pine, Douglas fir, and grand fir; and subalpine zones - dominated by lodgepole pine, Engelmann spruce and subalpine fir. Human occupation and land use occur throughout the action area. Riparian habitat may benefit from marine derived nutrients released from decomposing steelhead carcasses that result from artificially propagated steelhead, and their descendants, that spawn and die in the natural environment.

3.2 Biological Environment

The biological resources that potentially could be affected by the proposed action include salmon, steelhead, trout, and other aquatic and terrestrial species. A detailed discussion of the biological resources found in the action area is presented in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002). The specific resource segments and baseline condition that may be affected by the proposed artificial propagation programs are described below.

3.2.1 Anadromous Fish Listed Under the ESA

Since 1991, NMFS has identified twelve populations of Columbia River Basin anadromous salmon and steelhead as requiring protection under the ESA. The biological attributes of salmon and steelhead, the dimensions and variability of the Columbia River system, and the natural cycles in the ocean environment make determination of the effects from the proposed artificial propagation activities downstream of the action area very difficult. Most of the species interact with fish that would be produced by the proposed artificial propagation activities in the migration corridor and the ocean environments. However, as discussed in Section 1.3 (Action Area) artificially propagated steelhead associated with the proposed programs would comprise only about 1.5 percent of artificially propagated anadromous fish released annually (less than 1.1 million steelhead of 71 million total salmonid releases in 2001) and would be expected to be in the estuary for only a few weeks. Therefore, analysis of impacts of these activities on the biological environment will be limited to the two ESUs expected to be impacted by the proposed action. Both of the ESA-listed ESUs include some portion of artificially propagated fish as well as the naturally spawning populations.

3.2.1.1 Upper Columbia River Spring Chinook

The Upper Columbia River spring chinook salmon ESU was listed as endangered on March 24, 1999 (64 FR 14308). This ESU includes stream-type spring chinook salmon populations originating from all areas of the Columbia River basin upstream of Rock Island Dam (Myers *et al.* 1998). Production areas include the Wenatchee, Methow, and Entiat River Basins. The WDF *et al.* (1993) identified nine stocks within this ESU. All stocks, with the exception of the Methow stock, were considered by the WDF *et al.* (1993) to be of native origin, of "wild" production type, and as "depressed" in status. The Methow River spring chinook salmon stock is considered to be "composite" in production type, but of native origin, and depressed in status. When listing the Upper Columbia River spring chinook salmon as endangered, NMFS included six populations which have been artificially propagated in recent years as part of the ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek. These six artificially propagated populations were considered to be essential for recovery and were therefore listed as part of the ESU. Artificially propagated populations at Winthrop National Fish Hatchery, Entiat National Fish Hatchery, and Leavenworth National Fish Hatchery were not included as part of the ESU because they were derived from Carson National Fish Hatchery spring chinook salmon.

Upper Columbia River spring chinook salmon have a stream-type life history. Spring chinook salmon destined for the Upper Columbia River and tributaries begin entering the Columbia River in late February and early March, with approximately 50 percent passing Priest Rapids Dam by mid-May. Fish enter the Methow River from mid-May through July and primarily use the upper mainstem reaches of the Methow, Chewuch, Lost, and Twisp Rivers. Spawning occurs from late July through mid-September; fry emerge from the gravel in April and May. Juveniles spend the next year in fresh water prior to migrating downstream in the spring. Spring chinook salmon returning to the Wenatchee River have similar run timing with spawning starting about the second week of August and peaking in the first week of September. Spawning time is dependant on water temperature and generally begins when water temperatures are between 42.4°F and

57.5°F (Mullen 1987 in WDW *et al*. 1990a). Fry emerge from the gravel in January to February and rear in freshwater for up to a year prior to outmigrating during the following spring.

Recent year (1990-95) mean escapement for Upper Columbia River spring chinook salmon was estimated to be 4,880 (Myers *et al.* 1998). Estimates of recent annual trends in abundance were found by NMFS to be downward, with eight of the nine spring chinook populations exhibiting rates of decline exceeding 20% per year. Record low returns were experienced in the middle 1990s. For the Upper Columbia River spring chinook salmon ESU as a whole, NMFS estimates that the average population growth rate (lambda) over the base period ranged from 0.87 to 0.78, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of natural origin (Appendix B in McClure *et al.* 2000) (an annual average growth rate above 1.0 represents a population that is not declining). The estimated average population growth rates and the risk of absolute extinction within 24 and 100 years for the three spawning populations identified by Ford *et al.* (2001), using the same range of assumptions about the relative effectiveness of hatchery fish.

Wenatchee River adult spring chinook returns rebounded in 2000 from low returns observed in 1999. In 2000, an estimated 350 redds were counted in the basin, an almost seven-fold increase from the 54 redds observed in 1999. The greatest increases were seen in Nason Creek, Chiwawa River and the upper Wenatchee River. The 2001 return of naturally produced spring chinook to the Wenatchee River was estimated to be between 640 and 1,052 adults with an additional 438-696 hatchery spring chinook returning to the Chiwawa River. The increased returns in 2000 and 2001 are likely the result of favorable out migration conditions and ocean rearing environment.

Factors for decline in the Upper Columbia River Region, include hydropower facilities and habitat destruction as the major causes of population declines, although past over-harvest in fisheries, and some hatchery practices are other factors. To these factors for decline are added poor ocean conditions prior to 2000, that have suppressed fish survival, and vastly increased avian predation in the Columbia River estuary. These latter factors affect all of the Basin's salmon and steelhead populations.

3.2.1.2 Upper Columbia River Steelhead

The Upper Columbia River steelhead ESU was listed as endangered on August 18, 1997 (62 FR 43937). This ESU inhabits the Columbia River and tributaries upstream of the Yakima River. It includes rivers mostly draining the east slope of the Cascade Mountains. This area includes several rivers which originate in Canada, but it is not thought that steelhead ever occurred in Canada in large numbers; this ESU is defined to include only U.S. populations. This entire ESU has been heavily influenced by artificial propagation programs, with a thorough mixing of stocks as a result of the Grand Coulee Fish Maintenance Project beginning in the 1940s (Fish and Hanavan 1948; Mullan *et al*. 1992). Until recently, hatchery releases were composed of a composite of basin stocks. The Wells Fish Hatchery stock is included in the listing because it may retain the genetic resources of the original steelhead populations about Grand Coulee Dam (62 FR 43937) and may be used for recovery purposes. Currently, efforts are underway to develop artificial propagation programs from more locally-adapted stocks, incorporating some natural-origin steelhead into the broodstock. Steelhead juveniles released into the Wenatchee

River have been progeny of broodstock collected from the Wenatchee River exclusively since the 1998 brood (WDFW 2002).

The life history of this ESU is similar to other inland steelhead ESUs. However, smolt ages in this ESU are some of the oldest on the west coast (up to 7 years old), likely as a result of the ubiquitous cold water temperatures (Mullan *et al*. 1992). Adults of this ESU spawn later than most downstream populations. Adults primarily return after one year of ocean residency. Steelhead from this ESU enter the lower Columbia between May and September with fish arriving at Wells Pool in early July. Fish enter the Wenatchee and Methow Rivers in mid-July and peak between mid-September and October. During winter, fish generally return to the warmer Columbia River and re-enter the Methow to begin spawning in mid-March after ice-out. Spawning continues through May and many fish seek out higher reaches in the tributaries. Fry emergence occurs that summer and juveniles rear for two to four years prior to spring downstream migration.

Although runs during the period 1933 through 1959 may have already been affected by fisheries in the lower river, dam counts suggest a pre-fishery run size of more than 5,000 adults above Rock Island Dam. The return of Upper Columbia River natural-origin steelhead to Priest Rapids Dam declined from a 5-year average of 2,700 beginning in 1986 to a 5-year average of 900 beginning in 1994. Recent escapements at Priest Rapids Dam of both hatchery and natural-origin steelhead have shown an increasing trend reaching 11,330 in 2000, a peak of 30,077 in 2001, and an estimated 15,898 in 2002. Natural origin steelhead returns were estimated at 2,341, 5,715, and 3,013 in 2000, 2001, and 2002, respectively.

In the Upper Columbia River Region, hydropower facilities and habitat destruction are the major causes of population declines, although past over-harvest in fisheries and some hatchery practices are other factors. To these factors for decline are added poor ocean conditions prior to 2000 that have suppressed fish survival, and vastly increased avian predation in the Columbia River estuary. These latter factors affect all of the basin's salmon and steelhead populations.

3.2.2 Other ESA-listed Fish Species

Another ESA-listed fish species that could be present in the areas where the hatchery activities are proposed to occur is bull trout. Bull trout in the Columbia River basin were listed as threatened on June 10, 1998 (63 FR 31647). The Columbia River population segment encompasses a vast geographic area including portions of Idaho, Montana, Oregon, Washington, and British Columbia. Bull trout are present, and locally common, in most of the habitat occupied by anadromous fish in the upper Columbia River Basin. The WDFW (1997) identified 17 bull trout stocks in the Methow River watershed, most are located in the headwater tributaries. The status of these stocks was listed as unknown except for the Lost River stock which was considered healthy (WDFW 1997). In the Wenatchee River, the WDFW (1997) identified 11 bull trout stocks located in the headwater tributaries, out of these 11 stocks, 4 stocks were identified as being healthy and the remaining seven as unknown.

Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from 1 to 4 years before migrating to either a lake (adfluvial) system or a river (fluvial) system, where they grow to maturity. Anadromous fish spawn in tributary streams, with major growth and maturation occurring in salt water this form is not present in the Methow and Wenatchee Rivers.

Bull trout spawn from August to November as the water temperatures begin to decline. Depending on water temperature, the fry emerge in 100 to 145 days. Juveniles remain in the substrate for some time after hatching. Fry emerge from the gravel in about April. Bull trout populations are fragmented with may individual populations being isolated in one drainage. The distribution of this species appears to be greatly influenced by habitat components such as water temperature (bull trout prefer colder streams), cover, channel form and stability, substrates and migratory corridors (WDW *et al.* 1990b). Bull trout have complex life stage habitat needs. This species utilize large woody debris, undercut banks, boulders and pools. Altered stream flow can disrupt spawning and channel stability is a large factor in egg survival. It is believed that the migratory bull trout occasionally spawn outside of their own natal area, thus over time the genetics remain stable. Migrating adult bull trout are sometimes encountered at weirs during broodstock collection activities.

3.2.3 Non-listed Fish Species

Approximately 60 other species of fish live in the Columbia River and tributaries. About half are native species primarily of the families Salmonidae, Catastomidae, Cyprinidae, and Cottidae. White sturgeon*, Acipenser transmontanus,* occur in the mainstem Columbia River and feed on detritus found on the bottom of the river. They may incur a negligible benefit from juvenile steelhead from the proposed programs that die and sink during the migration. The Columbia River Basin also supports at least 25 introduced species primarily representing Percidae, Centrarchidae, and Ictaluridae. Most of the introduced species are game fish which may be the targets of fisheries that could incidentally take ESA-listed anadromous salmonids.

3.2.4 Wildlife

Wildlife that inhabit and utilize riparian areas include birds, terrestrial mammals, amphibians, and reptiles. A complete discussion of the species present and their habitat utilization is presented in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002).

In the upper reaches of the Wenatchee, Entiat, Methow, and Okanogan Rivers, and in the tributaries of these rivers, faster flowing, small streams bordered by riparian forest are present. These upper reaches provide habitat for a variety of riparian forest and stream associated wildlife, such as American dippers (*Cinclus mexicanus*), Steller's jays (*Cyanocitta stelleri*), ruby-crowned kinglets (*Regulus calendula*), and tailed frogs (*Ascaphus truei*). Bald eagles (*Haliaeetus*

leucocephalus) use these watersheds during winter and early spring months. The tributaries of the Wenatchee, Entiat, Methow, and Okanogan Rivers extend into remote areas where species such as bobcats (*Lynx rufus*) and mountain lions (*Felis concolor*) are expected to be more common than in developed areas. These species may feed minimally during limited times of the year on juvenile steelhead after release or on decomposing carcasses of spawned adult steelhead.

3.3 Socioeconomic Environment

A full discussion of the socioeconomic environment can be found in the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002). In general, Chelan, Douglas, and Okanogan Counties are largely rural with relatively small population. Together, the three counties contain just 2.4 percent of the State population while covering 10,010 square miles, or 15 percent of the State. The demographics of Native Americans that fish in the Columbia River include the Colville Tribes, Confederated Tribes and Bands of the Yakama Indian Nation, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation, and the Nez Perce Tribe. Of these reservations, only the Colville Tribes Reservation is located within the action area.

Historically, natural resources have been the mainstay of the economies of the Native Americans in the Columbia Basin. Hunting, fishing, and gathering are activities that have been important to Tribes for thousands of years. These activities not only continue to be important economically, but also for subsistence and ceremonial purposes. Today, the natural resource portion of the affected Tribal economies, which constitutes 8 percent of the total employment, is made up of fishing, agriculture, food processing, forestry/timber production and wood processing, livestock grazing, and power production. Fishing is the main Tribal industry that would be most affected by the proposed activities.

In 2000, the various Tribes landed 52,419 chinook salmon, 15,540 steelhead, 6,299 coho salmon, and 3,447 sturgeon during the commercial fishing season in the lower Columbia River (Joint Columbia River Management Staff 2001). The commercial fishery represents an important part of the economies of the five Tribes. Estimates of the Tribal salmon fishery in Washington were valued at almost $7 million in 1997 (Tiller and Chase 1999). However, over time, there has been a substantial decline in salmon stocks, and this decline has affected the economies of the project area Tribes. The subsistence fish harvest for the four Treaty Tribes includes the fish species listed above and also includes sockeye and spring- and summer run chinook salmon. In 2000, the Treaty Tribes caught 14,635 fall-run, 11,250 spring-run, and 280 summer-run chinook salmon, 6,628 steelhead, 2,765 sockeye salmon, 1,884 coho salmon, and 324 sturgeon, for subsistence or ceremonial purposes (NOAA Fisheries 2002).

In recent years, with salmonid numbers severely reduced due primarily to habitat degradation and hydropower development in the mainstem river, commercial and recreational fisheries have been considerably curtailed from earlier levels. Currently, harvest is not considered to be as great a source of salmonid population decrease as habitat degradation and hydropower projects. Harvest

rates are managed at conservative levels until improvements in other sectors of the environment are able to take effect.

Numerous jobs are indirectly (for example, commercial fishers and retailers) and directly (for example, fish culturalists and fish managers/regulators) associated with or affected by the proposed artificial propagation programs and the listing of the species under the ESA. In addition to their role in maintaining the viability of salmonid populations, the artificial propagation programs contribute fish to recreational, commercial, and tribal fisheries throughout the Columbia River Basin.

Natural and hatchery-origin steelhead continue to play an important role for Native American cultural, religious, subsistence, and commercial purposes in the action area. The current depressed status of listed spring chinook salmon and steelhead populations has severely limited many of the cultural practices and subsistence uses of salmon by the local tribes. The poor status of the listed populations has also curtailed economic and cultural benefits for non-Indian recreational fisheries that the steelhead resource formerly supported.

4 ENVIRONMENTAL CONSEQUENCES

The proposed action can potentially affect the physical, biological, social, and economic resources within the action area. The following is an analysis of the potential environmental consequences on the major components of the environment based on the current baseline condition described in Section 3 (Affected Environment), above, organized by the alternatives considered in Section 2 (Alternatives Including the Proposed Action). Please see the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002) for more detail of the environmental consequences of the three HCPs.

4.1 Alternative 1 - Do Not Issue Permits (No Action)

Under this alternative, the artificial propagation programs would not be operated as described.

4.1.1 Effects On the Physical Environment

The No Action alternative would not substantially change the magnitude or type of effects on the physical environment. The cessation of the proposed ESA-listed steelhead artificial propagation programs would not necessarily decrease impacts on the physical environment because the activities of artificially propagating unlisted salmon would continue and potentially be increased. The cessation of the steelhead program could result in loss of beneficial nutrient flow into the upper tributaries and spawning grounds. Specific considerations of effects on water quality, water quantity, and riparian habitat are described below.

4.1.1.1 Water Quantity

Production capacity at hatchery facilities would most likely be used to rear non-listed salmon species or listed spring chinook salmon. If this occurred, surface water withdrawals are likely to not change from the existing level. Water diversions at trapping facilities are minimal and trapping periods for other propagated species overlap (i.e., summer chinook and coho) much of the steelhead trapping period. Therefore it is unlikely a substantial change, either positive or negative would occur.

4.1.1.2 Water Quality

As described above, the total artificial production capacity of the hatchery facilities would likely not change. An increase in production of unlisted salmon would likely occur to fill the vacancy created by the cessation of the steelhead programs. Therefore, the impacts under this alternative would not be expected to result in any change from current baseline conditions.

4.1.1.3 Riparian Habitat

Small localized impacts at trapping sites might be reduced from the current level because steelhead broodstock collections would be discontinued at the remote locations, but because trapping periods of other propagated species overlap much of the steelhead trapping period, the reduced impacts would likely be negligible. The discontinuation of steelhead smolt releases from tank trucks could result in minor reductions of impacts at the release sites. The reduction in steelhead returns may result in negative impacts to the environment by decreasing the amount of marine derived nutrients that would have been released into the watershed from artificially propagated carcasses.

4.1.2 Effects On the Biological Environment

The biological environment considered in this EA includes ESA-listed anadromous fish species, other ESA-listed fish species, non-listed fish species, and wildlife.

4.1.2.1 Anadromous Fish Listed Under the ESA

Under the No Action alternative, annual takes of endangered Upper Columbia River steelhead associated with artificial propagation programs would not be authorized. To meet production goals in the Wenatchee, Methow, and Okanogan Rivers artificial propagation programs, under the proposed alternative, about 650 adult ESA-listed steelhead are needed for broodstock. If the program is discontinued, the 650 steelhead that would have been collected would be allowed to spawn naturally during the initial few years without hatchery production.

NMFS has concluded that the Upper Columbia River steelhead species is at risk of extinction (62 FR 43937). The risk of extinction and the hazard of the loss of genetic diversity is increased by the extremely low numbers of natural-origin parents in each generation. In years of low survival of natural-origin steelhead, the artificially propagated steelhead would be allowed to spawn naturally and assist in fully seeding the habitat, providing a benefit to the ESU. The benefits of artificially propagated steelhead spawning in the ESU when the natural population is at very low levels include preservation of genetic diversity, and persistence of the species. The long term implications of the cessation of the program would likely include the continued decline of the

species, particularly in the Methow and Okanogan Basins where the current populations are likely heavily represented by artificially propagated steelhead.

Under the No Action alternative, ESA-listed Upper Columbia River spring chinook would not benefit from the restored productivity and increased forage supply that could be provided by a restored steelhead population. Any reduced risk from lack of trapping activities would be negligible since steelhead and spring chinook salmon adult migrations occur during different times of the year. However, impacts may be similar or increased if another non-listed species was produced to replace the production capacity lost under this alternative.

4.1.2.2 Other ESA-listed Fish Species

The discontinuation of the listed steelhead artificial propagation would not likely reduce effects on bull trout. Steelhead trapping generally occurs at locations and times when bull trout are rarely present. Release of effluent and water withdrawal impacts would likely not change from the baseline condition if other species are reared at the hatchery to replace the discontinued steelhead program.

4.1.2.3 Non-ESA-listed Fish Species

The discontinuation of the ESA-listed steelhead artificial propagation program would not be expected to have any impacts on non-ESA-listed fish species because the hatchery facilities would likely increase production of non-ESA-listed species, and the overall impact of hatchery program operation would likely remain consistent with the baseline conditions.

4.1.2.4 Terrestrial Organisms

Without the annual input of artificially propagated steelhead adults and their carcasses in the river environment, terrestrial organisms that feed on live-caught or spawned-out carcasses may by adversely impacted such as bears, river otters, and other terrestrial scavengers. The extent of adverse impacts would be localized in the tributaries, and considering the entire scope of the action area, would likely be minor.

4.1.3 Effects On The Socioeconomic Environment

The No Action alternative would likely result in a decrease in the Upper Columbia River steelhead ESU population size. The risk of extinction or loss of important genetic material would continue or would increase. No fish would be available for treaty tribal ceremonial and subsistence use or for recreational fishing opportunities. Loss of these fishery opportunities would not fulfill tribal trust responsibilities and would potentially negatively impact the local economy because of lost income from local steelhead fisheries in the Upper Columbia River basin. Should the Upper Columbia River steelhead become extinct, the existence value of the species would also be lost. If Upper Columbia River steelhead continue to decline, it would be expected that more restrictions could occur in other areas that affect the species. These additional restrictions could impact water withdrawals for domestic and agricultural uses, grazing, mining, timber harvest, and development within the watersheds.

4.1.4 Environmental Justice

Executive Order 12898 (59 FR 7629) directs federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The No Action alternative would not be expected affect human health of any population located in the action area.

Under the No Action alternative recreational harvest opportunities for all population segments could be reduced. Tribal harvest and subsistence fishing opportunities, and potential fishing opportunities for low-income persons could be reduced as well, but would not be disproportionately affected under the No Action alternative.

4.2 Alternative 2 - Issue Permits Without Conditions

4.2.1 All Resources

The purpose of permit conditions is to prescribe requirements and/or restrictions that are expressly designed to minimize impacts to ESA-listed fish. Issuing permits and/or permit modifications without conditions would result in many of the same environmental impacts described under the No Action alternative because, as previously described, the proposed ESA-listed steelhead artificial propagation programs would likely be replaced by non-ESA-listed propagation programs. The impacts would likely also be similar to the impacts under the proposed alternative described below in Section 4.3 (Alternative 3 - Issue Permits With Conditions) because many of the techniques that result in permit conditions are provided as proposed strategies in permit applications. However, not imposing conditions in permits could potentially result in unexpected environmental impacts if impact minimization strategies are substantially altered or are not implemented by the permit holders. Establishing conditions in permits ensures that measures would be implemented by the permit holders to minimize adverse impacts to ESA-listed fish and that the actions of the agencies and tribes would not appreciably reduce the survival and recovery of ESA-listed species. In addition, NMFS' conditions may serve to further limit activities in such a way as to enhance the proposed conservation efforts. The effects of this alternative on the human environment would nominally be the same as under the proposed action, but the certainty of these actions would be unpredictable.

4.3 Alternative 3 - Issue Permits With Conditions (Proposed)

Under this alternative the proposed artificial propagation programs of ESA-listed Upper Columbia River steelhead would be operated as previously described in Section 2.3 (Alternative 3 - Issue Permits with Conditions) and subject to terms and conditions as required under section 10 of the ESA. The possible impacts to the physical, biological, and socioeconomic environments are described in this section. Please see the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002) for an in depth discussion of the ramifications of implementing the three HCP agreements.

4.3.1 Effects on the Physical Environment

The effects on the physical environment resulting from implementation of the proposed artificial propagation program could include impacts on water quantity, water quality, and riparian habitat. However, any impact would likely be minimal, occur in a small areas within the entire action area, and would not be substantial. Specific considerations of potential impacts on the physical environment by the proposed action are described below.

4.3.1.1 Water Quantity

To limit impacts on water quantity, the permit holders would comply with water right permits established for each hatchery to prevent over-appropriation of surface water. The hatchery facilities considered in this EA utilize a small portion of the total water allocation in each affected river (3 percent of the total water allocation in the Wenatchee River, and about 3 percent of the total average flow in the Methow River); furthermore, the steelhead programs use only a portion of the total water allocation for each facility. No change of the amount of available water would be expected. Water would be returned to the river of origin near the withdrawal point. All impacts would be similar to those described under the No Action alternative.

4.3.1.2 Water Quality

While water quality may be effected by effluent from the artificial propagation activities, all the hatchery facilities would be required to operate under National Pollutant Discharge Elimination System (NPDES) permits issued by the Washington Department of Ecology. Hatchery effluent standards and point source discharge criteria are set forth in the permit to protect aquatic life and the habitat in the area below the discharge points. To monitor water quality and the impacts of hatchery effluent, the facility operators monitor total suspended solids, settleable solids, upstream and downstream temperatures, and upstream and downstream dissolved oxygen. Considering that the effluent produced from the hatchery facilities complies with Environmental Protection Agency standards, coupled with the low percentage of effluent to discharge (dilution factor), there is a low possibility that effluent produced at these facilities would negatively impact the physical environment regardless of species of fish is being reared. Under the proposed alternative in which ESA-listed steelhead are propagated, the impact would not be expected to be different than the impacts described under the No Action alternative.

4.3.1.3 Riparian Habitat

Small localized impacts at trapping sites might be incurred because steelhead broodstock would be collected at the remote locations, but because trapping periods of other propagated species (i.e., summer chinook and coho) overlap much of the steelhead trapping period, the additional impacts would likely be negligible. The release of steelhead smolts from tank trucks could result in minor, short-term impacts at the release sites. Some additional marine derived nutrients may result from the hatchery carcasses, however, in the near-term the nutrient input would be negligible.

Possible impacts on riparian habitat and associated vegetation would occur primarily through activities directly related to the facilities used for trapping and rearing ESA-listed fish and the maintenance and repair of existing facilities. Existing hatchery facilities and traps would be

utilized to carry out the proposed activities. Therefore, effects are not likely to differ substantially from those under the No Action alternative.

4.3.2 Effects On the Biological Environment

The biological resources that may be affected include both ESA-listed and unlisted anadromous fish species, freshwater fish species, and terrestrial organisms. Impacts on these resources are described in the following section.

4.3.2.1 Anadromous Fish Listed Under the ESA

The expected impacts on anadromous ESA-listed fish species in the Upper Columbia River Basin from the proposed artificial propagation program would mainly be limited to steelhead in the Wenatchee, Methow, and Okanogan River drainages. The other anadromous ESA-listed fish species expected to occur in the action area is Upper Columbia River spring chinook salmon.

Upper Columbia River Steelhead: Compared to the No Action alternative, the Proposed Action alternative has the potential to contribute to the long term persistence of ESA-listed Upper Columbia River steelhead. The steelhead artificial propagation programs may be responsible in large part for sustaining the natural production component in the Methow and Okanogan Basins within the ESU (62 FR 43937). Continuation of these programs is likely to continue to contribute to the persistence of the steelhead stock. In carrying out the programs up to 650 adults steelhead would be removed from the run annually compared to the No Action alternative. However, the long-term impacts to the ESA-listed stock would be expected to be an increase in the ESA-listed population. Under this alternative special conditions to ensure the programs are operated to the benefit of the ESA-listed species would occur. Annual limits would be placed on the number of listed steelhead allowed to be collected based on the run composition. Run attributes that would be considered include age at return, sex ratio, and natural-to-hatchery origin ratio. Annual broodstock collection protocols would be developed and approved by NMFS prior to steelhead retention to ensure that the activities do not pose a substantial risk to the recovery of the ESU. While the proposed artificial propagation program has the potential to cause deleterious direct and indirect effects on the ESA-listed species, such as maladaptive genetic, physiological, or behavioral changes in donor or target populations (Hard *et al.* 1992), the program would likely be necessary to prevent the extinction of the ESU until habitat conditions that limit the productivity of naturally-produced steelhead in the region can be improved. Therefore, the program includes elements designed to minimize adverse impacts.

Measures designed to minimize impacts on the ESA-listed species include the use of more than one artificial propagation strategy, annual consideration of run size and composition, measures to purposely manage returning artificially propagated adult steelhead, and long-term monitoring and evaluation of the efficacy of the programs and a means to modify the programs through the HCP Hatchery Committees. When implemented, these measures would help to minimize the risk of genetic and/or ecological hazards to the ESA-listed species.

The proposed programs would collect no more than 650 mixed origin (natural and artificially propagated) adult steelhead annual. In some years, the total broodstock collection goal is likely

to be less, because run composition as determined at Priest Rapids Dam would be considered, and in years of high survival of steelhead that spent two years in the ocean the collection number would be adjusted downward in consideration of the high fecundity of the older fish. The proportion of natural origin steelhead for broodstock would be determined annually, again taking into account the total run composition as determined at Priest Rapids Dam.

Spring chinook: Listed spring chinook return to the Upper Columbia River from April through early July, while steelhead typically return in July through November. The temporal separation reduces the potential for negative impacts to occur. Program operation, such as trapping directed at steelhead would not take place when most of the spring chinook run is present. Native steelhead co-evolved with native spring chinook salmon and would be expected to suffer no negative impacts from the restoration of the steelhead population. ESA-listed steelhead and the ESA-listed salmon population would both be expected to benefit from the recycled marine nutrients added to the ecosystem by natural spawning hatchery fish. The impacts of the Proposed Action alternative would likely be less than the No Action alternative because the No Action alternative could result in an increase of artificial production of other species that could potential interact more directly with ESA-listed spring chinook salmon.

4.3.2.2 Other ESA-listed Fish Species

Bull trout may be present in the waters where the proposed hatchery activities would take place. However, the impacts on threatened bull trout are expected to be negligible and similar to impacts under the No Action alternative. Bull trout are rarely seen in the broodstock collection traps used for steelhead. The WDFW has established specific procedures for handling bull trout when they are encountered, with bull trout being enumerated and released unharmed back into the river. No mortalities are expected under the Proposed Action alternative. Bull trout co-evolved with steelhead, and restoring the fully functional ecosystem would not be expected to have a negative impact. Bull trout are piscivorous and may utilize the additional steelhead eggs, fry, and parr as a forage resource. Bull trout would also be expected to benefit from the recycled marine nutrients added to the ecosystem by natural spawning artificially propagated steelhead.

4.3.2.3 Non-listed Fish Species

Non-listed fish species may be encountered during the operation of the collection traps, and affected by the hatchery effluent and the withdrawal of water. Impacts would be expected to be very small, only slightly greater than under the No Action alternative. Non-listed species that would be encountered during hatchery operations would be released unharmed, and no mortalities would be expected. Non-listed fish species may be affected by hatchery effluent but these effects are limited to the point of release and so would be transitory. Resident fish species would be expected to benefit from the nutrient enrichment and the ecosystem restoration impacts that would occur concurrently with the recovery of the steelhead populations.

4.3.2.4 Terrestrial Organisms

Similar to the No Action alternative, the scale of the proposed artificial propagation program would be relatively small given the geographic region and because it makes use of existing hatchery facilities for the hatching and rearing stages, additional impacts on terrestrial organisms, ESA-listed or unlisted, are not anticipated to be substantial or long-lasting. Additional carcasses

from artificially propagated but naturally spawning steelhead would be added to the environment but, at the level considered here, they would not likely be an important source of nutrients or food for terrestrial organisms.

4.3.3 Effects On The Socioeconomic Environment

The principal impact of the proposed Upper Columbia River steelhead artificial propagation programs would be to restore the opportunity for non-consumptive observation of spawning steelhead and the existence value of the species. Real and sustained increases in salmonid numbers are uncertain, but are not likely to be great over the near-term. The artificial propagation program would be expected to continue into the future as mitigation for the operation of the hydropower projects whose impacts cannot be entirely minimized through design and operational changes.

In years of substantial natural-origin steelhead adult return, the availability of artificially propagated steelhead for ceremonial and subsistence uses by the treaty Indian tribes would increase. In years of low returns of natural-origin steelhead, the artificially propagated steelhead would be allowed to spawn naturally to fully seed the habitat and contribute to the recovery of the listed ESU. In years of high returns of naturally produced steelhead, the artificially propagated steelhead may contribute to tribal and recreational fisheries.

Recreational fishing provides income and employment opportunities in remote, rural communities located in the Columbia River Basin. In 2001, a very high return year in which a limited steelhead harvest on artificially propagated adipose fin-clipped fish was opened, an estimated 2,855 angler trips occurred (memo from H. Bartlett, WDFW, December 9, 2002). It has been estimated that the average angler spends about $34 per trip for salmon and steelhead. This resulted in an estimated benefit of $97,000 to the local economy during the 2001 steelhead fishery. Future local economic benefits could be expected to be similar, but would be widely variable, based on run sizes, and would be considered a positive impact compared to the No Action alternative.

4.3.4 Environmental Justice

Executive Order 12898 (59 FR 7629) directs federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. As under the No Action alternative, the Proposed Action alternative would not be expected to affect human health of any population located in the action area.

Under the Proposed Action alternative increased fishing opportunities may result compared to the No Action alternative for all population segments. Tribal harvest and subsistence fishing opportunities, and potential fishing opportunities for low-income persons could increase, but would not be disproportionately affected.

4.4 Cumulative Effects

Cumulative impacts from NMFS' proposed issuance of the section 10(a)(1)(A) permits, including terms and conditions as described, would be minor if at all measurable. Incremental impacts on the environment are included in the discussion above. NMFS' permitting of the described activities would be only one element of a large suite of regulations and environmental factors that may influence the overall management of artificial propagation actions in the affected environment, and that may impact the health of listed salmon populations and their habitat. For example water quality is monitored and managed through permits from the Washington Department of Ecology. Those programs that meet the requirements of section 10 and its implementing regulations would include monitoring and adaptive management measures so that basin co-managers can respond to changes in the status of affected listed salmon and steelhead. Monitoring and adaptive management would help ensure that the affected ESUs are adequately protected and help counter-balance any negative cumulative impacts.

Other federal, state, and tribal actions are expected to occur within the action area that would increase natural fish populations in the upper Columbia River Basin. Federal actions for salmon recovery in the Columbia Basin currently underway include initiatives by the Northwest Power Planning Council, the Federal Caucus basinwide recovery strategy, and others (NOAA Fisheries 2002). State initiatives include recently passed legislative measures to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. Regional programs are being developed that designated priority watersheds and facilitate the development of watershed management plans. Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the *Wy-Kan-Ush-Mi Wa-Kish-Wit* or *Spirit of the Salmon* plan. Please see the *Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NOAA Fisheries 2002) for further discussion of anticipated actions in the Columbia River Basin. The cumulative impacts of implementing recovery programs in the upper Columbia River Basin in addition to the three permits reviewed in the EA are expected to increase the production and survival of natural fish in the four tributary basins associated with the proposed programs.

5 AGENCIES CONSULTED

The following agencies and entities were consulted during the development of this environmental assessment.

NOAA's National Marine Fisheries Service
U.S. Fish and Wildlife Service
Washington Department of Fish and Wildlife
Colville Confederated Tribes
Public Utility District No. 1 of Douglas County
Public Utility District No. 1 of Chelan County

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7 Finding of No Significant Impact

Summary

NOAA's National Marine Fisheries Service (NMFS) Northwest Region (NWR) has prepared an Environmental Assessment (EA) of its proposed action to issue three permits pursuant to section 10(a)(1)(A) of the Endangered Species Act (ESA) (NOAA Fisheries 2003):

1. Permit 1395 would be issued jointly to the Washington Department of Fish and Wildlife (WDFW), Public Utility District No. 1 of Chelan County, and Public Utility District No. 1 of Douglas County,
2. Permit 1396 would be issued to the U.S. Fish and Wildlife Service (USFWS),
3. Permit 1412 would be issued to the Confederated Tribes of the Colville Reservation (Colville Tribes).

These permits would authorize direct take of listed Upper Columbia River (UCR) steelhead during operation of artificial propagation research/enhancement programs in the UCR Basin. These program are experimental and are designed to determine whether hatcheries can assist in recovering endangered steelhead UCR streams. Permit 1395 provides mechanisms, including recreational harvest, to manage surplus adult hatchery steelhead in specific areas of the basin, and transport of surplus adult hatchery steelhead collected at Ringold Springs Rearing Facility to landlocked ponds and lakes, where they could provide additional harvest opportunity. Permit 1395 would expire on December 31, 2013, and permits 1396 and 1412 would expire on December 31, 2008.

NMFS considered and analyzed the following alternatives, all of which are discussed in detail in the EA:

Alternative 1 - No Action: Do not issue the permits, which would likely require the program operators to cease, or drastically reduce the scope of, the programs.

Alternative 2 - Issue the permit based on the application without any additional specific conditions.

Alternative 3 - Proposed Action: Issue the permits based on the application with additional specific conditions to minimize adverse impacts on the ESA listed salmonids and to enhance conservation efforts.

The proposed action would allow the permit holders to implement artificial production programs that are designed to enhance natural production of ESA-listed UCR steelhead in the Wenatchee, Methow, and Okanogan River Basins in the state of Washington. The programs are fully described in the EA and in the permit application documents.

Issuance of the permits with additional special conditions would be expected to result in the following environmental, social, and economic effects:

- Small, localized, and transitory adverse effects on water quantity and water quality from water withdrawals and hatchery effluent.
- Benefits to the survival and persistence of endangered UCR steelhead.
- Benefits to the knowledge base of artificial propagation as a tool for recovery of depressed and/or threatened and endangered species.
- Potential deleterious effects from artificial propagation such as maladaptive genetic, physiological and behavioral changes, disease transmission and reduction in the number of adults spawning in the wild.
- Few, if any, effects on other ESA-listed species through trapping activities that have the potential to handle listed spring chinook, and bull trout.
- Benefits to listed fish and other resident species from recycled marine nutrients added to the ecosystem.
- Mitigation for continued impacts from the hydro-power system where impacts cannot be minimized through design and operational changes.
- Potential increase in the availability of steelhead for ceremonial and subsistence uses by treaty tribes and the opportunity for recreational fisheries.

These are fully described in the EA.

In the EA, NMFS considered the context and intensity of the factors identified in NOAA NAO 216-6 section 6.01b, as well as short and long term effects of the proposed action. Based on the analysis in the EA, NMFS finds that:

1. Public health and safety will be minimally affected by the preferred alternative. Any degradation of water quality will be restricted to the areas immediately adjacent to hatchery facility water discharges, and any adverse effects will be localized and temporary.

2. The proposed action alternative effects on the human environment are not likely to be highly controversial, based on information provided during the public comment period and the potential benefits to socioeconomic resources expected (as described in the EA).

3. This action does not establish a precedent for future actions with significant effects nor does it represent a decision in principle about a future consideration because NMFS has analyzed many comparable programs and issued many comparable permits.

4. This action is of limited context and intensity, with limited environmental effects, individually or cumulatively.

5. The effects of this action are relatively certain and do not involve unique or unknown risks because this artificial propagation program is similar to other artificial propagation programs designed for research and enhancement of natural production as a means of conservation and recovery of protected populations.

6. The proposed action will not adversely affect areas listed in or eligible for listing in the National Register of Historic Places, or cause loss or destruction of significant scientific, cultural or historic resources.

7. The proposed action will not adversely modify or destroy designated critical habitat as defined by the ESA or designated essential fish habitat (EFH) as defined by the Magnuson-Stevens Act. The artificial propagation programs that are the subject of the proposed action will affect habitat features such as water quality, water quantity, adult passage impediment, predation, competition, and exchange of disease organisms. As discussed in the EA, any adverse effects will by minimal, localized and temporary. The proposed permit conditions and operating procedures are designed to minimize the adverse effects.

9. The proposed action does not threaten a violation of federal, state, or local law requirements imposed for the protection of the environment. To comply with water quality standards, hatchery operators must obtain National Pollutant Discharge Elimination System (NPDES) permits; this requirement is included in the application.

Environmental Justice: Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The analysis of the impacts in the EA indicates that there will be no disproportionately high and adverse environmental impacts, as described in the executive order, on minority or low-income populations by the proposed action.

References:

NOAA Fisheries. 2003. Environmental assessment of a National Marine Fisheries Service action to issue three research and enhancement permits under section 10(a)(1)(A) of the Endangered Species Act for artificial propagation of ESA-listed Upper Columbia River steelhead. NOAA Fisheries, Portland, Oregon.

Determination

Based on the analysis in the EA, I conclude that the proposed action to issue permits 1395, 1396, and 1412 with specific conditions pursuant to section 10(a)(1)(A) of the ESA does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). Therefore, an environmental impact statement is not required.

Rebecca Lent for
William T. Hogarth, Ph.D.
Assistant Administrator for Fisheries
National Oceanic and Atmospheric Administration

7/10/03
Date

Biological Opinions Supporting Incidental Take Permits

Biological Opinion for Permit No. 1347 (2003)

National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Consultation Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation

Action Agencies:	National Marine Fisheries Service (NMFS) U.S. Fish and Wildlife Service (USFWS) Bonneville Power Administration (BPA)
Evolutionarily Significant Units (ESUs) Affected:	Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) UCR spring chinook salmon (*O. tshawytscha*)
Essential Fish Habitat Affected:	Chinook Salmon
Activities Considered:	1. Issuance of an incidental take statement (ITS) to the USFWS 2. Issuance of an ITS to the BPA and the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) 3. Issuance of permit 1347 jointly to the Washington Department of Fish and Wildlife (WDFW), the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD)
Consultation Conducted by:	Salmon Recovery Division, Northwest Region Consultation Number 1999/01883

This Biological Opinion (Opinion) constitutes NMFS' consultation under section 7 of the ESA on artificial propagation programs in the UCR basin (1) operated by the USFWS that rear and release unlisted spring chinook salmon, and (2) funded by the BPA and operated by the Yakama Nation for production of unlisted coho salmon (*O. kisutch*). Additionally, it considers NMFS' intention to issue one ESA section 10(a)(1)(B) permit action authorizing incidental take of ESA-listed UCR spring chinook salmon and UCR steelhead by artificial propagation programs for unlisted summer chinook salmon, fall chinook salmon, and sockeye salmon (*O. nerka*) operated by the WDFW, and funded by the Chelan PUD and the Douglas PUD. It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided by the USFWS, the BPA/Yakama Nation, the WDFW, the Chelan PUD, the Douglas PUD, published and unpublished scientific information on the biology and ecology of steelhead and spring chinook salmon in the action area, and other sources of information. A complete administrative record of this consultation is on file with the Salmon Recovery Division in Portland, Oregon.

Approved by: D. Robert Lohn, Regional Administrator **Date Issued:** 11/2/03 (**Expires ten years from signing**)

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1 INTRODUCTION

This Biological Opinion (Opinion) is the result of an interagency consultation carried out pursuant to section 7(a)(2) of the Endangered Species Act (ESA) and implementing regulations 50 CFR §402 concerning artificial propagation programs located in the upper Columbia River (UCR) basin that rear and release unlisted spring chinook salmon, summer chinook salmon, fall chinook salmon, coho salmon, and sockeye salmon. This Opinion considers the effect of facilities operations, juvenile releases, adult collection, related monitoring and evaluations, and related research projects on ESA-listed species of anadromous salmon and steelhead in the Columbia River basin. The federal agencies that fund and/or operate hatcheries, namely the U.S. Fish and Wildlife Service (USFWS), and the Bonneville Power Administration (BPA), have initiated consultation with National Marine Fisheries Service (NMFS) on operation of the federal hatchery programs. In addition, NMFS is consulting with itself on its proposed issuance of an incidental take permit (1347) for hatchery programs implemented jointly by the Washington Department of Fish and Wildlife (WDFW) , the Public Utility District No. 1 of Chelan County (Chelan PUD), and the Public Utility District No. 1 of Douglas County (Douglas PUD) pursuant to section 10(a)(1)(B) of the ESA.

1.1 Consultation History

USFWS Artificial Propagation Programs

On December 16, 1999, the USFWS requested initiation of formal section 7 consultation under the ESA concerning the potential effects of U.S. Department of Interior-funded artificial propagation of unlisted salmon on ESA-listed salmon and steelhead in the UCR basin. Included with the USFWS consultation request was a section 7 Biological Assessment (BA) addressing the effects of the Entiat, Leavenworth, and Winthrop National Fish Hatcheries (NFH) operations, including unlisted salmon releases, on listed Columbia River salmon and steelhead (USFWS 1999). The USFWS submitted proposed modifications to the BA on March 1, 2000, to provide further information regarding proposed actions and their effects on listed fish species through the federal hatchery operations evaluated in the BA (Cates 2000). The USFWS also provided additional information regarding water withdrawals associated with the proposed hatchery programs (USFWS 2000a), and a description of a new proposed hatchery program on the Okanogan River for NMFS review (USFWS 2000b). A May 2001 agreement between NMFS, USFWS, the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), the Confederated Tribes of the Colville Reservation (Colville Tribes), and WDFW further modified proposed USFWS unlisted salmon hatchery programs under review in this Opinion (WDFW 2001). The results of the 2001 agreement have been incorporated as proposed actions evaluated for effects on listed salmon and steelhead. Most recently, the USFWS submitted draft Hatchery and Genetic Management Plans (HGMPs) (USFWS 2002a,b,c) as an additional source of information for the programs being considered in this Opinion.

BPA Funded/Yakama Nation Operated Artificial Propagation Programs

NMFS had previously completed a section 7 consultation with the BPA/Yakama Nation on April 27, 1999 authorizing, for 1999 only, coho salmon releases in the region (NMFS 1999a). The 1999 NMFS Opinion required completion of a long-term management plan for restoration of coho salmon into the mid- and UCR basin. In response to that requirement, BPA/Yakama Nation submitted an HGMP to NMFS on December 13, 1999, describing the proposed coho salmon reintroduction program (BPA 1999). The HGMP includes plans proposed by the Mid-Columbia Coho Technical Work Group for coho salmon artificial propagation activities in

the region for 2000 and beyond (BPA 1999). In a subsequent letter to NMFS on March 17, 2000, the BPA noted that their submittal of the HGMP for the coho program comprised their formal request for initiation of consultation with NMFS on that program (Beraud 2000). In December 2002, NMFS received a revised HGMP from the BPA/Yakama Nation for the mid-Columbia Coho Reintroduction Project.

Public Utility District Funded/WDFW Operated Artificial Propagation Programs

In October 1999, NMFS received a request to operate artificial propagation programs, in the form of three HGMPs from the WDFW (WDFW 1999a, 1999b, 1999c). These HGMPs addressed programs in the UCR basin that artificially propagate and release unlisted summer chinook salmon, fall chinook salmon, and sockeye salmon. The summer chinook salmon and sockeye salmon programs are funded by the Chelan PUD and the Douglas PUD. The fall chinook salmon program is funded by the Public Utility District No. 2 of Grant County (Grant PUD), and the WDFW. The WDFW operates the hatchery facilities and is the lead co-manager of the anadromous fish resources in the state of Washington.

In April 2002, negotiations on three Habitat Conservation Plans (HCPs) were concluded; *Anadromous Fish Agreement and Habitat Conservation Plan Wells Hydroelectric Project FERC[1] License No. 2149* with Douglas PUD for the operation of Wells Dam (DPUD 2002), and *Anadromous Fish Agreement and Habitat Conservation Plan Rocky Reach Hydroelectric Project FERC License No. 2145* (CPUD 2002a) with Chelan PUD for the operation of Rocky Reach Dam, and *Anadromous Fish Agreement and Habitat Conservation Plan Rock Island Hydroelectric Project FERC License No. 943* with Chelan PUD for the operation of Rock Island Dam (CPUD 2002b). These HCPs are long term agreements between NMFS, the PUDs, the WDFW, the USFWS, the Colville Tribes, and other stakeholders. They provide the PUDs with some degree of certainty for the long-term operation of these projects and require the PUDs to provide mitigation in the form of a tributary fund for habitat improvement projects, and artificial propagation programs to mitigate for unavoidable loss of natural fish production due to habitat inundation and passage mortality at the projects. The HCPs were developed to protect five species of anadromous salmonids, including endangered UCR steelhead and UCR spring chinook salmon. The HCP agreements restrict the PUDs and NMFS from changing the artificial propagation production level during the period of this permit. The HCPs provide for HCP Hatchery Committees[2] that may adjust the operation or implementation strategy of the programs based on new scientific data, changes in NMFS hatchery policy, or recommendations of the HCP Hatchery Committees.

Many of the artificial propagation programs funded by the PUDs and operated by the WDFW are intended to supplement natural populations in the UCR basin by returning adult salmon to the spawning grounds and allowing them to reproduce naturally. This supplementation strategy necessitates monitoring in the natural environment, and has lead to the inclusion of monitoring, evaluation, and research actions that previously have been considered in separated formal section 7 consultations and section 10 authorizations to be included in this consultation. Assessment of the impacts of artificial propagation programs in the natural environment is critical to increasing

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[1] *Federal Energy Regulatory Commission*

[2] *Each HCP agreement specifies the formation of a Hatchery Committee which consists of one representative of each signatory entity to the specific HCP. In general the HCP Hatchery Committee representation is likely to be similar for all three HCPs.*

our understanding of these programs after juvenile fish releases, and our ability to manage these types of actions to not only minimize adverse impacts on listed species, but to utilize these programs to conserve existing unlisted native populations to prevent future listings from being necessary. Activities previously authorized by permit 1203 issued to the WDFW that will be included in this consultation include spawning ground surveys to conduct redd counts and collection biological data from salmon carcasses, snorkeling surveys, and juvenile salmon capture actions that are specifically directed toward monitoring the artificial propagation programs impacts on the natural environment.

No long-term agreement concerning the operation of the Grant PUD hydropower projects has been reached, nor has NMFS received a permit application from the Grant PUD. The WDFW, as the artificial propagation program operator of the Grant PUD-funded programs, has submitted an HGMP for this program.

Public comment on the section 10 permit application (in the form of HGMPs) and the proposed issuance of permit 1347 was opened on October 16, 2001 (66 FR 52567), specific to WDFW operation of artificial propagation programs. On June 25, 2002 (67 FR 42755), a public comment period was opened specific to the HCPs, including Chelan PUD and Douglas PUD's obligation for artificial propagation programs to mitigate for unavoidable fish losses that result from operation of Rock Island, Rocky Reach, and Wells Dams.

A National Environmental Policy Act (NEPA) process addressing the PUD proposed actions of funding these artificial propagation programs was conducted, including public comment periods, which includes the development of an Environmental Impact Statement (EIS) (NMFS 2003a). An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) (NMFS 2003b) specific to the WDFW operation of the artificial propagation programs was also conducted, including a 30 day public comment period which opened on October 16, 2001 (66 FR 52567).

In developing this Opinion, NMFS considered information presented in documents submitted by the agencies, both federal and non-federal, operating the artificial propagation programs, and the three HCP agreements. Other sources of information considered in this Opinion include: the Biological Opinion on 1995 to 1998 Hatchery Operations in the Columbia River Basin (NMFS 1995), information in the NMFS report, *Pacific Salmon and Artificial Propagation Under the Endangered Species Act* (Hard *et al*. 1992), the *Biological Opinion on Effects on Upper Columbia River Spring Chinook Salmon Supplementation Program and Associated Scientific Research and Monitoring Conducted by the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service* (NMFS 2002a), the Artificial Production Review Report (NPPC 1999); and information available from the scientific literature. Additional information was received from federal and non-federal agencies, as indicated below, and in the "Literature Cited" section of this Opinion.

1.2 Analysis Framework

Over the course of the last decade and hundreds of ESA section 7 consultations, NMFS developed the following approach for applying the ESA Section 7(a)(2) standards as defined by 50 CRF §402.02 when determining what effect a proposed action is likely to have on a given listed species. In conducting analyses of the actions under Section 7 of the ESA, NMFS uses the following steps:

1. Define the biological requirements and current status of each listed species and the relevance of the environmental baseline to the species' current status in the action area (Section 3).

2. Determine the effects of the proposed or continuing action on listed species and their habitat and evaluate any cumulative effects within the action area (Section 4).

3. Evaluate whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species or is likely to destroy or adversely affect their designated critical habitat (Section 5).

2 PROPOSED ACTIONS

This consultation addresses artificial propagation programs that rear and release unlisted spring chinook salmon and coho salmon with a federal nexus, operated by the USFWS and the Yakama Nation. NMFS is also consulting on its proposed issuance of an incidental take permit 1347, pursuant to section 10(a)(1)(B) of the ESA, jointly to the Chelan PUD, the Douglas PUD, and the WDFW on the operation of seven non-federal artificial propagation programs.

Table 1. Federal hatchery programs considered in this Opinion.

Hatchery Facility	Agency	Program	Annual production level
Leavenworth NFH	USFWS	Carson stock spring chinook salmon	1,625,000
Entiat NFH	USFWS	Carson stock spring chinook salmon	400,000
Winthrop NFH	USFWS	Carson stock spring chinook salmon [a]	600,000
Winthrop NFH	USFWS	Okanogan basin spring chinook salmon reintroduction	50,000
various	BPA/YN	Wenatchee basin coho salmon reintroduction	1,000,000
various	BPA/YN	Methow basin coho salmon reintroduction	250,000

[a] *Carson stock is being phased out and replaced with Methow Composite stock.*

Table 2. Non-federal hatchery (Chelan PUD, Douglas PUD, and WDFW) programs considered in this Opinion.

Implementing Entity Program	Hatchery Facilities	Annual production level
Chelan PUD		
Eastbank Hatchery is the central facility for these programs		
Wenatchee sockeye salmon	Lake Wenatchee Net Pens	200,000
Wenatchee summer chinook	Dryden Pond	864,000
Methow summer chinook	Carlton Pond	400,000
Okanogan summer chinook	Similkameen Pond	576,000
Turtle Rock summer chinook	Turtle Rock Hatchery	1,800,000
Douglas PUD		
Wells summer chinook salmon	Wells Hatchery	804,000
Grant County PUD [a]		
fall chinook salmon	Priest Rapids Hatchery	6,700,000

[a] *This permit for this program is proposed to be issued only to WDFW. Grant PUD is not part of the permit application at this time.*

Comprehensive descriptions of all proposed activities evaluated in this Opinion were presented in the BAs and HGMPs submitted to NMFS by the federal and non-federal action agencies (USFWS 1999; 2000a; 2000b; 2002a; 2002b; 2002c; BPA 1999; CPUD 2002a; 2002b; DPUD 2002; WDFW 1999a; 1999b; 1999c; 1999d). Updates or changes in the hatchery facilities and programs, including goals, broodstock collection strategies, and release numbers, were also included, as provided by the respective action agencies in BAs and HGMPs. A total of 13 hatchery programs (six federal and seven non-federal) with releases of approximately 15.3 million salmon smolts are proposed for operation and considered in this Opinion (Tables 1 and 2).

An early product of HCP negotiations was the *Biological Assessment and Management Plan* (BAMP) (1998) developed by technical representatives from the co-managers[3] and signatory entities of the HCPs. The BAMP included review and recommendation for all artificial propagation programs in the UCR basin, HCP related and otherwise. Although the BAMP does not create legal obligations as a stand-alone document, it does provide guidance for program management and monitoring and evaluation of UCR artificial propagation programs. The HCPs define the commitment by the PUDs for implementation of hatchery propagation programs for steelhead, summer/fall chinook salmon, spring chinook salmon and sockeye salmon for the middle and upper Columbia River region. The proposed actions addressed in this Opinion are derived from the HCP agreements, the WDFW HGMPs, the USFWS permit application, and the Yakama Nation HGMP.

[3] *Anadromous fisheries resource co-managers in the UCR basin include the WDFW, the USFWS, NMFS, the Colville Tribes, and the Yakama Nation.*

2.1 U.S. Fish and Wildlife Service

The USFWS operates the Leavenworth NFH Complex in the UCR region constructed by the U.S. Bureau of Reclamation (BOR) to replace fish losses that resulted from construction of Grand Coulee Dam. These programs were authorized as part of the Grand Coulee Fish Maintenance Project (GCFMP) on April 3, 1937, and re-authorized by the Mitchell Act (52 Stat. 345) on May 11, 1938. The complex consists of three hatchery facilities, Leavenworth, Entiat, and Winthrop NFHs, with the following mission:

> "*To produce high quality spring chinook salmon and summer steelhead smolts commensurate with the production goals established by the Columbia River Fisheries Management Plan*" (USFWS 2002a)

Historically, these facilities have reared and released spring chinook salmon eggs transferred from the Carson NFH on the lower Columbia River. Carson-stock spring chinook salmon are not included in the ESA-listed UCR spring chinook salmon ESU. The USFWS has discontinued transferring eggs from Carson NFH in favor of utilizing hatchery-origin adult spring chinook salmon returning to each facility as the primary egg source.

Artificial propagation program activities proposed by the USFWS include the collection of unlisted spring chinook salmon for broodstock; holding and spawning of broodstock; incubation of resultant eggs; juvenile fish rearing; externally marking by removal of the adipose fin (fin-clipping); internal tagging with coded-wire tags (CWTs) and/or passive integrated transponder (PIT) tags; release of yearling spring chinook salmon smolts into UCR basin tributaries.

Standardized, routine activities related to the proposed hatchery facility operations include:

- Monitoring of total suspended solids, settleable solids, and influent and effluent water temperature, and compliance with a National Pollutant Discharge Elimination System (NPDES) Permit No. WA-000190-2 (EPA 1977) issued for the hatchery operation.
- Following fish disease control policies as outlined by the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998), the Integrated Hatchery Operation Team (IHOT 1995) and the Pacific Northwest Fish Health Protection Committee (PNFHPC 1989), to promote production of healthy fish and to reduce the incidence of diseases.
- Burying of spawned-out carcasses at these facilities to reduce the potential for fish disease transmission (USFWS 1999), or distribution in natural production areas for stream nutrient enrichment purposes, if appropriate disease-free certifications and permits are received.

Artificial propagation program and hatchery facility operational activities specific to the programs at each facility are detailed below.

2.1.1 Leavenworth National Fish Hatchery

The USFWS proposes to continue to operate the Leavenworth NFH to rear unlisted Carson stock spring chinook salmon. The annual fish production goal is 1,625,000 yearling spring chinook salmon smolts at a size of 15 to 18 fish per pound (fpp) which equates to approximately 137 to 146 mm fork length (fl) for release in April. External marking with an adipose fin-clip has

increased in the last few years from about 12 percent in 2000, to 18.5 percent (300,000 fish) in 2001, 34 percent (550,000 fish) in 2002, and 50 percent (810,000 fish) in 2003 (Cates 2000). A representative proportion of the total annual externally marked yearling release will also receive a CWT. In some years, PIT tags may be inserted into the smolt prior to release to monitor travel time, smolt migration survival, and smolt-to-adult survival. Increased hatchery fish marking will improve the ability to identify contributions to fisheries and escapement, and to monitor and evaluate straying of Carson stock spring chinook salmon adults to watersheds within the listed ESU, but outside of the hatchery release areas.

Returning adult spring chinook salmon are collected for broodstock as volunteers to the hatchery. The fish ladder and trap are typically operated from mid-May through July. The annual broodstock collection goal necessary to meet production levels for the hatchery is 1,000 adult fish.

An annual average of 1,282 spring chinook salmon adults trapped are surplus to broodstock collection. These surplus spring chinook salmon have been routinely distributed in unspawned condition to tribal and non-profit groups, including the Yakama Nation for ceremonial and subsistence purposes. Trout Unlimited, a private fish conservation organization, has also received surplus spring chinook salmon adults for various functions to raise money for fish restoration purposes (Dan Davies, USFWS, pers. comm.). About 350 surplus salmon have been released into Peshastin Creek for natural spawning in some years. The USFWS proposes to continue the above surplus spring chinook salmon distributions, including outplanting unspawned adults into Peshastin Creek.

2.1.2 Entiat National Fish Hatchery

The USFWS proposes to continue to rear and release unlisted Carson stock spring chinook salmon at the Entiat NFH with an annual production goal of 400,000 yearling spring chinook salmon smolts (13-18 fpp) for on-station release in April.

Adult spring chinook salmon are collected for broodstock as volunteers to the hatchery. The adult ladder and trap are typically operated to collect broodstock from mid-May through July. The annual broodstock collection goal for the facility is 350 adult spring chinook salmon. In addition, 100 adult fish from Entiat NFH will be made available for transfer to Omak Creek, in the Okanogan River basin, for spring chinook salmon reintroduction purposes (WDFW 2001). Although the intent is to meet broodstock collection and egg take goals for the program through spawning of fish recruiting to Entiat NFH, the USFWS proposes that egg take short-falls be augmented through transfers from Leavenworth NFH.

To improve monitoring and evaluation of Entiat NFH spring chinook salmon straying to natural production areas, other hatcheries, and other fish collection facilities in the region (e.g., Wells Dam), 100 percent of the Entiat NFH yearling spring chinook salmon production will be externally marked with an adipose fin-clip. A representative proportion of the total annual release of externally marked yearling fish will receive a CWT for fisheries contribution and fish survival evaluation purposes. The external marking, and the recovery of those fish receiving a CWT, will improve the ability to monitor and evaluate contribution to fisheries, and escapement to regional hatcheries, fish collection facilities, and natural spawning areas.

Distribution of adult Carson stock spring chinook salmon returning to the hatchery that are surplus to fish production needs to the Colville Tribes and Spokane Tribes will be maximized (WDFW 2001). Any remaining surplus fish will be used for local food banks, and for nutrient enhancement through carcass dispersion in the Entiat River watershed.

The USFWS has collected tissue sampled from spawning ground carcasses as a means to investigate the contribution and impact of the Carson-lineage artificial propagation program on the indigenous stock. They proposed to continue this sampling through at least 2005 return year.

2.1.3 Winthrop National Fish Hatchery

Winthrop NFH is one of two major anadromous salmon production facilities that operate in the Methow River basin. The hatchery is located adjacent to the Methow River in north-central Washington, near the town of Winthrop. The original hatchery purpose was to mitigate for the loss of salmon to fisheries due to lost habitat caused by the construction and operation of Grand Coulee Dam. Following the ESA listing of the local stock of spring chinook salmon in the Methow River basin, and the inability to maintain complete separation of the Carson stock fish from the listed stock, Winthrop NFH management objectives were modified to include the recovery of the local endangered stock. To achieve this new objective, the USFWS is in the process of discontinuing the Carson stock spring chinook salmon at this facility and transition to the Methow Composite stock. The annual production goal at Winthrop NFH is 600,000 yearling spring chinook salmon smolts (15-18 fpp) for on-station release in April. The USFWS released approximately 201,000 listed spring chinook salmon yearlings, and zero unlisted (Carson) stock yearlings from the hatchery in 2002, and 265,000 listed spring chinook salmon and 260,000 Carson crossed spring chinook salmon in 2003.

Spring chinook salmon adults can be trapped upon return as volunteers to the hatchery ladder. No weir is used to direct migrating spring chinook salmon adults in the Methow River into the hatchery. The Winthrop NFH fish ladder has typically been operated to collect spring chinook salmon adults from mid-May through July. The unlisted spring chinook salmon broodstock collection goal in 2000 was 357 adult fish. This collection goal was proposed to be reduced as the spring chinook salmon program is transitioned to the propagation of listed spring chinook salmon (USFWS 1999).

Under the 2001 Methow basin spring chinook salmon production agreement (WDFW 2001) and subsequent 2002 agreement (NMFS 2002b), no returning adult spring chinook salmon were collected at Winthrop NFH for use as broodstock. Spring chinook salmon gametes required to effectuate the program were collected at the WDFW's Methow Hatchery, or the Chewuch River trapping facility. All adult Carson stock fish returning to Winthrop NFH were prevented from entering the hatchery facility, and allowed to spawn naturally in the Methow River.

Unlisted Carson stock spring chinook salmon produced in previous years at Winthrop NFH have been, and will continue to be differentiated from listed spring chinook salmon at the time of spawning through on-site reading of CWTs removed from each fish.

Currently, Carson-lineage hatchery spring chinook salmon returning to the region from past juvenile fish releases cannot be differentiated from listed spring chinook salmon produced through the WDFW and USFWS supplementation programs by external examination. Both groups carry the same adipose fin-clip/CWT combination mark. Winthrop NFH-origin

Carson-lineage spring chinook salmon inadvertently collected with listed spring chinook salmon adults at Wells Dam or tributary trap sites have been transported to Winthrop NFH and the WDFW's Methow Hatchery for holding through spawning. Regardless of collection site, unlisted Carson spring chinook salmon and target, listed spring chinook salmon will be identified and separated during spawning at the hatcheries through on-site evaluation of CWTs removed from all fish. Carson-lineage spring chinook salmon adults identified through this process may either be used as broodstock for authorized unlisted salmon production programs, or left unspawned as surplus to production needs.

Under the 2001 and 2002 Methow agreements (WDFW 2001; NMFS 2002b), production of listed spring chinook salmon smolts is given priory over non-listed Carson stock smolts at Winthrop NFH. Future smolt releases will be confined to listed composite, native spring chinook salmon stock-origin fish beginning with the 2004 brood. As mentioned previously, unlisted Carson stock spring chinook salmon smolts, or Carson x listed spring chinook salmon crosses, will only be produced at the hatchery to prevent short-falls in the agreed, annual 1.15 million hatchery smolt production goal for the Methow basin through 2003 brood years (WDFW 2001, NMFS 2002b). Carson stock spring chinook salmon adults may be collected at Winthrop NFH to compensate for collection short-falls at the preferred WDFW listed spring chinook salmon trapping locations. Any smolts produced through Carson stock collections at the hatchery that are surplus to the number needed to meet Methow basin production needs would be outplanted into the lower mainstem Methow River or used for programs outside the Methow basin (NMFS 2002b). All listed spring chinook salmon smolts released from Winthrop NFH will receive an internal tag to allow for their identification at the time of spawning.

In 2000, a new program was proposed to reintroduce spring chinook salmon in the Okanogan River basin, using surplus Carson-lineage spring chinook salmon produced at Leavenworth Complex Hatcheries (including Winthrop NFH) as the primary brood-source (USFWS 2000b). This original proposal was modified through the 2001 "Methow/Upper Columbia Agreement" (WDFW 2001). The USFWS originally proposed to transfer 50 Carson-lineage marked adult spring chinook salmon pairs from Winthrop NFH to Omak Creek in the Okanogan River watershed for release each year, beginning in 2001 and extending through 2004. As a result of the 2001 Methow/Upper Columbia agreement, these adult fish will be made available from Entiat NFH (WDFW 2001). If water temperatures in Omak Creek are too high to allow successful transfer and survival of adult fish, USFWS proposes to plant 100,000 eyed eggs or marked fry that are progeny of Carson-lineage adults taken at Winthrop NFH as a substitute.

Beginning in 2001 and extending through 2005, the USFWS also proposed to produce and transfer 40,000 to 50,000 Carson-lineage spring chinook salmon yearlings to Omak Creek from Winthrop NFH. This yearling production is proposed to augment adult, egg, or fry out-plants. All yearling fish released into Omak Creek in 2001 were marked with a ventral fin-clip. Under the 2001 agreement (WDFW 2001), 300,000 Carson stock juveniles held at Winthrop NFH were raised to smolts, and out-planted in the Okanogan River basin. With the agreed, immediate phase-out of Carson stock production at Winthrop NFH, surplus spring chinook salmon yearlings for the Omak program will be provided in future years from either Entiat or Leavenworth NFH. Further details regarding the spring chinook salmon reintroduction program in Omak Creek are provided in the following section describing Okanogan River basin programs.

In addition to the Okanogan River spring chinook salmon reintroduction program, two other uses of surplus Carson stock spring chinook salmon have been proposed (USFWS 2000b). These

additional programs were originally proposed as "relief valve" measures to disperse excess Carson-lineage spring chinook salmon to appropriate release sites, as an alternative to culling surplus unlisted hatchery salmon. This option may be applied in future years to address Carson stock surpluses at regional hatcheries. The USFWS transferred up to 2.0 million unfed spring chinook salmon fry originating from surplus Carson-lineage spring chinook salmon adult returns to USFWS' Big White Salmon River NFH and WDFW's Ringold Hatchery for rearing and release (USFWS 2000b). USFWS indicates that as the phase-out of the Carson-lineage spring chinook salmon stock is completed at Winthrop NFH, these "relief valve" programs will be re-evaluated. The effects of juvenile spring chinook salmon releases and adult returns on listed salmonids resulting from the Big White River and Ringold programs are evaluated in a separate section 7 consultation pertaining to mid-Columbia River region hatcheries.

Through the 2000 release year, all spring chinook salmon yearlings released from Winthrop NFH into the Methow River have been marked with an adipose fin-clip/CWT combination for identification, and monitoring and evaluation purposes. Beginning in 2002, all spring chinook salmon smolts produced at the hatchery will be internally tagged (and if of Carson x Chewuch or other non-Carson origin, adipose fin-clipped) to allow for their differentiation from other listed and unlisted Methow basin fish upon return as adults to the region for spawning, hatchery fish survival evaluations, or stock assessment purposes. Annual monitoring by USFWS and WDFW includes recovery of straying hatchery fish in natural production areas and at other hatchery and fish collection facilities in the UCR region.

The proposed Okanogan River spring chinook salmon program is new. The reintroduction program in the basin began with releases of 1999 brood year fish in 2001, and will extend through 2005 (USFWS 2000b). The main purpose of the program is to release spring chinook salmon into a watershed that is believed by some parties to have historically supported this chinook salmon race. Original artificial production plans for the region (e.g. BAMP 1998) do not mention use of Carson stock spring chinook salmon for reintroduction purposes in the Okanogan basin. Past discussions have included use of the indigenous listed Methow "Composite" stock for this purpose, however very low adult return abundances and egg take levels have not yet allowed for any transfers of the stock out of the Methow basin. The parties to the 2001 "Methow/Upper Columbia Agreement" have indicated the need to identify the most appropriate stock for use in the Okanogan River basin (WDFW 2001).

As an outcome of the 2001 and 2002 agreements, the USFWS may transfer unlisted spring chinook salmon adults, eyed eggs, or fry, and pre-smolts or smolts from the Leavenworth Complex hatcheries (including 1999 and 2000 brood year juveniles from Winthrop NFH) for release into suitable habitat in Omak Creek, a left bank tributary to the Okanogan River near Omak, Washington. The source of unlisted spring chinook salmon to effectuate the introduction effort may include the other Leavenworth Complex hatcheries beginning with the 2001 brood year.

Facilities at Winthrop NFH used to support the Okanogan River spring chinook salmon reintroduction program were described above. The USFWS has recommended on-site acclimation of spring chinook salmon pre-smolts or smolts transferred to Omak Creek, to increase smolt to adult survival rates and to reduce potential straying of returning adult fish. The USFWS, WDFW, and Colville Tribes are currently identifying potential water sources and rearing locations for that purpose. Adult fish transferred by USFWS will be released directly into Omak Creek to spawn naturally. Eyed eggs, if produced for the program, will be incubated in

egg boxes at yet to be identified locations on Omak Creek to produce unfed fry. Spring chinook salmon fry transferred from Winthrop NFH or the other Leavenworth Complex hatcheries will be released directly into suitable habitat in Omak Creek.

The locations of the donor USFWS hatcheries and the Okanogan River are within the same Fish Health Management Zone (FHMZ). The FHMZs were defined by the Co-managers (WDFW and the Washington Treaty Tribes) as a means to limit disease transfer risks between isolated basins (NWIFC and WDFW 1998).

The proposed annual spring chinook salmon reintroduction goals for the program include release of 50 pairs of adult Carson-lineage spring chinook salmon into Omak Creek (USFWS 2000b; WDFW 2001). The adult spring chinook salmon release program would begin in 2001 and continue until August, 2004. The USFWS proposes to provide adult fish each year from Winthrop NFH, or if unavailable at Winthrop (as is likely with no broodstock collection in 2001 and phase out of production of the stock), from Entiat NFH or Leavenworth NFH. If release of unlisted adult spring chinook salmon is not feasible due to high water temperatures in Omak Creek (exceeding 55 degrees Fahrenheit) at the planned time of release, USFWS proposes to transfer up to 100,000 eyed eggs or 100,000 fry as a substitute. Beginning in 2003, Entiat NFH and Leavenworth NFH will be the donor sources, commensurate with phase out of Carson stock propagation at Winthrop NFH.

In addition to adult spring chinook salmon, or eyed egg or fry releases, USFWS proposes to transfer pre-smolt or yearling smolt spring chinook salmon to Omak Creek for acclimation prior to release. Transfers of pre-smolts and smolts began in spring 2001 and will continue through the 2005 release year. Approximately 40,000 brood year 1999 Carson-lineage yearling smolts were transferred from Winthrop NFH and released in 2001. Up to 50,000 yearling pre-smolts or smolts were proposed by USFWS for transfer and release in subsequent years (USFWS 2000b). Under the 2001 agreement (WDFW 2001), 300,000 brood year 2000 Carson stock juveniles initially reared at Winthrop NFH were transferred to an acclimation pond in the Okanogan basin for final rearing and were subsequently released in April 2002.

The USFWS proposes to externally marked with an adipose fin-clip all Carson-lineage spring chinook salmon adults released into Omak Creek through the program. An external mark will allow for differentiation of transferred hatchery fish from any natural-origin spring chinook salmon in Omak Creek. The progeny of naturally spawning hatchery spring chinook salmon transferred as adults to Omak Creek, and any eyed eggs transferred for incubation and release as fry, would not be marked. The USFWS recommended that eggressing fry or emigrating smolts that result from adult and eyed egg transfers be captured in Omak Creek and marked to evaluate their survival and to monitor straying of resultant adult fish.

All spring chinook salmon fry and yearling smolts transferred from the USFWS hatcheries to Omak Creek will also be externally marked. Marking of all fry stage or larger spring chinook salmon released into Omak Creek will allow for hatchery fish performance (e.g., juvenile to adult survival) and adult fish straying evaluations.

2.2 Bonneville Power Administration/Yakama Nation

The proposed long-term goal is to restore adult coho salmon populations in the UCR basins to their historical levels: 6,000 to 7,000 in the Wenatchee River basin, 23,000 to 31,000 in the Methow basin, and 9,000 to 13,000 in the Entiat basin (BPA 1999, historical levels from Mullan 1983). In identifying these production goals, Yakama Nation acknowledged that, due to varying degrees of habitat degradation in each of the basins, historical numbers used to establish the goals are unlikely ever to be achieved (BPA 1999; YN *et al*. 2002). The feasibility phase of the coho salmon restoration program is expected to extend from 2000 through at least 2005, perhaps longer for some studies. The Yakama Nation estimates an annual return (based on release numbers and assumed survival rates) of 2,100 to 3,800 coho salmon adults to the Wenatchee River, and 130 to 180 coho adults to the Methow River during the 2001 through 2005 period (Dunnigan *et al*. 2001). Following are descriptions of the coho salmon programs in the Wenatchee and Methow River basins. Specifics of a coho salmon program for the Entiat River have not been proposed at this time.

2.2.1 Wenatchee River Basin Coho Salmon Reintroduction

At this time, there is no central hatchery facility for coho salmon production in the UCR basin, and releases into the Wenatchee River basin rely on transfers from various facilities throughout the Lower and UCR basins of up to 1.0 million pre-smolts to existing rearing ponds (hatchery and natural locations) for acclimation prior to release (Table 3). Coho salmon broodstock for the Wenatchee Coho Reintroduction program will be collected in the Wenatchee River and spawned at a mid-Columbia facility, currently Entiat NFH. A broodstock collection goal of 1,400 coho adults is required for replacement in the hatchery environment (Murdoch and LaRue 2002). If necessary, to meet production goals, progeny from lower Columbia River hatchery broodstock for the BPA/Yakama Nation program will be incubated and reared at Willard NFH and/or ODFW's Cascade Hatchery in the Lower Columbia River. Pre-smolts (~20 fpp average size) produced at the lower Columbia hatcheries are transferred to Wenatchee basin acclimation sites in late winter or early spring the subsequent year. The broodstock collection phase of the lower river hatchery program will be described and analyzed in a separate NMFS section 7 consultation addressing Lower Columbia River basin unlisted salmon hatchery effects.

Adult coho salmon returning to the Wenatchee River basin are proposed to be collected at Dryden Dam and Tumwater Dam trapping sites, and possibly at Leavenworth NFH (ladder and "Dam 5"). The Winthrop NFH trap in the Methow River watershed will also be used to collect broodstock, whose progeny could be used to supplement releases in the Wenatchee River basin. The traps are proposed to be operational from September through early December at these locations, during which time coho salmon adults required as broodstock can be collected. Adult coho salmon returning to Leavenworth NFH will be trapped in the fish ladder, or at Dam 5 at the base of the old Icicle Creek channel. The Yakama Nation propose to operate the Dryden Dam trap passively 24 hours a day, 5 days a week to trap coho broodstock in the mainstem Wenatchee River. The Dryden trap would be checked by Yakama Nation staff once a day during this period. To provide an additional trapping option for the mainstem river, the Yakama Nation also propose to operate the Tumwater Dam trap to collect coho salmon broodstock or for monitoring and evaluation purposes. Under the proposal, the Tumwater trap will be operated 8 hours a day, three days a week, with the ladder open during the night, through December 8.

Table 3. Estimated source of proposed coho releases in the Wenatchee River basin.

Release year	Lower River [a]	Wenatchee production	Methow production	Total
1999	1,000,000	0	0	1,000,000
2000	1,000,000	0	0	1,000,000
2001	856,000	0	144,000	1,000,000
2002	400,000	600,000	0	1,000,000
2003	0	837,000	163,000	1,000,000
2004	0	1,000,000	0	1,000,000
2005	0	1,000,000	0	1,000,000

[a] *only if localized production is sufficient to meet total release numbers.*

In 2000, coho salmon adults captured at the Wenatchee basin trapping locations were held at the WDFW's Chiwawa Ponds through spawning. Eggs taken from the fish were incubated at Leavenworth NFH through the eyed stage, and transferred to Cascade and Willard hatcheries for hatching and for continued propagation. Broodstock holding, spawning, and incubation locations used to accommodate Wenatchee basin coho returns are subject to the availability of facilities. For 2002 and beyond, coho collected in the Wenatchee basin will be held and spawned at Entiat NFH; incubated to the eyed egg stage at Entiat NFH and transferred to Cascade and Willard NFH for final incubation and rearing. Coho salmon that return to their release site in the Methow River basin (Winthrop NFH) are held, spawned, incubated, and reared there (YN *et al*. 2002). Coho salmon adults spawned through the proposed programs will be buried or returned to the river.

In the Wenatchee River basin, the Yakama Nation propose to acclimate, rear, and release up to 1,000,000 coho salmon at several acclimation locations (Table 4). Sites have changed in the past due to research needs and/or landowner decisions, and they could change again in the future. Planned or previously used acclimation sites currently include Nason Creek (Butcher Creek and Early Pond), Beaver Creek, Coulter Creek, Mahar Creek Pond, Whitepine Beaver Pond, Little Wenatchee River (Two Rivers), Comstock Creek, Bender Creek and Icicle Creek (Leavenworth NFH old river channel through 2003, and then in unused small Foster-Lucas ponds on the Leavenworth NFH grounds). The Leavenworth NFH (the old Icicle Creek channel) and Butcher Creek sites are in operation (beginning in 1999). The Beaver Creek and Early Pond sites were used for coho smolt acclimation and release beginning in 2002. Additional sites, primarily in the Nason Creek watershed, are proposed for use beginning in 2003. Some have been and others will be subjected to an environmental analysis by the Yakama Nation.

Progeny from returning adults to the Wenatchee and Methow River basins will be planted into natural habitat areas as a first priority. If the number of progeny from returning adults (mid-Columbia brood) is low, then Lower Columbia River hatchery transfers will be released in natural habitat areas. Coho salmon pre-smolts will be transferred in February, March or April from Lower Columbia River hatcheries to the Wenatchee basin acclimation sites. The duration of acclimation generally ranges from four to six weeks post-transfer, after which time the fish are volitionally released. The target size range for coho smolts at the time of release is 110 to 120

mm fl (20 to 25 fpp), but because fish come from several hatcheries, a number of factors limit the Yakama Nation's control over final size. The expected volitional release period is April 15 through May 30 (YN *et al*. 2002.).

Permanent hatchery rearing locations required in the UCR region for progeny of adult coho salmon returns will not be proposed until feasibility has been demonstrated, although options have been identified. These include sites on the Chiwawa River, White River, Two Rivers (Little Wenatchee), Leavenworth NFH, Entiat NFH, and Dryden Dam, but others could be identified in the future (YN *et al*. 2002).

All phases of the coho salmon program will follow fish disease control policies outlined by the IHOT (1995) and the PNFHPC (1989) to reduce the incidence of diseases (YN *et al*. 2002). Fish will be monitored to detect and diagnose disease outbreaks at all production facilities.

Of the total annual number of coho salmon smolts transferred from Lower Columbia River hatcheries for release into the Wenatchee River, the BPA/Yakama Nation propose to mark 8,000 each year through 2002 with a PIT-tag for identification and monitoring and evaluation purposes. Of the total annual number of coho salmon smolts originating from adult collections in the Wenatchee River for release into the Wenatchee River basin, 17,000–24,000 (depending on funding) will be marked each year beginning in 2002 with a PIT-tag, to measure downstream smolt survival rates. All coho releases into the Wenatchee basin will be internally marked with a coded wire tag for evaluation. No external marking is proposed (YN *et al*. 2002).

Table 4. Estimated coho salmon smolt releases for the Wenatchee River basin for 2000 - 2005.

Release Year	Nason Creek	Beaver Creek	Two Rivers	Comstock Creek	Bender Creek	Leavenworth (Icicle Creek)	Total
2000	75,000					925,000	**1,000,000**
2001	75,000					925,000	**1,000,000**
2002	173,500 [a]	75,000		75,000		676,500	**1,000,000**
2003	306,000 [a]	75,000	100,800		37,500	453,100	**1,000,000**
2004	TBD	TBD	TBD	TBD	TBD	TBD	**1,000,000**
2005	TBD	TBD	TBD	TBD	TBD	TBD	**1,000,000**

[a] *Includes releases from Merritt Pond on Nason Creek.*
TBD: "To be determined". Release levels by site beyond 2003 to be determined through application of research results additional research needs, and to meet natural production goals.

The monitoring and evaluation program proposed for the coho salmon reintroduction effort is detailed in a HGMP submitted by the BPA/Yakama Nation (YN *et al*. 2002). Additional descriptions of research proposed to evaluate coho salmon smolt predation on spring chinook salmon fry, and coho salmon smolt interaction with sockeye salmon juveniles, were also submitted for review (YN 2001a; 2001b). Internal tagging of the juvenile coho salmon is proposed to estimate the smolt-to-adult survival rate for coho juveniles released into the Wenatchee River basin. A proportion of all coho salmon will be PIT-tagged to help identify the

proportion of smolt-to-adult mortality that is occurring in the freshwater migrant lifestage and to monitor year-to-year changes in juvenile fish survival.

Predation and species interaction studies are proposed for the Wenatchee River basin to determine the effects of the coho salmon release program on listed and unlisted salmon (YN 2001a; 2001b; YN *et al*. 2002). The BPA/Yakama Nation propose to operate a five-foot diameter rotary screw trap in Nason Creek at approximately rm 0.8 to capture emigrating coho salmon, and to evaluate coho smolt predation on spring chinook salmon juveniles (YN 2001a; YN *et al*. 2002). Subject to water conditions, the BPA/Yakama Nation may also use beach seines or electroshockers to collect coho smolts that may be holding upstream of the trap location. The trap will be located below the proposed coho release site on Nason Creek, and below all natural spring chinook salmon spawning areas in the creek. This trapping location therefore increases the likelihood for capture of emigrating hatchery and natural-origin salmon, and detection of predation, if it is occurring. The trap will be operated from mid-March through mid-June to encompass the expected emigration period for coho salmon smolts released from Nason Creek acclimation sites, as well as for a study of predation by "naturalized" smolts. The trap will be operated up to 12 hours per night, with staff checking the trap every hour during the hatchery predation study. During the study of predation by "naturalized" smolts, the trap will run 24 hours/day, seven days/week, and be checked as necessary (once to twice per day) until sufficient numbers of migrants warrant the start of stomach sample collection and hourly checks. The rotary cone will be locked in the "up" position when the trap is not in operation, for public safety purposes.

Fish captured (including coho collected by beach seine or electroshocker) will be anesthetized with MS-222 and enumerated by species. A random sample of the catch each day will be sampled to collect morphometric data. A total of 1,000 juvenile coho salmon will be randomly collected, sacrificed and preserved for later stomach content analysis. Stomach content data will be used to derive the incidence of spring chinook salmon fry predation, and then the estimated total number of chinook salmon consumed.

The BPA/Yakama Nation estimated that the operation of the Nason Creek trap may lead to the capture, handling, and release of up to 1,000 spring chinook salmon smolts and 500 fry each year, with an incidental lethal take of up to 20 smolts and 10 fry (YN *et al*. 2002). The BPA/Yakama Nation does not expect to encounter any listed adult spring chinook salmon because the timing of trap operation does not overlap with the June-July migration period or the August-September spawning period for adult fish (YN 2001a). Trap operation could also lead to capture, handling, and release of up to 500 steelhead juveniles, with an incidental lethal take of up to 10 smolts (YN *et al*. 2002).

The BPA/Yakama Nation also propose to continue a sockeye salmon/coho salmon interaction study in Lake Wenatchee which began in 2001 (YN 2002). The study has three components: coho radio-telemetry work designed to determine duration and route of hatchery coho emigration through Lake Wenatchee post-release; tow-net sampling and evaluation to determine the distribution of sockeye salmon fry in Lake Wenatchee during the coho smolt emigration period; and a study of coho smolt predation on sockeye, using an existing WDFW trap at the outlet of Lake Wenatchee. For the first component, the BPA/Yakama Nation proposes to radio-tag and release up to 150 coho migrating smolts (originating from Butcher Creek releases collected at the Nason Creek screw trap site) into the Little Wenatchee and White Rivers from 1-2.5 miles upstream of Lake Wenatchee. Radio-tagged smolts will be tracked in Lake Wenatchee and just

downstream of its outlet using a combination of six fixed monitoring stations and mobile tracking. Mobile tracking will occur by boat at four transects in the lake a minimum of 4 days per week, beginning the date of tagged fish release. Mobile tracking will continue along designated transects until the maximum tag life has passed, if not all coho have exited the lake (based on fixed station readings). The predation study would use methods similar to the Nason Creek predation study.

The proposed sockeye salmon fry distribution study will employ either a conical tow net or bongo-type tow nets (transect sampling) to collect fry. Seven sampling units have been identified for weekly fishing of the tow nets during April and May in 2002. Details regarding tow net sampling location, timing and tow duration are presented in Yakama Nation (2001b). The type of nets proposed for the study are designed to capture small fish without injury or mortality. The cod-end bucket proposed for use on the tow nets creates a safe reservoir for fish entrained in the net. Fish collected in the cod-end bucket will be removed after each ten-minute tow period, anesthetized with MS-222, and enumerated by species. A sub-sample of up to 20 fry from each 10 minute sample period will be measured and weighed. All fry will be allowed to recover before release into the lake. The BPA/Yakama Nation proposes to use a mid-water trawl to collect sockeye fry, in the event that the bongo-type tow nets prove ineffective (YN 2001b). The mid-water trawl is constructed of 1' stretch mesh near the opening, decreasing to 1/8" mesh at the cod-end. The trawl has a 6' by 6' square opening and is 21 feet long. In the littoral zone the BPA/Yakama Nation proposes to snorkel or employ beach seines to locate sockeye fry.

The radio-telemetry portion of the species interaction study should not affect listed spring chinook salmon. During 2002, the Yakama Nation staff captured only sockeye salmon fry and sockeye salmon smolts. All smolts were released uninjured (no descaling or visible injury). No bull trout or spring chinook salmon were encountered in 2001 or 2002. If spring chinook salmon are present in the lake, they are not pelagic and will not be found in the center as sockeye salmon are (where we are tow netting). Spring chinook salmon would be found only near the lake edges. Therefore, we estimate no take of spring chinook salmon or bull trout from tow netting.

In 2003, the project will begin a study of coho salmon predation on sockeye, using methods similar to those described for the Nason Creek predation study. The Yakama Nation would collect coho smolts using the existing WDFW trap at the outlet of Lake Wenatchee, beginning approximately March 1 and ending approximately June 30 (BPA 2001). The trap is normally operated 24 hours/day, 7 days/week.

In addition to the Nason Creek and Lake Wenatchee studies, the BPA/Yakama Nation propose to conduct foot and boat surveys in several Wenatchee basin tributaries where coho salmon smolts are released. These surveys will be used to determine where and how many adult coho return to spawn in areas where the fish were released. Genetic and morphometric data will be collected from returning adult coho salmon to monitor and guide reintroduction strategies, with the goal of determining production methods that will best lead to self-sustaining coho production.

The BPA/Yakama Nation proposes to evaluate the potential for naturally produced coho salmon to negatively impact steelhead and spring chinook salmon through competition of space and food during 2002 and 2003 (YN 2001a). They propose to release up to 33,000 hatchery coho fry as surrogates for naturally produced juveniles into Nason Creek between river kilometer 13.3 and the confluence with the Wenatchee River. Prior to fry releases, baseline distribution and habitat use by spring chinook salmon and steelhead will be determined by snorkel surveys. Juvenile

spring chinook salmon and steelhead will be collected using electroshocking to collect baseline size data. Post coho salmon fry release evaluation will include snorkel surveys and electroshocking to compare distribution, habitat utilization and size. In the spring of 2003, the Yakama Nation proposes to compare the predation rates of naturalized coho smolts that result from the fry releases to predation rates of hatchery reared and newly released coho smolts using their rotary screw trap located at RM 1.3 on Nason Creek. For this study the rotary trap will operate from mid-March through mid-June, and may be operated up to 24 hours per day. Coho released for this study are in addition to the 1,000,000 smolt releases described above.

Detection of PIT tagged emigrating juvenile coho salmon in mainstem Columbia River areas will help identify survival rates during emigration. Additional PIT tag and adult coho salmon abundance monitoring is mentioned as possible at Priest Rapids and Rock Island Dams, at Dryden and Tumwater Dams on the Wenatchee River, and at the WDFW's Chiwawa River weir (BPA 1999). A radio-telemetry study and extension of trap operations at Priest Rapids Dam and trapping for the radio-telemetry study at Tumwater Dam are also proposed (YN *et al*. 2002). Additional ecological interaction work being done for other projects in the Yakima River basin could benefit scientific understanding of the likely ecological effects of coho salmon production in the UCR region (BPA 1999). The results of the Yakima River studies may be used to indicate the potential for adverse effects on indigenous fish in the Wenatchee River basin resulting from the coho salmon reintroduction program.

Monitoring and evaluation plans may be discontinued, continued, or otherwise changed pending study results, and will be coordinated through the mid-Columbia Coho Technical Work Group.

2.2.2 Methow River Basin Coho Salmon Reintroduction

The Mid-Columbia Coho Reintroduction Program has both short- and long-terms goals for reestablishing coho salmon in the Methow River basin. Goal statements for the coho salmon reintroduction program are included in the above section describing the BPA/Yakama Nation coho reintroduction program in the Wenatchee basin.

Coho salmon broodstock proposed as the source for the Methow basin releases are spawned, incubated and reared at Winthrop NFH. If progeny of mid-Columbia returns raised at Winthrop are not sufficient to meet production goals, their numbers would be supplemented by eyed egg transfers from coho salmon eggs taken at Lower Columbia River facilities.

In the Methow River basin, the BPA/Yakama Nation propose to release acclimated coho salmon smolts from Winthrop NFH in a co-operative venture with USFWS. Hatchery progeny of Winthrop NFH adult coho salmon returns will be released as smolts in the Methow River watershed unless production from Wenatchee basin returns is insufficient to meet release goals in the Wenatchee.

All phases of the coho salmon program will follow fish disease control policies developed by IHOT (1995) and the PNFHPC (1989) to reduce the incidence of fish diseases. Fish will be monitored to detect and diagnose disease outbreaks at all production facilities.

Any adult coho salmon returning from Methow basin smolt releases are proposed to be collected at Winthrop NFH or Wells Dam. The Winthrop trap will be operational from September through November during which time coho salmon adults required as broodstock can be collected.

Experience in 2001 showed more returns (536) to the Methow River than the 100 – 125 projected in the 1999 HGMP. Even with the lower number projected in 2002 due to low juvenile survivals in 2000, the expected number is still approximately 200 (YN *et al*. 2002). As a result, numbers used for broodstock also could vary widely in future years (YN *et al*. 2002). The remainder of the adult coho salmon return to the Methow River basin is expected to spawn naturally, or be lost to pre-spawning mortality (YN *et al*. 2002).

The BPA/Yakama Nation also propose to collect coho salmon broodstock destined for the Methow River at the Wells Dam trapping locations if returns to the Methow are expected to be less than 150 coho salmon (YN *et al*. 2002). Trapping at Wells Dam would be done during the permitted WDFW steelhead broodstock collection period (YN *et al*. 2002). The WDFW currently operates the west ladder trap at Wells Dam 3 days per week, 16 hours per day from early July through the last week of October to collect steelhead from the run at large as broodstock for the Methow and Okanogan steelhead supplementation programs (WDFW 2000). The Yakama Nation propose to extend the trapping period at Wells Dam through the third week of November.

The current annual production goal for the Methow River basin is 250,000 yearling coho salmon smolts, released from Winthrop NFH (BPA 1999). The 250,000 number has been used because of production limits at Winthrop NFH, but could be increased in the future, depending on project needs. Progeny from returning adults to the Methow River basin are acclimated and released in the Methow basin (YN *et al*. 2002). If, however, an insufficient number of coho are spawned from Wenatchee River basin returns for release into the Wenatchee basin, progeny from adults returning to the Methow River will be released into the Wenatchee River basin.

Beginning in 1999, Winthrop NFH began incubation and rearing of eggs and juveniles from adults returning to the mid-Columbia. They have the capacity to rear up to 250,000 smolts per brood year, with two brood years on station at a time. If the production goal of 250,000 smolts cannot be met with mid-Columbia fish, coho will be transferred to Winthrop NFH as eyed eggs in December or January from Lower Columbia River hatcheries. The fish will be released volitionally in April. Of the 250,000 coho salmon smolts originating from Lower Columbia River hatcheries and released into the Methow River, 8,000 will be marked every third year with a PIT-tag for identification and monitoring and evaluation purposes. All coho salmon releases in the Methow River are marked with a coded wire tag for evaluation purposes. Survival evaluation will be based on coded wire tags recovered in broodstock and from carcasses recovered during spawning ground surveys (YN *et al*. 2002).

Monitoring and evaluation proposed for the coho salmon reintroduction program is detailed in an HGMP submitted by the BPA/Yakama Nation and WDFW (YN *et al*. 2002). Monitoring and evaluation of the effects of the coho reintroduction program on listed salmon and steelhead is proposed to be accomplished primarily in the Wenatchee basin (YN 2000). Currently, studies of predation by hatchery coho on sensitive species are planned only for the Wenatchee River basin.

For Winthrop NFH coho releases, internal tagging is proposed to estimate the smolt-to-adult survival rate for coho juveniles released into the Methow River basin. A proportion of all coho will be PIT-tagged to help identify the proportion of smolt-to-adult mortality that is occurring in the freshwater migrant lifestage, and to monitor changes in juvenile survival.

Genetic and morphometric data will be collected from returning coho salmon adults to monitor and guide reintroduction strategies, with the goal of determining production methods that will best lead to self-sustaining coho production.

2.3 National Marine Fisheries Service

NMFS proposes to issue section 10(a)(1)(B) permit 1347 as a jointly held permit to the WDFW, the Chelan PUD, and the Douglas PUD pursuant to the permit application, three HMGPs, and the three HCPs, to authorize take of listed species incidental to the implementation of sockeye salmon, summer chinook salmon, and fall chinook salmon artificial propagation programs in the UCR region. The HCP agreements for Rock Island, Rocky Reach, and Wells Dams with the Chelan PUD and the Douglas PUD require the PUDs to implement the proposed artificial propagation programs. Implementation may apply to anything necessary to carry out the artificial propagation programs within the boundaries of the HCP agreements. The WDFW is generally the lead co-manager of the fisheries resources of the state of Washington and is also the operator of the hatchery facilities in which the proposed artificial propagation activities would occur. Below is a description of the proposed activities followed by the conditions that NMFS would include in the permit to ameliorate potential negative effects. Together, the proposed activities and the conditions, imposed by NMFS, constitute the proposed actions considered in issuing the permit.

2.3.1 Chelan PUD and Douglas PUD Activities

The Chelan PUD and the Douglas PUD (PUDs) propose to provide artificial propagation compensation for spring chinook salmon, summer/fall chinook salmon, sockeye salmon, and coho salmon with origins upstream of Rock Island Dam, and summer steelhead as provided by the HCPs (CPUD 2002a; 2002b; DPUD 2002). Artificial propagation programs, facilities, release goals, and implementing PUD are listed in Table 2. Additional details of the PUDs proposed actions and obligations are provided in the three HCP agreements.

The PUDs, or their designated agents (currently the WDFW), propose to operate the hatchery facilities according to the terms of Section 8 "Hatchery Compensation Plan" of the HCPs (CPUD 2002a; 2002b; DPUD 2002), the ESA Section 7 and 10 permit(s), and in consultation with the HCP Hatchery Committees. The total number of each species artificially propagated in the UCR basin is not expected to change unless agreed to by the HCP Coordinating Committees following survival studies or until program reviews occur in 2013, which is outside the duration of this Opinion which is ten years.

The three HCP agreements result in the formation of HCP Hatchery Committees consist of one representative of each HCP signatory entity. NMFS will be represented in the HCP Hatchery Committee forum to ensure activities proposed by the HCP Hatchery Committees are consistent with ESA recovery goals and do not operate to the detriment of protected species.

The HCP Hatchery Committees will develop five-year monitoring and evaluation plans for the hatchery programs and updating them every five years. The PUDs will fund the implementation of the monitoring and evaluation plans. The first monitoring and evaluation plans shall be completed by the HCP Hatchery Committees within one year of the issuance of the FERC order incorporating the HCPs into the PUDs' licenses. Existing monitoring and evaluation programs shall continue until replaced by the HCP Hatchery Committees. The monitoring plans may

include data collection and analysis of all life stages of the salmon within the hatchery environment as well as data collection activities outside the hatchery facilities such as spawning ground surveys, juvenile fish traps, adult traps, and monitoring sites. Program-specific monitoring activities necessary to evaluate the programs will be determined by the HCP Hatchery Committees.

The PUDs agree that over the duration of the HCPs, new information and technologies that are developed will be considered and utilized in the monitoring and evaluation of the hatchery programs, if appropriate. The PUDs shall implement monitoring and evaluation of the hatchery programs consistent with the HCPs, the general objectives and guidelines listed for each Plan Species in the BAMP (1998) and as determined by the HCP Hatchery Committees.

There will be species-specific recommendations pertaining to each hatchery program that will evaluate the overall effectiveness of that program in meeting the goals and objectives of each program. These species-specific recommendation will be developed by the HCP Hatchery Committees, and the PUDs will be responsible for funding the implementation of those recommendations.

2.3.2 Washington Department of Fish and Wildlife Activities

Proposed artificial propagation activities include the collection of broodstock, spawning, incubation, rearing, acclimation, release of juvenile fish, monitoring and evaluation, and research tasks both within and outside the hatchery environment to assess each programs effectiveness in meeting program specific goals and objectives. Described below are the activities common to all the artificial propagation programs followed by program specific activities and special conditions proposed to be included in the permit.

The WDFW proposes to incorporate the following measures into all of the artificial propagation program operation to minimize potential negative impacts on ESA-listed species:

- Conduct routine water monitoring to ensure that the levels of total suspended solids, settleable solids, and water temperature at each facility to remain compliant with National Pollutant Discharge Elimination System (NPDES) permits issued by Washington Department of Ecology;
- Follow fish disease control guidelines developed by IHOT (1995) and the PNFHPC (1989) to reduce the incidence of fish diseases;
- Operate all rearing facilities compliant with "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" standards (NWIFC and WDFW 1998);
- Conduct routine, generally monthly, fish growth monitoring during rearing at each facility;
- Dispose of juvenile and adult carcasses via the local solid waste management system, on-station burial, or distributing carcasses into the river system of origin for nutrient enhancement after appropriate fish health certification.

Monitoring and evaluation plans, and research projects will be developed by the HCP Hatchery Committees as described in Section 2.3.1 (Chelan and Douglas PUD Activities). Additional details of the monitoring and evaluation plan development time lines and responsibilities are

provided in the three HCP agreements. Tasks proposed for consideration at this time, which, in all likelihood, will be included in the plans developed by the HCP Hatchery Committees, include monitoring within the hatchery facilities and monitoring of artificially propagated salmon in the natural environment.

Within-Hatchery Environment Monitoring

Monitoring and evaluation activities will be conducted on all of the salmon life stages that occur within the hatchery facility environment. The HCP Hatchery Committees are expected to fine-tune the evaluation activities through time to improve the knowledge base and success of the artificial propagation programs. The following tasks would be anticipated under current or future monitoring plans:

Adult salmon

- Broodstock (and mortalities at trap locations) would be sampled for stock composition analysis including determination of sex, age, and stray rates.
- Biological sampling may include meristic, morphometric, tissue samples (for genetic stock identification or DNA (deoxyribonucleic acid) analysis), and scale sampling.
- Snouts of CWT salmon would be collected.
- Annual determination of average fecundity will be conducted for a representative sample of spawned females in each program using an electronic egg counter.

Juvenile salmon

- Growth rate and general health will be monitored monthly.
- Unfertilized egg-to-eyed egg, eyed egg-to-fry, and fry-to-smolt survival rates will be determined.
- Numbers, size, and health condition of all salmon juveniles will be determined prior to or at the time of any transfers among facilities, and prior to release.

Natural Environment Monitoring

Natural environment monitoring of juvenile artificially propagated salmon will be conducted using a variety of standard techniques such as angling, trapping, and snorkeling. In general, these population sampling techniques will be used to identify both external marks and tags and internal tags. Only the Lake Wenatchee sockeye salmon program has a developed monitoring plan for post release monitoring of the juveniles which will be discussed in the program specific section below.

Monitoring of adult salmon returning to the UCR basin from the proposed programs would vary depending on the goals and objectives specific to the programs however, the following information will be collected to some extent on all adult monitoring programs:

- Routine biological data, such as length, sex, scale samples and snouts for CWT extraction would be collected on all carcasses encountered at trap sites, spawning ground surveys, and in carcass surveys;
- Spawning and carcass surveys would be conducted on foot, from an airplane, or from a boat, depending on area;
- Spawning and carcass surveys would be coordinated by WDFW as the lead staff in determining monitoring protocols in coordination with PUD, Tribal, USFWS, and U.S. Forest Service personnel;

- Spawning and carcass surveys would be designed to target about 20 percent of the escapement in a given area is sampled to ensure biologically substantial data is obtained;
- Creel surveys would be conducted on all fisheries occurring in the UCR basin that target unlisted salmon originating from these artificial propagation programs.

All subyearling sockeye and yearling summer chinook salmon released in the UCR basin will be externally marked with an adipose fin-clipped, and internally tagged with a CWT for identification and program evaluation. Fall chinook salmon released from Priest Rapids Hatchery are marked at a lower rate as described below. Subyearling chinook salmon released in the UCR basin are currently marked at a rate less than 100 percent. Brief artificial propagation program descriptions are provided below; additional information is available in the permit application and HGMPs.

2.3.2.1 Eastbank Fish Hatchery

The hatchery began operation in 1989 to mitigate for smolt losses resulting from the operation of Rock Island Dam. The hatchery is used for holding adult broodstock, spawning, incubation and rearing of steelhead, and spring chinook, summer chinook, and sockeye salmon. The hatchery is operated with five satellite facilities, located on five different water bodies; Dryden Pond on the Wenatchee River, Chiwawa Pond on the Chiwawa River, Lake Wenatchee Net Pens on Lake Wenatchee, Carlton Pond on the Methow River, and Similkameen Pond on the Similkameen River.

Broodstock are not collected at Eastbank Hatchery. There are no on-station releases of fish at Eastbank Hatchery into the mainstem Columbia River. Production and transfer goals for Eastbank Hatchery are: 864,000 Wenatchee summer chinook salmon for acclimation and release into the Wenatchee River basin, primarily from Dryden Pond; 200,000 Wenatchee sockeye salmon for acclimation and release from net pens in Lake Wenatchee, Wenatchee River basin; 400,000 Methow/Okanogan summer chinook salmon for acclimation and release in the Methow River basin primarily from Carlton Pond; and 576,000 Methow/Okanogan summer chinook salmon for acclimation and release in the Okanogan River basin generally from the Similkameen Pond.

2.3.2.2 Wenatchee Sockeye Salmon

The annual production goal for the Lake Wenatchee sockeye salmon program is 200,000 yearlings. Broodstock collection occurs at Tumwater Dam and fish are transported to the Lake Wenatchee Net Pens, a four to six net-pen array located in the north end of Lake Wenatchee, for holding through spawning. Eggs and juvenile sockeye salmon are incubated and early reared at Eastbank Hatchery. Juvenile sockeye are transferred to the Lake Wenatchee Net Pens for rearing and release.

The WDFW proposes to develop annual broodstock collection goals and protocols prior to the arrival of the adults each year to allow for consideration of run size, run composition in terms of sex, age, and natural to hatchery components with the following sideboards (WDFW 1999c; 2000):

- Retain broodstock from the Wenatchee River run at large at Tumwater Dam from July 15 through early August;

- Actively operated three days a week for eight hours per day;
- The broodstock collection goal is approximately 260 adults;
- To maintain the genetic integrity of the artificially propagated population, limit the number of adipose fin-clipped adult sockeye salmon used for broodstock to 10 percent of the total collection;
- To reduce the risk of adverse genetic effects on the founding natural population, the total collection is limited to 10 percent of the total run (WDFW 1999c).

The fish are transferred as juveniles to the net pens in early April to early July depending on rearing strategy. After four to seven months of rearing, the sockeye are liberated between August and October from the net pens into Lake Wenatchee at an average size of 17 grams (110 mm fl). The hatchery sockeye fingerlings overwinter in the lake, and emigrate to the ocean the following spring as yearling smolts. All net pen origin sockeye are identifiable from natural sockeye salmon by an adipose fin-clip and CWT (WDFW 1999c).

In addition to the monitoring and evaluation described above, WDFW operates a smolt trap on the Wenatchee River to collect sockeye salmon juveniles emigrating from Lake Wenatchee. The smolt trap is currently authorized in a section 10 research permit 1203 issued to WDFW (Table 3) which expires on December 31, 2003. The collection of listed spring chinook salmon and steelhead is authorized through this permit (1203), and the trapping program will not be analyzed in this Opinion.

2.3.2.3 Wenatchee Summer Chinook Salmon

The Wenatchee summer chinook salmon program release goal is 864,000 yearling smolts. The Eastbank Hatchery is used for holding broodstock, spawning, incubation and early rearing. Pre-smolt summer chinook salmon produced at Eastbank Hatchery are transferred to Dryden Pond on the Wenatchee River for acclimation and release.

The WDFW proposes to determine annual broodstock collection goals and protocols prior to the arrival of the adults each year to allow for consideration of run size, run composition in terms of sex, age, and natural to hatchery components. Broodstock collection protocols are generally as follows (BAMP 1998, with reference to annual co-manager review and approval of broodstock protocols):

- Retain predominately unmarked natural origin salmon for broodstock;
- Retain salmon throughout the duration of the run;
- Retain no more than 25 percent of the broodstock from Tumwater Dam;
- About 492 adult summer chinook salmon would be collected for broodstock;
- Follow established protocols for operation of the inflatable bladder at Dryden Dam;
- Operate the Dryden Dam right and left bank traps passively seven days per week and 24 hours per day during the trapping periods, which was between July 5 and November 17 in 2000 (WDFW 2000);
- Check traps daily and remove all captured fish;
- Fish not retained for broodstock will be released into the Wenatchee River, upstream from the collection site, utilizing water-to-water transfers;
- Operate the trap at Tumwater Dam actively three days each week for 8 hours each day between mid July and November;

- Delay operation of the Tumwater trap to collect salmon and steelhead broodstock is delayed until July to allow any late-arriving spring chinook salmon to clear the area;
- Open the Tumwater Dam trap open at night for unimpeded passage of migrating Wenatchee River salmonid populations, including listed steelhead.

The WDFW proposes to assist the Yakama Nation in collecting coho broodstock for the restoration program at the Dryden Dam and Tumwater Dam traps through the above trapping schedules, pending availability of the Yakama Nation personnel and tanker trucks when the traps are worked, primarily after mid-September (WDFW 2000).

All summer chinook salmon yearlings released from Dryden Pond are marked with an adipose fin-clip/CWT combination for visual identification, and for monitoring and evaluation purposes.

2.3.2.4 Methow Summer Chinook Salmon

The annual summer chinook salmon production objective in the Methow River is 400,000 yearlings at an average size of 10 fpp. There is no centralized summer chinook salmon production facility located in the Methow River basin. Eastbank Hatchery is used for spawning, incubation and early rearing. Summer chinook salmon juveniles are transferred to Carlton Pond on the Methow River in February for acclimation and released in April and May. Carlton Pond is located adjacent to the Methow River at river mile 35 near Twisp, Washington.

Summer chinook salmon adults used for the Methow program are trapped at Wells Dam, and held through maturity at Eastbank Hatchery. Summer chinook salmon destined for release into the Methow River are incubated and reared to fingerling size at Eastbank Hatchery. Juvenile fish reared are transferred as fingerlings in the late winter or early spring to Carlton Pond for continued rearing to yearling smolt size, and a spring release.

The WDFW proposes to determine annual broodstock collection goals and protocols prior to the arrival of the adults each year to allow for consideration of run size, run composition in terms of sex, age, and natural to hatchery components. The recent annual broodstock collection goal at Wells Dam ladder traps for the Methow summer chinook salmon supplementation program was 492, in combination with Okanogan summer chinook salmon program broodstock collection. Broodstock collection protocols are generally as follows:

- Trap at Wells Dam three days per week and 16 hours per day;
- Open the ladders for free upstream fish passage at night;
- Retain summer chinook salmon in equal number of males and females;
- Identify to species and count all salmonids encountered during trapping activities;
- Release all non-target fish back into ladder upstream of the traps;
- Allow all fish subjected to anesthetic to fully recovery in continual flow water prior to release back into ladder.

2.3.2.5 Okanogan Summer Chinook Salmon

The WDFW annual summer chinook salmon production objective in the Okanogan River basin is 576,000 yearlings at an average size of 10 fpp. Adult summer chinook salmon broodstock for this program are captured as described above with Methow River-origin summer chinook salmon

at the Wells Dam ladder traps between July and August as described above for the Methow summer chinook salmon program.

2.3.2.6 Turtle Rock Summer Chinook Salmon

The annual hatchery production goals are 200,000 yearling summer chinook and 1,600,000 sub-yearling summer chinook salmon for release from Turtle Rock Hatchery or (for 100,000 yearlings for Chelan PUD dam passage survival studies) above Rocky Reach Dam. Summer chinook salmon broodstock are not collected at Turtle Rock Hatchery. Currently, broodstock for the program is provided through collection of summer chinook salmon volunteers to the Wells Hatchery trap. Summer chinook adults collected at Wells Hatchery are a mixture of hatchery and a few natural-origin fish.

All yearling summer chinook salmon released from Turtle Rock Hatchery are marked with an adipose-clip and CWT combination for visual identification and monitoring and evaluation purposes. Progress is being made toward marking all sub-yearlings. Currently 200,000 "accelerated" (target release size of 20 fpp) sub-yearlings are marked and 200,000 "normal" release size (40 fpp) sub-yearlings are marked as a survival index group. Summer chinook salmon juveniles destined for release from Turtle Rock are transferred to the island ponds in November for six months of acclimation (April release of yearlings), or in April-May for three months of acclimation (June-July release of sub-yearlings).

The long-term strategy for summer chinook salmon production in the region is to transfer production from mainstem facilities (particularly Turtle Rock) to acclimation sites on upper river tributaries (or near mainstem spawning habitat) (BAMP 1998). This action would presumably benefit local adaptation, smolt to adult survival rates, and natural productivity.

A monitoring and evaluation plan for Turtle Rock releases will be developed by the HCP Hatchery Committees as previously described. Current post-release survival and contribution rates for Turtle Rock releases is monitored through the regional CWT recovery and evaluation program implemented by WDFW, the Tribes, and other fisheries management agencies in the Columbia basin.

2.3.2.7 Wells Summer Chinook Salmon

The annual Wells Hatchery on-station release goals are 320,000 summer chinook salmon yearlings released in April at an average size of 10 fpp and 484,000 accelerated sub-yearlings released in June at an average size of 20 fpp. Summer chinook salmon yearlings and sub-yearlings produced at Wells Hatchery are reared entirely at the hatchery and released directly into the mainstem Columbia River.

The WDFW proposes to determine annual broodstock collection goals and protocols prior to the arrival of the adults each year to allow for consideration of run size, run composition in terms of sex, age and natural to hatchery components. Broodstock collection protocols are generally as follows:

- Retain summer chinook salmon that volunteer to the Wells Hatchery trap from about July 10 through August 31, or until the summer chinook salmon broodstock collection objective is met, which ever is earliest;

- Retain approximately equal numbers of male and female salmon;
- Adult broodstock collection objectives may vary, but is generally about 1,210 salmon, contingent on HCP Hatchery Committee recommendations for survival studies throughout the middle and upper Columbia River region.

2.3.2.8 Priest Rapids Fall Chinook Salmon

The annual production goal is 6,700,000 fall chinook sub-yearlings for release in June. Fingerlings are acclimated on river water for release as sub-yearling smolts on-station. Approximately 4 percent of the total annual release (approximately 268,000 fish) receive an adipose fin-clip/CWT combination to assess brood year fishery contribution and survival rates (WDFW 1999c).

Fall chinook salmon broodstock are collected from September through November at the Priest Rapids Hatchery trap. The trap is located at the head of a ½-mile long hatchery water discharge channel tributary to the mainstem river, downstream of Priest Rapids Dam. The hatchery trap is presently not a "run of the river operation", relying only on hatchery adult returns volunteering to the trap (WDFW 1999c). The number of natural-origin fall chinook trapped at the hatchery each year is unknown (J. Sneva, B. Foster, WDFW, pers. comm.), but is thought to be low due to the location of the trap high in the outlet channel, and the use of well water to supply the channel to attract hatchery-produced adult fish. Broodstock collection is proposed with the following sideboards:

- Retain salmon broodstock across the entire run to ensure that the run timing for the population is maintained;
- When stray salmon from a program outside the mid-Columbia exceeds 5 percent, then remove those stray salmon from hatchery broodstock;
- Operate the Priest Rapids Hatchery trap three days a week during the September through November;
- Collection goal is 6,102 adult salmon.

Adult fall chinook salmon have, in the past, been collected from the east ladder trap in Priest Rapids Dam, but these fish were usually surplus to the hatchery's on station production needs. Although fall chinook adults have not been collected from the east ladder trap since 1989, the WDFW has proposed to collect run at large UBR fall chinook broodstock at the east ladder trap from September through November in years when collections at Priest Rapids Hatchery are below desired levels. The weekly effort of trap operation within this period is dependent on the abundance of chinook salmon migrating through the ladder, and the number of adult fish required to augment broodstock collections at the Priest Rapids Hatchery trap. Natural and hatchery-origin URB chinook salmon, and stray fall-run chinook salmon from other Columbia River regions may be taken in the east ladder trap. Migrating listed UCR steelhead may also be trapped incidentally when the east ladder trap is operated.

Approximately four percent of the fall chinook salmon produced through the program are marked with an adipose fin-clip/CWT combination. In addition, the Pacific Salmon Treaty's Chinook Technical Committee (CTC) has mandated marking a survival index group of 200,000 natural-origin Hanford Reach chinook salmon juveniles annually. The natural fish marking project is a cooperative effort with the Yakama Nation.

2.3.3 Permit Conditions

The following conditions will be required to minimize and reduce te level of incidental take associated with the proposed artificial propagation programs:

Production Levels

The following conditions address the production levels limits of unlisted chinook and sockeye salmon.

1. The WDFW shall limit annual production of sockeye salmon for release into Lake Wenatchee to not exceed 200,000 yearling juveniles released in August through November. These juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

2. The WDFW shall limit annual production of Wenatchee summer chinook salmon for release into the Wenatchee River to not exceed 864,000 yearling juveniles released in April to May. These juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

3. The WDFW shall limit annual production of summer chinook salmon for release into the Methow River to not exceed 400,000 yearling juveniles released in April or May. These juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

4. The WDFW shall limit annual production of summer chinook salmon into the Similkameen River or Okanogan River to not exceed 576,000 yearling juveniles released in April or May. These juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

5. The WDFW shall limit annual production of summer chinook salmon for release into the Columbia River from Wells Hatchery to not exceed 320,000 yearling juveniles released in April and 484,000 sub-yearling juveniles released in June. These juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

6. The WDFW shall limit annual production of summer chinook salmon for release from Turtle Rock Hatchery into the mainstem Columbia River shall not exceed 200,000 yearling juveniles released in April and 1,600,000 sub-yearling juveniles in June. The yearling juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release. At least 200,000 of the sub-yearling juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

7. The WDFW shall limit annual production of fall chinook salmon for release into the Columbia River from Priest Rapids Hatchery to not exceed 6,700,000 sub-yearlings, released in June. At least a portion of the juveniles shall be externally marked with an adipose fin-clip and internally tagged prior to release.

8. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates, lead to the inadvertent possession of salmon substantially

in excess (>110 percent) of program production levels specified above, then surplus eggs or fish shall be culled from the population in a manner consistent with achieving program goals.

Program Management and Operating Conditions

The following conditions address program management, fish handling, hatchery facility operations and monitoring and evaluations activities.

1. The Chelan PUD and Douglas PUD shall fund the specific elements of the artificial propagation programs objectives developed by the HCP Hatchery Committee, which may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

2. The Permit Holders are responsible for the actions of any individual operating inder the authority of this permit. Such actions include capturing, handling, and releasing any ESA-listed species authorized to be incidentally taken by this permit.

3. The Permit Holders must ensure that all ESA-listed species are handled carefully. Should NMFS determine that a procedure provided for under this permit is no longer acceptable, the Permit Holders must immediately cease such activity until an acceptable substitute procedure is identified and approved by NMFS Salmon REcovery Division.

4. Measures shall be applied to ensure that artificially propagated chinook salmon juveniles released will be ready to actively migrate to the ocean. To meet this condition, fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay after release. Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism, that necessitates early release of ESA-listed steelhead to prevent catastrophic mortality. Any emergency releases made by the action agencies shall be reported immediately to the NMFS Salmon Recovery Division.

5. The Permit Holders must allow any NMFS employee or representative to accompany field personnel while they conduct authorized activities.

6. The Permit Holders are responsible for obtaining all other federal, state, and local permits/authorizations needed for the proposed activities.

7. The Chelan PUD and Douglas PUD shall be responsive to new information and technologies that are developed, and approved by the HCP Hatchery Committees, which may be considered and utilized in the monitoring and evaluation of the artificial propagation programs, where appropriate.

8. The Chelan PUD and Douglas PUD shall fund artificial propagation program monitoring and evaluation consistent with the HCPs, the general objectives and guidelines listed for in the BAMP, this Opinion, and as determined by the HCP Hatchery Committees.

9. The WDFW shall operate and manage the artificial propagation programs including following impact minimization measures as proposed in the section 7 Biological Opinion on the issuance of this permit.

10. To the extent possible without imposing increased risk to listed species, the Permit Holders shall enumerate and identify marks and tags on all anadromous species encountered at adult and juvenile trapping sites. This information shall be included in either an annual brood program report or a monitoring and evaluation report submitted to NMFS.

11. In trapping operations directed at the collection of broodstock, the Permit Holders shall apply measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being operated.

12. All traps that have the potential to incidentally capture listed UCR spring chinook salmon or UCR steelhead when they are operated must be checked and have all trapped fish removed at least daily.

13. If water temperature at adult trapping sites exceeds 21°C (69.8°F), the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species that may be incidentally encountered.

14. The Permit Holders shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. The Permit Holders shall carefully handle and immediately release upstream incidentally captured listed UCR spring chinook salmon and steelhead adults that are not intended for use as broodstock in concurrently operated and otherwise authorized listed stock recovery programs.

15. The Permit Holders shall limit operation of Wells Dam east and west ladder traps to no more than three days per week from July through November. If both traps are operated, they shall be operated concurrently, operating on the same three days each week. When operating, active trapping may occur up to 16 hours per day. The ladder shall be open to passage at night to allow passage for listed steelhead.

16. The Permit Holders may operated Dryden Dam right and left bank traps up to 7 days per week to collect summer chinook broodstock from July through August. Incidental take of UCR steelhead shall not exceed 11 steelhead. Steelhead capture and handling authorized under permit 1395 will not count toward this incidental take limit.

17. The Permit Holders shall limit operation of Tumwater Dam trap for the collection of sockeye salmon broodstock to no more that three days per week, beginning after the sockeye migration peak at Rock Island Dam, but no earlier that July 15.

18. The WDFW shall collect fall chinook salmon adults volunteering to the Priest Rapids Hatchery trap as the primary means for obtaining broodstock for the Priest Rapids Hatchery program.

19. The WDFW may collect fall chinook broodstock at Priest Rapids Dam ladder trap as a secondary broodstock collection site. The incidental take of UCR steelhead shall not exceed 10 steelhead. Steelhead encountered during otherwise authorized activities, such as UCR steelhead run monitoring, authorized under permit 1395 shall not count toward this take limit.

20. The Permit Holders shall ensure that water intakes into artificial propagation facilities be properly screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they shall comply with transitional criteria set forth by NMFS in 1999 for juvenile fish screens constructed prior to the establishment of the 1995 criteria (NMFS 1996), to minimize risks to listed salmon and steelhead. The Permit Holders shall inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility; the results of this monitoring shall be included in annual reports.

21. The Permit Holders shall implement the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998) and Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) guidelines to minimize the risk of fish disease amplification and transfer, and to ensure that artificially propagated fish would be released in good health.

22. The Permit Holders shall conduct hatchery operations and monitor hatchery effluent in compliance with applicable National Pollutant Discharge Elimination System (NPDES) (EPA 1999) permit limitations.

23. Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish.

24. The WDFW shall monitor and report Priest Rapids Hatchery fall chinook salmon contribution to natural spawning in the Hanford Reach, and straying levels to other Columbia River Basin watersheds, including mainstem river reaches upstream of Wanapum Dam. Information regarding contribution to natural spawning and straying to natural areas will be included in the annual report for the program.

25. The Permit Holders must coordinate with other co-managers and researchers to ensure that no unnecessary duplication and/or adverse cumulative effects occur as a result of the Permit Holder's activities. This coordination shall include, but is not limited to, the HCP Hatchery Committees.

26. The Permit Holders may conduct spawning ground and carcass surveys to assess the distribution and impact of artificially propagated salmon on the natural-origin opulations.

Reports and Annual Authorization

NMFS contact for all reports: NMFS - Salmon Recovery Division
525 NE Oregon Street, Suite 510
Portland, Oregon 97232
Phone: (503) 230-5407
Fax: (503) 872-2737

1. The Permit Holders must notify NMFS as soon as possible, but no later than two days after, any authorized level of take is exceeded or if such an event is likely. The Permit Holders must submit a written report detailing why the authorized take level was exceed or is likely to be exceeded.

2. The Permit Holders shall update and provide to NMFS by December 15th of each year, the projected hatchery releases by age class and location for the coming year.

3. The Permit Holders shall provide annual reports that summarize numbers, pounds, dates, tag/mark information, locations of artificially propagated fish releases, and monitoring and evaluation activities that occur within the hatchery environment, and adult return numbers to the UCR basin for each program. The Permit Holders shall ensure collection and reporting of the coefficient of variation around the average (target) release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status. Reports shall also include any preliminary analyses of scientific research data, any problems that may have arisen during conduct of the authorized activities, a statement as to whether or not the activities had any unforeseen effects, and steps that have been and will be taken to coordinate the research or monitoring with that of other researchers. Unless otherwise noted in the specific terms and conditions, the reports shall be submitted by January 31st, of the year following release (i.e., brood year 2002, release year 2003, report due January 2004) to NMFS.

4. The Permit Holders must provide plans for future projects and/or changes in sampling locations or enhancement/research protocols and obtain approval from NMFS prior to implementation of such changes.

5. Adult return information shall include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. If a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31st, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 2004) to NMFS.

6. The Chelan PUD and Douglas PUD, in coordination with the HCP Hatchery Committees, shall develop five-year monitoring and evaluation plans for the hatchery programs that are updated every five years. The first monitoring and evaluation plans shall be completed within one year of the issuance of the FERC order incorporating the HCPs into the hydroproject operation licenses. Existing monitoring and evaluation programs shall continue until replaced by the HCP Hatchery Committees.

7. The Chelan PUD and Douglas PUD shall assume the lead, and work in coordination with the HCP Hatchery Committees, in developing the ten-year hatchery program reviews and directing the development of annual summary reports. The program reviews will determine if egg-to-fry and smolt-to adult survival rates, and other appropriate hatchery program goals and objectives of the HCPs and the ESA section 10 permits have been met or sufficient progress is being made towards their achievement. This review shall include a determination of whether artificially propagated production objectives are being achieved.

8. The WDFW shall develop annual broodstock collection and spawning protocols for the sockeye and chinook salmon artificial propagation programs. Protocols should be coordinated with the co-managers and HCP Hatchery Committees which must be submitted to NMFS by April 15th of the collection year.

9. The Permit Holders must report the take of any ESA-listed species not included in this permit or authorized under a separate ESA permit, when it is killed, injured, or collected during the course of enhancement/research activities. Notification should be made as soon as possible, but no later than two days after the unauthorized take. The Permit Holders must then submit a detailed written report of the non-permitted take. Pending review of these circumstances, NMFS may suspend enhancement/research activities.

Penalties and Sanctions

1. The persons actually doing the activity must have a copy of this permit while conducting the authorized activities.

2. The Permit Holders may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

3. If a permit holder violates any permit term or condition, they will be subject to any and all penalties provided by the ESA.

4. The Permit Holders, in effectuating the take authorized by this Permit, are considered to have accepted the terms and conditions of this permit and must be prepared to comply with the provisions of this permit, the applicable regulations, and the ESA.

5. The Salmon Recovery Division, NMFS, may amend the provisions of this permit after reasonable notice to the Permit Holder.

6. 50 CFR Section 222.23(d)(8) allows NMFS to charge a reasonable fee to cover the costs of issuing permits under the ESA. The fee for this permit has been waived.

7. Any falsification of annual reports or records pertaining to this permit is a violation of this permit.

8. Under the terms of the regulations, a violation of any of the terms and conditions of this permit will subject the Permit Holders, and/or any individual who is operating under the authority of this permit, to penalties as provided for in the ESA.

2.4 Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02).

Direct effects of the action of the issuance of all three permits would occur within the UCR basin and includes areas primarily in Chelan, Douglas, and, Okanogan counties; more specifically, the Columbia River at and above Priest Rapids Dam, the Wenatchee River, Entiat River, Methow River, and Okanogan River basins and artificial propagation facilities along the mainstem Columbia River (Figure 1).

The effected area in the Wenatchee River basin includes the Chiwawa River, Nason Creek, Dryden and Tumwater Dams, and all tributaries accessible to anadromous salmon. The effected area in the Methow River basin includes the Methow River, Twisp River, Chewuch River, the Methow Hatchery, the Winthrop NFH, and various smaller tributaries that are accessible to salmon. The effected area in the Okanogan River basin includes the Okanogan River, Similkameen River, Omak Creek, and Salmon Creek, and other small tributaries that are accessible to salmon. The effected area in the Columbia River basin includes the Wells, Eastbank, Turtle Rock, and Priest Rapids hatcheries and ladder traps at Wells and Priest Rapids dams.

Critical habitat was designated for UCR steelhead and UCR spring chinook salmon in 2000 when NMFS published a final rule in the Federal Register (65 FR 7764). However, the critical habitat designation for these ESUs was vacated and remanded to NMFS for new rulemaking pursuant to a court order in May 2002. The designation of critical habitat for the UCR spring chinook salmon and UCR steelhead ESUs will trigger a reinitiation of ESA consultation.

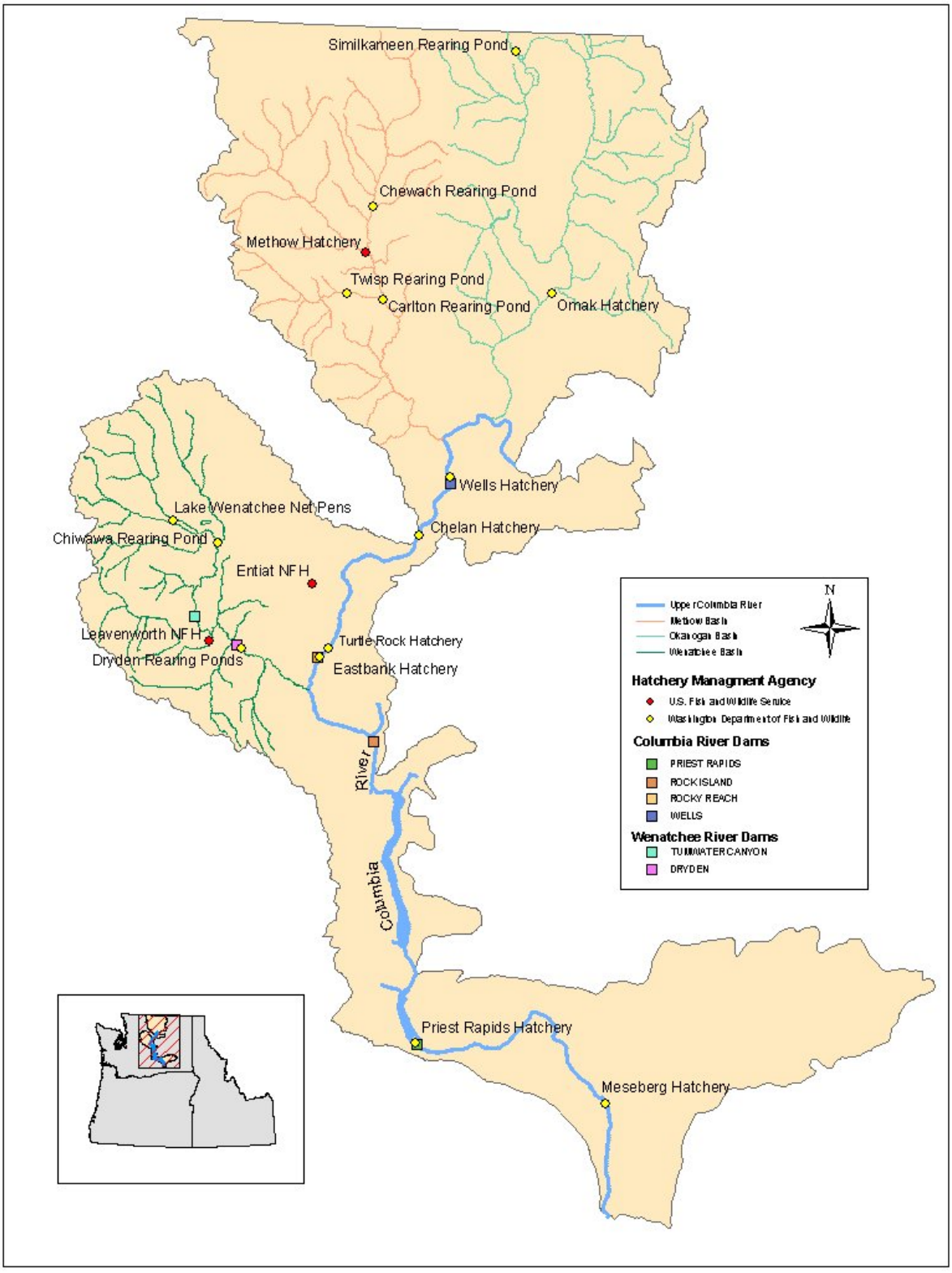

Figure 2. Map of the upper Columbia River basin with hatchery facilities and dams relevant to the proposed artificial propagation programs identified.

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire

taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered. UCR steelhead and spring chinook salmon are just such DPSs and, as such, are for all intents and purposes considered "species" under the ESA.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group populations is referred to as an evolutionarily significant unit (ESU) of the species. Hence, UCR steelhead constitute an ESU of the species *O. mykiss,* and UCR spring chinook salmon are an ESU of *O. tshawytscha*.

On March 24, 1999, NMFS listed UCR spring chinook salmon as an endangered species under the ESA (64 FR 14308). In its final listing determination, NMFS concluded that the UCR spring chinook salmon ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that six hatchery stocks in the UCR Basin (Chiwawa, Methow, Twisp, Chewuch, and White Rivers and Nason Creek) should be considered part of the ESU because they are currently essential for the recovery of the ESU. The WDFW operates most of the artificial propagation programs for listed UCR spring chinook salmon.

On August 18, 1997, NMFS listed UCR steelhead as an endangered species under the ESA (62 FR 43937). NMFS concluded that the UCR steelhead ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that one hatchery stock in the UCR basin, the Wells Hatchery stock, should be considered part of the ESU because it is currently essential for the recovery of the ESU. All artificial propagation programs rearing steelhead in the UCR were derived from the Wells Hatchery stock and natural origin UCR steelhead and are considered part of the ESU.

The UCR spring chinook salmon and steelhead were listed because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to become extinct within the foreseeable future. These factors for decline affect UCR chinook salmon and steelhead biological requirements at every life stage and they arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place.

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at that time and in that action area. For the purposes of this consultation, UCR spring chinook salmon and steelhead biological requirements are expressed in two ways: Population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, stream substrates, and food availability. Clearly, these two types of information are interrelated. That is, the condition of a given habitat has a large impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so provides a more complete picture of all the factors affecting UCR spring chinook salmon and UCR steelhead survival. Therefore, the discussion to follow will be divided into two parts: Species Distribution and Trends; and Factors Affecting the Environmental Baseline.

3.1 Species Distribution and Trends

3.1.1 Chinook Salmon

Chinook salmon are the largest of the Pacific salmon. The species' North American distribution historically ranged from the Ventura River in California to Point Hope, Alaska. In northeastern Asia, the species range from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit the most diverse and complex life-history strategies. Healey (1986) described 16 age categories for chinook salmon, seven total ages at maturity with three possible freshwater ages. Gilbert (1912) initially described two general freshwater life-history types: "stream-type" chinook salmon reside in fresh water for a year or more following emergence; "ocean-type" chinook salmon migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. This racial approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations. The generalized life history of Pacific salmon includes freshwater phases of incubation, hatching, emergence, migration to the ocean, rearing in marine waters, and subsequent initiation of maturation and return to fresh water for completion of maturation and spawning. Juvenile rearing in fresh water can be minimal or extended. Additionally, some male chinook salmon mature in fresh water, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to varying degrees of genetic and environmental determinants and interactions thereof. Chinook salmon may spend one to six years in the ocean before returning to their natal streams to spawn.

Ocean distribution differs between ocean- and stream-type chinook salmon (Healey 1983, 1991). Ocean-type chinook salmon tend to migrate along the coast, and stream-type chinook salmon migrate far from the coast in the central North Pacific. Chinook salmon populations can be characterized by their time of freshwater entry as spring, summer, or fall runs. Spring chinook salmon tend to enter freshwater and migrate far upriver, where they hold and become sexually mature before spawning in the late summer and early autumn. Fall chinook salmon enter freshwater in a more advanced stage of sexual maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of their natal rivers and spawn within a few days or weeks of freshwater entry (Fulton 1968, Healey 1991). Summer chinook salmon are intermediate between spring and fall runs, spawning in large and medium-sized tributaries, and not showing the extensive delay in maturation exhibited by spring chinook salmon (Fulton 1968).

3.1.1.1 UCR Spring Chinook Salmon

The UCR spring chinook salmon ESU, listed as endangered on March 24, 1999 (64 FR 14308), includes all natural-origin stream-type chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River basins (Myers *et al.* 1998). All chinook salmon in the Okanogan River are apparently ocean-type and are considered part of the UCR summer/fall run ESU. Nine stocks have been identified within the UCR spring chinook salmon ESU (WDF *et al.* 1993). All stocks, with the exception of the Methow stock, were considered by WDF *et al.* (1993) to be of native origin, of natural production type, and as depressed in status. The WDFW considers the Methow spring chinook salmon stock to be a composite in production type, but of native origin, and depressed in status.

When listing the UCR spring chinook salmon as endangered NMFS included six hatchery populations as part of the ESU: Chewuch River, Methow River, Twisp River, Chiwawa River, White River and Nason Creek. These six hatchery populations were considered to be essential for recovery and were therefore listed as part of the ESU. Hatchery populations at Winthrop NFH, Entiat NFH, and Leavenworth NFH were not included as part of the ESU because they were derived from Carson NFH spring chinook salmon.

The UCR spring chinook salmon have a stream-type life history. Adults return to the Wenatchee River during late March through early May, and to the Entiat and Methow Rivers during late March through June. Most adults return after spending 2 years in the ocean, although 20 to 40 percent return after three years at sea. The UCR spring chinook salmon experience very little ocean harvest. Peak spawning for all three populations occurs from August to September. Smolts typically spend one year in freshwater before migrating downstream. There are slight genetic differences between this ESU and others containing stream-type fish, but more importantly, the ESU boundary was defined using ecological differences in spawning and rearing habitat (Myers *et al.* 1998). The Grand Coulee Fish Maintenance Project (1939 through 1943) may have had a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the UCR region. A more detailed discussion of UCR spring chinook salmon is provided in the Biological Opinion concerning spring chinook salmon artificial propagation programs (NMFS 2000).

NMFS recently proposed Interim Recovery Abundance Levels and Cautionary Levels (Ford *et al*. 2001). *Cautionary Levels* were characterized as abundance levels that the population fell below only about 10 percent of the time during a historical period when it was considered to be relatively healthy. The three independent populations of spring chinook salmon identified for the ESU include those that spawn in the Wenatchee, Entiat, and Methow basins (Ford *et al.* 2001).

All three of the existing UCR spring chinook salmon populations have exhibited similar trends and patterns in abundance over the past 40 years. The 1998 status review (Myers *et al*. 1998) reported that long-term trends in abundance were generally negative, ranging from -5 to +1 percent. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. Based on redd count data series, spawning escapements for the Wenatchee, Entiat, and Methow rivers have declined an average of 5.6, 4.8, and 6.3 percent per year, respectively, since 1958. In the most recent five year geometric mean (1997-2001), spawning escapements were 273 for the Wenatchee population, 65 for the Entiat population, and 282 for the Methow population, only 8 to 15 percent of the interim abundance recovery targets, although escapement increased substantially in 2000 and 2001 in all three river systems. Based on 1980-2000 returns, the average annual growth rate for this ESU is estimated as 0.85. Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring chinook salmon populations are projected to have very high probabilities of 90 percent decline within 50 years (87 to 100 percent).

Summary

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for very guarded optimism, there has been no genuine change in the species' status since they were listed as endangered, and the most likely scenario is that the biological requirements are not being met with respect to abundance, distribution, or overall trend.

3.1.2 Steelhead

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water and the duration of the spawning migration (Burgner *et al*. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns relatively shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, others only have one run type. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do so are females. Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Multiple spawnings for steelhead range from three percent to 20 percent of runs in Oregon coastal streams. Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973).

Based on catch data, juvenile steelhead tend to migrate directly offshore during their first summer, rather than migrating nearer to the coast as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986). Available fin-mark and coded-wire tag data suggests that winter steelhead tend to migrate farther offshore but not as far north into the Gulf of Alaska as summer steelhead (Burgner *et al.* 1992). Maturing Columbia River steelhead are found off the coast of Northern British Columbia and west into the North Pacific Ocean (Busby *et al.* 1996). At the time adults are entering freshwater, tagging data indicate that immature Columbia River steelhead are out in the mid-North Pacific Ocean.

3.1.2.1 UCR Steelhead

The UCR steelhead ESU, listed as endangered on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River, Washington, to the U.S./Canada border. The Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing.

The Wells hatchery stock is considered part of the UCR ESU because it was founded from a mixture of native populations and retains genetic resources of steelhead populations above Grand Coulee Dam that are now extinct. Since 1997, the WDFW has been developing a Wenatchee River stock for the juvenile released into the Wenatchee basin. Currently, there is probably a close resemblance between the natural and hatchery populations in this ESU because of the incorporation of naturally-spawning adults into the hatchery program and the large number of hatchery fish that have been spawning in the natural environment (65-80 percent of the spawning population in the Methow basin; Busby *et al.* 1996). Since natural replacement rates of UCR steelhead are low (0.3:1), the hatchery supplementation programs were determined to be essential for recovery and included in the endangered listing under the ESA. These hatchery fish could be used to reduce the short-term risk of extinction and aid in the recovery of the UCR steelhead ESU.

Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest on the west coast (up to 7 years old), probably due to the ubiquitous cold water temperatures (Mullan *et al.* 1992). Adult steelhead from this ESU enter the lower Columbia between May and September with fish arriving at Wells Pool in early July. Fish enter the Wenatchee and Methow Rivers in mid-July and peak between mid-September and October.

During winter, adult steelhead generally return to the warmer Columbia River and re-enter the Methow to begin spawning in mid-March after the ice has thawed. Spawning continues through May and many fish seek out higher reaches in the tributaries. Fry emergence occurs that summer and juveniles rear for two to four years prior to spring downstream migration.

On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Lohn 2002). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Lohn 2002).

Returns of both hatchery and naturally produced steelhead to the UCR basin have increased in recent years. The average 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was 7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g., hatchery/natural fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 10 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time (BRT 2003).

In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (BRT 2003). A 5-year geometric mean (1997-2001) of approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4 percent per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35 to 29 percent, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9 percent per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of natural origin spawners dropped from 19 percent for the period prior to the 1998 status review to 9 percent for the 1997 to 2001 returns.

Naturally produced steelhead made up an average of 17.8 percent of the steelhead run at Priest Rapids Dam during the 18-year period from 1986 to 2001. These natural origin steelhead are not equally distributed among the UCR tributary basins. Mullen *et al*. (1992) reported annual escapement to the Methow basin at only 10 percent natural origin steelhead; however, in recent years the WDFW (2002) report natural origin steelhead composition of 12 to 29 percent in 1998 through 2000 at Wells Dam. The escapement to the Wenatchee basin from 1998 to 2000 averages 430 natural origin steelhead.

Summary

While some improvement can be seen in recent years, the ESU is still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for very guarded optimism, there has been no genuine

change in the species' status since they were listed as endangered, and based on the best available science, NMFS believes that the biological requirements are not being met with respect to abundance, distribution, or overall trend.

3.2 Factors Affecting the Environmental Baseline in the Action Area

Environmental baselines for biological opinions are defined by regulation at 50 CFR §402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for this biological opinion is therefore the result of the impacts a great many activities (summarized below) have had on UCR steelhead and spring chinook salmon survival and recovery. Put another way, the baseline is the culmination of the effects that multiple activities have had on the species' biological requirements and, by examining those individual effects, it is possible to derive the species' status in the action area.

The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. These factors are well known and documented in dozens—if not hundreds—of scientific papers, policy documents, news articles, books, and other media. It is therefore unnecessary to detail in this opinion the many ways in which human activities and natural factors have affected the UCR steelhead's and chinook salmon's habitat-related biological requirements; thus the following paragraphs constitute a brief summary of what the most recent accepted science has to say about how human action and natural processes have degraded essential steelhead habitat features in the UCR subbasin.

Some factors in the action area (e.g., hydropower and agricultural development—particularly irrigation diversions) have had adverse effects on the habitat-related biological requirements of UCR spring chinook salmon and UCR steelhead, while other factors have only affected some of those essential habitat features. For example, road building in the UCR subbasin has had a sizeable effect on stream substrates and water quality (through siltation), and road culverts have blocked fish passage, but such activities have not had much of an effect on water velocity. In another instance, timber harvest and grazing activities have affected—to greater or lesser degrees—all the factors except space. And urban development has affected them all, but generally to a small degree in the largely rural UCR subbasin. In short, nearly every widespread human activity in the basin has adversely affected some or all of the habitat features. And by disrupting those habitat features, these activities—coupled with past hatchery and fishery effects and occasional natural disturbances such as drought and fire—have had detrimental impacts on UCR steelhead and spring chinook salmon health, physiology, numbers, and distribution in virtually every subpopulation and at every life stage. For detailed information on how various factors have degraded essential habitat features in the UCR subbasin, please see any of the following: NMFS (1991), NMFS (1997), NMFS (1998a), NMFS (2000), NMFS (2002), NMFS (2003) and, in particular, NMFS (2000b).

Summary

In conclusion, the picture of whether UCR steelhead and spring chinook salmon biological requirements are being met is more clear-cut for habitat-related parameters than it is for population factors: given all the factors for decline, it is clear that the UCR steelhead and spring chinook salmon biological requirements are currently not being met under the environmental baseline. Thus their status is such that there must be a substantial improvement in the environmental conditions of their habitat (over those currently available under the environmental

baseline). Any further degradation of the environmental conditions could have a large impact because the species is already at risk of going extinct. In addition, there must be efforts to minimize impacts caused by dams, harvest, hatchery operations, habitat degradation, and unfavorable natural conditions.

4 EFFECTS OF THE ACTIONS

NMFS analyzes the direct and indirect effects of an action on the species or its critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for the justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR §402.02).

The proposed actions may result in incidental take of UCR spring chinook salmon and UCR steelhead. The applicants proposed protective measures and NMFS provides conditions that will be included in permit 1347 in order to minimize the extent of take. The following analysis is also considered in determining whether or not the artificial propagation programs pose substantial risk to the UCR spring chinook salmon ESU and UCR steelhead ESU.

4.1 General Effects

The *Biological Opinion on Artificial Propagation in the Columbia River* (NMFS 1999a), the *Biological Opinion on Effects on Upper Columbia River Spring Chinook Salmon Supplementation Program and Associated Scientific Research and Monitoring Conducted by the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service* (NMFS 2002a), and the *Biological Opinion on Artificial Propagation in the Hood Canal and Eastern Strait of Juan de Fuca Regions of Washington State* (NMFS 2002c) identify multiple general types of potential adverse effects of hatchery operations and production on natural fish populations. This analysis will consider the following general risks: (1) operation of hatchery facilities, (2) broodstock collection, (3) genetic introgression, (4) disease, (5) competition/density-dependent effects, (6) predation, (7) residualism, (8) nutrient cycling, (9) masking, (10) fisheries, and (11) monitoring and evaluation/research. A full discussion of each of these types of potential impacts is provided in the documents listed above. Furthermore, each of the biological opinions listed above conclude that artificial propagation programs that employ the basic hatchery reform measures or operate under the sideboards as defined in the Conditions (Section 2.3.3) for Permit 1347 are not likely to prevent the survival and recovery of listed salmon and steelhead in the ESUs affected by those programs. This Opinion considers the potential impacts of the specific artificial propagation programs as described in the Proposed Actions (Section 2) of this document in a manner consistent with the previously issued biological opinions listed above.

Adverse impacts cause by several of the general effect types listed above on UCR spring chinook and UCR steelhead by the proposed artificial propagation programs of unlisted salmon species are unlikely because of differences among the species. For example, none of the programs propose to rear steelhead therefore, no genetic introgression impacts are expected to occur on the UCR steelhead ESU, and no further analysis is provided in this Opinion. The proposed sockeye salmon and coho salmon programs are not expected to pose genetic introgression risks to UCR spring chinook salmon for the same reason, and are not further evaluated in this Opinion. However, the proposed summer chinook salmon and spring chinook salmon program pose some risk, which will be addressed in the specific effects on UCR spring chinook salmon section below.

Additionally some potential impacts are very general, such as operation of hatchery facilities, competition/density dependent effects, predation, disease, residualism, and monitoring and

evaluation effects and the means to minimize risk is largely the same for all of the programs. Those potential impacts and the methods to reduce impacts are summarized below. Programs that pose somewhat higher risks or whose specific impacts are quantifiable are further analyzed (Table 5).

Table 5. Categories of potential generic effects of artificial propagation programs and programs whose specific impact concerns are further analyzed.

Potential Effect Category	Programs with Specific Impacts of Concern
Operation of hatchery facilities	Leavenworth NFH
Broodstock collection	Leavenworth NFH; Entiat NFH; Coho Reintroduction Programs
Genetic introgression	Summer Chinook Programs; Leavenworth, Entiat, and Winthrop NFHs
Disease	None
Competition/density dependent effects	Entiat NFH; Coho Reintroduction Programs
Predation	Coho Reintroduction Programs
Residualism	None
Nutrient cycling	None
Masking	Leavenworth, Entiat, and Winthrop NFHs
Monitoring and evaluation	Coho Reintroduction Programs

4.1.1 Operation of Hatchery Facilities

Adverse impacts on listed fish due to the operation of hatchery facilities for the propagation of unlisted species may occur because of river water intake placement, or design, or operation including blocked migration, de-watering river reaches or reduced stream flow, and entrainment from unscreened or improperly screened intakes. Effluent from hatchery facilities may decrease quality through changes in water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the receiving streams mixing zone (Kendra 1991).

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State chapter 90.03 Revised Code of Washington (RCW) water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing.

In the Wenatchee River basin, all of the water intake systems at hatchery facilities that have surface water intakes are screened in compliance with NMFS screening criteria (NMFS 1996), except for the USFWS' Leavenworth NFH which is discussed in further detail in the specific effects on UCR steelhead section below.

The Lake Wenatchee Net Pens rely on passive flow, and do not withdraw water. Off-channel acclimation sites proposed for the coho salmon rearing are natural rearing locations, relying on spring flows. These sites are removed from listed fish rearing and migration areas and are screened to contain the hatchery fish for a limited rearing time. Modifications to those locations to accommodate fish rearing are minimal.

In the Entiat River basin, the Entiat NFH withdraws only a small portion of its water (up to 1,000 gpm) from the Entiat River during mid-February to mid-April and mid-May through July to supplement well water withdrawals. This is a period of relatively abundant water, and so the amount withdrawn is a small proportion of th stream flow. Juvenile fish screening associated with the Entiat NFH water intake is in compliance with NMFS screening criteria (NMFS 1996), and listed juvenile spring chinook salmon and listed steelhead are not expected to be adversely affected through entrainment.

In the Methow River basin, water intake sites are appropriately screened and in compliance with NMFS criteria and water withdrawals occur consistent with water rights granted by the state Department of Ecology. Withdrawal of 15 cfs of water from the Methow River for rearing summer chinook salmon at Carlton Pond occurs for only a short time during the year, from about late February to mid-April when the total stream flow is increasing because of spring run off.

Methow River water required for rearing spring chinook salmon and coho salmon at USFWS' Winthrop NFH is provided through a water intake at Foghorn Dam. In recent years, problems have arisen regarding the availability of sufficient river water for meeting salmon production needs at the hatchery using this water source. Head pressure and water volume available through Foghorn Dam have been reduced as a result of erosion of the dam structure, sedimentation of the bypass channel supplying water from the dam to the hatchery, and drought conditions in the region. The USFWS is currently working with the NMFS Habitat Conservation Division to develop measures to address water availability problems at the Foghorn Dam withdrawal point. The program is considered non-consumptive, returning water used for fish rearing to the river downstream of the point of withdrawal (Foghorn Dam). Any measures authorized by NMFS to increase flow volumes to Winthrop NFH will take into account instream flow needs for natural-origin, UCR spring chinook salmon in the Methow River reaches adjacent to the hatchery. NMFS expects that water withdrawal practices applied at the hatchery will continue to be protective of listed fish.

In the Okanogan River basin, the water diversion associated with Similkameen Pond is in compliance with NMFS screening criteria, and water is withdrawn consistent with a water right of 21 cfs held by WDFW and Douglas PUD. The water use is non-consumptive and only a small proportion of the average daily stream flow.

In the mainstem Columbia River, Eastbank Hatchery does not use any surface water, so no intake structures are associated with these operations, and no intake screening that may lead to listed juvenile fish injury through entrainment exists. Juvenile fish screening for the water intake systems at Wells Hatchery and Priest Rapids Hatchery are not in compliance with NMFS screening criteria (NMFS 1996). The facilities were built prior to the establishment of NMFS criteria. Douglas PUD is committed to be in compliance by November 2005 (Shane Bickford, pers. com., October 1, 2003). Routine intake screen inspections and upgrading to current screening criteria when existing screens fail are conditions which will be included in permit 1347. Without these conditions, water intakes for the hatchery may adversely affect listed spring chinook and steelhead juveniles through entrainment. Application of the conditions to the operation of these hatcheries through this Opinion will help ensure that the effects of the hatchery intakes on listed fish are adequately minimized.

The applicants propose to operated and monitor their programs in compliance with applicable NPDES permit effluent discharge limitations. Each permit contains limits concerning discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. In essence, the permit translates general requirements of

the Clean Water Act into specific provisions tailored to the specific hatchery facility operations and the discharge of pollutants. Although the actual level of impact of hatchery effluent discharge on listed fish survival is unknown, it is presumed to be small and localized at outfall areas, as effluent is diluted downstream. NMFS believes that programs operated in compliance with NPDES permits sufficiently minimize the likelihood for adverse effects on downstream aquatic life, including listed fish.

Based on the above discussion, compliance with NMFS screening criteria, adherence to Washington's water code and water rights, and all applicable NPDES permits, NMFS finds that the anticipated effects on listed species from operation of the hatchery facilities are minimal and are not likely to adversely impact listed species.

4.1.2 Broodstock Collection

Broodstock collection for the proposed programs would occur at various dams, traps and hatchery facilities, which include: Priest Rapids Hatchery and Wells Dam on the Columbia River, Dryden and Tumwater Dams on the Wenatchee River, Leavenworth NFH on Icicle Creek, Entiat NFH on the Entiat River, and Winthrop NFH on the Methow River.

Several of these sites are also used to collected UCR spring chinook salmon and UCR steelhead and are permitted to do so under separate ESA section 10 permits 1196, 1300, and 1395. Because of the targeted collection of the listed species under existing permits at the sites, incidental impacts on the listed stocks are minimal, but potentially could occur at Tumwater Dam, Leavenworth NFH, Entiat NFH, and Wells Dam and are further analyzed in the specific effects sections below.

At each broodstock collection location, all UCR spring chinook salmon and UCR steelhead encountered and not otherwise authorized for collection and retention would be released unharmed, upstream of the collection site. No substantial broodstock removal effects, including numerical reduction or selection effects, on listed UCR spring chinook salmon or UCR steelhead are likely to occur as a result of the proposed broodstock collection programs at Priest Rapids Hatchery, Dryden Dam, or Winthrop NFH.

Operation of unlisted summer chinook salmon and sockeye salmon broodstock collection programs at Dryden and Tumwater Dams is not likely to lead to the capture and handling of listed spring chinook salmon. The summer chinook salmon and sockeye salmon adults that are the targets of the trapping operations return to the Wenatchee River in July and August. It is unlikely that May-June migrating spring chinook salmon adults will be encountered in the trapping programs directed at these species. The WDFW delays operation of the Tumwater Dam trapping site until after July 15 as an additional measure to preclude takes of any late-arriving or delaying spring chinook salmon that may be present in Tumwater Canyon.

4.1.3 Genetic Introgression

As mentioned above, species differences between the unlisted chinook, sockeye, and coho salmon prevent genetic introgression to effect the UCR steelhead ESU. Additionally, species difference between the listed UCR spring chinook and the propagated coho and sockeye salmon are not possible. Potential effects of propagating chinook salmon are discussed below in the species specific effects section.

4.1.4 Disease

Risks of fish disease transmittal to listed natural fish may be posed by the proposed artificial propagation programs. Disease transmittal may occur while unlisted salmon are held in the hatchery facility through horizontal transmission of fish pathogens (if present) to listed species in the natural environment by exposure to hatchery effluent, or through contact with the hatchery fish after they are released.

The Columbia River watershed is a single "Fish Health Management Zone" under the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998), and transfers of salmon within the same zone are allowed from a fish disease management perspective. Regulated pathogens include bacterial kidney disease (BKD), which occurs routinely at virtually all of the facilities that rear chinook salmon, and the pathogen is ubiquitous in Columbia River basin chinook salmon populations, and infectious hematopoietic necrosis virus (IHNV), which has also been identified in adult chinook salmon returning to hatchery facilities in the UCR basin. North American viral hemorrhagic septicemia virus (VHSV) is also regulated, as is *Myxobolus cerebralis* (the protozoan causing whirling disease) which has not been found in the UCR basin. The proposed artificial propagation program will be operated to comply with these guidelines.

In addition, fish health protocols will be followed in accordance with Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) and Integrated Hatchery Operations Team (IHOT 1995) guidelines for all programs. To reduce the likelihood for the amplification of fish disease, the incidence of viral pathogens in all salmon broodstocks is determined by sampling fish at spawning in accordance with procedures set forth in the above documents. Fish health and condition would be monitored routinely during rearing by fish health professionals for each proposed program. Additionally, juvenile fish undergo fish health sampling prior to transfers between facilities and prior to release into the natural environment. NMFS finds that implementation of these guidelines is sufficient to minimize the risk of fish disease amplification through hatchery spawning practices, and disease transmission to listed adult fish outside of the hatcheries.

There is a risk that the intra-basin transfer of coho salmon for the BPA/Yakama Nation program may introduce coho anemia disease (CAD), a non-regulated pathogen, into the Wenatchee River and Methow River basins, as CAD has been detected in certain Lower Columbia River hatchery coho salmon stocks. However, there is no evidence at this time that CAD is vertically or horizontally transmitted to other stocks (BPA 1999), and fish health pathologists will continue to monitor coho salmon for signs of CAD and to identify the causative agent for this disease. In addition, VHSV was identified in 1999 brood coho salmon adults at WDFW Lewis River Hatchery, indicating that there is a risk of the transfer of this disease from coho salmon reared at the designated, donor federal and state hatcheries in the lower Columbia River. Lewis River Hatchery is currently not used as a source of coho salmon pre-smolts for the BPA/Yakama Nation program, and coho reared at the Willard and Eagle Creek NFHs, and Cascade Hatchery, are being monitored for this regulated pathogen. NMFS finds that the existing fish health protocols are sufficient to minimize the above risks.

The general policy of the WDFW, the USFWS, and the Yakama Nation is to bury juvenile fish mortalities, and dead eggs to minimize the risk of disease transmission to natural fish. The action agencies may place at least some of the adult salmon carcasses in regional streams for nutrient enrichment purposes, consistent with permitting and disease certification protocols. If adult carcasses are not used for nutrient enhancement they will be buried or disposed of at a local

waste disposal site. The distributing of spawned, dead carcasses into the natural environment should benefit natural fish productivity through nutrient enrichment. NMFS finds that risk to the listed populations is minimal if disease certification protocols are followed.

4.1.5 Competition/Density Dependent Effects

When artificially propagated salmon are released into the natural environment, the potential exists for intra- and interspecific competition with natural-origin juvenile salmonids, including listed UCR spring chinook salmon and UCR steelhead. Risks are likely to be greatest near the point where the hatchery fish are released, diminishing as the hatchery smolts disperse downstream. Artificially propagated salmon could cause displacement of rearing listed spring chinook salmon and steelhead from occupied stream areas, leading to abandonment of advantageous feeding areas or premature out-migration (Pearsons *et al.* 1994).

The release of migration-ready juveniles beginning the smolting process limits the duration of interaction between the artificially propagated fish and listed naturally produced fish rearing in areas adjacent to, and downstream of, the release locations. This release practice therefore likely decreases resource competition and behavioral dominance risks posed by the larger hatchery fish. The large size of the hatchery fish relative to the natural fry and fingerlings present at the time of the releases also decreases the likelihood for competition for the same food resources by the hatchery and natural fish. The larger, seaward-migrating hatchery smolts will also tend to use different habitat than rearing listed steelhead and spring chinook salmon fry and fingerlings that may be encountered.

Adult salmon and steelhead have evolved a variety of strategies to partition available resources among species that are indigenous to a particular watershed. Artificially propagated salmon may compete with different species of natural origin salmon and steelhead for redd sites, with the same species of salmon for mates and redd sites, or stray into areas other than the release site. In general, the proposed programs use local, native stocks of salmon in the artificial propagation program. Juvenile fish are released into areas where adult returns are desired to supplement the natural origin spawners as a specific goal of the program. The non-native stock of spring chinook salmon propagated at Leavenworth, Entiat, and Winthrop NFHs and the non-native coho salmon pose higher competitive risks upon return to listed species which are discussed in detail in the specific effects sections below.

4.1.6 Predation

Risk of predation on listed UCR spring chinook salmon and UCR steelhead juveniles by artificially propagated is minimized through several general mechanisms. The proposed artificial propagation programs release migration ready juveniles at the appropriate time for migration based on natural origin salmonid migration and coincident with spill at Columbia River dams. The only exemption to this is the Wenatchee sockeye salmon program which released juvenile sockeye into Lake Wenatchee in the late summer or fall for over-winter rearing in the lake. At release, the average length of sockeye release groups ranges from about 73 - 122 ml. Sockeye salmon are not recognized as piscivorous, therefore predation on listed salmon and steelhead is not likely.

Coho salmon yearlings have the potential to prey upon listed fish in the action area. In its analysis of the effects of the proposed coho salmon reintroduction program on indigenous fish in the Wenatchee River basin, BPA (1999) identified spring chinook salmon juveniles as the

species most at risk for direct predation by hatchery coho salmon smolts, this is discussed further in the specific effects section (4.2.3) below.

Potential direct and indirect predation impacts on listed UCR spring chinook salmon and UCR steelhead from chinook salmon releases are expected to be minimal because hatchery salmon are released as migration-ready smolts, during high flows in the spring, further limiting interaction with natural fish rearing in the action area. Finally, UCR spring chinook salmon smolts that are present downstream from the hatchery release locations should be of a large enough size during the April and May release period that direct predation by hatchery salmon is not likely.

The summer chinook salmon programs that release juveniles into the tributary basins (Wenatchee, Methow, and Okanogan) are designed to supplement the indigenous summer chinook salmon populations in those basins. Adult summer chinook produced through the programs will therefore contribute to natural summer chinook juvenile production. The progeny of these fish are likely to be sub-yearling migrants, and their presence as rearing fish in the basin is limited. Adverse impacts because of predation by progeny of hatchery-origin summer chinook spawners to listed juvenile UCR spring chinook salmon is likely to be low, assuming resource partitioning between fish species that have evolved sympatrically.

The programs considered in this Opinion releases only migration-ready, yearling juveniles into tributary waters, with the exception of Wenatchee sockeye salmon. Yearling spring chinook salmon released from the hatchery are expected to travel rapidly downstream at rates ranging from 5 to greater than 59 km/day (Dawley *et al.* 1986). The release of volitionally migrating smolts limits the duration of interaction between the hatchery fish and listed UCR spring chinook salmon and UCR steelhead juveniles rearing in areas adjacent to, and downstream of, the hatchery release location.

NMFS finds that the potential of predation on UCR spring chinook salmon and UCR steelhead by chinook salmon and sockeye salmon released from the proposed programs is not substantial due to the migration-ready status and quick exodus from UCR spring chinook salmon and UCR steelhead rearing areas.

4.1.7 Residualism

Spring chinook salmon, summer chinook salmon, sockeye salmon, and coho salmon released from hatcheries into tributary areas as yearling smolts do not have the same potential to residualize as steelhead. Standardization of the life history of these salmon species by producing yearling juveniles defers from the variability in growth and advent of smoltification evident in natural fish populations. The hatchery production strategies designed to release uniform sized juvenile salmon limit the likelihood for residualization of the fish released.

The coho reintroduction programs raise specific concerns about the potential adverse impacts of hatchery released coho on naturally produced UCR spring chinook salmon and steelhead. Snorkel surveys conducted by the Yakama Nation throughout the Chewuch River after the release of hatchery yearling coho observed 13 coho salmon that did not emigrate in 1998 (Dunnigan and Hubble 1998). Most of the coho smolts that residualized were in the middle portion of the survey reach and only one of the 13 was in the vicinity of other salmonid species (Dunnigan and Hubble 1998). Also, 20 hatchery coho remained in the lower Eightmile acclimation pond from which the fish were released. All 33 coho that failed to emigrate appeared to be less than optimal size for smolt outmigration. Snorkel surveys are also being conducted by the Yakama Nation personnel in the Wenatchee River basin to determine if coho

smolts residualize. Results from surveys in 2000 indicate that few hatchery coho salmon remain in the vicinity of the Wenatchee release areas post-release (Murdoch and LaRue 2002).

The potential of adverse effects from residual unlisted hatchery salmon species in the region appears to be low, and no impacts on UCR spring chinook salmon or UCR steelhead are anticipated.

4.1.8 Nutrient Cycling

Current escapements of natural origin and naturally spawning hatchery origin anadromous salmonids in the Columbia Basin are estimated at about 7 percent of the historic biomass (Cederholm *et al*. 1999). Artificial propagation programs in the basin add substantial amounts of fish biomass to the freshwater ecosystem. The potential to utilize the marine-based nutrients that are imported to freshwater ecosystems in the carcasses of hatchery returns may be of value for stimulating ecosystem recovery. Experiments have shown that carcasses of hatchery produced salmon can be an important source of nutrients for juvenile salmon rearing in streams (Bilby *et al*. 1998). Hatchery carcasses may also replace some of the nutrient deficit in riparian plant and terrestrial wildlife communities where natural-origin spawners are lacking.

Distributing carcasses after spawning at hatchery facilities may be incorporated into many of the artificial propagation programs evaluated in this opinion. Managers considering carcass outplants must follow disease control guidelines and should not transfer carcasses between drainages. Managers should also consider other habitat conditions of target streams including the presence of small woody debris that helps retain carcasses as they decompose, the likely natural density of spawner carcasses and the presence of nutrient enrichment such as agricultural runoff.

4.1.9 Masking

Under certain circumstances, artificially produced fish may lead to escapements of adult hatchery fish to natural spawning areas where they may intermingle with natural-origin fish of the same species. For many of the programs proposed, this is an explicit goal of the program. However, continuous annual escapements of the hatchery fish to natural spawning areas may confound the ability to determine the annual abundance of the natural-origin fish, if present and commingled with the hatchery fish. This situation may lead to an over-estimation of the actual abundance and productivity of the natural fish population, and as a corollary, a lack of ability to assess the health and production potential of habitat for the natural population. This latter factor exists because the hatchery fish might not be as successful in producing future generation in the natural environment. The abundance and productivity of the natural fish population, and the health of the habitat that sustains the natural fish, is therefore "masked" by the continued infusion of hatchery origin fish. Most of the proposed programs are not likely to result in any masking effect on UCR spring chinook salmon and UCR steelhead because of morphological differences between the listed species that allow accurate visual identification or adult run timing differences that distinguish the adult returns from UCR spring chinook salmon and UCR steelhead. Additionally, if summer chinook salmon return timing overlaps with UCR spring chinook salmon returns, the summer chinook salmon smolts released into tributaries are identifiable because their adipose fin is removed prior to release, whereas the UCR spring chinook salmon are adipose fin clipped. The proposed USFWS programs rearing non-native stock of spring chinook salmon have the potential to mask the productivity of listed UCR spring chinook salmon and is further discussed below.

4.1.10 Fisheries

Fisheries in the UCR basin are currently limited by the need to protect ESA-listed UCR spring chinook salmon and UCR steelhead. Fisheries in the migration corridor and ocean are also limited to protect these populations, and to minimize harvest impacts on other listed salmon and steelhead returning to other Columbia River basin and Snake River basin areas. NMFS evaluates and authorizes annual fisheries proposed by the co-managers in the action area each year through separate section 7 biological opinions. The WDFW and the Yakama Nation promulgated fisheries in Icicle Creek in 2000 to harvest surplus unlisted spring chinook salmon adults originating from Leavenworth NFH through separate section 7 consultations. These fisheries occurred in May near the Leavenworth NFH dam and in lower Icicle Creek. Icicle Creek fisheries for Leavenworth NFH are expected to continue in subsequent years. Impacts on listed spring chinook salmon are expected to be insubstantial in these hatchery-fish directed harvests, as the Icicle Creek return area is isolated from listed fish production areas in the Wenatchee River basin. Current, low external marking levels for Leavenworth NFH spring chinook salmon allowing for their differentiation from listed spring chinook hampers the ability to harvest returning adult fish in other regional areas. Proposed increased external marking proportions may increase opportunities for the beneficial use of returning Leavenworth NFH spring chinook salmon in fisheries. The new Yakama Nation coho salmon reintroduction program is currently experimental, and will not lead to substantial numbers of adult returns that might be targeted for harvest for the term of this Opinion.

Harvest actions outside the action area, such as in the ocean, mainstem Columbia River and other basin areas will be managed through the *U.S. v Oregon* and Pacific Fisheries Management Council (PFMC) planning and management processes, with guidance from NMFS.

Proposed releases of spring chinook salmon, summer chinook salmon, sockeye salmon, and coho salmon juveniles into the UCR basin are not expected to create any substantial harvest complications with listed species. NMFS involvement with the co-managers in the PFMC and *U.S. v Oregon* fishery planning processes will adequately limit harvest effects on listed salmon and steelhead. Proposals for future fisheries will continue to be addressed by NMFS through separate section 7 consultation processes.

4.1.11 Monitoring and Evaluation/Research

Listed UCR spring chinook salmon and UCR steelhead may be affected by foot, snorkel, and boat surveys conducted by the action agencies each year to enumerate adult salmonids on the spawning grounds and collect biological data on salmon carcasses. These activities could result in the temporary displacement or harassment of UCR spring chinook salmon and UCR steelhead. However, spawning surveys targeting these listed species have been previously authorized in permits 1203, 1115, 1119, and 1395 (NMFS 2002d, 2003b). In the analysis for each of those permits, NMFS concluded that spawning ground surveys were not likely to result in any long-term adverse effect on any of the populations or to the species as a whole. Spawner count data collected through the surveys are used to assess the status of salmon populations in the UCR region, the effectiveness of artificial propagation programs, and allow for management responses commensurate with run size decreases or increases. Information collected through the surveys includes observations regarding the distribution and timing of spawning of salmonids in the basins. These observations are combined with data from previous years to identify trends in escapement and to describe characteristics of the spawning populations. Biological data collected from carcasses include length, sex, scale and/or tissue sampling, snouts for CWT recovery, and assessment of egg voidance. These data are used to assess artificial propagation

program effectiveness, natural-origin spawner contribution, adult age at return, stray rates, and smolt-to-adult survival rates. Incidental take may occur in the form of temporary displacement. No UCR spring chinook salmon or UCR steelhead will be lethally taken. During most of the spawning surveys activities for summer chinook salmon, sockeye salmon and coho salmon, UCR spring chinook salmon are not present because they have completed spawning and have died of natural causes and UCR steelhead are in the process of returning to the basin and finding holding areas to stage for spawning which begins in late winter.

Activities associated with the surveys will include trained staff walking on the stream banks or in shallow river areas to count live and dead adult salmonid or using rafts to float river reaches where spawning has historically occurred. Snorkel surveys may also be used to count adult fish in these spawning areas. Float and snorkel surveys may occur throughout the river channel, but will focus on coverage of the transitional area between pools and riffles where the majority of spawning generally occurs. These surveys provide critical information about each artificial propagation program and the impacts on natural populations. They are not anticipated to result in any long-term or substantial adverse impacts on any of the populations or the UCR spring chinook salmon and UCR steelhead ESUs as a whole.

4.2 Specific Effects on UCR Spring Chinook Salmon

The specific effects that require additional detail from the preceding general effects analysis on the UCR spring chinook salmon ESU in the action area are evaluated in this section. Specific areas of concern include broodstock collection activities, genetic introgression risk from programs that rear unlisted spring chinook salmon, competition from those same programs and the coho reintroduction programs, and predation from artificially propagated coho, masking effects from unlisted spring chinook salmon programs, and potential monitoring and evaluation project impacts.

4.2.1 Broodstock Collection

Carson NFH stock spring chinook returning to Leavenworth NFH are trapped as volunteers to the hatchery from late May through mid-June. There is a potential that listed natural-origin spring chinook originating from other portions of the Wenatchee River watershed may also be trapped at the hatchery as volunteers. However, the number of listed spring chinook adults that are likely to return to Leavenworth NFH is low. Scale analysis of spring chinook adults collected at Leavenworth indicates that very few wild spring chinook escape to the hatchery (one was estimated to have been taken in 1994) (USFWS 1999).

Carson NFH-lineage spring chinook salmon returning to Entiat NFH are trapped as volunteers to the hatchery from late May through mid-June. There is a potential that May-June migrating listed natural-origin spring chinook salmon returning to the Entiat River may also be trapped at the hatchery as strays. If the run arrives in early May, the hatchery fish may be excluded from entering the trap and remain in the natural environment. The hatchery does not use a weir to direct fish into the ladder and trap, and natural-origin fish spawn mainly in (and home to) areas at least ten miles upstream of the hatchery. The number of listed spring chinook adults that recruit to the hatchery rather than spawn naturally in the Entiat River is likely to be very low.

The BPA/Yakama Nation coho salmon broodstock collection program proposed for Dryden and Tumwater Dams and "Dam 5" on Icicle Creek should not pose additional risk to listed spring chinook salmon, as the coho adults are proposed to be collected between September and December, much later than the May-June adult spring chinook migration period. The above

activities are not likely to affect listed juvenile spring chinook salmon due to the design and location of the broodstock collection actions.

The above trapping programs directed at summer chinook salmon, sockeye salmon, and coho salmon at Leavenworth NFH, Dam 5, and Dryden Dam are not likely to affect the listed UCR spring chinook salmon ESU.

4.2.2 Genetic

Impacts to listed UCR spring chinook salmon through are not anticipated as a result of the summer chinook salmon programs considered in this Opinion. Spring chinook salmon spawn in the Wenatchee and Methow River basins from late July through September, peaking about mid-August (WDF *et al*. 1993; Chapman *et al*. 1995a). Summer chinook salmon begin spawning in late September and end in early to mid-November, with peak spawning in October (Chapman *et al*. 1994a; WDF *et al*. 1993).

The proposed Carlton Pond summer chinook salmon program is not likely to affect the within population diversity of listed spring chinook salmon. Broodstock for the summer chinook program are collected at Wells Dam in late summer. Spring chinook salmon destined for the Methow River basin are unlikely to be encountered to a significant extent, or inadvertently incorporated as broodstock. Due to morphological differences between the spring and summer chinook races, WDFW staff are able to visually separate and pass upstream any spring chinook encountered during trapping at Wells Dam. The WDFW delays operation of the Wells Dam east ladder trapping site until July 10 to further minimize the likelihood for inadvertent retention of late-arriving Methow basin spring chinook.

Temporal separation in spawning time between the summer and spring races of chinook salmon minimizes the risk to listed spring chinook salmon of genetic introgression in the event that the hatchery summer chinook salmon stray into natural spring chinook spawning areas. Reduction in genetic diversity among listed spring chinook populations is not a significant risk for the artificial propagation programs rearing summer chinook salmon.

The Leavenworth NFH Carson-stock spring chinook salmon program has the potential to pose genetic risks to listed UCR spring chinook salmon. Returning Leavenworth NFH spring chinook salmon overlap in return and spawn timing with listed natural spring chinook salmon. Spawning of Carson-lineage spring chinook salmon occurs at the hatchery from mid-August until early September (USFWS 1999). As noted above, native spring chinook salmon in the Wenatchee River basin spawn from late July through September. Hatchery fish that stray into natural spring chinook salmon spawning areas may adversely affect the genetic diversity of the natural population if a significant level of spawning between the hatchery and natural origin fish occurs.

The risk posed by straying of Leavenworth NFH-origin adult spring chinook salmon to natural spring chinook salmon spawning areas in the Wenatchee River basin appears to be low. Leavenworth NFH spring chinook salmon are released into, and home back to, Icicle Creek, a Wenatchee tributary lacking a self-sustaining natural spring chinook salmon population. Also, homing of the fish to Icicle Creek provides separation of hatchery spawners from natural-origin spring chinook salmon produced in other tributaries, reducing the likelihood for interbreeding. From extant mark recovery information, Leavenworth NFH spring chinook salmon adults appear to exhibit a high fidelity to the hatchery release site. Few coded wire tagged hatchery fish have been recovered in the Wenatchee River basin outside of the hatchery (Chapman *et al*. 1995a; USFWS 1999). However, juvenile fish tagging proportions, and subsequent tagged adult spring

chinook salmon returns on which the low hatchery spring chinook salmon adult stray findings are based, have been low (~12 percent of the total spring chinook salmon production). Proposed, significant increases in the annual proportion of Leavenworth NFH spring chinook salmon yearlings marked (USFWS (1999) - 50 percent by the 2003 release year) will help corroborate this low stray rate assumption. With the information in hand, it is NMFS's opinion that straying of Leavenworth NFH-origin spring chinook salmon adults to areas outside of the Icicle Creek basin is low, and the risk of genetic introgression posed by the program to listed natural origin spring chinook salmon is low. Additional information gained from increased marking percentages for Leavenworth NFH release groups will allow for the reassessment of this opinion. New information regarding hatchery fish straying risks will also allow adaptive management of the Leavenworth NFH program if stray levels appear to be above expected low levels.

The Entiat NFH Carson-lineage spring chinook salmon program has the potential to pose genetic risks to listed natural spring chinook salmon. Returning Entiat NFH spring chinook salmon overlap in return and spawn timing with listed natural spring chinook salmon. Spawning of Carson-lineage spring chinook salmon occurs at the hatchery from mid-August until early September (USFWS 1999). Native spring chinook salmon in the Entiat River spawn upstream of the hatchery from late July through September. Hatchery fish that stray into natural spring chinook salmon spawning areas may adversely affect the genetic diversity of the natural population if a significant level of spawning between the hatchery and natural origin fish occurs.

Carcass recovery and sampling data had previously indicate that Entiat NFH spring chinook salmon do not tend to stray into natural spawning areas in the Entiat River (USFWS 1999; Carie 2000). The USFWS reports that no Entiat NFH-origin fish have been found on natural spawning grounds in the Entiat River in six years of carcass sampling (Cates 2000a; Carie 2000). Although evidence of straying to natural spawning areas using coded-wire tag recoveries is minimal, only 31 percent of the yearling spring chinook salmon released through the Entiat program have been marked in recent years. The majority of hatchery fish returning as adults are therefore indistinguishable from natural-origin spring chinook, absent scale pattern analysis sampling. Recent sampling in 2001 to the present, which included DNA sampling, indicate that stray rates of hatchery produced spring chinook salmon may be higher than early thought. Also, Entiat NFH fish stray to other hatcheries in the region (e.g., to Winthrop NFH in 1999), and marked Entiat NFH spring chinook salmon that bypass the Entiat River have been regularly encountered during WDFW's annual spring chinook salmon broodstock collection operations at Wells Dam (A. Murdoch, WDFW, pers. comm.).

Mass marking of spring chinook salmon yearlings released from Entiat NFH by the 2001 release year with an externally visible mark is proposed by USFWS. This increased fish marking provides an improved means to identify the hatchery fish and to separate them from listed spring chinook salmon at trapping locations and other hatcheries within the region. Mass marking will also improve the ability to monitor hatchery fish straying to natural spawning areas within the UCR spring chinook salmon ESU. Mark recovery information, and the collection of additional genetic stock identification data from Entiat NFH-origin and Entiat River natural spring chinook salmon, will help clarify concerns regarding genetic diversity within the system, and the effects of Entiat NFH spring chinook salmon straying on listed spring chinook. Additional DNA monitoring should be done as well as increased spawning grounds surveys undertaken to substantiate the genetic composition of spring chinook salmon in the Entiat River basin. New information in this area, may necessitate reinitiating consultation.

The Winthrop NFH Carson stock spring chinook salmon program has posed significant genetic risks to listed natural spring chinook salmon. Returning unlisted Winthrop NFH spring chinook

salmon overlap in return and spawn timing with listed indigenous-origin spring chinook salmon in the Methow River basin. Spawning of Carson stock spring chinook salmon occurs at the hatchery from mid-August until early September (USFWS 1999). This spawning date range may also be assumed for Winthrop NFH fish that stray into natural spawning areas. Native spring chinook salmon in the Methow River spawn in mainstem areas and tributaries from late July through September.

Significant concerns exist regarding straying and spawning of non-native Winthrop NFH spring chinook salmon in natural spring chinook salmon spawning areas within the Methow River basin (Myers *et al*. 1998). Genetic introgression risks to the native spring chinook salmon populations posed by straying Carson ancestry hatchery fish were identified as a major concern which led to the listing of UCR ESU spring chinook salmon as endangered (Myers *et al*. 1998; 64 FR 14308, March 24, 1999). In contrast to the Leavenworth NFH program, the Carson stock spring chinook salmon program at Winthrop NFH is not isolated. Non-native adult fish produced by the hatchery return directly to riverine areas that sustain naturally spawning, listed spring chinook salmon populations. The hatchery does not use a weir in the mainstem Methow River to direct returning adult fish into the hatchery, and attraction water to the trapping facility is low in volume relative to mainstem river flow. Because of its mainstem river location and lack of a fish weir, Winthrop NFH has no way of keeping its fish from straying into the natural spawning areas. Non-native Winthrop NFH-origin spring chinook salmon adults have therefore commonly spawned in the mainstem Methow River. The USFWS production of the Carson stock at Winthrop NFH has led to hatchery fish contribution levels to total Methow River natural spawning escapements estimated to be as high as 39 percent in some years (Myers *et al*. 1998). In addition, adult spring chinook salmon strays originating from Winthrop NFH have escaped to WDFW's Methow Hatchery where listed spring chinook salmon are produced as part of a stock recovery program. Straying of Winthrop NFH-origin Carson adult fish has resulted in the inadvertent incorporation of the non-native stock into the listed Methow "Composite" broodstock maintained at the WDFW hatchery. The effects of this straying on the genetic characteristics of the listed "composite" broodstock have been significant. For example, approximately 65 percent of the 1997 brood year Methow "Composite" adult return to Methow Hatchery in 2001 was estimated to be of Carson stock genetic lineage, based on an analysis of the origin of broodstock contributing to that brood year (D. Campton, USFWS, April 23, 2001 draft analysis). However, other brood years of Methow Composite have had significantly less Carson stock influence.

Given the above, it is likely that the natural Methow River mainstem spring chinook salmon population has some level of non-native hatchery fish ancestry, and is a composite of hatchery and natural origin fish as a result of interbreeding (WDF *et al*. 1993; BAMP 1998; Myers *et al*. 1998). The current genetic characteristics of the native and non-native Carson-origin spring chinook salmon populations in the Methow River, and the consequences of Carson stock production on the indigenous stocks, are addressed in a report distributed to NMFS and the Co-managers by the USFWS (Badgley 2000, with attached draft report by Don Campton, fish geneticist for USFWS).

The USFWS originally proposed to reduce the risk of continued genetic introgression posed by Carson stock spring chinook salmon straying by gradually phasing out releases of Carson stock smolts, supplanting production with smolts of listed spring chinook salmon stock-origin (USFWS 1999; Cates 2000a). Under this proposal, by 2005, the Carson stock would be supplanted entirely by releases of listed, indigenous-origin, Methow "Composite" stock hatchery spring chinook salmon developed and maintained through WDFW's Methow Hatchery program. To expedite phase-out of the Carson stock, USFWS reduced Carson stock releases sooner than proposed. In 2001, 177,000 listed Methow "Composite" stock yearlings and no Carson stock

yearlings were released at Winthrop NFH (D. Carie, USFWS, pers. comm.). The Winthrop NFH trap would continue to be operated during the phase-out period. Carson stock, and listed Methow "Composite" adult spring chinook salmon escaping to the hatchery would continue to be used as broodstock. Carson stock fish surplus to broodstock needs during the phase-out period would be provided to the Colville Tribes or to local food banks.

The original USFWS proposal for phasing out Carson stock production at Winthrop NFH was modified through the 2001 "Methow/Upper Columbia Agreement" (WDFW 2001). Under the agreement, effective 2001, the Winthrop NFH program will transition to the propagation of only listed Methow "Composite" spring chinook salmon stock. The last Carson stock adult returns to the hatchery as five year old fish will therefore occur in 2003. This approach will help forestall further genetic introgression risks to the listed spring chinook salmon populations that may result from Carson stock returns and straying to natural spawning areas or Methow Hatchery.

Detailed, supportive information regarding the need to phase-out use of the Carson-lineage spring chinook salmon stock at Winthrop NFH as a measure to protect the listed spring chinook salmon population is presented in a recent NMFS review and management recommendation document (NMFS 2001). The scientific basis for the hatchery stock management strategies applied to limit adverse genetic effects to listed salmon populations, including those proposed for Winthrop NFH, are described in an additional document prepared by NMFS Northwest Fisheries Science Center staff (Ford 2001). Information presented in these NMFS documents is summarized below.

In several scientific studies (e.g., Chilcote 1997; Reisenbichler and Rubin 1999), fish from non-native hatchery stocks have been shown to have poor spawning success in the natural origin compared to natural origin fish, even for programs that are capable of producing high returns to the hatchery or to fisheries. This is likely to also be the case with the Winthrop NFH Carson stock, which is not only not native to the Methow River, but has also been under domestication for over forty years. Current understanding of non-native hatchery fish performance and effects suggest that the Winthrop NFH Carson stock is more likely to harm than benefit the natural Methow River spring chinook salmon populations. Although Carson stock spring chinook salmon and their progeny will probably have some ability to reproduce in the natural origin, their reproductive success and survival will almost certainly be lower than the native fish. This means that over time the genetic attributes of the Carson-stock have the risk of being transferred to the native populations through interbreeding, reducing their survival and reproductive success. This process will be slow if only a few Carson-stock fish stray into natural spawning areas, but may occur rapidly if large numbers of Carson-stock fish were allowed to spawn with the native fish. The need to prevent further genetic introgression by limiting the straying of Carson-lineage spring chinook salmon into natural production areas supports the immediate phase out of the stock at Winthrop NFH.

The Methow "Composite" stock that will be used to supplant the Carson stock best represents the genetic lineage and diversity of the indigenous, natural Methow basin populations. Both the history of the stock and recent genetic data strongly suggest that the Methow Composite stock is more representative of native Methow River basin spring chinook salmon than is the Winthrop NFH Carson stock. The Methow Composite stock is, however, a mixture of at least two previously genetically distinguishable natural populations (from the Methow River mainstem and Chewuch Rivers) and certainly includes some degree of Carson-stock influence.

An additional component of the 2001 agreement (WDFW 2001) called for the cessation of adult spring chinook salmon trapping at Winthrop NFH. All adult fish returning as a result of

Winthrop NFH releases in 2001 will be prevented from entering the hatchery, and allowed to spawn naturally. Prior to the 2001 agreement, the majority of returning Carson stock adults were removed from the natural environment at the hatchery. The agreement to prevent returning fish from entering the hatchery and allowing all hatchery spring chinook salmon to spawn naturally responds to treaty tribal desires to expeditiously increase spring chinook salmon natural spawning numbers in the Methow River basin using available stocks, regardless of their origin. The proportion of the total naturally spawning spring chinook salmon population in the Methow River basin comprised by Carson stock fish will likely be significantly increased over recent year levels as a result of this agreement. The biological risk of this approach is that a relatively small number of indigenous-origin spawners in the basin could be overwhelmed by a relatively large number of non-native Carson stock spawners.

NMFS believes that genetic introgression risks to listed spring chinook salmon populations attendant with the allowance for all Winthrop NFH-origin Carson stock adults to spawn naturally may be ameliorated by several factors. First, it is hoped that adult fish prevented from entering Winthrop NFH will maintain a high fidelity to their release location. Returning fish may therefore have a tendency to spawn in the mainstem Methow River adjacent to or downstream of the Winthrop NFH outfall channel. Annual spawning ground surveys indicate that the mainstem river section downstream of the hatchery outfall supports a low proportion of the total naturally spawning spring chinook salmon escapement each year. The 1987-1999 annual mean spring chinook salmon redd count in this section of the river was 9, or 5.9 percent of the mean redd count of 152 recorded for the entire mainstem Methow River for this period (redd count data from H. Bartlett, WDFW, pers. com.). If the majority of returning Carson stock adults spawn in the mainstem river downstream of the hatchery, genetic introgression risks to the mainstem and tributary-spawning spring chinook salmon populations in the Methow River basin should be low. In 2001, Carson stock origin fish spawned predominately in the Methow River in close proximity to the hatchery facilities (Joel Hubble, pers. com. 2002).

In addition, based on recent research on the natural spawning success of hatchery-origin adult fish (e.g., Chilcote 1997; Reisenbichler and Rubin 1999), naturally spawning Carson stock spring chinook salmon can be expected to have poor spawning success in the natural origin. The Carson stock at Winthrop NFH has been under domestication for approximately 10 generations. Few progeny of naturally spawning Carson stock fish are expected to survive to adulthood, and any that do survive will be the result of a full generation of natural selection. The risk that the stock will prosper naturally, and increase genetic diversity reduction risks to listed spring chinook salmon in future years, is likely to be low.

Finally, NMFS believes that the short term adverse effects on listed spring chinook salmon resulting from the agreement to allow all Winthrop NFH Carson stock fish to spawn naturally in 2001 are adequately balanced by the long term genetic risk reduction benefits of the agreement achieved by prioritizing production of only listed, indigenous-origin smolts at Winthrop NFH. The risk that adverse among population diversity reduction effects on listed spring chinook salmon populations will be exacerbated by the forced escapement of Carson stock adult fish into natural spawning areas in 2001-2003 exists. This risk will be present through 2003, when the last Carson stock five year old adults from Winthrop NFH return (assuming the transition away from Carson stock smolt releases continues). However, NMFS believes that the 2001 & 2002 agreements are likely to reduce genetic risks to the listed Methow River spring chinook salmon populations more immediately than the previously agreed, gradual phase-out of Carson smolt releases at Winthrop NFH. Through the 2001 & 2002 agreements, and if no Carson stock smolts are released after 2001, non-native adult spring chinook salmon produced by the hatchery will

cease to return after 2003, instead of 2008 under the previous, proposed USFWS stock phase-out approach.

In past years when adult spring chinook salmon returns to the Methow River basin were low, USFWS' Winthrop NFH has relied on collections of spring chinook salmon adults trapped at Wells Dam to meet unlisted and listed spring chinook salmon broodstock needs. Volunteers to the hatchery, primarily of Carson stock, have also been used as broodstock. With transition of the program to the production of listed Methow "Composite" stock spring chinook, beginning in 2004, the majority of spring chinook salmon that return to the Methow River will be the listed stock. Listed Methow Hatchery spring chinook salmon adults have historically strayed into the Winthrop NFH trap. With the 2001 and 2002 agreements (WDFW 2001, NMFS 2002), spring chinook salmon adults will not be trapped at Winthrop NFH, and all fish will be prevented from entering the hatchery trap. Because no trapping will occur in 2001 and 2002, listed natural-origin spring chinook salmon will not be trapped at Winthrop NFH, nor incorporated into the hatchery broodstock.

4.2.3 Competition/Density Dependent Effects

Listed natural spring chinook salmon are present year-round in the Wenatchee and Methow tributary and mainstem areas. Spring chinook salmon fry emerge from the gravel in late winter or early spring at an average size of approximately 30 mm fl. The fry will disperse to the available habitat, with some fry immediately moving downstream to mainstem tributary areas for rearing. The spring chinook salmon range in size from 30-40 mm fl in the spring and average 54 mm fl in June. Spring chinook salmon migrating seaward as yearling fish between April and June average 87 to 127 mm fl (data summarized in Chapman *et al.*1995a).

For the species viewed as posing competition risks by SIWG (1984), spring chinook salmon, summer chinook salmon, and coho salmon yearling smolts released from the hatcheries by the action agencies in April and May likely encounter newly emerged, listed spring chinook salmon fry adjacent to the hatchery release sites. These release groups may also encounter spring chinook salmon fry in river reaches downstream of the release sites. Emigrating spring chinook salmon smolts in the action area may also be encountered during the hatchery fish emigration period. The SIWG (1984) identified a high risk that competition by hatchery-origin chinook salmon and coho salmon juveniles could have a substantial negative impact on productivity of natural chinook salmon juveniles in freshwater. The group identified hatchery sockeye salmon releases as posing a low risk of negative competitive effects in freshwater to natural chinook salmon and steelhead juveniles (SIWG 1984).

The majority of coho salmon juveniles released into the Wenatchee River basin are expected to emigrate rapidly, and soon after the fish volitionally leave the acclimation sites. Actively migrating coho salmon juveniles released mainly from the old Icicle Creek channel starting in late April, 2000 arrived at WDFW's Monitor out-migrant trapping location (approximately 20 miles travel distance) in 2.5 to 3.5 days, on average (Murdoch and LaRue 2002). Yearling coho salmon juveniles released on-station from lower Columbia River region hatcheries also have been shown to exit tributary waters quite rapidly. Coho yearlings released from Elochoman Hatchery reach the Columbia River mainstem - a distance of 9 miles - within 24 hours post-release (Fuss 1997). Chinook salmon yearlings released as actively migrating fish from WDFW and USFWS hatcheries emigrate and disperse from the release sites rapidly. The Wenatchee River basin hatchery chinook salmon programs considered in this Opinion also release migration-ready, yearling juveniles. These hatchery-produced juveniles are also expected

to emigrate seaward soon after liberation, vacating and dispersing from stream areas where natural juvenile fish may be present.

Fry and parr resulting from naturally spawning coho salmon have the potential to compete with listed steelhead and spring chinook salmon juveniles in the Wenatchee River basin. The following analysis of the potential competitive effects of natural coho production resulting from the reintroduction program was partially included in the NMFS 1999 Biological Opinion for the BPA/Yakama Nation coho salmon program (NMFS 1999a). That analysis is carried forth here to describe and evaluate the potential effects of the naturally-produced progeny of reintroduced coho salmon on the indigenous listed salmon and steelhead populations. It is recognized, however, that the BPA (1999) proposal incorporates only a limited number of life history cycles for coho salmon. Most returning coho salmon adults are proposed to be collected as "localized" hatchery broodstock over this period, and minimal natural production is expected.

Information suggests that juvenile coho salmon are behaviorally dominant in agonistic encounters with juveniles of other stream-rearing Pacific Northwest salmonid species, including chinook salmon, steelhead, and cutthroat trout (*O. clarki*). Dominant salmonids tend to capture the most energetically profitable stream positions (Fausch 1984, Metcalfe 1986), providing them with a potential survival advantage over subordinate fish. Stein *et al.* (1972) showed that coho salmon fry dominated fall chinook fry in laboratory raceways, which led to displacement of chinook salmon fry from habitats they used when coho salmon fry were not present. Taylor (1991) suggested that coho salmon fry are dominant in agonistic encounters with spring chinook salmon fry; when the two species were reared sympatrically, coho salmon displaced chinook salmon from the pool habitats.

The BPA/Yakama Nation's long term proposal is to stock coho salmon in the Wenatchee River basin at levels consistent with historic natural coho salmon densities, and based on parr and smolt carrying capacity estimates for the major basin tributaries (BPA 1999). To reduce potential adverse impacts on spring chinook salmon and steelhead in the upper tributaries, the BPA/Yakama Nation should focus their coho salmon releases in areas where impacts on the ESA-listed species will be minimal, such as Peshastin and Icicle Creeks. The proposed coho salmon release levels considered in this Opinion represent the initial, feasibility stage of the reintroduction effort. Release levels are designed to be those necessary to identify ecological risks to listed fish, coho salmon broodstock requirements to meet desired production levels, and survival of out-of-watershed stocks (BPA 1999). Therefore, on the short term, and for the duration of the program considered in this Opinion, the numbers of coho salmon that are progeny of naturally spawning coho salmon will likely be very low and well below the estimated juvenile coho salmon carrying capacity of Wenatchee basin tributaries.

The BPA (1999) estimated that the number of coho salmon adults returning to the Wenatchee River basin as a result of the proposed annual release of 1,000,000 juveniles would be approximately 1,000. However, returns in 2000 and 2001 have fluctuated widely. The preliminary smolt-to-adult survival rate estimate for the 1998 and 1999 brood releases in the Wenatchee River were 0.21 percent (about 1,500 fish), and 0.17 percent (334 fish), respectively (Murdoch and LaRue 2002). Dunnigan *et al.* (2001) estimated that, based on planned coho salmon release sites and levels, adult coho salmon returns to the Wenatchee River watershed upstream of Tumwater Dam (where the majority of listed spring chinook salmon and steelhead production occurs) may range from a low of 66 fish in 2001 to a high of 2,396 in 2004. Coho salmon escapements at these levels would range from 1 to 37 percent of the historic natural coho escapement level to the basin, estimated to be 6,000 to 7,000 fish.

The majority of the coho salmon juveniles proposed for planting in the basin will be released from the old Icicle Creek channel, adjacent to Leavenworth NFH. Through an examination of CWT recoveries for hatchery coho salmon, Vander Haegen and Doty (1995) reported that from 0 to 12.4 percent of adult coho salmon originating from on-station releases from Lower Columbia River region hatcheries were recovered in areas other than the watershed where the fish was reared. They generally found that stray rates for hatchery coho salmon reared and released on-station were comparable to natural fish. The expected high fidelity of returning adult coho salmon adults to the vicinity of Leavenworth NFH, where the coho salmon will be reared and acclimated for four to six weeks, should limit the likelihood for natural spawning by these fish, and the resultant production of progeny that may pose a competitive risk to listed juvenile spring chinook salmon and steelhead.

Density-dependent effects resulting from competition between two different species can still be severe at densities well below the carrying capacity of the habitat. However, estimating carrying capacity is extremely difficult, and even an abundant population may not be "fully seeded" for all life history stages (Lestelle *et al.* 1996; Moussalli and Hilborn 1986). Therefore, interactions between coho salmon and listed UCR spring chinook salmon should be monitored and evaluated regardless of the estimated carrying capacity or historic run size. The BPA/Yakama Nation (BPA 1999; YN *et al*. 2002) recognized the need for studies in the basin to evaluate the effects of naturally producing coho salmon through competition on listed fish, when the numbers of coho in the target basins were adequate to make such studies possible.

Hatchery-origin adult salmon from these programs that may home to, or stray into, UCR spring chinook salmon spawning areas during the egg incubation periods may pose an elevated risk to listed fish productivity. Competition for redd sites or egg mortality posed by hatchery-origin fish redd superimposition are concerns. Superimposition of redds by later spawners kills or removes previously deposited eggs from the gravel, and has been identified as an important source of salmon mortality in some areas.

Protected UCR spring chinook salmon adults spawn from late July through September in the Wenatchee River basin. Spawning areas in the basin include the Chiwawa River (Rkm 0 to 58.0), Nason Creek (Rkm 0 - 25.4), White River (Rkm 10.3 to 23.0), the Little Wenatchee River (Rkm 4.3 to 11.4), and the upper most reaches of the Wenatchee River.

Adult coho salmon resulting from the BPA/Yakama Nation reintroduction program may spawn naturally in Icicle Creek, or in areas near the acclimation pond release sites on Nason Creek, and in future years, the Chiwawa River, Little Wenatchee River, Brender Creek, and Chumstick Creek during November and December (BPA 1999). The number of adult coho salmon returning to the Wenatchee River basin and allowed to spawn naturally upstream of Tumwater Dam will need to be monitored and possible limited to ensure that the coho salmon are not superimposing redds over previously deposited ESA-listed spring chinook salmon redds. As a conservation measure, the number of coho allowed to spawn naturally in Nason Creek should be limited to no more than 50 percent of the total number of UCR spring chinook salmon that returned to Nason Creek (Tynan and Weitkamp 2001).

The use of non-native stock spring chinook salmon in the Entiat and Winthrop NFHs programs poses a higher risk of competition with listed UCR spring chinook salmon which may affect listed natural fish productivity through competition for redd sites and redd superimposition. The natural population interim abundance target is 500 and 2,000 spring chinook salmon adults in the Entiat and Methow Rivers, respectively.

Historic USFWS data indicates that few returns from Entiat NFH stray in most years. However, more recent years data indicate increased straying (Hamstreet and Carie 2003). Considering that total redd counts have ranged from 13 to 218 (1994 to 2002 data) (Hamstreet and Carie 2003) it is unlikely that density dependent and competition effects are substantial in the Entiat River.

The five year geometric mean (1997-2001) of natural origin spawners in the Methow River population was 358. The estimated total adult return to Methow Basin from Winthrop NFH releases for that same period of time was 1,167 salmon. Depending on where the hatchery produced spring chinook spawn in the basin, some adverse impacts on the listed stock is possible. Spawning ground surveys to count redds and sample carcasses indicate that most Winthrop NFH origin spring chinook salmon spawn in the mainstem Methow River near the hatchery outlet and that natural origin listed spring chinook salmon spawn higher up in the Methow River and its tributaries, the Chewuch and Twisp Rivers (Hubble and Crampton 2000). Additionally, the transition from Carson stock to the local Methow River stock in order to contribute to the recovery of the listed stock result in NMFS finding that density dependent and competition effects are not anticipated to adversely impact the UCR spring chinook salmon ESU.

4.2.4 Predation

Coho salmon predation studies conducted on the Yakima River in 1998, 1999, and 2001, by the Yakama Nation (2002) suggest that predation by hatchery coho salmon juveniles on spring chinook fry is low. The Yakama Nation, in coordination with WDFW, conducted studies in 2000 to assess the effects of Wenatchee basin hatchery coho salmon predation on unlisted natural summer chinook salmon fry. Coho salmon juveniles liberated from the old Icicle Creek channel and Butcher Creek were trapped at WDFW's Monitor screw trap site, and sampled for stomach contents. Preliminary results of the study indicate that the incidence of summer chinook salmon fry predation averaged 0.0241 fry per coho salmon smolt captured. Based on this rate, estimated trapping facility, and assumptions of emigrating coho salmon smolt residence time in the river (assumed to be 7 or 16.5 days), the Yakama Nation initially estimated that from 145,705 to 343,447 summer chinook fry may have been consumed by coho salmon juveniles in the mainstem river above Monitor post-release. However, the predation rate used to derive this range may overestimate actual fry consumption, as trap operation procedures confined the fry with coho salmon in trap live boxes for three or more hours. This practice may have exposed the summer chinook salmon fry to predation levels higher than actual natural levels. In addition, the summer chinook salmon fry preyed upon by the coho salmon were relatively abundant in the release area, and the proportion consumed of the total summer chinook salmon fry population present in the Wenatchee basin was likely quite low. Also, results in 2000 may have been affected by the presence of a large number of summer chinook salmon redds at the mouth of Icicle Creek (immediately below the main coho salmon release site). There may therefore have been a concentration of summer chinook salmon fry available for predation in this area that may have biased the predation results towards higher than typical levels.

The Yakama Nation study at Monitor may be used to indicate summer chinook salmon fry predation effects only. However, due to their extremely depressed status in the Wenatchee basin, spring chinook salmon fry are much lower in abundance than summer chinook salmon fry in the vicinity of the study area. Also, the majority of spring chinook salmon fry are likely to remain in tributary areas upstream of the Icicle Creek and Butcher Creek coho release sites where they may not be exposed to predation. However, additional, proposed coho salmon acclimation sites in the listed spring chinook production areas may pose predation risks to spring chinook salmon fry. Further predation/interaction studies in the watershed are proposed, including trap operation on Nason Creek, sockeye salmon -directed sampling in Lake Wenatchee, and river snorkel surveys,

to help identify specific predation effects of the hatchery coho salmon release program on listed spring chinook salmon fry in the important tributary production areas. Releasing coho salmon juveniles in areas with little ESA-listed spring chinook salmon and steelhead production such as Peshastin, Icicle, and Brender Creeks would reduce risks of adverse impacts on these protected species while still allowing the assessment of the coho salmon reintroduction program.

All of the Wenatchee River basin hatchery chinook salmon and coho salmon programs considered in this Opinion release migration-ready, yearling juveniles. The majority of coho salmon juveniles released into the Wenatchee River are expected to emigrate rapidly after liberation from acclimation sites. Data collected by the Yakama Nation for old Icicle Creek channel releases in 2000 supports a rapid downstream migration of liberated coho salmon juveniles (Murdoch and LaRue 2002). Yearling spring chinook salmon released from Leavenworth NFH are also be expected to travel rapidly downstream. Yearling chinook salmon juveniles released from up-river Columbia basin areas have been shown to travel downstream at rates ranging from 5 to greater than 59 km/day (Dawley *et al.* 1986). The WDFW targets the release of uniform sized hatchery juveniles (a coefficient of variation (CV) of <10 percent around the average fish size is applied) as an additional measure to ensure that the majority of the hatchery population is migration-ready.

The production of natural coho salmon juveniles by naturally spawning hatchery adult coho that could pose elevated predation risks to listed fish fry and fingerlings in the region should be limited over the next five years. Approximately 66-2,400 adult coho may return to the Wenatchee River basin as a result of the proposed annual release of 1,000,000 coho juveniles. The BPA (1999) estimates that fewer than half of any returning coho will spawn naturally. Expected, low adult coho returns to natural areas, and the proposed collection of most returning coho adults as hatchery broodstock over that period should result in the natural production of few coho juveniles. Also, coho natural spawning that does occur is expected to take place removed from (Icicle Creek), or downstream of (lower Nason Creek), spring chinook spawning areas in the basin. Icicle Creek is the predominant release site for the first years of the reintroduction program, and most adult coho will return to that location for the term of this Opinion. Differences in habitat preferences by natural-origin coho and natural spring chinook may further minimize the risk of predation on spring chinook salmon fry by natural-origin coho. Over the short term, predation risks to listed spring chinook salmon fry should be limited. The Yakama Nation plans to conduct studies (e.g., Nason Creek trapping) that will help gauge the effects of coho predation in upper tributary areas important to spring chinook salmon production. The results of these studies should be used to guide activation and management of the other proposed coho salmon acclimation sites in the region.

4.2.5 Masking

Unlisted spring chinook salmon adults produced through Leavenworth NFH program return to the Wenatchee River basin and spawn at the same time as listed UCR spring chinook salmon. Mark recovery work indicates that returning Leavenworth NFH spring chinook salmon adults have a low tendency to stray to areas outside of their Icicle Creek release location. High fidelity of returns to Icicle Creek, where there is no listed spring chinook salmon population, limits the likelihood that the program leads to substantial masking effects. The USFWS proposes to increase the external marking rate for juvenile spring chinook released from the hatchery as a measure to improve the ability to detect stray fish in natural spawning areas. Increased external marking will also allow for differentiation of the hatchery fish from natural fish during spawning ground and carcass recovery surveys, improving the accuracy of natural fish population censuses. Also limiting the risk of masking effects on listed spring chinook salmon populations is the

release of fish into a tributary lacking listed fish, and the removal of surplus adult returns through Icicle Creek fisheries, or at the hatchery for beneficial uses. NMFS finds that the risk of masking effects on listed spring chinook salmon through the Leavenworth NFH program is adequately limited through the above management practices and measures.

Unlisted spring chinook salmon adults produced through the Entiat NFH program return to the Entiat River and spawn at the same time as listed natural-origin spring chinook salmon in the Basin. Carcass recovery and spawning ground studies by USFWS indicate that returning Entiat NFH spring chinook salmon adults have a low tendency to stray to areas within the Entiat River basin outside of their hatchery release location. However, as previously mentioned, the low marking rate may confound the ability to identify hatchery produced spring chinook salmon on the spawning grounds. Stray Entiat NFH-origin adult fish are recovered at Wells Dam each year, and some adult fish are also recovered at hatcheries in the Methow River Basin. The USFWS proposes to increase the external marking rate for juvenile spring chinook released from the hatchery as a measure to improve the ability to detect stray Entiat NFH fish at these trapping locations and in natural spawning areas. Increased external marking of the hatchery fish will also allow for differentiation of the hatchery fish from wild fish during trapping operations, and through spawning ground and carcass recovery surveys, improving the accuracy of wild fish population censuses. Also limiting the risk of masking effects on listed spring chinook salmon populations is the removal of surplus hatchery adult returns to the hatchery for beneficial uses. The risk of masking effects on listed spring chinook salmon through the Entiat NFH program should be adequately limited through these practices and measures.

Unlisted spring chinook salmon adults produced through the Winthrop NFH program return to the Methow River and spawn at the same time as listed spring chinook salmon. Returning Winthrop NFH-origin spring chinook salmon adults have a high tendency to stray into natural spawning areas in the Methow River mainstem. Significant proportions of the total annual naturally spawning fish population in the mainstem river in some years have been of Winthrop NFH-origin. This situation has confused managers' ability to determine the abundance status of listed spring chinook in the mainstem river.

Phase out of unlisted Carson spring chinook stock production at Winthrop NFH, and cessation of unlisted spring chinook returns to the facility after 2004 should help address the masking issue. The listed Methow composite stock used to supplant Carson stock for production is considered of closer lineage to naturally spawning fish in the Methow River mainstem. The risk of masking effects on listed spring chinook salmon through the Winthrop NFH program is adequately limited through the planned stock transition.

4.2.6 Monitoring and Evaluation

The BPA/Yakama Nation (BPA 1999; YN 2001a) propose to operate a rotary screw-type trap, and potentially electroshockers, in Nason Creek in the Wenatchee River basin to collect juveniles released from the Butcher Creek acclimation site. The trapping study is proposed to determine predation rates on listed spring chinook salmon fry. The Nason Creek screw trap operation may lead to the incidental capture, handle and release of about 500 fry and 1,000 smolt listed spring chinook salmon juveniles, with a potential lethal take of 10 fry and 20 juveniles (YN *et al*. 2002). The loss of 30 juvenile UCR spring chinook salmon is not likely to substantially affect the UCR spring chinook salmon ESU.

The Yakama Nation do not expect to encounter any UCR spring chinook salmon during tow or trawl net component of the proposed Lake Wenatchee sockeye salmon/coho salmon interaction

study. Adequate equipment and measures are included for tow net sampling to minimize harm to listed juvenile fish that are incidentally collected. These measures include use of a cod-end bucket on the terminus of gear to provide a sanctuary for entrained fish, and careful handling, sampling, and release procedures proposed for application. Potential use of mid-water trawl gear as an alternative to tow nets poses an elevated risk to listed juvenile fish that may be encountered. Fish captured in trawl nets have a greater potential for injury and mortality. The number of listed fish encountered is expected to be very small. The juvenile coho salmon radio-telemetry portion of the Yakama Nation study is not expected to affect listed juvenile fish.

The BPA/Yakama Nation (1999) also proposes to conduct snorkel surveys to monitor coho salmon emigration in the watershed, and electro-shocking for presence-absence study purposes, or potentially, to collect additional coho salmon for the Nason Creek predation study. Snorkeling may temporarily displace rearing listed fish from stream areas, for brief periods of time. Electro-shocking in Nason Creek may result in incidental take in the form of capture, handle and release of 150 juvenile/smolt spring chinook salmon, and the lethal take of 15 juveniles/smolts from the ESU. The Yakama Nation's compliance with NMFS electro-fishing guidelines (NMFS 1998b) should adequately limit the risk of adverse effects on listed fish encountered during proposed electro-fishing and could result in a numerically small lethal take of UCR spring chinook salmon.

Predation and species interaction studies proposed by the Yakama Nation in Nason Creek and in Lake Wenatchee are not likely to affect listed adult fish. The proposed Nason Creek screw trap and Lake Wenatchee tow net operations occur prior to the adult spring chinook salmon migration and spawning periods, and adult fish are therefore not expected to be encountered.

4.3 Specific Effects on UCR Steelhead

The specific effects that require additional detail from the preceding general effects analysis on the UCR steelhead ESU in the action area are evaluated in this section. Specific areas of concern include operation of the Leavenworth NFH facilities, broodstock collection activities, and competition/density dependent effects from the coho salmon artificially propagated programs, and potential monitoring and evaluation project impacts.

4.3.1 Operation of Hatchery Facilities

A barrier to upstream fish passage associated with structures in Icicle Creek placed in association with the Leavenworth NFH program has been in place since 1940, and may adversely affect listed steelhead productivity in the Wenatchee River basin. This barrier to upstream fish passage is being addressed through a separate forum (the Icicle Creek Restoration Project EIS process), including USFWS, NMFS, state, tribal, Icicle Creek Watershed Council, and other private participants. NMFS expects that the EIS process will lead to the application of a preferred alternative allowing passage of adult and juvenile fish above the barrier, potentially benefitting steelhead recovery in the Wenatchee River basin and reducing the risk to the listed steelhead ESU. The preferred alternative will be evaluated by NMFS for effects on listed fish through a separate section 7 consultation. The effects on listed fish of water withdrawal from upper Icicle Creek for municipal, agricultural, and hatchery use, and the operation of the water intake structure for water withdrawals from Icicle Creek, will also be addressed by NMFS through a separate section 7 consultation. Although an effects analysis and jeopardy determination for this portion of the Leavenworth NFH operation will not be rendered in this Opinion, it is NMFS ' expectation that free upstream passage for listed UCR steelhead juveniles and adults must be provided at the Leavenworth NFH Dam. The Icicle Creek does not support listed UCR spring

chinook salmon and no adverse impacts are expected to result from the operation of the Leavenworth NFH facility on UCR spring chinook salmon.

The hatchery water intake structure for Leavenworth NFH in Icicle Creek is currently not screened to exclude juvenile ESA-listed fish in compliance with NMFS screening criteria, due to the location of the intake in a high velocity, exposed section of the creek. As mentioned previously, the USFWS, with potential funding from the BOR, is investigating options for the modification of this structure to achieve full compliance with these criteria (USFWS 2000a). It is NMFS ' opinion that, although fish may enter the water intake and be displaced downstream, the system functions adequately to reduce the risk of injury and mortality, or other harm to any anadromous fish that may be entrained, and that the risk of substantial adverse effects on listed Wenatchee basin steelhead is minimal. The present lack of access to anadromous fish to the area of the intake beyond the few steelhead and Carson-lineage spring chinook salmon passed upstream for the radio-tagging study also supports this opinion. However, NMFS acknowledges the future, enhanced need to modify the intake structure to minimize the risk of juvenile steelhead entrainment when upstream fish passage at the hatchery dam is provided.

Structures, including screens, maintained in the old Icicle Creek channel during rearing to contain acclimating coho salmon may prevent, if present, listed juvenile and adult fish from accessing the channel. The issue of appropriate acclimation and rearing sites for coho salmon in the Icicle Creek watershed needs to be addressed in the long-term management plan. The BPA/Yakama Nation are working with local watershed groups to reach consensus regarding acceptable rearing locations for coho salmon in the Icicle Creek watershed at, or in the vicinity of, Leavenworth NFH.

The overall number of listed steelhead incidentally captured, handled, and released each year in unlisted salmon trapping operations is currently low, and under 100 fish. The proposed operation schedules for the summer chinook salmon trapping programs exclude the majority of migrating adult steelhead. The duration of weekly and daily trapping at proposed broodstock collection locations is limited to allow free passage of adult steelhead upstream without delay or handling. BPA (1999) has proposed to expand the trapping durations at Tumwater Dam to collect adult coho salmon for broodstock, leading to increased adult steelhead take levels. The USFWS trapping programs directed at unlisted hatchery spring chinook salmon stocks are confined to the hatcheries, which rely on volunteers to the hatchery traps. Listed UCR steelhead adult stray rates to these hatchery traps will be low. Listed steelhead adult returns to Wells Hatchery are expected. Wells Hatchery is a production location for this listed species, and steelhead takes at the hatchery were previously authorized under section 10 permit 1395. Risk aversion measures applied at the trapping facility during broodstock collection, including minimal holding and handling of incidentally encountered steelhead, should reduce the risk of harm. Therefore, unlisted salmon broodstock collection operations as proposed are anticipated to have minimal adverse impacts on UCR steelhead.

4.3.2 Broodstock Collection

The BPA/Yakama Nation have proposed to modify trap operational times and durations at Dryden and Tumwater Dams from those proposed by WDFW to accommodate coho salmon broodstock collection objectives (BPA 1999). The WDFW is currently permitted under section 10 permit 1395 for the directed collection of 208 steelhead in the Wenatchee River (Dryden and Tumwater traps combined) and 395 steelhead from the run at large arriving at Wells Dam. This steelhead take is authorized by NMFS for collection as broodstock for the Wells Hatchery-based listed steelhead supplementation program. Increased trap operational days proposed by BPA will

lead to estimated incidental takes (through additional capture, handling and release) of 25 to 30 steelhead at each location during trapping operations to collect coho broodstock (BPA 1999).

The Dryden and Tumwater Dam traps encounter a small number of adult steelhead each year during operations directed at the collection of summer chinook and sockeye salmon broodstock. The average annual numbers of adult steelhead that are captured, handled and released are 11 at Dryden Dam (1992-96 average) and 23 at Tumwater Dam (1996 data only), respectively (WDFW 1999d). The WDFW applies measures to minimize steelhead capture levels, and the risk of harm to any incidentally captured steelhead. These measures include the allowance for unrestricted passage of steelhead at Tumwater Dam when the trap is not being actively operated, continuous monitoring during trapping at Tumwater Dam, minimal holding times in trap live boxes at Dryden (< 24 hours), and careful handling and release upstream of all steelhead captured.

Few listed steelhead are reported to be encountered during trapping for unlisted spring chinook salmon at Leavenworth NFH each year (Cooper *et al*. 2002). On average 15-20 adult steelhead are trapped and released back into the river annually (B. Cates, USFWS, February 8, 1999). These steelhead are usually un-spawned adult steelhead that have entered the Leavenworth NFH fish ladder during spring chinook trapping periods, in May and early June. These steelhead are released unharmed. Some steelhead are trapped at the hatchery and passed upstream above the hatchery dam for a migration and habitat utilization study in Icicle Creek. This steelhead-directed study has been authorized by NMFS under a separate ESA permit process.

Few listed steelhead are reported to be encountered during trapping for unlisted spring chinook salmon at Entiat NFH each year (Cooper *et al*. 2002). Spawned out steelhead may enter the Entiat NFH fish ladder during the May through early June spring chinook salmon trapping period. Any steelhead encountered are released unharmed into the Entiat River.

The BPA/Yakama Nation's proposed collection of coho salmon adults returning to the Leavenworth NFH ladder and old Icicle Creek channel between September and December has a small potential for additional captures of steelhead adults. The number of steelhead that may be incidentally collected by the Yakama Nation staff in the ladder and at "Dam 5" at the base of the old Icicle Creek channel should be very low. During USFWS snorkel surveys in September, no adult steelhead have been observed in the pool below the hatchery barrier adjacent to where coho salmon broodstock will be collected. Juvenile steelhead or resident rainbow trout are observed during these surveys on occasion. While it is likely that the mainstem Wenatchee River does hold steelhead at the time coho salmon are proposed to be collected as broodstock (September - December), adult steelhead should rarely be present in Icicle Creek during that period. Trapping by BPA/Yakama Nation at the hatchery dam to collect coho broodstock is therefore not expected to lead to substantial impacts on listed steelhead.

The BPA/Yakama Nation also proposes to collect coho salmon broodstock at the Dryden Dam traps on a five to seven day per week frequency (BPA 2002 - ltr to Rob Jones dated Feb. 11, 2002; YN *et al*. 2002) through the first week of December. The WDFW currently operates the Dryden Dam traps seven days per week until November 14th, so the proposed BPA/Yakama Nation coho program could increase the number of steelhead encountered. Steelhead encountered may be collected as broodstock for the Wenatchee steelhead program as authorized under permit 1395. If steelhead are not retained for broodstock they would be released unharmed upstream of the trap site and the overall impact to the protected population is anticipated to be negligible.

The increased frequency of trapping proposed by BPA to collect coho at Tumwater Dam trap during the September through December period will likely lead to increases above current levels in the number of adult steelhead that will be incidentally captured, handled and released. The WDFW currently proposes to operate the trap to collect summer chinook and steelhead (direct take authorized by NMFS under section 10 permit 1395 (NMFS 1998a)) as broodstock three days per week, eight hours per day during the September and November period to limit handling of steelhead, and to prevent potential problems with steelhead migrational delay and fall-back. The BPA proposes to increase the frequency of trapping at Tumwater Dam to four days per week in November and December, which could result in the additional capture and handling of 25 to 30 adult steelhead. The BPA proposes to staff the Tumwater Dam trap with the Yakama Nation staff full-time. The BPA (1999) also indicates that all listed fish captured during the coho-directed broodstock collection program, including steelhead, will be removed from the trap and released immediately upstream. In years of high coho salmon returns, it may be recommended to remove all coho encountered at Tumwater Dam to restrict the number of adult coho salmon on the spawning grounds to reduce potential impacts on spring chinook salmon redds which are built earlier in the year.

The above trapping programs directed at summer chinook, sockeye, and coho salmon at Leavenworth NFH, Dam 5, and Dryden Dam may affect, but are not likely to adversely affect listed UCR ESU steelhead due to low numbers encountered, and the implementation of impact reduction measures during trapping. Trapping proposed to collect sockeye, summer chinook, and coho broodstock at Tumwater Dam (WDFW 2000) may affect, but are also not likely to adversely affect listed UCR ESU steelhead. Low numbers of steelhead are encountered through operation of the trap at the frequency proposed, and listed fish may pass the dam freely when the trap is not being actively operated.

The hatchery programs reviewed in this Opinion collect as broodstock, spawn, and propagate unlisted salmon. Listed salmon and steelhead incidentally encountered through the programs, and not transferred for use as broodstock in previously authorized stock recovery programs, are released at the point of capture. No substantial broodstock removal effects, including numerical reduction or selection effects, on listed UCR steelhead will occur through the proposed broodstock collection programs.

4.3.3 Competition/Density-Dependent Effects

Listed UCR steelhead are present year round in the Wenatchee, Methow, and Okanogan River basin tributary and mainstem areas. Steelhead fry imerge and disperse to downstream areas in late summer and fall at a size of 30-33 mm fl. Steelhead emigrate seaward as age 2+ (43.2 percent) or 3+ (46.4 percent) smolts (Peven 1990) during April and May at an average size of 163 to188 mm (Chapman *et al.* 1994b).

As described above in Section 4.2.3, coho salmon smolts released into the Wenatchee River basin are expected to emigrate rapidly, soon after the fish volitionally leave the acclimation sites, thereby limiting the potential for negative impacts on rearing natural origin steelhead. The large size of the hatchery fish relative to the natural fry and fingerlings present at the time of the releases also decreases the likelihood for competition for the same food resources by the hatchery and natural fish. The larger, seaward migrating hatchery smolts will also tend to use different habitat than rearing steelhead and spring chinook salmon fry and fingerlings that may be encountered.

The Wenatchee summer chinook salmon program is designed to supplement the indigenous summer chinook salmon population in the Wenatchee River and the release sites are well below the spring chinook salmon spawning and early rearing areas. Adult summer chinook salmon produced through the program will therefore contribute to the naturally spawning summer chinook salmon population. The risk of adverse competitive effects posed by progeny of hatchery-origin summer chinook salmon spawners to listed juvenile spring chinook salmon and steelhead is likely to be low, assuming resource partitioning between fish species that have evolved sympatrically in the Wenatchee River system and the spatial separation of the species. Fish species that evolved sympatrically in the UCR basin have developed slight differences in habitat use that tend to reduce opportunities for interaction, including competition for food resources, rearing space, and spawning areas.

Natural spawning by straying Leavenworth NFH spring chinook salmon adults appears to be low, and the risk that progeny of such spawners will adversely affect listed juvenile fish through competition is therefore low.

As previously mentioned, information suggests that juvenile coho salmon are behaviorally dominant in agonistic encounters with juveniles of other stream-rearing Pacific Northwest salmonid species, including chinook salmon, steelhead, and cutthroat trout (*O. clarki*). Dominant salmonids tend to capture the most energetically profitable stream positions (Fausch 1984, Metcalfe 1986), providing them with a potential survival advantage over subordinate fish. Aggressive interaction between coho salmon and steelhead fry that result in competitive displacement of steelhead trout are well documented (Hartman 1965, Allee 1974). Fraser (1969) observed that the survival rate of steelhead living sympatrically with coho salmon declined slightly as coho salmon densities increase. However, where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho salmon and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho salmon are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic insects. However, Fraser (1969) stated that the instantaneous growth rate of steelhead declines with increasing coho salmon density during sympatry.

Steelhead and coho salmon share a common ancestry and similar habitat requirements. Recent research by Merz and Vanicek (1996) found that in a two year study of salmon and steelhead juvenile diets in the American River, California, the diets of the two species was substantially the same. Furthermore, in the mainstem Columbia River, Muir and Emmett (1988) found migrating chinook salmon, coho salmon, and steelhead juveniles all ate predominately the same food item - *Corophium salmonis*. Therefore, interspecific competition is expected to occur and may strongly influence the behavior, growth, and survival of the two species when they occur sympatrically in nature. The level of competition and influence on behavior, growth and survival is dependent upon the food source being limited in the mainstem Columbia River.

Coho salmon may have a competitive advantage over steelhead when they coexist. Juvenile coho salmon tend to emerge from the gravel earlier then steelhead, which allows them to establish territories and reach larger sizes than steelhead of the same age class (Berejikian 1995). Both laboratory and stream studies indicate that these species use different stream microhabitats. In the absence of coho salmon, steelhead use more of the water column and more pool habitat than when coho salmon are present (Hartman 1965; Allee 1974; Bugert and Bjornn 1991). In the

presence of coho salmon, age-0 steelhead generally occupy the shallower, faster water of riffles and pool slopes, while coho salmon occupy the deeper water of pools (Bugert and Bjornn 1991).

In-stream segregation between coho salmon and steelhead appears to be both actively maintained and adaptive (Nilsson 1967). Their habitat segregation is consistent with interspecific morphological variation: juvenile steelhead are more fusiform in shape than coho salmon and therefore better able to cope with higher water velocities (Bisson *et al.*1988). These differences may reduce competition and facilitate partitioning of stream resources during low summer flows in streams when competition is most intense (Hard 1996). Because of their different morphology and habitat use, it is expected that stream characteristics will be primary determinants of interactions between these species: steelhead are expected to thrive better in the presence of coho salmon in streams with higher gradients and velocities, while steelhead are likely to diminish in streams with lower gradients and velocities (Hard 1996; Stelle 1996).

Recent investigations by the Yakama Nation in the Wenatchee River basin indicate that the artificially propagated coho salmon released in Nason Creek and Icicle River in 1999, 2000, and 2001 have emigrated out the Wenatchee system quickly, and therefore have had minimal opportunity for competition or density dependent effects on occur (Murdoch and LaRue 2002).

The BPA/Yakama Nation's long term proposal is to stock coho salmon in the Wenatchee River basin at levels consistent with historic natural coho salmon densities, and based on parr and smolt carrying capacity estimates for the major basin tributaries (BPA 1999). To reduce potential adverse impacts on spring chinook salmon and steelhead in the upper tributaries, the BPA/Yakama Nation should focus their coho salmon releases in areas where impacts on the ESA-listed species will be minimal, such as Peshastin and Icicle Creeks. The proposed coho salmon release levels considered in this Opinion represent the initial, feasibility stage of the reintroduction effort. Release levels are designed to be those necessary to identify ecological risks to listed fish, coho salmon broodstock requirements to meet desired production levels, and survival of out-of-watershed stocks (BPA 1999). Therefore, on the short term, and for the duration of the program considered in this Opinion, the numbers of coho salmon that are progeny of naturally spawning coho salmon will likely be very low and well below the estimated juvenile coho salmon carrying capacity of Wenatchee basin tributaries.

4.3.4 Monitoring and Evaluation

The BPA/Yakama Nation (BPA 1999; YN 2001a) propose to operate a rotary screw-type trap, and potentially electroshockers, in Nason Creek in the Wenatchee River basin to collect smolts released from the Butcher Creek acclimation site. The trapping study is proposed to determine predation rates on listed spring chinook salmon fry. The Nason Creek screw trap operation may lead to the incidental capture, handle and release of about 500 fry and 1,000 smolt listed spring chinook salmon juveniles, with a potential lethal take of 10 fry and 20 smolts (YN *et al*. 2002). The Yakama Nation estimate that 500 juvenile/smolt steelhead may be incidentally captured, handled and released, and 10 may be lethally taken during the Nason Creek screw trap operations.

The Yakama Nation do not expect to encounter any spring chinook salmon or steelhead during tow or trawl net component of the proposed Lake Wenatchee sockeye salmon/coho salmon interaction study. Adequate equipment and measures are included for tow net sampling to minimize harm to listed juvenile fish that are incidentally collected. These measures include use of a cod-end bucket on the terminus of gear to provide a sanctuary for entrained fish, and careful handling, sampling, and release procedures proposed for application. Potential use of mid-water

trawl gear as an alternative to tow nets poses an elevated risk to listed juvenile fish that may be encountered. Fish captured in trawl nets have a greater potential for injury and mortality. The number of listed fish encountered is expected to be very small. The juvenile coho salmon radio-telemetry portion of the Yakama Nation study is not expected to affect listed juvenile fish.

The BPA (1999) also proposes to conduct snorkel surveys to monitor coho salmon emigration in the watershed, and electro-shocking for presence-absence study purposes, or potentially, to collect additional coho salmon for the Nason Creek predation study. Snorkeling may temporally displace rearing listed fish from stream areas, but is not expected to exert substantial adverse effects. Electro-shocking in Nason Creek may result in incidental take in the form of capture, handle and release of 150 juvenile/smolt spring chinook salmon and 150 juvenile/smolt steelhead, and the lethal take of 15 juveniles/smolts of each protected species. The Yakama Nation's compliance with NMFS electro-fishing guidelines (NMFS 1998b) should adequately limit adverse effects on listed fish encountered during proposed electro-fishing.

Predation and species interaction studies proposed by the Yakama Nation in Nason Creek and in Lake Wenatchee are not likely to affect listed adult fish. The proposed Nason Creek screw trap and Lake Wenatchee tow net operations occur prior to the adult spring chinook salmon migration and spawning periods, and adult fish are therefore not expected to be encountered.

4.4 Cumulative Effects

Cumulative effects are defined in 50 CFR §402.02 as "those effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area considered in this biological opinion." Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities, are not considered within the category of cumulative effects for ESA purposes because they require separate consultations pursuant to Section 7 of the ESA after which they are considered part of the environmental baseline. Future State, tribal, local, or private actions within the action area are described for NEPA purposes in the EIS (NMFS 2003) regarding the implementation of the three HCP agreements. NOAA Fisheries evaluated these actions to determine whether or not they would meet the requirements of its implementing regulations. Those actions which are most notable include Washington State TMDL (total maximum daily load) development and implementation, Washington State legislation to enhance salmon recovery through tributary enhancement programs, and recent human population trends in the action area. However, after considerable review, NOAA Fisheries has determined that these actions cannot be deemed reasonably likely to occur based on its ESA implementing regulations.

The Endangered Species Consultation Handbook describes this standard as follows:

> "Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."

There are, of course, numerous non-Federal activities that have occurred in the action area in the past, which have contributed to both the adverse and positive effects of the environmental

baseline. This step of the analysis for application of the ESA Section 7(a)(2) standards requires the consideration of what of those past activities are "reasonably certain to occur" in the future within the action area.

First of all, any of these actions that involve Federal approval, funding, or other involvement are not considered "cumulative effects" for this analysis (see ESA definition, above). This Federal involvement will trigger ESA Section 7(a)(2) consultation in the future. Once the consultation on those actions is completed the effects may be considered part of the environmental baseline, consistent with the ESA regulatory definition of "effects of the action" (50 CFR §402.02). Thus, for example, state efforts to improve water quality in compliance with the Federal Clean Water Act would not be considered because of the involvement of the EPA, until separate ESA consultations are completed. Others examples include irrigation water withdrawals involving the

USFS (right-of-way permits for irrigation canals) or agricultural practices that receive Federal funding through the U.S. Department of Agriculture.

Next, actions that do not involve Federal activities must meet the "reasonably certain to occur" test for NOAA Fisheries to consider their effects in this Opinion. Recognizing that this is a narrower standard than used for NEPA purposes, not all of the actions identified in the EA may be considered as "cumulative effects" for this ESA Section 7(a)(2) consultation. In reviewing the actions identified in cumulative effects analysis of the EA, after eliminating from consideration those with Federal involvement, NOAA Fisheries finds that currently few, if any, of the future adverse or beneficial State, tribal or private actions qualify for consideration in this analysis as "cumulative effects."

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NOAA Fisheries concludes that most of the factors for the decline of these species are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon, against which the effects of this action are considered, are likely to be improved, although to an unknown or possibly minor extent, over those reflected by the historical trends under the environmental baseline.

4.5 Integration and Synthesis

The proposed actions may result in incidental take of listed UCR spring chinook salmon and UCR steelhead. The applicants propose protective measures, and NMFS further limits incidental take with conditions to be included in permit 1347 to minimize the extent of take. The above analysis suggests that species and behavioral differences between sockeye salmon, summer chinook salmon, coho salmon, and the listed UCR spring chinook salmon and UCR steelhead largely reduce potential adverse impacts.

In particular, risks associated with broodstock collection activities are minimal. The return timing and duration of sockeye salmon, and limited spawning and rearing areas of sockeye salmon in comparison to the listed species ESUs result in minimal interaction between sockeye salmon and the listed ESUs, and don't adversely affect their habitat. The adult return timing, and spacial and temporal differences of summer chinook compared with the listed ESUs reduces the potential risk from summer chinook programs. The proposed coho salmon program broodstock trapping timing largely coincides with UCR steelhead migrations. However, at most trapping sites, activities are ongoing that target the collection or sampling of UCR steelhead which have

been previously evaluated and authorized under ESA section 10(a)(1)(A) permit process (NMFS 2003).

No intake structures are associated with these operations. NMFS finds that the operation of hatchery facilities in the Wenatchee River basin with regard to water intake systems are not likely to pose a substantial risk to the UCR spring chinook salmon and UCR steelhead ESU.

Genetic risks are non-existent from sockeye salmon and coho salmon because of species differences. Genetic risk from summer chinook salmon programs are minimal due to spatial and temporal differences between the two chinook salmon races. Masking effects are not likely to occur because physical differences allow biologist to accurately identify the different species and the different chinook races where adult co-occur. Nutrient cycling impacts are expected to be mostly positive effects, increasing the food resources for listed species in the tributaries and potentially enhance the general health of the aquatic ecosystem. Monitoring and evaluation projects are crucial to increasing our understanding of artificial propagation programs, and their effects on listed and unlisted species, and will be carried out in a manner which minimizes adverse impacts on UCR spring chinook salmon and UCR steelhead.

Potential adverse impacts on juvenile UCR spring chinook salmon and UCR steelhead include impacts from the operation of the hatchery facilities, competition/density dependent effects, predation, and disease transfers. Hatchery facilities in the UCR generally employ techniques to minimize risks to listed species. They follow fish health protocols developed by regional co-managers, obtain and follow water withdrawal permits which limit surface water intakes, adhere to conditions of applicable NPDES water quality permits for water discharged from their facilities, and have implemented hatchery reform measures where possible.

Competition/density dependent effects and predation impacts are minimized for most of the programs by releasing only migration ready smolts which migrate out of the action area quickly. The sockeye salmon program releases juvenile sockeye in the late summer and fall at a size that is unlikely to prey on listed UCR spring chinook salmon or steelhead that could be rearing in Lake Wenatchee through the winter. The Wenatchee River basin coho program releases a small number of fry coho as part of a study designed to specifically investigate predation and competition impacts of the coho programs on the listed species.

Increased risks are posed by spring chinook salmon programs that rear non-native stock of spring chinook salmon. These programs proposed several strategies to limit or reduce adverse impacts. The Leavenworth NFH program promotes spatial separation between the non-native artificially propagated program and the listed UCR spring chinook program. Monitoring of the adults through scale analysis and CWT analysis at all the UCR basin hatchery facilities, carcasses sampled during spawning ground surveys, and harvest fishery sampling all generally support this conclusion and continued monitoring as proposed will help refine this analysis.

The Entiat NFH poses increased risk, although historic information suggested that this program also functioned in a manner to spatially separate the non-native artificially propagated spring chinook from the natural origin listed stock. However, increased monitoring is warranted which will be reflected in the program's annual reports, and may lead to reconsideration of the risks of this program. The Winthrop NFH has not been able to spatially separate the non-native stock and is in the process of transitioning the program to using the listed UCR spring chinook stock for the program. This program would be expected to aid in the recovery of the ESA listed UCR spring chinook salmon stock and operate as a conservation program after complete stock transition.

Monitoring of adult salmonids associated with all of the proposed programs would be conducted at trap sites incidental to authorized activities such as broodstock collection. Observation of adult salmonids on spawning grounds and sampling of dead carcasses pose minimal displacement or harrassment risks because either listed UCR spring chinook and UCR steelhead are not present at the time of these activities or similar activities directed toward the listed species are authorized under the ESA through separate processes, such as permit 1395 for UCR steelhead.

5 CONCLUSIONS

NMFS' approach for determining whether the proposed actions are likely to jeopardize the continued existence of ESA-listed salmonids or destroy or adversely modify designated critical habitat is based on an analysis of the existing or potential risk of hazards posed by the actions. NMFS has considered the analysis presented above and the likelihood for survival and recovery of the listed salmon and steelhead ESUs under the environmental baseline in making its jeopardy determination.

After reviewing the current status of listed UCR steelhead and UCR spring chinook salmon, the environmental baseline for the action area, the effects of the proposed artificial propagation programs in the UCR basin, and cumulative effects, it is NMFS' determination that the federal artificial propagation programs proposed for operation of funding by the USFWS and BPA in the UCR basin are not likely to jeopardize the continued existence of these listed ESU's or to destroy or adversely modify their habitat.

In addition, after reviewing the current status of listed UCR steelhead and UCR spring chinook salmon, the environmental baseline for the action area, the effects of the proposed artificial propagation programs in the UCR basin, and cumulative effects, NMFS concludes that the issuance of ESA section 10 incidental take permit 1347, including conditions as described above, for the artificially propagated programs proposed by the WDFW, the Chelan PUD, and the Douglas PUD is not likely to jeopardize the continued existence of the listed ESUs or to destroy or adversely modify their habitat.

6 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include substantial habitat modification or degradation that results in death or injury to listed species by substantially impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to substantially disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS).

The measures described below are non-discretionary, and must be undertaken by the action agencies so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The action agencies have a continuing duty to regulate the activity covered by this ITS. If the action agencies (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the agencies must report the progress of the action and its impact on the species to NMFS as specified in the ITS. [50 CFR §402.14(i)(3)].

An ITS specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

6.1 Amount or Extent of Take

The proposed actions are expected to result in the incidental take of listed salmon and steelhead in the Columbia River basin. A quantifiable take may occur during adult broodstock collection activities and some investigational activities for the unlisted artificial propagation programs. Tables 6-10 detail the estimated annual takes for activities where available. The incidental take of listed adult UCR spring chinook salmon and UCR steelhead most often will be in the form of capture, handling, and subsequent release of protected species. For activities that pose lethal threats to individuals, the estimated take level is provided. During most broodstock collection activities, retention of steelhead encountered is authorized for artificial propagation programs under separate section 10(a)(1)(A) permits.

Table 6. Expected annual ESA-listed adult UCR spring chinook salmon and steelhead take levels during USFWS operated UCR region unlisted spring chinook salmon broodstock trapping activities.

Species	Leavenworth NFH	Winthrop NFH	Entiat NFH
Spring chinook	< 10 (few)	[a]	< 10 (few)
Steelhead	20	< 10 (few)	<10 (few)

[a] *ESA-listed spring chinook capture at Winthrop NFH is authorized under section 10(a)(1)(A) permit 1300*

Table 7. Expected annual ESA-listed adult UCR spring chinook salmon and steelhead take levels during the Yakama Nation operated UCR region unlisted coho salmon broodstock trapping activities.

Species	Icicle River Dam 5	Priest Rapids	Dryden Dam	Tumwater Dam	Wells Dam East/West
Spring chinook	0	0	0	0	0
Steelhead [a]	0.5 %	3.5 %	5.0 %	3.5 %	4.5 %/4.5%

[a] *These take levels are in addition to take authorized to WDFW in permit 1395.*

Table 8. Expected annual ESA-listed adult UCR spring chinook salmon and steelhead take levels during WDFW operated UCR region unlisted salmon broodstock trapping programs.

Species	Priest Rapids	Dryden	Tumwater Dam	Wells
Spring chinook	0	0	< 10	<10 [a]
Steelhead [b]	10	11	23	19

[a] *Spring chinook encountered in the Wells Dam traps during summer chinook collection are shunted upstream without handling.*

[b] *Steelhead takes at the Dryden, Tumwater, and Wells Dam traps are authorized under section 10 permit 1395.*

Table 9. Expected annual ESA-listed adult UCR spring chinook salmon and steelhead take levels during YN weir operation in various UCR creeks.

Species	Brender Creek juvenile/adult	Beaver Creek juvenile/adult	Chumstick Creek juvenile/adult
Spring chinook			
capture, handle, release	0/0	0/0	0/0
lethal	0/0	0/0	0/0
Steelhead			
capture, handle, release	200/20	150/15	200/20
lethal	0/0	5/0	5/0

Table 10. Expected annual ESA-listed juvenile UCR spring chinook salmon and steelhead take levels during the Yakama Nation smolt trap monitoring of unlisted coho salmon smolt emigration activities.

Species	Eggs/fry	Juvenile/smolt
Spring chinook		
capture, handle, and release	500	1,000
lethal	10	20
Steelhead		
capture, handle, and release	0	500
lethal	0	10

Table 11. Expected annual ESA-listed juvenile UCR spring chinook salmon and steelhead take levels during the Yakama Nation monitoring of unlisted coho salmon juvenile interactions and impacts on growth of listed species using electroshocking techniques.

Species	Eggs/fry	Juvenile/smolt
Spring chinook		
capture, handle, and release	0	300
lethal	10	30
Steelhead		
capture, handle, and release	0	300
lethal	0	30

In the absence of the exact numbers of listed salmon and steelhead expected to be incidentally taken as a result of juvenile fish releases, NMFS has relied on a qualitative approach to limit incidental impacts on listed species. NMFS will monitor release numbers and locations to

determine compliance with the following reasonable and prudent measures and terms and conditions.

6.2 All Agency Reasonable and Prudent Measures

The following reasonable and prudent measures are provided to minimize and reduce the anticipated level of incidental take associated with the proposed artificial propagation programs:

1. The Action Agency shall manage their programs to minimize the risk of adverse demographic, ecological, and genetic effects on listed salmon and steelhead, including potential interbreeding of unlisted, hatchery-origin salmon and listed salmon, in the UCR basin.

2. The Action Agency shall coordinate the production of unlisted salmon with other fishery co-managers and other hatchery production programs in the UCR region.

3. The Action Agency shall apply external and/or internal marks to at least a portion of each hatchery release group for monitoring, evaluation and stock management purposes.

4. The Action Agency shall monitor and evaluate their respective artificial propagation programs in the UCR basin.

5. The Action Agency shall reduce potential negative impacts on listed salmon and steelhead in the UCR basin from physical operation of their respective artificial propagation facilities, including associated trapping locations.

6.3 All Agency Terms and Conditions

To carry out these reasonable and prudent measures, the following terms and conditions shall be implemented by the action agencies and their contractors.

<u>Program management, fish handling, hatchery facility operations, monitoring and evaluations activities</u>

1. Activities that encounter steelhead that are not authorized by other permits shall be limited to the levels indicated in Tables 6 through 11 of this Opinion. The action agencies shall report any occurrence in which this level is exceeded to NMFS in the monthly and annual report.

2. All action agencies shall manage adult artificially propagated stray rates to the lowest level achievable. For non-indigenous-origin salmon, stray rates should not exceed 5 percent of the annual natural-origin population size in the receiving stream. For within ESU-origin stocks out-planted for fishery augmentation/mitigation programs, unlisted salmon stray rates should be managed to not exceed 5 percent to 30 percent of the annual natural-origin population. The actual proportion allowed within this range will depend on the genetic compatibility of the straying artificially propagated stock with the natural population.

3. In the event that circumstances, such as unanticipated, higher-than-expected fecundity, or high egg-to-fry survival rates, lead to the inadvertent possession of salmon substantially in excess (>110 percent) of program production levels specified above, then surplus eggs

or fish shall be culled from the population in a manner consistent with achieving program goals.

4. The Action Agency is responsible for the actions of any individual operating under the authority of this permit. Such actions include capturing, handling, and releasing any ESA-listed species authorized to be incidentally taken by this permit.

5. The Action Agency must ensure that all ESA-listed species are handled carefully. Should NMFS determine that a procedure provided for under this permit is no longer acceptable, the Action Agency must immediately cease such activity until an acceptable substitute procedure is identified and approved by NMFS.

6. Measures shall be applied to ensure that artificially propagated chinook salmon juveniles released will be ready to actively migrate to the ocean. To meet this condition, fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay after release. Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism, that necessitates early release of ESA-listed steelhead to prevent catastrophic mortality. Any emergency releases made by the action agencies shall be reported immediately to the NMFS Salmon Recovery Division in Portland.

7. The Action Agency must allow any NMFS employee or representative to accompany field personnel while they conduct authorized activities.

8. The Action Agency are responsible for obtaining all other federal, state, and local permits/authorizations needed for the proposed activities.

9. The Action Agency shall operate and manage the artificial propagation programs including following impact minimization measures as proposed in this section 7 Biological Opinion.

10. To the extent possible without imposing increased risk to listed species, the Action Agency shall enumerate and identify marks and tags on all anadromous species encountered at adult and juvenile trapping sites. This information shall be included in either an annual brood program report or a monitoring and evaluation report submitted to NMFS.

11. In trapping operations directed at the collection of broodstock, the Action Agency shall apply measures that minimize the risk of harm to listed salmon and steelhead. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

12. All traps that have the potential to incidentally capture listed UCR spring chinook salmon or UCR steelhead shall be checked and have the fish removed at least daily.

13. If water temperature at adult trapping sites exceeds 21 C (69.8 F), the trap operation shall cease pending further consultation with NMFS to determine if continued trap operation poses substantial risk to ESA-listed species that may be incidentally encountered.

14. The Action Agency shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. The Action Agency shall carefully handle and immediately release upstream incidentally captured listed UCR spring chinook salmon and UCR steelhead adults that are not intended for use as broodstock in concurrently operated and otherwise authorized listed stock recovery programs.

15. The Action Agency shall ensure that water intakes into artificial propagation facilities be properly screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they shall comply with transitional criteria set forth by NMFS in 1999 for juvenile fish screens constructed prior to the establishment of the 1995 criteria (NMFS 1996), to minimize risks to listed salmon and steelhead. The Action Agency shall inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility; the results of this monitoring shall be included in annual reports.

16. The Action Agency shall implement the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and WDFW 1998) and Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) guidelines to minimize the risk of fish disease amplification and transfer, and to ensure that artificially propagated fish would be released in good health.

17. The Action Agency shall conduct hatchery operations and monitor hatchery effluent in compliance with applicable National Pollutant Discharge Elimination System (NPDES) (EPA 1999) permit limitations.

18. Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining the presence of anadromous fish. Snorkeling and streamside surveys will replace multi-pass electro-fishing procedures whenever possible.

19. The Action Agency must coordinate with other co-managers and researchers to ensure that no unnecessary duplication and/or adverse cumulative effects occur as a result of the Action Agency's activities.

20. The Action Agency may conduct spawning ground and carcass surveys to assess the distribution and impact of artificially propagated salmon on the natural-origin populations.

Reports

NMFS contact for all reports: NMFS - Salmon Recovery Division
525 NE Oregon Street, Suite 510
Portland, Oregon 97232
Phone: (503) 230-5407
Fax: (503) 872-2737

1. The Action Agency must notify the Salmon Recovery Division of NMFS as soon as possible, but no later than two days after, any authorized level of take is exceeded or if such an event is likely. The Action Agency must submit a written report detailing why the authorized take level was exceed or is likely to be exceeded.

2. The Action Agency shall update and provide to the Salmon Recovery Division of NMFS by December 15th of each year, the projected hatchery releases by age class and location for the coming year.

3. The Action Agency shall provide annual reports that summarize numbers, pounds, dates, tag/mark information, locations of artificially propagated fish releases, and monitoring and evaluation activities that occur within the hatchery environment, and adult return numbers to the UCR basin for each program. The Action Agency shall ensure collection and reporting of the coefficient of variation around the average (target) release size immediately prior to their liberation from the acclimation sites as an indicator of population size uniformity and smoltification status. Reports shall also include any preliminary analyses of scientific research data, any problems that may have arisen during conduct of the authorized activities, a statement as to whether or not the activities had any unforeseen effects, and steps that have been and will be taken to coordinate the research or monitoring with that of other researchers. Unless otherwise noted in the specific terms and conditions, the reports shall be submitted by January 31st, of the year following release (i.e., brood year 2002, release year 2003, report due January 2004) to the Salmon Recovery Division of NMFS.

4. The Action Agency must provide plans for future projects and/or changes in sampling locations or enhancement/research protocols and obtain approval from the Salmon Recovery Division of NMFS prior to implementation of such changes.

5. Adult return information shall include the most recent annual estimates of the number and proportion of artificially propagated fish on the spawning grounds, and the number and location of artificially propagated adults that were recovered outside the release areas. Adult return information and results from monitoring and evaluation activities outside the hatchery environment should be included in the annual report or a separate report. If a separate report on monitoring and evaluation activities conducted outside the hatchery environment is prepared, it shall be submitted by August 31st, of the year following the monitoring and evaluation activities (i.e., surveys conducted in 2003, report due August 2004) to the Salmon Recovery Division of NMFS.

6. The Action Agency shall develop annual broodstock collection and spawning protocols for each artificial propagation program operated. Protocols should be coordinated with the co-managers and must be submitted to the Salmon Recovery Division of NMFS by April 15th for spring chinook salmon programs and June 15th for coho salmon programs of the collection year.

7. The Action Agency must report the take of any ESA-listed species not included in this permit when it is killed, injured, or collected during the course of enhancement/research activities. Notification should be made as soon as possible, but no later than two days after the unauthorized take. The Action Agency must then submit a detailed written report of the non-permitted take. Pending review of these circumstances, NMFS may suspend enhancement/research activities.

Penalties and Sanctions

1. The Action Agency may not transfer or assign this incidental take statement to any other person as defined in Section 3(12) of the ESA. This incidental take statement ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

2. If an Action Agency violates any permit term or condition, they will be subject to any and all penalties provided by the ESA.

3. The Action Agency, in effectuating the take authorized by this incidental take statement, are considered to have accepted the terms and conditions set forth herein and must be prepared to comply with the provisions of this incidental take statement, the applicable regulations, and the ESA.

4. The Salmon Recovery Division, NMFS, may amend the provisions of this incidental take statement after reasonable notice to the Action Agency.

5. 50 CFR Section 222.23(d)(8) allows NMFS to charge a reasonable fee to cover the costs of issuing this incidental take statement under the ESA. The fee for this incidental take statement has been waived.

6. Any falsification of annual reports or records pertaining to this incidental take statement is a violation of this incidental take statement.

7. Under the terms of the regulations, a violation of any of the terms and conditions of this permit will subject the Action Agency, and/or any individual who is operating under the authority of this permit, to penalties as provided for in the ESA.

6.4 Agency Specific Terms and Conditions

In addition to the all agency terms and conditions the following agency specific terms and conditions shall be implemented by the action agencies and their contractors:

6.4.1 U. S. Fish and Wildlife Service

6.4.1.1 Leavenworth NFH Spring Chinook Program

1. The USFWS shall limit annual yearling spring chinook salmon smolt production from Leavenworth NFH to not exceed 1,625,000 fish, for release in April or May.

2. The USFWS shall increase adipose fin-clipping of spring chinook salmon yearling releases from Leavenworth NFH. In release year 2003, at least 50 percent or 810,000 spring chinook shall be externally marked.

3. The USFWS shall develop long-term solutions for fish passage issues associated with Leavenworth NFH facilities and operations through the on-going Icicle Creek Restoration Project EIS process. As an outcome of this process, NMFS expects that the completion of the Icicle Creek Restoration Project process will lead to passage of at least listed steelhead, and potentially salmon adults and juveniles, into that portion of Icicle Creek upstream of the Leavenworth NFH barrier.

4. The USFWS shall immediately provide adult steelhead passage for unspawned steelhead above the hatchery barrier dam on Icicle Creek. To meet this requirement, the USFWS shall pass, by, sanctuary net, listed adult steelhead trapped in the fish ladder at Leavenworth NFH upstream of the hatchery barrier. The requirement shall apply until upstream passage for listed steelhead in Icicle Creek is provided through modifications or methods developed as an outcome of the on-going Upper Icicle Creek Restoration process.

5. The USFWS shall coordinate with NMFS , BIA, WDFW, and the Yakama Nation to develop and implement operational practices that provide for the effective removal and best use of Carson stock spring chinook adult returns to Icicle Creek and to the Leavenworth NFH trap that are surplus to annual egg take needs. For 2001 through 2005, beneficial uses of surplus unlisted spring chinook salmon may include their use for the Omak Creek spring chinook salmon reintroduction program, harvest in Icicle Creek fisheries, distribution for tribal ceremonial and subsistence use, and distribution to food banks. Outplanting into Peshastin Creek may also be a potential use of surplus unlisted spring chinook, if appropriate monitoring of spawning activity and juvenile production will also be conducted.

6.4.1.2 Entiat NFH Spring Chinook Program

1. The USFWS' shall limit annual production of spring chinook salmon smolts at Entiat NFH to not exceed 400,000 yearlings, for release in April or May.

2. The USFWS shall coordinate with WDFW to monitor and evaluate straying levels of Entiat NFH-origin spring chinook adult salmon to other regional hatcheries and trapping locations, and to natural listed salmon and steelhead production areas.

3. Prior to 100 percent external marked Entiat NFH returns to the UCR region, the USFWS shall coordinate with other WDFW to identify stray Entiat NFH spring chinook salmon adults via scale pattern analysis at Wells Dam and Methow Hatchery. Entiat NFH spring chinook identified at Methow Hatchery will be removed and trucked to Entiat NFH, or otherwise culled.

4. The USFWS shall apply an externally visible mark to 100 percent of the Carson NFH-lineage spring chinook yearlings released each year from Entiat NFH.

5. The USFWS shall apply a CWT to a representative proportion of the total number of marked spring chinook salmon yearlings released into the Entiat River each year.

6. The USFWS shall coordinate with co-managers to develop operational practices that provide for the effective removal and beneficial use of Carson NFH-lineage spring chinook adult returns to the hatchery that are surplus to egg take needs. Beneficial uses of surplus spring chinook salmon may include their use for the Omak Creek spring chinook salmon reintroduction program, distribution for tribal ceremonial and subsistence use, and distribution to food banks.

7. The USFWS shall maintain the Entiat NFH ladder and trapping facility open through the entire duration of the annual Carson-lineage spring chinook salmon adult return period to maximize removal of the fish from critical habitat for listed spring chinook salmon.

8. The USFWS, as lead agency, and in co-ordination with the co-managers, should collect a representative number of samples from Entiat NFH-origin and Entiat River natural-origin juvenile and adult spring chinook salmon populations each through at least 2005 for genetic stock identification analysis.

6.4.1.3 Winthrop NFH Spring Chinook Program

1. The USFWS shall limit, as an annual management intent, the production of spring chinook salmon smolts at Winthrop NFH to 600,000 yearlings, for release in April or May.

2. The USFWS shall discontinue releases of Carson stock spring chinook salmon smolts and prioritize the use of listed Methow River basin spring chinook stocks to sustain the Winthrop NFH program.

3. The USFWS shall coordinate with NMFS and the fishery co-managers to develop an assessment of needed Methow "Composite" stock release numbers from hatcheries in the Methow River basin.

4. The USFWS shall internally tag 100 percent of the spring chinook salmon yearlings released each year from Winthrop NFH. This mark will allow for the differentiation of stocks returning to the region for spawning and stock assessment purposes.

5. The USFWS shall coordinate with NMFS and other co-managers regarding any spring chinook salmon trapping protocols developed and applied at Winthrop NFH, and the appropriate disposition of any spring chinook salmon adults returning to the hatchery.

6. The USFWS shall coordinate with co-managers to develop operational practices that provide for the effective removal and beneficial use of Carson NFH-lineage spring chinook adult returns to the basin. Beneficial uses of surplus spring chinook salmon may include their use for the Omak Creek spring chinook salmon reintroduction program, distribution for tribal ceremonial and subsistence use, and distribution to food banks.

7. The USFWS shall limit the number of Carson-lineage spring chinook salmon pre-smolts or smolts transferred each year from Leavenworth Complex hatcheries for acclimation and release in Omak Creek to 300,000. The limit defines a maximum yearling release level for 2001-2005.

8. The USFWS shall limit the number of Carson-lineage spring chinook salmon adults transferred each year from Leavenworth Complex hatcheries for release into Omak Creek to 50 pairs (100 fish).

9. The USFWS shall ensure that 100 percent of the adult spring chinook salmon transferred for release into Omak Creek during the experimental reintroduction period are externally marked. An external mark is necessary to differentiate direct hatchery adult releases from spring chinook returning to Omak Creek as a result of natural production, or releases of juvenile artificially propagated fish.

10. The USFWS shall limit the number of Carson-lineage spring chinook salmon eyed eggs or fry transferred each year from Leavenworth Complex hatcheries for release into Omak Creek to 100,000. Eyed eggs or fry may only be transferred to Omak Creek as a

substitute for adult spring chinook salmon releases. Therefore, no eyed egg or fry transfers are allowed if adult fish of the same brood year have been out-planted. The limit defines a maximum eyed egg or fry release level, as a substitute for adult releases, for 2001-2004. Consideration of continued release are subject to results of these initial year releases and development of a HGMP by the Colville Tribes.

11. The USFWS shall apply an externally visible mark to 100 percent of the spring chinook fry, pre-smolts and smolts transferred each year to Omak Creek. A representative proportion of the marked pre-smolts and smolts shall also receive a CWT for fisheries and escapement contribution and overall survival evaluation purposes.

12. The USFWS, NMFS and the Colville Tribes shall review the use of Carson stock spring chinook salmon for reintroduction into the Okanogan River basin, and develop a proposed long term plan identifying the preferred spring chinook stock for reintroduction. This review and plan development process will be conducted in year 3 (2004) or 4 (2005) of the reintroduction effort. The feasibility of retaining the donor Carson stock, supplanting the Carson stock with "local" listed Methow "Composite" stock (when available), or of using some other appropriate spring chinook salmon stock, shall be considered. The need for this review process recognizes that the Omak Creek spring chinook reintroduction program is experimental. The most appropriate, most successful means for creating a viable, self-sustaining natural-origin spring chinook return to the basin should be evaluated and identified.

6.4.2 Bonneville Power Administration/Yakama Nation

1. The BPA/Yakama Nation shall, as the management intent, limit juvenile fish releases to 1,000,000 coho salmon smolts in the Wenatchee River basin and 250,000 coho salmon smolts in the Methow River basin annually for the feasibility study portion of the reintroduction effort. The number of juvenile coho salmon released into subbasin areas may be increased following Coho Technical Committee and NMFS Salmon Recovery Division approval.

2. The duration of acclimation at each of the release locations shall be no less than three weeks to adequately foster fidelity of returning adult fish to the release location, and to reduce the risk of homing back to the hatcheries from which the fish were transferred as pre-smolts.

3. Juveniles that are progeny of adult coho salmon returning to the Wenatchee River shall, as a priority, be released into the Wenatchee basin. The specific release locations and number will be determined in the Coho Technical Workgroup forum and must be approved by NMFS Salmon Recovery Division.

4. Juveniles that are progeny of adult coho salmon returning to the Methow River shall, as a priority, be released into the Methow River basin. The specific release locations and number will be determined in the Coho Technical Workgroup forum and must be approved by NMFS Salmon Recovery Division.

5. Approval of new acclimation and release sites beyond those currently identified in the HGMP shall be obtained from NMFS Salmon Recovery Division prior to being utilized.

6. The BPA/Yakama Nation shall allow free, unimpeded passage of listed steelhead through the old Icicle Creek channel during the time period that the channel is used to acclimate coho salmon smolts. If listed steelhead passage is determined to be impeded (either upstream or downstream) the BPA/Yakama Nation must correct the situation immediately.

7. The BPA/Yakama Nation shall continue to work with the USFWS, Icicle Creek Watershed Council and Washington Trout on agreements to use the old Icicle Channel for acclimation of coho smolts.

8. The BPA/Yakama Nation shall identify, for NMFS approval, adult coho salmon spawning and holding facilities that will be used to maintain returning adults for the production of coho salmon in the Wenatchee River basin.

9. To minimize incidental injury and mortality levels to listed populations present in Nason Creek, BPA/Yakama Nation shall limit the annual number of spring chinook and steelhead juveniles that may be captured, handled, and released in the Nason Creek coho predation study to not exceed 1,000 and 500, respectively. Incidental lethal takes associated with the study shall not exceed 20 spring chinook and 10 steelhead juveniles.

10. The PBA/Yakama Nation shall comply with NMFS electro-fishing guidelines when the equipment is used to collect fish. Incidental take in the form of capture, handling and release associated with electro-fishing shall of spring chinook salmon and steelhead juveniles shall not exceed 300 and 300, respectively. Incidental lethal takes associated with electro-fishing shall not exceed 30 spring chinook and 30 steelhead juveniles.

11. The BPA/Yakama Nation shall report tow net capture results by species in annual reports, including fish numbers, life stage, and condition upon release.

12. Only tow nets fitted with cod-end buckets shall be used to capture fish for the proposed sockeye/coho interaction study in Lake Wenatchee. In the event that the bongo-type tow nets proposed for sampling transect areas in Lake Wenatchee prove ineffective in capturing fish, The BPA/Yakama Nation shall contact the Salmon Recovery Division of NMFS to propose alternative sampling gear types and methods. Alternative sampling gear and methods must ensure safe capture of listed fish that may be encountered, posing minimal risk of injury and mortality.

13. The BPA/Yakama Nation shall apply internal tags (CWT or PIT) in all coho salmon smolts to be released into the Wenatchee River and Methow River basins each year. During the development of the local UCR coho stock, external marking or tagging shall not be required.

14. The BPA/Yakama Nation shall conduct spawning ground carcass surveys to determine the number of coho salmon on the spawning grounds and the location of spawning. The results shall be summarized and submitted to NMFS in an annual report.

15. The BPA/Yakama Nation shall submit annual broodstock management protocols to NMFS for approval by June 30 of the collection year. The protocols should be coordinated with other fish resource managers and shall include run forecast estimates, broodstock collection goals, and spawning ground escapement targets.

16. The Yakama Nation shall limit the number of adult coho salmon on the Nason Creek spawning grounds to 459, which is ½ the estimated spring chinook salmon carrying capacity (expressed as 917 spawners), or no greater than the total number of spring chinook salmon adults estimated inseason that have escaped to Nason Creek that year, whichever is smaller. This condition may be revised based on new information and agreement by the Coho Hatchery Work Group and NMFS Salmon Recovery Division.

17. The Yakama Nation, in cooperation with the Douglas PUD and the WDFW, may operate the Wells Dam east ladder trap no more than three days per week between September 1 and December 7 for the collection of coho salmon broodstock when steelhead are present. When operating, active trapping may occur up to 16 hours per day. If both the east and west ladders are operated, they must be operated on the same three days during the week. The ladder shall be open at night to allow passage for listed steelhead. If WDFW is operating the east ladder trap for broodstock collection, any coho incidentally caught may be kept for broodstock or radio-tagged. All steelhead diverted into the trapping facility will count toward the take limit unless other wise authorized under separate ESA permit or ITS (i.e., steelhead captured during WDFW's steelhead broodstock collection will not apply toward the Yakama Nation's incidental steelhead take). If WDFW is not operating the east ladder trap then incidental take in the form of diversion into the trap, capture, handle, and release shall not exceed 4.5 percent of the total adult steelhead to return over Wells Dam.

18. The Yakama Nation, in cooperation with the Douglas PUD and the WDFW, may operate the Wells Dam west ladder trap no more than three days per week between September 1 and December 7 for the collection of coho salmon broodstock when steelhead are present. When operating, active trapping may occur up to 16 hours per day. If both the east and west ladders are operated, they must be operated on the same three days during the week. The ladder shall be open at night to allow passage for listed steelhead. All steelhead diverted into the trapping facility will count toward the take limit unless otherwise authorized under separate ESA permit or ITS (i.e., steelhead captured during WDFW's steelhead broodstock collection will not apply toward the Yakama Nation's incidental take). If WDFW is operating the west ladder trap for broodstock collection, any coho incidentally caught may be kept for broodstock or radio-tagged. All steelhead handled during WDFW's steelhead broodstock collection will not apply towards the Yakama Nation's incidental steelhead take. Should steelhead broodstock collection goals be met early, or if WDFW is not operating the west ladder trap then incidental take in the form of diversion into the trap, capture, handle, and release shall not exceed 4.5 percent of the total adult steelhead to return over Wells Dam.

19. The Yakama Nation, in coordination with the WDFW and Chelan PUD, may operate the Tumwater Dam trap between September 1 and December 7 for the collection of coho salmon broodstock or radio-tagging no more than three days per week when steelhead are present. When operating, trapping may occur up to 16 hours per day. The ladder shall be open at night to allow passage for listed steelhead. All steelhead diverted into the trapping facility will count toward the take limit unless other wise authorized under separate ESA permit or ITS. Incidental take in the form of capture, handle, and release shall not exceed 3.5 percent of the total number of adult steelhead to return to the Wenatchee River as measured by the difference in steelhead count at Rock Island and Rocky Reach Dams. If increased coho collection at the Tumwater Dam trap is necessary to limit the number of coho adults on the spawning grounds in Nason Creek in

accordance with Condition 16 above, then this incidental take limit may be exceeded per ongoing consultation with NMFS Salmon Recovery Division.

20. The Yakama Nation, in coordination with the WDFW and Chelan PUD, may operate the Dryden Dam trap for the collection of coho salmon broodstock no more than five days per week between September 1 and December 7 when steelhead are present. When operating, trapping may occur up to 24 hours per day. All steelhead diverted into the trapping facility will count toward the take limit unless other wise authorized under separate ESA permit or ITS (i.e., steelhead captured during WDFW's steelhead broodstock collection under permit 1395). If steelhead broodstock collection goals are met early and/or WDFW is not operating the Dryden Dam traps, then incidental take in the form of capture, handle, and release shall not exceed 5 percent of the total adult steelhead to return to the Wenatchee River as measured by the difference in steelhead count at Rock Island and Rocky Reach Dams.

21. The Yakama Nation, in coordination with the USFWS, may operate fish traps at Dam 5 in Icicle Creek and/or the LNFH fishway between September 1 and December 7 for the collection of coho salmon broodstock. When operating, trapping may occur up to 24 hours per day, 7 days per week. Incidental take of steelhead in the form of capture handle, and release shall not exceed 0.5 percent of the total adult steelhead to return to the Wenatchee River as measured by the difference in steelhead count at Rock Island and Rocky Reach Dams.

22. The Yakama Nation, in coordination with the WDFW and Grant PUD, may operate the Priest Rapids Dam trap for the collection of coho broodstock and for inserting radio tags no more than two days per week between August 20 and November 20 when steelhead are present, in a manner consistent with the WDFW trap operation schedule and procedures. When operating, active trapping may occur up to 16 hours per day. The ladder shall be open to passage at night to allow passage for listed steelhead. If WDFW is operating the Priest Rapids Dam trap for steelhead stock assessment and/or radio tagging steelhead handled will not apply toward the Yakama Nation's incidental take limit. Between October 15 and November 20, when WDFW is not operating the Priest Rapids Dam trap for steelhead stock indexing, incidental take in the form of capture, handle, and release shall not exceed 3.5 percent of the total adult steelhead to return over Priest Rapids Dam.

6.4.3 National Marine Fisheries Service

In issuing permit 1347 authorizing incidental takes of listed spring chinook salmon and steelhead, NMFS shall require the permit holders to adhere to the activities as proposed and the terms and conditions identified in Section 2 of this Opinion.

7 REINITIATION OF CONSULTATION

This concludes formal consultation of the actions outlined in the applications for section 10(a)(1)(A) permits. As provided in 50 CFR §402.16, reinitiation of formal consultation is required if: (1) the amount or extent of annual take, either intentional take or incidental take, is exceeded or is expected to be exceeded; (2) new information reveals effects of the agency action that may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect to listed species that was not previously considered; or (4) a new

species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the operation that results in exceeding take must cease, and consultation must be reinitiated.

Specifically, if new monitoring or research information indicate that adverse genetic impacts are occurring on UCR spring chinook salmon from operation of the proposed unlisted chinook salmon programs, then consultation must be reinitiated.

8 MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

The MSA and its implementing regulations at 50 CFR 600.920 require a federal agency to consult with NMFS before it authorizes, funds or carries out any action that may adversely effect EFH. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects on EFH. Further, the action agency must provide a detailed, written response to NMFS within 30 days after receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NMFS ' conservation recommendation, the agency must explain its reasons for not following the recommendations.

Thus, one of the objectives of this consultation is to determine whether the proposed actions of artificially propagated programs in the UCR region of Washington State - are likely to adversely affect EFH. If the proposed actions are likely to adversely affect EFH, conservation recommendations will be provided.

8.1 Identification of Essential Fish Habitat

The Pacific Fishery Management Council (PFMC) is one of eight Regional Fishery Management Councils established under the Magnuson-Stevens Act. The PFMC develops and carries out fisheries management plans for Pacific coast groundfish, coastal pelagic species, and salmon off the coasts of Washington, Oregon and California. Pursuant to the MSA, the PFMC has designated freshwater and marine EFH for chinook and coho salmon (PFMC 1999). For purposes of this consultation, freshwater EFH for salmon in Washington includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to Pacific salmon, except upstream of the impassable dams. In the future, should subsequent analyses determine the habitat above any impassable dam is necessary for salmon conservation, the PFMC will modify the identification of Pacific salmon EFH (PFMC 1999). Marine EFH for Pacific salmon in Oregon and Washington includes all estuarine, nearshore and marine waters within the western boundary of the U.S. Exclusive Economic Zone (EEZ), 200 miles offshore.

8.2 Proposed Action and Action Area

For this EFH consultation, the proposed actions and action area are as described in detail above. The actions are the operation of artificially propagated programs that collect, rear and release unlisted salmon within the geographical boundaries of the UCR Spring-Run Chinook Salmon ESU and the UCR Steelhead ESU, and their effects on the survival and recovery of listed spring chinook salmon and steelhead. The proposed action area includes freshwater areas accessible to anadromous salmon upstream of the Yakama River's confluence with the mainstem Columbia River, excluding waters upstream of Chief Joseph Dam. A more detailed description and identification of EFH for salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts on these species' EFH from the above proposed action is based on this information.

8.3 Effects of Proposed Action

Based on information submitted by the action agencies, as well as NMFS ' analysis in the ESA consultation above, NMFS believes that the effects of the actions on EFH are likely to be within the range of effects considered in the ESA portion of this consultation.

8.4 Conclusion

Using the best scientific information available and based on its ESA consultation above, as well as the foregoing EFH sections, NMFS has determined that the proposed actions are likely to adversely affect EFH for Pacific salmon.

8.5 Essential Fish Habitat Conservation Recommendations

The Reasonable and Prudent Measures and the Terms and Conditions outlined above are applicable to designated salmon EFH. Therefore, NMFS recommends that those same Reasonable and Prudent Measures, and the Terms and Conditions be adopted as the EFH Conservation Recommendation for this consultation.

8.6 Statutory Response Requirement

Section 305(b)(4)(B) of the MSA and implementing regulations at 50 CFR section 600.920 require a federal action agency to provide a detailed, written response to NMFS within 30 days after receiving an EFH conservation recommendation. The response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the impact of the activity on EFH. If the response is inconsistent with a conservation recommendation from NMFS , the agency must explain its reasons for not following the recommendation.

8.7 Consultation Renewal

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

9 REFERENCES

Section 7(a)(2) of the ESA requires biological opinions to be based on "the best scientific and commercial data available." This section identifies the information sources in developing this Opinion.

9.1 Federal Register Notices

62 FR 43937. August 18, 1997. Final Rule, Endangered and threatened species: Listing of several evolutionary significant units (ESUs) of west coast steelhead. Federal Register 62(159): 43937-43954.

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Biological Opinions Supporting Incidental Take Permits

Environmental Assessment for Permit No. 1347 (2003)

COVER SHEET
May 2003

Title of Environmental Review:	Environmental Assessment of a National Marine Fisheries Service Action To Issue an Incidental Take Permit Under Section 10(a)(1)(B) of the Endangered Species Act
Evolutionarily Significant Units	Upper Columbia River (UCR) spring chinook (*Oncorhynchus tshawytscha*) UCR steelhead (*O. mykiss*)
Responsible Agency and Official:	D. Robert Lohn NOAA – National Marine Fisheries Service 7600 Sand Point Way N.E. Seattle, WA 98115
Contacts:	Kristine Petersen Salmon Recovery Division NOAA – National Marine Fisheries Service 525 N.E. Oregon St., Suite 510 Portland, OR 97232-2737 (503) 230-5409
Legal Mandate:	Endangered Species Act of 1973, as amended and implemented 50 CFR Part 223
Location of Proposed Activities:	Upper Columbia River Basin in the State of Washington
Action Considered:	Issuance of Endangered Species Act (ESA) section 10(a)(1)(B) permit 1347 jointly to Washington Department of Fish and Wildlife (WDFW), Public Utility District No. 1 of Chelan County (Chelan PUD), and Public Utility District No. 1 of Douglas County (Douglas PUD).
Environmental Assessment Conducted by:	Department of Commerce NOAA Fisheries Salmon Recovery Division Propagation, Tributary Fisheries, and Recovery Branch NOAA – National Marine Fisheries Service 525 N.E. Oregon St., Suite 510 Portland, OR 97232-2737

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1.0 INTRODUCTION

1.1 Background

NOAA Fisheries proposes to issue incidental take permit 1347 pursuant to section 10(a)(1)(B) of the Endangered Species Act (ESA). The permit would authorize take of listed chinook salmon and steelhead incidental to operation of artificial propagation programs rearing and releasing unlisted species. Under section 10(a)(1)(B), non-federal entities may apply for permits from NOAA Fisheries to incidentally take ESA-listed species under the jurisdiction of NOAA Fisheries if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 10(a)(2)(A) defines the requirement for a complete application. Following public comment, a permit shall be issued if the applicant provides a complete conservation plan pursuant to ESA section 10(a)(2)(B) that specifies: (1) the taking will be incidental; (2) the applicant will, to the maximum extent practicable, monitor, minimize, and mitigate the impacts of such taking; (3) the applicant will ensure that adequate funding for the conservation plan will be provided; (4) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (5) any other measures that the Secretary may require as being necessary or appropriate will be met.

On December 15, 1999, the WDFW submitted an application in the form of a Conservation Plan (WDFW 1999a) to NOAA Fisheries for an ESA section 10(a)(1)(B) permit for the incidental take of ESA-listed anadromous fish species that may result from operation of artificial propagation programs of unlisted salmon at hatcheries in the UCR region; the application was made available for public comment for 30 days, closing on November 15, 2001. Included with the WDFW permit application were three Hatchery and Genetic Management Plans (HGMPs), which supplemented the Conservation Plan by providing in-depth descriptions of each artificial propagation program, and measures applied to minimize risks of adverse effects on natural fish populations (WDFW 1999b; 1999c; 1999d).

Negotiations were completed on three Habitat Conservation Plans (HCPs) in April 2002; two with Chelan PUD for the operation of Rock Island Dam and Rocky Reach Dam (CPUD 2002a; 2002b), and one with Douglas PUD for the operation of Wells Dam (DPUD 2002). A public comment period closed on the HCPs on July 25, 2002. The HCPs provide for implementation of the artificial propagation programs addressed in this EA, required as mitigation for hydro project operation by the Federal Energy Regulatory Commission (FERC). The HCPs specifically obligate NOAA Fisheries to issue pertinent section 10 permits to the PUDs for operation of the artificial propagation programs they implement.

The proposed permit (1347) would be a mechanism by which NOAA Fisheries can ensure that the PUDs are adequately funding the programs in a manner that minimized any adverse impacts the non ESA-listed artificial propagation programs could have on the protected stocks. It also would help ensure that the programs are operated by WDFW in an effective manner to meet specific program objectives as determined by the agencies responsible for managing the natural fish resources.

Therefore, the proposed section 10(a)(1)(B) permit would be issued jointly to the WDFW, Chelan PUD, and Douglas PUD. Table 1 lists the proposed artificial propagation programs.

Table 1. List of WDFW operated unlisted salmon artificial propagation programs considered in this EA (FH=Fish Hatchery).

Program	Primary Facilities	River
Wenatchee Sockeye	Lake Wenatchee Net Pens, Eastbank FH	Wenatchee
Wenatchee Summer Chinook	Eastbank FH, Dryden Pond	Wenatchee
Methow Summer Chinook	Eastbank FH, Carlton Pond	Methow
Okanogan Summer Chinook	Eastbank FH, Similkameen Pond	Okanogan
Wells Summer Chinook	Wells FH	Columbia River Mainstem
Turtle Rock Summer Chinook	Turtle Rock FH	Columbia River Mainstem
Priest Rapids Fall Chinook	Priest Rapids FH	Columbia River Mainstem

1.2 Description of the Proposed Action

The artificial propagation programs are described in the ESA section 10 incidental take permit application and HGMPs submitted to NOAA Fisheries by the WDFW (WDFW 1999a;1999b; 1999c; 1999d) and summarized below (section 2.3.1). The rationale for, and obligation to implement, these propagation programs is described in the three HCPs (CPUD 2002a; 2002b; DPUD 2002) and summarized here.

The hatcheries produce unlisted summer chinook, fall chinook (*O. tshawytscha*), and sockeye (*O. nerka*) salmon to mitigate for the loss of natural fish production due to hydroelectric project operation in the Columbia River. The operation of these artificial propagation programs would provide unlisted salmon adults to augment harvests in treaty reserved Columbia River tribal fisheries in the Columbia River, and non-Indian fishery harvests in the Columbia River and in Pacific Northwest marine fishing areas. The adult salmon produced by the programs are also intended to supplement naturally spawning populations in the UCR region, helping to preserve those populations commensurate with the operation of hydropower projects impacting salmon survival. The salmon produced for harvest purposes provide economic opportunity and cultural benefits to Columbia River treaty tribes, and economic benefits for local communities through the sale of fish, licences, equipment, and the conduct of other financial transactions related to recreational and commercial fisheries.

1.3 Purpose Of and Need For the Proposed Action

The purpose of and need for the issuance of the section 10(a)(1)(B) permit 1347 is to ensure that the activities covered under the permit have been thoroughly analyzed for adverse impacts to listed species, and are in compliance with the ESA, and to ensure the continuation of the programs and

their implementation. The purpose of this EA is to evaluate the potential environmental effects as a consequence of NOAA Fisheries issuing a permit jointly to the WDFW, Chelan PUD, and Douglas PUD and implementing a conservation plan for the incidental take of ESA-listed anadromous fish associated with the proposed artificial propagation programs.

1.4 Scope of the Action

The scope of the action considered here addresses artificial propagation actions proposed by the WDFW, Chelan PUD, and Douglas PUD in the upper Columbia River region for the ten year period from 2003 to 2013. These actions include collecting adult unlisted summer chinook, fall chinook, and sockeye salmon adults for broodstock through trapping in UCR tributaries or at the hatcheries, propagating resultant progeny in the hatchery environment, releasing juvenile salmon from the hatcheries or from satellite facilities into the natural environment, and conducting scientific research and monitoring activities associated with the hatchery operations. This EA does not address the entire scope of the HCPs. A separate Environmental Impact Statement has been completed (NOAA Fisheries 2002) and has undergone a public comment period which ended in May 2001 (65 FR 82976) . The activities that would occur under the proposed actions considered here are expected to incidentally affect endangered UCR spring chinook salmon and steelhead as a result of broodstock trapping, hatchery facility water withdrawal and effluent discharge practices, and release of juvenile fish. Threatened bull trout (*Salvelinus confluentus*) of the Columbia River distinct population segment may also be affected by the hatchery activities.

1.5 Action Area

The key issues identified during the development of the application and HGMPs for a section 10 permit focused on the effects of the proposed programs on listed endangered spring chinook salmon and steelhead in the UCR ESUs (Figures 1 and 2). The WDFW concluded that the benefits of allowing the programs to occur outweighed the small incidental impacts on listed species.

This EA's action area includes all habitat accessible to anadromous salmon from the vicinity of Priest Rapids Dam on the mainstem Columbia River upstream to the border with Canada, including the mainstem Columbia River, the Wenatchee, Methow, and Okanogan Rivers, and their tributaries. The locations of the WDFW hatchery facilities considered in this EA within this action area are indicated in Figure 3.

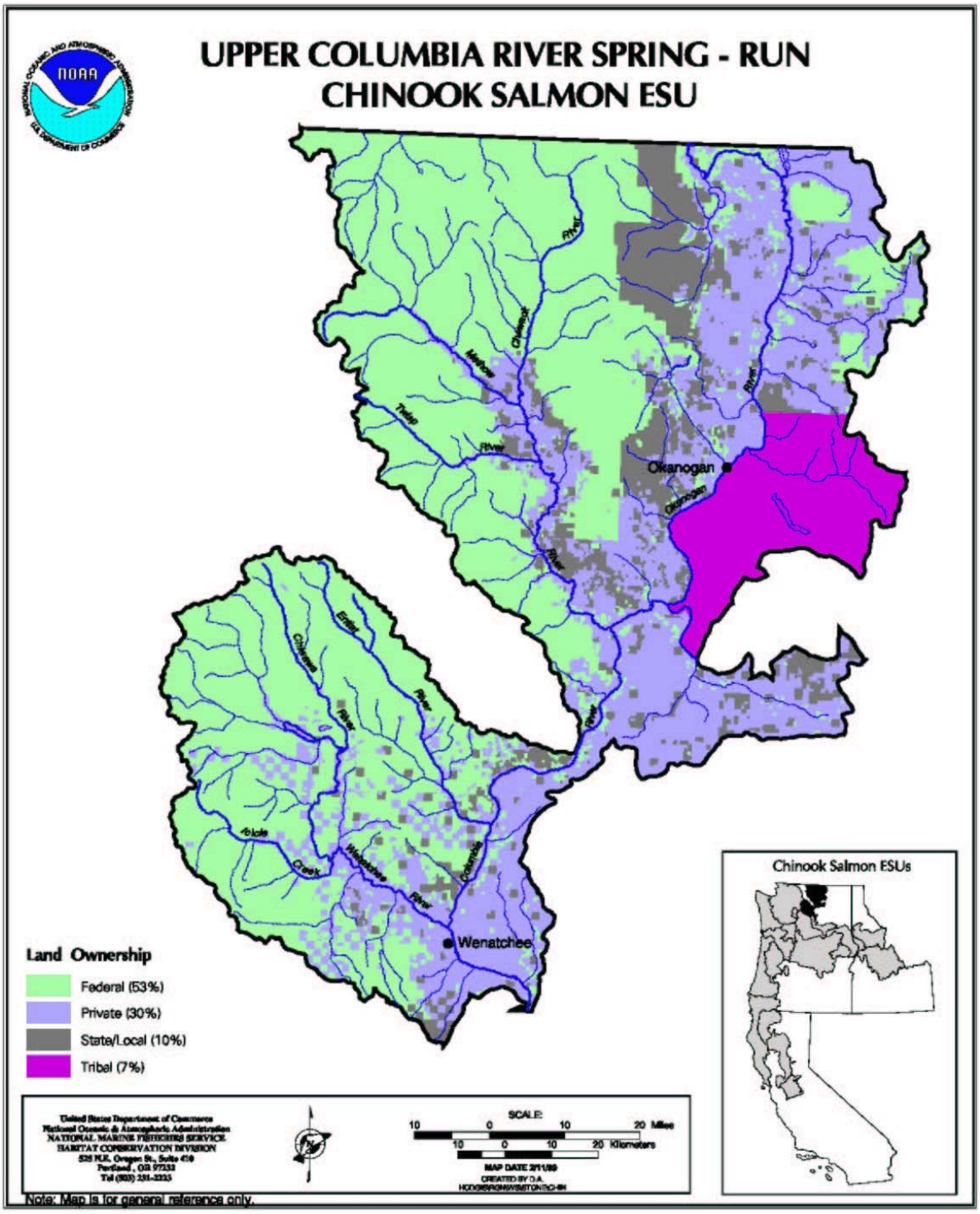

Figure 1. Upper Columbia River spring chinook ESU.

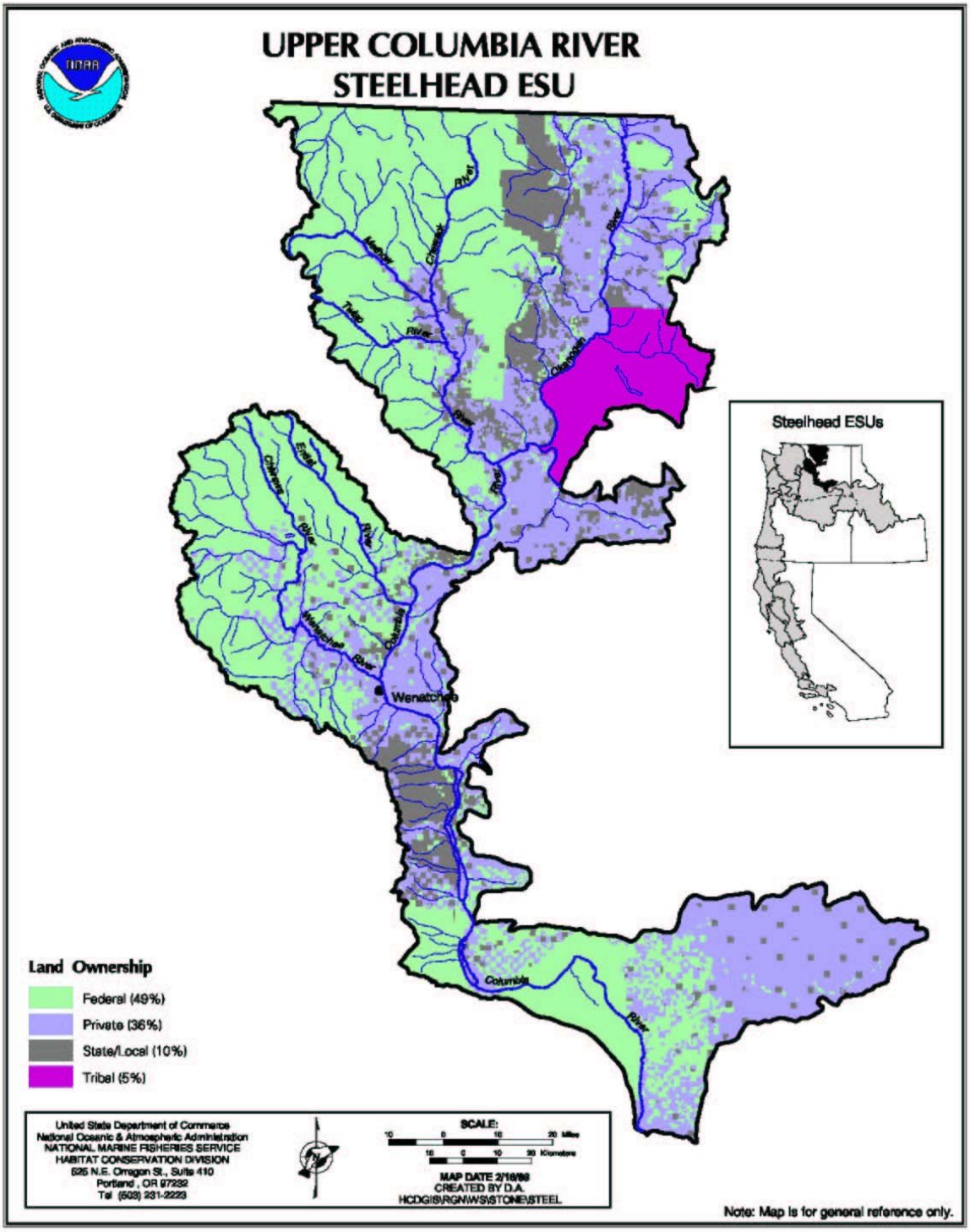

Figure 2. Upper Columbia River steelhead ESU.

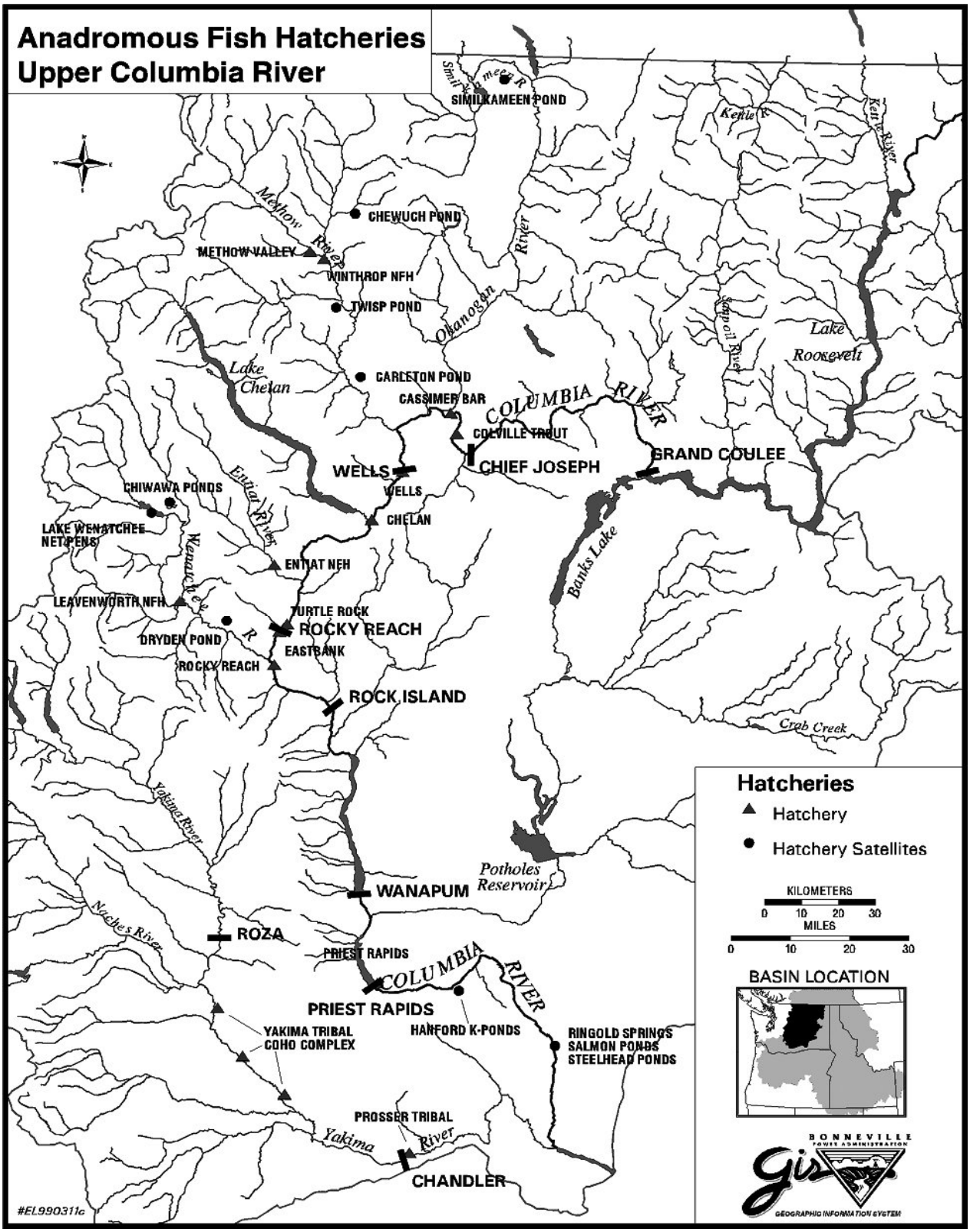

Figure 3. Anadromous salmon hatcheries in the Upper Columbia River Basin.
(Map courtesy of BPA' Geographic Information Systems, 1999.)

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Three alternatives were identified and considered in this EA: Alternative one (no action) is to not issue an incidental take permit for the artificial propagation activities specified in the permit application, HGMPs, and HCPs; Alternative two is to issue an incidental take permit based on the application, HGMPs, and HCPs without any additional specific conditions; and Alternative three (proposed action) is to issue an incidental take permit jointly to the WDFW, Chelan PUD, and Douglas PUD based on the application, HGMPs, and the HCPs, with additional specific conditions to minimize adverse impacts on the ESA listed salmonids and to enhance conservation efforts. The major aspects of the identified alternatives are described below.

2.1 Alternative One - Do Not Issue Permit (No Action)

Under a No Action alternative, NOAA Fisheries would not issue an ESA section 10(a)(1)(B) permit authorizing incidental takes of ESA-listed species associated with the activities proposed in the Application, HGMPs, and HCPs. The Conservation Plan, HGMPs, and HCPs, would not be implemented.

This alternative would effectively prohibit the incidental take of ESA-listed fish associated with the operation of the unlisted salmon hatchery operations. This alternative would therefore prohibit critical aspects of the artificial propagation programs, including broodstock trapping and juvenile fish releases in the proposed action area, because to do so the WDFW, Chelan PUD, and Douglas PUD would likely be in violation of the ESA. Limitations on application of the take prohibitions under section 4(d) are not available because the UCR spring chinook and UCR steelhead ESUs are listed as Endangered. The Chelan PUD and Douglas PUD would not be able to meet the HCP requirements of implementing artificial propagation programs to compensate for fish losses due to hydro project operations, and would not be able to obtain FERC licenses for operation of Rocky Reach Dam, Rock Island Dam and Wells Dam. To provide the broadest range of effects for the purpose of this analysis, NOAA Fisheries assumes that the programs would be discontinued if the permit was not issued.

2.2 Alternative Two - Issue Permit Without Conditions

Under this alternative, a permit would be issued to the applicant based strictly on the application, HGMPs, and pertinent terms of the HCPs, without additional special conditions to minimize adverse effects on listed salmon and steelhead. The Application, HGMPs, and HCPs include protocols for broodstock collection, artificial propagation, release of unlisted salmon species and mitigation requirements of hydro project operation impacts required in FERC licenses. While permit conditions that might otherwise be imposed would likely encompass and resemble the protocols described in the application, no requirement that the WDFW, Chelan PUD, and Douglas PUD follow those specific implementation and reporting tasks would be imposed under this alternative. With the exception that special conditions would not be imposed by NOAA Fisheries, the description of this alternative mirrors the description of the proposed action (section 2.3, below). The disadvantage of this alternative is that the WDFW, Chelan PUD, and Douglas PUD would not

be required to follow the specific implementation and reporting tasks that would be imposed under Alternative 3. The artificial propagation programs could be altered to increase incidental take of protected UCR spring chinook and UCR steelhead, thereby increasing the likelihood of significant impacts on the protected stocks.

2.3 Alternative Three - Issue Permit With Conditions (Proposed Action)

The proposed action alternative is to issue a permit under section 10(a)(1)(B) of the ESA based on the Application, HGMPs, and HCPs as modified by additional special conditions that NOAA Fisheries may require as being necessary and appropriate. NOAA Fisheries' special conditions would further minimize the risk of annual take of ESA-listed anadromous fish that may occur through the proposed actions. NOAA Fisheries' special conditions would also help to ensure that the annual take would not jeopardize the continued existence of ESA-listed anadromous salmon and steelhead. Issuance of the permit would meet FERC license requirements pertaining to the mitigation for operation of Rocky Reach Dam, Rock Island Dam, and Wells Dam. The permit would expire on December 31, 2013.

2.3.1 Proposed Artificial Propagation Programs

Below are descriptions of unlisted salmon artificial propagation programs proposed by the WDFW in the action area. This information is summarized from the WDFW Conservation Plan (WDFW 1999a), and from three HGMPs (WDFW 1999b; 1999c; 1999d), and HCPs (CPUD 2002a; 2002b; DPUD 2002) submitted to NOAA Fisheries and that would be addressed in the proposed permit.

Specific activities needed to implement the artificial propagation programs may be altered and modifications to program implementation may be made through the Hatchery Committees as described in the HCPs (CPUD 2002a; 2002b; DPUD 002). The Hatchery Committees consist of one representative of each signatory entity for each of the HCPs. NOAA Fisheries will be represented in the Hatchery Committee forum to ensure activities proposed by the Hatchery Committees are consistent with ESA recovery goals and do not operate to the detriment of protected species. The minor adjustments that may be made by the Hatchery Committees are not expected to alter the effects on the human environment.

Eastbank FH Programs

The Eastbank FH began operation in 1989 to mitigate for salmon smolt losses resulting from the operation of Rock Island Dam. The facility is located on the east side of the Columbia River near Rocky Reach Dam at river mile 474, seven miles north of Wenatchee, Washington. The hatchery complex would operate with five satellite facilities, located on five different waters in the action area: Dryden Pond on the Wenatchee River, Chiwawa Pond on the Chiwawa River, Lake Wenatchee Net Pens on Lake Wenatchee, Carlton Pond on the Methow River, and Similkameen Pond on the Similkameen River. The hatchery would be used for incubation and rearing of steelhead, and spring chinook, summer chinook, and sockeye salmon. There would be no on-station releases of fish at Eastbank FH.

Broodstock would be not collected at Eastbank FH. Sockeye and summer chinook salmon propagated at the hatchery originate from broodstock collected in the Wenatchee River (Dryden and Tumwater Dams) and at Wells Dam as described below for each program.

Transfers of fish reared at Eastbank FH to other locations would occur as described below, for the watershed areas where the fish would be released. Production goals for Eastbank FH would be: 864,000 summer chinook for acclimation and release into the Wenatchee River; 200,000 Wenatchee sockeye salmon for acclimation and release into Lake Wenatchee; 400,000 summer chinook for acclimation and release into the Methow River; and 576,000 summer chinook for acclimation and release into the Okanogan River Basin.

Wenatchee Sockeye Salmon Program

The program's purpose is to mitigate for the loss of sockeye salmon attributable to the construction and operation of Rock Island Dam (WDFW 1999d). The program is funded by the Chelan PUD. The Wenatchee sockeye salmon program uses indigenous Wenatchee River Basin sockeye salmon stock returning to the Little Wenatchee and White Rivers as broodstock. Broodstock collection occurs at Tumwater Dam during the annual migration of sockeye adults returning to the Lake Wenatchee Basin generally from mid-July through early August. Specific broodstock collection protocols are developed annually based on run size estimates and river environment conditions. The broodstock collection goal is approximately 260 adults or no more than 10% of the total run.

Sockeye broodstock are transported to the Lake Wenatchee Net Pens for holding through spawning. Eggs and juvenile sockeye salmon are incubated and early reared at the WDFW's Eastbank Fish Hatchery (FH), which is located on the mainstem Columbia River at river mile 474 near Rocky Reach Dam. After four to six months of rearing, the sockeye would be liberated during September, October or November from the net pens into Lake Wenatchee. The hatchery sockeye fingerlings overwinter in the lake, and emigrate to the ocean the following spring as yearling smolts. All Lake Wenatchee Net Pen origin sockeye would be identifiable from natural sockeye salmon by an adipose fin clip and coded wire tag (CWT). The annual production goal for the Wenatchee sockeye salmon program is 200,000 fish.

Wenatchee Summer Chinook Salmon Program - Dryden Pond

The purpose of this summer chinook salmon artificial propagation program in the Wenatchee River Basin is to mitigate for the loss of fish due operation of Rocky Reach and Rock Island Dams. The WDFW's Eastbank FH, located on the mainstem Columbia River, is used for spawning, incubation and early rearing. Pre-smolt summer chinook salmon produced at Eastbank FH would be transferred to acclimation sites in the Wenatchee Basin (primarily Dryden Pond) for acclimation and release.

Broodstock used in the Wenatchee summer chinook salmon artificial propagation program would be taken from native fish returning to the Wenatchee River and its tributaries. The annual broodstock collection goal for the program would be about 492 adults, but an annual broodstock collection protocol would be developed based on run size estimates, run timing, and river environment conditions. Proposed broodstock collection facilities include traps at Dryden (river

mile 16) and Tumwater Dams (river mile 32) on the Wenatchee River and trapping would occur primarily during July and August, but may extend through November in some years for late-arriving summer chinook salmon (WDFW 1999a; NMFS 2001).

Summer chinook salmon collected at the Dryden and Tumwater Dam traps would be transported to Eastbank FH for holding through spawning. The progeny of these broodstock would be reared at Eastbank FH to the pre-smolt stage. Summer chinook salmon would be transferred from Eastbank FH to acclimation sites in the Wenatchee Basin (usually Dryden Pond) for acclimation and release. The fish would be released as migration-ready yearlings at a size of 10 to 12 fish per pound (~6-6.5 inches fork length) in late April or early May. All summer chinook salmon yearlings released in the Wenatchee Basin would be marked with an adipose fin clip and CWT combination for visual identification, and for monitoring and evaluation purposes. The annual production goal would be 864,000 yearling summer chinook salmon for release in the Wenatchee River Basin.

Methow Summer Chinook Salmon Program - Carlton Pond

The purpose of this summer-run chinook salmon artificial propagation program is to mitigate for the loss of summer chinook salmon adults that would have been produced in the Methow River Basin in the absence of the Wells, Rocky Reach, and Rock Island Dams.

Summer chinook salmon presently used in the Methow (Carlton Pond) program would be the progeny of natural or hatchery-origin fish originating from the Methow and Okanogan River watersheds collected at Wells Dam. The Eastbank FH would be used for spawning, incubation and early rearing. Summer chinook salmon juveniles produced at Eastbank FH would be transferred to Carlton Pond on the Methow River for acclimation and release. Carlton Pond is located adjacent to the Methow River at river mile 36 near Twisp, Washington.

Summer chinook salmon adults used for the Carlton Pond program would be trapped by the WDFW at Wells Dam between early July and late August, and held through maturity at the Eastbank FH (WDFW 1999b). The annual broodstock collection goal would be developed annually, and is usually about 556 fish for the Carlton Pond combined with the Similkameen Pond Program (see below), with equal numbers of each sex.

Summer chinook salmon destined for release from Carlton Pond into the Methow River would be incubated and reared to fingerling size at Eastbank FH. Juvenile fish reared at Eastbank FH would be transferred as pre-smolts in early spring to Carlton Pond for continued rearing, and a spring-time release. The annual summer chinook salmon production objective in the Methow River would be 400,000 yearlings at an average size of 10 fish per pound. All summer chinook salmon yearlings would be marked with an adipose fin clip and CWT combination for visual identification and monitoring and evaluation purposes.

Okanogan Summer Chinook Salmon Program - Similkameen Pond

The purpose of the Okanogan summer chinook salmon artificial propagation program is to mitigate for the loss of summer chinook salmon adults that would have been produced in the Okanogan River Basin in the absence of Wells, Rocky Reach, and Rock Island Dams. The Eastbank FH

would be used for spawning, incubation and early rearing. Summer chinook salmon juveniles produced at Eastbank FH would be transferred to acclimation sites in the upper Okanogan River watershed (primarily Similkameen Pond) for acclimation and release. Similkameen Pond is located adjacent to the Similkameen River (a tributary to the Okanogan River) near Oroville, Washington.

Summer chinook salmon presently used in this program would originate from natural or marked hatchery-origin fish collected at the Wells Dam concurrent with broodstock for the Carlton Pond Program described above.

Fish reared at Eastbank FH would be transferred as fingerlings in the fall for overwintering at Similkameen Pond or other acclimation sites in the Okanogan Basin. The fish would be reared to yearling smolt size through the winter for release in the spring to acclimate the chinook to the release site. The annual summer chinook production objective in the Okanogan River Basin would be 576,000 yearlings at an average size of 10 fish per pound. All yearlings released through the program would be marked with an adipose fin clip and CWT combination for visual identification and monitoring and evaluation purposes.

Priest Rapids Fall Chinook Salmon Program

The goal of the Priest Rapids "upriver bright" (URB) chinook salmon program is to mitigate for the loss of fall-run chinook salmon adults that would have been produced in the region in the absence of the Priest Rapids Project (Priest Rapids and Wanapum dams) and John Day Dam. The hatchery facility is located on the mainstem Columbia River at river mile 397. The original stock used at the present Priest Rapids FH location came from late-run URB chinook salmon trapped at Priest Rapids Dam.

Fall chinook salmon would be trapped for use as broodstock from early September through November at the Priest Rapids FH trap, downstream of Priest Rapids Dam. Fall chinook salmon would be collected from the salmon that volunteer into the trap from September through November. Broodstock would be collected across the entire run to ensure that the run timing for the population is maintained. The broodstock collection goal at Priest Rapids FH would usually not exceed 6,102 adults.

The annual production goal would be 6,700,000 fall chinook sub-yearlings for release in June (WDFW 1999c). Fingerlings would be acclimated on river water for release as sub-yearling smolts on-station. Approximately 4% of the total annual release (approximately 268,000 fish) would receive an adipose fin clip and CWT combination to assess brood year fishery contribution and survival rates.

Turtle Rock Summer Chinook Salmon Program

Turtle Rock FH is operated as a mitigation facility for fishery impacts caused by the construction and operation of Rocky Reach Dam. The hatchery is located adjacent to the Columbia River two miles upstream from Rocky Reach Dam at river mile 475 on the Columbia River. The facility includes the old Rocky Reach FH, located just downstream from Rocky Reach Dam and rearing

ponds on Turtle Rock Island located in the Rocky Reach Dam pool. The facility would be used for summer chinook salmon incubation and rearing and steelhead rearing.

Summer chinook salmon broodstock would not be collected at Turtle Rock FH. Broodstock would be provided through collection of summer chinook salmon volunteers to the Wells FH trap. Summer chinook salmon adults collected at Wells FH would be primarily hatchery origin fish with a few natural origin salmon.

The Wells FH volunteer trap would operate from early July through late August. Annual broodstock collection protocols would be developed based on run size estimates and run timing, and would generally be about 1,208 adults for the Wells and Turtle Rock programs (WDFW 1999a; 1999b). The summer chinook broodstock collection effort would be curtailed in late August to minimize inclusion of fall chinook salmon into the summer chinook gene pool. Eggs taken from spawners at Wells FH would be shipped to Turtle Rock FH and for incubation and rearing.

The annual hatchery production goals would generally be 200,000 yearling summer chinook and 1,600,000 sub-yearling summer chinook salmon for release from Turtle Rock FH (WDFW 1999b). Yearlings would be released in April and sub-yearlings would be released in June. All yearling summer chinook released from Turtle Rock FH would be marked with an adipose-clip and CWT combination for visual identification and monitoring and evaluation purposes. All "accelerated" (early release timing at a larger size) sub-yearlings would be marked, but only 200,000 "normal" release timing sub-yearlings would be marked as a survival index group. Summer chinook juveniles destined for release from Turtle Rock FH would be transferred to the island ponds in November for six months of acclimation (April release of yearlings), or in April-May for three months of acclimation (June-July release of sub-yearlings).

Wells Summer Chinook Salmon Program

Wells FH is located on the mainstem Columbia River at river mile 516 just below Wells Dam. The hatchery operates as a mitigation facility for salmon fishery impacts caused by Wells Dam. Summer chinook adults collected as broodstock for the Wells summer chinook program would be trapped at the hatchery volunteer trap concurrent with broodstock for the Turtle Rock Program described above.

The annual on-station release goals would generally be 320,000 summer chinook yearlings released in April and 484,000 accelerated sub-yearlings released in June (WDFW 1999b). Summer chinook salmon yearlings and sub-yearlings produced at Wells FH would be reared entirely at the hatchery. All summer chinook salmon released into the Columbia River at Wells FH would be adipose fin clipped and CWT for visual identification and monitoring and evaluation purposes.

2.3.2 Conservation Plan

The application and HGMPs comprise a comprehensive conservation plan designed to minimize and mitigate for the incidental take of listed steelhead and spring chinook resulting from the unlisted hatchery salmon produced by WDFW in the UCR region. Below are general and specific

aspects of the conservation plan that are designed to minimize and mitigate the effects of the incidental take on listed species for each artificial propagation program. As stated in the Scoping section, all of the key issues identified were related to the listed anadromous salmon species in the region.

General Conservation Measures:
The permit applicants propose to apply the following general measures to minimize effects of the unlisted salmon artificial propagation programs on listed salmon and steelhead:

1. the production and release of smolts through fish culture and release practices, fostering rapid seaward migration with minimal rearing or delay in the rivers;
2. acclimation to release sites of all salmon that are transferred from main production hatcheries to satellite production facilities to minimize straying;
3. adipose fin clip and CWT applied to all hatchery salmon populations to allow for adequate monitoring of migration, fisheries contribution, and survival;
4. continued monitoring and research to investigate the ecological effects of fish culture practices, and to identify salmonid migration timing and behavior;
5. compliance with IHOT (1995) guidelines regarding fish health, genetics, local ecological interactions, hatchery practices, and hatchery operations to maintain healthy hatchery and wild salmonid populations;
6. compliance with all the WDFW fish transfer and disease standards to minimize the risk of disease transference to wild fish;
7. consistent achievement of hatchery effluent and best management practice standards set forth in National Pollutant Discharge Elimination System (NPDES) permits to avoid adverse affects on wild fish and their habitat; and
8. adherence to the annual Basin-wide salmon production ceiling established by NOAA Fisheries (NMFS 1995) to address ecological carrying capacity concerns in the migration corridors, the estuary, and the marine ecosystem, and to minimize over-all density-dependent effects of hatchery production on listed species.

Specific Conservation Measures:
Wenatchee Sockeye Salmon Program and Wenatchee Summer Chinook Salmon Program
The trap used to collect sockeye and summer chinook salmon broodstock at Tumwater Dam would be operated to allow free upstream passage of listed spring chinook salmon and steelhead on the days when the trap is not operated, and during nighttime on the days when trapping occurs. Trap operation to collect sockeye salmon would begin after July 15 each year to allow unobstructed passage of the main portion of the earlier-migrating spring chinook salmon populations. Any listed spring chinook encountered after that date would be passed upstream with minimal delay. Collection of listed steelhead adults is authorized for a conservation artificial propagation program under section 10 permit 1094, issued by NOAA Fisheries to the WDFW on February 4, 1998 (NMFS 1998). Concurrent species broodstock collection protocols, promulgated annually, would be designed to minimize adverse adult trapping impacts on all species normally encountered.

Methow, Okanogan, Turtle Rock, and Wells Summer Chinook Programs
These programs share trapping operations at Wells Dam and Wells FH. All steelhead encountered that would not be retained as broodstock, as authorized by the WDFW's section 10 permit 1094, would move through the Wells Dam traps with no substantial handling or delay. Run timing of spring chinook and summer chinook are quite distinct. No other chinook populations are present in the project area during the July-August summer chinook broodstock collection period. The risk of adverse genetic effects on the population would be diminished by operating the adult collection between late June and late August to exclude spring-run and fall-run chinook from collections. Protected spring chinook which may be incidentally trapped would be distinguished from the recently arriving summer chinook by external coloration and body conformation. Unless needed for authorized recovery program broodstock, listed spring chinook thus identified would be passed upstream with minimal delay.

Adverse effects on the natural summer chinook population, and on listed fish that may be encountered incidentally during trapping, would be minimized through the following measures:

1. The Wells Dam ladder traps would be continuously monitored and operation limited to three days per week during the summer chinook migration (late June through late August). The east ladder trap would be actively manned during trapping and the west ladder trap would be passively operated and checked at least daily when operating, ensuring minimal holding times for fish captured.
2. The Wells FH trap does not use a fish weir to guide fish into the hatchery fish ladder. All fish returning to Wells FH recruit to the trap as volunteers. The trapping program would therefore not be a "run of the river" operation, and captures of other species besides summer chinook salmon that were produced at the hatchery are minimal.
3. To minimize migration delays to fish other than the targeted species, the fish sorting flume in the west ladder trap would be staffed at all times while the fishway is barricaded for the purpose of guiding fish into the trap. Attraction flows from the false weir would be maintained to encourage fish to use the sorting flume.
4. The traps would be operated in a manner to reduce retention time in the holding pools above the fishways accessing the trap.
5. Fish not required for broodstock would be returned into the fishway as they move through the sorting flumes to continue their upstream migration.

Priest Rapids Fall Chinook Salmon Program
Adverse effects on listed fish that may be encountered incidentally during trapping, would be minimized through the following measures:

1. The Priest Rapids FH trap would be monitored and fish removed at least 3 days per week during the hatchery fall chinook migration (September through November).
2. The hatchery trap is located in the hatchery outlet channel ½ mile upstream from its confluence with the Columbia River. A fish weir is not used to guide fish into the hatchery outlet. All fish returning to Priest Rapids FH recruit to the trap as volunteers. The trapping program would therefore not be a "run of the river" operation, and captures of other species besides fall chinook salmon that were produced at the hatchery would be minimal.

3. Other salmonids incidentally trapped would be returned into the outlet channel to continue their migration.

2.3.3 Special Conditions

NOAA Fisheries proposes to issue a section 10(a)(1)(B) permit jointly to the WDFW, Chelan PUD, and Douglas PUD with special conditions. NOAA Fisheries' conditions are designed to minimize ESA-listed fish takes incidental to: the collection and spawning of adult unlisted sockeye, summer chinook, and fall chinook salmon; releases of unlisted salmon juveniles in the respective stream of origin to supplement the naturally spawning populations in the UCR Basin; and the conduct of associated hatchery scientific research and monitoring activities. Of primary concern in the development of the conditions for the proposed permit is the necessity to take special measures to avoid adverse impacts from artificial propagation, including demographic, ecological, and genetic impacts on the ESA-listed species. In addition to compliance with all measures identified in the application, HGMPs, and the HCPs, the permit holders would comply with special conditions that would address the following.

1. *Wenatchee River Basin* - Wenatchee Summer Chinook and Wenatchee Sockeye Salmon Programs

   a. The annual production of Wenatchee summer chinook for release from Dryden Pond into the Wenatchee River shall be limited to 864,000 yearlings released in April or May. The annual production of sockeye salmon for release from the Lake Wenatchee Net Pens into Lake Wenatchee shall be limited to 200,000 yearlings released in September, October or November.

   b. Monitoring and reporting of the contribution of hatchery-origin summer chinook and sockeye salmon to the naturally spawning populations shall be conducted annually. This information shall be included in the annual report for the program specified below.

   c. To minimize incidental capture of listed spring chinook salmon and steelhead during summer chinook and sockeye salmon trapping at Dryden and Tumwater dams, the annual broodstock collection protocols based on run size estimates, average run timing, and river environment conditions shall be developed and submitted to NOAA Fisheries by April 15th of each collection year. Operation of broodstock traps shall be limited to the following general schedules:
      1. The Dryden Dam traps may be operated seven days per week between July and November. The traps shall be passively operated on the right and left banks, and all fish removed at least daily on days of operation.
      2. The Tumwater Dam trap shall be operated no more than three days per week between mid-July and November. The Tumwater Dam trap would be monitored and all fish removed daily. The trap shall be open to allow

unimpeded passage of salmon, including steelhead, upstream of the trap at night.

d. The retention of adult summer chinook salmon shall be limited to about 492 fish at Dryden Dam subject to minor adjustments as determined in annual broodstock collection protocols to minimize incidental take effects on listed fish. Of the total collection goal, up to 123 summer chinook salmon may be collected after August 15 at Tumwater Dam to augment summer chinook salmon retention at Dryden Dam, as necessary.

e. The retention of adult sockeye salmon shall be limited to 260 mixed-origin or not more than 10% of the total run, whichever is lower, of run-at-large fish at Tumwater Dam, to be collected after the peak of the sockeye run past Rock Island Dam.

f. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during summer chinook and sockeye salmon trapping. The WDFW shall carefully handle and immediately release upstream listed spring chinook salmon and steelhead adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs. The number of listed salmon and steelhead encountered during summer chinook and sockeye salmon trapping, and their general condition at release, shall be included in the annual report for the program specified in section 6 below.

g. The WDFW shall adipose fin clip and CWT all hatchery summer chinook salmon yearlings and sockeye salmon juveniles released into the Wenatchee River Basin.

2. *Methow Summer Chinook Program* - Carlton Pond

a. The annual production of summer chinook salmon into the Methow River shall be limited to 400,000 yearlings released in April or May.

b. To minimize incidental capture of listed spring chinook and steelhead during trapping at Wells Dam, the operation of the east and west ladder traps shall be limited to no more than three days per week between July and August. If both the east and west ladders are utilized, they shall be operated concurrently, operating on the same three days each week. The ladders shall be opened to fish passage at night to allow free passage of listed steelhead.

c. The retention of broodstock for the Methow and Okanogan summer chinook salmon programs at the Wells Dam shall be limited to about 556 Methow/Okanogan river-origin summer chinook salmon subject to minor adjustment as determined through annual broodstock collection protocols to minimize incidental take effects on listed fish.

d. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. The WDFW shall carefully handle and immediately release upstream incidentally captured listed spring chinook salmon and steelhead adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs. The number of listed salmon and steelhead encountered during trapping, and their general condition at release, shall be included in the annual report for the program specified in section 6.

e. All hatchery summer chinook salmon yearlings released into the Methow River Basin shall have adipose fin clips and CWTs.

3. *Okanogan Summer Chinook Program* - Similkameen Pond

a. The annual production of summer chinook for release into the Similkameen or Okanogan Rivers shall be limited to 576,000 yearlings released in April or May.

b. The retention of broodstock for the Similkameen Pond and Carlton Pond (Methow Basin) programs at the Wells Dam shall be limited to about 556 Methow/Okanogan River-origin summer chinook salmon subject to minor adjustment as determined in annual broodstock collection protocols to minimize incidental take effects on listed fish.

c. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during trapping. The WDFW shall carefully handle and immediately release upstream incidentally captured listed spring chinook salmon and steelhead adults that are not intended for use as broodstock in concurrently operated and previously authorized listed stock recovery programs. The number of listed salmon and steelhead encountered during trapping, and their general condition at release, shall be included in the annual report for the program specified in section 6.

d. All hatchery summer chinook salmon yearlings released into the Okanogan River Basin shall have adipose fin clips and CWTs.

4. *Mainstem Columbia River* - Wells and Turtle Rock Summer Chinook Salmon Programs

a. The annual production of summer chinook for on-station release from Wells Hatchery shall be limited to 320,000 yearlings released in April and 484,000 sub-yearlings released in June.

b. The annual production of summer chinook for on-station release from Turtle Rock Hatchery into the mainstem Columbia River shall be limited to 200,000 yearlings released in April and 1,600,000 sub-yearlings in June.

c. Wells-lineage summer chinook salmon volunteering to the Wells Hatchery trap shall be used as broodstock to effectuate the Wells Hatchery and Turtle Rock artificial propagation programs.

d. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during summer chinook trapping at the hatchery. The WDFW shall carefully handle and immediately release upstream incidentally captured listed spring chinook salmon and steelhead adults that are not intended for use as broodstock in concurrently operated and previously authorized Wells Hatchery listed stock recovery programs. The number of listed salmon and steelhead encountered during summer chinook trapping at the hatchery, and their general condition at release, shall be included in the annual report for the program specified in section 6.

e. All summer chinook salmon yearlings released from the hatcheries shall have adipose fin clips and CWTs to monitor program performance and to allow for monitoring and evaluation of adult salmon contribution levels to other Basin salmon production areas.

f. All sub-yearlings released from Wells Hatchery into the mainstem Columbia River shall have adipose fin clips and CWTs to allow monitoring and evaluation of the artificial propagation program.

g. At least 200,000 of the 1,600,000 sub-yearlings released from Turtle Rock Hatchery (the equivalent of a 12.5% marking rate) shall have adipose fin clips and CWTs. Monitoring and evaluation results shall be included in the annual report.

5. *Mainstem Columbia River* - Priest Rapids Fall Chinook Salmon Program

a. The annual production of fall chinook salmon for on-station release from Priest Rapids Hatchery shall be limited to 6,700,000 sub-yearlings, released in June.

b. Fall chinook salmon adults volunteering to the Priest Rapids Hatchery trap shall be utilized as the primary means for obtaining broodstock for the Priest Rapids artificial propagation program.

c. The WDFW shall monitor the incidence of, and minimize capture, holding, and handling effects on, listed salmon and steelhead encountered during fall chinook adult capture activities at the hatchery. The WDFW shall carefully handle and immediately release upstream incidentally captured listed spring chinook salmon and steelhead adults that are collected at Priest Rapids Hatchery. The number of listed

salmon and steelhead encountered during fall chinook adult capture activities at the hatchery, and their general condition at release, shall be included in the annual report for the program specified in section 6.

d. At least 4% (268,000) of the fall chinook salmon juveniles released from the hatchery each year shall have adipose fin clips and CWTs to allow monitoring and evaluation of the artificial propagation program. Monitoring and evaluation results shall be included in the annual report specified below. The proportion of the total annual fish release from Priest Rapids Hatchery that are marked shall be subject to reevaluation through the comprehensive basinwide fish marking initiative proposed through the FCRPS biological opinion.

e. The WDFW shall monitor and report Priest Rapids Hatchery fall chinook salmon contribution to natural spawning in the Hanford Reach, and straying levels to other Columbia River Basin watersheds, including mainstem river reaches upstream of Wanapum Dam. Information regarding contribution to natural spawning and straying to natural areas shall be included in the annual report specified in section 6.

6. *All Programs* - Monitoring and Reporting

a. Broodstock collection protocols shall be developed for all artificial propagation programs addressed in permit 1347 which shall include scheduled trapping dates, trapping times, and collection goals that minimize potential adverse impacts on listed species and incorporate the special conditions listed above. These protocols shall be submitted to NOAA Fisheries by April 15th each year.

b. An annual report for each artificial propagation program shall be prepared that summarizes broodstock trapping activities including capture and disposition of all ESA protected species, spawning, rearing, and release of propagated salmon. Information regarding contribution to natural spawning and straying to natural areas shall be included in the annual report. An annual report of any recreational fishery in the UCR targeting salmon from the permitted programs shall be prepared including estimates of impacts on UCR spring chinook salmon and UCR steelhead.

c. Prior to modification of or deviation from the proposed actions, the permit holders shall notify NOAA Fisheries, Hatchery and Inland Fisheries Branch.

3.0 AFFECTED ENVIRONMENT

The alternatives identified above can potentially affect the physical, biological, economic, and social environments within the proposed action areas. Below is a summary of the major components of the environment and its current baseline condition.

3.1 Physical Environment

The Columbia River is the fourth largest river in North America. Its basin, including its tributaries, covers 258,500 square miles in seven U.S. states and British Columbia. It is the dominant water system in the Pacific Northwest. The Columbia River originates in the Rocky Mountains in British Columbia, flowing over 1,200 miles to enter the ocean near Astoria, Oregon. Major tributaries of the Columbia River in the U.S. are the Kootenai, Clark Fork-Pend Oreille, Snake, and Willamette Rivers.

The Columbia River serves the Pacific Northwest in a number of ways, including navigation, irrigation and other water supply, and electrical power generation. Detailed information on the importance of the river to the region can be found in the NOAA Fisheries FCRPS biological opinion (NMFS 2000).

The Columbia River also has historically produced some of the region's most important and well-known runs of salmon and other anadromous fish. However, it is generally recognized by the scientific community that development – in particular, the construction of hydroelectric projects, including irrigation diversions and urbanization – has radically altered the Columbia River ecosystem to the detriment of Pacific salmon (NRC 1996). Upper Columbia River salmonid populations, including endangered UCR spring chinook salmon and steelhead, have been among the salmon species that have been adversely affected by development. In particular, the construction of Chief Joseph and Grand Coulee Dams prevented thousands of UCR-origin spring chinook salmon and steelhead from reaching their natal streams. Remaining anadromous salmonid populations in the UCR region must traverse at least seven mainstem dams during downstream and upstream migration; Methow River populations must migrate through nine dams. Mortalities occurring at the seven mainstem dams are considered a primary man-caused limiter to spring chinook salmon production (WDF et al. 1993). Local habitat problems related to irrigation diversions, hydroelectric development, urbanization, and livestock grazing also limit the productivity of naturally-produced spring chinook salmon and steelhead in the region (WDFW 1998; NMFS 2000; NMFS 2001). Supplementation and mitigation programs are being implemented because the natural salmonid populations are not replacing themselves. Artificial propagation programs are viewed as an appropriate strategy to mitigate the effects of development and to assist in the recovery of wild fish populations (NMFS 2000).

Artificial propagation actions could temporarily adversely affect water quality through water withdrawals or diversions (from aquifers and streams) to support hatchery facilities. In the long term, some amount of additional fish wastes may enter the streams from rearing and acclimation ponds, but this impact is regulated by existing water quality standards. Effects on water quality related to the presence of salmonid carcasses in the water, as a result of dying after spawning or dying during unsuccessful upstream migration, may occur. The historical amounts of nutrients available to the ecosystem from these carcasses was large, and contributed to the enhancement of many forms of aquatic and terrestrial life, including the organisms juvenile salmon feed upon during rearing. Decomposing carcasses of spawned salmon would have temporary and local effects on water quality as nutrients are dissolved into the stream and taken up by aquatic and terrestrial

flora and fauna. Over-all and long-term effects on water quality resulting from artificial propagation programs are expected to be negligible, and are regulated by existing water quality regulations.

3.2 Biological Environment

The proposed artificial propagation programs are located and implemented within the UCR Basin from the mainstem Columbia River just downstream of Priest Rapids Dam to the extent of anadromous salmon migration in mainstem and tributary areas downstream of Chief Joseph Dam. Biological resources outside of these areas are not likely to be affected.

3.2.1 Fish Species Listed Under the ESA

Since 1991, NOAA Fisheries has identified twelve populations of Columbia River Basin salmon and steelhead as requiring protection under the ESA. Two of the ESA-listed ESUs originate in the UCR Basin. The ESUs expected to be impacted by the artificial propagation programs covered in this EA and their current listing status are described below. Both of the ESA-listed ESUs in the region include natural-origin and artificially propagated components.

UCR Spring-Run Chinook Salmon ESU – listed "endangered" (March 24, 1999, 64 FR 14308). The UCR spring-run chinook salmon ESU includes stream-type spring chinook salmon populations originating from all areas of the Columbia River basin upstream of Rock Island Dam (Myers et al. 1998). Production areas include the Wenatchee, Methow, and Entiat River Basins. WDF et al. (1993) identified nine stocks within this ESU. All stocks, with the exception of the Methow stock, were considered by WDF et al. (1993) to be of native origin, of "wild" production type, and as "depressed" in status. The Methow River spring chinook salmon stock is considered "composite" in production type, but of native origin, and depressed in status. When listing the UCR spring chinook salmon as endangered, NOAA Fisheries included six hatchery populations as part of the ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek. These six hatchery populations were considered to be essential for recovery and were therefore included in the listing determination. Hatchery populations at Winthrop NFH, Entiat NFH, and Leavenworth NFH were not included as part of the ESU because they were derived from Carson NFH spring chinook salmon.

Spring chinook salmon destined for the UCR and tributaries begin entering the Columbia River in late February and early March. Their abundance downstream from Bonneville Dam peaks in April and early May. Upper Columbia River spring chinook salmon have a stream-type life history. Adults return to the Wenatchee River from late March to early May, and from late March to June in the Entiat and Methow Rivers. Most adults return after spending two years in the ocean, while 20-40 percent return after three years at sea. Peak spawning for all three populations occurs from August to September. Smolts typically spend one year in freshwater before migrating downstream. This ESU has slight genetic differences from other ESUs containing stream-type fish, but more importantly it has ecological differences in spawning and rearing habitats that were used to define the ESU boundary (Myers et al. 1998). The Grand Coulee Fish Maintenance Project (1939-1943)

was also a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the UCR Region.

Upper Columbia River Steelhead ESU – listed "endangered" (August 18, 1997, 62 FR 43937). This ESU inhabits the Columbia River and tributaries upstream of the Yakima River. It includes rivers mostly draining the east slope of the Cascade Mountains. This area includes several rivers which originate in Canada, but it is not thought that steelhead ever occurred in Canada in large numbers; this ESU is considered to include only U.S. populations. This entire ESU has been heavily influenced by artificial propagation programs, with a thorough mixing of stocks as a result of the Grand Coulee Fish Maintenance Project beginning in the 1940s (Fish and Hanavan 1948; Mullan et al. 1992). Until very recently, hatchery releases composed of a composite of basin stocks continued. The Wells Hatchery stock is included in the listing. Currently, efforts are underway to develop artificial propagation programs from more locally-adapted stocks, using naturally-spawning fish.

The life history of this ESU is similar to other inland steelhead ESUs. However, smolt ages in this ESU are some of the oldest on the west coast (up to 7 years old), likely as a result of the ubiquitous cold water temperatures (Mullan et al. 1992). Adults of this ESU spawn later than most downstream populations. Adults of Wenatchee and Entiat River populations return after 1 year in the ocean, of the Methow River primarily after 2 years of ocean life. Adults remain in fresh water up to a year before spawning. Steelhead counts at the dams above Bonneville Dam surge as mainstem water temperatures decline in the fall. Counts peak at the UCR dams in August and September. During years of above average September-October flows and lower temperatures, steelhead move readily past the dams on the Columbia River during the summer/fall counting period (July-October).

Bull Trout - Another ESA-listed fish species that could be present in the areas where the hatchery activities are proposed to occur is bull trout. The Columbia River population segment of bull trout was listed as threatened by the U.S. Fish and Wildlife Service in 1997 (June 10, 1998, 63 FR 31647). Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from 1 to 4 years before migrating to either a lake (adfluvial) system or a river (fluvial) system, where they grow to maturity. Anadromous fish spawn in tributary streams, with major growth and maturation occurring in salt water.

Migratory bull trout have been restricted or eliminated due to stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. The disruption of migratory corridors, if severe enough, would result in the loss of migratory life history types and isolate resident forms from interacting with the metapopulation. The Columbia River population segment encompasses a vast geographic area including portions of Idaho, Montana, Oregon, Washington, and British Columbia. Bull trout are present, and locally common, in most of the habitat occupied by anadromous fish in the UCR Basin.

3.2.2 Unlisted Fish Species

Approximately 60 other species of fish live in the Columbia River and tributaries. About half are native species primarily of the families Salmonidae, Catastomidae, Cyprinidae, and Cottidae. Unlisted white sturgeon, *Acipenser transmontanus,* occur within the action area in the mainstem Columbia River. The Columbia River Basin also supports at least 25 introduced species primarily representing Percidae, Centrarchidae, and Ictaluridae. Most of the introduced species are game fish which may be the targets of fisheries that could incidentally take ESA-listed anadromous salmonids. No measurable positive or negative affects are anticipated on unlisted fish species.

3.2.3 Terrestrial Organisms

Impacts on terrestrial organisms such as beavers, river otters, and other piscivores and scavengers, ESA-listed or unlisted, as a result of the proposed programs are not anticipated to be substantial. The scale of the proposed artificial propagation programs is relatively small given the geographic region, and because the programs make use of existing hatchery facilities for the hatching and rearing stages, and no substantial impact to the riparian habitat is anticipated. Long-term benefits accruing to terrestrial piscivores and scavengers may be important if the projects are successful, with commensurate habitat restoration and fisheries harvest management actions outside the scope of this assessment, in restoring salmon populations to historic abundance levels. Nutrients derived from carcasses of naturally spawning, or out-planted, hatchery-origin salmon would be added to regional watersheds. These carcasses and their nutrients would be utilized naturally, benefitting terrestrial organisms within the watersheds where the artificial propagation programs are located. However, such effects are not expected to be of substantial benefit for some years to come.

3.2.4 Water Quality

Hatchery-related impacts on water quality may potentially occur through activities directly related to holding and spawning of adult salmon, egg incubation, rearing of juvenile salmon, and release of salmon smolts. Section 303(d) of the Federal Clean Water Act administered by the Environmental Protection Agency (EPA) requires states to monitor water quality and prepare a list of waterbodies that fall outside the surface water quality standards set by the EPA. In the UCR basin, the Columbia, Wenatchee, Methow, and Okanogan Rivers, along with various tributaries of those rivers, are on the 1998 303(d) list because water temperatures were above the standard set on at least more than one sampling occasion. The water temperature standard was calculated based on biological tolerances of salmon (*http://www.ecy.wa.gov/programs/wq/swqs/index.html*, as of November 12, 2002). Additionally, low instream flows in the Wenatchee and Methow Basins placed these rivers on the 1998 303(d) list. The Okanogan River Basin also repeatedly exceeded fecal coliform and toxic substance (arsenic and polychlorinated biphenyls) limits when tested in 1988.

3.3 Social and Economic Resources

Salmon are culturally, economically, and symbolically important in the Pacific Northwest. Natural and hatchery-origin salmon continue to play an important role for Native American cultural, religious, subsistence, and commercial purposes in the action area. The current depleted status of listed spring chinook salmon and steelhead populations has severely limited many of the cultural practices and subsistence uses of salmon by the local tribes. There has been a 90% decrease in tribal harvest throughout the Pacific Northwest from about 5 million salmon in 1986 to about 500,000 in 1999 (Frank 2002). Historically, the salmon resources in the UCR basin were critical in the life of the Colville Tribes. The Colville Reservation is bordered by the Columbia River for more miles than any other Indian Reservation in the basin. However, due to endangered stocks and areas blocked by federally-owned hydroelectric projects, and the location of the Reservation at the upper end of adult salmon return migration, fishing opportunities for the members of the Confederated Tribes of Colville Reservation are at best severely limited (CCT 2002).

The poor status of the listed populations has also curtailed economic and cultural benefits for non-Indian recreational fisheries that the salmon resource formerly supported. Columbia River chinook salmon populations were at one time acknowledged to be the largest in the world. Early traders, trappers, and settlers began arriving around 1800. These early immigrants began taking salmon for their own use and consumption, often trading for fish with local Indian tribes. Early attempts at commercial taking of salmon began in 1829, with salmon harvest as a commercial industry beginning in earnest by the mid-1880s. The first cannery on the Columbia River produced its first pack of canned salmon in 1866. By 1887, the number of canneries in the basin peaked at 39. Salting, mild-curing, and other methods of salmon preparation were also taking place, and Columbia River salmon were becoming well-known internationally. The total production of canned, mild-cured, and frozen salmon and steelhead in the Columbia River Basin rose from 272,000 pounds in 1886 to annual productions between 20 and 50 million pounds from 1874 through 1936.

The gear used to fish commercially for Columbia River salmon included gill nets, purse seines, traps, dip nets, fish wheels, and a variety of other methods (Craig and Hacker 1940). The combined gear types were landing an average of nearly 24.5 million pounds of salmon and steelhead annually between 1927 and 1934. The increased use of gasoline engines on boats enhanced the development of trolling as a commercial salmon harvest method after about 1905, predominantly for chinook and coho salmon. Between 1926 and 1934, the average annual troll catch of Columbia River salmon was 894,000 pounds of chinook and 2.6 million pounds of coho salmon. Currently, harvest is not considered to be as great a source of salmonid population decrease as habitat degradation and hydropower projects. Harvest rates are managed at conservative levels until improvements in other sectors of the environment are able to take effect.

In the early 1900s, increased agriculture, industry, and land development began to reduce the amount of suitable habitat for salmon spawning and rearing. In that period, the annual catch of chinook salmon fluctuated widely. As chinook salmon abundances began to decline, starting around 1911, the focus of commercial harvest operations began to shift more to other species. As

total salmonid abundances in Columbia River fisheries continued to decline, concerns for the continued health of salmonid stocks increased. Management actions began to be developed and implemented to slow the decline of salmon abundances, including the elimination of fish wheels and purse seines on the Columbia River, and reduced commercial gillnet seasons.

The current status of the salmon populations has also required land and water use restrictions, which have adversely affected uses of local resources by landowners and local industries within the action area. For example, in the Methow River basin irrigation water withdraws have been shut down to protect listed fish. In recent years, with severely reduced salmonid numbers due primarily to habitat degradation and hydropower development in the mainstem river, commercial and recreational fisheries have been considerably curtailed from earlier levels.

Numerous jobs are indirectly (e.g., commercial fishers and retailers) and directly (e.g., fish culturists and fish managers/regulators) associated with or affected by the proposed unlisted salmon artificial propagation programs and the listing of the species under the ESA. Historically, artificial propagation efforts have had a substantial impact on salmon populations in the UCR region. These efforts included hatchery-based enhancement and the extensive trapping and transportation activities associated with the Grand Coulee Fish Maintenance Project (1939-1943), which was intended to mitigate the effects of dam construction and habitat loss by aiding depressed salmon stocks. Many artificial propagation efforts now focus on enhancing naturally spawning salmonid populations to encourage stock recovery and sustainability. In addition to their role in maintaining the viability of salmonid populations, the unlisted salmon artificial propagation programs provide equitable access of all citizens to recreational, commercial, and tribal fisheries throughout the Columbia River Basin in high adult return years.

Similar to rural areas across the country, the local economy of the UCR region has experienced a downturn brought on by many factors. The reductions of fishing opportunities has added to the economic slowdown in the local economy. It was estimated that salmon and steelhead recreational fishing in 1986 had an average value of $34 per trip (USACE). The average number of angler trips to the UCR region was estimated at between 1,500 and 3,000 annually, therefore the economic impact may be about $51,000 to $102,000 annually (1986 dollars).

4.0 ENVIRONMENTAL CONSEQUENCES

This section of the assessment evaluates the potential effects of the alternatives (including the proposed action) on biological, physical, social, and economic resources. NOAA Fisheries' approval or denial of the permit for the unlisted salmon artificial propagation programs could indirectly affect a variety of natural and human resources. Because many of the conditions described in the proposed action were addressed in the Conservation Plan and the HGMPs submitted for the artificial propagation programs, environmental consequences are expected to be similar for Alternatives 2 and 3. However, the environmental consequences resulting from Alternative 1 (No Action) are expected to differ somewhat from the proposed action.

4.1 Alternative One (No Action)

If permit 1347 is not issued, then none of the proposed artificial propagation programs that take listed species would be implemented. The environmental impacts related to the No Action alternative based on this assumption are identified in the following sections.

4.1.1 Effects on the Physical Environment

Termination of the artificial propagation programs would not have much effect on the physical environment in the action area. Riparian areas that may serve as access point to traps and juvenile fish release sites would still be utilized for artificial propagation programs of ESA-listed spring chinook and steelhead (authorized under permits 1196, 1248, 1300). While hatchery effluent would not be released from some of the facilities that rear only the unlisted species, other facilities would release effluent associated with ESA-listed species propagation authorized under other permits. The Wenatchee, Methow, Okanogan, and Columbia Rivers have temperatures above the optimal conditions for salmon as indicated by their inclusion on the EPA's 1998 303(b) list and this would not change due to curtailment of these programs.

4.1.2 Effects on the Biological Environment

Effects on ESA-listed Anadromous Fish
Under the "No Action" alternative, ESA-listed anadromous fish would not be exposed to risks of injury or mortality as a result of broodstock collection, juvenile fish release, or research and monitoring and evaluation actions occurring through the unlisted salmon artificial propagation programs. The complete curtailment of the unlisted salmon artificial propagation programs in the UCR region may result in a slight increase in escapements for listed salmonid populations. The amount of increase would be equal to or slightly less than the number of adults dying, debilitated, or otherwise rendered unable to spawn as a result of handling during broodstock collection activities. The potential increase in escapements is nearly impossible to estimate and the gain from such an action would not measurably benefit the conservation of ESA-listed salmon and steelhead.

Under the "No Action" alternative, the impacts on listed bull trout would be the same as under Alternatives 2 and 3. The artificial propagation programs are implemented in areas where bull trout are either not encountered, or occur at such low numbers that effects would be negligible.

Effects on Non-listed Target Anadromous Fish Species
The propagation programs considered in the proposed permit are designed to enhance the natural populations by returning adults to the spawning grounds. If the unlisted salmon artificial propagation programs are not implemented, beneficial prey sources (juvenile hatchery fish) and nutrients (hatchery-origin salmon carcasses) made available by the programs to natural population of the target species would no longer exist, though other prey and nutrients sources are present.

Effects on Non-listed Non-Target Anadromous Fish Species
No substantial effects of the No Action alternative are anticipated to occur on fish species not

targets of the artificial propagation program or listed under the ESA. If the unlisted salmon artificial propagation programs are not implemented, beneficial prey sources (juvenile hatchery fish) and nutrients (hatchery-origin salmon carcasses) made available by the programs to non-listed fish species in the region would no longer exist, though other prey and nutrients sources are present.

Effects on Terrestrial Organisms
No substantial effects of the No Action alternative are anticipated to occur on listed or unlisted terrestrial organisms. If the unlisted salmon artificial propagation programs are not implemented, beneficial prey sources (juvenile and adult hatchery fish) and nutrients (hatchery-origin salmon carcasses) made available by the programs to terrestrial species in the region would no longer exist. This is probably a negligible source of nutrition for terrestrial organisms.

4.1.3 Effects on the Social and Economic Resources

The "No Action" alternative would result in economic losses to local fishermen and communities, and in reductions in opportunities for Native American subsistence and cultural uses of salmon, within the UCR Basin. Surplus unlisted salmon produced by the programs for harvest in Native American and non-Indian fisheries would no longer be available. Fishery closures to protect ESA-listed anadromous salmonids from harvest have already occurred to a considerable extent, affecting commercial, recreational, and tribal fishers. Eliminating unlisted salmon production in the action area would also likely lead to curtailment of the last anadromous salmon fishery opportunities in this area. It was estimated that salmon and steelhead sport fishing in 1986 had an average value of $34 per trip (USACE 1999). During the summer chinook salmon season, between 1,500 and 3,000 angler trips may occur in the UCR Basin, therefore the economic impact could be the loss of about $51,000 to $102,000 annually (1986 dollars) to the local UCR region. Annual salmon harvest activities throughout the Columbia River basin are negotiated annually to minimize adverse effects on listed fish while still

providing fishery harvest opportunity. This alternative would also reduce local public support of conservation and recovery efforts because of the loss of local fishery benefits.

4.2 Alternative Two (Issue Permit Without Conditions)

The purpose of permit conditions is to prescribe requirements and/or restrictions that are expressly designed to minimize impacts on ESA-listed fish. Issuing permits and permit modifications to agencies without conditions would result in many of the same environmental impacts described in the proposed action alternative below because many of the techniques that result in permit conditions are provided as proposed strategies in permit applications. However, not imposing conditions in permits could potentially result in unexpected environmental impacts if strategies designed to minimize adverse impacts are significantly altered by the Permit Holder. Establishing conditions in permits ensures that measures would be implemented by the Permit Holder to minimize adverse impacts on ESA-listed fish and that agency actions would not appreciably reduce the survival and recovery of ESA-listed species. In addition, NOAA Fisheries' conditions may serve to further limit the proposed activities in such a way as to enhance the proposed conservation

efforts, as described in section 4.3, below.

4.3 Alternative Three (Proposed Action)

If permit 1347 is issued, then actions described in the conservation plan, HGMPs, and HCPs would be implemented with specific conservation recommendations, limits and reporting requirements.

4.3.1 Effects on the Physical Environment

The effects on the physical environment resulting from implementation of the proposed artificial propagation programs would include impacts on small areas of riparian vegetation and habitat during the operation of unlisted broodstock trapping, fish rearing, and fish acclimation and release facilities. The hatchery facilities, traps, and acclimation ponds are already in place and their operation would result in small effects on the physical environment. Possible impacts include walking through riparian areas to access traps and release juvenile fish. Such impacts would be minimal and short lived. Water quantity and quality could be minimally adversely affected. To limit impacts on water quantity, the action agencies would comply with water right permits established for each hatchery to prevent over-appropriation of surface water and/or rely on ground water withdrawal.

Water quality is minimally affected by effluent from the hatcheries, which would be monitored to ensure compliance with NPDES water quality standards. The water source for many of the hatchery facilities is pathogen-free well water. The water quality of hatchery effluent from a well water source is likely to be higher than many of the rivers the effluent is released into. Facilities that utilize surface water would apply measures such as settling ponds to remove settleable solids to ensure effluent does not exceed NPDES standards. Hatchery effluent from facilities that utilize well water would be released at a lower temperature than the ambient river temperature during summer and early fall months when the ambient river temperature exceeds EPA section 303(b) standards; therefore, if any impact is realized it would be a positive impact. Considering that the effluent produced from the hatchery facilities often originates from pathogen-, and contaminant-free well water, complies with EPA standards, and comprises a low percentage of effluent to discharge (dilution factor), there is a low possibility that effluent produced at these facilities would negatively impact the physical environment and any impact is likely to be minimal.

Impacts on Habitat
Impact of these activities on the habitat of the ESA-listed species is expected to be minor or non-existent. The WDFW, or the Chelan PUD and Douglas PUD funding the operations, retain water withdrawal permits issued by Washington Department of Ecology for ground and surface water used in the hatchery operations. Compliance with permit requirements ensures that the artificial propagation programs do not over-appropriate surface water to the detriment of adjacent water courses serving as aquatic habitat. Hatchery effluents currently meet NPDES permit requirements and would continue to do so, minimizing the likelihood of adverse effects on listed salmon and steelhead in the upper Columbia tributary areas. Dilution factors in the UCR mainstem migration corridor further reduce the likelihood of any adverse effects on listed salmon and steelhead

populations in the mainstem river.

4.3.2 Effects on the Biological Environment

Effects on ESA-listed Fish
Impacts on listed UCR fish species resulting from the proposed unlisted salmon artificial propagation programs may result from incidental capture and handling of adult fish during broodstock collection operations, and incidental injury or mortality resulting from encounters with liberated juvenile hatchery fish in the natural environment. The precise level of incidental take of listed salmon and steelhead resulting from and juvenile salmon releases in the mid and upper-Columbia River regions is unknown. Quantification of mortality levels of juvenile listed salmon and steelhead is not possible, due to the inherent biological characteristics of the listed fish, the scale and variability of the Columbia Basin river systems, and the operational complexity of the subject hatchery actions. The WDFW believes that the minimization actions directed towards wild salmon and steelhead protection implemented in upper-river major hatchery operations, including release practices and smolt-only releases, will lead to insignificant levels of incidental take. Broodstock collection activities are likely to encounter few ESA-listed spring chinook **SALMON BECAUSE OF MIGRATION TIMING DIFFERENCES BETWEEN THE SPECIES. STEELHEAD ENCOUNTERED DURING UNLISTED SPECIES BROODSTOCK COLLECTION ACTIVITIES ARE REGULARLY RETAINED AS BROODSTOCK FOR ESA-LISTED ARTIFICIAL PROPAGATION PROGRAMS.**

Effects on Unlisted Fish Species
The proposed artificial propagation programs would be implemented to supplement natural salmon populations in the UCR region. The WDFW applies appropriate broodstock collection, mating, and juvenile fish production procedures to ensure that adult fish produced through the programs are representative of the target natural-origin populations. The programs are designed to preserve the ecological and genetic characteristics of the supplemented populations, while increasing the abundance of adult returns to the region.

Unlisted fish species in the action area would be expected to benefit from nutrient enrichment provided by hatchery fish carcasses in stream reaches used by the species. The potential to utilize the marine-based nutrients that are imported to freshwater ecosystems in the carcasses of hatchery returns may be of value for stimulating ecosystem recovery. Experiments have shown that carcasses of hatchery-produced salmon can be an important source of nutrients for juvenile salmon rearing in streams (Bilby *et al.* 1998). Juvenile fish released by the hatcheries also are likely to benefit unlisted fish species as prey.

Adverse ecological effects on unlisted fish are minimized through the release of actively smolting fish from the artificial propagation programs. The hatchery smolts migrate seaward rapidly after release, limiting the duration of interaction, and opportunity for adverse ecological effects, on co-occurring unlisted fish species. The Wenatchee sockeye salmon are released during the fall and rear through the winter months in the lake. Winter activity is expected to be low because of reduced metabolic rates associated with low water temperatures.

Effects on Terrestrial Organisms
Juvenile fish releases and adult salmon returns resulting from the programs would make additional fish (live or as carcasses) available for use by terrestrial organisms. The potential to utilize the marine-based nutrients that are imported to freshwater ecosystems in the carcasses of hatchery returns may be of value for stimulating ecosystem recovery. Hatchery carcasses may replace some of the nutrient deficit in riparian plant and terrestrial wildlife communities where naturally produced spawners are lacking (Bilby *et al.* 1998). In the context of the entire geographic area, the nutrient input that would occur is small and limited by actions outside the scope of this EA, such as habitat improvement and restoration projects.

4.3.3 Effects on Social and Economic Resources

This alternative would likely result in beneficial effects on local communities. If a permit is issued authorizing the proposed unlisted salmon artificial propagation programs, economic, cultural, and aesthetic benefits would accrue to the human population within the UCR region. The programs would help contribute to self-sustaining salmon populations, and to the availability of fish for harvest in Native American and non-Indian fisheries. The availability of salmon for ceremonial and subsistence and commercial uses by the treaty Indian tribes would increase.

Non-Indian commercial and recreational fisheries accessing adult fish production from the hatcheries provide substantial income and important employment opportunities in remote, rural communities located in the Columbia River Basin. Revenue would be generated from the sale of adult salmon, fishing licenses, fishing equipment, lodging and food. It was estimated that salmon and steelhead sport fishing in 1986 had an average value of $34 per trip (USACE 1999). During the summer chinook season between 1,500 and 3,000 angler trips may occur in the UCR Basin, therefore the economic impact may be about $51,000 to $102,000 annually (1986 dollars). By assisting in increasing abundances of adult unlisted salmon, this alternative would also maintain local public support of salmon and steelhead recovery efforts because of the local economic benefits associated with these programs. The potential benefits of the proposed activities would be accessible to all citizens and not pose a disproportionate adverse impact on minority or low-income populations.

4.3.4 Cumulative Impacts

Cumulative impacts from NOAA Fisheries' proposed issuance of a section 10(a)(1)(B) permit, including additional special conditions as described, will be minor if at all measurable. Incremental impacts on the environment are included in the discussion above. NOAA Fisheries' permitting of the described activities is only one element of a large suite of regulations and environmental factors that may influence the overall management of artificial propagation actions in the affected environment, and that may impact the health of listed salmon populations and their habitat. Those programs that meet the requirements of section 10 and its implementing regulations will include monitoring and adaptive management measures so that basin co-managers can respond to changes in the status of affected listed salmon. Monitoring and adaptive management will help ensure that

the affected ESUs are adequately protected and help counter-balance any negative cumulative impacts.

5.0 AGENCIES CONSULTED

NOAA Fisheries (National Marine Fisheries Service)
Washington Department of Fish and Wildlife

6.0 REFERENCES

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7.0 FINDING OF NO SIGNIFICANT IMPACT

Summary

The National Marine Fisheries Service (NOAA Fisheries) Northwest Region (NWR) has prepared an Environmental Assessment (EA) of its proposed issuance of a permit pursuant to section 10(a)(1)(B) of the Endangered Species Act (ESA). The permit (#1347) would be issued jointly to the Washington Department of Fish and Wildlife (WDFW), Public Utility District No. 1 of Chelan County (Chelan PUD), and Public Utility District No. 1 of Douglas County (Douglas PUD) for annual take of ESA-listed Upper Columbia River (UCR) spring chinook and UCR steelhead incidental to operation of the artificial propagation programs rearing unlisted species in the Upper Columbia River. The permit would expire December 31, 2013.

NOAA Fisheries considered and analyzed the following alternatives, all of which are discussed in detail in the EA:

> Alternative 1 - No Action: Do not issue the permit, which would likely require WDFW, Chelan PUD, and Douglas PUD to cease, or drastically reduce the scope of, the programs.
>
> Alternative 2 - Issue the permit based on the application without any additional specific conditions.
>
> Alternative 3 - Proposed Action: Issue the permit based on the application with additional specific conditions to minimize adverse impacts on the ESA listed salmonids and to enhance conservation efforts.

The proposed action would allow the permit holders to implement artificial production programs that are designed to enhance natural production of salmonid species and provide fishery opportunity while still remaining consistent with recovery of ESA listed endangered UCR spring chinook salmon and UCR steelhead in the Wenatchee, Methow, and Okanogan River Basins in the state of Washington. The programs are fully described in the EA and in the permit application documents (the Conservation Plan, three Hatchery Genetic Management Plans, and three Habitat Conservation Plans).

Issuance of the permit with additional special conditions would be expected to result in the following environmental, social, and economic effects:

- Small, localized, and transitory adverse effects on water quantity and water quality from water withdrawals and hatchery effluent.
- Potential deleterious effects from artificial propagation such as maladaptive genetic, physiological and behavioral changes, disease transmission and reduction in the number of adults spawning in the wild.
- Few, if any, effects on other ESA-listed species through trapping activities that have the potential to handle listed spring chinook, steelhead, and bull trout.

- Benefits to listed fish and other resident species from recycled marine nutrients added to the ecosystem.
- Restoration of non-consumptive observation of spawning salmon and existence values.
- Mitigation for continued impacts from the hydro-power system where impacts cannot be minimized through design and operational changes.
- Increased availability of salmon for ceremonial and subsistence uses by treaty tribes and the opportunity for recreational fisheries.

These are fully described in the EA.

In the EA, NOAA Fisheries considered the context and intensity of the factors identified in NOAA NAO 216-6 section 6.01b, as well as short and long term effects of the proposed action. Based on the analysis in the EA, NOAA Fisheries finds that:

1. Public health and safety will be minimally affected by the preferred alternative. Any degradation of water quality will be restricted to the areas immediately adjacent to hatchery water discharges, and any adverse effects will be localized and temporary.

2. The proposed action alternative effects on the human environment are not likely to be highly controversial based on information provided during the public comment period and the low level of adverse impact on socioeconomic resources expected (as described in the EA).

3. This action does not establish a precedent for future actions with significant effects nor does it represent a decision in principle about a future consideration because NOAA Fisheries has analyzed many comparable programs and issued many comparable permits.

4. This action is of limited context and intensity, with limited environmental effects, individually or cumulatively.

5. The effects of this action are relatively certain and do not involve unique or unknown risks because this artificial propagation program is similar to other artificial propagation programs designed to provide fish for harvest and enhance natural production while still ensuring conservation of protected populations that NOAA Fisheries has considered and authorized.

6. The proposed action will not adversely affect areas listed in or eligible for listing in the National Register of Historic Places, or cause loss or destruction of significant scientific, cultural or historic resources.

7. ESA-listed endangered UCR spring chinook salmon and steelhead will be adversely affected by the proposed action. However, based on NOAA Fisheries' evaluation, the proposed action will have only relatively small impacts on non-target species.

8. The proposed action will not adversely modify or destroy designated critical habitat as defined by the ESA or designated essential fish habitat (EFH) as defined by the Magnuson-Stevens Act. The artificial propagation programs that are the subject of the proposed action will affect habitat features such as water quality, water quantity, adult passage impediment, predation, competition, and exchange of disease organisms. As discussed in the EA, any adverse effects will by minimal, localized and temporary. The proposed permit conditions and operating procedures are designed to minimize the adverse effects.

9. The proposed action does not threaten a violation of federal, state, or local law requirements imposed for the protection of the environment. To comply with water quality standards, hatchery operators must obtain National Pollutant Discharge Elimination System (NPDES) permits this requirement is included in the application.

Environmental Justice: Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The analysis of the impacts in the EA indicates that there will be no disproportionately high and adverse environmental impacts, as described in the executive order, on minority and low-income populations by the proposed action.

References:

NOAA Fisheries. 2002. Environmental Assessment of NOAA Fisheries' Issuance of Permit #1347 under Section 10(a)(1)(B) of the Endangered Species Act. NOAA Fisheries, Portland, Oregon.

Determination

Based on the analysis in the EA, I conclude that the proposed action to issue permit #1347 with specific conditions to WDFW, Chelan PUD, and Douglas PUD pursuant to section 10(a)(1)(B) of the ESA does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). Therefore, an environmental impact statement is not required.

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5/30/03
Date