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on information provided by the USFWS, the BPA/Yakama Nation, the WDFW, the Chelan PUD, the Douglas PUD, published and unpublished scientific information on the biology and ecology of steelhead and spring chinook salmon in the action area, and other sources of information.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.

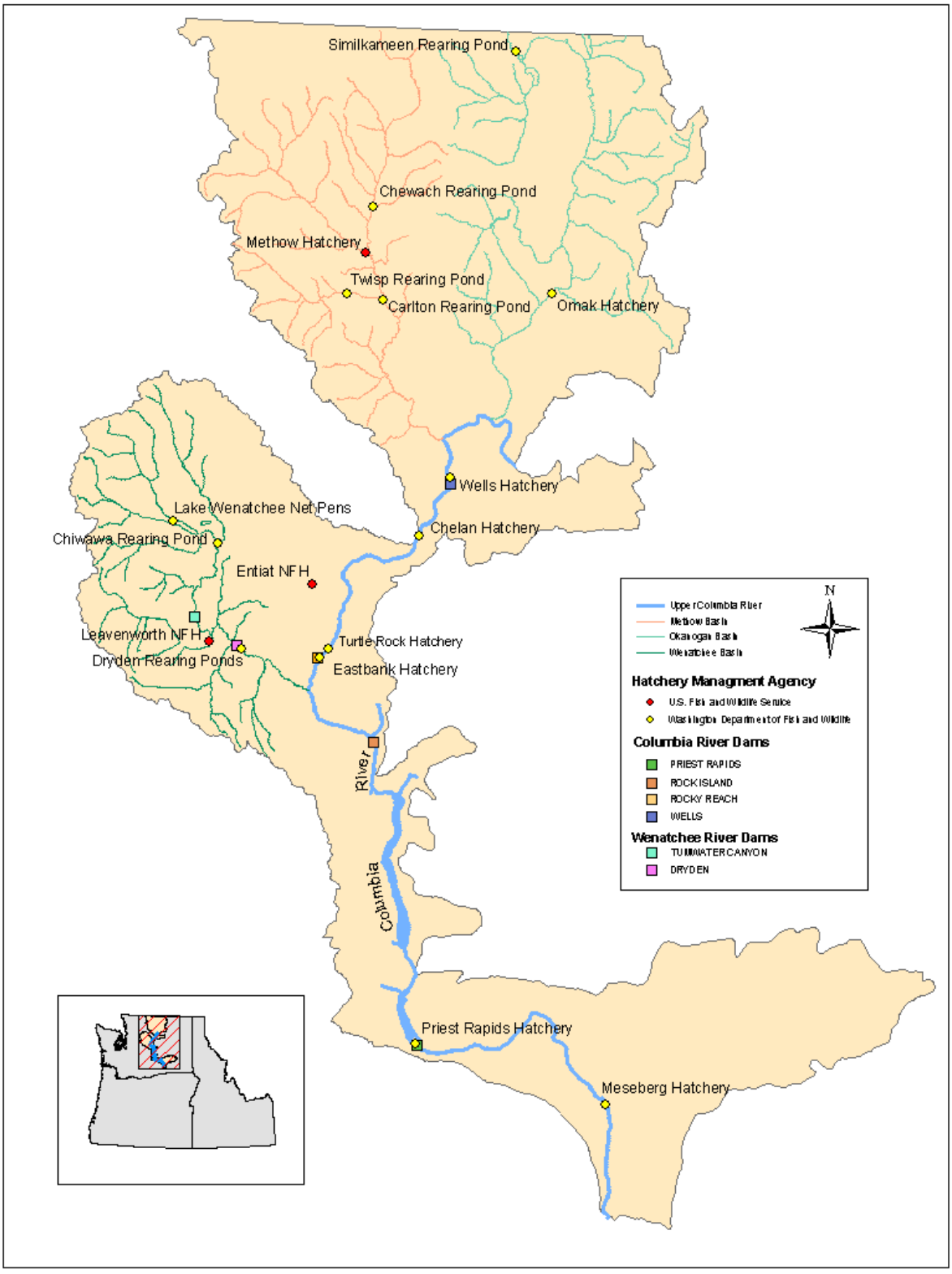

Figure 2. Map of the upper Columbia River basin with hatchery facilities and dams relevant to the proposed artificial propagation programs identified.

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

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9.1 Federal Register Notices

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