ANNUAL REPORT
CALENDAR YEAR 2007
OF ACTIVITIES UNDER THE ANADROMOUS FISH AGREEMENT AND HABITAT CONSERVATION PLAN

WELLS HYDROELECTRIC PROJECT
FERC LICENSE NO. 2149

Prepared for

Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

Prepared by

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East Wenatchee, Washington 98802-4497

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1 INTRODUCTION

On June 21, 2004, the Federal Energy Regulatory Commission (FERC) approved an Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Wells Hydroelectric Project (Wells Dam – FERC License No. 2149) on the Columbia River in Washington State. The Wells Project is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD). The HCP provides a comprehensive and long-term adaptive management plan for species covered under the HCP (Plan Species) and their habitats. This document is intended to fulfill Section 6.9 of the HCP and Article 59 of the Wells Project FERC License requiring an annual report of progress toward achieving the No Net Impact (NNI) goal described in Section 3 of the HCP, and a summary of common understandings based upon completed studies.

Designated representatives of the signatories of the Mid-Columbia HCPs (HCPs of the Wells, Rocky Reach, and Rock Island hydroelectric projects) comprise the Coordinating Committees, Hatchery Committees, and Tributary Committees for each HCP, which meet collectively to expedite the process for overseeing and guiding the implementation of their respective HCPs. Minutes from the monthly meetings are compiled in Appendices A (Coordinating Committees), B (Hatchery Committees), and C (Tributary Committees). In addition, a Policy Committee provides a forum for resolution of disputes that are either elevated to or arise in the Coordinating Committees that remain unresolved. The Policy Committees meet as needed to discuss any of these issues and receive updates on HCP progress; minutes from the 2007 meeting are included in Appendix D. Appendix E lists members of the Wells HCP Committees. The Coordinating Committee for the Wells HCP oversaw the preparation of this fourth Annual Report for calendar year 2007, which covers the period from January 1 to December 31, 2007. (The first, second, and third Annual Reports covered January 1 to December 31, 2004, 2005, and 2006, respectively.)

2 PROGRESS TOWARD MEETING NO NET IMPACT

The Wells Project HCP requires preparation of an Annual Report that describes progress toward achieving the performance standard of NNI for each Plan Species. The NNI standard consists of two components: 1) 91 percent combined adult and juvenile project survival achieved by project improvement measures implemented within the geographic area of the project, and 2) 9 percent compensation for unavoidable project mortality provided through hatchery and tributary programs, with 7 percent compensation provided through hatchery and 2 percent through tributary programs (Section 3.1 of the HCP). Section 4.1 of the HCP states that, given the present inability to differentiate between the sources of adult mortality, initial compliance with the combined adult and juvenile survival standard will be based on the measurement of 93 percent juvenile project survival or 95 percent juvenile dam passage survival (described further in Section 4.1.2 of the HCP).

The following sections of this chapter describe activities implemented during 2007 toward maintaining the HCP passage and survival standards and implementing the HCP objectives as they relate to decision making, continued implementation of the juvenile and adult passage plans, and project improvements for hatchery programs and tributary programs.

2.1 Status of Phase Designations for Current Plan Species

A major feature of the Wells HCP is what is termed a "phased implementation plan" to achieve the survival standards. These phases have been described in previous HCP Annual Reports to FERC. The current Phase Designations of all Plan Species covered by the Wells HCP are shown in Table 1. Since February 2005, steelhead, subyearling Chinook, yearling Chinook, and sockeye salmon are in Phase III (either Standard Achieved or Additional Juvenile Studies; Table 1). In December 2006, the Wells Coordinating Committee agreed to defer until 2007 a decision on whether the condition of section 8.4.5.1 of the Wells HCP had been met regarding mitigation for Methow River coho, and agreed that when and if such conditions were met, coho were to be designated at Phase III (Additional Juvenile Studies). This agreement was based on the Committee's determination that coho salmon would survive passage of Wells Dam at a level similar to other spring migrant salmonids. On December 12, 2007, the Wells HCP Hatchery Committee agreed that "the criterion pursuant to Section 8.4.5.1 of the Wells Project HCP for a long-term coho hatchery program has been met." Thus, effective December 12, 2007,

the requirement to provide compensation for coho salmon was established, and coho salmon were designated as in Phase III (Additional Juvenile Studies). Under Phase III conditions (Standard Achieved), Douglas PUD is required to re-evaluate survival at 10-year intervals.

Table 1
Phase Designations for Wells Dam

Plan Species	Phase Designation	Date
Upper Columbia River (UCR) steelhead	Phase III (Standard Achieved)	February 22, 2005
UCR yearling spring Chinook	Phase III (Standard Achieved)	February 22, 2005
UCR subyearling summer/fall Chinook	Phase III (Additional Juvenile Studies)	February 22, 2005
Okanogan River sockeye	Phase III (Additional Juvenile Studies)	February 22, 2005
Methow River Coho	Phase III (Additional Juvenile Studies)	December 12, 2007

2.2 Review of Phase Designation Status for Subyearling Chinook

In late 2007, the Coordinating Committees reviewed the phase designation for subyearling Chinook, noting that Section 4.1.2 of the HCP stated that at the time the HCP was signed, it was not yet possible to empirically measure Juvenile Project Survival and Juvenile Dam Passage Survival, and that a Phase Designation would be arrived at from a calculated estimate based on the "best available information" as determined by the Coordinating Committee. To facilitate this review, Douglas PUD summarized the method and information that was used to calculate an estimated survival, and referred to the February 2005 Coordinating Committees agreement defining subyearling Chinook as Phase III (Additional Juvenile Studies). The Committees discussed and agreed that the biological, logistical, and technological limitations that prevented empirical testing of survival were still limiting and that the calculated survival estimate was still the "best available information."

2.3 2007 HCP Decisions

Throughout 2007, the HCP Coordinating, Hatchery, and Tributary Committees made and noted a number of agreements during committee meetings in order to document HCP

decisions and maintain NNI conditions for Plan Species. These agreements are summarized in Table 2 and are discussed in the remainder of this report.

Table 2
Summary of 2007 Decisions for Wells HCP

Date	Agreement	HCP Committee	Reference
Jan 23, 2007	Recommendation to proceed with plans for baffle placement in east fishway of Wells Dam and develop a telemetry study for evaluation of passage time in 2007	Coordinating	Appendix F; Appendix A, Jan 23, 2007
Jan 23, 2007	Acceptance of the 2007 Wells Juvenile Bypass Plan	Coordinating	Appendix F; Appendix A, Jan 23, 2007
March 27, 2007	Approval of the Study Plan Titled *Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007*	Coordinating	Appendix F; Appendix A, March 27, 2007
Aug 15, 2007	Hatchery Evaluation Technical Team Operating Procedures	Hatchery	Appendix G; Appendix B, Aug 15, 2007
Aug 15, 2007	Proposed Changes to Monitoring and Evaluation (M&E) Plan Objective 9	Hatchery	Appendix G; Appendix B, Aug 15, 2007
Aug 15, 2007	Twisp Weir Modifications	Hatchery	Appendix G; Appendix B, Aug 15, 2007
Dec 12, 2007	Statement of Agreement Regarding the District's Okanogan Spring Chinook Obligation	Hatchery	Appendix G; Appendix B, Dec 12, 2007
Dec 12, 2007	Statement of Agreement Regarding Fulfilling the Douglas County PUD Coho Obligation	Hatchery	Appendix G; Appendix B, Dec 12, 2007

2.4 Project Operations and Improvements

This section summarizes project operations toward meeting and maintaining HCP requirements at Wells Dam in 2007. Actions in 2007 were guided by the 2007 Douglas PUD Action Plan, as approved by the Coordinating Committees (Appendix K).

2.4.1 Operations

Similar to past years, operation of the juvenile bypass system in 2007 was guided by the Bypass Operating Plan, contained within Section 4.3 of the Wells HCP. Spring bypass spill occurred this year from April 12 through June 13 and summer bypass spill occurred from June 14 through August 26, as implemented per the Pre-season Operating Plan agreed to by the Wells HCP Coordinating Committee in January 2007 (Appendix A and F). In September 2007, Douglas PUD provided a bypass operation summary that documented the initiation and termination dates for the Wells bypass operation. The year 2007 was the fourth year that operation of the bypass system was guided by representatives of the Wells HCP Coordinating Committee.

River flows at Wells Dam during the 2007 juvenile migration of Plan Species (April to August) were at 100 percent of the 20-year average. Operationally, all five bypass bays were available and were utilized as appropriate during the outmigration. Operation of the bypass system throughout the season was guided by the bypass operating criteria contained within Section 4.3 of the Wells HCP.

The spring bypass season started on April 12 at 0000 hours and ran continuously through June 13 at 2400 hours. The spring bypass operated for a total of 63 days and utilized a total discharge of 1.39 million acre feet (MAF), or an average of 11.09 thousand cubic feet per second (kcfs), which is 7.1 percent of total project discharge. During the spring bypass operation, there was forced spill during 420 hours or 27.8 percent of the season.

Summer bypass started on June 14 at 0000 hours and ran until August 26 at 2400 hours, for a total of 74 days. There were 1.24 MAF, or an average of 8.48 kcfs, which is 6.6 percent of the total discharge dedicated to summer bypass. During the summer bypass operating period, there were 79 hours, or 4.4 percent of the season's hours, with forced spill.

2.4.2 Assessment of Project Survival

As previously noted, Douglas PUD has met the HCP survival standard of 91 percent combined adult and juvenile project survival, and is in Phase III of the phased implementation plan for all Plan Species. In 2007, Douglas PUD continued to successfully implement the juvenile and adult passage plans, including documenting adult fall-back conditions and facilities maintenance.

2.4.2.1 Adult Passage Monitoring

The HCP acknowledges that no scientific methodology currently exists that would allow the Wells HCP Coordinating Committee to assess adult project survival for Plan Species (presumed to be 98 percent). This is because available methodologies are unable to differentiate between mortality caused by the project versus other sources of non-detection (such as mortality from natural causes, injuries resulting

from passage at downstream projects, or injuries sustained by harvest activities; or fish not detected for other reasons, such as spawning in locations downstream from Wells Dam). However, the Wells HCP Coordinating Committee is able to evaluate information to assess whether or not there is a high likelihood that the presumed adult survival rates are being achieved. Table 3 details detections at Priest Rapids Dam of known-origin adult steelhead and Chinook salmon tagged with Passive Integrated Transponders (PIT), the number of those adults redetected at Wells Dam, the estimated conversion rate (Priest Rapids Dam to Wells Dam), and average per project (i.e., four dams and four reservoirs) conversion rates.

These conversion rates are best viewed as a minimum survival estimate between the two detection sites because they encompass mortalities from all sources and non-detected fish (as described above) between the two detection sites. They do not include any indirect or delayed mortality that might occur upstream of Wells Dam (the redetection site). The per-project conversion rate exceeded 98 percent for steelhead and spring and summer Chinook salmon (that is, mortalities from all sources averaged less than 2 percent through each project). Insufficient data existed in 2007 to calculate per-project conversion rates for sockeye, fall Chinook, and coho. As noted above, this 2-percent figure reflects a combination of mortality attributable to both non-project related causes (e.g., recreational and tribal harvest, tailrace spawning, and disease) and dam passage, as well as non-detections resulting from straying and spawning below Wells Dam. For this reason, it is highly probable that the actual conversion rate for adult Plan Species exceeds the 98 percent per-project assumption set forth in the HCP.

Table 3
Adult Conversion Rates for All Available Release Groups

Stock Species	Priest Rapids Dam	Wells Dam	Priest Rapids to Wells Total Conversion Rate	Priest Rapids to Wells Average Per Project Conversion Rate[1]
All Releases[2] Summer Steelhead 2004-2007	5,316	4,944	93.0%	98.2%
All Releases[3] Spring Chinook 2003-2007	416	394	94.7%	98.7%
All Releases[4] Summer Chinook 2003-2004	15	14	93.3%	98.3%

Source: Columbia River DART website: http://www.cbr.washington.edu/dart/pit_obs_adult_conrate.html

1 Calculated as Priest Rapids Dam to Wells Dam Total Conversion Rate to the fourth root (four dams and four pools). Adults detected at Wells Dam that were not also detected at Priest Rapids Dam were excluded from the analysis.

2 Summer steelhead released into the Okanogan and Methow River Systems—PIT-tag release site designations: CHEWUR, METHR, OKANR, OMAKC, SIMILR, TWIS2P, TWISPR, BEAV2C, WINT, LIBBYC, METTRP, and STAPAC. This includes 30 fish collected in 2006 and seven fish collected in 2007 for broodstock at Wells Dam that were not detected by the antennas on the west ladder trap and thus not reported as OBS to PTAGIS/DART for inclusion in the calculations. Please note that many fish detected at Priest Rapids in 2007 will not pass Wells Dam until spring of 2008.

3 Spring Chinook salmon released into Methow River System—PIT-tag release site designations: CHEWUP, METH, TWISPP, BEAV2C, WINT, and METTRP. This includes nine fish collected in 2006 and one fish collected in 2007 for broodstock at Wells Dam that were not detected by the antennas on the west ladder trap and thus not reported as OBS to PTAGIS/DART for inclusion in the calculations.

4 Summer Chinook salmon released into Columbia River System above Wells Dam—PIT-tag release site designations: OKANR.

Although not addressed in the HCP, passage of adult bull trout was considered in the operation of Wells Dam in 2007. In 2004, FERC issued an order incorporating the HCP and the U.S. Fish and Wildlife Service (USFWS) *Bull Trout Biological Opinion* into the FERC license for the Wells Dam Project. Article 61 of the Wells Project license requires Douglas PUD to file an annual report with FERC describing the activities required by Douglas PUD's *Bull Trout Monitoring and Management Plan*; Douglas PUD filed this report with FERC on March 30, 2007.

2.4.2.2 Completed Studies 2007

In 2007, Douglas PUD continued funding a genetic study to examine historical and current population structure of spring Chinook salmon in the Methow River basin. The study explored the possible effects of hatcheries and a sustained genetic

bottleneck on natural populations, consistent with the *Monitoring and Evaluation Plan* (M&E Plan) approved by the Hatchery Committee. Results of this study indicated the following:

- The Methow River and Chewuch River populations were more genetically similar to each other than either was to the Twisp River population.
- Effective population sizes are stable in the Methow River and Chewuch River, but decreasing in the Twisp River population.
- Diversity appears unchanged by supplementation.
- Natural-origin components could be identified in a mixed sample from Wells Dam.

In March 2007, Douglas PUD conducted an analysis of survival estimates (based on PIT-tags) for sub-yearling summer Chinook from early and normal releases at the Wells Hatchery from 2004 through 2006. Because the differences in survival did not show a consistent pattern, the Committees recommended that Douglas PUD continue to split these groups into early- and late-release periods, double the number of PIT-tagged releases, and continue to collect data on their respective survivals through adult returns.

In June 2007, Douglas PUD documented the removal of 21,863 northern pikeminnow from the Wells Reservoir and tailrace during annual removal efforts occurring from March to August 2006. From 1995 to present, the pikeminnow removal programs sponsored by Douglas PUD have resulted in the capture of approximately 134,000 pikeminnows from the Wells Project. Documentation from northern pikeminnow removal efforts in 2007 is expected in early 2008.

In summer 2007, Douglas PUD conducted a study evaluating summer Chinook passage times through the collection galleries of the fishways at Wells Dam. This study was conducted to determine whether a flow-guidance baffle improved fish passage via the east fishway at Wells Dam (no modification was made to the west ladder). Results indicated that the baffle has provided an improvement in ladder passage time (i.e., decreased passage time), and the Wells Coordinating Committee

agreed in December 2007 that Douglas PUD could install a similar baffle in the west ladder.

In fall 2007, Douglas PUD performed a radio-telemetry study to investigate migration and passage behavior of adult lamprey migrating through Wells Dam. Adult lamprey were captured in the fishways at Wells Dam during August and September 2007. All captured lamprey meeting specific size criteria were tagged and released at or below Wells Dam, and fixed-station monitoring at Wells Dam was used to detect the movements of these tagged fish in and around the fishways. The purpose of this study was to provide the resource information needed to inform relicensing decisions related to adult lamprey passage through Wells Dam. Lamprey is not an HCP Plan Species; lamprey traps or guidance structures installed in fishways at Wells Dam are evaluated by the HCP Coordinating Committee for potential impacts to Plan Species.

2.4.2.3 Planned Studies 2008

At the close of 2007, the Hatchery Committees were developing a detailed proposal for a hatchery study evaluating the effects of Bacterial Kidney Disease (BKD) segregation and rearing densities on life cycle survival and specifically hatchery return rates (See Section 2.5.2.4).

As in 2007 (see Section 2.4.2.2), Douglas PUD plans to continue the pikeminnow removal program in 2008. Douglas PUD also intends to conduct a second lamprey passage study in the fall of 2008.

2.5 Hatchery Compensation

As required by the HCP, Douglas PUD supported hatchery production in 2007 to compensate for unavoidable project mortality and loss of habitat caused by original inundation by the project. Section 8 of the Wells HCP outlines a Hatchery Compensation Plan with two hatchery objectives for Douglas PUD: 1) to provide hatchery compensation for spring Chinook salmon, summer/fall Chinook salmon, sockeye salmon, summer steelhead, and coho salmon (an obligation to compensate for coho was established in

December 2007); and 2) to implement specific elements of the hatchery program consistent with the overall objectives of rebuilding natural populations and achieving NNI.

Broodstock Collection Protocols were reviewed by the Hatchery Committees in April and July 2007 (for Chinook, sockeye, and steelhead) and June 2007 (for coho), and were implemented at program hatcheries (Appendix I); in-season revisions were made as needed in coordination with the Hatchery Committees. Hatchery compensation in 2007 included the release of 802,287 yearling and 396,538 subyearling salmonids from hatcheries associated with the Wells Project (Appendix J). This total does not include the increased production of natural-origin sockeye smolts attributed to the continued implementation of the Fish-Water Management Tool project administered by the Okanagan Nation Alliance and funded by Douglas PUD.

2.5.1 Hatchery Production Summary

Tables 4 and 5 summarize and compare HCP hatchery production objectives and actual 2007 production levels for both the original inundation compensation program and HCP passage loss compensation program.

2.5.1.1 Inundation Compensation Program

The FERC license to operate the Wells Hydroelectric Project requires Douglas PUD to rear and release fish to compensate for original impacts associated with the development of the Wells Reservoir. All of the fish for this program are raised at the Wells Fish Hatchery. The number and pounds of fish to be released each year for the Inundation Compensation Program can be found in Section 8.4.6 of the Wells HCP Agreement.

Table 4
Production Objectives for the Inundation Compensation Program and Releases in 2007

Inundation Compensation Program	Numeric Target	Poundage Target	Target Weight	Number Released	Pounds Released
Yearling Summer/Fall Chinook (2005 brood year)	320,000	32,000	10 fpp	333,587[1]	31,176
Subyearling Summer/Fall Chinook (2006 brood year)	484,000	24,200	20 fpp	396,538[2]	9,927
Yearling Summer Steelhead (2006 brood year)	300,000	50,000	6 fpp	301,681[3]	45,027

fpp – fish per pound

1 C. Snow June 2007 Memo for the total released.

2 C. Snow June 2007 and July 2007 Memos show an early release on May 16 and 17 of 205,525 (58 fpp) and a late release on June 13 of 192,013 (30 fpp). The numbers of sub-yearling release were low due to an outbreak of coagulated yolk disease (C. Snow, January 2007). The poundage obligation was affected by the experimental early release of fish conducted by WDFW hatchery evaluation staff. The HCP Hatchery Committee supported the experimental release on March 21, 2007.

3 C. Snow June 2007 Memo shows total release of 451,374 steelhead smolts at 67,369 pounds, which is 100.6 percent of the numerical target for release. The small overage was equally assigned to Wells Inundation (301,681 fish); to NNI (49,151 fish); and for Group 3 Grant PUD Sharing Agreement (100,600 fish).

(The memos referenced above are available upon request.)

2.5.1.2 NNI Compensation Program

Section 8.4.3 of the Wells HCP contains specific numbers and pounds of juvenile Plan Species to be produced to meet Douglas PUD NNI production levels for unavoidable juvenile losses at the Wells Hydroelectric Project. Juvenile passage losses are offset through the production of juvenile Plan Species at three facilities (Wells Fish Hatchery, Methow Fish Hatchery, and Eastbank Fish Hatchery) and through the implementation of mitigation options identified in the Sockeye Enhancement Decision Tree.

Table 5
Production Objectives for the HCP Passage Loss Compensation Program and Releases in 2007

No Net Impact Compensation Program	Numeric Target	Poundage Target	Target Weight	Number Released	Pounds Released
Yearling Summer Steelhead (2006 brood year)	48,858	8,143	6 fpp	49,151[1]	7,336
Yearling Summer/Fall Chinook (2005 brood year)	108,570	10,857	10 fpp	71,576[2]	7,158
Yearling Spring Chinook (2005 brood year)	61,071[2]	4,071	15 fpp	46,292[3]	2,691
Yearling Osoyoos Lake Sockeye[4]	7%	NA	NA	55%	NA

1 C. Snow June 2007 Memo shows total release of 451,374 steelhead smolts at 67,369 pounds, which is 100.6 percent of the numerical target for release. The small overage was equally assigned to Wells Inundation (301,681 fish); to NNI (49,151 fish); and for Group 3 Grant PUD Sharing Agreement (100,600 fish).

2 Carlton Pond Summer Chinook released by Chelan PUD for Douglas PUD as part of Douglas-Chelan Hatchery Sharing Agreement.

3 There were 417,102 spring Chinook smolts released at an average of 17.2 fpp from the Methow Hatchery (May 2007 Memo from C. Snow). The target release of 550,000 fish was a combination of Wells NNI (61,071) and the sharing agreements with Chelan PUD (288,000) and Grant PUD (201,000). This is 75.8 percent of the numerical target for release for 2007. The shortfall was equally applied to the three programs giving Wells NNI 46,292; Chelan PUD 218,304; and Grant PUD 152,358 fish in 2007.

4 Okanogan Sockeye obligation for NNI is handled through the Fish/Water Management Tool program managed through the Okanagan Nation Alliance. The Wells HCP Hatchery and Coordinating Committees have agreed that the continued implementation of this program will satisfy the Douglas PUD requirement for 7 percent hatchery compensation.
(The memos referenced above are available upon request.)

2.5.2 Hatchery Planning

2.5.2.1 M&E Plan Implementation

In 2005, Douglas PUD and WDFW completed an M&E Plan for operation of Douglas PUD hatchery programs to assist in the determination of whether the specific hatchery objectives defined by the HCP are being met (M&E Plan titled: *Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas County Public Utility District*). Implementation of this M&E Plan began in 2006 and continued in 2007 in accordance with two documents: the *Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs*, which was prepared in 2006 and which provides the analysis tools for the M&E Plan; and the document *Implementation of Comprehensive Monitoring and Evaluation of Hatchery Programs funded by Douglas County PUD* (M&E Implementation Plan), which is prepared annually and describes the M&E activities for the next calendar year, anticipating that adaptive modification of the plan may be necessary in future years. The Hatchery Committees approved the M&E Implementation plan for next year (2008) in December 2007. In March 2007, WDFW provided an M&E Report documenting

M&E activities in 2006, titled *Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2006* (Appendix M). A similar report will be expected in 2008 for 2007 hatchery operations.

2.5.2.2 Coho Mitigation

In December 2006, the Wells Hatchery and Coordinating Committees deferred a determination on whether the District had an obligation to provide compensation for coho salmon. Under the HCP, this determination is to be made based on whether there is a continuing hatchery program for coho salmon (established outside the HCP) and/or a Threshold Population of naturally reproducing coho exists in the Methow Basin. In December 2007, the Hatchery Committee agreed that the criterion pursuant to Section 8.4.5.1 of the Wells Project HCP for a long-term coho hatchery program was met (Appendices A and F), and that:

- Pursuant to Section 8.4.5.1, an interim juvenile coho survival of 96.2 percent is assumed.
- In lieu of juvenile coho survival studies during the first 10 years of the funding agreement with the Yakama Nation, Douglas PUD will provide funding for a coho hatchery program equivalent to an assumed 7 percent mortality rate. During this period, hydro-related operations will be based on co-migrating Plan Species.

2.5.2.3 Potential Okanogan Spring Chinook Mitigation

The Wells, Rocky Reach, and Rock Island HCPs each require that the Hatchery Committees determine in 2007 whether there is a Threshold Population and/or a continuing hatchery program (funded outside the HCP) for Okanogan Basin spring Chinook salmon. A determination that such a population or program exists would necessitate the approval of mitigation plans by the Hatchery Committees. In 2007, both Douglas and Chelan PUD discussed this pending decision with the Colville Tribes (the Tribes), and agreed in December 2007 that any potential mitigation would be in the form of a cost-sharing agreement for the production of Okanogan Basin spring Chinook at the Tribes' planned Chief Joseph Hatchery. Because the Tribes are on track to secure long-term funding from the Bonneville Power Administration (BPA) during 2008 (thus establishing a long-term program as

required by the HCP), in December 2007 the Hatchery Committees conditionally agreed that a long-term hatchery program would exist (if funded), and provisionally agreed to the cost-sharing agreements negotiated by the PUDs and the Colville Tribes (Appendix B and G). In accordance with these agreements, cost sharing by the PUDs for Okanogan Basin spring Chinook shall commence upon completion of the Chief Joseph Hatchery, to provide compensation for passage losses at each HCP project. Compensation for Okanogan Basin spring Chinook passage losses would be based on the passage survival for the run-at-large of spring Chinook salmon passing the respective projects.

2.5.2.4 Hatchery Evaluation Technical Team

In 2007, the Hatchery Committees utilized a Hatchery Evaluation Technical Team (HETT) as an informal subcommittee under the Hatchery Committees of the Wells, Rocky Reach, and Rock Island HCPs (Operating Protocols given in Appendix L). The HETT is not a standing committee identified in or required by any of the HCPs. The primary purpose of the HETT is to address technical issues related to implementation of the HCP Hatchery Monitoring and Evaluation (M&E) Programs. The HETT receives all assignments from the Hatchery Committees and communicates its findings to the Hatchery Committees in the form of recommendations.

In 2007, the HETT was tasked with making recommendations to the Hatchery Committees on reference streams for the Douglas PUD M&E program. The HETT made significant progress establishing criteria for selection of these streams, compiling data from a number of different sources, and evaluating the appropriate use of several different productivity estimators. The group also explored time-series information to inform evaluation of historical variations in productivity for these streams. It is anticipated that the HETT will provide a list of recommended reference streams to the Hatchery Committees in spring 2008 for spring Chinook, with steelhead and sockeye to follow. The Hatchery Committees will then consider these recommendations in their selection of reference streams for the M&E program.

Throughout 2007, the Hatchery Committees engaged in discussions regarding the management of BKD as it pertains to HCP hatchery operations. Prevalence of BKD is important in the implementation of the HCPs on several levels: 1) the prevalence of BKD in spring Chinook (inferred from parental antigen levels) is often used as a criterion for setting rearing densities at hatcheries (thus influencing capacity); 2) there are long-term population implications of including in or excluding from hatchery programs fish testing positive for BKD antigen (e.g., as it affects genetic diversity); and 3) Objective 9 of the Hatchery M&E Plan requires an evaluation of the potential for hatchery supplementation programs to increase the prevalence of diseases that typically occur in the natural environment.

In August, the Hatchery Committees approved revising Objective 9 of the M&E Plan to 1) broaden the scope to include an experimental evaluation of the effects of hatchery management of BKD and 2) to reduce the emphasis on comparing bacterial concentrations in streams containing supplemented versus non-supplemented populations. The M&E Plan was modified to reflect this change. The overall goals of the Hatchery Committees' discussions this year were to lay out a path forward for managing BKD in HCP hatchery programs and to develop a detailed study plan to test the effects of BKD antigen levels and rearing density on life cycle survival. At the close of 2007, the HETT was developing this study plan and investigating potential hatchery facilities where such a study could be conducted.

2.5.3 Maintenance and Improvements

Maintenance activities supporting hatchery production under the Wells HCP in 2007 included several design projects, as well as work at existing facilities.

2.5.3.1 Wells Fish Ladder Maintenance

Wells fish ladder maintenance was completed in March, following a slightly extended work period due to baffle placement taking longer than expected (see Section 2.4.2.2). However, routine ladder maintenance was completed without complications.

2.5.3.2 Well Development at Methow Hatchery

In May 2007, Douglas PUD developed a new well at Methow Hatchery (Well No. 6) that delivers about 2,600 gallons per minute (gpm). All six wells are used to meet the hatchery groundwater needs of 4,500 gallons per minute.

2.5.3.3 Wells Hatchery Screens

In 2007, planning and design continued for the new surface water intake screens for the Wells Hatchery. In spring of 2007, design was completed and in summer 2007, Douglas PUD awarded the bid to the contractor. Installation began in fall 2007 and construction is expected to be completed by the end of February 2008.

2.5.3.4 Twisp Weir Improvements

The Twisp Weir was heavily damaged in 2006 during spring high flows. Douglas PUD made significant progress in designing a new weir in 2007, and in August 2007, the Hatchery Committee approved the final designs for the weir (Appendix B and G). For the trapping season in 2007, Douglas PUD installed temporary weir panels extending from the left bank to the existing notch in order to facilitate broodstock trapping at the location of the old weir. By the end of 2007, environmental permitting was completed for the new weir, and a construction contract had been awarded. The new weir is scheduled to be operational by April 2008.

2.5.3.5 Lamprey Trap and Exclusion Device

In June, the Coordinating Committee approved the installation of a lamprey trap for use in Wells fishways, determining that the trap would not affect Plan Species. As approved by the Coordinating Committee (Appendix F), Douglas PUD plans to install exclusion devices along with the lamprey traps for this year's lamprey radio-telemetry study. The intent of the devices is to prevent lamprey suction to the floor of the fishway at the orifices directly below overflow weir traps, with the goal of directing lamprey over the overflow weir rather than through the orifices, thereby increasing efficiency of lamprey capture in the overflow weir traps. The Committees discussed and agreed that these devices are not expected to affect Plan Species.

2.6 Tributary Committees and Plan Species Accounts

As outlined in the Wells HCP, the signatory parties designated one member each to serve on the Tributary Committee. The Rock Island, Rocky Reach, and Wells Tributary Committees meet on a regularly scheduled basis as a collective group to enhance coordination and minimize meeting dates and schedules. Subject items requiring decisions are voted on in accordance with the terms outlined in the specific HCPs. With few exceptions, the Tributary Committees have met monthly. The initial focus of the Tributary Committees was to adopt operating procedures, which provide a mechanism for decision making on various issues related to the Committees, and which were provided in the 2005 HCP Annual Report (Anchor 2005[1]). Subsequently, the Tributary Committees developed Policies and Procedures for soliciting, reviewing, and approving project proposals (Anchor 2005). The Policies and Procedures provide formal guidance to project sponsors on submission of proposals for projects to protect and restore habitat of Plan Species within the geographic scope of the HCP. The operating procedures and funding policies of the Rock Island, Rocky Reach, and Wells Tributary Committees are essentially the same. The Committees established two complementary funding programs, the General Salmon Habitat Program and the Small Projects Program.

In 2007, the Committees approved revisions to the Policies and Procedures for Funding Projects. Changes to the Policies and Procedures were as follows:

- Under Section 3.4, the Committees adopted a mandatory pre-proposal application process to give project sponsors an early indication of the appropriateness of a project concept, without having to complete an entire application process before getting an indication from the funding source.
- Under Section 3.6, the Committees increased the maximum contract allowed under the Small Projects Program from $25,000 to $50,000.
- Under Section 3.6, the Committees added a footnote that clarified the meaning of the $50,000 maximum allowed under the Small Projects Program.

[1] Anchor Environmental, L.L.C. 2005. Annual Report, Calendar Year 2005, of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan. Wells Hydroelectric Project, FERC license no. 2149. Prepared for FERC by Anchor Environmental L.L.C. and Public Utility District No. 1 of Douglas County.

The Committees also approved the addition of "Project Summary" to the General Salmon Habitat and Small Projects applications. In 2008, project sponsors will be required to add a summary of their proposed project on the applications. The Committees provided examples that Project sponsors can use to help them write their summaries.

At the April 2007 meeting, Mr. Bob Bugert, Chairperson of the Tributary Committees, formally announced his resignation as Committee Chair in order to accept another appointment. Mr. Bugert indicated that his new employer would allow for an extended period during which he could continue working with the Tributary Committees to ease the transition to a new chairperson. After considering several qualified candidates, the Tributary Committees selected Dr. Tracy Hillman as the new Tributary Committees Chair at the June 2007 Tributary Committees meeting. The Coordinating Committees members arranged for their Policy Committee representative to send correspondence to the Coordinating Committees Chair (Mike Schiewe) indicating their agency's agreement with this recommendation. Dr. Hillman was accepted as Chair and began his work in this position in July 2007.

2.6.1 Regional Coordination

To improve coordination, a representative from Grant PUD and the facilitator of the Priest Rapids Coordinating Committees (PRCC) are invited to the monthly meetings. In addition, they receive meeting announcements, draft agendas, and meeting minutes. This benefits the Tributary Committees through increased coordination and sharing of expertise. The Grant PUD representative and PRCC facilitator have no voting authority. The Tributary Committees, through the Coordinating Committees, also invited American Rivers and the Confederated Umatilla Tribes to participate in Committees meetings. Both parties contributed to the development of the HCP, yet elected not to sign the document. Neither of these parties participated in the deliberations of the Tributary Committees in 2007.

The Tributary Committees also coordinate with the Upper Columbia Salmon Recovery Board. Coordination is typically between the chairperson of the Tributary Committees and the Executive Director or Associate Director of the Upper Columbia Salmon

Recovery Board. In addition, some members of the Committees typically attend the meetings of the Upper Columbia Salmon Recovery Board to foster coordination in developing and selecting projects for funding. Moreover, some members of the Committees are also members of the Upper Columbia Regional Technical Team, which increases coordination in selecting projects for funding. Many of the policies and procedures of the Salmon Recovery Funding Board (SRFB) and Tributary Committees are complementary.

2.6.2 Fiscal Management of Plan Species Accounts

The Tributary Committees set up methods for the long-term management of the funds made available through the Plan Species accounts for each HCP. The Wells Tributary Committee agreed to have Douglas PUD manage the accounting services internally, and to structure the relationship so that it can invoice these administrative costs to the Wells Plan Species accounts. The beginning balance of the Wells Plan Species Account on January 1, 2007 was $1,496,539.42; interest accrued during 2007 was $80,976.66; funds disbursed for projects in 2007 totaled $53,218.97; disbursements for administrative costs included $21,691.93 to Chelan PUD for administrative support provided to the Wells Plan Species Account from July 2005 through October 2007, and $2,304.00 to Douglas PUD for account administration during 2007; resulting in an ending balance of $1,500,301.18 on December 31, 2007.

The Wells Tributary Committee delegated signatory authority to the Tributary Committee chairperson for processing of payments for invoices approved by the committee, with the Coordinating Committee Chairperson serving as the alternate. The Tributary Committee Chairperson works for a limited liability corporation and the Tributary Committees provide funds for liability insurance.

2.6.3 General Salmon Habitat Projects

The Tributary Committees established the General Salmon Habitat Program as the principal mechanism for funding projects. The goal of the program is to fund projects for the protection and restoration of Plan Species habitat. An important aspect of this program is to assist project sponsors in developing practical and effective applications for relatively large projects. Many habitat projects are increasingly complex in nature

and require extensive design, permitting, and public participation to be feasible. Often, a reach-level project involves many authorities and addresses more than one habitat factor. To address this, the General Salmon Habitat Program was designed to fund relatively long-term projects. There is no maximum financial request in the General Salmon Habitat Program; the minimum request is $50,000, although the Committees may provide lesser amounts during a phased project.

In an effort to coordinate with ongoing funding and implementation programs within the region, the Tributary Committees used the previously established technical framework and review process for this area, and worked with the other funding programs to identify cost-sharing procedures.

2.6.3.1 2007 General Fund Projects

The Tributary Committees announced their 2007 funding cycle in March, with pre-proposal applications due on June 1, 2007 and full proposals due on August 1, 2007. The Tributary Committees received and reviewed 19 pre-proposal applications. The committees selected 11 projects that they believed warranted full proposals. The Committees dismissed seven projects because they were either inconsistent with the intent of the Tributary Fund or did not have strong technical merit. The remaining pre-proposal application was withdrawn by the project sponsor.

In August, the Tributary Committees received 11 full proposals to the General Salmon Habitat Program. Most of these were "cost-shares" with SRFB or other funding entities. By November, four proposals were withdrawn by their project sponsors. Of the remaining seven proposals, the Committees approved funding for six projects. The following table (Table 6) identifies the projects, sponsors, amount requested from Tributary Funds, and, if funded, which Plan Species Account supported the project.

Table 6
General Salmon Habitat Program Projects Reviewed by the Tributary Committees in 2007

Project Name	Sponsor	Cost Share	Amount Requested from Tributary Committees	Plan Species Account
Harrison Side Channel	Chelan County NRD	$707,195	$90,105	Rocky Reach
Lower Wenatchee River Complexity Site 12/13	Chelan County NRD	$290,390	$51,245	Not Funded
Entiat PUD Canal System Conservation Project	Cascadia Conservation District	$397,224	$99,360	Rock Island
Roaring Creek Flow Enhancement and Barrier Removal Project	Cascadia Conservation District	$122,069	$25,000	Rock Island
Keystone Canyon Habitat Restoration Project	Cascadia Conservation District	$164,705	$29,100	Rock Island
Wildhorse Spring Creek Steelhead Habitat Acquisition	Colville Tribes	$5,000	$62,826	Rock Island
Okanagan River Restoration Initiative—Construction (Phase IV)	Canadian Okanagan Basin TWG	$611,000	$411,000	Wells

In 2007, the Wells Tributary Committee agreed to fund the Okanagan River Restoration Initiative—Construction (Phase IV) for the amount of $411,000 (with cost share the total cost of the project was $1,022,000). This project is the initial construction phase of a design project funded by the Wells Plan Species Account in 2005. Funded actions will return part of the channelized river back to a semi-natural meandering path by setting back existing dikes, reconnecting two existing oxbows, restoring river meanders, restoring riparian vegetation, and creating pool-riffle sequences. This should provide spawning and rearing habitat for Chinook salmon and steelhead, and spawning habitat for sockeye salmon.

2.6.4 Small Projects Program

The Small Projects Program has an application and review process that increases the likelihood of participation by private stakeholders that typically do not have the resources or expertise to go through an extensive application process. The Committees encourage small-scale projects by community groups, in cooperation with landowners, to support salmon recovery on private property. Project sponsors may apply for funding at any time, and in most cases, will receive a notification of funding within three months. The maximum contract allowed under the Small Projects Program is $50,000.

2.6.4.1 2007 Small Projects

In 2007, the Tributary Committees received six requests for funding under the Small Projects Program. Five projects were approved for funding. The following table (Table 7) identifies the projects, sponsors, amount requested from Tributary Funds, and, if funded, which Plan Species Account supported the project.

Table 7
Projects Reviewed by the Tributary Committees under the Small Projects Program in 2007

Project Name	Sponsor	Cost share	Amount requested from T.C.	Plan Species Account
Lower Beaver Creek Livestock Exclusion	Okanogan Conservation District	$6,111	$18,559	Wells
Heath Floodplain Restoration	Methow Salmon Recovery Foundation (MSRF)	None	$48,695	Wells
LWD Removal & Relocation	Chelan County NRD	None	$10,000	Rocky Reach and Rock Island
LWD/Rootwad Acquisition & Transport	Cascadia Conservation District	None	$24,600	Rocky Reach
Methow Monitoring Coordination	Wild Fish Conservancy/MSRF	None	$50,000	Not Funded
WRIA's 45/46 Riparian Restoration Project	Cascadia Conservation District	$25,000	$25,000	Rock Island

In 2007, the Wells Tributary Committee agreed to fund two projects: (1) the Lower Beaver Creek Livestock Exclusion project for the amount of $18,559 (with cost share the total cost of the project was $24,670) and (2) the Heath Floodplain Restoration project for the amount of $48,695.

3 HCP ADMINISTRATION

This chapter lists events of note that occurred in 2007 related to the administration of the HCPs, as well as a list of reports published in 2007 that relate to the HCPs.

3.1 Mid-Columbia HCP Forums

In 2005 and 2006, Mid-Columbia Forum (Forum) meetings were held as a means of communicating and coordinating with the non-signatories and other interested parties on the implementation of HCP. Current non-signatory parties at the time of the 2006 meeting included the Confederated Tribes of the Umatilla Reservation and American Rivers. These parties were invited by letter this year to attend a Forum, in conformity with the 2005 FERC Order on Rehearing 109 FERC 61208 and in accordance with the offer to non-signatory parties of non-voting membership in HCP Tributary and Hatchery Committee processes. The parties indicated no interest in attending a Forum in 2007, and thus no forum was held in 2007.

3.2 Policy Committees Meeting

The Policy Committees met on October 23, 2007, to review progress on implementation of the HCPs and to receive an update on current Committee work. Topics discussed included updates on progress toward NNI; hatchery programs and issues; Tributary Committees updates, including introduction of the new chairperson; progress toward a BKD rearing study; and the status of coho salmon and Okanogan spring Chinook as Plan Species requiring mitigation (See Appendix D).

3.3 HCP Informational Brochure

In 2007, the HCP Coordinating Committees collaborated on preparing a brochure explaining ongoing developments in the implementation of the HCP. This brochure was sent to the Mid-Columbia Forum mailing list and various other interested parties in fall 2007. Brochures were made available to Committees members for direct distribution as well.

3.4 Three-Year Review of Hatchery and Coordinating Committees Chair

As per Section 6.5 of the Wells HCP, the Coordinating Committees performed the first 3-year performance review for the committee chair. The Committees members expressed their appreciation and support for work that Mike Schiewe and Ali Wick, as well as other Anchor Environmental, L.L.C. (Anchor) staff, have provided. Specific items that were noted included:

- Well organized minutes
- Timely agendas
- Timely statements of agreement
- A useful FTP site, which allows access to documentation
- Timeliness and completeness of products (e.g., annual reports)
- Organized meetings with processes, decisions, and contingency plans
- Clear expectations and impartial and fair treatment of Committees members
- Smooth transition for new Committees members
- Broad knowledge of fisheries issues

All members wanted to note that Ali Wick's efforts are key to the success of the Committees' processes.

Also, as per Section 8.2.5 of the Wells HCP, at the August 2007 monthly meeting, the HCP Hatchery Committees performed a 3-year evaluation of the Chair position held by Mike Schiewe of Anchor. The response in all areas was very favorable. Specific items that were noted included:

- Ability to foster inclusive solutions among the parties
- Manner of addressing members
- Ability to guide the discussion
- Ability to accurately record intent of the meeting
- Timeliness of minutes and annual reports
- Organization skills of the Chair

High compliments were paid to Ali Wick and Mike Schiewe as a team for guiding, facilitating, and note-taking. The Hatchery Committees recommended that the HCP parties continue the contract with Schiewe and Wick.

3.5 HCP Related Reports Published in Calendar Year 2007

The following is a list of reports released in 2007 related to the implementation of the Wells HCP:

- Anchor Environmental. 2007. Annual Report, Calendar Year 2006, of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan. Wells Hydroelectric Project. FERC License No. 2149. Prepared for FERC. April 2007.
- HCP Hatchery Committees. Revised 2007. Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas County Public Utility District. Last modified: September 2007.
- Hyatt, K.D., M.M. Stockwell, H. Wright, K. Long, J. Tamblyn and M. Walsh. 2006. Fish and Water Management Tool Project Assessments: Okanagan Adult Sockeye Salmon (*Oncorhynchus nerka*) Abundance and Biological Traits in 2005. Report to file: JSIDS- SRe 3-05. Salmon and Freshwater Ecosystems Division, Fisheries and Oceans Canada, Nanaimo, B.C., V9T 6N7.
- Hyatt, K.D. and C. Bull. 2007. Fish and Water Management Tool Project Assessments: Record of Management Strategy and Decisions for 2005.
- Hyatt, K.D. and Rankin, D.P. 2007. Fish and Water Management Tool (FWMT) Project Assessments: Osoyoos Lake juvenile sockeye salmon (*Oncorhynchus nerka*) production associated with 2001-2005 brood year returns of adults to the Okanagan River, British Columbia. Report to file: JSIDS- SRe03-2007. Salmon and Freshwater Ecosystems Division, Fisheries and Oceans Canada, Nanaimo, B.C., V9T 6N7.
- Hyatt, K.D., Stockwell, M.M. and Rankin, D.P. 2007. Fish and Water Management Tools Project Assessments: Miscellaneous observations of Okanagan sockeye salmon (*O. nerka*) smolt abundance, size, migratory timing and associated environmental conditions between 1957 and 2006. Report to file: JSIDS- SRe04-06. Salmon and Freshwater Ecosystems Division, Fisheries and Oceans Canada, Nanaimo, B.C., V9T 6N7.
- Hyatt, K.D., M.M. Stockwell, H. Wright, K. Long, P. Askey, L. Wiens and K. Wodchyk. 2007. Okanagan Fish and Water Management Tools Project Assessments: Brood Year 2006 Salmon (*Oncorhynchus nerka*) Abundance and Biological Traits. Report to file: JSIDS- SRe 8-06. Salmon in Regional Ecosystems Program, Fisheries and Oceans Canada, Nanaimo, B.C., V9T 6N7.

- Jerald, T. 2007. 2006 Public Utility District No. 1 of Douglas County: Northern Pikeminnow Removal and Research Program. Prepared for: Public Utility District No. 1 of Douglas County by Columbia Research. June 5, 2007.
- LGL Limited Environmental Research Associates and Public Utility District #1 of Douglas County. 2007. Wells Bull Trout Monitoring and Management Plan 2006 Annual Report. Wells Hydroelectric Project, FERC No. 2149. March 30, 2007.
- Murauskas, J.G., and B. Nass. 2007. Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery, 2007. A Technical Memorandum of Data Results and Analyses. Prepared by LGL Environmental. December 10, 2007.
- Murdoch, A., C. Snow, and T. Pearsons. Implementation of Comprehensive Monitoring and Evaluation of Hatchery Programs Funded by Douglas County PUD. Submitted to Douglas County PUD. October 2007.
- Small, M.P., K.I. Warheit, C. Dean, and A. Murdoch. 2007. Genetic Monitoring of Methow spring Chinook. Final Report to Douglas PUD. Prepared by WDFW. April 13, 2007.
- Snow, C., C. Frady, A. Fowler, A. Murdoch, M. Small, K. Warheit, and C. Dean. 2007. Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2006. Prepared for Douglas County Public Utility District and Wells Habitat Conservation Plan Hatchery Committee. Prepared by WDFW. March 1, 2007.
- Public Utility District No. 1 of Douglas County. 2007. Annual Report of Operations, Fish Facilities: 2006. Wells Hydroelectric Project, FERC No. 2149. April 2007.

APPENDIX A

HABITAT CONSERVATION PLAN COORDINATING COMMITTEES MEETING MINUTES AND CONFERENCE CALL MINUTES

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven, Tom Kahler

Date: February 28, 2007

Re: Final Minutes of January 23, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at Chelan PUD, Wenatchee, Washington on Tuesday, January 23, 2007, from 9:30 am to 12:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final minutes approved at the meeting to the Committees (Item I).
- Ali Wick will forward the agenda to the Committees for the Northwest Hydropower Association (NWHA) conference in Portland on February 20 (Item II).
- Rick Klinge will send the final version of the Douglas PUD 2007 Bypass Operating Plan to Ali Wick for attachment to the Statement of Agreement (SOA) (Item III-A).
- Rick Klinge will provide an updated SOA on the fishway baffle to Ali Wick (Item III-B).
- Rick Klinge will forward the 2007 Wells Action Plan to Bryan Nordlund (Item III-C).
- Ali Wick will check on whether a study plan for Rock Island 10 percent spill studies was formally approved by the Committees or whether just the SOA was approved; a draft plan was provided to the Committees in November 2006 (Item V-A).
- Chuck Peven will revise the Rocky Reach Unit Operation Study proposal and send it to Ali Wick for distribution and Committees discussion (Item V-B).
- Ali Wick will send out conference line information for the call on February 8 at 9:30 am regarding the Rocky Reach Unit Operation Study (Item V-B).

- Chuck Peven will provide a summary of coho and yearling Chinook passage metrics for use in the Committees' discussion at the February meeting of the potential use of a surrogate species for coho phase designation (Item V-C).
- Douglas and Chelan PUD will provide a mock-up of a public outreach brochure describing accomplishments under the HCP for discussion at the February meeting (Item VI-C).
- Mike Schiewe updated the Committees that he will draft a letter to the non-signatory parties asking for interest in setting a Mid-Columbia Forum, with a 30-day deadline for signifying interest (Item VI-D).

DECISION SUMMARY

- The Committees approved the SOA for the Douglas PUD 2007 Bypass Operating Plan (Item III-A).
- The Committees approved the SOA for the prototype fish ladder baffle project, and agreed that Douglas PUD can proceed with construction and the design of a study plan for the radio telemetry evaluation (Item III-B).
- The Committees approved the Chelan PUD 2006 Survival Study Report and SOA as final (Item IV-A.).

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the November 28 and December 14, 2006 Meeting Minutes and the December 27, 2006 Conference Call minutes. Ali Wick will distribute the final minutes by email to the Committees.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items (the final December Hatchery Committee meeting minutes will be forwarded to the Coordinating Committees for their information):

- The meeting with Linda Rhodes and Diane Elliott regarding Bacterial Kidney Disease (BKD) and supplementation was postponed and will be rescheduled (February or March)
- The Committees are developing a schedule for addressing BKD management concerns

- Received a presentation from Lars Mobrand and Dave Fast (Hatchery Review Technical Team) regarding hatchery reform
- Chelan PUD has reported that the installation of Passive Integrated Transponder tag (PIT-tag) detection equipment on Peshastin and Entiat Rivers is on schedule
- The Colville Tribes briefed the Committees that discussions among BPA, the PUDs, and the Colville Tribes were ongoing regarding the potential cost-sharing of Chinook salmon production at Chief Joseph Hatchery
- The Committees approved a plan prepared by Washington Department of Fish and Wildlife (WDFW) for the disposition of broodyear 2006 Methow spring Chinook
- The Committees discussed the proposal to rear summer Chinook at Chelan Falls net pens; an SOA approving the plan will be on the agenda for the February meeting
- Also on the agenda for February will be a presentation on production capacity at Methow Hatchery for spring Chinook
- WDFW will be providing an overview of results of the early/late release study conducted using summer Chinook at Wells Hatchery at a future meeting
- Chelan PUD provided a brief introduction to their Integrated Hatchery Improvement Plan: a management tool to track planning and funding for hatchery programs (upcoming presentation for future meeting)
- The Douglas and Chelan PUD Action Plans for 2007 were reviewed and accepted by the Committees
- Chelan PUD updated the Committees on hatchery facilities
- The Committees have started to address whether success/fail criteria can be reasonably defined for the coho salmon reintroduction program.
- The Committees were briefed by Chelan PUD on the Eastbank Hatchery power loss and recommendations for remedying power outages
- Chelan PUD staff will be participating in the NWHA conference in Portland on February 20; Ali Wick will forward the agenda to the Coordinating Committees
- Chelan PUD alerted the Committees that they would be asking for input on configuration of Chiwawa steelhead rearing ponds in the near future
- Chelan PUD briefed the Committees that Trout Unlimited had inquired about using Blackbird Island Pond for rearing steelhead
- The Hatchery Evaluation Technical Team (HETT) is focusing on these items:

- Debrief from field crews implementing the Monitoring and Evaluation (M&E) program; first year was very successful
- Implementation of Objectives 9 (effect of supplementation on disease prevalence) and 10 (effect of supplementation on non-target taxa) of the M&E Implementation Plan
- Identifying reference streams for steelhead and spring Chinook; recommendations forthcoming in several months
- Effects of less than 100 percent marking for evaluating programs; statistical perspective being provided by John Skalski, statistician
- Potential to PIT-tag Skaha sockeye production to evaluate downstream survival; need a certain number and location to capture these fish

Mike Schiewe updated the group that the Tributary Committees are finalizing funding decisions for 2006, most of which were also funded by the Salmon Recovery Funding Board (SRFB). The Tributary Committees are considering long-term approaches to support salmon recovery that establish a unique niche for the Tributary Committees. So far in 2007, the Committees have also received one application for Small Project funding.

III. DECISION ITEMS – Douglas PUD (Rick Klinge)

A. Draft 2007 Bypass Plan for Wells Dam

Rick Klinge asked for approval of the draft 2007 Bypass Operation Plan for Wells Dam that proposes to provide spill from April 12 through August 26, 2007, which are the same dates as in past years. The Committees approved the SOA and the plan and Rick Klinge will send the final version of the plan to Ali Wick for attachment to the SOA (Attachment B).

B. Fish Ladder Baffle Project

Rick Klinge updated the group that their consultant has developed a physical model of a prototype fishway baffle that is being proposed for Wells Dam; a group of agency representatives (including Bryan Nordlund and Carmen Andonaegui via video-conference) attended a demonstration of this model earlier this month. Douglas PUD will be developing a telemetry study later this year to evaluate the performance of the prototype baffles in reducing time spent in the collection gallery by adult summer Chinook and not interfering with lamprey at the east fishway. The Committees approved the SOA and

agreed that Douglas PUD can proceed with construction and the design of the telemetry study. Rick Klinge will provide a final SOA on the fish baffle to Ali Wick for the record (Attachment C). Nordlund inquired regarding a multi-PUD study, to fulfill Chelan PUD's intention of testing the pump diffuser discharge effects on Rocky Reach ladder exit. Chelan PUD responded that they would look into it and report at a later meeting.

C. 2007 Wells Action Plan

Rick Klinge introduced the 2007 Wells Action Plan. The Hatchery Committees have previously provided comments on hatchery-related components of the plan. The Coordinating Committees accepted this plan with no further revisions, and agreed that Action Plans do not and will not require SOAs. Rick Klinge will forward the 2007 Wells Action Plan to Bryan Nordlund for his information.

IV. DECISION ITEM - Chelan PUD (Shaun Seaman)

A. 2006 Survival Study Report

Shaun Seaman introduced this topic of acceptance of the 2006 Survival Study Report as final. The Committees approved the SOA and 2006 Survival Study Report as final (SOA is Attachment D).

V. Updates: Chelan PUD (Shaun Seaman)

A. 2006-2007 Report and Study Table

Shaun Seaman briefly reviewed the schedule for delivery and approval of each of the items on the previously provided 2006-2007 Report and Study Table for Chelan PUD. Based on a question from the Committees, Ali Wick will check on whether a final study plan for Rock Island 10 percent spill study was formally approved by the Committees or whether just the SOA was approved; a draft plan was provided to the Committees in November 2006.

B. Rocky Reach Unit Operation Study Plan

Shaun Seaman introduced the Rocky Reach Unit Operation Study Plan and invited Chuck Peven to describe the development of this plan. The Committees discussed several aspects of the plan, including potential effects of low-flow years on the results, and how alternative locations for the release of fish in the tailrace were resolved. Peven agreed to provide a

modified Figure 4 or table to show how fish using various passage routes would have survived if modeled through additional passage routes. He will also incorporate other changes as suggested by the Committees. Peven will send out a revised draft and will provide a final plan and SOA for next meeting. There will be a conference call to check in on this plan on February 8 at 9:30 am; Ali Wick will send out conference line information for this call.

C. Coho Surrogacy Decision

The Rock Island and Rocky Reach HCP Coordinating Committees is required to make a decision by October 2007 on whether there is a continuing coho hatchery program. If the answer is "yes" then Chelan would be required to conduct survival studies on coho or use a surrogate species for the purposes of phase designation. The Committees have agreed to address this question by March 31, 2007. Chuck Peven indicated that Chelan PUD will ask the Committees to approve the use of yearling Chinook salmon as a surrogate for coho in survival studies. To facilitate the discussion, Peven will provide a summary of historical information comparing coho and yearling Chinook passage metrics that can be used in the Committees discussion at the February meeting. The PUD will provide an SOA at the March meeting.

VI. HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

The following informal agreements were reached at this meeting:

- Because Action Plans lay out a conceptual path forward for each year, they do not require formal SOAs and formal approval; rather, they require only informal Committee acceptance. The Committees, therefore, informally accepted the 2007 Wells Action Plan (Item III-C).

B. HCP Annual Report Schedules

Ali Wick updated the Committees that the HCP Annual Reports will be out for a 30-day Committee review on February 13. The schedules and deliverables for these reports will be the same as last year.

C. Newsletter/Brochure

Carmen Andonaegui introduced the topic of the Committees preparing a newsletter or brochure-type handout available to the public to explain ongoing developments in the HCP process. Shaun Seaman and Rick Klinge verified that the PUDs would be supportive of developing a product like this, and the Committees indicated their agreement. Douglas and Chelan PUD will provide a mock-up of such a brochure at the next meeting. In preparing this, they will consider the list of accomplishments that was provided to the Policy Committees at the recent Policy Committee meeting.

D. Mid-Columbia Forum

Mike Schiewe updated the Committees that he will draft a letter to the non-signatory parties asking for interest in setting a Mid-Columbia Forum, with a 30-day deadline for signifying interest. If he does not hear back from them, he would not organize a meeting this year. Ali Wick confirmed that the similar letter sent in 2006 will become part of the 2006 Annual Report to document this correspondence with the non-signatories as required by the Federal Energy Regulatory Commission (FERC).

E. Next Meeting Dates

Mike Schiewe updated the Committees that the next Coordinating Committees meeting dates are:

- February 27 in SeaTac – 9:30 am to 2:30 pm
- March 27 in SeaTac – 9:30 am to 2:30 pm
- April 24 in SeaTac – 9:30 am to 2:30 pm

VII. List of Attachments

Attachment A – List of Attendees

Attachment B – SOA, Acceptance of 2007 Wells Bypass Plan

Attachment C – SOA, Recommendation to proceed with plans for baffle placement in east fishway of Wells Dam and development of a telemetry study for evaluation of passage time in 2007

Attachment D – SOA, Survival of Sockeye Salmon and Steelhead Smolts through Rocky Reach and Rock Island Projects in 2006

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler	Douglas PUD
Bryan Nordlund * (by conference call)	NMFS
Brian Cates *	USFWS
Carmen Andonaegui *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

STATEMENT OF AGREEMENT FOR ACCEPTANCE OF 2007 WELLS BYPASS PLAN

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County
Acceptance of the 2007 Bypass Plan
23 January 2007

Statement

The Wells HCP Coordinating Committee accepts the draft 2007 Juvenile Bypass Operating Plan as submitted by Douglas County PUD on 14 December 2006.

Background: Operation of the bypass system throughout the 2007 season will be guided by the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan (Wells Juvenile Bypass Plan) found in Section 4.3 of the Wells HCP. One of the main goals of the Wells Juvenile Bypass Plan is to provide bypass operation for at least 95% of the spring and at least 95% of the summer migration of juvenile plan species.

During the last three years, bypass operations have been implemented based upon an analysis of 21 years of hydroacoustic and 14 years of species composition information collected on juvenile run patterns at Wells Dam. Based upon this analysis, Douglas PUD has proposed bypass operating dates there have been broader than those contained within the Wells HCP Agreement. The HCP Agreement originally directed the District to operate the bypass continuously from April 10th to August 15th.

However, based upon the District's 21-year run-timing analysis, presented and agreed to by both the Wells HCP Hatchery and Coordinating Committees in February 2004, initiation of the Wells bypass system on April 12th and termination on August 26th will conservatively provide bypass operations for 95% of both the spring and summer outmigrations.

Historically, initiation of the bypass system on April 12th would provide a non-turbine passage alternative for 95.5% of the spring migration. Similarly, shutting down the bypass system on August 26th, on average would provide bypass operation for 95.0% of the summer migration. Similar to the past 7 years and for accounting purposes, the end of the 2006 spring bypass season will be June 13th at 2400 hours and the beginning of the summer bypass season will be June 14th at 0000 hours.

ATTACHMENT C

STATEMENT OF AGREEMENT FOR RECOMMENDATION TO PROCEED WITH PLANS FOR BAFFLE PLACEMENT IN EAST FISHWAY OF WELLS DAM AND DEVELOPMENT OF A TELEMETRY STUDY FOR EVALUATION OF PASSAGE TIME IN 2007

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County

Recommendation to proceed with plans
for baffle placement in east fishway of Wells Dam
and development of a telemetry study for evaluation of passage time in 2007

23 January 2007

Statement

The Wells HCP Coordinating Committee recommends that Douglas PUD proceed with placement of flow guiding baffles in the east fishway at Wells Dam to improve passage time of ascending adult fish through the east fishway. A study plan for 2007 radio telemetry study will be submitted for approval in February 2007.

Background: Douglas PUD has been working with Northwest Hydraulic Consultants to improve flows through the collection chamber at the bottom of the fishways at Wells Dam to improve passage times for ascending salmonids. Radio telemetry studies in the 1990's show some delay in passage occurring in the collection chamber of the fishways as fish move from the tailrace to the ladder environment. The District perceived part of the problem for the fish was the inability to detect flows coming down the fishway. Large amounts of water are introduced into the collection chamber to provide attraction flows for fish at the fishway entrance. Telemetry studies have shown this area to be one of some confusion or delay for salmonids ascending the fishway. Telemetry studies have also shown that once fish are committed beyond the first several steps in the ladder, they ascend with little delay.

A model of the lower portions of the Wells fishway was built in the Northwest Hydraulic Consultants hydraulic lab in North Vancouver, British Columbia. This model helped show how flows between the various wall diffusion grates were fairly balanced. A series of baffles were placed in the model just below pool No. 1 of the fishway. Dye tests showed that the flow stream from the upper portions of the ladder was detectable much further into the attraction gallery when the baffles were in place. It is hoped this improvement in the flow stream may help guide fish earlier to the first several pools of the fishway. A demonstration of this model was made available to the members of the HCP Coordinating Committee on January 18, 2007. The recommendation from the members that witnessed the demonstration was to proceed with the construction of the baffles and develop a telemetry test for 2007.

ATTACHMENT D

STATEMENT OF AGREEMENT FOR SURVIVAL OF SOCKEYE SALMON AND STEELHEAD SMOLTS THROUGH ROCKY REACH AND ROCK ISLAND PROJECTS IN 2006

Rocky Reach and Rock Island HCP Coordinating Committees
Statement of Agreement
Chelan County PUD
Survival of Sockeye Salmon and Steelhead Smolts
through Rocky Reach and Rock Island Projects in 2006

Statement

The Rocky Reach and Rock Island HCP Coordinating Committees have reviewed the Chelan County PUD report, "*Survival of Sockeye Salmon and Steelhead Smolts through Rocky Reach and Rock Island Projects in 2006"* and accept the report as final.

ANCHOR ENVIRONMENTAL, L.L.C.

Anchor Environmental, L.L.C.
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Seattle, Washington 98101
Phone 206.287.9130
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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven, Tom Kahler, and Steve Parker

Date: March 27, 2007

Re: Final Minutes of February 27, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, February 27, 2007, from 9:30 am to 1:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final minutes approved at the meeting to the Committees (Item I).
- As discussed at the last meeting, Chelan PUD will investigate and report at a later meeting about the potential to develop a study to test pump diffuser discharge effects on Rocky Reach ladder exits (Item I).
- Committee members will review the *Evaluation of Summer Chinook through the Wells Dam Fishway Collection Gallery 2007* and will discuss it on a conference call scheduled for March 15 at 9:30 am (Item IV-A).
- Chuck Peven will provide the paper *Additional Information Concerning Coho as a Plan Species* to Ali Wick for distribution to the Coordinating and Hatchery Committees (Item V-C).
- Steve Parker will provide the Yakama Nation's comments on an early draft of *Additional Information Concerning Coho as a Plan Species* to Ali Wick for distribution to the Committees (Item V-C).
- The Committees will provide any comments on the *2007 Fish Spill Plan* by March 13 (Item V-D).

- Ali Wick will review how spill plan approval has been conducted in the past and will update the Committees (Item V-D).

DECISION SUMMARY

- The Committees approved the Statement of Agreement accepting the *Study Plan to Estimate Rock Island Project Survival for Yearling Chinook During a 10 Percent Spill Operation* (Item III-A).
- The Committees approved the Statement of Agreement accepting the *Study Proposal for Sockeye Salmon Testing at Rocky Reach for 2007* (Item III-B).

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the January 23 Meeting Minutes and the February 8 Conference Call minutes. Ali Wick will distribute the final minutes by email to the Committees.

The Committees discussed follow up that was needed on the January 23 meeting minutes, and an Action Item will be added to today's meeting that Chelan PUD will investigate and report at a future meeting on the potential to develop a multi-PUD study to test pump diffuser discharge effects on Rocky Reach ladder exits.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items (the final December Hatchery Committee meeting minutes will be forwarded to the Coordinating Committees for their information):

- The meeting with Linda Rhodes and Diane Elliott regarding bacterial kidney disease (BKD) research occurred at the last Hatchery Committees meeting. The Committees discussed potential ways to implement Objective 9 of the Hatchery Monitoring and Evaluation (M&E) Plan (effect of supplementation on disease prevalence) and some of the opportunities and constraints for these options.
- The Hatchery Evaluation Technical Team (HETT) is focusing on these items:

  - Implementation of Objectives 9 (effect of supplementation on disease prevalence) and 10 (effect of supplementation on non-target taxa) of the M&E Implementation Plan
  - Identifying reference streams for steelhead and spring Chinook:
    - Recommendations forthcoming
    - Installation of Passive Integrated Transponder tag (PIT-tag) detectors is moving forward.
  - Evaluating effects of less than 100 percent marking for evaluating programs; statistical perspective provided by John Skalski, statistician
  - Working with Collaborative Systemwide Monitoring Program (CSMP) to discuss M&E Monitoring
  - Potential to PIT-tag Skaha sockeye production to evaluate downstream survival; requires high handling and effort, so probably will recommend not pursuing this
  - Drafting the 2006 M&E Annual Report, which will be submitted to the Hatchery Committees for review by March 1
- The Committees approved Washington Department of Fish and Wildlife (WDFW) Broodyear 2005 Summer Chinook rearing in net pens at Chelan Falls.
- The Committees received WDFW updates on trapping Wenatchee steelhead at Tumwater and Dryden.
- The Committees received updates on the Douglas PUD 2007 Twisp trapping setup, plans for new Chewuch weir, well development for Methow Hatchery, and an ongoing capacity evaluation for Methow Hatchery.
- The Committees will soon be reviewing the spring Chinook genetics analysis from geneticist Ken Warheit for the Methow subbasin.
- The Committees received updates from Chelan PUD on discussions of production levels for steelhead as well as recent engineering work at hatchery facilities.
- Committee discussion is ongoing regarding coho and if there is a hatchery program and/or a naturally reproducing population that would have mitigation requirements, and the three Chelan PUD issues of use of a surrogate species (i.e., yearling spring Chinook) for Phase Designation, expectations regarding PUD contribution and responsibilities, and performance standards..

- The Committees decided for 2007 that they will not pursue PIT-tagging of Skaha fish to estimate Smolt-to-Adult Return Rates (SARs), due to concerns regarding the number of non-target fish that would need to be handled.
- WDFW, U.S. Fish and Wildlife Service (USFWS), and Chelan PUD will have a planning meeting to review techniques for ultrasound gender ID.
- The Committees debriefed regarding the recent HCP/Priest Rapids Coordinating Committee (PRCC) joint meeting, and feedback was generally favorable.

Mike Schiewe updated the group that the Tributary Committees are now reviewing Committee funding policies and processes since funding decisions are complete for 2006. During this time, they will consider how to make a stronger link from Tributary Committees work to salmon recovery plans, revise the current method of screening pre-proposals, and discuss raising the funding minimum for Small Projects from $25,000 to $50,000.

III. DECISION ITEMS - Chelan PUD (Shaun Seaman)

A. Statement of Agreement for Study Plan to Estimate Rock Island Project Survival for Yearling Chinook During a 10 Percent Spill Operation

Shaun Seaman introduced this topic of the 2007 study plan for the Rock Island 10 percent spill study, the concept of which was previously approved by the Committees on December 8, 2006. The Committees approved the Statement of Agreement and study plan as provided (Attachments B, B.1, and B.2).

B. Statement of Agreement for Study Proposal for Sockeye Salmon Testing at Rocky Reach for 2007

Shaun Seaman introduced this study proposal for biological testing of sockeye salmon at Rocky Reach in 2007, which was discussed at the Coordinating Committees conference call on February 8. The Committees discussed this proposal and approved it with a title change to refer to sockeye salmon as the test species (Attachment C and C.1).

IV. Douglas PUD (Rick Klinge)

A. Telemetry Study

Rick Klinge updated the group that Douglas PUD has provided the Committee with a plan entitled *Evaluation of Summer Chinook through the Wells Dam Fishway Collection Gallery 2007*.

This plan will compare passage times over 4 weeks, as measured by radio tag, between east and west sides of the fishway in summer 2007. Fish will be trapped in conjunction with broodstock collection for Carlton and Similkameen facilities. The tagging and visible external marking for this study will be coordinated with WDFW and the Colville Tribes, both of which have an active fishery in the vicinity of this study. Committee members will review this plan and will discuss it on a conference call scheduled for March 15 at 9:30 am.

B. Wells Ladder Maintenance Memo

Rick Klinge updated the group that Douglas PUD recently provided a memo to the Committee describing the schedule for Wells fish ladder maintenance. This memo addressed the need for additional work this year, and that the east ladder (which is currently out of service) will be back in service this Friday, March 2. At that point, the west ladder (which is currently in service) will be taken out of service for maintenance until approximately the second week of March; this work is typically completed by the end of February. Total passage for both ladders in March is historically low, and at any one time, Douglas PUD will always keep at least one ladder in service. It was discussed that this schedule issue was a discussion item and not a decision item because there is no HCP stipulation or requirement that all maintenance be completed prior to March 1. Douglas PUD indicated, however, that it is and will continue to be their goal to have all work completed by March 1, and that this extended maintenance was the result of baffle placement (approved by the Committees) that took longer than expected.

V. Chelan PUD (Shaun Seaman)

A. Presentation on Predator Impact Study in 2006

Chuck Peven provided a summary presentation on the results of the predator impact study in Rocky Reach reservoir conducted in 2006. Peven noted that the results indicated that travel distances were greatest for pikeminnow and least for smallmouth bass. No salmonids were found in walleye stomachs. Next year, the study will place increased emphasis on documenting temperature and flow relationships, more intensive sampling during the peak of the juvenile migration, and investigating the possibility of using set lines to collect target fish.

B. Presentation on Rock Island Over/Under Gates

Steve Hemstrom provided a presentation on the status of the plans for installing over/under gates at Rock Island; the gates are designed to reduce total dissolved gas as compared to the notched gate design. Chelan PUD's initial studies showed that the over/under gates provide similar flow, less total dissolved gas (TDG), and a high fish passage survival relative to notched gates. Prototypes and initial installation at Gate 31 were tested in 2005 for survival and guidance of fish through the gates, and there were observed reductions in TDG as well as high fish survival for these gates relative to traditional or notched gates. One finding of these studies was that the vent stacks installed in Gate 31 to reduce vorticity did not reduce TDG; therefore, the future designs for Gates 30 and 32 will not include this feature. In April 2007, all gate sections are expected to be installed for use in the 2007 fish spill season (both spring and summer spill). After completion of these, there will be six notched gates and three over/under gates at Rock Island Dam, out of a total of 31 existing gates.

C. Coho Surrogacy Discussion

Shaun Seaman introduced the draft information paper *Additional Information Concerning Coho as a Plan Species*, prepared by Chelan PUD to further the discussion on the potential use of yearling spring Chinook as a surrogate for initial Phase Designation of coho salmon should the HC determine there is a hatchery program and/or a naturally reproducing population requiring mitigation obligations. Peven discussed that the paper showed that coho typically guide better than yearling Chinook and steelhead through surface passage routes and travel higher in the water column. Peven will provide an updated version of the paper (which includes comments from the Yakama Nation) to Ali Wick for distribution to the Coordinating and Hatchery Committees. Steve Parker noted that the Yakama Nation would like to submit comments on a previous draft of this paper for review by the Committees; Parker will send these comments to Ali Wick for distribution to the Committees. Chelan PUD will be discussing the paper further internally and with the Yakama Nation and plans to bring the next revision of the document to the Committees by March 19.

D. 2007 Fish Spill Plan for Rocky Reach and Rock Island Dams

Steve Hemstrom introduced the *2007 Fish Spill Plan for Rocky Reach and Rock Island Dams.* The Committees previously received this plan by email for their review and Committees members agreed to provide any comments to Chelan PUD by March 13. In responding to a question, Ali Wick agreed to review how Chelan PUD's spill plan was approved in the past and will update the Committees.

VI. HCP Committees Administration (Mike Schiewe)

A. HCP Annual Report Review

Ali Wick updated the Committees that comments on the HCP Annual Reports need to be forwarded to Anchor Environmental, L.L.C. by March 13.

B. Monthly Hatchery Reports to the PUDs

The Committees were previously queried as to their interest in receiving the monthly hatchery reports that are sent to the Hatchery Committees as part of the M&E process. Several members indicated their interest in receiving these; Ali Wick will begin sending these to Coordinating Committees members.

C. Debrief on HCP/PRCC Joint Meeting

The Committees expressed support for the idea of an annual joint HCP/PRCC meeting early in the calendar year, which would establish opportunities to coordinate and other pertinent issues. Bill Tweit indicated that even more frequent meeting involving both the HCP and PRCC committees would be desirable from WDFW's perspective.

D. Newsletter/Brochure

The Committees have previously discussed preparing a newsletter or brochure-type handout available to the public to explain ongoing developments in the HCP process. Douglas and Chelan PUD will provide a mock-up of such a brochure at the next meeting.

E. Mid-Columbia Forum

Mike Schiewe updated the Committees that a letter has been sent to the non-signatory parties asking for interest in setting a Mid-Columbia Forum, with a 30-day window for signifying interest. This window ends on March 12. This letter will continue to be sent

yearly in accordance with Federal Energy Regulatory Commission (FERC's) order on this matter.

F. Meeting Schedule

The Committees discussed the idea of shifting the meeting to a 12:30 pm start time. The March meeting will remain at 9:30 am to allow for some items that may require extended discussion. The upcoming meeting schedule is set as follows:

- March 27 in SeaTac – 9:30 am to 2:30 pm
- April 24 in SeaTac – 12:30 am to 4:00 pm
- May 22 (Update: This is scheduled for 9:30 am to 2 pm at Rock Island Dam)

List of Attachments

Attachment A – List of Attendees

Attachment B - Statement of Agreement: Chelan County PUD Study Plan to Estimate Rock Island Project Survival for Yearling Chinook during a 10% Spill Operation

Attachment B.1 – Study Plan to Estimate Rock Island Project Survival for Yearling Chinook during a 10% Spill Operation

Attachment B.2 - Appendix A Statistical Synopsis for the 2007 HCP Survival Studies at Chelan County PUD

Attachment C - Statement of Agreement: Approval of the 2007 Rocky Reach Study Plan

Attachment C.1 – Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam For 2007

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Steve Hemstrom	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Brian Cates *	USFWS
Bill Tweit *	WDFW
Steve Parker *	Yakama Nation

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

STATEMENT OF AGREEMENT FOR CHELAN COUNTY PUD STUDY PLAN TO ESTIMATE ROCK ISLAND PROJECT SURVIVAL FOR YEARLING CHINOOK DURING A 10% SPILL OPERATION

FINAL

Rock Island HCP Coordinating Committees
Statement of Agreement
Chelan County PUD
Study Plan to Estimate Rock Island Project Survival for Yearling Chinook during a 10% Spill Operation

February 27, 2007

Statement
The Rocky Reach and Rock Island HCP Coordinating Committees have reviewed the Chelan County PUD document, "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook during a 10% Spill Operation,"* and accept the plan for 2007 testing.

Background
On December 8, 2006, the Committees approved a Statement of Agreement for testing a 10% spill operation in 2007 at Rock Island Dam to assess yearling chinook survival, subject to several conditions outlined in that Statement. The testing is described in the plan attached here (Attachments B.1 [Plan] and B.2 [Appendix]).

ATTACHMENT B.1

STUDY PLAN TO ESTIMATE ROCK ISLAND PROJECT SURVIVAL FOR YEARLING CHINOOK DURING A 10% SPILL OPERATION

Final
Study Plan to Estimate Rock Island Project Survival for Yearling Chinook during a 10% Spill Operation

Prepared by

Andrew Grassell
Public Utility District Number 1 of Chelan County
Wenatchee, WA

February 1, 2007

Introduction

2006 marked the final year of Phase 1 testing for spring species at Rock Island Dam in accordance with the Rock Island Habitat Conservation Plan (HCP). The three-year average for project survival for each of the three spring species, yearling Chinook salmon, sockeye salmon, and steelhead, exceeded the 93% survival standard and met the required standard error (Table 1.), and are now designated as Phase-3 standard achieved at a 20% spill level. Section 5.3.3 in the HCP provides the opportunity to test a different project operations if the three year survival standard is met. The proposed project survival study plan at Rock Island in 2007 is designed to determine if the HCP standard can be maintained under an alternative Rock Island Dam spill operation.

Table 1. Summary of Rock Island Phase-1 Survival Study Results with Standard Errors

Species	2002	2003	2004	2005	2006	Average
Yearling Chinook	.956* (.025) .952^ (.026)	.934* (.016) .939^ (.016)	.914* (.023) .942^ (.012)			.935* .944^
Steelhead	NA	NA	.966 (.011)	.916 (.015)	.940 (.013)	.941
Sockeye	NA	NA	.985 (.014)	.953 (.011)	.960 (.011)	.966

*Estimates generated using PIT tags.

^ Estimates generated using acoustic tags

Operation Alternative

Chelan believes the HCP survival standard can be maintained under a 10% spill level. The decision to test 10% was made using information from a 2005 route-specific survival study utilizing yearling Chinook (Skalski and Townsend 2005a) and a 1998 hydroacoustic study (Iverson and Birmingham 1998). This information was used in a Rock Island system model to determine the level of spill that the fish passage gates (those shown to provide higher fish passage efficiency) could pass compared with the probable amount of time the plant would experience river flows above operating capacity. When total river flows are above plant capacity, additional spill gates would be utilized. This concept is more fully discussed below.

Request to review a 20/10 block spill design

At the October HCP Coordinating Committee, Chelan was asked to include a discussion relative to performing this spill reduction study using two blocks of spill (20% and 10%). Chelan reviewed this request and determined that it would be extremely difficult to measure a survival difference between spill levels of 20 and 10 percent based on the similarity of predicted survival levels. It would take over 3000 fish in order to statistically detect a difference of three tenths of a percent seen in our modeling exercises (Pers. Comm. Rich Townsend). In addition, the HCP requirement we are studying is project survival, not the difference in survival from two test groups. This study plan therefore is

designed to study if yearling Chinook survival is at or above the 93 percent standard agreed to in the HCP.

Justification

Although the HCP provides the option to reduce spill, the agreement does not specify the magnitude of the reduction. Chelan initially chose the 10% spill level based on the percentage of maximum plant capacity the surface spill gates could accommodate. The surface spill gates are able to pass a total of 22.5 kcfs which is approximately 10% of a 225,000 cfs river flow. The powerhouse capacity is about 210,000 cfs, thus at flows above 225,000 cfs the use of additional spillway gates is needed to maintain forebay levels at or below maximum.

Secondly, Chelan looked at the information provided by Skalski and Townsend (2005a) to determine the survival and percent passage at the available routes at Rock Island. These routes were differentiated as powerhouse 1 (Douglas County Side), Spillway 1, Spillway 2, and Powerhouse 2 (Chelan County Side). This information is summarized in Table 2.

Table 2. Summary of 2005 Route-Specific Survival and Passage of Yearling Chinook at Rock Island Dam

	PH1	SP1	SP2	PH2	Dam	Project
Survival	.838	.990	.976	.955	.959	.948
Percent Passage	.035	.019	.361	.586	NA	NA

Almost 95% of the yearling Chinook passed Rock Island via powerhouse 2 and spillway 2 where survival estimates for both routes exceeded 95%.

Thirdly, Chelan looked into the most recent hydroacoustic study conducted at Rock Island (Iverson and Birmingham 1998). This study suggests that over 73 percent of the fish that use spillway 2 do so via the surface spill gates. Additionally, these gates are also the most efficient in terms of percentage of fish to percentage of flow (range 1.29 – 2.40). This is 2 to 4 times greater then the standard gates that ranged from .37 to .67.

Using the above information, Chelan conducted two forms of analysis when determining the likelihood of a 10% spill level meeting the 93% survival standard. The first is a system model that takes into account run-timing, route-specific passage, river flow, plant operations, spill gate operations, fish-to-flow (spill) data, and route-specific survival. This analysis was conducted for yearling Chinook since they are the species with the lowest project passage. A calibration run was conducted using the 2005 operations (20% spill) and data from Skalski and Townsend (2005a). Both the model and the measured

survival estimate was 94.8%. A test run was conducted using a 10% spill operation with the following assumptions:

- A low water year;
- Same route-specific passage as measured in 2005

The result of the model run was a 94.4% project survival. The small change may be attributed to the high survival through powerhouse 2 or the fact the surface spill gates are more efficient. There may not be much of a shift in passage from spillway 2 to powerhouse 2 even at the reduced levels.

The second analysis conducted was a redistribution of passage from spillway 2 to powerhouse 2. Since very few fish use the powerhouse 1/spillway 1 side for passage, it is assumed that any redistribution of fish passage linked to a lower spill level would occur between spillway 2 and powerhouse 2. No redistribution of fish is expected to occur between spillway 1 and powerhouse 1 because typically one gate (a surface spill gate) is operated on that side of the dam and this will not change.

To conduct the analysis, half the percentage of yearling Chinook that utilized spillway 2 was redistributed to powerhouse 2 to coincide with the 50% spill reduction. Based on the fact that the notched gates have much higher fish passage efficiency than the standard gates, the assumption that 50% fewer fish would use spillway two is a worst-case scenario. The dam survival was then recalculated by multiplying the route-specific survival for each route by the new passage percentage through each route. This new dam passage estimate was then multiplied by the pool survival to determine the new project survival. Figures 1 and 2 are schematics that show the comparison between 20% and 10% spill.

Figure 1. Schematic of route-specific, dam and project survival based on Skalski and Townsend 2005a at 20 percent spill.

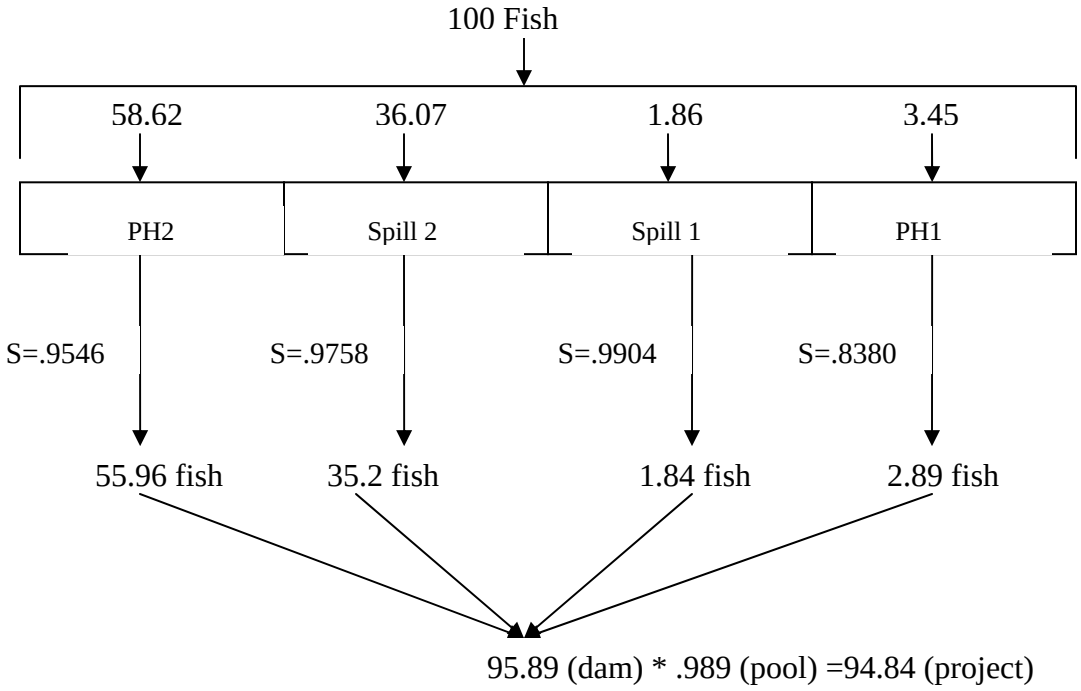
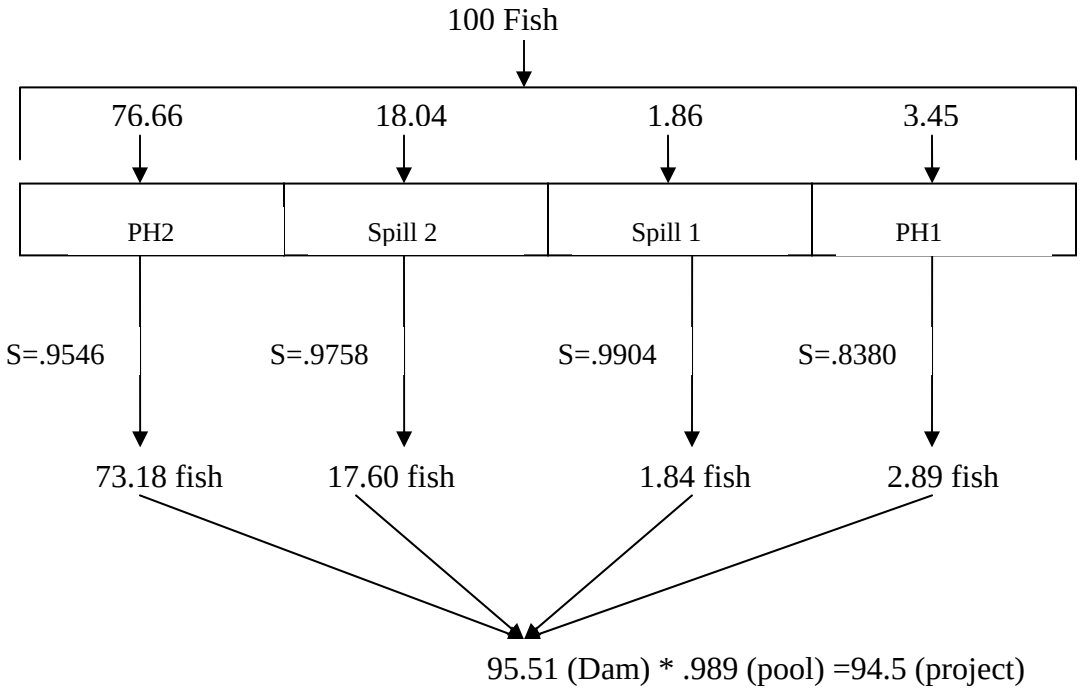


Figure 2. Schematic of route-specific, dam, and project survival based on redistribution of half the spillway 2 passage to powerhouse 2 passage at 10 percent spill.



Both the model analysis and the redistribution analysis provide similar estimates of project survival based on a 10% spill operation. Additionally, even if the point estimates are not exact, the magnitude of change in survival is small. Having both analyses comporting so closely provides some confidence that project survival will not be impacted in such a manner that lowers it below the HCP standard.

Methods

3.1 Study Design

The general study design to estimate project survival at Rocky Reach and Rock Island dams in 2007 is consistent with the survival studies conducted at Rock Island Dam using acoustic and PIT tags in 2002, 2003, 2004 and 2005, where the paired-release methodology was used (Skalski 2001 and Appendix A). Table 3 summarizes the number of fish to be released by site, species/stock, and tag type.

Rock Island project survival will be estimated using the paired-release model. During spring 2007, paired-releases of a total of 500 yearling Chinook tagged with acoustic transmitters will be released in each of the tailraces of Rocky Reach and Rock Island dams (Table 3). These releases will be divided into 18-20 replicates (undecided yet) at each site, with approximately 25-30 fish per replicate.

As was done in 2002, 2003, 2004, 2005, and 2006 the yearling Chinook will be monitored at two sites downstream of the dam near Crescent Bar (Figure 3) and Sunland Estates (Figure 4). Table 4 summarizes the release and detection locations for the acoustic tag project. To verify the operating life of the tags, a life test of 50 "E" tags (1.5 g in air) will be conducted during the study. These tags will be tested in continuously cycled river water in a holding tank, similar to the fish holding tanks.

Table 3. Number of fish to be tagged/released by location, tag type, and species/stock for the Rock Island 2007 survival study.

Release Location	ROR Steelhead Acoustic 1.5g
Rocky Reach Tailrace	500
Rock Island Tailrace	500
Total	1,000

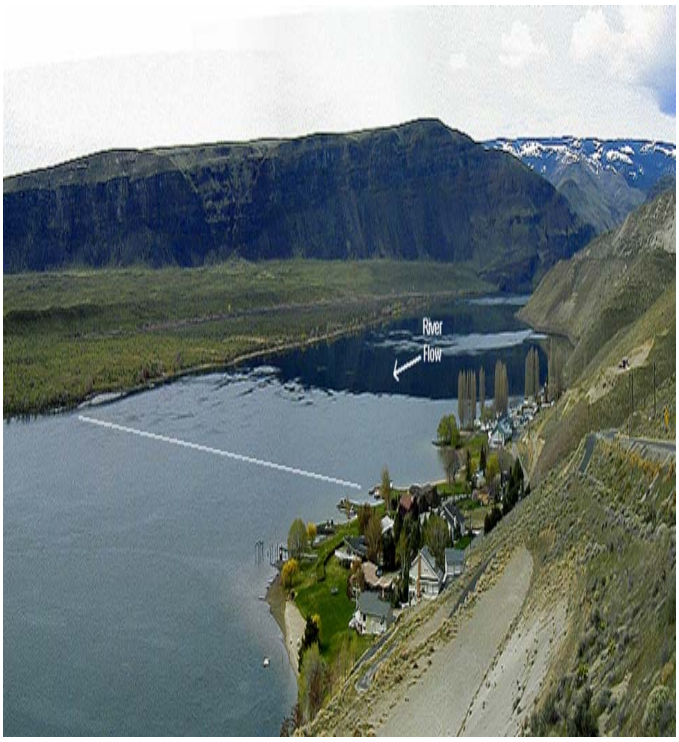


Figure 3. Picture of Crescent Bar showing the 2007 proposed monitoring site with the approximate hydrophone transect across the Columbia River.

Figure 4. Picture of Sunland Estates showing the 2007 proposed monitoring site with the approximate hydrophone transect across the Columbia River.

Table 4. Release and detection locations for Acoustic Tags for the Rocky Reach and Rock Island 2007 survival study

Location	Release/Detection	# of Hydrophones
Rocky Reach Dam Tailrace	Release	
Rock Island Dam Tailrace	Release	
Crescent Bar In River Site	Detection	8
Sunland Estates In River Site	Detection	10

3.2 System Design

The acoustic tag methods used to monitor fish movements at the various detection sites in 2006 will be very similar to those employed at Rocky Reach and Rock Island dams during studies conducted each year from 1998 - 2005 (HTI 1997; Steig 1999a, 1999b, 2000; Steig et al. 1999, 2001, 2002, 2005; Steig and Timko 2000; Skalski et al. 2003a, 2003b, 2005b).

Each Acoustic Tag Receiver (ATR) system can determine the presence or absence of tagged fish. Received signals will be synchronized at all detection sites in order to determine time of arrival for each detected pulse.

3.2.1 ***Rock Island Downstream Acoustic Systems –***ATR systems will be deployed in the river downstream of Rock Island Dam at Crescent Bar and at Sunland Estates. The primary objective of these systems is to detect acoustically tagged fish for the Rock Island survival estimates.

3.2.2 ***Acoustic Tags –*** For the 2007 survival study, one model of acoustic tags will be used. The Hydroacoustic Technology, Inc. (HTI) Model 795E Acoustic Tags will be used for run-of-river (ROR) yearling Chinook. These tags will be approximately 6.8 mm in diameter by 18 mm long, and will average 1.50 g in air, with an average operating life of from 32 – 36 days (based on 2003-2006 tag life tests). Assuming that the test fish will be similar in size to the fish tagged in 2003, 2004, and 2005, the Model 795E tag will range from 1.4% - 7.1% of the fish body weight. For the 2007 survival study, the ping rate will most likely be set at 1 ping every 4-8 sec, with a pulse width of 0.5 msec.

3.3 System Setup

The ATR systems and equipment require installation and testing. HTI will be responsible for these installations with the assistance of the District personnel. The installation of some of the hydrophones will require the assistance of District mechanics.

3.4 Fish Handling

In most cases, all aspects of fish handling (i.e., collection, transport, tagging, holding, and release) will be consistent with the protocols used during the each of the juvenile survival evaluations from 1999 – 2006. For further details, see Stevenson et al. (2000) and Skalski et al. (2001). Holding and release protocol for the horizontally distributed tailrace releases will require separation of fish into smaller batches (5-6 fish per batch) for post-tagging holding and release, which is consistent with previous survival study protocol.

3.4.1 ***Collection and Transport*** **–** Yearling Chinook used in the survival estimation will be ROR collected from the juvenile bypass collector at Rocky Reach Dam. All fish will be captured and transferred into a 275-gallon tank for transport to the fish tagging sites daily throughout the study. Fish will be transferred through a 4 in. flex-hose directly from the transport tank into 35-gallon tanks at the tagging sites where densities will be less than 1 fish/gallon. Fish will be enumerated as they are captured. The target number of fish to be captured for each daily sample will be within 20% of the daily sample.

All fish transfers will be water-to-water transfers to reduce the likelihood of injuries during transport. The transfers will occur in the morning and fish will be held overnight to allow them to recover from the stress of transport prior to tagging. ROR sockeye will be held over two nights to allow them to recover from the transportation stress. To insure that the fish in the holding tank are receiving sufficient water flow and dissolved oxygen levels remain between 7 and 12 PPM, tag site monitors (District personnel) will record these levels. Tag site monitors will be present 24 h/d while fish are being held at the tagging sites.

3.4.2 ***Fish Tagging and Post-Tag Holding*** **–** For all experimental groups, handling protocols are standardized to reduce the potential for bias (i.e. fish length, number of times handled, tagging procedures, transport methods, transport time, tagging procedures, and release protocol). All acoustic transmitters will be surgically implanted. The minimum size of steelhead to be tagged with acoustic transmitters will be 150 mm in length. For sockeye, the minimum size will be 100 mm in length.

Tagging consists of three steps: (1) pre-operative MS-222 bath, (2) implantation of the acoustic tag, and (3) post-operative recovery. At the time of tagging, fish will be transferred by a dip net with a water sanctuary to an anesthetic tank containing a 100-mg/l solution of MS-222. Once anesthetized, the fish will be inspected. Those with obvious injuries, deformations, or >20% scale loss will be rejected. The acoustic tags will be surgically implanted into the fish after making a small incision (~ 1 cm) into the body cavity. The incision is stitched using a 5/0 coated Vicryl suture after implanting the tag. The wound is then irrigated with an oxytetracycline solution. The time from knockout to recovery will be 5-7 min.

To the extent possible, selection criteria of fish that will be tagged for the survival study will be standardized to eliminate potential bias associated with differential size, health, condition, etc. However, the limited number of fish available for tagging will limit the

ability of the tagging crew to be selective regarding the size of tagged fish. All fish, regardless of source, stock, species or release site will be held for up to 48 hours after tagging to allow ample recovery from the tagging procedure, to identify and remove individuals that succumb to post-tagging mortality, and to identify pre-mature acoustic tag failure should it exist. Observations from past studies indicate that fish mortality due to complications associated with the surgical procedure typically occur within 24 hours of tagging, and early tag failures within 48 hours. Acoustic tagged ROR yearling Chinook will be held in 35-gallon containers. All groups of fish will be held in densities of less than 3 fish/gallon and supplied with fresh, de-nitrified river water. Water temperature and dissolved oxygen levels will be recorded hourly throughout the holding period by tag site monitors.

3.4.3 ***Fish Releases –*** A 1-day (24-h) lag period will be applied between tagging/release dates at Rocky Reach and Rock Island dams, to account for fish migration time between the projects. This is necessary to ensure adequate mixing of the test groups, an important assumption of the survival statistical model employed.

3.4.4 ***Smolt Health Monitoring –*** Data will be collected on the external health of the smolts during the study. Data for each test group will be compared with other respective release groups and controls to expose potential differences in health and stress of study animals. Sampling will be conducted on all release groups. The length and weight of every tagged fish will be recorded.

3.5 Data Collection

Received signals will be synchronized in order to determine time of arrival for each detected pulse. The individual echoes will be entered in digital format into a database using the HTI software package *MarkTag*. Acoustic tag systems at Crescent Bar and Sunland Estates will all be monitored and maintained by HTI.

3.6 Data Analysis

There are three phases associated with preparing the databases required for the survival analyses: I) data detection during the field season; II) data marking and tracking during and after the field season; and III) data quality control during and after the field season. The specific data processing steps included in each phase are listed below:

Phase I. Data detection during the field season

1. Detection of acoustic tag codes for each fish in all release groups.

2. Verification and data input of all the fish and tag release data.

3. Continuous verification of the operation of all of the ATR systems.

4. Collection and backup of all raw acoustic tag data.

Phase II. Data marking and tracking during and after the field season

5. All acoustic tag data files will be tracked using the MarkTags tracking software. Lists of all detected fish will be developed daily.

Phase III. Data quality control during and after the field season

6. The data will be constantly verified during and after the field season to ensure the integrity of the acoustic tag database.

7. The Project Leaders in charge of each of the study objectives will review the data on a daily basis.

3.7 Statistical Analysis

Statistical support will be provided by Dr. John Skalski, consisting of the tasks described below. The intent of these tasks is to provide integrated statistical support from study design through data analysis and interpretation of results. These tasks will be coordinated with the field efforts of HTI.

3.7.1 ***Task 1*** **–** Develop the likelihood models used in the analysis of the acoustic tag data. The likelihood models for the acoustic tag analyses will be based on the statistical principles reported in Skalski et al. (1998). The statistical models are uniquely tailored for each study, taking into account detection locations, passage routes at the hydroelectric projects and release locations (Skalski 2006 in prep). The 2007 statistical models will be modifications of the 1999-2006 models. Statistical development will precede the field study to assure the data generated by the field studies will be compatible with model structure and design specifications. A statistical synopsis will be prepared for peer review.

3.7.2 ***Task 2*** **–** Process the in-season acoustic tag data to monitor the progression of the studies.

3.7.3 ***Task 3*** **–** Perform the actual survival analysis of the acoustic releases. A modified Cormack-Jolly-Seber analysis will be used to estimate project survival using the acoustic tag data (Cormack 1964, Jolly 1965, Seber 1965). Tests of model assumptions will be performed. Standard errors and confidence intervals will be provided for the estimated parameters. Estimates will be provided for each of the replicate release-pairs along with modeling to identify the most parsimonious (and most precise) model that adequately describes the data. Seasonal average will be computed along with associated standard error. Tests of assumptions will be based on Burnham tests 1-3 (Burnham, et al. 1987) along with Chi-square tests of mixing. Between year comparisons of survival estimates will be performed.

3.7.4 ***Task 4 –*** Determine length distributions of steelhead and sockeye comparing the tagged fish and the run at large collected during sampling efforts at the Rocky Reach Juvenile Sampling Facility.

3.8 Report Preparation

Preliminary raw acoustic tag survival estimates for ROR yearling Chinook will be available by August 15, 2007.

> One report will be drafted: the report will include project survival estimates for ROR yearling Chinook based on estimates derived from acoustic tag methodologies and travel time and detection rate evaluation.

A preliminary draft report will be completed by October 15, 2007 for review by the District. Draft reports will be completed by November 1, 2007 for distribution to the HCP Coordinating Committee for review, and final reports will be submitted to the District by January 31, 2008.

3.9 Termination of Acoustic Tag Survival Study

If all the protocols are followed and unanticipated or unaccounted for problems arise (i.e. high post-tag mortalities), the District will consult with the HCP CC to discuss termination of the survival study.

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ATTACHMENT B.2

APPENDIX A STATISTICAL SYNOPSIS FOR THE 2007 HCP SURVIVAL STUDIES AT CHELAN COUNTY PUD

Appendix A

Statistical Synopsis
for the 2007 HCP Survival Studies
at Chelan County PUD

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30 January 2007

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1.0 Introduction

In 2007, run-of-river yearling Chinook salmon smolts will be used to estimate project passage survival at Rock Island Dam. The project passage survival will be based on a paired release-recapture design conducted over course of the spring outmigration.

2.0 Release-Recapture Design

Estimates of Rock Island project passage survival will be based on paired releases (i.e., R_1 and R_2) of acoustic-tagged yearling Chinook salmon smolts from Rocky Reach and Rock Island tailraces (Figure 1). Each release will consist of 500 acoustic-tagged smolts. The study will be conducted over the course of the outmigration, using approximately 20 replicate releases of 25 smolts per location per trial event.

Downstream hydrophone detection arrays will be located at Crescent Bar and Sunland Estates as in previous years.

3.0 Statistical Analysis

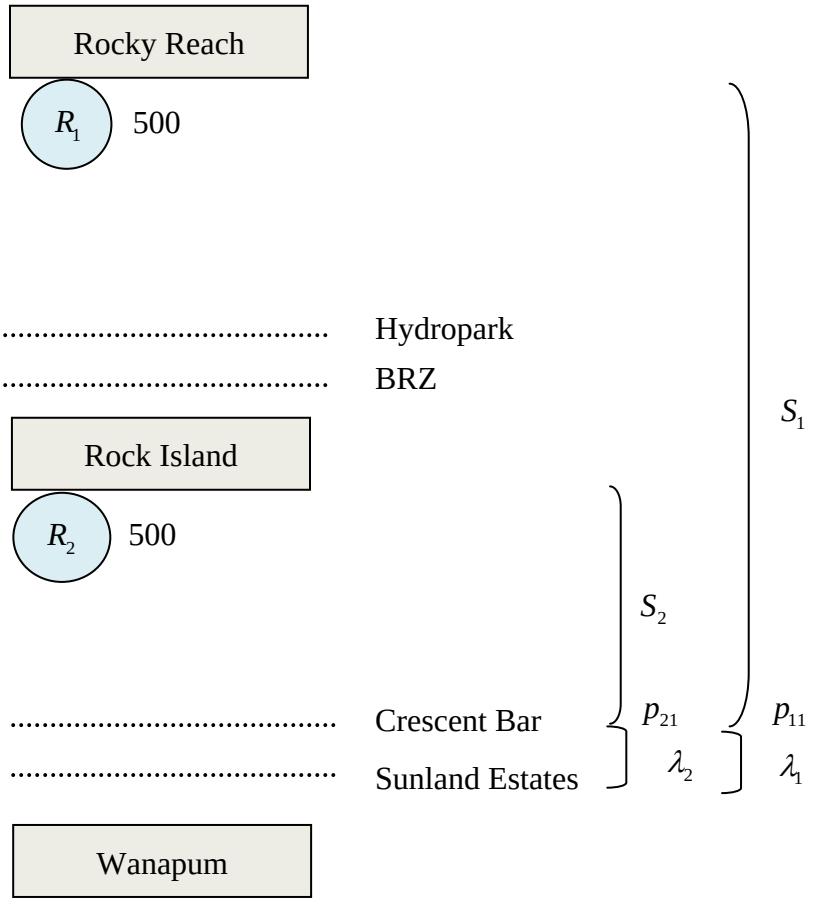
3.1 Survival Estimates

In estimating Rocky Reach passage survival, the fully parameterized release-recapture model can be written as follows:

$$\begin{aligned} L = & \binom{R_1}{\underset{\sim}{n}} \left(S_{11}p_{11}\lambda_1\right)^{n_{11}} \left(S_{11}\left(1-p_{11}\right)\lambda_1\right)^{n_{01}} \left(S_{11}p_{11}\left(1-\lambda_1\right)\right)^{n_{10}} \\ & \cdot \left(\left(1-S_{11}\right)+S_{11}\left(1-p_{11}\right)\left(1-\lambda_1\right)\right)^{n_{00}} \\ & \cdot \binom{R_2}{\underset{\sim}{m}} \left(S_{21}p_{21}\lambda_2\right)^{m_{11}} \left(S_{21}\left(1-p_{21}\right)\lambda_2\right)^{m_{01}} \left(S_{21}p_2\left(1-\lambda_2\right)\right)^{m_{10}} \\ & \cdot \left(\left(1-S_{21}\right)+S_{21}\left(1-p_{21}\right)\left(1-\lambda_2\right)\right)^{m_{00}} \end{aligned} \quad (1)$$

where $\underset{\sim}{n}$ and $\underset{\sim}{m}$ are the vectors of counts associated with the downstream capture histories of releases R_1 and R_2, respectively (Figure 1).

Figure 1. Schematic of the paired release-recapture design to estimate project passage survival at Rock Island Dam, indicating estimable parameters.



Rock Island project survival $\hat{S}_{RI} = \frac{\hat{S}_1}{\hat{S}_2}$

In the case of tag failure, additional parameters need to be added to the above model (1), based on the methods of Townsend et al. (2006). Table 1 presents the expected probabilities of occurrence for each of the possible capture histories under tag-failure where:

L_{11} = probability a tag from release R_1 survives the first reach,

$P\left(L_{12}\middle|L_{11}\right)$ = conditional probability a tag from release R_1 survives the second reach given its survival to the first reach,

L_{12} = probability a tag from release R_1 survives both reach 1 and reach 2,

L_{21} = probability a tag from release R_2 survives the first reach,

$P\left(L_{22}\middle|L_{21}\right)$ = conditional probability a tag from release R_2 survives the second reach conditional on its surviving the first reach,

L_{22} = probability a tag from release R_2 survives both reach 1 and reach 2.

The joint likelihood can be expressed as

$$L = L\left(S_{11}, p_{11}, \lambda_1 \middle| R_1, \underset{\sim}{n}, \underset{\sim}{L}_1\right) \cdot L\left(S_{21}, p_{21}, \lambda_2 \middle| R_2, \underset{\sim}{m}, \underset{\sim}{L}_2\right). \quad (2)$$

The estimates of survival from likelihood model (2) should be more reliable for it takes into account tag-life probabilities less than one.

The estimates of the survival and capture parameters in likelihood model (2) will be calculated, treating the estimates of tag-life (i.e., $\hat{L}_{12}$, $\hat{L}_{11}$, $\hat{L}_{21}$, and $\hat{L}_{22}$) as known constants. However, to calculate a realistic variance estimator for the survival parameters, the error in the estimation of the tag-life probabilities must be incorporated into an overall variance calculation. The variance of the survival estimates will be calculated using the total variance formula

$$\mathrm{Var}\left(\hat{S}_{RR}\right) = \mathrm{Var}_{\underset{\sim}{\hat{L}}}\left[E\left(\hat{S}_{RR}\middle|\underset{\sim}{\hat{L}}\right)\right] + E_{\underset{\sim}{\hat{L}}}\left[\mathrm{Var}\left(\hat{S}_{RR}\middle|\underset{\sim}{\hat{L}}\right)\right]. \quad (3)$$

Table 1. Detection histories and expected probabilities of occurrences for releases R_1 and R_2 for the acoustic-tag study.

Release	Detection History	Expected Probabilities
R_1	11	$S_{11}L_{11}p_{11}P\left(L_{12}\middle\|L_{11}\right)\lambda_1 = S_{11}p_{11}L_{12}\lambda_1$
	01	$S_{11}L_{11}\left(1-p_{11}\right)P\left(L_{12}\middle\|L_{11}\right)\lambda_1 = S_{11}\left(1-p_{11}\right)L_{12}\lambda_1$
	10	$S_{11}L_{11}p_{11}\left[1-P\left(L_{12}\middle\|L_{11}\right)\lambda_1\right] = S_{11}p_{11}\left(L_{11}-L_{12}\lambda_1\right)$
	00	$\left(1-S_{11}\right)+S_{11}\left[\left(1-L_{11}\right)+L_{11}\left(1-p_{11}\right)-L_{12}\left(1-p_{11}\right)\lambda_1\right]$
R_2	11	$S_{21}p_{21}P\left(L_{22}\middle\|L_{21}\right)\lambda_2 = S_{21}p_{21}L_{22}\lambda_2$
	01	$S_{21}L_{21}\left(1-p_{21}\right)P\left(L_{22}\middle\|L_{21}\right)\lambda_2 = S_{21}\left(1-p_{21}\right)L_{22}\lambda_2$
	10	$S_{21}p_{21}\left[1-P\left(L_{22}\middle\|L_{21}\right)\lambda_2\right] = S_{21}p_{21}\left(L_{21}-L_{22}\lambda_2\right)$
	00	$\left(1-S_{21}\right)+S_{21}\left[\left(1-L_{21}\right)+L_{21}\left(1-p_{21}\right)-L_{22}\left(1-p_{21}\right)\lambda_2\right]$

The above variance can therefore be estimated in stages using the expression

$$\widehat{\mathrm{Var}}\left(\hat{S}_{RR}\right) = s^2_{\hat{S}_{RR}|\hat{L}} + \mathrm{Var}\left(\hat{S}_{RR}\middle|\hat{\underset{\sim}{L}}\right). \quad (4)$$

The second term in Eq. (4) will be derived from the maximum likelihood model (2) conditioning on the tag-life probabilities (i.e., $\hat{\underset{\sim}{L}}$). The first variance component in Equation (4) will be calculated using bootstrap resampling techniques (Efron and Tibshirani 1993). Alternative estimates of $\hat{\underset{\sim}{L}}$ will be computed by bootstrapping both the observed tag-life data and travel-time data. For each estimated vector of tag-life parameters, survival will be estimated using likelihood model (2). One thousand bootstrap estimates of the tag-life parameters will be calculated along with the corresponding conditional maximum likelihood estimates of survival. The first variance component in Eq. (4) will be then estimated by the quantity

$$s^2_{\hat{S}_{RI}|\hat{L}} = \frac{\sum_{b=1}^{1000}\left(\hat{S}_b - \hat{\bar{S}}\right)^2}{(1000-1)}$$

where

$\hat{S}_b$ = the bth bootstrap estimate of survival $(b = 1,\ldots,1000)$;

$$\hat{\bar{S}} = \frac{\sum_{b=1}^{1000}\hat{S}_b}{1000}.$$

Use of Eqs. (3) and (4) also permits examining the contribution of the sampling error in the tag-life parameters to the overall variance in survival estimates.

3.2 Estimating Tag Life

In 2007, 50 E-tags will be used to characterize tag life from systematically sampling tags used in the yearling Chinook salmon study. The tags will be initiated and continually monitored in water until they fail. The failure times or tag lives will be recorded for each of the 50 tags.

The failure-time data will be fit to either a Gompertz distribution (Elandt-Johnson and Johnson 1980) of the form

$$f(x) = \beta e^{\frac{\beta}{\alpha}\left(1-e^{\alpha x}\right)+\alpha x}, \tag{5}$$

Weibull distribution of the form

$$f(x) = e^{-\left(\frac{x-\gamma}{\eta}\right)^{\beta}} \left(\frac{\beta}{\eta^{\beta}}\right)(x-\gamma)^{\beta-1}, \tag{6}$$

or logistic distribution of the form

$$f(x) = \beta e^{\alpha-\beta x}\left[1+e^{\alpha-\beta x}\right]^{-2}. \tag{7}$$

3.3 Tests of Assumptions

Tests Within a Release. The detection design for 2007 (Figure 1) does not permit calculation of Burnham et al. (1987) Tests 2 and 3. Because smolts are not physically rehandled during detection, there is no reason to believe upstream detection would have an effect on downstream survival and detection processes.

Tests of Mixing. For the estimates of project survival to be valid, the detection data need to conform to the assumptions of statistical model (2). One assumption is the downstream mixing of release groups. Chi-square R × C contingency tables will be used to test the assumption of homogeneous arrival distributions for the various paired-releases. The chi-square contingency table tests of homogeneity will be of the form:

		Release	
		R_1	R_2
Arrival Date	1		
	2		
	⋮		
	D		

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ATTACHMENT C

STATEMENT OF AGREEMENT FOR APPROVAL OF THE 2007 ROCKY REACH STUDY PLAN

FINAL

February 27, 2007

Statement of Agreement – Approval of the 2007 Rocky Reach Study Plan
Rocky Reach HCP Coordinating Committee

Agreement Statement:
The Rocky Reach HCP Coordinating Committee agrees that Chelan PUD should implement the study plan entitled, "***Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam for 2007***" (Attachment C.1).

Background
In 2007, the District would like to continue monitoring and research activities to improve survival of juvenile sockeye salmon at Rocky Reach Dam. In the last few years, passage has been improving through the surface collector, but 50% or more of juvenile sockeye continue to pass through the powerhouse, and, despite a spill level of 24% of flow, less than five percent passed through the spillway.

Because most of the fish continue to pass through the powerhouse, the District believes that a two-pronged approach to improving survival should be pursued; improve survival through the powerhouse, and continue to increase passage through the surface collector.

Given this emphasis, two **objectives** are identified:

1. ***Maximize survival of juvenile sockeye passing through the powerhouse.***

2. ***Maximize passage of juvenile sockeye through the fish bypass system.***

For objective 1, there have been some tests that have demonstrated peak survival (direct survival) of salmonids passing through a turbine occurs at higher flows through the turbine. While survival differences between low and high flow settings in these studies have often not been statistically significant, the same pattern appears repeatedly across studies.

One of the guiding principles for development of the surface collector at Rocky Reach Dam was that the surface flow patterns and the eddy that develops in the forebay, adjacent to Unit 1, are key factors that concentrate fish near Unit 1, and are hence available for guidance or attraction through the bypass. Therefore, in development of the surface collector structure, these conditions were always maintained to the greatest extent possible.

Horizontal passage of juvenile sockeye in 2005 and 2006 is demonstrated in Figure 3 of the study plan. Passage through the surface collector increased approximately 10 percentage points from 2005 to 2006. The average total flow was higher in 2006 compared to 2005 (164 kcfs versus 120 kcfs during May, respectively), and this may have been a factor in guiding more fish towards and ultimately through the surface collector. More fish also went through the upper turbine units in 2006. This is understandable since those units were passing more flow in 2006 compared to 2005.

The flow pattern in the tailrace emanates from the powerhouse, and generally moves towards the opposite (east) bank, and then proceeds downstream (yellow arrows in Figure 4). When water is flowing through the spillway, there is generally a more "confused" pattern that sets up, primarily in the vicinity of the downstream edge of the turbine "boils" (personal observation). The strength of the "confused" water is dictated by the total flow coming through the spillway and how it is shaped (which gates it emanates). Another concern is what part of the water column the different (powerhouse versus spill) flows effect. The District's predator control program participants catch pikeminnow only on or near the bottom. Based on the tailrace structures downstream of the spillway, it is highly likely that the water coming from the spillway may not affect the water column near the bottom, and thus have less of an effect on moving predators away from the area compared to turbine flow.

From information obtained from previous studies at Rocky Reach and other projects, there appears to be higher direct survival at higher turbine discharges. This probably occurs because of larger gaps between turbine components (wicket gates, blades, etc.); sometimes called "better geometry."

> H_o: When a block of turbines are run near the maximum flow, the indirect effects (predation) of turbine passage are reduced.

We postulate that by running a block of turbines, it "trains" flow in the tailrace, creating a narrower, higher velocity water column, which would make it more difficult for predators to stage and await smolts passing through the powerhouse. Also, by creating a narrower flow field as compared to a more broad flow field, the edge effects (amount of water column that predators could stage) would be lowered and the fish within this flow stream would have a shorter transit time through the tailrace area.

Objective 2 (*Maximize passage of juvenile sockeye through the fish bypass system)*:

> H_o: More fish will be drawn to and pass through the fish bypass system when turbines at the south end of the powerhouse are passing maximum flow.

Based on both physical and computational modeling, higher flows in the vicinity of the cul de sac will likely increase the flow characteristics (eddy strength and surface currents) that concentrate fish in the area. Greater concentrations of fish in the immediate area of the surface collector entrance will increase the probability of more fish entering and passing through the surface collector.

ATTACHMENT C.1

STUDY PROPOSAL FOR SOCKEYE SALMON TESTING AT ROCKY REACH DAM FOR 2007

FINAL

Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam For 2007

Fish Bypass Optimization Team

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March 24, 2008

Introduction

In 2007, the District would like to continue monitoring and research activities to improve survival of juvenile sockeye salmon at Rocky Reach Dam. In the last few years, passage has been improving through the surface collector, but 50% or more of juvenile sockeye continue to pass through the powerhouse, and, despite a spill level of 24% of flow, less than five percent passed through the spillway.

Because most of the fish continue to pass through the powerhouse, the District believes that a two-pronged approach to improving survival should be pursued; improve survival through the powerhouse, and continue to increase passage through the surface collector.

Given this emphasis, two **objectives** are identified:

1. ***Maximize survival of juvenile sockeye passing through the powerhouse.***

2. ***Maximize passage of juvenile sockeye through the fish bypass system.***

Background

Turbine survival

For objective 1, there have been some tests that have demonstrated peak survival (direct survival) of salmonids passing through a turbine occurs at higher flows through the turbine (Normandeau and Skalski 1996; Skalski et al. 2005a; Fulmer et al. 2006). While survival differences between low and high flow settings in these studies have often not been statistically significant, the same pattern appears repeatedly across studies.

In Figure 1 below, we "normalized" the turbine settings because actual flow is relative to the turbine size, so by using a setting relative to the operating flow range of the turbine (low, medium, high) or as a percent of the flow above minimum, with 100% being maximum flow.

For Wanapum and John Day, the highest discharge equated to the highest survival estimate. At Rocky Reach Dam, the highest survival (96.6%) for the new units at both the 30 and 10 foot release depths was seen at the middle discharge level (Figure 2; approximately 12 kcfs). The highest discharge at Rocky Reach was approximately 15 kcfs, which showed statistically equivalent survival for both depths. Similar small decreases in survival estimates at the highest discharge were reported for the old units at Rocky Reach and Bonneville Dam. We discuss below in greater detail why the District still believes the indirect survival improvements and potential increase in passage through the surface collector would outweigh a potential small reduction in direct survival from operating at the high end of the turbines operating range.

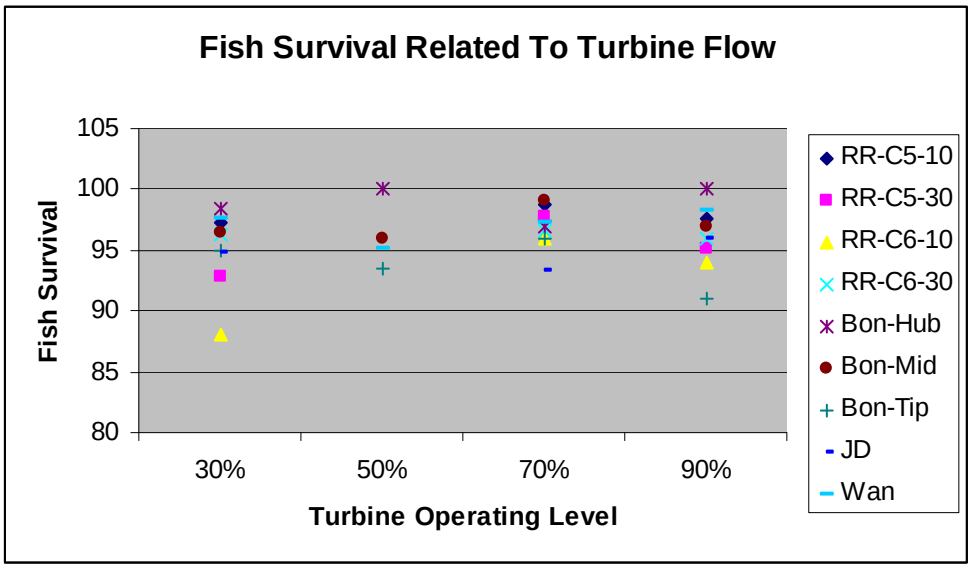


Figure 1. Comparison of direct survival after 48 hrs between Rocky Reach, Wanapum, and John Day dams at different discharge levels.

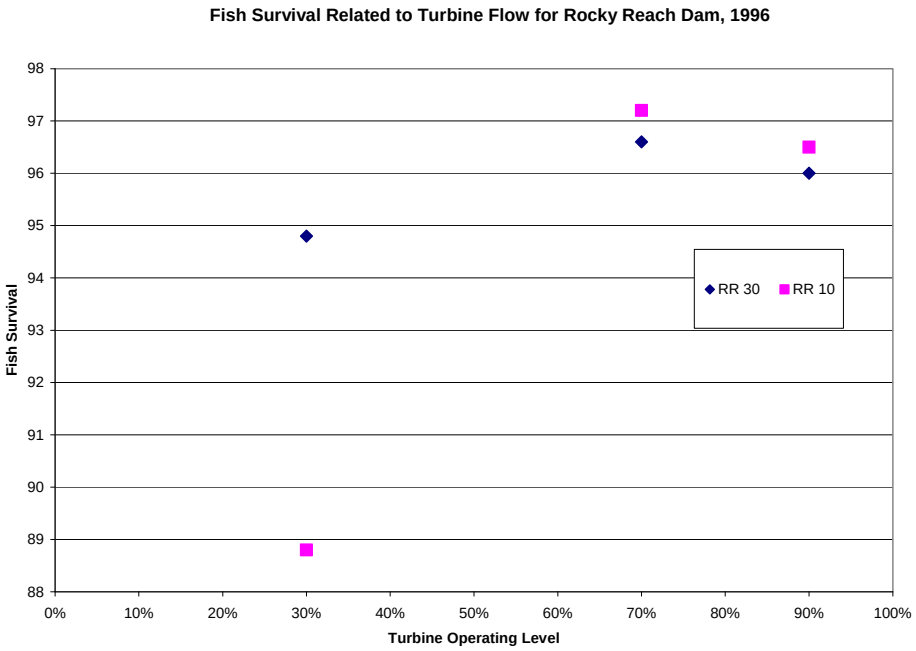


Figure 2. Comparison of direct survival after 48 hrs between Rocky Reach Dam at different discharge levels and release depths.

Conditions within the forebay

One of the guiding principles for development of the surface collector at Rocky Reach Dam was that the surface flow patterns and the eddy that develops in the forebay, adjacent to Unit 1, are key factors that concentrate fish near Unit 1, and are hence available for guidance or attraction through the bypass. Therefore, in development of the

surface collector structure, these conditions were always maintained to the greatest extent possible.

Horizontal passage of juvenile sockeye in 2005 and 2006 is demonstrated in Figure 3. Passage through the surface collector increased approximately 10 percentage points from 2005 to 2006. The average total flow was higher in 2006 compared to 2005 (164 kcfs versus 120 kcfs during May, respectively), and this may have been a factor in guiding more fish towards and ultimately through the surface collector. More fish also went through the upper turbine units in 2006. This is understandable since those units were passing more flow in 2006 compared to 2005.

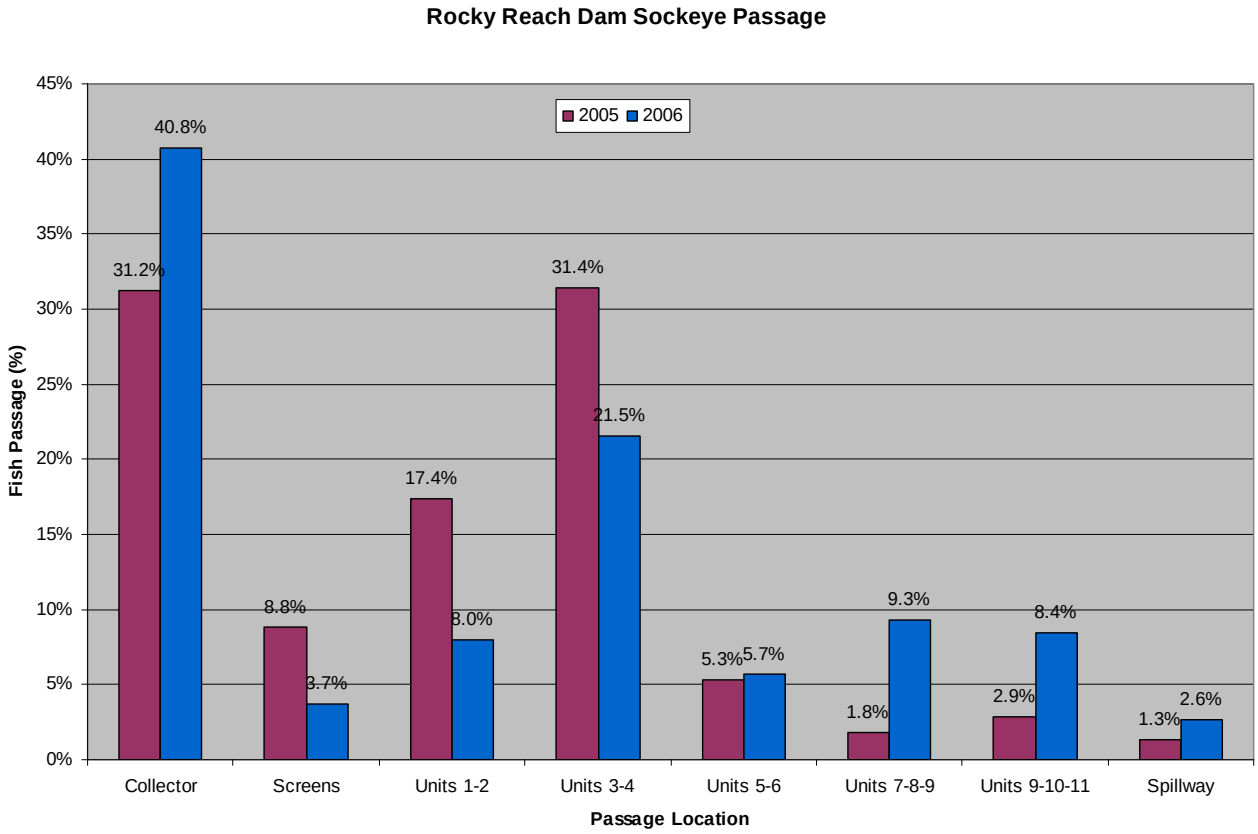


Figure 3. Horizontal passage of juvenile sockeye salmon at Rocky Reach Dam during the entire season (note, spill percentages reflect total season which includes no spill periods). Data from T. Steig, personal communication.

Conditions within the tailrace

The flow pattern in the tailrace emanates from the powerhouse, and generally moves towards the opposite (east) bank, and then proceeds downstream (yellow arrows in Figure 4). When water is flowing through the spillway, there is generally a more "confused"

pattern that sets up, primarily in the vicinity of the downstream edge of the turbine "boils" (personal observation). The strength of the "confused" water is dictated by the total flow coming through the spillway and how it is shaped (which gates it emanates). Another concern is what part of the water column the different (powerhouse versus spill) flows effect. The District's predator control program participants catch pikeminnow only on or near the bottom. Based on the tailrace structures downstream of the spillway, it is highly likely that the water coming from the spillway may not affect the water column near the bottom, and thus have less of an effect on moving predators away from the area compared to turbine flow.

Figure 4. Generalized flow patterns in the Rocky Reach Dam tailrace.

Hypotheses

From the information above, we have formulated the following hypotheses;

Objective 1 (*Maximize survival of juvenile sockeye passing through the powerhouse)*:

H_o: Fish that pass through a turbine that is operating near the maximum flow level (within efficiency bounds) survive (direct survival) at a higher rate than fish that pass through a turbine operating at the lower end of its flow range.

From information obtained from previous studies at Rocky Reach and other projects, there appears to be higher direct survival at higher turbine discharges. This probably occurs because of larger gaps between turbine components (wicket gates, blades, etc.); sometimes called "better geometry."

> H_o: When a block of turbines are run near the maximum flow, the indirect effects (predation) of turbine passage are reduced.

We postulate that by running a block of turbines, it "trains" flow in the tailrace, creating a narrower, higher velocity water column, which would make it more difficult for predators to stage and await smolts passing through the powerhouse. Also, by creating a narrower flow field as compared to a more broad flow field, the edge effects (amount of water column that predators could stage) would be lowered and the fish within this flow stream would have a shorter transit time through the tailrace area.

Objective 2 (*Maximize passage of juvenile sockeye through the fish bypass system)*:

> H_o: More fish will be drawn to and pass through the fish bypass system when turbines at the south end of the powerhouse are passing maximum flow.

Based on both physical and computational modeling, higher flows in the vicinity of the cul de sac will likely increase the flow characteristics (eddy strength and surface currents) that concentrate fish in the area. Greater concentrations of fish in the immediate area of the surface collector entrance will increase the probability of more fish entering and passing through the surface collector.

Spill

Testing in 2004-2006 has shown little benefit to overall juvenile sockeye project- or dam passage survival through spill. Spill passed less than 4% of the juvenile sockeye in 2005 and 2006, and approximately 11% in 2004. Information collected in 2005 (and to a lesser degree in 2006) suggested that survival through the surface collector may have decreased during spill periods.

To conduct this test, we propose not to spill in 2007 because:

- It has shown little overall benefit to the species in terms of survival,

In Figure 5 and 6 below, a comparison is made between Dam survival that was estimated for sockeye in 2005 and 2006, and what the estimate may have been if the fish that went through the spillway were "re-routed" through the surface collector or powerhouse. The information shows that the difference in Dam Passage Survival changed negligibly if the small percentage of fish that went through the spillway went through either the powerhouse or surface collector (Table 1). We have also included a comparison of

visibility between 2005 and 2006 (Figure 7). We will be measuring visibility again this year in the forebay of Rocky Reach Dam.

- We propose another fish release location within the tailrace that is designed to enable us to estimate indirect mortality; this release will not be possible if spilling because of safety concerns.

Our proposed additional release location in the tailrace near the turbine "boils" will enable us to estimate indirect survival between that location and our normal release location (see below). This is the first time this type of estimate of indirect mortality is being attempted to the best of our knowledge. If we are successful in getting estimates with high precision, this could have large implications in ensuring survival standards are reached at Rocky Reach, and potentially other dams. If there is spill during the study period, tailrace conditions will render boating unsafe and the releases would not proceed. Without this release, we would not know the relative importance of tailrace predation to the total survival for powerhouse passage. We would not be able to separate the effect of the turbine operation settings from the total mortality. Without the turbine "boil" release, we would not be able to assess whether the block flow concept (see next bullet) reduces indirect mortality due to predation.

- To be able to evaluate the benefits (reduced predation) of running the powerhouse in blocks of turbines, we need to be able to maintain the desired effect we are trying to create. If spilling, this would not be possible.

By running a block of turbines, we are attempting to create a narrower, higher velocity flow field where predators would have a more difficult time staging, and reducing the area of the "edge" effect, where predators could stage. By spilling water, the flow effect we are attempting to create will not occur, and it will essentially make any subsequent analysis moot.

- To maximize our ability to run the turbines at full flow in blocks of adjacent units, and determine if this operation increases surface collector guidance, we will need all water directed at the powerhouse and surface collector.

If any flow is diverted through the spillway, our ability to be able to analyze whether the additional flow through individual and groups of turbines (see below), will be compromised, in other words, we will be unable to create the conditions we are trying to study. It is also likely that at some hours of the night, spill flow would be greater than powerhouse flow, further reducing our ability to determine if the test condition is increasing survival past the project.

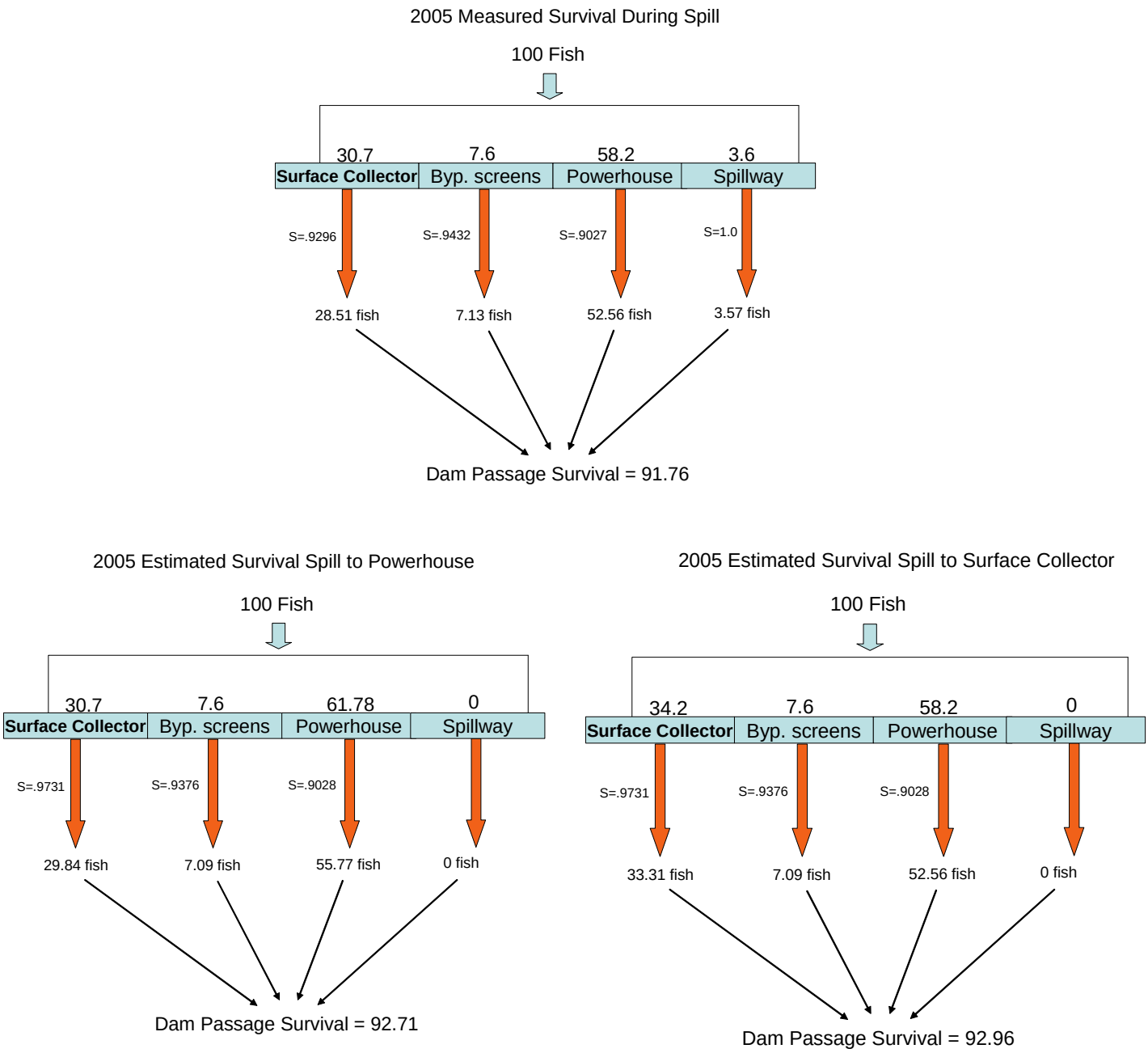


Figure 5. Comparison of measured and estimated dam passage survival when fish that passed through the spillway are theoretically routed either through the powerhouse or surface collector. Note that survival rates for theoretical passages are from the "no-spill" test configurations for 2005.

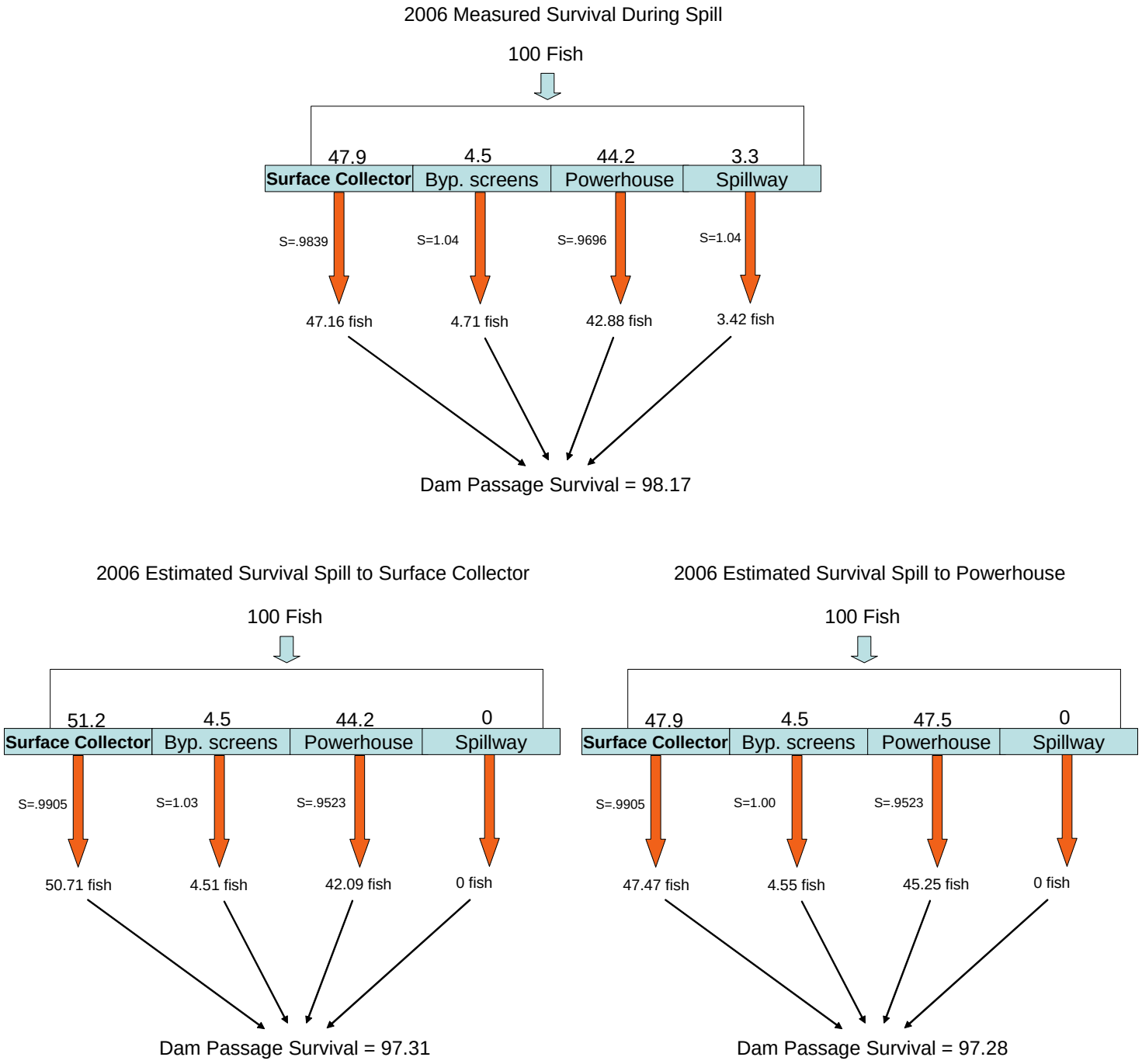


Figure 6. Comparison of measured and estimated dam passage survival when fish that passed through the spillway are theoretically routed either through the powerhouse or surface collector. Note that survival rates for theoretical passages are from the "no-spill" test configurations for 2006.

Table 1. Summary of comparison of measured and estimated dam passage survival when fish that passed through the spillway are theoretically routed either through the powerhouse or surface collector. Note that survival rates for theoretical passages are from the "no-spill" test configurations for 2005 (data from graphs above).

	Percent passage					Route survival					Dam passage
Configuration	**SC**	**Screens**	**PH**	**SP**		**SC**	**Screens**	**PH**	**SP**		**survival**
2005 measured (w/spill)	.3067	.0756	.5822	.0356		.9296	.9432	.9027	1.0022		91.76
2005 est. through PH	.3067	.0756	.6178	0		.9731	.9376	.9028	0		92.71
2006 est. through SC	.3423	.0756	.5822	0		.9731	.9376	.9028	0		92.96
2006 measured (w/spill)	.4793	.0454	.4422	.033		.9839	1.0375	.9696	1.0375		98.17
2006 est. through PH	.4793	.0454	.4752	0		.9905	1.0029	.9523	0		97.28
2006 est. through SC	.5123	.0454	.4422	0		.9905	1.0029	.9523	0		97.31

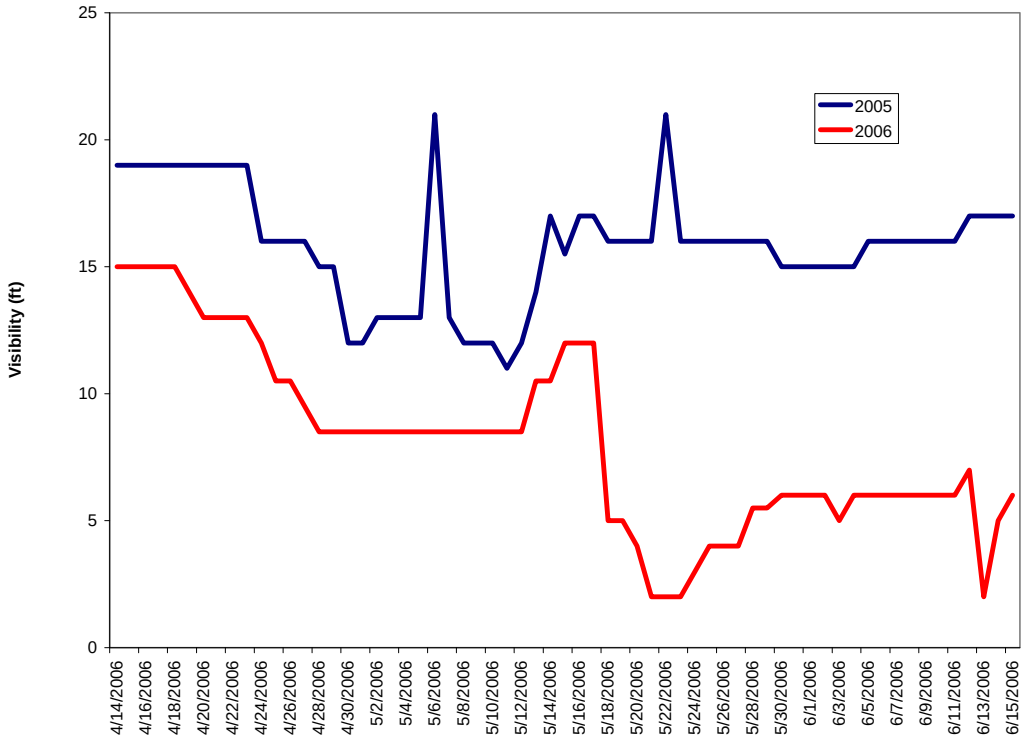


Figure 7. Comparison of visibility from April 14-June 15 between 2005 and 2006, measured in the Rocky Reach Dam forebay.

Potential Effects on Yearling Chinook and Steelhead

One concern of eliminating spill is whether there might be potential effects on other species like yearling Chinook and steelhead. Since 2004, these species have passed Rocky Reach during time periods when there was no spill.

Survival

In 2004, there was a statistically significant decline in survival over the course of the yearling Chinook PIT-tag study at Rocky Reach (P = 0.0132) (Figure 7). There was no significant relationship between project survivals and river flow volume (P = 0.2928). However, there was a statistically significant relationship between survivals and spill volume (P = 0.0182) and survivals and temperature (P = 0.0151; Figure 7).

However, both PIT tag and acoustic tag overall project survival (for all releases) was slightly below the HCP standard of 93% (Table 2).

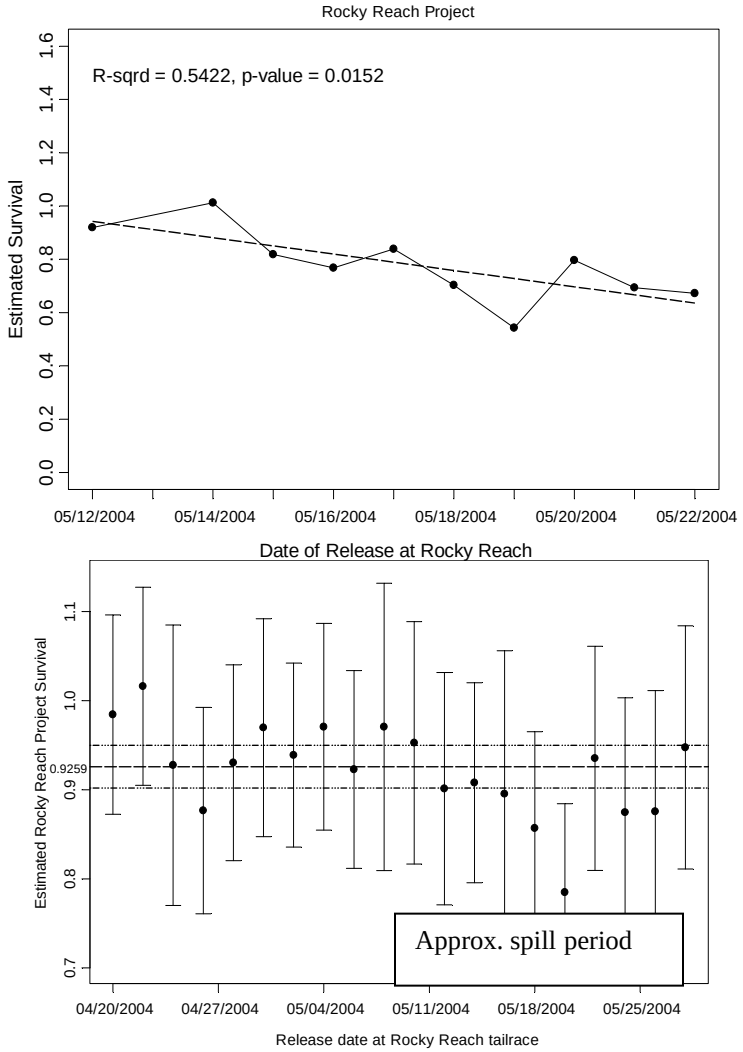
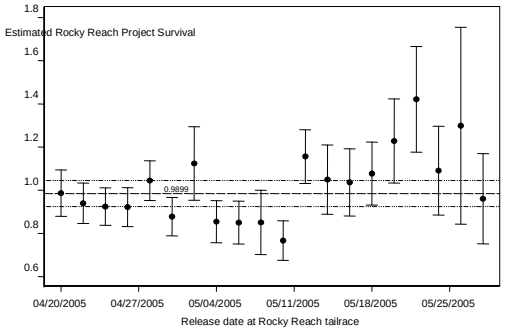


Figure 7. Linear regression of survival over time (upper graph) and patterns of Rocky Reach project survival for yearling Chinook salmon in 2004 by replicate release pairs along a weighted average survival (95% CI; lower graph).

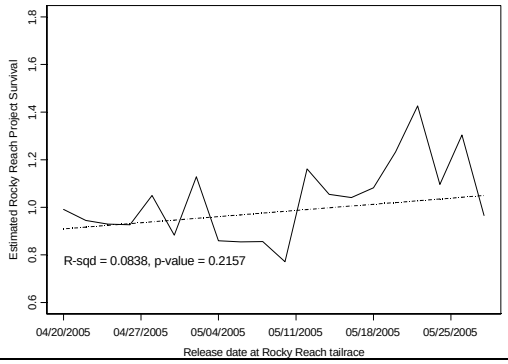
Table 2. Summary of project survival estimates for yearling Chinook and steelhead at Rocky Reach in 2004.

Project	Stock	Method	Survival Estimate	Standard Error
Rocky Reach	Yearling Chinook	PIT-tag	0.9259	0.0123
		Acoustic-tag	0.9293	0.0196
	Steelhead	Acoustic-tag	0.9833	0.0184

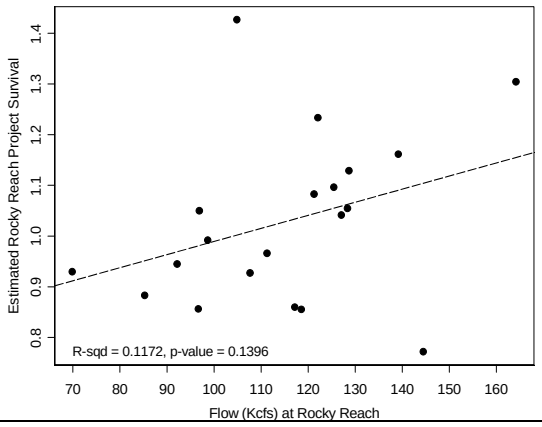
a. Survival by replicate release, along with weighted average survival (95% CI)



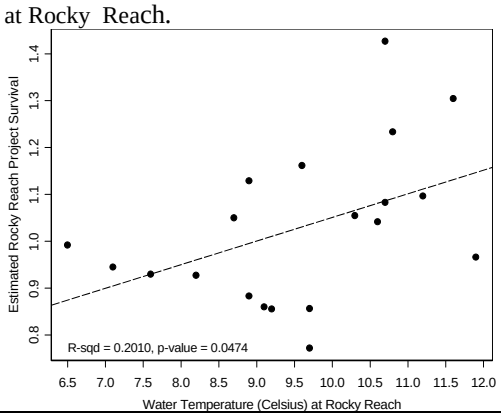
b. Linear regression of survival estimates over time.



c. Linear regression of survival estimates vs. flow at Rocky Reach.



d. Linear regression of survival estimates vs. temperature at Rocky Reach.



e. Linear regression of survival estimates vs. spill at Rocky Reach.

f. Linear regression of survival estimates vs. dissolved gas at Rocky Reach.

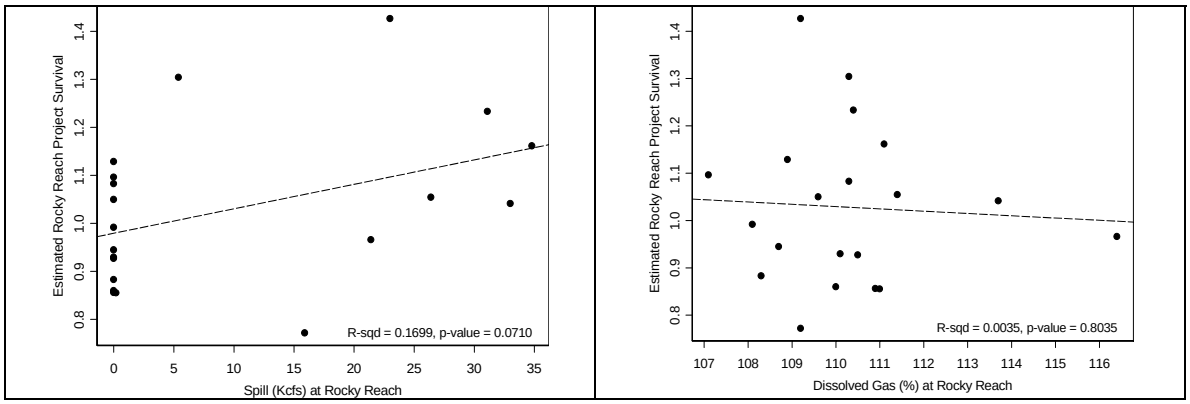


Figure 8. Patterns of Rocky Reach project survival for steelhead in 2005 (a) by replicate release pairs along with weighted average survival (95% CI); (b) linear regression of survivals over time, and survival versus (c) flow, (d) temperature, (e) spill, and (f) dissolved oxygen.

Table 3. Summary of project survival estimates for yearling Chinook and steelhead at Rocky Reach in 2005.

Project	Stock	Method	Survival Estimate	Standard Error
Rocky Reach	Yearling chinook, ROR	Acoustic-tag	0.9109	0.0179
2005	Steelhead, ROR	Acoustic-tag	0.9303	0.0134
	Steelhead, Hatchery	Acoustic-tag	0.8737	0.0182
	Steelhead, Hatchery	PIT-tag	0.9899	0.0308

Route-specific passage

Route-specific passage of steelhead and yearling Chinook has varied over the last three years. For periods when spill is occurring, passage through the spillway have varied between approximately 7-13% for steelhead and 8.5-15% for yearling Chinook (no tagged Chinook in 2006).

Coupling the information on route-specific passage and project survival above does not show any potential problems during no spill periods.

Table 4. Summary of juvenile steelhead and yearling Chinook route-specific passage at Rocky Reach during spill and non-spill periods, 2004-2006 (Steig et al. 2005, 2006, and 2007).

	Non-spill	**spill**		**Non-spill**	**spill**
	Stlhd – 2004			**Chin – 2004**	
SC	68.7	65.6		26.2	26.8
Screens	3	3.7		5.4	6.5
1&2	18.9	6.1		39.5	22.3
3-11	9.3	16.3		28.9	29.1
Spill		8.3		0	15.3

	Stlhd (ROR) – 2005			**Chin – 2005**	
SC	64.4	74.3		31.8	33.8
Screens	7.3	6.8		10.4	11.3
1&2	7.6	2.7		15.4	12.7
3-11	20.6	9.5		42.4	33.8
Spill		6.8			8.5
	Stlhd - 2006				
SC	66.1	61			
Screens	3.4	3.7			
1&2	6	1.8			
3-11	24.4	20.12			
Spill	0	13.4			

Proposal

Individual turbines:

We propose to put "soft constraints" on all individual turbines (including C1 and C2) and they should be run between 15-17 kcfs during the "test" condition.

During the "no test" condition, all turbines will be run as they normally would through the optimization program, "Waterview." Turbine priority and settings for turbines C1 and C2 will be the same (soft constraint to operate at 12 kcfs) as used during the 2005 and 2006 sockeye studies during the test condition.

Powerhouse:

We propose to put "soft constraints" on the use of turbines during the "test" condition. During this condition, Unit C1 (unit closest to the bypass entrance) would be the first on and the last off. As total river flow increases, Unit C2 and upper units would be added sequentially moving north (higher numbered units) up to the target discharge, as flow increases. Essentially the same operation will occur as river flow decreases, only in reverse order from upper units to lower units, thus maintaining the desired test condition to have a sequential block of adjacent turbines operating.

During the "no test" condition, powerhouse turbine priority will be similar, except that flow will be spread through more turbines operating at lower flows, as selected by "Waterview".

System Design

The acoustic tag methods used to monitor fish movements at the various detection sites in 2007 will be very similar to those employed at Rocky Reach Project during studies the last few years (Steig et al. 2005; Skalski et al. 2005, 2006).

Each Acoustic Tag Receiver (ATR) system can determine the presence of tagged fish. The ATR system supports up to 16 hydrophones and operates at 307 kHz, which has been found to be an optimum frequency for use at the numerous hydropower dams where the system has been used to date. The ATR receives and automatically stores tag detections for each hydrophone simultaneously. Received signals will be synchronized at all detection sites in order to determine time of arrival for each detected pulse.

Wells to Rocky Reach Acoustic Systems –

ATR systems will be deployed in the river downstream of Wells Dam at the Rocky Reach Dam boat restriction zone (BRZ) in the (forebay), and dual systems at various locations on Rocky Reach Dam to cover available passage routes. The primary objective of these systems is to detect acoustically tagged fish for the survival estimates. The information from these sites will also be used to evaluate differences in survival and fish distribution.

Rocky Reach to Rock Island Acoustic Systems –

ATR systems will be deployed in the river downstream of Rocky Reach Dam at Rock Island Hydro Park, in the river upstream of Rock Island Dam at the BRZ, and at various locations in the forebay of Rock Island Dam. The primary objective of these systems is to detect acoustically tagged fish for the Rocky Reach survival estimates.

Acoustic Tags –

For the 2007 survival study the HTI Model 795m Acoustic Tags will be used for ROR sockeye. These tags will be approximately 6.8 mm in diameter by 16.5 mm long, and will average 0.75 g in air, with an average operating life of from 15 – 21 days (based on 2004-2006 tag life tests). Assuming that the test fish will be similar in size to the fish tagged in 2004 - 2006, the Model 795m tag will range from 1.4% - 7.5% of the fish body weight. Ping rate, pulse width, and individual tag ID will be programmed in the field. Up to 50,000 individual tags can be uniquely coded. The transmission rate (i.e. ping rate) can be set from 3 pings/sec to 1 ping every 16 sec, with pulse widths from 0.5 msec to 5 msec, with either a standard CW pulse or an encoded pulse. For the 2007 survival study, the ping rate will most likely be set at 1 ping every 4-8 sec, with a pulse width of 0.5 msec.

System Setup

The ATR systems and equipment require installation and testing. Hydroacoustic Technology, Inc. (HTI) will be responsible for these installations with the assistance of the District personnel. The installation of some of the hydrophones will require the assistance of District mechanics.

Fish Handling

In most cases, all aspects of fish handling (i.e., collection, transport, tagging, holding, and release) will be consistent with the protocols used during the each of the juvenile survival evaluations from 1999 – 2006. For further details, see Stevenson et al. (2000) and Skalski et al. (2001). Holding and release protocol for the horizontally distributed tailrace

releases (in the Rocky Reach tailrace) will require separation of fish into smaller batches (5-6 fish per batch) for post-tagging holding and release.

Collection and Transport –

Sockeye used in the survival estimation will be ROR collected from the juvenile bypass collector at Rocky Reach Dam. All fish will be captured and transferred into a 275-gallon tank for transport to the fish tagging sites daily throughout the study. Fish will be transferred through a 4 in flex-hose directly from the transport tank into 35-gallon tanks at the tagging sites where densities will be less than 3 fish/gallon. Fish will be enumerated as they are captured. The target number of fish to be captured for each daily sample will be within 20% of the daily sample.

All fish transfers will be water-to-water transfers to reduce the likelihood of injuries during transport. The transfers will occur in the morning and fish will be held overnight to allow them to recover from the stress of transport prior to tagging. ROR sockeye will be held over two nights to allow them to recover from the transportation stress. To insure that the fish in the holding tank are receiving sufficient flow and that dissolved oxygen levels remain between 7 and 12 PPM, tag site monitors (District personnel) will record these levels. Tag site monitors will be present 24 h/d while fish are being held at the tagging sites.

Fish Tagging and Post-Tag Holding –

For all experimental groups, handling protocols are standardized to reduce the potential for bias (i.e. fish length, number of times handled, tagging procedures, transport methods, transport time, tagging procedures, and release protocol). All acoustic transmitters will be surgically implanted. The minimum size for sockeye will be 100 mm in length.

Tagging consists of three steps: (1) pre-operative MS-222 bath, (2) implantation of the acoustic tag, and (3) post-operative recovery. At the time of tagging, fish will be transferred by a dip net with a water sanctuary to an anesthetic tank containing a 100-mg/l solution of MS-222. Once anesthetized, the fish will be inspected. Those with obvious injuries, deformations, or >20% scale loss will be rejected. The acoustic tags will be surgically implanted into the fish after making a small incision (~ 1 cm) into the body cavity. The incision is stitched using a 5/0 coated Vicryl suture after implanting the tag. The wound is then irrigated with an oxytetracycline solution. The time from knockout to recovery will be 5-7 min.

To the extent possible, selection criteria of fish that will be tagged for the survival study will be standardized to eliminate potential bias associated with differential size, health, condition, etc. However, the limited number of fish available for tagging will limit the ability of the tagging crew to be selective regarding the size of tagged fish. All fish, regardless of source, stock, species or release site will be held for up to 48 hours after tagging to allow ample recovery from the tagging procedure and to identify and remove individuals that succumb to post-tagging mortality, and to identify pre-mature acoustic tag failure should it exist. Observations from past studies indicate that fish mortality due

to complications associated with the surgical procedure typically occur within 24 hours of tagging, and early tag failures within 48 hours. Acoustic tagged ROR sockeye, for the historical release method, will be held in separate 35-gallon containers. Sockeye for the alternative horizontally distributed release (in the Rocky Reach tailrace)will be held in groups of 5 fish per container. All groups of fish will be held in densities of less than 3 fish/gallon and supplied with fresh, de-nitrified river water and water temperature and dissolved oxygen levels will be recorded hourly throughout the holding period by tag site monitors.

Fish Releases

A 1-day lag period will be applied between tagging/release dates at Wells and Rocky Reach dams, to account for fish migration time between the projects. This is necessary to ensure adequate mixing of the test groups, an assumption of the statistical survival model employed. The various groups will be released as follows:

For all release sites, when the release crew arrives in the morning, they will use a periscope and siphon device to search for shed tags or dead fish in the bottom of the tanks. Shed tags or dead fish will be removed from the tanks prior to release. Before the release boat leaves the dock, the water source for the fish in the release tanks will be transferred from the electric, shore based, pump to the diesel pump located on the release boat. The release boat will then proceed to a point in the river approximately 1,000 feet below the project. When the release boat is in position, the motor will be put into neutral (to stop the propeller from spinning) and the fish will be released Sockeye tailrace releases will occur between 0730 and 0930 hours. The alternative horizontally distributed release procedure will be similar, except they will be held in groups of five fish per container. Each container will be released at a different horizontal location.

Smolt Health Monitoring –

Data will be collected on the external health of the smolts during the study. Data for each test group will be compared with other respective release groups and controls to expose potential differences in health and stress of study animals. Sampling will be conducted on all release groups. The length and weight of every tagged fish will be recorded.

Data Collection

Received signals will be synchronized in order to determine time of arrival for each detected pulse. The individual echoes will be entered in digital format into a database using the HTI software package *MarkTag*. Acoustic tag systems at Rocky Reach BRZ, Rocky Reach Dam, Rock Island Hydro Park, Rock Island BRZ, Rock Island Dam, Crescent Bar and Sunland Estates (the last two are for Rock Island testing only) will all be monitored and maintained by HTI.

Data Analysis

There are three phases associated with preparing the databases required for the survival analyses: I) data detection during the field season; II) data marking and tracking during and after the field season; and III) data quality control during and after the field season. The specific data processing steps included in each phase are listed below:

Phase I. Data detection during the field season

1. Detection of acoustic tag codes for each fish in all release groups.
2. Verification and data input of all the fish and tag release data.
3. Continuous verification of the operation of all of the ATR systems.
4. Collection and backup of all raw acoustic tag data.

Phase II. Data marking and tracking during and after the field season

5. All acoustic tag data files will be tracked using the MarkTags tracking software. Lists of all detected fish will be determined daily.

Phase III. Data quality control during and after the field season

6. The data will be constantly verified during and after the field season to ensure the integrity of the acoustic tag database.
7. The Project Leaders in charge of each of the study objectives will review the data on a daily basis.

Statistical Analysis

Statistical support will be provided by Dr. John Skalski, and consists of the tasks that are described below. The intent of these tasks is to provide integrated statistical support from study design through data analysis, and interpretation of results. These tasks will be coordinated with the field efforts of HTI.

Task 1 – Develop the likelihood models used in the analysis of the acoustic tag data. The likelihood models for the acoustic tag analyses will be based on the statistical principles reported in Skalski et al. (1998). The statistical models are uniquely tailored for each study, taking into account detection locations, passage routes at the hydroelectric projects and release locations (Skalski et al. 2006). The 2007 statistical models will be modifications of the 1999-2005 methods. The 2007 statistical model will incorporate a route specific survival design based on the triple release method (Skalski et al. 2005b). The 2007 statistical model will also present the methods that will be used to analyze the comparisons between the historical and alternative tailrace release methods and incorporation of the alternative release fish into the survival study. Statistical

development will precede the field study to assure the data generated by the field studies will be compatible with model structure and design specifications.

Task 2 – Process the in-season acoustic tag data to monitor the progression of the studies.

Task 3 – Perform the actual survival analysis of the acoustic releases. A modified Cormack-Jolly-Seber analysis will be used to estimate project survival using the acoustic tag data (Cormack 1964; Jolly 1965; Seber 1965). Tests of model assumptions will be performed. Standard errors and confidence intervals will be provided for the estimated parameters. Estimates will be provided for each of the replicate release-pairs along with modeling to identify the most parsimonious (and most precise) model that adequately describes the data. Seasonal average will be computed along with associated standard error. Tests of assumptions will be based on Burnham tests 1-3 (Burnham et al. 1987) along with Chi-square tests of mixing. Between year comparisons of survival estimates will be performed.

Task 4 – Determine length distributions of steelhead and sockeye comparing the tagged fish and the run at large collected during sampling efforts at the Rocky Reach Juvenile Sampling Facility.

Report Preparation

Preliminary raw acoustic tag survival estimates for ROR sockeye will be available by August 15, 2007.

Two reports will be drafted:

1. One will include project survival estimates for ROR sockeye and will include estimates derived from acoustic tag methodologies, travel time and detection rate evaluation.

2. The second will include estimates of route specific survival with the various comparisons that will be possible (see below).

A preliminary draft report will be completed by October 15, 2007 for review by the District. Draft reports will be completed by November 1, 2007 for distribution to the HCP Coordinating Committee for review, and final reports will be submitted to the District by January 31, 2008.

Termination of Acoustic Tag Survival Study

If all the protocols are followed and unanticipated or unaccounted for problems arise (i.e. high post-tag mortalities), the District will consult with the HCP CC to discuss termination of the survival study.

Schedule:

During the study period, we propose to alternate between the "test" and "no test" condition using a randomized block design experiment.

This study will be conducted for 24 days (start date depends on sockeye arrival) in six blocks, with 4 days in each block (an example shown in Table 5). Within each 4-day test block, test conditions will be on two days, and off two days, in a randomized pattern. The randomized block design will be used to eliminate any potential confounding of treatment conditions with seasonal trends in survival.

Concurrently, the triple-release design will be used to estimate absolute survival through the surface collector. In turn, the downstream detections from the paired releases in the surface collector and proportion of fish through each route will be used to estimate absolute survival through the bypass screens, powerhouse, and spillway.

Block 1		**Block 2**		**Block 3**		**Block 4**		**Block 5**		**Block 6**	
T	NT	NT	T	T	NT	T	NT	NT	T	NT	T
1,2	3,4	5,6	7,8	9,10	11,12	13,14	15,16	17,18	19,20	21,22	23,24

Table 5. Block treatment design example showing a randomly chosen order of no test (NT) and test (T) treatments (each treatment is 2-days in duration) during the 24-day juvenile sockeye salmon test at Rocky Reach Dam in 2007.

Fish releases

Juvenile sockeye salmon will be released as shown in Table 6 and Figure 9:

Release location	**Number of Tagged fish released**	**Purpose**	**Comment**
Wells Tailrace	500	Test release – Project survival	Normal release site
Surface Collector	500	Test release – Route-specific survival	Consistent with previous years
Rocky Reach tailrace			
Release 1	500	Test release – Route- and Project survival	Consistent with previous years
Release 2	500	Indirect Survival	Downstream of turbine "boil"
Release 3	500	Test of Control site	Compared to Release 1
Bucket	50	Tag life	

Table 6. Proposed release locations for juvenile sockeye studies in 2007 at Rocky Reach Project.

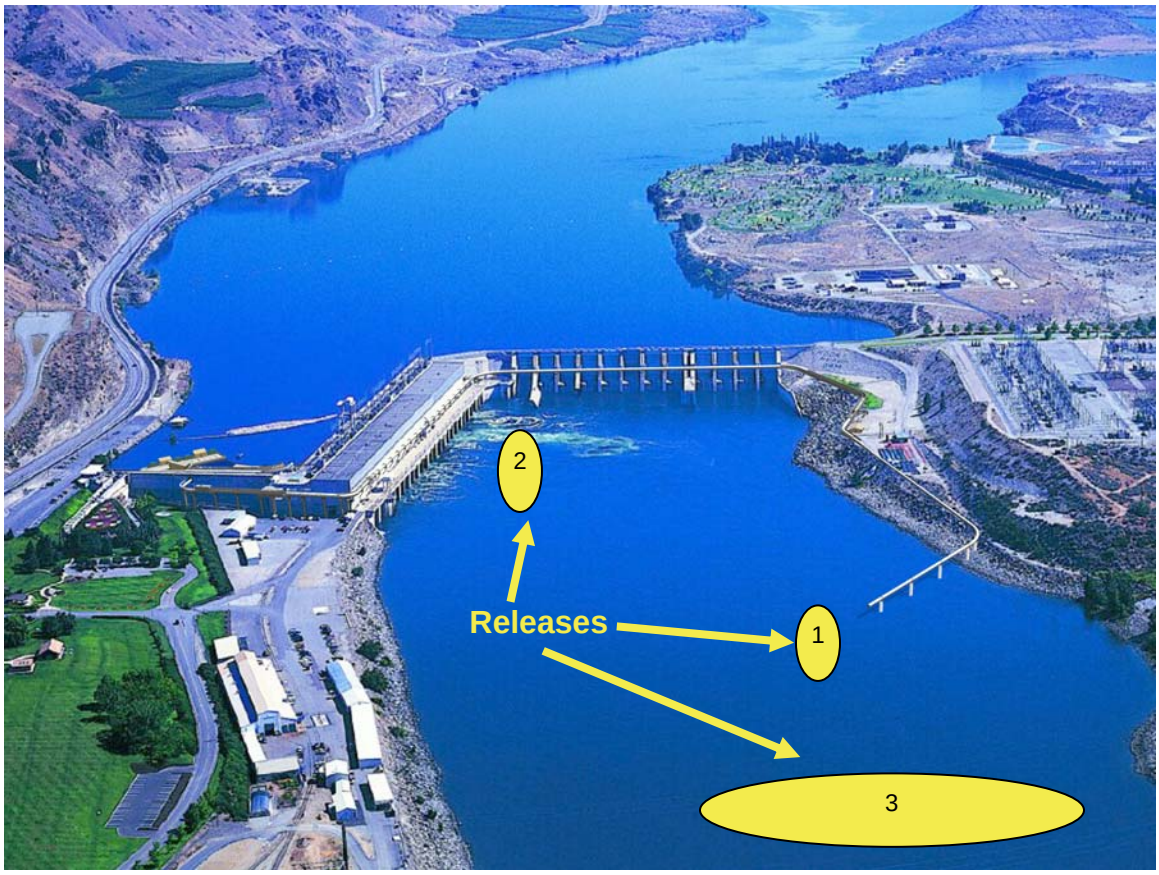
Analysis

Survival estimates will rely on methods described in previous reports (see Skalski et al. 2006). However, identifying which estimates will be made could be useful to ensure all possible analyses are considered. In Table 7, we show the potential estimates.

	Wells Tailrace	Surface Collector	Tailrace 1	Tailrace 2	Tailrace 3
Wells Tailrace			x		x
Surface Collector			x		x
Tailrace 1	x	x		x	
Tailrace 2			x		x
Tailrace 3	x	x		x	

Table 7. Potential survival estimates based on release location.

For project survival, we propose to release fish in the middle of the river in the Wells tailrace because the comparisons in 2005 between multi releases across the tailrace and the historic release location showed that to be a good representative site.



Note: Release number 3 will be done at the same vicinity (except distributed horizontally) as release number 1. They are separated above for illustrative purposes.

Figure 9. Proposed release sites of sockeye in the tailrace of Rocky Reach Dam, 2007.

Parallel Paths

Based on discussions with the HCP CC, FBOT will pursue additional information needs, as they are identified. This could include additional modeling of flows in the tailrace or forebay, discussions of additional structures in the forebay, or other ideas that may increase the survival of juvenile sockeye through Rocky Reach.

Discussion

Direct versus indirect survival

We postulate that the actions proposed on turbine operations (both individually and in blocks) will increase both direct and indirect survival of sockeye passing through Rocky Reach Dam. However, from Normandeau and Skalski (1996), survival decreased at the highest flow tested. Whether this is a real drop in survival at the higher flow at Rocky Reach is difficult to determine. In 1996, Unit 6 (the first turbine with the new design installed) was not complete. The feature of a "3-D Cam" had not been installed when the tests were conducted. The "3-D Cam" feature allows the pitch of the turbine blades and opening of the wicket gates to track automatically (in "real time") with the changes in hydraulic head that occur continuously. This may have been a factor in the survival estimates that were generated and whether the highest survival would have been achieved with the highest discharge is not known.

However, indirect mortality may be a larger factor affecting survival of sockeye passing Rocky Reach Dam than actual turbine passage. In 2005, survival of sockeye passing through the powerhouse was approximately 90%, while in 2006, it was approximately 95%. Various phenomenon might help explain this difference. Average flows were higher in 2006 compared to 2005 (see above), and consequently flows through the powerhouse were greater. However, the majority of fish still passed through the first four units (Figure 3), with more fish passing through the higher numbered units in 2006. Turbidity was also much different between years, with much less visibility in 2006 compared to 2005.

We postulate that the increased flow through the tailrace and decrease in visibility decreased predation of fish in the tailrace and increased indirect survival. While we have no control over the visibility, our proposal will attempt to create tailrace conditions (that are manageable) that should decrease predation of fish entrained in the bulk flow created by using a block of turbines.

Likelihood of implementation

In January, 2007, the current forecast is that the snow pack will end up near 90% of normal. While actual run-off is impossible to predict because of the influence of

continued precipitation and weather, it is likely we will be able to perform the study in 2007 without having to spill water because of exceeding the hydraulic capacity of the powerhouse (about 200 kcfs).

In Figure 10, we evaluated what percent of the time flows exceeded 200 kcfs (a refined estimate of powerhouse capacity) between 1973 and 2003 during May. For the 30-year record that we examined, flows exceeding 200 kcfs only occurred approximately 10% of the time. Based on this analysis, it is highly likely that if the test condition is successful in increasing survival of fish passing Rocky Reach, we will be able to implement the test condition over 90% of the time in May.

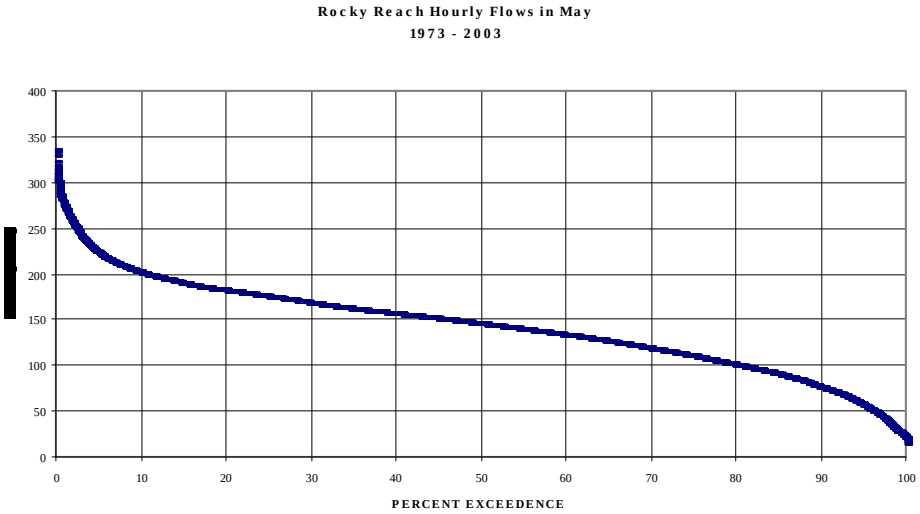


Figure 10. Exceedence curve for hourly flows at Rocky Reach Dam between 1973 and 2003.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: April 25, 2007

Re: Final Minutes of March 27, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, March 27, 2007, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final minutes approved at the meeting to the Committees (Item I) and will forward the final January and February Hatchery Committees meeting minutes (Item II).
- Mike Schiewe will call Tom Scribner to notify him of the status of the Passive Integrated Transponder tag (PIT-tag) detector installation in Peshastin Creek and the Entiat River (Item II).
- Ali Wick will begin forwarding Chelan PUD's Engineering Reports to the Coordinating Committees (Item II).
- Tom Kahler will send out the final Wells radio-telemetry study with minor edits (Item III-A).
- Chuck Peven will send the Committees information comparing spring Chinook and coho salmon passage timing at Rocky Reach and Rock Island dams. (Item VI-B).
- Shaun Seaman will send out a list of issues that would be addressed in a potential statement of agreement (SOA) for coho surrogacy (VI-B).
- Ali Wick will send out the information for the call on coho surrogacy on April 13 at 9:30 am, and will include the Hatchery Committees on the meeting invitation (Item VI-B).

DECISION SUMMARY

- The Committees approved the SOA accepting the study plan *Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007* (Item III-A).
- The Committees approved the SOA accepting the *2007 Fish Spill Plan, Rocky Reach and Rock Island Dams* (Item IV-A).
- The Committees approved the SOA accepting the *Study Plan for the Rocky Reach Juvenile Fish Bypass System* (Item IV-B).

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the February 27 Meeting Minutes and the March 15 Conference Call minutes as amended at the meeting. Ali Wick will distribute the final minutes by email to the Committees.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items (the final January and February Hatchery Committee meeting minutes will be forwarded to the Coordinating Committees for their information):

- The Hatchery Evaluation Technical Team (HETT) is focusing on these items:
  - Providing a memorandum regarding the implications of less than 100 percent marking for summer Chinook. The HETT does not recommend a partial mark for most releases of summer Chinook reared at the Eastbank Fish Hatchery Complex due to the precision required for evaluation of Monitoring and Evaluation (M&E) objectives.
  - Redrafting Objective 9 (effect of supplementation on disease prevalence) to encompass evaluating hatchery/wild interactions and within-hatchery effects.
  - Discussing how to address Objective 10 (effect of supplementation on non-target taxa of concern [NTTOC]); the Hatchery Committees are currently evaluating the proposed NTTOC process and the time commitment required to complete it.
  - Identifying reference streams for steelhead and spring Chinook:
    - Recommendations forthcoming in May after a work session in April

        - Efforts to install PIT-tag detectors this spring, but weather and high river flows may limit potential to install these this year; Mike Schiewe will call Tom Scribner to notify him of this situation
    - Preparing a recommendation to the Hatchery Committees not to PIT-tag Skaha sockeye production to evaluate downstream survival
    - Preparing the Final 2006 M&E Annual Report, which will be submitted to the Hatchery Committees by May 15
- The Committees received an update from the Washington Department of Fish and Wildlife (WDFW) on broodstock disposition for the 2006 Chiwawa spring Chinook and Wenatchee summer Chinook.
- The Committees received an update from WDFW and Douglas PUD on recent evaluations of capacity at Methow Hatchery.
- The Colville Tribes are proposing to release Wells summer steelhead smolts into Salmon Creek as well as Omak Creek, and the Committees agreed with this, given there is an adequate rearing and release plan with sufficient water to limit stranding.
- The Committees received updates on Douglas PUD's plans to install a full complement of panels at the Twisp weir, which will be installed as soon as flows permit.
- The Committees will soon be reviewing the spring Chinook population structure analyses from geneticist Ken Warheit for the Methow subbasin.
- The Committees received updates from Chelan PUD on recent engineering/facilities work at hatchery facilities. The Committees will soon receive some requests for letters to the Washington State Department of Ecology (Ecology) in support of Chelan PUD's water rights applications.
- Based on a HETT recommendation, the Committees decided for 2007 that they will not pursue PIT-tagging of Skaha fish.

The Coordinating Committees requested that Ali Wick begin forwarding the monthly Chelan PUD Engineering Reports to them, for their information.

Mike Schiewe has been requested to provide a presentation to the Upper Columbia River Salmon Recovery Funding Board regarding HCP progress and process. The Hatchery Committees have provided their agreement with this, and the Coordinating Committees agreed today that they are on board with this as well.

Mike Schiewe updated the group that the Tributary Committees have approved their funding policies and processes for this funding cycle and preproposals for potential projects are due June 1. They will provide site tours for potential projects on June 25 through 28. Bob Bugert will soon be phasing out of his responsibilities with the Tributary Committees and the Committees will discuss their new approach for facilitation at their April meeting.

III. DECISION ITEMS - Douglas PUD (Rick Klinge)

A. Statement of Agreement for the Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007

Rick Klinge introduced the SOA for the revised study plan, *Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007* (Attachment B). The Committees discussed this plan on the conference call on March 15. The Committees approved the SOA and the study with minor edits to the study plan as discussed at today's meeting. Tom Kahler will send out the final telemetry study plan with these edits incorporated.

IV. DECISION ITEMS - Chelan PUD (Shaun Seaman)

A. Statement of Agreement for 2007 Fish Spill Plan, Rocky Reach and Rock Island Dams

Shaun Seaman presented the SOA for the *2007 Fish Spill Plan, Rocky Reach and Rock Island Dams* (Attachment C). The Committees approved the SOA and the plan.

B. Statement of Agreement for the Study Plan for the Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2007

Shaun Seaman introduced the SOA for the *Study Plan for the Rocky Reach Juvenile Fish Bypass Systems* (Attachment D). The Committees approved the SOA and the plan.

V. Douglas PUD (Rick Klinge)

A. Update on West Ladder Outage

Rick Klinge updated the group that Douglas PUD recently conducted maintenance on the Wells west fish ladder in March. As expected, this was a quiet period for passage and the maintenance was to be completed and the ladder back in service by the end of the week.

B. CRITFC Request for Access to Wells Dam for Sockeye Scale Sampling

Rick Klinge updated the Committees that Douglas PUD has received its annual request from the Columbia River Intertribal Fish Commission (CRITFC) for access to the Wells Dam for scale sampling. The Committees indicated their concurrence with this request.

VI. Chelan PUD (Shaun Seaman)

A. CRITFC Request for Access to Tumwater Dam for Sockeye Scale Sampling

Chuck Peven updated the Committees that Chelan PUD has also received a request from CRITFC for access to Tumwater Dam for scale sampling. The Committees indicated their concurrence with this request. CRITFC staff also proposed the temporary installation of a PIT-tag detector at Tumwater Dam. Peven briefed the Committees that he informed CRITFC that any installation would have to be approved by the HCP Hatchery Committees, and that without an evaluation of fish behavior (like the one currently being conducted by Chelan PUD) it is unlikely that the Committees would approve installing any new detector device.

B. Coho Surrogacy Discussion

Shaun Seaman updated the group that Chelan PUD and the Yakama Nation would like additional time (probably until the end of April) to consider the decision for deferring or reaching a decision on the status of coho salmon as a Plan Species that requires mitigation. The Coordinating Committees' role in the decision will be considering the potential use of spring Chinook as a surrogate for an initial phase designation. The Committees indicated their agreement with the time delay. Bryan Nordlund requested that Chuck Peven send the Committees any information comparing spring Chinook and coho passage timing in order to determine whether conditions being provided for spring Chinook would be adequate to cover coho passage. Jerry Marco indicated that it was important to follow the language in the HCP regarding the potential use of a surrogate species for phase designation. The

Committees discussed the need for a future check in survival study with coho if a decision is made that initial phase designation would be based upon surrogacy. To facilitate more discussion on this, Shaun Seaman will send out a list of issues that would be addressed in a potential SOA for coho surrogacy. The Committees scheduled a conference call to discuss this further on Friday, April 13 at 9:30 am. Ali Wick will send out the information for this call and will include the Hatchery Committees on the meeting invitation.

Mike Schiewe confirmed that phase designation check-ins are scheduled every 10 years (after initial phase designation), and hatchery check-ins will first occur in 2013. The Committees will continue to discuss these coho surrogacy issues in April.

C. Recent Documents

Shaun Seaman updated the Committees that a document has been circulated describing additional information that will be collected via the *Study Plan for Monitoring Route Specific Fish Passage Using Acoustic Tag Methodologies at Rock Island Dam in 2007*. This study does not require formal Committees approval because it will analyze fish data being collected for other studies, and no new fish releases are required.

Also, there was a supplement sent out to the 2007 Rocky Reach Study Plan, which discussed contingencies dealing with release locations. Chuck Peven reviewed the information in this supplement with the Committees for their information.

VII. HCP Committees Administration (Mike Schiewe)

A. Newsletter/Brochure

Douglas and Chelan PUDs are still working on a mock-up handout to explain ongoing developments in the HCP process.

B. Mid-Columbia Forum

Mike Schiewe updated the Committees that he did not get any response on the letter to the non-signatory parties (American Rivers and the Confederated Tribes of the Umatilla Indian Reservation) regarding their interest a Mid-Columbia Forum meeting; thus, no forum will be held this year.

C. Meeting Schedule

The upcoming meeting schedule is set as follows:

- April 24 in SeaTac – 12:30 pm to 4:00 pm
- May 22 at Rock Island Dam – 9:30 am to about 2 pm
- June 26 in SeaTac – 12:30 pm to 4:00 pm

List of Attachments

Attachment A – List of Attendees

Attachment B – Approval of Study Plan *Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007,* revised March 15, 2007

Attachment C – Statement of Agreement – Approval of the *2007 Fish Spill Plan, Rocky Reach and Rock Island Dams*

Attachment D - Statement of Agreement – Approval of the *Study Plan for the Rocky Reach Juvenile Fish Bypass System 2007*

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Brian Cates *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

APPROVAL OF STUDY PLAN *EVALUATION OF SUMMER CHINOOK PASSAGE TIMES THROUGH THE WELLS DAM FISHWAY COLLECTION GALLERY 2007,* REVISED MARCH 15, 2007

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County

Approval of Study Plan "Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007", (revised March 15, 2007)

27 March 2007

Statement

The Wells HCP Coordinating Committee approves the study plan, "Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007", dated March 15, 2007 (as revised) to evaluate passage times of summer Chinook in the Wells Dam ladder Collection Gallery.

Background: The District has worked with the Wells HCP Coordinating Committee (HCP-CC) to develop a simple flow-guidance improvement to the Wells ladder Collection Gallery for ascending fish. In December 2006, a demonstration of a guidance baffle was tested by Northwest Hydraulic Consultants in North Vancouver, British Columbia. This demonstration was attended by some of the membership of the HCP-CC. The tests demonstrated that the placement of a flow guiding baffle at the upper portions of the collection chamber will provide an improvement to attraction flow for fish to locate the series of weirs and pools of the ladder. The HCP-CC approved the design of a baffle and recommended the construction of this baffle in the East Ladder for the 2007 fish passage season to allow a comparison of travel times between the East ladder with baffles and the West Ladder without baffles (HCP-CC SOA on January 23, 2007). A draft study to compare travel times of ascending fish through the collection galleries was submitted to the HCP-CC for review on February 27, 2007. This plan was discussed during a HCP-CC conference call on March 15. Modifications to the draft plan were made per recommendation of the HCP-CC, and a second draft was submitted on March 15. The HCP-CC is supportive of this study to evaluate the expected improvements to passage time for summer Chinook at Wells Dam in 2007.

ATTACHMENT C

STATEMENT OF AGREEMENT FOR APPROVAL OF THE *2007 FISH SPILL PLAN, ROCKY REACH AND ROCK ISLAND DAMS*

FINAL

March 27, 2007

Statement of Agreement – Approval of the 2007 Fish Spill Plan, Rocky Reach and Rock Island Dams
Rocky Reach and Rock Island HCP Coordinating Committees

Agreement Statement:
The Rocky Reach and Rock Island HCP Coordinating Committees approve the plan and agree that Chelan PUD should implement the work in the document entitled, **"2007 Fish Spill Plan, Rocky Reach and Rock Island Dams."**

ATTACHMENT D

STATEMENT OF AGREEMENT FOR APPROVAL OF THE *STUDY PLAN FOR THE ROCKY REACH JUVENILE FISH BYPASS SYSTEM 2007*

FINAL

March 27, 2007

Statement of Agreement – Approval of the Study Plan for the Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2007
Rocky Reach HCP Coordinating Committees

Agreement Statement:
The Rocky Reach HCP Coordinating Committee approves the study plan and agrees that Chelan PUD should implement the work in the document entitled, **"Study Plan for the Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2007."**

Anchor Environmental, L.L.C.
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Phone 206.287.9130
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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: May 23, 2007

Re: Final Minutes of April 24, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, April 24, 2007, from 12:30 pm to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final minutes approved at the meeting to the Committees (Item I).
- Mike Schiewe will contact Bob Bugert regarding the role of the Tributary Committees members in selecting a new Tributary Committees chairperson.
- Chuck Peven will provide the link to the U.S. Fish and Wildlife Service (USFWS) review of hatcheries in north-central Washington for distribution to this group and to the Hatchery Committees (Item II).

DECISION SUMMARY

- There were no decision items at this meeting.

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the March 27 Meeting Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Committees received an update from the Washington Department of Fish and Wildlife (WDFW) on their recent genetics work in the HCP subbasins. Full reports are available on the Anchor ftp site.
- Chuck Peven has recently received the USFWS review of hatcheries in north-central Washington. (Peven will provide the link to this document to Ali Wick for distribution to this group and to the Hatchery Committees. At today's meeting, the Coordinating Committees discussed how these types of documents relate to the HCP process. They discussed that these documents will be reviewed and any recommendations considered, but that the HCP Committees will continue to guide HCP decisions.)
- WDFW is currently developing broodstock objectives and protocols for 2007 and the Hatchery Committees are reviewing them.
- WDFW, USFWS, and Chelan PUD will be attending a demonstration by Allen Evans of RTR at the end of May on ultrasound fish gender identification.
- WDFW provided an update on planned supplemental trapping of broodyear 2007 Wenatchee steelhead females at Tumwater and Dryden Dams.
- The Yakama Nation has noted that BPA is interested in cost sharing with the PUDs to expand acclimation for spring Chinook and steelhead in the Upper Columbia.
- The Hatchery Committees are currently discussing how potential monitoring of coho would potentially fit into the existing Monitoring and Evaluation (M&E) Plan.
- The Hatchery Committees considered a concept proposal from Chelan PUD to raise hatchery steelhead in the Wenatchee River at Blackbird Island Pond, with the goal of designating these fish for harvest. The Joint Fisheries Parties (JFP) members of the Hatchery Committees indicated they had already been considering this idea, and agreed that the PUD should proceed with the Blackbird pond plan such that the Chiwawa site plans would not be delayed while options were developed for Blackbird Island Pond. At this time, Chelan is interested in using the pond as part of their total rearing space, not in addition to the proposed Chiwawa facility expansion.
- The Hatchery Committees also discussed a Chelan PUD concept proposal for comparing the reproductive success of Chiwawa River hatchery spring Chinook released as either parr or smolts. The Hatchery Committees were unsupportive of this proposal, partially because of concern about the potential for low survival of spring chinook released as

parr, and partially on concern that hatchery parr might adversely affect natural parr rearing in the same areas.

- The Committees provided a list of topics they would like to see the Okanagan Nation Alliance (ONA) address at the Hatchery Committee meeting in June. The ONA will be attending this meeting to provide an update on progress of the Skaha sockeye program.
- The Hatchery Evaluation Technical Team (HETT) is focusing on these items:
  - The HETT is developing a set of operating protocols.
  - The HETT provided a final recommendation to the Hatchery Committees not to Passive Integrated Transponder tag (PIT-tag) Skaha sockeye production to evaluate downstream survival.
  - The HETT provided a final recommendation against a partial mark for most releases of HCP summer Chinook due to the precision required for evaluation of M&E objectives.
  - The HETT is following up on installation of remote site PIT-tag detectors.
  - The HETT is awaiting input from the Hatchery Committees on the re-written Objective 9 (effect of supplementation on disease prevalence) to encompass evaluating hatchery/wild interactions and within-hatchery effects.
  - The HETT is awaiting input from the Hatchery Committees on Objective 10 (effect of supplementation on non-target taxa of concern [NTTOC]); the Hatchery Committees are currently evaluating the proposed NTTOC process and the time commitment required to complete it.
  - The HETT is working on identifying reference streams for steelhead and spring Chinook; recommendations forthcoming in May.
  - The HETT is preparing the Final Chelan PUD 2006 M&E Annual Report, which will be submitted to the Hatchery Committees for another review by May 15, with the final draft due by no later than July 15.

Mike Schiewe updated the group that the Tributary Committees are working with local project sponsors to address issues related to development of project applications. Some of these projects will not be fully developed in time for consideration this funding cycle. There will be a tour of proposed habitat protection efforts on the White River on May 7. Four projects are currently being developed for the Small Projects program. All 2005 projects are progressing well.

III. Chelan PUD (Shaun Seaman)

A. Coho Discussion

Shaun Seaman introduced the coho discussion and recognized that the Coordinating Committees are currently ready to move forward with a decision on this item. However, Chelan PUD is still engaged in internal discussions among managers and needs additional time to work through the issues. Seaman will have a draft Statement of Agreement out soon for review.

B. Update on Operations and Maintenance

Shaun Seaman updated the Committees on Chelan PUD's current fish operations and maintenance issues. He noted that all operations were proceeding smoothly at Rocky Reach; however, they have observed a slightly higher mortality than expected at the fish trap at Rock Island that they are working to resolve.

C. Status of Informational Brochure

Shaun Seaman continues to work on a draft brochure being developed by Chelan and Douglas PUDs that is intended to explain ongoing developments in the HCP process.

D. Lake Chelan Implementation Update

Shaun Seaman updated the group that the Lake Chelan implementation group is moving forward with implementation of Federal Energy Regulatory Commission (FERC) requirements as part of the license. Seaman will provide an implementation update at each month's meeting.

E. Predator Impact Study

Chuck Peven reminded everyone that the predator impact study results report for 2006 (Qualitative Analysis of Non-Indigenous Predators in Rocky Reach Reservoir) is out for review, and that comments are requested back by May 16. Walleye collection as part of the ongoing study is going well. Stomachs have, for the most part, been empty.

IV. Douglas PUD (Rick Klinge)

A. Update on Operations and Maintenance

Rick Klinge updated the group on the following Douglas PUD Operations and Maintenance (O&M) items:

- A lamprey study may be upcoming for 2007. Design and discussions are ongoing for this project.
- Bypass activity was initiated on April 12 pursuant to their plan. High flows out of Chief Joseph Dam have required the operation of all five spill gates. There was a one-time spill test that occurred this week at Chief Joseph Dam.
- The telemetry study contract was awarded to LGL, and will be initiated in July.

V. HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meeting schedule is set as follows:

- May 22 at Rock Island Dam – 9:30 am to about 2 pm; Ali Wick to send out details.
- June 26 in SeaTac – 12:30 pm to 4:00 pm.
- July 24 in SeaTac – 12:30 pm to 4:00 pm.

B. Tributary Committee Chair

The Coordinating Committees briefly discussed the process for selecting a new chairperson for the Tributary Committees. Bob Bugert, the current chairperson, has recently announced that he has accepted a job as the Executive Director of the Chelan/Douglas Land Trust, and would be resigning as chair of the Tributary Committees. Anticipating that the Tributary Committees members would like to play a major role in selecting the chair, Mike Schiewe agreed to talk to Bugert about developing a process for consideration by the Coordinating Committees.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco * (by conference call)	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Brian Cates *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick and Chuck Peven

Date: June 27, 2007

Re: Final Minutes of May 22, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at Rock Island Dam Cottage A on Tuesday, May 22, 2007, from 12:30 pm to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final minutes approved at the meeting to the Committees (Item I).
- Ali Wick will send out details on an upcoming conference call on June 13 or 14 (Item V-A).
- Shaun Seaman and Rick Klinge will develop a mockup brochure for HCP accomplishments (Item V-C).

DECISION SUMMARY

- There were no decision items at this meeting.

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the April 24 Meeting Minutes and the April 13 Conference Call Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group on recent Tributary Committees work:

- The Tributary Committees participated in a tour of ongoing habitat protection efforts on the White River.
- The Committees have sponsored a project briefing workshop for potential project sponsors.
- The Committees are also in the process of selecting a recommended replacement chairperson for Bob Bugert, who will be moving from the position.

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Committees were briefed by Rollie Schmitten from Trout Unlimited regarding potential development of Blackbird Island Ponds for steelhead acclimation.
- The new well at Methow Hatchery will be connected and plumbed by the middle of July. The bid package is out for the Wells Hatchery surface water screens.
- Spring Chinook are being trapped at Wells for broodstock. The Okanogan Water Management tool was once again successful in protecting sockeye redds from desiccation and scouring; last year's annual report is expected soon. Also, the late release group of summer Chinook rearing at Wells Hatchery are being marked.
- At the next Hatchery Committee meeting, Chelan PUD will be presenting some draft plans for Chiwawa Ponds steelhead acclimation.
- The Washington State Department of Ecology is currently developing a total maximum daily load (TMDL) for phosphorus and may be investigating hatchery effluent as a potential point source.
- The Washington Department of Fish and Wildlife (WDFW) has found that melamine-enriched food was used in the HCP hatcheries; they are in the process of replacing it.
- The Yakama Nation is requesting assistance from the members of the Committees (not the Committees per se) in ground truthing a production table to be used in the U.S. vs. Oregon production and harvest negotiations.
- The Hatchery Committees will soon be discussing the schedule for a determination whether Okanogan Spring Chinook are a Plan Species requiring mitigation.
- WDFW and Douglas PUD are developing a report on production capacity at Methow Hatchery.
- The Okanagan Nation Alliance will be providing an update of the Skaha sockeye program at the June Hatchery Committees meeting.

- The 2006 Chelan PUD Monitoring and Evaluation (M&E) Annual Report is out for review in the Hatchery Committees.
- The Hatchery Evaluation Technical Team (HETT) is focusing on the following issues:
  - The HETT is awaiting input from the Hatchery Committees on the re-written Objective 9 (effect of supplementation on disease prevalence) and will be receiving this input in the next few weeks.
  - The HETT is awaiting input from the Hatchery Committees on a process for implementing Objective 10 (effect of supplementation on non-target taxa of concern); Todd Pearsons of WDFW, who has developed a process, will be attending the July Hatchery Committees meeting to discuss this process.
  - The HETT plans to provide a recommendation for reference streams for spring Chinook in June or July. The HETT is also working on reference streams for steelhead.

III. Presentation: Predator Impact Study (Chuck Peven)

Chuck Peven provided a brief update on this year's predator impact study. Preliminary results indicate that there is no "smoking gun" on smolt predation by piscivorous predators; in other words, he found no evidence that sockeye smolts (or any other salmonid species) were being preyed upon by any one species in any large number. Uncertainties include whether a representative sample of predators had been collected. The final report from this study will be forthcoming after July.

IV. Douglas PUD (Rick Klinge)

A. Approval of Lamprey Trap Deployment in the Wells Fishways to Aid in Telemetry Study

Rick Klinge provided preliminary drawings being used in development of a lamprey trap for use in the Wells fishways. This trap would be deployed to aid in the telemetry study in August and September of this year. Bryan Nordlund, as well as the rest of the Committees, expressed support for the design of the device as depicted in the preliminary drawings as long as there are no sharp edges, in order to preclude fish injury.

B. Discussion of Tributary Trap in the Twisp River

Rick Klinge recently asked the Hatchery Committees for clarification on the reasons for continuing to move forward on a tributary trap in the Twisp River. Douglas PUD is requesting this list of reasons because the recent genetics study has shown that Twisp spring Chinook can be identified at Wells Dam, and therefore deploying a trap in the tributary may not be required. Potential reasons suggested by the Coordinating Committees today included: 1) uncertainty regarding phenotypic expression and whether fish identified as being of Twisp origin would actually return to the Twisp River; and 2) the potential need to collect steelhead at a Twisp trap in the future.

V. Chelan PUD (Shaun Seaman)

A. Coho Discussion

Shaun Seaman discussed that Chelan PUD is nearing completion of internal discussions regarding coho as a Plan Species requiring mitigation. Seaman will be preparing Statements of Agreement for the Coordinating and Hatchery Committees deferring the coho decision until September of 2007. A joint conference call with the Hatchery Committees will be held on either June 13 or 14; Ali Wick will send out details after checking with the Hatchery Committees on their availability.

B. Update on Operations and Maintenance

Thad Mosey provided an update on the recent increase in the numbers of injured juvenile salmonids found at the fingerling bypass system at Rock Island Dam. He used a schematic drawing of the bypass system to describe the operation of the system, noting that damaged components (seals and brushes) were discovered during inspections of Gate R11 and R12 and were replaced, and that Chelan PUD is continuing to carefully monitor the situation. Based on recent sampling, it appears that the recent repairs have solved the problems, and the numbers of injured fish have dropped significantly.

C. Status of Informational Brochure

Shaun Seaman updated the Committees that for the next meeting, Chelan and Douglas PUD will have a mockup of a brochure that is intended to explain ongoing developments in the HCP process.

D. Lake Chelan Implementation Update

Shaun Seaman updated the group that the Chelan River Forum has been meeting regarding improvements in Reach 4 and the design is nearing 30 percent completion.

VI. HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meeting schedule is set as follows:

- June 26 in SeaTac – 12:30 pm to 4:00 pm
- July 24 in SeaTac – 12:30 pm to 4:00 pm
- August 28 in SeaTac – 12:30 pm to 4:00 pm

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Thad Mosey	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Brian Cates *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: August 8, 2007

Re: Final Minutes of June 26, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, June 26, 2007, from 12:30 pm to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final May 22 Meeting Minutes and the June 13 Conference Call Minutes as approved at the meeting to the Committees (Item I).
- Ali Wick will send the Okanagan Nation Alliance (ONA) presentation on the Skaha reintroduction program to the Coordinating Committees for their information (Item III).
- Rick Klinge will send Kim Hyatt's presentation to Ali Wick for distribution to the Hatchery and Coordinating Committees (Item III).
- Coordinating Committees members will arrange for their Policy Committee representative to send an email or letter to Mike Schiewe indicating that their agency's position on the Tributary Committees' recommendation to select Dr. Tracy Hillman as the new Tributary Committees chairperson (Item III).
- For the proposed pikeminnow trap, Shaun Seaman will send out drawings for the location of the trap, the study plan, and a brief summary of the history of the study plan by the end of this week (IV-B).
- Mike Schiewe will call Bryan Nordlund and Jim Craig to discuss the plans for the proposed pikeminnow trap and study plan (Item IV-B).
- The Committees will provide edits to the draft Informational Brochure to Chelan PUD by the next meeting (Item IV-C).

- Shaun Seaman will provide the Informational Brochure text in Word and PDF format for editing purposes (Item IV-C).
- Ali Wick will send the Informational Brochure to the Hatchery and Tributary Committees for their review and comment and will request edits by July 24, the date of the next Coordinating Committees meeting (Item IV-C).

DECISION SUMMARY

- The Committees approved the Statement of Agreement (SOA) Regarding (Chelan PUD's) Coho Obligation (Item II).

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the May 22 Meeting Minutes and the June 13 Conference Call Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II. DECISION ITEM: Coho Decision

Mike Schiewe invited Shaun Seaman to discuss the current SOA for the Chelan PUD coho obligation that is out for review. Tom Scribner joined the meeting by phone and suggested a revision to the footnote that describes an example of what type of information would qualify as "compelling evidence" that coho may experience differential mortality rates at project passage. The Committees approved the SOA as revised at the meeting (Attachment B).

III. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Committees received an update from the ONA on the Skaha reintroduction program. Ali Wick will send the presentation to the Coordinating Committees for their information.
- The Hatchery Committees received an update from Kim Hyatt (Department of Fisheries and Oceans – Canada) on the Okanagan Fish/Water Management Tool. Rick Klinge will send Kim Hyatt's presentation to Ali Wick for distribution to the Hatchery and Coordinating Committees.
- The Hatchery Committees approved the SOA Agreement Regarding (Chelan PUD's) Coho Obligation.

- The Hatchery Committees conditionally approved the SOA on Production Levels for Chelan PUD Steelhead Hatchery Program, pending email approval.
- The Hatchery Committees will be receiving a presentation at the July meeting from Todd Pearsons of the Washington Department of Fish and Wildlife (WDFW) on Objective 10 of the Monitoring and Evaluation (M&E) Plan (effect of supplementation on non-target taxa of concern [NTTOC]).
- The Hatchery Committees are considering a new Objective 9 and accompanying Hypothesis Statements for the M&E Plan, and will be discussing this week the potential implementation of the Bacterial Kidney Disease (BKD) Objectives to support the development of this plan.
- The Yakama Nation is preparing coho broodstock collection protocols.
- Hatchery Committees members (as individuals) reviewed and commented on the U.S. v. Oregon production tables provided by Tom Scribner of the Yakama Nation.
- The Hatchery Evaluation Technical Team (HETT) is working on identifying reference streams for spring Chinook; recommendations are forthcoming in August.
- WDFW and Douglas PUD have been working to determine capacity at Methow Hatchery; Kirk Truscott will be sending out a document shortly that summarizes their analyses.
- Douglas PUD will be convening a group to review and coordinate trapping activities at the Wells East Ladder this year.
- WDFW is submitting a proposal responding to an RFP from National Marine Fisheries Service (NMFS) for the collection of tissue samples at Tumwater Dam for a proposed Upper Columbia steelhead reproductive success study; the Hatchery Committees will be commenting on this proposal.
- The Committees have discussed the water source for the new steelhead and existing Chiwawa rearing facilities.
- The Committees received a WDFW memorandum regarding release of high-ELISA fish in Meadow Creek; Kirk Truscott indicated he will provide release locations in future memorandums of this type.
- The Colvilles are considering developing a well water source for Bonaparte Pond to remedy water quality issues there.

- Jerry Marco updated the group that the Colvilles have been planning a research project to hold adult fish at Wells Hatchery to investigate the effect of trapping, handling, and holding on pre-spawn mortality.

Mike Schiewe updated the group that the Tributary Committees are currently reviewing 11 proposals, primarily in the Entiat and Okanogan subbasins. Funding decisions will be made in November. At the last Tributary Committees meeting, the Tributary Committees recommended selection of Tracy Hillman as the new Committees chairperson. Mike Schiewe requested that each Coordinating Committees member arrange for their Policy Committee representative to send an email or letter to Mike Schiewe indicating their agency's formal position on this recommendation.

Mike Schiewe noted that at the next Coordinating Committees meeting, the members might want to review the performance of Coordinating Committee chairperson. The HCPs specify that the performance of the Chair shall be evaluated at least every 3 years; Schiewe has served in this capacity since August 2004. Shaun Seaman suggested that at the July meeting the Coordinating Committees members review his performance, provided all Committees members are present.

IV. Chelan PUD (Shaun Seaman)

A. Discussion of Rock Island Fishway Maintenance

Shaun Seaman introduced this item regarding recent fishway maintenance issues at Rock Island Dam. Mike Simpson and Thad Mosey verified that maintenance was ongoing for these issues. Bryan Nordlund commented that he would like to see a long-term solution for maintenance problems associated with the attraction water pumps to prevent future in-season outages, as well as those associated with the ability of the attraction water system to meet head differentials of 1 to 1.5 feet at all fishway entrances for all tailwater conditions. Simpson confirmed that he had brought this issue up with the maintenance department. Nordlund also brought up the point that he would like Chelan PUD to address any Rock Island or Rocky Reach fishway maintenance issues outside of the fish passage season, consistent with other PUD and COE projects on the Columbia River. Nordlund also requested that any activity with fishway maintenance needs to be brought to the attention of

the CC and discussed prior to the work being implemented. Shaun Seaman will follow up on these issues and respond no later than the next Coordinating Committees meeting.

B. Proposal to Trap Pikeminnow in Ladders

Shaun Seaman invited Andrew Grassell to give an update on the recent interest in use of lamprey ladder traps to trap northern pikeminnow. Grassell commented that the traps would fit on top of the existing overflow weirs. The PUD would like to install these traps to coincide with the typical pikeminnow migration, which peaks in early/mid-July and again in mid-late August. Seaman will send out proposed drawings for the location of the trap, the study plan, and a brief summary of the history of the study plan by the end of this week. Mike Schiewe will call Bryan Nordlund and Jim Craig to discuss the plans for the proposed trap and study plan, and provide Chelan PUD and the Committees with any outstanding issues or questions that need to be addressed before proceeding.

C. Status of Informational Brochure

Shaun Seaman provided a draft brochure being developed by Chelan and Douglas PUDs that is intended to explain ongoing developments in the HCP process. The Committees will provide ideas and feedback to Shaun by the next meeting. Seaman will provide the text in Word and PDF format for review. Ali Wick will send the brochure files to the Hatchery and Tributary Committees for their review and comment and will request edits by July 24, the date of the next Coordinating Committees meeting

D. Lake Chelan FERC License Implementation Update

Shaun Seaman updated the group that the Lake Chelan implementation group is moving forward with implementation of Federal Energy Regulatory Commission (FERC) requirements as part of the license. Chelan PUD is still on target to meet deadlines, including the Reach 4 pump station, low-level outlet at the dam, and the Reach 4 habitat modifications.

E. Update on Flows During Study Season

Shaun Seaman indicated that average flows were 139,000 cubic feet per second (cfs) as measured at Grand Coulee Dam for the 2007 study year. Detailed flow information will be

in the 2007 study reports. These preliminary results indicate that studies conducted in 2007 will be valid from a flow perspective.

V. Douglas PUD (Rick Klinge)

A. Discussion of Tributary Trap in Twisp River

Rick Klinge updated the Committees that the Joint Fisheries Parties (JFP) provided Douglas PUD with a list of reasons for moving forward on constructing a tributary trap on the Twisp River. Douglas PUD is currently reviewing this information, and will respond shortly.

VI. HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meeting schedule is set as follows:

- July 24 in SeaTac – 12:30 pm to 4:00 pm
- August 28 in SeaTac
- September 25 in SeaTac

List of Attachments

Attachment A – List of Attendees

Attachment B – Statement of Agreement Regarding District's Coho Obligation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Steve Hays	Chelan PUD
Andrew Grassell	Chelan PUD
Chris Klein	Chelan PUD
John Smith	Chelan PUD
Thad Mosey (from 1:30 pm)	Chelan PUD
Michael Simpson (from 1:30 pm)	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Dave Benner	Fish Passage Center
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

STATEMENT OF AGREEMENT REGARDING DISTRICT'S COHO OBLIGATION

Rocky Reach and Rock Island HCP Coordinating Committees
Statement of Agreement
Regarding District's Coho Obligation
June 26, 2007

Statement

The Rocky Reach and Rock Island HCP Coordinating Committees (hereafter "Committees") acknowledge that the Rock Island and Rocky Reach Hatchery Committees have agreed to provide a coho hatchery compensation program as detailed in Section 8.4.3.a of the Rocky Reach and Rock Island HCPs.

The Committees therefore agree that:

1. As per Section 8.4.3, an interim juvenile survival value of 93% will be assumed.
2. Juvenile coho survival studies will not be performed unless there is compelling[1] information that demonstrates hydro project operations have an impact of greater than seven percent mortality on coho. Priority will remain on measurement and related hydro operations for co-migrating Permit Species.
3. If coho studies are performed, and for the initial coho study conditions, project operations will be based on other co-migrating Permit Species.

If the Committees decide to test coho survival moving past Rocky Reach and Rock Island dams, the decision will be based on:

- Agreement that coho captured for study at the Rocky Reach juvenile bypass are representative of the coho population at-large and are appropriate for biological testing. This determination will be based on a review of the biological performance of hatchery and natural origin coho to determine if they are performing similar to other plan species as measured through the hatchery M&E program.

- Agreement that if there is a coho survival study, that it is accomplished in the most cost-effective manner.

- Agreement that if coho survival is measured and does not meet interim survival goals, additional studies, potentially along with other species, will be completed prior to modifications to project operations. This is consistent with Section 5.3 of the HCPs.

Consistent with Section 5.3.3 (Phase III Additional Juvenile Studies) of the HCPs, the District will have five years to perform these studies and, upon completion of the studies,

[1] "Compelling" evidence could relate to information collected as part of the hatchery monitoring and evaluation program. For example, smolt-to-adult survivals for coho that are significantly lower than other species in the same geographical area may be compelling evidence that coho are experiencing differential mortality rates at project passage. In all cases the evidence should be empirical and related to Project survival.

the Committees will have one year to evaluate study results and determine an appropriate Phase designation for coho.

Background

Both of the HCPs describe the District's coho salmon hatchery compensation obligation (Section 8.4.3.a.). For the Hatchery Committee to determine that the District has a coho salmon compensation obligation under the Rock Island HCP, it must identify a continuing coho hatchery program (by an entity other than the District and occurring outside of the HCP) and/or the establishment of a naturally reproducing population of coho. For the Hatchery Committee to determine that the District has a coho salmon compensation obligation under the Rocky Reach HCP, it must identify a continuing coho hatchery program (by an entity other than the District and occurring outside the HCP) and/or the establishment of a Threshold Population of naturally reproducing coho in the Methow Basin.

Originally, the Rock Island HCP required the Hatchery Committee to make its compensation assessment in 2005; however, the Hatchery Committee chose to defer the decision until the end of 2006, thus aligning the timing of the decision with that specified for coho in the Rocky Reach HCP.

Although the conditions in 8.4.3.a of the HCPs have not been met, the District has agreed to extend the decision date and to provide hatchery compensation for coho under the Rocky Reach and Rock Island HCPs.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick and Chuck Peven

Date: August 29, 2007

Re: Final Minutes of July 24, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, July 24, 2007, from 12:30 pm to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final June 26 Coordinating Committees Meeting Minutes to the Committees (Item I).
- Ali Wick will obtain and place Todd Pearsons' presentation on the Non-Target Taxa Risk Assessment Procedure on the Anchor FTP site (Item II).
- Tom Kahler will follow up with the National Marine Fisheries Service (NMFS) and the Washington State Department of Fish and Wildlife (WDFW) regarding time limits for operation of the temporary Twisp Weir (Item II).
- Shaun Seaman will update the Committees on any Chelan PUD plans for lamprey research (Item III-A).
- Shaun Seaman will distribute a final draft of the HCP Informational Brochure to the Committees for final review and comment (Item III-B).
- Shaun Seaman will send the Committees an e-mail summarizing the recent pump outage and repair of the right bank adult attraction system at Rock Island Dam, as well as the path forward for managing this type of problem in the future (Item III-C).
- Shaun Seaman will provide a summary of planned maintenance at Rock Island and Rocky Reach for Committees' review each fall (Item III-C).

- Tom Kahler and Rick Klinge will provide the Committees with further information on the incidental trapping of small sockeye salmon in the lamprey trap in the Wells Dam fishway (Item IV-D).
- Mike Schiewe will check on possible dates for a fall Policy Committees meeting (Item V-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees discussed the June 26 Meeting Minutes. (Note: These minutes will need to receive final approval by email). Ali Wick will distribute the final minutes to the Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Committees received a presentation at the July meeting from Todd Pearsons of WDFW on monitoring the effects of supplementation on non-target taxa of concern (NTTOC), which is the focus of Objective 10 of both the Chelan and Douglas PUD's Hatchery Monitoring and Evaluation Plan. Ali Wick will place this presentation on the Anchor FTP site.
- The Hatchery Committees are developing a new Objective 9 (disease interactions) for the Hatchery Monitoring and Evaluation (M&E) program. The Hatchery Evaluation Technical Team (HETT) is working to develop a preliminary experimental design for an evaluation of hatchery rearing practices for the progeny of high Bacterial Kidney Disease (BKD) antigen titer female spring Chinook.
- The HETT is working on identifying reference streams for spring Chinook; recommendations are forthcoming in August.
- A charter for the HETT is being drafted and will be up for approval at the next Hatchery Committees meeting. The charter describes the types of issues that are assigned to HETT, identifies who participates in developing HETT recommendations, and describes the process for setting timelines for completing assignments.

- Contingent on the results of trial use this year, Chelan and Douglas PUDs will purchase additional portable ultrasound units (possibly four total) for determining fish gender at broodstock collection facilities.
- WDFW reported that it is currently behind schedule collecting broodstock this year, but is confident that it will be able to catch up soon; the greatest shortfall is in natural origin spring Chinook returning to the Chiwawa River.
- The temporary Twisp River trap will be operated from July 19 to 31, with the ending time limit set by the permit. Douglas PUD will be following up with NMFS and WDFW regarding the reasons for these time limits on the operation of the weir.
- The Colville Tribes are exploring options for preventing icing of the Bonaparte Pond; they are modeling winter temperatures and volumes of ground water needed to reduce the likelihood of icing. They have also been in discussions with Chelan PUD about the feasibility of drilling a well at the site.
- The Hatchery Committees will be reviewing chairperson performance at their next meeting.

Mike Schiewe updated the group on recent Tributary Committees events. These include the following:

- The Committees have a new chairperson, Tracy Hillman of BioAnalysts.
- The Committees are reviewing a "Small Projects" application for a study using LiDAR and Ortho-Imagery in Upper Columbia tributaries.
- Tributary Fund Applications for the 2008 funding cycle are due on August 3; the Committees are expecting several projects in the Entiat subbasin.
- The next Tributary Committees meeting will be held on August 13.

III Chelan PUD (Shaun Seaman)

A. Update on Pikeminnow Trapping at Rocky Reach Dam

Shaun Seaman introduced this item regarding testing the use of the existing lamprey trap to catch pikeminnow at Rocky Reach Dam. Currently, Chelan PUD has captured more than 70 pikeminnow; adult Chinook have been observed moving past the trap with no delay. Some small sockeye and kokanee have also been captured. In the future, Chelan PUD will be videotaping the trap in order to better observe fish behavior. Pikeminnow that are caught are euthanized; for disposal, the swim bladder is punctured, and the carcasses are returned

to the river. Jim Craig asked whether there were any plans to collect lamprey at the traps in the spring for tagging. Seaman replied that it is uncertain whether this is included in the study plan and will update the Committees on any plans for this research.

B. Status of Informational Brochure

Shaun Seaman updated the group that he received comments on the informational brochure from Douglas PUD and NMFS. Others at the meeting also provided comments; Seaman will incorporate the comments and send the final draft to the Committees this week. It was decided that Chelan PUD will provide printing for the brochure. Seaman will check on whether he will ask Anchor to handle mailing of the brochure.

C. Update on Fishway Operation at Rock Island Dam

Chuck Peven updated the group that the pump for the adult attraction system on the right bank experienced an outage in June due to a gear box problem. Fish count data suggest that there were no fish delayed as a result of this problem. One long-term fix that may be implemented in the future would be a more proactive maintenance program. Short-term options discussed included installing stop logs or shutting off various orifices. However, stop logs were determined to be a poor solution. The possibility of shutting off orifices is still being investigated, and a preliminary plan will be developed. Seaman will send the Committees an e-mail summarizing the recent outage, repair, and path forward. Seaman will also provide a summary of planned maintenance at Rock Island and Rocky Reach Dams for the Committees' review each fall. Generation staff from Chelan PUD will attend the September meeting to provide the information for the upcoming maintenance period.

IV Douglas PUD (Rick Klinge)

A. Update on Summer Chinook Radio Telemetry Study at Wells Dam

Tom Kahler provided the group a summary table of the numbers of fish tagged so far in the radio tagging study at Wells Dam. To date, 100 fish have been tagged, out of a total of 208 identified in the study design. The field crew is tagging today and is expecting to finish tagging by July 25. To date, hatchery fish have comprised 45 percent of those tagged and wild fish have comprised 55 percent.

B. Update on Wells Hatchery Surface Water Screens

Tom Kahler updated the Committees that the bid was awarded to construct and install the new intake screen for the Wells Hatchery, and that installation will begin between mid-October and mid-December, with completion by the end of February 2008.

C. Update on PIT-Tag Detector on the Exit from the Wells Hatchery West Ladder Trap

Tom Kahler updated the Committees that the Passive Integrated Transponder tag (PIT-tag) detector system on the exit pipe from the broodstock trap on the west ladder had a chronically low detection rate. The PIT-tag detection system on the west ladder was functioning normally, but fish trapped and shunted from the ladder to the hatchery do not pass the ladder antennas before they enter the trap, and are thus not counted as having passed the dam. To account for this loss of data, a detection system on the end of the exit pipe from the ladder trap is intended to detect PIT-tagged fish as they exit the pipe at the hatchery. However, the detection efficiency of this system has been inexplicably low (approximately 2% during the 2007 spring Chinook run). Hatchery staff have been wanding the fish manually to read their tags, so the data have not been lost. Biomark (the vendor who installed the system) has investigated the causes of this low detection efficiency, and has informed Douglas PUD that it is caused by EMF "noise" and vibration interference from a nearby pump. Douglas PUD is currently working to relocate the PIT-tag detector.

D. Use of Lamprey Traps to Count Sockeye

Tom Kahler discussed the e-mail memo that Rick Klinge sent out last week that described the incidental collection of small sockeye (100 to 150 mm) in the Wells Dam lamprey trap. The Committees discussed the potential use of data from the trap. WDFW expressed interest in these data and requested more time to consider their use. Kahler and Klinge will provide the Committees with further information on incidental trapping over the next few weeks.

E. May Hatchery Update for Methow and Wells Hatcheries

Tom Kahler provided an update on production at the Methow Hatchery. There was a loss of approximately 16,000 spring Chinook fry from the 2006 brood due to a screen failure in January. The loss resulted from the failure of a foam insert used to close a gap between the screen and the floor of the raceway. Fish that escaped through the gap were able to exit the

hatchery and many resided in the hatchery outfall through the winter. These fish were unmarked, fed fry. Douglas PUD was not directly notified of the loss, and only learned about it when reported in the May monthly hatchery update from WDFW (submitted on June 8, 2007, where it was incorrectly reported as a loss of 27,288 fish). The magnitude of the loss was determined by hatchery staff during tagging in May. Douglas PUD will be modifying the screens to ensure that this does not happen in the future, and has requested of hatchery staff that a better reporting process be developed for these kinds of events.

F. Wells Counts and Online Data

Jerry Marco noted that the Wells fish counts posted on the web are currently five days behind Rocky Reach counts. Tom Kahler verified that Douglas PUD is working to resolve this and has hired an additional counter to review tapes. The intent is to catch up on these updates by the end of the week.

V HCP Committees Administration (Mike Schiewe)

A. Committees Chair Review

The members of the Coordinating Committees performed the first three-year performance review for the committee chair as per section 4.5 of the Rocky Reach and Rock Island HCPs and section 6.5 of the Wells HCP. The Committees members expressed their appreciation and support for work that Mike Schiewe and Ali Wick as well as other Anchor staff have provided. Specific items that were noted included:

- Well organized minutes
- Timely agendas
- Timely statements of agreement
- A useful FTP site, which allows access to documentation
- Timeliness and completeness of products (i.e., annual reports)

In addition, the members noted that Schiewe works to keep the meetings on track, and that decisions are made as planned or contingency plans are developed to ensure decisions are made as agreed to by the Committees. Schiewe is aware of those members that can not attend meetings and if they are unable to attend, Schiewe ensures he has a proxy if required. Schiewe makes expectations of the Committees members clear, but treats all members impartially. Everyone feels fairly represented.

Finally, the Committees noted that Schiewe keeps Committees processes on track; ensuring that members are performing assignments between meetings to ensure no backlog of work.

The Committees noted that Schiewe's broad knowledge is beneficial to the process and has been much appreciated. Some members noted that they appreciated how Schiewe worked new participants into Committees' processes. This has maintained a smooth transition for the new members and the Committees.

Schiewe's broad experience, and how it benefited the Committees, was noted in how the recent decision to reduce spill at Rock Island was addressed by Schiewe. Schiewe helped the Committees work through the technical, policy, and programmatic issues that arose from this process. He helped the Committees work through the various issues, ensuring that the integrity of the HCP was maintained and that all the issues were thoroughly vetted by the Committees.

The Committees did ask that Schiewe work with the Policy Committees members to ensure that annual meetings occur earlier than it did in 2006. The suggested time was after the 2007 study results were available.

All members wanted to note that Ali Wick's efforts are key to the success of the Committees' processes. Her work on the meeting minutes, action items and other documentation are commendable. The information she provides is well written, timely, and beneficial to the Committees. She is responsive and diligent, even if out in the field. All members agreed that she fills the email inbox better than any other person they work with.

B. Fall Policy Committees Meeting

Mike Schiewe agreed to check on possible dates for a fall Policy Committees meeting.

C. Meeting Schedule

Ali Wick will explore with Chelan PUD the cost savings of changing the meeting reservations to afternoons only. The Committees agreed to switch back to full day meetings in October at the earliest. The upcoming meeting schedule is set as follows:

- August 28 in SeaTac – 12:30 pm to 4:00 pm
- September 25 in SeaTac
- October 23 in SeaTac

VI List of Attachments

Attachment A – List of Attendees

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Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Steve Hemstrom	Chelan PUD
Shaun Seaman *	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge *	Douglas PUD
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: October 1, 2007

Re: Final Minutes of August 28, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, August 28, 2007, from 12:30 pm to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final Meeting Minutes approved at the meeting to the Committees (Item I).
- Ali Wick will distribute the final Chelan PUD Predator Impact Study report to the Committees (Item III-A).
- Keith Truscott will report back on what contract flexibilities there may be for extending bypass operations past August 31 in future years (Item III-C).
- Chuck Peven will forward a proposal from the Oregon State University Fish and Wildlife Co-op to study avian predation on salmon in the Mid Columbia to Ali Wick for distribution to the Committees as an informational item (Item III-E).
- Coordinating Committees members will relay any potential agenda items to Mike Schiewe for the upcoming Policy Committees Meeting (Item V-B).

DECISION SUMMARY

- There were no decision items at this meeting.

I. Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the July 24 Coordinating Committees Meeting Minutes as well as the August 13 and August 20 Rocky Reach and Rock Island Conference Call Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II. Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Committees approved the Operating Protocols for the Hatchery Evaluation Technical Team (HETT).
- The Hatchery Committees approved a Statement of Agreement (SOA) for the new Objective 9 of the Chelan and Douglas PUDs Monitoring and Evaluation (M&E) Plans, which deals with rearing densities and adult returns relative to Bacterial Kidney Disease (BKD) in HCP hatchery programs, and disease interactions in supplemented populations.
- The Hatchery Committees gave their approval for the plans and the SOA for the Douglas PUD Twisp Weir Modifications.
- The HETT presented its recommendation report to the Hatchery Committees on reference streams for spring Chinook, and asked the HETT to summarize the potential use of smolt trapping data and the technical merits of installing a smolt trap in the Little Wenatchee River, and report back at the September meeting.
- Douglas PUD updates included the following:
    - A new well has been completed at Methow Hatchery.
    - Due to a shortfall in broodstock, Chelan, Douglas, and Grant County PUDs will divide the anticipated production shortfall of Methow Hatchery spring Chinook proportionally among themselves.
    - Douglas PUD is working with Washington Department of Fish and Wildlife (WDFW) to finalize a draft of the 2006 Annual Report on their Hatchery PUD M&E Program.
- Chelan PUD updates included the following:
    - Chelan PUD will be investigating the setup at Wells Hatchery and consulting with WDFW and Douglas PUD regarding alternative designs for trapping exiting fish at Chiwawa Hatchery steelhead ponds.

- WDFW updated the group that collection of spring Chinook for the Chiwawa and Methow programs are both short of their goal.
- The Colville Tribes are continuing to discuss with the Washington State Department of Ecology (Ecology) the possibility of developing a well at Bonaparte Pond.
- The Yakama Nation asked the Committees to re-consider the potential to Passive Integrated Transponder tag (PIT-tag) out-migrating Skaha Lake sockeye juveniles.

Mike Schiewe updated the group that Tracy Hillman is now officially serving as Chair of the Tributary Committees. Chuck Peven is the new representative to the Tributary Committees for Chelan PUD, replacing Keith Truscott. The Tributary Committees have received eleven applications for the General Salmon Habitat Program, and seven of these will be presenting proposals to the Tributary Committees in September. The Tributary Committees will be working with the Salmon Recovery Funding Board (SRFB) to ensure close coordination. Two proposals were received for the Small Projects Program, one of which was approved for funding; this project was the Heath Floodplain Restoration Project, proposed by the Methow Salmon Recovery Foundation.

III. Chelan PUD (Keith Truscott and Chuck Peven)

A. Predator Impact Study

Chuck Peven asked for final comments to the Predator Impact Study, and there were none. Ali Wick will send out the final version to the Committees.

B. Status of Informational Brochure

Keith Truscott updated the group that Chelan PUD is making final graphical edits to the Informational Brochure. It should be ready for mailing within the next few weeks.

C. Termination of Spill at Rocky Reach and Rock Island Dam

Mike Schiewe thanked the Committees for their work on resolving the date for the end of summer spill at Rocky Reach and Rock Island Dam. The Committees complimented Steve Hemstrom of Chelan PUD for his work on this year's analyses.

Bryan Nordlund noted that during the last conference call on termination of spill, the Committees discussed extending bypass operations beyond August 31. Keith Truscott

confirmed that Chelan PUD would typically need a request by the end of the previous calendar year in order to contract for labor for the following season. Mike Schiewe advised that NMFS should cue this up as a discussion point on the Committees agenda before the end of this year if NMFS (or any other party) is interested in the Committees considering this idea. Keith Truscott will report back on what additional contract flexibilities may be possible.

D. Lake Chelan Implementation Update

Keith Truscott updated the group that the U.S. Army Corps of Engineers (Corps) permit was received for the Reach 4 project. The construction and procurement schedule has been delayed about 2 months. Completion of the Chelan River projects (low level outlet, pump station, and Reach 4 Habitat) is still anticipated to meet the April 2009 timeline.

E. Study to Evaluate Impacts of Avian Predation on Salmon

Chuck Peven briefed the group on a recent proposal from the Oregon State University Fish and Wildlife Co-op to collect and PIT-tag Upper Columbia steelhead at Rock Island and release them below Priest Rapids as part of a study to assess avian predation on salmon. At this time, the proposal has been sent out for review to several agencies. Chuck Peven will forward this to Ali Wick for distribution to the Committees as an informational item.

F. Rocky Reach License Biological Opinion

Carmen Andonaegui inquired as to the status of the Rocky Reach Federal Energy Regulatory Commission (FERC) license Biological Opinion that is currently being developed by the USFWS. Keith Truscott indicated that when he had any new information on the schedule, he would update the group.

IV. Douglas PUD (Rick Klinge and Tom Kahler)

A. Summary of 2007 Bypass Activities at Wells Dam

Rick Klinge updated the group that spring spill at Wells Dam occurred this year from April 12 through June 13 and summer spill occurred from June 14 through August 26.

B. Update on 2007 Summer Chinook Telemetry Study at Wells Dam

Rick Klinge updated the group that the summer Chinook radio-telemetry study at Wells Dam is going well. He noted that this year a large proportion of summer Chinook are using the east ladder. A draft report from this study is due out in November.

C. Update on Lamprey Trapping and Tagging Activities at Wells Dam

Rick Klinge updated the group that lamprey trapping began on August 13. Seven lamprey have been observed passing the dam, and four of these have been radio tagged.

D. Approval of 2006 Pikeminnow Report

Tom Kahler confirmed that there have been no comments to the 2006 Pikeminnow Report; the Committees approved this report.

V. HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

The following agreements were reached at today's meeting:

- The Committees approved Douglas PUD's 2006 Pikeminnow Report.

B. Agenda for October Policy Committees Meeting

Mike Schiewe discussed the upcoming agenda items for the upcoming Policy Committees meeting:

- Welcome of Tracy Hillman as Tributary Committees Chair
- Update on progress on BKD management in the past year

Coordinating Committees members will relay any additional items to Mike Schiewe for the agenda.

C. Meeting Schedule

The upcoming meetings are set as follows:

- September 25 in SeaTac
- October 23 in SeaTac
- November 27 in SeaTac
- December 11 in Wenatchee

D. Chelan PUD Representative

Keith Truscott will replace Shaun Seaman as the Chelan PUD representative to the Coordinating Committees. Truscott attended today's meeting.

VI. List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Keith Truscott *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW
Bob Rose*	Yakama Nation

* Denotes Coordinating Committees member or alternate

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Revised Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: October 30, 2007

Re: Revised Final Minutes of September 25, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, September 25, 2007, from 12:30 pm to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final Meeting Minutes approved at the meeting to the Committees (Item I).
- Thad Mosey will provide time estimates for options for back-up gear box repair (spare parts versus spare gear box) for the Rock Island fishway attraction water system (AWS) pump and right fishway entrance dimension information to Bryan Nordlund (Item III-A-a).
- Chelan PUD will document their Updated Maintenance Plan in the next Fish Passage Plan, which is annually submitted to National Marine Fisheries Service (NMFS) in December (Item III-A-b).

DECISION SUMMARY

- There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the August 28 Coordinating Committees Meeting Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the Committees on the following Hatchery Committees items:

- The Hatchery Evaluation Technical Team (HETT) is still working to identify reference streams for evaluating spring Chinook supplementation programs.
- The Hatchery Committees requested that HETT provide input at the next Hatchery Committees meeting on the potential usefulness of smolt trapping data from the Little Wenatchee River as it relates to the Monitoring and Evaluation (M&E) programs.
- Douglas PUD updates included the following:
    - Permits are on track for construction of the new Twisp River Weir.
    - Douglas PUD has sent out for 60-day review a draft of the 2006 Annual Report of the Hatchery M&E Program.
- Chelan PUD updates included the following:
    - The September Engineering Report was reviewed.
    - Chelan PUD is moving forward on the design of the Chiwawa steelhead ponds. The Hatchery Committees have agreed to coordinate with Chelan PUD engineering staff to provide input on the design.
    - Chelan PUD is evaluating the possibility of drilling a well at the Bonaparte Pond site in order to develop a supply of warmer water that can be used to prevent icing over. Since the feasibility evaluation will not be completed in time to make a decision this year, there will be no fish reared in Bonaparte Pond this year.
- Mike Schiewe contacted Howie Wright of the Okanagan Nation Alliance (ONA) and Kim Hyatt at Department of Fisheries and Oceans Canada regarding the usefulness of Passive Integrated Transponder tagging (PIT-tagging) Skaha sockeye smolts to estimate smolt-to-adult returns (SARs). They indicated that existing plans already called for hydro acoustic monitoring of smolts in Skaha Lake and performing spawning ground counts to estimate the numbers of returning adults; these data would be a better basis from which to estimate SARs . They further indicated that PIT-tagging of sockeye smolts was often associated with high post-tagging mortality and that any use of PIT-tags in this species should be considered experimental.
- The Colville Tribes are currently discussing with Douglas and Chelan PUDs the upcoming HCP decision regarding Okanogan spring Chinook, a plan species that requires mitigation. The decision is tied to the funding decision for the construction of

Chief Joseph Hatchery by the Northwest Power and Conservation Council (NWPCC) and Bonneville Power Administration (BPA). The Colville Tribes are currently waiting for a decision on their Step 2 funding package which was submitted to the NWPCC in August. Jerry Marco described the process, and indicated that the Tribe is anticipating a final decision in early 2008.

- Washington Department of Fish and Wildlife (WDFW) is discussing the next steps for Blackbird Island Pond. If made operational, approximately 50,000 steelhead would be separately marked, acclimated, and released from the site. The PUDs have discussed that there should be additional discussion regarding funding or potential cost sharing.

Mike Schiewe updated the group that the Tributary Committees recently conducted site visits on potential Tributary Fund projects. The Committees also reviewed Regional Technical Team (RTT) rankings and comments on proposed Tributary Fund projects.

III Chelan PUD (Keith Truscott and Thad Mosey)

A. Update on Fishway Maintenance Activities

a. Rock Island Pump Overhaul

Thad Mosey reviewed with the Committee the failure of a gear box associated with a fishway attraction water pump at Rock Island that occurred in early summer. The repair required 8 weeks to complete, during which time attraction flows were reduced. To partially compensate, Chelan PUD modified fishway operations until all three pumps were up and running again. Based on this experience, Chelan PUD has adopted a new preventative maintenance plan that requires overhaul of the pump gearboxes every 5 years. A first step will be to rehabilitate the other two gear boxes at Rock Island by March 1, prior to the time when the ladders will need to be back in operation. Mosey is also requesting the budget for a spare gear box to have in storage (approximately $250,000); an alternative to a spare gear box is to purchase all the spare parts necessary to rebuild a gear box at Gear Works (Seattle), if necessary.

Mosey also indicated that there had been some trouble with the juvenile fish bypass regulating gates (R11 and R12) at Rock Island Dam. There has been a problem with the brushes and seals failing, which has caused injury to some of the smaller fish

passing the gates. For this reason, Chelan PUD will include replacement of seals and brushes during every overhaul. Since the concrete aggregate is very rough, Mosey is recommending an epoxy coating to keep the seals and brushes functioning longer.

Mosey discussed that for the past several years, fishway inspections have indicated that the District had a difficult time meeting the criterion of a 1-foot differential at each entrance to the right fishway during the spring. In the spring, tailwater elevations reach and exceed 575 feet, and the three AWS pumps (at full operation) sometimes cannot supply enough water to stay one foot above spring tailwater elevations. With agreement from Bryan Nordlund, Chelan PUD closed one of two right powerhouse entrances (RPE) to conserve water in the fishway when only two of the three AWS pumps could be operated this past summer. Mosey noted that daily fish counts were not noticeably different between one open RPE and two open RPEs. Mosey asked the Committee to consider the closure of one RPE (with the three AWS pumps in operation) during future spring time operations to help the District reach the 1 foot criterion at 575 feet (and above) at the right fishway. Bryan Nordlund requested that Mosey provide him with dimensions of the right fishway entrances. Nordlund also asked Mosey to provide an estimate of how quickly a pump could be repaired, so this could be compared with the alternative of having a spare pump on site. Additionally, Nordlund suggested that it would help increase fishway entrance head by closing one of the right powerhouse entrances, but he would like to verify fishway entrance gate dimensions before making this decision.. Mosey agreed to provide a time estimate for gear box repair and replacement ,and right fishway dimension information to Bryan Nordlund.

b. Rocky Reach Pump Overhaul

Thad Mosey updated the Committee that two years ago, one of the fishway attraction water pumps at Rocky Reach was rehabilitated. Mosey indicated that the PUD was planning to rehabilitate a second pump this year and would do so when the fishway is dewatered in December for routine maintenance. He indicated that rehabilitation of the third pump was planned for the 2008/2009 winter period. Routine cleaning and other maintenance would be done as necessary.

Mosey also noted that Chelan PUD had named one superintendent to oversee fish facility maintenance at both Rocky Reach and Rock Island dams, and the superintendent was developing a new comprehensive preventative maintenance plan for the fishways. The new plan would be documented in the Annual Fish Passage plan that is required by Federal Energy Regulatory Commission (FERC) and is submitted annually to NMFS for review and approval. Bryan Nordlund indicated that he would review the plan and brief the Committee on its context. Nordlund also requested that the PUD include a schematic diagram of the dams in the plan document.

B. Fish Spill Program Update

Keith Truscott reviewed the summary of the 2007 Rocky Reach and Rock Island Fish Spill Program that was distributed to the Committees by e-mail last week. He updated the group that summer spill at Rocky Reach covered 98.6 percent of the subyearling Chinook; and that Rock Island spring spill covered 93.7 percent of the yearling Chinook migration and 99.4 percent of the subyearling Chinook migration. Bryan Nordlund noted that actual spill for the 81-day summer spill period at Rocky Reach averaged 9.29 percent of the total river flow and asked whether forebay elevation was higher than anticipated. Truscott confirmed that the PUD had had to spill in order to maintain headwater control because flow had exceeded powerhouse capacity.

Truscott also reported back to the Committees on his internal discussions regarding the possibility of extending the operation of the Rock Island Dam bypass system beyond the normal shutdown at the end of August. He indicated that because of staffing issues a

request would need to be considered prior to the start of the spring migration. Chuck Peven indicated that historical fish counts indicate that only about 20 fish pass the project between August 31 and October 1. If the decision to extend the bypass season is made, Truscott indicated that Chelan PUD would need some additional time to plan for it.

C. Survival Studies Update

Keith Truscott updated the group that preliminary results from the Rock Island 10 percent spill study may be available for discussion at the October Coordinating Committees meeting; results of the Rocky Reach sockeye survival study will probably not be available until November.

D. Lamprey Approach at Rocky Reach

Keith Truscott discussed that Chelan PUD is anticipating the Rocky Reach licensing process to result in lamprey actions that include but are not limited to: 1) adult fishway operation in accordance with criteria of Fish Passage Plan, 2) Adult upstream passage counts, 3) a literature review to evaluate the state of the science regarding lamprey passage at hydroelectric projects, 4) design, implement, and evaluate appropriate and reasonable upstream passage modifications. . The District will also be conducting periodic monitoring to verify that lamprey passage rates are similar to those at others dams on the Columbia River. Douglas PUD is also completing a review of lamprey passage as part of its pre-license studies at Wells Dam.

E. *Rocky Reach Relicensing Update*

Keith Truscott updated the group that the U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the Rocky Reach Relicensing is still in draft form. It is understood that the USFWS is addressing a couple of new issues; potentially including the Yakima River as a component of the project area for the Rocky Reach license, and hence the USFWS has to address Yakima bull trout, and climate change in its Biological Opinion.

IV Douglas PUD (Tom Kahler)

A. Summary of 2007 Bypass Activities at Wells Dam

Tom Kahler updated the group that spring spill at Wells Dam occurred this year from April 12 to June 13 and summer spill occurred from June 14 to August 26. This operation was consistent with the spill plan previously agreed to by the Coordinating Committee.

B. Update on 2007 Summer Chinook Telemetry Study at Wells Dam

Tom Kahler updated the group that the summer Chinook radio telemetry study at Wells Dam is going well. Fish do not appear to be immediately selecting the right or left fishway for upstream passage, but have been visiting both sides of the dam before ascending a particular ladder. He noted that this year a large proportion of summer Chinook are using the left ladder. A draft report from this study is expected to be available in November.

C. Update on Lamprey Trapping and Tagging Activities at Wells Dam

Tom Kahler updated the group that lamprey trapping began on August 13. Seven lamprey have been observed passing the dam, and four of these have been radio tagged.

D. Approval of 2006 Pikeminnow Report

Tom Kahler confirmed that there have been no comments to the 2006 Pikeminnow Report; the Committees approved this report.

V HCP Committees Administration (Mike Schiewe)

A. Agenda for October Policy Committees Meeting

Mike Schiewe discussed the upcoming agenda items for the upcoming Policy Committees meeting:

- Phase designation for each project
- Individual HCP Committees member involvement. Mike would like individual members to be available to answer questions.
- Items expected to be on the final agenda include the following:
    - Emergence of DNA technology that can be used to identify fish by population-of-origin before arriving on the spawning grounds
    - Progress in design of steelhead rearing ponds at the existing Chiwawa Ponds site

- Conversion of the Turtle Rock summer/fall chinook program to a yearling program and relocation to Chelan Falls
- Implementation of the Hatchery M&E Plan
- Bacterial Kidney Disease (BKD) – Progress toward developing an interim management plan in the hatchery programs and development of an experimental design to test effects of rearing density and BKD status on adult returns
- Status of coho salmon as a plan species requiring mitigation
- Status of Okanogan River spring Chinook as a plan species requiring mitigation
- Expectation regarding actions and responsibilities outside the HCP
- Improvements in adult passage facilities

Mike Schiewe noted that he would be calling Committees members personally to discuss further agenda items by phone. He requested that everyone discuss the current agenda items with their policy staff to identify any additional agenda items. Schiewe agreed to provide an electronic copy of agenda to the Committees for their review. Schiewe also noted that the final HCP informational brochure will be distributed at the Policy Committees meeting.

B. Meeting Schedule

The upcoming meetings are set as follows:

- October 23 in SeaTac: 9:00 am to 12:00 pm (Policy Committees meeting 1:00 pm to 4:30 pm)
- November 27 in SeaTac
- December 11 in Wenatchee

VI List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Brianne Cohen	Anchor Environmental, L.L.C.
Keith Truscott *	Chelan PUD
Chuck Peven	Chelan PUD
Thad Mosey	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

Anchor Environmental, L.L.C.
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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: November 29, 2007

Re: Final Minutes of October 23, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, October 23, 2007, from 9:00 am to 12:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final Meeting Minutes approved at the meeting to the Committees (Item I).
- Ali Wick will send by e-mail the previously approved Statement of Agreement (SOA) for the Rock Island 10 percent spill study for the Committees' information (Item III-A).
- Carmen Andonaegui will ask Kris Ryding, Washington Department of Fish and Wildlife (WDFW) biometrician, to attend the November meeting to participate in discussions regarding statistical interpretation (Item III-B).

DECISION SUMMARY

- There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees conditionally approved the September 25 Meeting Minutes as amended in review. Committees members will send any additional edits to Ali Wick by the end of the week for final incorporation. Ali Wick will then distribute the final minutes by email to the Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees have recently reviewed and decided against funding a Small Projects application from the Cascadia Conservation District that requested funding for coordination and outreach; also, they approved no-cost budget adjustments associated with administering two ongoing projects. The Tributary Committees will meet on November 15 to visit a project on Nason Creek, and to review funding applications.

Schiewe updated the Committees on the following Hatchery Committees items:

- Chelan PUD updates included the following:
    - WDFW collection of tissue samples from steelhead at Tumwater Dam has begun per the protocol previously agreed to by the Committees under National Marine Fisheries Service (NMFS) funding. WDFW will be coordinating with Chelan PUD regarding sampling during the upcoming cold weather conditions. In January, the Hatchery Committees will be discussing the path forward for the steelhead reproduction study that is a requirement in the HCPs.
    - The Hatchery Committees have agreed that Chelan PUD can develop a proposal to perform a pilot study on partial water re-use to meet some of the PUD's hatchery production requirements. The PUD will be meeting with WDFW fish health specialists to discuss the development of this study.
    - The signed agreement for funding for the Yakama Nation's (YN) coho program has now been received by Chelan PUD, with the PUD General Manager expected to sign the agreement shortly. Funding will then begin.
    - Chelan PUD is moving forward on the design of the Chiwawa Hatchery steelhead rearing ponds and will be submitting the water rights application.
    - Chelan PUD has been developing a proposed study plan to determine sockeye spawning ground residency time and observer error (counter efficiency) for Area-Under-the-Curve (AUC) estimates of spawner abundance.
- Douglas PUD updates included the following:
    - Based on review and comments from the Hatchery Committees, Douglas PUD has decided to design the trap box fyke opening for the Twisp Weir to be adjustable from 2.5 to 8 inches.

- The Fish-Water Management reports and the Douglas PUD Hatchery Monitoring and Evaluation (M&E) Report are out for review.
- Douglas is working with the Yakama Nation on terms of coho compensation based on the establishment of a coho hatchery program. Douglas anticipates an agreement will be reached by the end of the calendar year.

- Hatchery Evaluation Technical Team (HETT) updates included the following:
  - The HETT recommended that collecting juvenile production data for the Little Wenatchee River would be required under the current M&E program only if the Hatchery Committees select the Little Wenatchee as a reference stream. The Committees noted that there is a decade-long time series of data from juvenile snorkel surveys that have been conducted, which could also be used for estimating relative juvenile abundance.
  - The HETT is continuing to develop recommendations for reference streams.
  - Mike Schiewe has been working with John Skalski, statistician, to develop the statistical strategy for a Bacterial Kidney Disease (BKD) Rearing Density Study that would use adult returns as the evaluation endpoint. Also, Schiewe indicated that once agreements had been reached for the Methow and Chiwawa Rivers spring Chinook programs, he would work with WDFW and PUD staff to package the agreements for Hatchery Committees' review and approval.
- The Hatchery Committees will soon be considering several SOAs to determine whether Okanogan Spring Chinook are a Plan Species requiring mitigation. There will likely be a provisional SOA stating that the Hatchery Committees have determined that Okanogan spring Chinook are an HCP Plan Species requiring mitigation based on the existence of a continuing hatchery program developed outside of the HCP; the approval of this SOA will be contingent on Northwest Power and Conservation Council (NPCC) approval of funding. A potentially separate component of the decision process would be Hatchery Committees' approval of the nature of the mitigation.

III Chelan PUD (Keith Truscott)

A. Survival Study Results

Keith Truscott distributed a draft version of the 10 percent spill study conducted at Rock Island in spring 2007. Truscott said that results showed a 97.25 percent survival estimate during the spill study, and he confirmed that the study met flow and precision criteria as

required by the HCP. According to the SOA previously approved for this study, there will now be 2 more years of testing with yearling Chinook and at least 1 year of testing with steelhead, both beginning/continuing in 2008. To refresh memories, Ali Wick will e-mail the approved SOA to the Committees members.

B. Rock Island Sockeye Study Results

Chuck Peven discussed preliminary estimates of sockeye survival at Rock Island during the 10 percent spill study; these estimates were generated using the single release model and sockeye smolts were released in the tailrace of Rock Island as part of a separate study. John Skalski, who conducted the analyses for Chelan PUD, used an adjustment factor of 1.0189 times the raw estimate to yield a final estimate of 93.6%. Bryan Nordlund pointed out that the adjustment was based on comparisons of paired-release and single-release results from 2004, 2005, and 2006, and that although the 2005 and 2006 results are similar, the 2004 paired-release results were almost 4 percent higher. Hence, the 2004 data influenced the adjustment factor upward, and Nordlund questioned the use of this adjustment method. Specifically, he reminded the group that one purpose of using an average of the 3 year survival study results to verify the survival performance standard was to accommodate changes in study condition - eg water year, handling effects, fish conditions. Based on this, Nordlund indicated a preference for conducting at least one paired-release study at Rock Island with sockeye salmon. The Committees discussed the potential to do paired-release testing in 2008; opinions were varied on whether this testing should be done. Keith Truscott said that John Skalski will be in attendance at the November meeting, and that he would be able to provide additional information and answer questions that hopefully would assist the Committees in making a decision on 2008 testing. Truscott said that a Committees decision about testing another species would be needed at the November meeting to allow sufficient time for planning. Carmen Andonaegui will ask Kris Ryding, a WDFW biometrician, to attend the next meeting in order to participate in discussions regarding statistical interpretation. The Committees will discuss plans for next year at the next meeting when Skalski presents the final report and results.

IV Douglas PUD (Rick Klinge and Tom Kahler)

A. Update on 2007 Telemetry Study in Wells Fishways

Rick Klinge updated the Committees on the recent telemetry study investigating fish use of the adult fishways at Wells Dam. The study was designed to evaluate transit time in both the east and west fishways after the installation of a flow-modifying baffle in the east fishway. Klinge noted that Douglas PUD was surprised that over 90 percent of summer Chinook used the east ladder; in past years, summer Chinook tended to ascend both ladders in approximately equal numbers. The preference for the east ladder was also true for those fish fitted with radio tags. After tagging, the fish were liberated back into the tailrace at the base of the ladder at which they had been tagged, and they often crossed the dam to use the fishway opposite the one at which they had been tagged. Fish did often visit both ladders, but there was still a strong preference for the east ladder for passage. Klinge said that since only 14 of the 208 tagged fish ascended the west ladder, that statistical analysis was somewhat problematic. Douglas PUD has asked LGL (the consultant conducting the study) to investigate options for analyzing these data in light of the small sample sizes.

There was additional discussion about the fish-handling methods used in the study because tagging was done without the use of anesthetic. Klinge described the process by which the fish were turned onto their dorsal side in a foam cradle and then tagged after a period of rest in this position. This method was used to avoid using MS-222 because of potential capture in the sport fishery. He reported that Douglas PUD found this to be a satisfactory method for handling and tagging and was pleased with the outcome of using this method.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- November 27 in SeaTac, 9:30 am to 4:00 pm
- December 11 in Wenatchee, 12:30 pm to 4:00 pm
- January 22 in SeaTac

VI List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Keith Truscott *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: January 23, 2008

Re: Final Minutes of November 27, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Hotel Gateway in SeaTac, Washington, on Tuesday, November 27, 2007, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final Meeting Minutes approved at the meeting to the Committees with the minor edits discussed (Item I).
- Chuck Peven will send Ali Wick a memo describing additional statistical analyses that will be conducted on the sockeye salmon survival and migration dynamics data. Wick will distribute the memo to the Committees for comment and any additional recommended analyses. Comments or additions are due to Peven by December 3 (Item II-A).
- Rick Klinge (Douglas PUD) will distribute the results of the Wells Dam adult radio telemetry studies before the next meeting. Klinge will send these to Carmen Andonaegui early, so that she can send her comments ahead of time (Item IV).
- Ali Wick will correct and send out the December 2006 Statement of Agreement (SOA) approving the 10 percent spill survival study at Rock Island to reflect the actual date of December 2006, currently dated as 2007 (Item V).
- Mike Schiewe will work with Douglas and Chelan PUD staff to prepare briefing documents summarizing previous Committees agreements regarding survival studies and phase designations of subyearling Chinook survival under all three HCPs (Item V).

SUMMARY OF AGREEMENTS

The Rock Island Coordinating Committee agreed that a paired-release sockeye salmon survival study would be conducted at Rock Island Dam under 10 percent spill in 2008. This study would be in addition to previously planned paired-release yearling Chinook and steelhead survival studies.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the Committees approved the October 23 Meeting Minutes as amended in review. Ali Wick will distribute the final minutes by email to the Committees.

II Chelan PUD (Keith Truscott)

A. Survival Study Results – John Skalski

Drs. John Skalski and Rich Townsend (University of Washington) presented results of survival and behavioral studies conducted for Chelan PUD at Rocky Reach and Rock Island dams in 2007 (see Attachment B). The objectives of the Rocky Reach studies were to:

- Determine project passage survival
- Compare route-specific passage proportions and survival
- Estimate tailrace mortality
- Evaluate alternative tailrace release locations

The objectives the Rock Island studies were to:

- Estimate project passage survival of yearling Chinook salmon using the paired-release model under a 10 percent spill operation
- Estimate project passage survival of sockeye salmon using the single-release model under a 10 percent spill operation.

The presentation materials are attached. There were extended question-and-answer periods during and after the presentation regarding interpretation of study results. Chuck Peven pointed out that the estimated Rocky Reach pool survival for sockeye was only 91 percent; he noted that even if dam survival was improved to 100 percent, sockeye salmon project survival would not meet the HCP project performance standard of 93 percent. Responding

to a question regarding variance in sockeye salmon survival estimates at Rocky Reach, Peven speculated that the relatively large differences among estimates between the years 2004 to 2007 were primarily due to differences in predation rates, which are directly related to flow and water visibility. For example, 2006 was a high-flow, low-visibility year, and there was a 10 percent higher survival in 2006 as compared to 2007, which was a lower-flow year. The Committees also discussed taking a closer look at the potential to increase direct survival through the powerhouse, including how changes in powerhouse operations might affect tailrace conditions.

Following the formal presentation of results, Skalski and Peven briefed the Committees on a series of additional analyses that were planned. Of note was a more detailed study of the potential effects of different staff implanting acoustic tags in the test fish. Skalski explained that in another study he recently conducted, the "tagger effect" was found to have a major effect on the final survival estimate. Peven agreed to provide the Committees with a list of the additional analyses planned; the Committees agreed to provide comments on the list and any suggested additional analyses by December 3.

With John Skalski still present to answer potential questions regarding his analyses, Mike Schiewe facilitated a discussion of 2008 survival studies at Rock Island Dam under 10 percent spill. In addition to the previously agreed-to paired-release studies using spring Chinook salmon and steelhead, it was agreed that Chelan PUD would conduct a paired-release survival study using sockeye salmon as well.

III Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that he has not yet distributed the most recent Tributary Committees meeting summary because the document includes details of funding decisions, and the Tributary Committees have not yet notified the project sponsors. There were a total of seven projects funded. When the applicants are notified of the Committees' decision, the list will be distributed. In the next few months the Tributary Committees will be considering project monitoring activities, and will work to determine how to allocate funds designated for monitoring.

Schiewe updated the Committees on the following Hatchery Committees items:

- Chelan PUD updates included the following:
  - The Hatchery Committees have requested that Chelan PUD design a study to better define the parameters of observer error and spawner residence time for sockeye salmon; both are needed for estimating spawning abundance using the area-under-the-curve (AUC) method. The study will be conducted during the sockeye spawning period in 2008.
  - The Hatchery Committees have been discussing a proposed pilot partial water re-use study. Chelan PUD is seeking interim approval for a proposed pilot recirculation system with 80 percent re-use on each cycle. The Hatchery Committees gave Chelan PUD approval to finalize the pilot study proposal, including the development of detailed monitoring and evaluation protocols.
  - There is an upcoming meeting between Chelan and Douglas PUDs and Bonneville Power Administration (BPA) staff to discuss coordination of hatchery actions required by the HCPs with actions proposed as part of the draft Federal Columbia River Power System (FCRPS) Biological Opinion.

- Douglas PUD updates included the following:
  - Several Douglas PUD reports and proposals are out for Committees review. The comment period for the 2008 Monitoring and Evaluation (M&E) Report is now closed. No comments were received.
  - Douglas PUD is reviewing a draft steelhead reproduction study that is designed to determine if hatchery fish are as successful as naturally spawned fish when reproducing naturally. The Hatchery Committees will be taking up this topic in January.
  - Douglas PUD is preparing their hatchery compliance report for the Wells and Methow hatcheries; this report will be incorporated into the HCP Annual Reports.
  - Construction of the Wells hatchery screens will be completed by the end of February. The solicitation for bids for construction of the new Twisp Weir is currently open (closes on December 3).
  - Douglas PUD staff is working with Yakama Nation staff on a coho salmon mitigation plan; both parties anticipate bringing an agreement to the Hatchery Committees for approval by the end of the year.

- Douglas PUD staff is also working with Colville tribal staff on a potential mitigation agreement for Okanogan spring Chinook. Such an agreement will be required under the HCP if the Committees determine that either a Threshold Populations Okanogan spring Chinook exists or an ongoing hatchery program is established outside the HCP. Under the currently developed plan, mitigation will be in the form of cost sharing of spring Chinook production at Chief Joseph Hatchery.

- Hatchery Evaluation Technical Team (HETT) updates included the following:
  - HETT is working through the reference stream issue for the M&E Plan.
  - Because of HETT's interest in using Asotin Creek as a steelhead reference stream, the Wells Hatchery Committee sent a letter to BPA encouraging continued funding of the Asotin Creek Assessment Project.
  - John Skalski has been working with HETT to develop a study plan for evaluating the effects of rearing density and parental bacterial kidney disease (BKD) antigen titer on adult return rates of hatchery spring Chinook.

IV Douglas PUD (Rick Klinge)

Rick Klinge discussed the ladder maintenance schedule for winter 2007/2008 with the Committees. Typically, minor maintenance is performed every year, with major maintenance being scheduled as needed. This year the east ladder will be out of service for a shorter time than the west ladder.

Rick Klinge provided the Committees with a brief summary of preliminary results of the Wells Dam adult radio-telemetry study conducted this past summer. The study was designed to determine if a flow-guidance baffle placed in the east ladder would decrease passage time. Preliminary analyses indicated that there is a reduction in passage time; however, these data were statistically problematic to analyze because a vast majority of the tagged fish ascended via the east ladder. This phenomenon created substantially different sample sizes that made comparing passage between the east and west ladders difficult. Klinge pointed out that a previous hydraulic modeling study suggested that placement of this structure affected flows to the collection gallery, and might contribute to shorter fish residence time prior to ascending the ladder. Klinge will distribute a draft report on the study before the next meeting, and the

consultant team that conducted the study will attend the next Coordinating Committees meeting to present the results of their detailed analyses. Klinge will send these results to Carmen Andonaegui early, so that she can send her comments ahead of time (as she will not be able to attend the December meeting). If the Committees agree that the results demonstrate a benefit from the flow-guidance baffle, then Douglas PUD will be seeking Committee approval to install a similar baffle in the west ladder during the upcoming maintenance period.

V NMFS Updates (Bryan Nordlund)

Bryan Nordlund updated the Committees that there is a workshop on lamprey passage scheduled for early 2008; he invited any Committees members to contact him if they were interested in additional information.

Nordlund pointed out that the December 2006 SOA approving the 10 percent spill survival study at Rock Island has an incorrect date. Ali Wick will update and send out this SOA with the correct date of December 2006, instead of the incorrect date of 2007.

After reviewing the summary table on phase designations of the three HCP projects that was distributed at the last Policy Committees meeting, Nordlund asked for clarification regarding the status of several species and the schedule for completing testing and passage survival estimation. He noted that a Chelan PUD Gantt chart submitted to the Committees in 2005 anticipated the completion of survival studies at Rock Island by the end of 2007, and he was questioning whether that goal was from the Rock Island HCP and, if so, what had been accomplished toward that goal. If the Rock Island HCP required that phase designation be complete for all species by the end of 2007, the "To Be Determined (TBD)" designations on the summary table would need to be updated unless the Coordinating Committees agreed otherwise. In particular, he was interested in the phase designations for subyearling Chinook. Following a brief discussion of the logistical, biological, and technical difficulties associated with estimating passage survival of subyearling Chinook, the Committees agreed that a review and summary of the previous Committees discussion on this topic would be useful. In addition, the Committees discussed the intent of the HCP as a living framework and that the agreement provided the Committees the ability to adjust schedules and dates for performance issues related to limitations of methodologies and/or technology. Mike Schiewe will work with Douglas and Chelan PUD staff to prepare the summary for discussion at the next meeting.

VI HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

The following agreements were reached at the meeting that did not require formal SOAs:

- The Rock Island Coordinating Committee agreed that a paired-release sockeye salmon survival study would be conducted at Rock Island Dam under 10 percent spill in 2008. This study would be in addition to previously planned paired-release yearling Chinook and steelhead survival studies.

B. Meeting Schedule

The upcoming meetings are set as follows:

- December 11 in Wenatchee, 12:30 pm to 4:00 pm
- January 22 in SeaTac
- February 26 in SeaTac

VII List of Attachments

Attachment A – List of Attendees

Attachment B – Survival Study Results Presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Brianne Cohen	Anchor Environmental, L.L.C.
Keith Truscott *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Kris Ryding	WDFW
Rich Townsend	University of Washington
John Skalski	University of Washington
Carmen Andonaegui *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: January 30, 2008

Re: Final Minutes of December 11, 2007 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at Chelan PUD in Wenatchee, Washington, on Tuesday, December 11, 2007, from 1:00 pm to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the draft Meeting Minutes to the Committees when they are ready (Item I).
- Douglas and Chelan PUDs will each prepare short briefing papers describing the logistical, biological, and technological limitations that prevent the PUDs from testing passage survival at this time, and the implications of this for assigning a phase designation for subyearling Chinook (Items IV-C and V-A)
- Chuck Peven will send the document *Auxiliary Analyses of 2007 Sockeye Salmon Acoustic-Tag Releases at Rocky Reach* to Ali Wick for distribution to the Committees (Item V-B).

DECISION SUMMARY

- There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting and informed the group that the November 27 Meeting Minutes are still in review and will be sent out soon.

II 2007 Telemetry Ladder Passage Study Presentation (Joshua Murauskas)

Joshua Murauskas from LGL Environmental presented results of the study, *Evaluation of summer Chinook passage times through the Wells Dam collection gallery*. This radio-telemetry study was conducted to determine whether a flow-guidance baffle improved fish passage via the east fishway at Wells Dam (no modification was made to the west ladder). Gallery passage times were recorded for fish ascending as well as residing in the galleries, and these times were summed by tagged fish and by fishway. In addition, the number of movements between fishways and gallery rejections were recorded and summed by individually monitored fish and by fishway. Also, data from this year's study were compared to passage data from 1998 radio-telemetry study with regard to time after the first ladder approach through the time a fish passed the last weir in the fishway. Results indicated that fish that successfully ascended the fishways had faster passage times through the baffled fishway. In addition, fish spent more time in the gallery of the baffled fishway. Fish were more likely to reject the east fishway gallery but fish detected in the east gallery were seven times more likely to make a valid ascent than fish detected in the west fishway gallery. Eighty-six percent of fish detected in either gallery made movements between the galleries before making an ascent (an average of six trips per fish [range = 1-88]). The more times that a fish visited the east gallery the greater the likelihood that it would make a valid ascent of the fishway. Comparisons to the 1998 passage data showed that the 2007 "time after first approach" was 73 percent shorter for the east fishway than in 1998.

Rick Klinge discussed with the Committees that Douglas PUD believes that these results indicate that the baffle has provided an improvement in ladder passage time, and that Douglas PUD would like Committee agreement to install a similar baffle in the west ladder. When asked if Douglas PUD would perform a second year of telemetry evaluation with the second baffle in place, Rick Klinge said the District would not. The Committee agreed that Douglas could install this baffle.

III Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees and the Hatchery Committees have not met since the Coordinating Committees met last, so there is no update from these groups at this time.

IV Douglas PUD (Rick Klinge)

A. Coho Salmon SOA

Mike Schiewe introduced this topic by stating that the Hatchery Committees would be considering for approval at tomorrow's meeting a Douglas PUD coho salmon mitigation agreement and associated Statement of Agreement (SOA) that was negotiated with the Yakama Nation. The agreement includes language stating that coho survival of 96.2 percent will be assumed. Because this is a fish passage issue and subject to Coordinating Committees' oversight, Schiewe requested Coordinating Committees' concurrence with this provision at this time (subject to the Hatchery Committees approving the provisions of the agreement that are unrelated to fish passage). The Committees agreed that the provisions regarding fish passage and survival in the SOA are acceptable and appropriate under the HCP.

B. Okanogan Spring Chinook SOA

Mike Schiewe opened the discussion by indicating that all three HCPs require that the Hatchery Committees determine by the end of 2007 whether there is a Threshold Population and/or a continuing hatchery program for Okanogan spring Chinook salmon (funded outside the HCP). If it is determined that there is such a population or program, then the Hatchery Committees have to approve an appropriate mitigation plan. Recently, both PUDs have been discussing this pending decision with the Colville Tribes, and have agreed that any potential mitigation would be in the form of a cost-sharing agreement for the production of Okanogan spring Chinook at the Colville Tribes' planned Chief Joseph Hatchery. Because the Tribes are on track to secure long-term funding from the Bonneville Power Administration (BPA) during 2008 (thus establishing a long-term program as required by the HCP), the Hatchery Committees will be considering a "contingent on funding" SOA at tomorrow's meeting that would confirm the existence of a long-term hatchery program (if funded), and provisionally agree to the cost-sharing agreements negotiated by the PUDs and the Colville Tribes. Because each draft SOA has a provision stating that Okanogan spring Chinook would be considered along with extant spring Chinook populations (and not separately) under the HCP, Schiewe stated that he wanted to confirm this provision of the SOAs with the Coordinating Committees. What this means is that when and if Okanogan spring Chinook are added as a plan species requiring mitigation under the SOA, then passage survival at each HCP project would be considered the same as

the passage survival for the run-at-large of spring Chinook salmon passing the respective project. The Coordinating Committees agreed that this was an appropriate way to incorporate Okanogan spring Chinook into the HCP.

C. Discussion on Phase Designation for Subyearling Chinook

Mike Schiewe introduced this topic by noting that at the November Coordinating Committees meeting, several Committees members expressed an interest in reviewing the status of phase designation for subyearling Chinook, noting that a Chelan PUD Gantt chart submitted to the Committees in 2005 anticipated completion of survival studies at Rock Island by the end of 2007. To facilitate this review, the PUDs had agreed at the last meeting to begin compiling information and agreements from past meetings on the subject of subyearling Chinook survival and phase designation. Rick Klinge discussed Douglas PUD's perspective on this topic. Klinge reviewed with the Committees the February 2005 agreement defining subyearling Chinook as Phase 3 (additional testing) based on a "calculated" estimate of survival as described in the Wells HCP. He also discussed the inability to test subyearling passage survival at Wells Dam due to biological, logistical, and technological limitations—limitations that affect the ability to empirically test survival at all three Douglas PUD and Chelan PUD dams. Klinge also distributed some background documents on how phase designation was calculated, including a table from the Final Environmental Impact Statement (FEIS) for the HCPs (Table 3-4). Bryan Nordlund asked about the source of the information in the table, to which Chuck Peven responded that PUD staff and National Marine Fisheries Service (NMFS) worked together to generate the estimates.

The Committees also discussed the status of acoustic tagging technology, and in particular whether a new tag which has the ability to switch off to save battery power would be useful for subyearling Chinook. Peven noted that there are several issues that would still be outstanding even if battery power were not an issue. For example, there is mortality that may be associated with overwintering in the reservoir that would not be a passage effect (e.g., predation, disease) and would confound survival results. The Committees discussed that the technology to measure subyearling survival is not yet available. Klinge agreed to provide the Committees with a brief summary document reviewing the status of survival

study testing and phase designation of subyearling Chinook at Wells Dam. (Also see Item V-B.)

D. 2008 Proposed Schedule of Activities (2008 Action Plan)

Rick Klinge distributed the 2008 Action Plan, which outlines the expected Douglas PUD 2008 activities for the Coordinating and Hatchery Committees. This will be distributed tomorrow at the Hatchery Committees meeting as well. If Committees members have questions, they may get in touch with Klinge.

E. Lamprey Exclusion Device

Rick Klinge informed the group that Douglas PUD is proposing to install exclusion devices along with the lamprey traps in the fishways at Wells Dam for this year's lamprey radio-telemetry study. The intent of these devices is to prevent lamprey suction at the orifice floor directly below overflow weir traps, with the goal of preventing lamprey from attaching to the floor and thereby increasing efficiency of lamprey capture in the overflow weir traps themselves. The Committees agreed that these devices could be installed and are not expected to affect salmonids.

V Chelan PUD (Keith Truscott)

A. Discussion on Phase Designation for Subyearling Chinook

See Item IV-C also. Keith Truscott introduced Chelan PUD's perspective on this topic. Truscott referenced information in the SOA on appropriate tag methodology in the 2005 HCP Annual Report, and the language in the body of the SOA that discussed phase designation in a footnote as 'to be determined.' He also noted that the HCP gives guidance that survival can either be determined by empirical study or by calculation using estimated inferred parameters if empirical testing is not possible. The Committees discussed that empirical testing is not possible at this time (see IV-C above), and that limited data exist for calculation. The Committees agreed that a short briefing paper should be prepared to further expand on the footnote in the SOA, in order to be clear about this process and the path forward for subyearling Chinook phase designation.

B. Auxiliary Analyses of 2007 Sockeye Salmon Acoustic-Tag Releases at Rocky Reach

Chuck Peven discussed that tagging effects and delayed mortality were unexpectedly high in this year's sockeye salmon acoustic-tag release study, and that certain taggers were statistically linked to fish that experienced higher mortality than the overall average. Chelan PUD will be investigating whether this was the case for last year as well, and would like to see what the effect would be if fish from these high-mortality taggers were to be eliminated from analysis. Peven will send this document to Ali Wick for distribution.

VI HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

- The Committees agreed that Douglas PUD can install a baffle in the west ladder (Item II).
- The Committees agreed that Douglas PUD can install floor exclusion devices in the fishways at Wells Dam when installing lamprey traps for this year's lamprey radio-telemetry study (Item IV-E).

B. Meeting Schedule

The upcoming meetings are set as follows:

- January 22 in SeaTac, 12:30 pm to 4:00 pm
- February 26 in SeaTac
- March 25 in SeaTac

VII List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Keith Truscott *	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco * (by conference call)	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nass	LGL Limited
Joshua Murauskas	LGL Limited
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

APPENDIX B

HABITAT CONSERVATION PLAN HATCHERY COMMITTEES MEETING MINUTES AND CONFERENCE CALL MINUTES

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: February 22, 2007

Re: Final Minutes of January 17, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Radisson Hotel in SeaTac, Washington, on January 17, 2007, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send the Final December 27, 2006 Conference Call Minutes to the Hatchery Committees (Item I).
- Kirk Truscott will provide the final version of the Broodyear Methow 2006 Spring Chinook Egg Disposition memo to Ali Wick for distribution to the Committees (Item IV-A).
- Douglas PUD and Washington Department of Fish and Wildlife (WDFW) will work together to provide information on rearing capacity at Methow Hatchery for the next meeting (Item V-A).
- WDFW and Douglas PUD will review results of the Wells Hatchery early-late summer Chinook release studies, and report back to the Committees at the February meeting (Item V-A).
- Tom Kahler will provide the revised 2007 Douglas PUD Action Plan to Ali Wick by January 18 for distribution to the Committees (Item V-C).
- The Committees will provide any additional comments to the 2007 Douglas PUD Action Plan by the end of the day, Friday, January 19 and will copy Rick Klinge, Mike Schiewe, and Ali Wick on the emails (Item V-C).
- Kirk Truscott will check with Rick Stilwater about the timing of reinstalling the predator exclusion nets at the Chiwawa Rearing ponds (Item VI-B).

- Chelan PUD will draft proposed criteria (including their rationale) for the Committees to consider in defining future conditions under which the Committees could consider de-funding the coho reintroduction program, and send to Ali Wick for distribution prior to the next meeting (Item VI-C).
- Mike Schiewe will check with Bacterial Kidney Disease (BKD) researchers Diane Elliott and Linda Rhodes regarding their availability to attend a Hatchery Committees meeting in the near future (Item VI-D).
- Shaun Seaman will send information regarding the upcoming Northwest Hydropower Association (NHA) conference to Ali Wick for distribution to the Committees (Item VI-G).
- Chelan PUD will distribute the preliminary site plan for the Chiwawa steelhead acclimation ponds to the Committees as soon as available (Item VI-H).
- Shaun Seaman noted that he will forward to the Committees an email from Trout Unlimited requesting funding for fixing Blackbird Island pond to potentially rear hatchery steelhead (Item VI-I).

DECISION ITEM SUMMARY

- There were no decision items at this meeting

I Welcome and Meeting Minutes Approval

Mike Schiewe opened the meeting; attendees at this January 17 meeting are listed in Attachment A to these Meeting Minutes. Schiewe noted that the December meeting and conference call minutes are currently out for review and will be approved by email.

II HETT Update

Keely Murdoch updated the Hatchery Committees that the Hatchery Evaluation Technical Team (HETT) is currently focusing on the following topics:

- Debriefing of Monitoring and Evaluation (M&E) field crews to obtain input for adjusting next year's activities
- Identification of reference streams and coordination with the regional approach to identify streams (per Independent Scientific Advisory Board recommendation)
- Discussion of M&E Objectives 9 and 10

  - Meeting with Linda Rhodes will be rescheduled
  - Discussion of sample sizes for less than 100 percent marking
  - Skaha Passive Integrated Transponder tag (PIT-tag) memorandum
  - Management implications for harvest and broodstock in determining marking
- Proposed table of contents for M&E report
- Precision vs. accuracy for spawning data
- Installation of remote PIT-tag detectors

III Colville Tribes

Jerry Marco provided an update on preliminary discussions between the Colville Tribes and Bonneville Power Administration (BPA), Chelan PUD, and Grant PUD regarding potential cost sharing for summer/fall Chinook and potentially spring Chinook production at Chief Joseph Hatchery. Marco commented that the goal is to have an agreement in place by 2008. A step along the way will be a report to BPA documenting progress toward cost-share agreements with the PUDs. The report will specifically address the HCP obligation for spring Chinook, and potentially summer and fall runs as well. WDFW expressed interest in ensuring that the Hatchery Committee is involved in the discussion if the preliminary cost-sharing agreements being developed would affect any HCP programs.

IV WDFW

A. Broodyear 2006 Methow Spring Chinook Egg Disposition Memo

Kirk Truscott updated the group that he updated and finalized his memorandum describing the distribution of broodyear 2006 Methow spring Chinook salmon, consistent with the discussion at the December Hatchery Committees meeting and follow up discussions with National Marine Fisheries Service (NMFS). Truscott noted that the memo is intended to document what the disposition is for broodyear 2006, and is not necessarily indicative of an approach that would or could be used in future years. Tom Scribner asked whether the fish reared in the Twisp Ponds were differentially marked so that Smolt-to-Adult Return Rates (SARs) could be estimated. Truscott mentioned that the fish are differentially marked, but that the small number of fish (approximately 5,600 fish) would result in an SAR of low confidence. Truscott agreed to follow up on the possibility of PIT-tagging these fish for additional monitoring; however, he noted that a complicating factor

was that no electrical power is currently available for a monitoring antenna at this site. Kirk Truscott commented that the 2006 release was not part of WDFW's Endangered Species Act (ESA) agreement, and that if this practice were to be repeated as a standard long-term strategy for the program, WDFW would initiate the required ESA consultation. Kris Petersen noted that NMFS would be in support of a study of BKD issues related to the survival of these early released fish. The Committees accepted the memo as final and Truscott will provide the final version with a revised date to Ali Wick for distribution to the Committees.

B. Draft SOA Summer Chinook Chelan Falls Net Pen Rearing

Kirk Truscott provided a draft statement of agreement (SOA) on WDFW's proposed rearing of some of the Turtle Rock summer Chinook production in net pens at Chelan Falls. This would be in an interim measure in advance of when the permanent facility at Chelan Falls will be ready for fish within the next few years. WDFW has initiated consultation with NMFS as part of the existing Section 10 agreements, but concurrence is still forthcoming. WDFW is also initiating a full SEPA process and an Hydraulic Project Approval (HPA). WDFW and Chelan PUD are currently in discussion on flow issues at the proposed site. Truscott agreed to include all the co-permit holders on correspondence regarding this action. Truscott indicated that the SOA covering this first step would be on the agenda for the February Hatchery Committees meeting, but actual implementation is still several steps away. Kris Petersen requested that any significant comments from Chelan PUD also be sent to her so that she can include these in her response letter for Section 10 consultation.

V Douglas PUD

A. Capacity Issues at Methow Hatchery

WDFW and Douglas PUD are currently working together to further define production capacity at Methow Hatchery. A more complete discussion will occur at the February Hatchery Committees meeting. To prepare Committees members for that discussion, Kirk Truscott distributed two spreadsheets with rearing guidelines, rearing density indices, and ELISA levels. Resolving any question about rearing capacity will require a better understanding of the interaction between density and size, and how this relates to the HCP agreement and the former Mid-Columbia Settlement Agreements (Settlement agreement

requires that the rearing density not exceed 0.75 pounds of fish per cubic foot of rearing area for yearling Chinook to a size of 10 fish per pound, which is different than the 15 fish per pound as specified in the HCP). Douglas PUD and WDFW will work further on this information for presentation next month.

B. Approval of 2006 Production Compliance Report

Rick Klinge distributed copies of Douglas PUD's 2006 Production Compliance Report for Committees approval. In responding to questions, Klinge confirmed that significant differences from targets for subyearling summer Chinook were counterbalanced by the fact that a higher number of the early released fish were detected as compared to late released fish, based on PIT-tag detections at McNary Dam. Kirk Truscott confirmed that future plans for following this early/late production will be up for Committees discussion at the next meeting. Truscott mentioned that he would like to review this report and follow up with Charlie Snow (of WDFW), and then the report would be up for approval at the next meeting.

C. 2007 Douglas PUD Action Plan

Rick Klinge introduced the topic of Hatchery Committees approval of the 2007 Douglas PUD Action Plan. Klinge was seeking Committees approval of those items relevant to the programs, and that he would be presenting this plan to the Coordinating Committee next Tuesday, January 23. Committee members suggested several largely editorial comments to the document, and Tom Kahler agreed to provide the revised plan to Ali Wick by tomorrow, January 18, for distribution to the Committees. The Committees will provide any additional comments by the end of the day, Friday, January 19 and will copy Rick Klinge, Mike Schiewe, and Ali Wick on the emails.

VI Chelan PUD

A. Presentation: Integrated Hatchery Improvement Plan

Julie Pyper discussed Chelan PUD's Integrated Hatchery Improvement Plan, and will provide a more detailed presentation at the next meeting. The plan has several parts: 1) an analytical tool to determine whether Chelan PUD's programs are meeting production goals; 2) an overall project schedule; 3) a program schedule (e.g., hatchery and other required projects); and 4) budget and forecast. This plan will be coordinated with the

Hatchery Committee and Douglas PUD. Chelan PUD and the Hatchery Committees will both provide input on the level of detail provided in the plan.

B. Facilities Update

Mike Schiewe updated the group that this month's Chelan PUD Facilities Summary was previously sent to the group prior to the meeting, and in the interest of conserving time, will not be discussed unless there are specific questions. Tom Scribner asked about the timing for reinstalling the predator exclusion net at the Chiwawa Rearing Ponds. Kirk Truscott agreed to check with Rick Stilwater (WDFW Hatchery staff) about the timing and report back to the Committees. Scribner also asked about Chelan PUD's meeting with the Washington Department of Ecology, and whether the Chelan Falls facility will require an National Pollutant Discharge Elimination System (NPDES) permit. Julie Pyper confirmed that the issue of an NPDES permit is being addressed. Scribner expressed interest in seeing the piping alignment (site plan) for the Chiwawa juvenile steelhead ponds, and Shaun Seaman commented that this is still under development, and that it will be distributed when complete.

Jerry Marco asked for an update on the Chiwawa manifold warming study, and Julie Pyper confirmed that there were no problems with operations thus far, and that Chelan PUD has a contractor on call to remove ice on the ponds should this become a problem.

C. Coho: Next Steps

Shaun Seaman identified several topics in the Rock Island and Rocky Reach SOA for the coho decision that require HCP Committees attention prior to March 31, 2007: a) a decision on use of surrogate species for initial phase designation if coho are designated a Plan Species requiring mitigation (the decision is a Coordinating Committee issue); b) long-term options for funding the coho program (Chelan PUD needs to understand the Yakama Nation's long-term plans and expectations); and c) how to define "success" or "lack of success" for the program, including off-ramps in the event of an unsuccessful outcome.

The majority of the discussion that followed was an exchange between Shaun Seaman and Tom Scribner. Chelan PUD will request that the Committees establish criteria for determining success of the coho reintroduction program, citing: 1) the uniqueness of coho

to the HCP process; 2) the binding nature of production under the HCP even if coho recovery is not successful; and 3) the fact that coho represent a re-introduction of a species. Tom Scribner commented that he would not like to enter discussions on criteria at this time, and the Yakama Nation would only like to consider an off-ramp as a possible option if no benefits from the program are ultimately realized. The Committee requested that Chelan PUD prepare a memorandum summarizing how they would like the Committees to address the question of pass/fail criteria for discussion at the next meeting. Shaun Seaman agreed to prepare this memo prior to the next meeting and to send it to Ali Wick for distribution to the Committees.

D. BKD Management Schedule

Mike Schiewe will check with BKD researchers Diane Elliott and Linda Rhodes regarding their availability to attend a Hatchery Committees meeting in the near future. The Committees are interested in a presentation on how to best address Objective 9 of the Hatchery M&E plan.

E. Use of Lake Wenatchee Net Pens by Grant PUD

Shaun Seaman commented that there could be some permit issues with Grant PUD's use of the Lake Wenatchee net pens, and Chelan PUD anticipates that Grant PUD will be required to obtain its own SEPA permits etc. in order to complete this work.

F. Eastbank Hatchery Power Loss

Kirk Truscott updated the Committees that the windstorm on January 7 caused the loss of all three power feeds (at approximately 2:30pm) to the Eastbank Hatchery, but hatchery crews were able to save the majority of the fish. Power spikes caused damage to several pieces of equipment (fuses and switch gear), and all pumps were running again by 6:30 pm. The loss of steelhead was about 20,000 fish. Chelan PUD is working internally to avoid future problems, such as those that were caused by the windstorm. Kirk Truscott commended Chelan PUD for their rapid and professional response.

G. Northwest Hydropower Association Conference

Shaun Seaman updated the group that he will be participating in a session on the role of hatcheries in hydropower mitigation at the NWHA conference in Portland, Oregon, on

February 20 from 1 to 5:00 pm. Seaman will send the conference agenda to Ali Wick for distribution to the Committees.

H. Juvenile Steelhead at Chiwawa Hatchery

Chuck Peven updated the Committees that there are several issues regarding design of the juvenile steelhead acclimation facilities at the Chiwawa site that will require the Committees' input and decisions. Chelan PUD will bring a proposal to the next meeting to facilitate the necessary discussion. Chelan PUD will also distribute the preliminary site plan for the Chiwawa steelhead acclimation ponds to the Committees as soon as available.

I. Trout Unlimited

Shaun Seaman committed to write an email to the Committees regarding Trout Unlimited's request for funding for fixing Blackbird Island pond to potentially rear hatchery steelhead .

VII Presentation and Question/Answer: Hatchery Review Process

Lars Mobrand and Dave Fast provided a presentation on the Hatchery Review Process, beginning at 1:00 pm, and lasting through the remainder of the meeting.

VIII Other Items

A. Next Meetings

Mike Schiewe noted that the schedule for next meetings are as follows:

- Wednesday, February 21, 2007, at Chelan PUD in Wenatchee.
- Wednesday, March 21, 2007, at Chelan PUD in Wenatchee.
- Wednesday, April 18, 2007, (Update: this meeting will now be in SeaTac at Grant PUD offices – to be confirmed).

IX List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Paul Schlenger	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge *	Douglas PUD
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Lars Mobrand	Mobrand--Jones& Stokes
Kris Petersen *	NMFS
Brian Cates *	USFWS
Kirk Truscott *	WDFW
Steve Parker	Yakama Nation
Dave Fast	Yakama Nation
Tom Scribner *	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: March 22, 2007

Re: Final Minutes of February 21, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on February 21, 2007, from 9:30 am to 3:45 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send the Final December 13, 2006 Meeting Minutes, the December 27, 2006 Conference Call Minutes, and the January 17, 2007 Meeting Minutes to the Hatchery Committees (Item II).
- Rick Klinge will contact LGL Limited and work with Rick Stilwater to investigate the possibility of installing temporary pickets at the Twisp Weir prior to Twisp trapping, on the right bank to the notch, in order to preclude fish jumping over the weir on the right bank side of the river (Item VI-A-1-a).
- Kirk Truscott and Rick Klinge will develop a report summarizing recommendations for 2007-2008 capacity at Methow Hatchery, and will distribute this to the Committees prior to the next meeting (Item VI-D).
- Ali Wick will distribute the previous Statement of Agreement for steelhead acclimation to the Committees (VIII-A).
- Chuck Peven will distribute the American Fisheries Society (AFS) abstract he and several colleagues are working on to the Committees once it is finalized (Item VIII-B).
- Ali Wick will send out conference call informational for the call on Wednesday, March 7, 2007 to discuss coho (Note: This call was subsequently cancelled) (Item VIII-E).

- Chelan PUD will develop an information white paper on the coho determination for distribution to the Committees prior to the conference call by Monday, March 5 (Item VIII-E). (Delayed as noted above).
- Chuck Peven will forward an email to Ali Wick for distribution to the Committees that contains the latest information from Howie Wright of the Okanagan Nation Alliance regarding collecting and tagging Skaha sockeye (Item VIII-H).

DECISION ITEM SUMMARY

- The Committees approved the Statement of Agreement on Net Pen Rearing 100,000 Broodyear 2005 Turtle Rock Summer Chinook at the Chelan River (Item IV).

I BKD Question/Answer with Diane Elliott (USGS) and Linda Rhodes (NMFS)

Mike Schiewe introduced Drs. Linda Rhodes and Diane Elliott and invited them to open the bacterial kidney disease (BKD) question/answer session. Rhodes and Elliott began by summarizing their understanding of the Monitoring and Evaluation (M&E) Program and specifically Objective 9 as it relates to their BKD research. Chuck Peven confirmed that the Committees had not yet agreed on a preferred approach to addressing this objective, and the Committees hope to further discuss options for this objective today.

In response to a question from the Committees, Elliott listed a number of reasons why so many questions remained unanswered about BKD, including funding issues and technology limitations. She mentioned one of her current projects for the Great Lakes Fishery Trust in which her research team is working to develop non-lethal sampling methods (one method under developments is a gill snip, but Elliott noted that the biological significance of a positive result using this sample method is uncertain). She also noted that one of the major problem areas in BKD research was the uncertain relationship between infection and clinical disease—that is, BKD infection does not always lead to fish disease. Further, fish disease may not always lead to fish death.

Linda Rhodes discussed some preliminary results from her research sampling and testing for BKD in marked and non-marked juvenile Chinook salmon in the Puget Sound nearshore. In her preliminary data, prevalence of disease (as measured by Quantitative Fluorescent Antibody

Technique [QFAT]) varies between broad geographic embayments, with certain hotspots of disease prevalence. Based on results of a multivariate analysis of these data, factors considered not important in predicting disease prevalence included fish length and marking status; factors considered important in predicting disease prevalence included geographic location, and to a lesser degree, water temperature. For both marked and unmarked fish, the pattern was the same. These results suggest a stronger influence of horizontal than vertical transmission in this study, but these data are still being analyzed. Elliott noted that at Dworshak Hatchery in Idaho, vertical transmission seemed to be a factor in survival, as higher adult returns were generally observed in progeny from low-ELISA adults, but sample sizes were too low for a statistically valid result.

Mike Schiewe asked Rhodes and Elliott to address the question of what research could be done related to the HCP Plan Species to understand whether there is an interaction between hatchery and natural spawners and BKD levels. Ideas they suggested included the following:

- Monitor BKD levels in marked vs. unmarked fish (a close analog for hatchery vs. natural spawners) at various life history stages sampled at various dams along the migration route.
- Conduct regular monitoring, comparing concentrations of *Renibacterium* in water both up- and downstream of rearing ponds.
- Place fish housed in live boxes upstream and downstream of hatcheries, and monitor for infection and disease.
- Design a hatchery experiment that would include evaluating Smolt-to-Adult Return Rates (SARs) of progeny of high- and low-ELISA spring Chinook reared at high and low densities. Thus far, an experiment of this type that includes controls has not been conducted. Linda Rhodes suggested that the minimum number of brood cycles needed to obtain meaningful results could be between two and four (she mentioned, however, that this number was based on best professional judgment, as there is no current information on the biological meaning of a given number of cycles to overall results).

Shaun Seaman asked whether either Rhodes or Elliott had concerns over an interim approach by the HCP Committees in dedicating a certain percentage of a hatchery to raising high-ELISA fish (high-ELISA as determined by a certain Optical Density [OD] value). Rhodes and Elliott expressed no concern with this approach. Mike Schiewe thanked Rhodes and Elliott for

attending and suggested that Committee members may contact them in the future with additional questions.

II Meeting Minutes Approval

The Committees approved the December 13, 2006 Meeting Minutes, the December 27, 2006 Conference Call Minutes, and the January 17, 2007 Meeting Minutes. Ali Wick will send these finalized minutes out by email.

III HETT Update

Ali Wick updated the Hatchery Committees that the Hatchery Evaluation Technical Team (HETT) is currently working on the following topics:

- The HETT is reviewing a document prepared by John Skalski called the "Review of Precision Performance of Mid-Columbia CWT Releases." The document was prepared to assist the HETT in responding to a question from the Yakama Nation about the proportion of hatchery fish that needed to be marked to address the hypotheses posed in the Hatchery M&E Plan.
- The HETT is overseeing the installation of in-stream Passive Integrated Transponder tag (PIT-tag) detectors near the mouths of Peshastin Creek and the Entiat River; the goal is to complete permitting and installation by March 1.
- The HETT is evaluating several watersheds/rivers as possible reference areas for spring Chinook salmon; they are developing spreadsheets for tracking selected metrics by year for three systems (Methow, Wenatchee, and Yakima). At the next HETT meeting, following the recent Regional Supplementation M&E Workshop in Portland, the HETT will finalize next steps.
- The HETT continued evaluation of Todd Pearsons' (of Washington Department of Fish and Wildlife [WDFW]) model for addressing the interaction of plan species with non-target taxa of concern (NTTOC); the HETT decided to invite Todd to run the model for the HCP populations. Andrew Murdoch will get more information from Todd Pearsons about what data are needed for this exercise.
- The HETT is continuing the evaluation of recent information from the Okanagan Nation Alliance regarding the potential to PIT-tag some Skaha Lake sockeye smolts (see updated information in Item VIII-H).

- The HETT is preparing the 2006 M&E Annual Report and will send a draft to the Hatchery Committees by March 1.
- Chuck Peven, Russell Langshaw, and Steve Hays have submitted an abstract to this fall's AFS Annual Meeting. The abstract focuses on a proposed approach to hatchery compensation that may reduce risk by relying more on integration with the existing habitat and standing crop of naturally produced fish.
- Several HETT members are involved with the Columbia Salmon Monitoring and Evaluation Program (CSMEP).

IV DECISION POINT: WDFW Broodyear 2005 Summer Chinook Net Pen Rearing at Chelan River

Kirk Truscott introduced the Statement of Agreement on Net Pen Rearing 100,000 Broodyear 2005 Turtle Rock Summer Chinook at the Chelan River. The Committees approved the Statement of Agreement with the only revision being a current date (Attachment B).

V WDFW

A. Wenatchee Steelhead Broodstock Collection

Kirk Truscott updated the group that WDFW has begun trapping Wenatchee steelhead at Dryden and Tumwater; he recently sent a memo to the Committees describing this effort. The trapping action is consistent with the Section 10 permit and the broodstock collection protocols reviewed by the Committees in spring 2006. Thus far, WDFW is short an additional 19 females and 10 males to reach program goals.

VI Douglas PUD

A. Progress on Broodstock Trapping

1. 2007 Twisp Production

a. Discussions with WDFW Hatchery Staff on Collection in the Twisp River in Spring 2007

Rick Klinge updated the Committees that Douglas PUD is anticipating that, despite damage to the weir last year, broodstock trapping will occur this year at the Twisp Weir. Douglas PUD is planning to install weir panels extending from the left bank to the notch prior to the trapping season. Klinge clarified

that because of deep river depths on the left side, the fish tend to prefer to use the left bank. Tom Scribner asked if there were any additional panels or pickets that could be installed prior to the trapping on the right bank to the notch, in order to improve trapping efficiency. It was agreed that Klinge will contact LGL and work with Rick Stilwater to investigate this possibility.

b. Status of Genetic Analysis of Methow Subbasin Spring Chinook

Rick Klinge updated the group that Douglas PUD anticipates having the preliminary results of genetics analysis of the Methow subbasin spring Chinook prior to the next meeting. Ken Warheit of WDFW is conducting a molecular analysis of population structure in the Methow in support of Objective 3 of the M&E Plan; part of that analysis will be a determination of whether or not population-specific markers might be used to identify Twisp River fish at Wells Dam. Tom Scribner asked whether Warheit could be asked to speculate on the "significance" of any differences between natural- and hatchery-origin fish as it relates to fitness and survival. Tom Kahler noted that such a determination of relative fitness and survival would be beyond the scope of the study, and that the intent of the genetics exercise relative to broodstock collection is to evaluate whether the Twisp and Methow populations collected at Wells Dam can be differentiated genetically, as well as to inform whether Douglas PUD can maintain the segregation of these spawning aggregates through broodstock collection at Wells Dam.

2. 2007 Trapping Facilities and Status of Facilities on Twisp and Chewuch Rivers

Rick Klinge updated the group that Douglas PUD is proceeding with design drawings and engineering on traps on the Twisp and Chewuch Rivers. The drawings will probably be available to the Hatchery Committees next month.

B. Survival Data of Early and Late Releases of Subyearling Summer Chinook from Wells Hatchery

Rick Klinge updated the group that WDFW analysis of tag data (detections at McNary) indicates that the early release group of subyearling summer Chinook from Wells Hatchery is surviving at a higher rate than later releases. John Skalski is preparing CJS survival

estimates that should be available soon. Klinge will summarize these findings at a future meeting.

C. Progress toward Development of a new Well Water Supply Methow Hatchery

Rick Klinge updated the group that the well development at Methow Hatchery is anticipated to be completed by the end of May and is proceeding according to schedule.

D. Update on Hatchery Capacity for 2007-2008 at Methow Hatcheries

Douglas PUD and WDFW have been evaluating current facility and rearing criteria to determine rearing capacity at the Methow Hatchery. The next steps will be for Kirk Truscott and Rick Klinge to prepare a brief report of their findings and recommendations for discussion at the next the next Hatchery Committees meeting.

VII Yakama Nation

Tom Scribner updated the Committees that 2006 coho acclimation at Wells Hatchery went very well, and that the Yakama Nation would like to conduct the same program in 2007. He asked the Committees if there were any objections to acclimating coho at Well Hatchery again; there were no objections and Scribner indicated that the program will proceed in 2007 similar to in 2006.

VIII Chelan PUD

A. Production Levels for Steelhead

Shaun Seaman noted that today's agenda item concerning production levels of steelhead at the new Chiwawa Ponds will be changed from a decision item to a discussion item for today's meeting; Seaman indicated he needed additional time for further internal discussions. Chelan PUD is, however, still planning on building an acclimation facility at the Chiwawa Hatchery location. Chelan PUD will bring this item to the Committees for a decision at the next meeting. Ali Wick will find and circulate the previous Statement of Agreement for steelhead acclimation, for the Committees information.

B. American Fisheries Society Conference Abstract

Chuck Peven updated the Committees that he, Russell Langshaw, Tracy Hillman, and Steve Hays have submitted an abstract for AFS this fall. The presentation would focus on an approach to hatchery compensation that may reduce risk by relying more on integration with the existing habitat and standing crop of naturally produced fish; the abstract describes the proposal to develop a robust experiment to evaluate this approach. Chuck Peven will send the abstract to the Committees once it is finalized, for their information.

C. Engineering Report

Julie Pyper updated the group that this month's Chelan PUD Engineering Report was sent to the Committees prior to the meeting, and in the interest of conserving time, will not be discussed unless there are specific questions. The Committees agreed that this is an acceptable format for handling this information.

Pyper addressed several questions on the recent report that were posed by the Committees:

- Chelan PUD will be working with WDFW to resolve staffing issues at the Chiwawa Rearing Ponds as we move into the spring season. Fewer staff may be needed to operate/monitor the water supply system.
- Tom Scribner asked whether there was a plan to replace the predator exclusion net at the Chiwawa facility. Julie Pyper and Rick Stilwater replied that now that the snow is melting and the weather is warming, WDFW will evaluate the timing of net replacement. Currently, the ponds are still frozen over.
- Julie Pyper clarified that Chelan PUD is meeting on a programmatic basis with the Washington State Department of Ecology (Ecology) regarding water quantity issues related to facilities. The fisheries co-managers may be contacted by Ecology to verify their support of Chelan PUD's current water right applications. Also, Pyper may request a letter from the HCP Committees in support of the applications.

D. Integrated Hatchery Improvement Plan

Shaun Seaman briefed the Committees that Chelan PUD is currently developing an Integrated Hatchery Improvement Plan (IHIP; and "tool") to address interactions among hatchery programs, facilities, and events (e.g., the recent pond freeze at Chiwawa Hatchery and how events like these would impact other species and hatchery capacity). Chelan PUD

is currently working with WDFW on bioprogramming and will have more information for the Committees as the tool is developed.

E. Coho Discussion

Shaun Seaman noted that Chelan PUD met with the Yakama Nation to discuss the coho determination. Chelan PUD would like to set a conference call before the March Hatchery Committees meeting to specifically address three issues: 1) use of yearling summer Chinook as surrogates for coho for the purposes of initial Phase Designation; 2) options for long-term funding to meet the PUD's hatchery obligations; and 3) options for performance standards. Chelan PUD will provide some pre-discussion information to the Committees by Monday, March 5. This call will be held on Wednesday, March 7, 2007, at 9:30 am, and Ali Wick will send out conference call information. (Note: This call was subsequently cancelled, and will be rescheduled if necessary.)

F. Reference Streams

Chuck Peven provided an update on PIT-tag detector installation in Peshastin Creek and the lower Entiat River; it is on schedule for installation by about March 1. Outstanding issues include securing landowner consent and providing electrical power.

G. Colville Confederated Tribes Okanogan River Smolt Trap

Chelan PUD informed the Committees that it is funding a month of operation of the Colville Tribes' Okanogan River smolt trap.

H. Skaha Sockeye

Chuck Peven will forward an email to Ali Wick for distribution to the Committees that contains the latest information from Howie Wright of the Okanagan Nation Alliance regarding collecting and tagging Skaha sockeye. This information indicates that a very large number of Osoyoos sockeye would be handled in order to PIT-tag 10,000 Skaha sockeye, and this may not be desirable. The HETT will provide a recommendation to the Hatchery Committees on this prior to the next Hatchery Committees meeting. Jerry Marco mentioned that over 1 million sockeye were estimated in Skaha Lake, attributable to the Okanagan Nation Alliance's Skaha program. The 2007 fry release will occur on May 15.

I. Ultrasound Equipment

Chuck Peven updated the group that WDFW, U.S. Fish and Wildlife Service (USFWS), and Chelan PUD will have a planning meeting in June to coordinate with hatchery personnel on the potential use of ultrasound equipment for gender identification in returning spawners.

IX Other Items

A. Meeting Agreements

The following informal agreements were reached at this meeting:

- The Yakama Nation will acclimate coho salmon at Wells Hatchery in 2007, as in 2006 (Item VII).
- Chelan PUD's Engineering Reports will be sent to the Committees prior to the meeting so that any questions can be addressed at the meeting; there will not be detailed presentations on the reports at the meetings (Item VIII-C).

B. PRCC/HCP Meeting

Mike Schiewe asked for feedback on the recent Priest Rapids Coordinating Committee (PRCC)/HCP meeting. The Committees responded that they found the discussions useful and they considered the meeting productive.

C. Next Meetings

Mike Schiewe noted that the schedule for the next meetings are as follows:

- Wednesday, March 21, 2007, at Chelan PUD in Wenatchee.
- Wednesday, April 18, 2007, at Grant offices in SeaTac (to be confirmed).
- Wednesday, May 16, 2007, at Chelan PUD in Wenatchee.

X List of Attachments

Attachment A – List of Attendees

Attachment B – Rocky Reach and Rock Island HCP Hatchery Committees Statement of Agreement on Net Pen Rearing 100,000 BY 2005 Turtle Rock Summer Chinook at the Chelan River

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge *	Douglas PUD
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Linda Rhodes	NMFS
Kris Petersen * (by conference call)	NMFS
Brian Cates *	USFWS
Diane Elliott	USGS
Kirk Truscott *	WDFW
Andrew Murdoch	WDFW
Rick Stilwater	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

ATTACHMENT B

ROCKY REACH AND ROCK ISLAND HCP HATCHERY COMMITTEES STATEMENT OF AGREEMENT ON NET PEN REARING 100,000 BY 2005 TURTLE ROCK SUMMER CHINOOK AT THE CHELAN RIVER

Rocky Reach and Rock Island HCP Hatchery Committees
Statement of Agreement on Net Pen Rearing 100,000 BY 2005 Turtle Rock Summer Chinook at the Chelan River
February 21, 2007

Statement

The HCP Hatchery Committee (HC) agrees to net pen rearing 100,000 BY 2005 Turtle Rock yearling summer Chinook in the Chelan River below the Chelan Falls powerhouse for release in spring 2007. The rearing/acclimation will occur from mid-February through early-May, at which time the fish will be released as smolts from the net pens into the Chelan River and allowed to emigrate from the Chelan River to the Columbia River for seaward migration. The HCP Hatchery Committee (HC) agrees that the operation of the Chelan Falls summer/fall Chinook net pens installed by WDFW are independent of the operations of the Lake Chelan project and the implementation of the Lake Chelan license and is not linked nor will interfere with operations of the project in any way for the life of the net pen operation. To the extent practicable, Chelan PUD will coordinate internally to minimize impacts to this Chelan Falls summer Chinook net pen operation while not impairing the District's ability to operate the Chelan Hydro project in a manner consistent with the District's objectives for that project.

This program will be evaluated by the Hatchery Committee by the end of year (2007) to determine if it should be repeated in subsequent years.

Background

At the May 17, 2006 meeting, the HCP HC agreed to change the current Turtle Rock summer Chinook program from approximately 1.6 million subyearlings and 200,000 yearlings to a program of up to 600,000 yearlings, raised at a new facility at Chelan Falls: "*The Rocky Reach and Rock Island HCP Hatchery Committees agree that Chelan PUD should move final rearing and acclimation for the Turtle Rock summer Chinook program to a new facility that will be built near the Chelan Powerhouse area. The new yearling program will be made up of 400,000 fish from the conversion from sub-yearlings and an additional 200,000 fish from the current production requirements (that are subject to revision in 2013 per the HCP). The District agrees to consider retaining some portion of the sub-yearling program, as long as it can be accommodated within the current future facility modifications that have been agreed to by the hatchery committee previously."*

One of the primary reasons that this program is being moved from its current location on Turtle Rock Island is to increase homing fidelity to the release site. Furthermore, the primary purpose of this program is to provide a fishery for the original inundation of Rocky Reach Reservoir.

By moving the program to Chelan Falls area and rearing on Chelan River (Lake) water, the HCP HC agrees that 1) homing fidelity to the release area should increase, and 2) a local fishery will most likely develop in the area, similar to what currently occurs near the mouth of the Okanogan River.

The 100,000 yearling Turtle Rock summer Chinook reared in the net pens are a component of the current program production of 200,000 yearlings and does not constitute a program increase.

Net pens with a volume of at least 12,000 cubic feet will be needed to acclimate/imprint 100,000 yearling summer Chinook and is consistent with density index rearing criteria in the Hatchery Facilities Evaluation Suggested Guidelines for Anadromous Fish Hatchery Programs developed for Chelan PUD funded hatchery programs. Two net pens with dimensions of 20ft x 20ft x 15ft will be used, providing 12,000 ft^3 of rearing space.

Fish would be placed in the net pens during late-February or early-March where they would remain until release on about April 15 (60) days. The fish will have to be about 11-12 fish to the pound when they enter the net pen and are expected to be approximately 10 fish to the pound by April 15.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: April 20, 2007

Re: Final Minutes of March 21, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on March 21, 2007, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send the Final February 21, 2007 Meeting Minutes to the Hatchery Committees (Item I).
- Committees members will provide comments on the 2006 Monitoring and Evaluation (M&E) Annual Report by April 18 (Item II).
- Andrew Murdoch will send a recent publication that reports the application of the non-target taxa of concern (NTTOC) in the Yakima River basin to Ali Wick for distribution to the Committees (Item II).
- Regarding Objective 10 of the M&E Plan, Ali Wick will distribute the publications that explain the procedure for running the NTTOC model (Item II).
- Committees members will review the NTTOC papers prior to the next meeting (Item II).
- Kirk Truscott will coordinate with Kris Petersen on the memo regarding the proposed disposition of high ELISA broodyear 2006 Chiwawa spring Chinook and Wenatchee summer Chinook; the recommendation is to cull high eggs from high ELISA females from the Wenatchee summer Chinook group. He will ask her to send an email discussing her concurrence or concerns on the memo (Item III-A).
- Kirk Truscott will forward a copy of the handout and spreadsheet regarding Methow Hatchery capacity for spring Chinook to Ali Wick (Item III-B).

- Julie Pyper will provide a draft template for letters of support for water right applications (Item IV-C).

DECISION ITEM SUMMARY

- There were no decision items at this meeting.

I Meeting Minutes Approval

The Committees approved the February 21, 2007 Meeting Minutes. Ali Wick will send these finalized minutes out by email.

II HETT Update

Ali Wick and other Hatchery Evaluation Technical Team (HETT) members updated the Hatchery Committees regarding the HETT's progress on the following topics, as discussed below:

- The HETT has drafted a brief report (circulated yesterday) summarizing their conclusions regarding the need for 100 percent marking of summer Chinook. The HETT used John Skalski's report *Review of the Precision of Mid-Columbia CWT Releases and Recommended Sample Sizes* to inform the conclusion that the current 100 percent mark rate is appropriate for the present level of precision, and does not recommend changing marking percentages unless a decreased level of precision is acceptable. This recommendation will be on the agenda for Committees concurrence at the next meeting.
- The HETT is overseeing the installation of in-stream Passive Integrated Transponder tag (PIT-tag) detectors near the mouths of Peshastin Creek and the Entiat River, which will be completed as soon as the water level comes down.
- The HETT is evaluating several watersheds/rivers as possible reference areas for spring Chinook salmon; they have developed spreadsheets for tracking selected metrics by year for three systems (Methow, Wenatchee, and Yakima). At the next HETT meeting, the HETT has scheduled a working session to use these spreadsheets in the selection of reference streams. A recommendation from the HETT for reference streams will be on the agenda at the May Hatchery Committees meeting.
- The HETT has concluded that Regional Objective 9 of the M&E Plan (regarding bacterial kidney disease [BKD]) as it is presently written is unanswerable with current

technologies, and asked the Hatchery Committees for concurrence on the idea of rewriting a workable Objective 9. The Hatchery Committees agreed with this idea. The new Objective will address both an experimental approach to evaluating the relationship among BKD anitigen levels in returning adult spring Chinook, rearing densities of the progeny of these adults, and ultimate adult return rates; and a proposed approach to monitoring BKD prevalence in hatchery vs. wild populations.

- The HETT will soon be providing a memo regarding its recommendation to not PIT-tag Skaha Lake sockeye smolts, based on information provided by the Okanagan Nation Alliance. This information indicated that large numbers of non target sockeye would need to be handled to facilitate collecting the necessary number of fish to ultimately gain useful downstream survival information.
- The HETT is preparing the 2006 M&E Annual Report and requests final Committees comments by April 18. Following revision of the report with these comments, the HETT will submit the final report to the Hatchery Committees by May 15.

Regarding Objective 10 of the M&E Plans, Andrew Murdoch provided a packet summarizing Todd Pearsons' (of Washington Department of Fish and Wildlife [WDFW]) model for addressing the interaction of plan species with NTTOC. He described the summary of new modeling tools (found at the back of the packet), which can now be applied to improve the certainty of output from the original model. Murdoch presented this information to help the Committees better understand this process and to verify that the Committees agree that this process is the one they want to use to address Regional Objective 10. Ali Wick will forward the publications that explain the procedure for this model, and Murdoch will send an additional new publication that describes the results for one model run. The Committees would like to further review this process and asks the HETT to put this process on hold until they can review these papers. The Committees will review these papers and discuss the path forward at the April meeting.

III WDFW

A. Discussion of WDFW Memo on Disposition of Progeny of High ELISA Chiwawa Spring Chinook and Wenatchee Summer Chinook (Broodyear 2006)

Kirk Truscott previously distributed a memo discussing the disposition of progeny of high ELISA broodyear 2006 Chiwawa spring Chinook and Wenatchee summer Chinook. The

recommendation is to cull eggs of high ELISA females from the Wenatchee summer Chinook group, and to adipose-clip and early release the progeny of high ELISA Chiwawa spring Chinook. The Committees indicated their agreement with the activities described in the memo. Kirk Truscott will coordinate with Kris Petersen on these recommendations since she was unable to attend this meeting. Truscott will ask Petersen to send an email discussing her concurrence or concerns.

B. Methow Spring Chinook Production Status

Kirk Truscott provided an update and a handout on his work with Douglas PUD regarding capacity at Methow Hatchery for rearing spring Chinook. This handout showed how rearing the progeny of moderate and high ELISA fish at reduced density affects hatchery production capacity as the proportion of wild broodstock changes. The handout compared these density and capacity values for fish at average high ELISA (≥ 0.12 Optical Density [OD]) rate of either 26 or 33 percent. Values were shown using a no cull option for wild fish and a full cull option for hatchery fish. Truscott noted that this exercise could be re-run to include different average OD rates. At the next meeting, there will be a refined production capacity estimate, including an estimate of 2007 brood rearing capacity. Also, a schedule will be prepared for finalizing the report on production capacity. Truscott will forward a copy of the handout and spreadsheet from today's meeting to Ali Wick.

IV Colville Tribes

A. Wells Summer Steelhead Smolt Release Stratification for Okanogan River

Jerry Marco updated the group that the Colville Tribes are currently discussing releasing Wells summer steelhead smolts into Salmon Creek as well as into Omak Creek. There is presently enough water to release these fish below the diversion on Salmon Creek. The current program in Omak Creek has a surplus of about 8,000 smolts. The Committees discussed this proposal and agreed to supplement the 8,000 Omak Creek fish with approximately 13,000 Wells summer steelhead. Marco brought this up today for Committee discussion and information. The Committees discussed this proposal and are generally in agreement with it, given that there is an adequate rearing and release plan and sufficient water to preclude stranding.

V Douglas PUD

A. Status of Trapping at Twisp Weir for 2007 Brood

Rick Klinge updated the group that Douglas PUD is currently reconditioning some of the old weir panels obtained from Chelan PUD for use on the Twisp weir, and plans to install these panels as soon as there is an appropriate river flow to accommodate the activity.

B. Draft Partial Report on Genetic Study for Twisp Spring Chinook

Rick Klinge updated the group that Ken Warheit (of WDFW) has provided a partial report on the genetics study of spring Chinook salmon population structure in the Methow basin. The report concludes that Twisp River fish could be differentiated genetically from Methow, Chewuch, and Methow composite (MetComp) fish based on analysis of genetic markers. The final report from this analysis will be part of a larger report that will be available soon.

C. Survival Estimates for Wells Hatchery Sub-yearling Summer Chinook Early and Normal Releases

Tom Kahler updated the Committees that Douglas PUD has asked John Skalski to make survival estimates (based on PIT-tags) for Wells Hatchery sub-yearling summer Chinook from early and normal releases from 2004 through 2006. The results were inconclusive for survival to McNary Dam; although they indicated that the normal release timing had lower survival from McNary to John Day Dam compared to the early release group, but this may be due to some residualization and late outmigration. It is hoped that analysis of the data on adult returns from these release groups will reveal whether or not there is any survival benefit to the early release strategy. Because the differences in survival that were presented here do not show a consistent pattern, the Committees agreed that Douglas PUD should continue to split these groups into early- and late-release periods and continue to collect data on their respective survivals through adult returns. The Committees were in agreement that Douglas PUD could proceed with their proposal to double the number of fish being PIT-tagged.

VI Chelan PUD

A. Engineering Report

Julie Pyper brought up selected points from this month's Chelan PUD Engineering Report.

- Pyper confirmed that there has been a dummy PIT-tag detector and there will soon be a camera installed at Tumwater Dam that will be used evaluate fish behavior relative to a modification of this type, prior to installation of an actual detector.
- Pyper noted that Well C-2 at the Chelan hatchery is now online, which is earlier than the expected completion timeframe of May 2007.
- The 16 and 21 percent Wenatchee River water that was added to the Chiwawa ponds in December and January, respectively, only includes water actually added to the ponds. As of the last 3 weeks, there has been no Wenatchee water added to these ponds.
- Chelan PUD may finish concrete placement on the Eastbank Adult Holding Pond by late May or early June, depending on construction delays pursuant to a problem with concrete cracking.
- Chelan PUD has a revised schedule for design for the Chelan Falls Rearing Pond that indicates that construction can begin by fall 2008.

B. Coho Update

Shaun Seaman introduced this topic and noted that Chelan PUD will need a little more time to discuss the coho decision and will be ready to discuss this in April. The Committees agreed with this course of action.

C. Water Right Letters of Support

Julie Pyper updated the group that Chelan PUD is requesting letters of support for water right applications that have been submitted to the Washington State Department of Ecology (Ecology). Committees members agreed to arrange a letter of support that would be sent to Ecology by their directors. There will also be a joint Committees letter that expresses support as an HCP Committee, per Section 9.6 of the HCPs. Julie Pyper will provide a draft letter template for the Committees' review.

D. PIT-Tag Detector Installation

Julie Pyper indicated that PIT-tag detector installation on Peshastin Creek and the Entiat River is proceeding as planned.

E. Ultrasound Equipment Update

Julie Pyper and Brian Cates updated the group that WDFW and U.S. Fish and Wildlife Service (USFWS) have a meeting next Monday, March 26, to discuss the logistics of testing ultrasound devices to be used for fish gender identification.

VII HCP Administration

A. Meeting Agreements

The following informal agreements were reached at this meeting:

- The Hatchery Committees agreed that the HETT can rewrite Regional Objective 9 of the M&E Plan; the current Objective 9 is unanswerable with current technologies (Item II).
- The Committees agreed with the proposed actions described in the memo dated March 9, 2007, regarding the disposition of high ELISA broodyear 2006 Chiwawa spring Chinook and Wenatchee summer Chinook (Item III-A).
- The Committees agreed that Douglas PUD should continue to split Wells hatchery summer Chinook subyearlings into early- and late-release groups and continue to collect data on their survival. The Committees were in agreement that Douglas PUD could proceed with its proposal to double the number of fish being PIT-tagged (Item V-C).
- The Committees agreed that Chelan PUD may extend to April 2007 the discussion on the coho decision (Item VI-B).
- Mike Schiewe has been invited by the Upper Columbia River Salmon Recovery Board to update them of HCP progress and process. The Committees agreed with this idea and Schiewe will also vet the idea with the Coordinating Committees (Item VII-B).

B. Upper Columbia River Salmon Recovery Board

Mike Schiewe noted that he has been asked to attend an Upper Columbia River Salmon Recovery Board to update them of HCP progress and process. The Committees agreed with this idea and Schiewe will vet this idea with the Coordinating Committees as well.

C. Next Meetings

Mike Schiewe noted that the next scheduled meetings are as follows:

- Wednesday, April 18, 2007, at the Grant PUD office in SeaTac
- Wednesday, May 16, 2007, at Chelan PUD in Wenatchee
- Wednesday, June 20, 2007, at Chelan PUD in Wenatchee

VIII List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge *	Douglas PUD
Tom Kahler	Douglas PUD
Brian Cates *	USFWS
Kirk Truscott *	WDFW
Andrew Murdoch	WDFW
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: June 1, 2007

Re: Final Minutes of April 18, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Grant PUD Offices, in SeaTac, Washington, on April 18, 2007, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send the Final March 21, 2007 Meeting Minutes to the Hatchery Committees (Item I).
- Ali Wick will post today's genetics presentations on the Anchor ftp site (Item II).
- Ali Wick will develop a draft Operating Protocols for the Hatchery Evaluation Technical Team (HETT), and send them to the Committees for review (Item III).
- Ali Wick will follow up with Tracy Hillman to discuss a schedule for completing the 2006 Monitoring and Evaluation (M&E) Annual Report (Item III).
- Kirk Truscott will incorporate comments and will send the revised broodstock collection protocols out to the Committees (Item IV-A).
- Kris Petersen will provide National Marine Fisheries Service's (NMFS') comments on broodstock protocols to Kirk Truscott (Item IV-B).
- Tom Kahler will be sending out the genetics report from Ken Warheit's group for Committees review (Item VI).
- Shaun Seaman will be preparing a Statement of Agreement for the Hatchery Committees' review regarding the coho discussion (Item VII-A).

DECISION ITEM SUMMARY

- There were no decision items at this meeting.

I Meeting Minutes Approval

The Committees approved the March 21, 2007 Meeting Minutes with some revisions discussed at the meeting. Ali Wick will send these finalized minutes out by email.

II Presentation: Genetics Analyses (WDFW Genetics group)

Ken Warheit of Washington Department of Fish and Wildlife (WDFW) introduced his colleagues that have recently conducted genetics research in the Wenatchee and Methow basins. Scott Blankenship presented results from the genetics study investigating potential effects of the Chiwawa River supplementation program on natural spring Chinook in the Wenatchee system. Results of this study indicated that the hatchery program has not affected the population structure of spring Chinook in the Wenatchee River basin. Scott Blankenship emphasized that there was no evidence that the Chiwawa spring Chinook program had impacted the White River spring Chinook population. Maureen (Mo) Small presented results from the genetics study investigating potential effects of the Winthrop Hatchery supplementation program on spring Chinook in the Methow system. Results indicated that the Methow and Chewuch were more similar to each other than either was to the Twisp; effective population sizes are stable in the Methow and Chewuch but decreasing in the Twisp; diversity appears unchanged by supplementation; and natural-origin components could be identified in a mixed sample from Wells Dam. Ali Wick will post these presentations on the ftp site.

III HETT Update

Mike Schiewe brought up the topic of the need for a brief, but formal HETT operating protocol to define the process by which HETT will be assigned work. Schiewe noted that the HCP provides a committee structure and the intent of the HETT within this structure was to provide a venue for technical issues more efficiently addressed by a smaller work team. In general, the protocols will describe how the HETT will be assigned work from the Hatchery Committees. Ali Wick will develop these protocols and send them to the Committees for review. Grant PUD will be developing protocols for their members to use since they are part of the Priest Rapids Coordinating Committee (PRCC) process and jointly meet with the HETT for coordination purposes.

Ali Wick and other HETT members updated the Hatchery Committees regarding progress on the following topics, as discussed below:

- Completed items:
  - The HETT previously provided a brief report summarizing its conclusions that the current 100 percent mark rate for summer Chinook is appropriate for the present level of precision, and the HETT recommendation is to not change marking percentages unless a decreased level of precision is acceptable. The Hatchery Committees concurred today with this conclusion and the conclusions of the HETT report.
  - The HETT previously provided a memo with its recommendation not to Passive Integrated Transponder tag (PIT-tag) Skaha fish, the concept of which was accepted at the last Hatchery Committees meeting.
  - Chuck Peven provided an update at today's Hatchery Committees meeting indicating that the Peshastin Creek PIT-tag detector had been installed, and the Entiat detector will be installed next year due to this year's high flows.
- The HETT is evaluating reference streams; it has developed spreadsheets for tracking selected metrics and will be meeting again on April 26 to look at the results. A summary report and presentation by the HETT will be on the agenda at the May Hatchery Committees meeting.
- The HETT had previously provided the Committees with a new Regional Objective 9 of the M&E Plan, and a list of hypothesis statements within the Analytical Framework document. The Hatchery Committees will review these and will further discuss at the next Committees meeting on May 16.
- The HETT is awaiting further direction from the Hatchery Committees on the non-target taxa of concern (NTTOC) process. The Hatchery Committees will discuss the NTTOC process at the May 18 Hatchery Committees meeting and will provide direction to the HETT on this item following the May meeting.
- The HETT is preparing the 2006 M&E Annual Report. The Hatchery Committees discussed today that they would like to review a more complete draft before finalization. Ali Wick will follow up with Tracy Hillman to discuss a schedule for completing the report, which was discussed today as tentatively thus: Hillman would

provide a final draft by May 15, the report would be out for review from May 15 until June 15, and Hillman would provide the finalized report by either July 1 or July 15.

IV WDFW

A. Discussion on Broodstock Objectives and Protocols

Kirk Truscott introduced the broodstock objectives and protocols previously sent out to the Committees. Comments from the Committees have been requested by WDFW, and Truscott will incorporate comments and will send the revised protocols out. Kris Petersen will provide NMFS' comments to Kirk Truscott shortly. At the next meeting, the Committees will consider acceptance of the protocols for 2007.

Tom Kahler raised the question of why natural-origin Wells steelhead are being spawned in the hatchery earlier than the naturally spawning fish. Kirk Truscott responded that the water temperature in the holding area brings the spawning fish to maturity earlier than those in the natural environment. Truscott said that some data have been collected to evaluate this, but it has not been analyzed yet.

B. Discussion of Memo on Supplemental Broodstock Trapping for BY 2007 Wells Steelhead

Kirk Truscott updated the Committees that there was a shortage of 31 females that was discovered late in the season for the 2007 Wells steelhead broodstock being trapped at Tumwater and Dryden. An email and a document from WDFW recommending a course of action were previously circulated through the Committees and commented on by NMFS. Truscott noted that 13 additional females had been collected last week, and that he expected the remaining females needed to reach the 31 female total would be obtained in the coming weeks. The Committees raised no issue with the proposed course of action.

C. Ultrasound ID Update

Kirk Truscott updated the Committees that WDFW, USFWS, and Chelan PUD will be testing ultrasound equipment at Leavenworth National Fish Hatchery during the last week of May. Allen Evans from Real Time Research will be demonstrating the ultrasound gender identification process.

D. Methow Spring Chinook Production Capacity Estimate

WDFW and Douglas PUD will provide a presentation on Methow Spring Chinook production capacity estimates at the June meeting.

V Yakama Nation

Tom Scribner indicated that in recent conversations with Sarah McNary of the Bonneville Power Administration (BPA), McNary indicated that the Federal Columbia River Power System (FCRPS) Action Agencies might be interested in exploring options to cost share with the PUDs to expand acclimation sites for spring Chinook and steelhead. Scribner suggested that this topic might be discussed at the May 9 meeting among the PUDs, the Yakama Nation (YN), and BPA.

VI Douglas PUD

Tom Kahler will be sending out the genetics report from Ken Warheit's group (WDFW) that was discussed in today's presentations. The Committees will review and comment on this report concurrent with Douglas PUD's review.

VII Chelan PUD

A. Coho Discussion

Shaun Seaman introduced this topic and updated the group that the Coordinating Committees are currently discussing the determination of coho as a plan species requiring mitigation. He will be preparing a draft Statement of Agreement for the Hatchery Committees' review by early next week, and will provide a separate draft Statement of Agreement to the Coordinating Committees for their concurrence next week as well. Seaman indicated that one provision of the agreement Chelan PUD would be requesting was that, due to limited water supply, Eastbank Hatchery not be used in any new mitigation. The Committees discussed how such a provision could be worded so as not to overly constraint the Committees role in implementing the program.

The Committees also discussed how monitoring of coho would potentially fit into the existing Hatchery M&E Plan. Tom Scribner suggested that the Yakama Nation might provide a list of M&E elements for coho that might fit into the existing M&E program. Shaun Seaman commented that Chelan PUD would like to leave open the opportunity to

remove the coho mitigation obligation in the event that the entire Committees (including the Yakama Nation) agrees that the coho program is not successful.

B. Presentation on Proposals For Chiwawa River Spring Chinook and Steelhead Management in the Wenatchee (Chuck Peven)

Chuck Peven presented a proposal to acclimate hatchery steelhead in the Wenatchee River at Blackbird Island Pond, with the intention to apportion these fish for harvest. Peven mentioned that one of the reasons for bringing this up today is that the PUD would like to investigate the potential to transfer some of its HCP steelhead obligation to Blackbird Pond, while continuing forward with plans to develop steelhead acclimation ponds at the Chiwawa site. Seaman indicated Chelan PUD's intent was that use of the pond would be in-lieu of constructing facilities at Chiwawa. The Joint Fisheries Parties (JFP) indicated that they agreed with the concept of raising steelhead at Blackbird Pond, but that Chelan PUD should still plan facilities at the Chiwawa Pond site to accommodate the full program. The Committees emphasized that the PUD could proceed with the Blackbird pond plan as long as the Chiwawa site plans would not be delayed. Kris Petersen commented that the existing permit would not need to be modified to allow a steelhead harvest component in the Wenatchee subbasin. Peven clarified that he was suggesting that the permit could potentially be restructured to ensure that a fishery could open more often if these fish were designated strictly for harvest. Petersen indicated that NMFS opinion was that that was not a viable option because the opening of fisheries is limited by natural origin returns – not just the presence of hatchery fish.

Peven also described a proposal to investigate differences in reproductive success of naturally-spawning hatchery spring Chinook salmon released as parr versus those released as yearling smolts. The JFP members of the Committees indicated that they had discussed this proposal and concluded that they would not be supportive of this proposal. Therefore, the Committees did not wish to pursue this study at this time.

C. Updates (Julie Pyper)

Julie Pyper provided copies of the Engineering Report to the Committees and briefly discussed some of the updates regarding the following topics.

- Chelan Hatchery Wellfield Improvements

- Chiwawa Water Warming Study
- Eastbank Adult Holding Pond and Spawning Structure Enclosure
- Chelan Falls Rearing Pond
- Similkameen Hatchery Feasibility Study
- Eastbank Hatchery Adult Steelhead Holding Study
- Chiwawa Juvenile Steelhead Study
- Integrated Hatchery Improvement Plan

VIII HCP Administration

A. Brian Cates Retirement

Brian Cates of announced his retirement from the USFWS and the HCP Committees as of June 3. Cates indicated that the USFWS was currently discussing new representatives to the Hatchery and Coordinating Committees, and will soon be designating these individuals. The Committees congratulated him on his accomplishments and thanked him for his work on the Committees for the past several years.

B. Discuss Presentation Needs from Okanagan Nation Alliance (ONA) re: Skaha Sockeye Program, for June Hatchery Committees Meeting

Mike Schiewe asked for items that the Hatchery Committees would like to hear about from the ONA at the June Hatchery Committees meeting. Topics brought up included the following:

- The Committees would like for the ONA to present a general overview of their goals of their program and the recent results.
- Tom Scribner indicated he would like to hear a discussion of what types of evaluations the ONA have considered to test the performance of Skaha sockeye as the migrate outside Canada.
- Tom Scribner also expressed interest in hearing what recommendations the ONA might have regarding integrating monitoring of Skaha sockeye into the HCP Hatchery M&E program.
- Jerry Marco indicated he would like the ONA to address the status of the Hatchery feasibility study.

C. Meeting Agreements

The following informal agreements were reached at this meeting:

- The Hatchery Committees agreed that Chelan PUD could proceed with the Blackbird pond plan such that the Chiwawa site plans would not be delayed while options were developed for Blackbird Pond. See note in Section VII B. regarding clarification by PUD use of the pond which would be in-lieu of constructing facilities at Chiwawa.

D. Next Meetings

Mike Schiewe noted that the next scheduled meetings are as follows:

- Wednesday, May 16, 2007, at Chelan PUD in Wenatchee
- Wednesday, June 20, 2007, at Chelan PUD in Wenatchee
- Wednesday, July 18, 2007, at Chelan PUD in Wenatchee

IX List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Brian Cates *	USFWS
Kirk Truscott *	WDFW
Ken Warheit (morning only)	WDFW
Scott Blankenship (morning only)	WDFW
Maureen Small (morning only)	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: June 21, 2007

Re: Final Minutes of May 16, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on May 16, 2007, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will re-circulate the April 18, 2007 Meeting Minutes to the Hatchery Committees before finalizing them (Item I).
- Mike Schiewe will get in touch with Rollie Schmitten regarding a Hatchery Committee contact and support for the potential Blackbird Pond project (Item II).
- Andrew Murdoch will coordinate Todd Pearsons' participation on Non-Target Taxa discussion at the July meeting (Item III-B).
- Ali Wick will retransmit the revised Hatchery Monitoring and Evaluation (M&E) Objective 9 and hypotheses (Item III-C).
- Kris Petersen will coordinate a Joint Fisheries Parties (JFP) meeting to develop a list of reasons for reestablishing the Twisp weir to Rick Klinge (Item IV-A).
- Shaun Seaman will prepare a draft Statement of Agreement for Chiwawa steelhead production (Item V-A).
- Andrew Murdoch will follow up with Kirk Truscott to check on the status of Washington Department of Fish and Wildlife's (WDFW's) letters of support to the Washington State Department of Ecology (Ecology) for Chelan PUD's water right applications (Item V-C).

- Jerry Marco (of the Colville Tribes) and David Carie (of the U.S. Fish and Wildlife Service [USFWS]) agreed to prepare and send a letter of support to Ecology for Chelan PUD's water right applications (Item V-C).
- Committees members will send comments on the 2006 M&E Annual Report to Tracy Hillman by June 15 [following the meeting, this date was amended to June 25] (Item IX-A).
- Ali Wick will address ftp site issues for posting of the Word version of the 2006 M&E Annual Report (Item IX-A).

DECISION ITEM SUMMARY

- There were no decision items at this meeting.

I Meeting Minutes Approval

The Committees approved the April 18, 2007 Meeting Minutes with some revisions discussed at the meeting. Ali Wick will re-circulate these minutes by email for final review and approval.

II Presentation: Blackbird Pond Steelhead Pond Proposal (Trout Unlimited)

Rollie Schmitten and colleagues made a presentation on behalf of Trout Unlimited and other fishery interest groups in North Central Washington on the potential use of Blackbird Pond for acclimation of steelhead. Schmitten discussed that his intention today was to let the Hatchery Committees know that the sport fishing community strongly supports the project. He mentioned two goals for the potential project: 1) recovery of Upper Columbia steelhead, of which Wenatchee steelhead are a key part; and 2) to have the Wenatchee River reopened to a sport fishery. Some benefits of the project discussed were that the retrofitting pond could be done this year, would be relatively inexpensive, and could provide preliminary data to support a larger acclimation effort in the Wenatchee River. The project would also be a cooperative effort between the public and private sectors focused on steelhead recovery.

Dan Davies then presented some site information for the project. He described the ponds as sized at approximately 1/3 acre and located approximately 20 feet from the Wenatchee River on City of Leavenworth property; they are approximately 20 feet deep and kidney shaped. Davies stated that the Hydraulic Permit Application (HPA) is already in place for the project, and the

Mayor and City Council have approved it, but that water rights will need to be worked out with Ecology. WDFW has agreed to conduct the design work, which will follow the securing of an adequate water right. The project is estimated to cost approximately $50,000 to $60,000 for pond improvements, plus electricity costs (approximately $12,000)

In general, the Committees were supportive of this potential project. The Committees discussed that any fish culture needs for the project would be handled by WDFW. The water right would likely extend from mid-March to mid-May, with a minimum of 45 days; Andrew Murdoch commented that WDFW would recommend planning for March 1 to give fish 30 days acclimation before smolting begins. Schmitten requested a point of contact within the Committees and Mike Schiewe will get back to him with this information. Schmitten also mentioned that Trout Unlimited may request some assistance from the Committees on supporting water right applications.

III Hatchery Evaluation Technical Team (HETT) Update

A. Reference Streams Progress

Andrew Murdoch gave an update on the Hatchery Evaluation Technical Team's (HETT's) recent progress on evaluating reference streams. The HETT has developed spreadsheets for tracking selected metrics for several spring Chinook salmon populations, particularly the recruit per spawner dataset, which appears to be the best dataset for comparing reference streams. Murdoch presented the HETT's first analysis of this dataset, to answer the question, "How well do reference streams correlate to treatment streams?" Murdoch discussed that environmental considerations such as physical parameters and the distance between sites will be part of next evaluation step.

A HETT recommendation for spring Chinook will be delivered to Committee members prior to or at the June Hatchery Committees meeting. Tom Scribner expressed concern with the time needed to complete the process given that steelhead are another of the species discussed in Objective 1, and the Yakama Nation would like the opportunity to collect data sooner rather than later. Mike Schiewe responded that the Committees had already agreed that the collection of new data on juvenile steelhead would follow an examination of adult spawner composition, and that the recent installation of Passive Integrated Transponder tag (PIT-tag) detection equipment in Pashastin Creek (and planned

for the Entiat) was intended to collect this new information. Schiewe also reminded the Committee that the HETT will be providing preliminary recommendations for spring Chinook within the next 2 months.

B. Non-Target Taxa Risk Process

Mike Schiewe introduced this topic and mentioned that some background reading material on this process has been previously provided to the Hatchery Committees, and it is now appropriate for the Hatchery Committees to make a decision on whether to proceed using this method. The Committees expressed interest in asking Todd Pearsons to attend a future meeting to discuss a recent application of the model to assess the effects of spring Chinook supplementation on rainbow trout (in Oregon) and to discuss how the process could be used in the Wenatchee, Entiat, and Methow subbasins. Andrew Murdoch agreed to coordinate Pearsons' attendance at the July meeting.

C. Revised Objective 9 and Hypothesis Statements

The Committees requested more time to review the revised Objective 9 and hypothesis statements. Also, it was agreed that when documents are distributed, the authors will be clearly identified. Ali Wick will re-transmit the documents to the Committees and ask for approval or comments by return e-mail.

IV Douglas PUD

A. Updates on Construction Projects

Rick Klinge updated the group that construction of the new well at Methow Hatchery was nearing completion and that it was expected to deliver about 1,500 gallons per minute (gpm); the former well capacity was about 800 gpm. Also, bid documents will be transmitted to the PUD Commissioners this week for the Wells Hatchery Intake Surface Screens. Bids are due June 18 and the project should be constructed within the year 2007.

Rick Klinge informed the group that, in light of the recently demonstrated ability to identify Twisp River spring Chinook at Wells Dam, Douglas PUD was requesting that the Hatchery Committees reaffirm in writing their reasons for re-establishing the Twisp River trap/weir. Klinge noted that any delay due to this re-evaluation would not necessarily

mean a missed work window for construction. He emphasized that if, by next meeting, the JFP can provide information on why a new facility at Twisp is needed, the initial schedule can still proceed. Kris Petersen agreed to coordinate a JFP response focusing on reasons the Twisp weir would be necessary. Petersen will transmit this list to Rick Klinge and the other Committee members for discussion at the June meeting.

B. Status of Spring Chinook Brood Collection at Wells

Rick Klinge updated the group that spring Chinook brood collection is ongoing at Wells Dam and collection is occurring per the broodstock collection protocols. Andrew Murdoch noted that jack counts have been high this year to date (greater than 20 percent of total fish).

C. Status of Fish/Water Management Tool for 2006-2007 Water Year

Rick Klinge noted that he had received an email from Kim Hyatt (Department of Fisheries and Oceans – Canada [DFO]) that use of the Okanagan Fish-Water Management Tool was quite successful in managing water to minimize mortality of sockeye eggs from desiccation or scour this year. One recent issue that came up is maintaining enough water in Lake Okanogan to be able to spill for alleviating low oxygen conditions in Lake Osoyoos. The Committees will hear more about this issue during the Okanagan Nation Alliance/DFO presentations at the June meeting. Klinge said that the 2006 report will be ready at end of May.

D. Status of Marking Late Release Group of Summer Chinook Sub-yearlings from Wells Hatchery

Rick Klinge updated the group that PIT-tagging of late-release summer Chinook subyearlings will occur today, and that the early group was released earlier this week.

V Chelan PUD

A. SOA for Chiwawa Steelhead Production Levels

Shaun Seaman introduced this topic and discussed a number of issues and topics that Chelan PUD would like to address in a Statement of Agreement for the steelhead rearing facility at the Chiwawa Pond site. The current plan is to construct ponds to rear up to 450,000 smolts, and will raise 400,000 through 2013. The number will be re-evaluated in 2013 and again in 2023. If the 2013 evaluation indicates a need to rear more than 450,000,

then the Committees would cap production at 450,000 while exploring reasons for low productivity. Chelan PUD would rear the steelhead on Wenatchee River water until at least 2013, when the expected production of spring Chinook may decrease, freeing up some Chiwawa River water. Tom Scribner commented that he is not comfortable with limiting options to explore for water source(s) between now and 2013.

The Statement of Agreement will acknowledge Chelan PUD's potential increase in capital expenses, and will include language to allow satellite acclimation facilities. Seaman noted that two or three ponds will be constructed in order to design for trapping and allow for some volitional releases. The water right applications have not been submitted yet. Seaman also noted that the timeline for this work is well in advance of 2013. The draft Statement of Agreement will be distributed for review and comment before the next meeting, with a final decision on the agenda for the June meeting.

B. Coho Discussion

Shaun Seaman described the status of ongoing discussions regarding the coho decision, stating that there are currently two issues before the Hatchery Committees: 1) the type of mitigation that will be required; and 2) an off-ramp for the coho program if not successful. Currently, Chelan PUD is involved in internal discussions as well as those with the Yakama Nation, and a decision is expected soon. Seaman updated the group that Chelan PUD will bring back a draft Statement of Agreement to the Committees in the coming weeks. Tom Scribner noted that he appreciates the work that Chelan PUD has done on this.

C. Engineering Report and Water Rights Application Update

Julie Pyper updated the group on the status of water right applications for Chelan PUD facitity projects. Currently, Ecology is waiting for more letters of support (National Marine Fisheries Service [NMFS] and the Yakima Tribe have provided their letters; USFWS and the Colville Tribes have not yet, and it is unknown whether WDFW has sent one). Andrew Murdoch will follow up with Kirk Truscott to check on the status of WDFW's letter, and Jerry Marco (of the Colville Tribes) and David Carie (of USFWS) agreed to prepare and send letters for their respective agencies. Pyper indicated that the monthly Engineering Report will be sent out upon his return.

D. Phosphorus TMDL Issue Related to Fish Food

Shaun Seaman updated the group that a Lake Wenatchee-area citizen had recently raised an issue about whether fish ponds/facilities were a source for high levels of phosphorus in Lake Wenatchee and the Wenatchee River. Steve Hays commented that Ecology was currently preparing a total maximum daily load (TMDL) on phosphorus for the Wenatchee River, and that the only known phosphorus source associated with fish culture was a small amount in feed. Hays is developing estimated inputs for Lake Wenatchee and Dryden. He commented that it is known that fish can assimilate up to 89 percent of the available phosphorus in feed, depending on the type of fish. He also noted that White River spring Chinook typically use low phosphorus feed. Brian Cates recommended that Hays discuss his estimates with the Leavenworth hatchery manager.

VI WDFW – Melamine in Fish Food

Rick Stilwater updated the group that WDFW is investigating the recent presence of melamine in fish feed products at its hatcheries, including those used for HCP production. WDFW has directed human health questions to the Food and Drug Administration (FDA) in Portland. The WDFW spokesperson in Olympia for this issue has indicated that use of melamine-containing fish feed is not anticipated to be a problem as it relates to human health. Stilwater noted that as a result of this investigation, WDFW will likely change fish feed sources, and increases in feed costs are likely.

VII Yakama Nation Updates

A. Production Schedule Table to be Presented in US v. Oregon

Tom Scribner introduced a production schedule table that was previously provided to the Committees. This table is being developed for use in the U.S. vs. Oregon negotiations for production and harvest. His intention today was to request assistance from those present in reviewing the production numbers for accuracy. Rick Klinge noted that Douglas PUD has some comments, which he will provide. Shaun Seaman commented that there should be a disclaimer stating that this table was reviewed but not specifically endorsed by the HCP Committees. Committee members agreed to provide input to Scribner as individual representatives of their agencies and not as part of the HCP process.

B. Recent 9th Circuit Court Ruling on BPA Rate Case

Tom Scribner briefed the committee on a recent 9th Circuit Court ruling criticizing the Bonneville Power Administration (BPA) for not adequately considering fish and wildlife funding needs in setting their rates.

C. Kelt Reconditioning in Upper Columbia

Tom Scribner updated the group that the Yakama Nation is evaluating the possibility of retaining steelhead broodstock from Wells and Eastbank Hatcheries for kelt reconditioning. To date, the Yakama Nation and WDFW are both interested in this proposal.

VIII Colvilles: Update on Salmon Creek Outplant

Jerry Marco updated the group that on May 8, 13,000 Chinook smolts were released in Salmon Creek and an additional 7,300 were released in Omak Creek. Stranding (which had previously been a concern) was highly unlikely as high flows occurred shortly after the release.

IX HCP Administration

A. Methow Hatchery Production Capacity Report Upcoming

There will be a report on Methow Hatchery production capacity by Douglas PUD and WDFW at the next meeting.

B. New Review dates for 2006 M&E Annual Report

Committees members will send comments on the 2006 M&E Annual Report to Tracy Hillman by June 15 [after the meeting, this date was amended to June 25]. Ali Wick will address ftp site issues for posting of the Word version of the 2006 M&E Annual Report.

C. Schedule for Okanogan Spring Chinook as a Plan Species Requiring Mitigation

Mike Schiewe noted that a decision will be required this year on Okanogan spring Chinook as a Plan Species requiring mitigation. Jerry Marco updated the group that this decision is tied to the Northwest Power Planning Council's three-step process and the Colville Tribes are on schedule to submit their step two package to the Council at their July meeting, with

a decision anticipated by November. Kris Petersen noted that the draft Environmental Impact Statement (EIS) for the Chief Joseph Hatchery is currently out for review.

D. Next Meetings

Mike Schiewe noted that the next scheduled meetings are as follows:

- Wednesday, June 20, 2007, at Chelan PUD in Wenatchee
- Wednesday, July 18, 2007, at Chelan PUD in Wenatchee
- Wednesday, August 15, 2007, at Chelan PUD in Wenatchee

X List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Paul Schlenger	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Brian Cates *	USFWS
Dave Carie (afternoon only)	USFWS
Andrew Murdoch	WDFW
Rick Stillwater	WDFW
Tom Scribner *	Yakama Nation
Rollie Schmitten (morning presentation)	Trout Unlimited
Dave Graybill (morning presentation)	Trout Unlimited
Bob Stroup (morning presentation)	Trout Unlimited
Dan Davies (morning presentation)	Trout Unlimited

* Denotes Hatchery Committees member

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: August 1, 2007

Re: Final Minutes of June 20, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on June 20, 2007, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final May 16, 2007 Meeting Minutes to the Hatchery Committees (Item I).
- Shaun Seaman will revise the Statement of Agreement (SOA) for Production Levels for Chelan PUD's Steelhead Hatchery Program and Ali Wick will re-circulate the SOA for approval (Item III).
- Ali Wick will send out information for a Bacterial Kidney Disease (BKD) subgroup conference call on Thursday, June 28 at 9:30 am to discuss planning and schedule for implementation of the BKD Objectives (Item IV-B).
- Keely Murdoch will send out a revised version of the coho broodstock collection protocol document with the comments discussed at today's meeting (Item V-A).
- Kirk Truscott will send out a document summarizing Washington State Department of Fish and Wildlife (WDFW) and Douglas PUD's recent analyses of Methow Hatchery capacity (Item VI-A).
- Kirk Truscott will check with Carmen Andonaegui on any additional WDFW comments on the reasons for the Twisp and Chewuch River traps (Item VI-B).
- Rick Klinge will send out a document by the end of June summarizing Douglas PUD's comments on the Joint Fisheries Parties (JFP) document summarizing reasons for rebuilding the Twisp and Chewuch River Traps (Item VI-B).

- Rick Klinge will convene a group to discuss the use of the Wells facility for collection and trapping activities this year at the Wells East Ladder (Item VI-D).
- Ali Wick will work with Kris Petersen to draft appropriate language for an SOA for the proposed National Marine Fisheries Service (NMFS) study on reproductive success of Upper Columbia steelhead (VII-A).

DECISION ITEM SUMMARY

- The Committees approved the Chelan PUD proposed SOA Regarding the District's Coho Obligation (Item II).
- The Committees conditionally approved the SOA on Production Capacity for Chelan PUD Steelhead Rearing Program at the Chiwawa Ponds, pending email approval (Item III).

I Meeting Minutes Approval

The Committees approved the May 16, 2007 Meeting Minutes with no revisions. Ali Wick will send out the final May 16, 2007 Meeting Minutes to the Hatchery Committees .

II DECISION ITEM: Coho Decision

Shaun Seaman introduced the SOA for Chelan PUD's coho salmon mitigation obligation; the SOA incorporated changes that had been discussed during the Hatchery Committees conference call on June 13. The Committees approved the SOA with a revision indicating that the June 26, 2007 date mentioned in the SOA refers to a draft SOA that the Coordinating Committee will be considering during their June 26 meeting (Attachment B).

III DECISION ITEM: Production Levels for Chelan PUD Steelhead Hatchery Program

Shaun Seaman introduced a draft SOA on Production Capacity for Chelan PUD's Steelhead Hatchery Program at the Chiwawa Pond site. The initial proposed capacity is for 450,000 smolts. The proposed SOA also sets a priority on improving smolt-to-adult survival rates (SARs) before further adjusting production levels, and identifies the Wenatchee River as the water source until space is available in the existing Chiwawa River Chinook ponds. Kirk Truscott and Tom Scribner expressed concern that they would prefer avoiding the setting of a priority on potential methods of improving SARs, particularly any that would preclude

potential facilities expansion, or that would set improvements in operational practices as a higher priority than potential facilities expansion. Seaman responded that the SOA is intended to convey that facilities expansion would not be precluded, but that expansion would be considered once improvements in operational practices were implemented. The Committees also discussed the water source for the new and existing Chiwawa rearing facilities; Kirk Truscott commented that WDFW would like to avoid precluding a dual water source. Seaman noted that he would verify that the plan was to use existing Chiwawa ponds after modifications, for raising steelhead on Chiwawa River water, as reflected in the draft SOA**.** The Committees conditionally approved the SOA with several comments discussed at the meeting; Seaman will revise this SOA and Ali Wick will re-circulate the SOA to the Committees for final approval (Attachment C).

IV Hatchery Evaluation Technical Team (HETT) Update

A. Non-Target Taxa Risk Process

Ali Wick updated the group that Todd Pearsons of WDFW will be attending the July Hatchery Committees meeting to discuss a recent application of the Non-Target Taxa Risk Assessment Model to assess the effects of spring Chinook supplementation on rainbow trout (in Oregon) and to discuss how the process could be used in the Wenatchee, Entiat, and Methow subbasins.

B. Revised Objective 9 and Hypothesis Statements

The Committees briefly considered the proposed new Objective 9 and the accompanying Hypothesis Statements for the Monitoring and Evaluation (M&E) Plan. Several members indicated that they had not yet reviewed the documents, and were not prepared to discuss any of the proposed changes. Mike Schiewe suggested a subgroup of the Hatchery Committees convene to further discuss and review the proposed changes; a subgroup will convene by conference call on Thursday, June 28 at 9:30 am to discuss implementation of the BKD Objectives to support the development of this plan. This group will include Schiewe, Rick Klinge, Russell Langshaw, Shaun Seaman, Kris Petersen, Kirk Truscott. Ali Wick will send out information for this call.

C. Progress on Reference Streams

The Committees asked the Hatchery Evaluation Technical Team (HETT) to present their recommendations for spring Chinook reference streams at the August Hatchery Committee meeting.

V Yakama Nation

A. Coho Broodstock Collection Protocols

Keely Murdoch introduced the coho broodstock collection protocol that had been previously distributed. Kirk Truscott asked for some clarification to be included in the protocol that fish would not be misdirected to the Wells Hatchery volunteer channel. Tom Kahler noted that installation of a new fish screen on the surface-water intake for Wells Hatchery, scheduled for October through December, would affect the availability of surface water for the operation of the Wells Hatchery volunteer channel. The Committees provided some additional edits to this document and Murdoch will revise and send out this document.

B. U.S. v. Oregon Production Tables

Tom Scribner extended his appreciation for the Committee members' input on the U.S. v. Oregon production tables that he had provided for review.

C. Summer Chinook Surplus at Wells Hatchery

Tom Scribner noted that he would like to initiate discussion of the timing of distribution of surplus summer Chinook prior to the arrival of these fish at Wells Hatchery. Kirk Truscott indicated that surplusing these fish will depend as usual on run strength, and that the use of the ultrasound technology was expected to improve gender assignment and allow determining the extent of any surplus at an earlier date. As discussed at the Policy Committee meeting in December 2006, it is the responsibility of the Hatchery Committee to determine if an excess exists, but how any excess might be distributed is the responsibility of the JFP. Tom Kahler noted that Douglas PUD would like the discussion to include consideration of public perception of early surplused fish; Truscott verified that these concerns will be discussed.

VI Douglas PUD

A. Methow Hatchery Capacity

Kirk Truscott informed the Committees that WDFW and Douglas PUD have been developing new estimates of production capacity at Methow Hatchery, and he will be sending out a document shortly that summarizes their analyses.

B. Response from JFP on Need for Twisp River Trap

Kris Petersen indicated that the JFP had provided the Committees with a document summarizing the reasons why Douglas PUD should move forward with the Twisp (and Chewuch) traps. Kirk Truscott will check with Carmen Andonaegui from the Coordinating Committees for any additional comments that WDFW may have on this issue. Rick Klinge indicated that Douglas PUD will send out a document summarizing their comments on the list by the end of June. The PUD is continuing to make progress toward implementation of the necessary modifications of the Twisp Weir this fall/winter.

C. Update on Construction Projects

The new Methow Hatchery water supply well has been drilled and the screens have been installed; the well field will be developed by early next week. Also, the Wells Hatchery surface-water intake screens will be installed this fall; the installation of these screens will be timed and/or sequenced to not interfere with the hatchery's use of surface water and will conclude before the close of the fish window (by February 28).

D. Wells Facility Trapping

Because of intensive planned use, Rick Klinge noted that he intends to convene the involved parties to discuss the use of the Wells East Ladder for trapping activities this year. The goal is to minimize conflicts.

VII Chelan PUD

A. Request for Proposals Released for NMFS Proposed Reproductive Success Study for Upper Columbia Steelhead

Shaun Seaman asked Kirk Truscott to introduce the topic of the recent Request for Proposals (RFP) for a NMFS proposed study on reproductive success of Upper Columbia steelhead. Truscott indicated that this project involves tissue collection from returning adults at Tumwater Dam in 2007, and WDFW would like to respond to the RFP. Seaman asked for clarification that the project would be consistent with the HCP requirement for a

reproductive success study, and Truscott verified that this was the case. The Committees discussed that they would ultimately like to review a full experimental plan before project implementation. Truscott requested that the Committees forward any comments on the proposal by July 2 because the deadline for submittal to NMFS is July 10. Kris Petersen requested that an SOA be prepared for the collection so as to be consistent with the Endangered Species Act (ESA) permit. Ali Wick will work with Petersen to draft a SOA for the Committees to consider.

B. Engineering Report

Julie Pyper introduced the Engineering Report and discussed the recent study that U.S. Geological Survey (USGS) and Chelan PUD are proposing regarding temperature in the Wenatchee aquifer. Kirk Truscott commented that he would like to discuss Chiwawa Ponds configuration at a future meeting; it was confirmed that this will be on the July meeting agenda. Pyper expressed her appreciation for everyone's assistance in sending the agency letters of support for Chelan PUD's water rights applications.

VIII WDFW

A. Release of High-ELISA fish

Kirk Truscott briefed the Committees on the recent release of high-ELISA spring Chinook fry in Meadow Creek. He noted that in the future he will be requesting Committee approval for the planting location of these types of early releases.

B. PIT-Tagging of Broodstock used for Stock Assessment

Kirk Truscott indicated that WDFW will be Passive Integrated Transponder tagging (PIT-tagging) all broodstock collected for hatchery programs. This will simplify future identification of individuals. The Committees expressed their support for this change.

IX Colville Tribes

A. Bonaparte Pond

Jerry Marco updated the Committees that Chinook held overwinter in the Bonaparte Pond experienced a high rate of mortality that was not evident until ice melt. Recommendations from WDFW fish pathologists are to hold off placing more fish into the pond until the problem is resolved. The Colvilles will be obtaining input from Sam Dilly (Chelan PUD

engineer) on options for using well water to reduce icing, and Marco or Chelan PUD will report back to the Committees on this point.

B. Research Project and Selective Gear

Jerry Marco updated the group that the Colville Tribes have been planning a research project to hold adult fish at Wells Hatchery to evaluate post capture survival. In addition, the Colvilles are conducting a feasibility study for investigating post-release survival on the spawning grounds.

X Presentation: Skaha Sockeye Progress Update and Fish/Water Management Tool

A. Progress on Skaha Program

The Okanagan Nation Alliance (ONA) provided a presentation on the progress of the Skaha Lake sockeye reintroduction program, focusing on 2006 broodyear results. Ali Wick sent the presentation out this morning by email to the Committees for their information. Deana Machin began the presentation by reviewing a list of studies completed in past years in support of the reintroduction program. Howie Wright updated the group on broodstock collection, marking techniques, and egg survival, as well as disease results and zooplankton interaction. Ryan Benson presented estimates of the number and timing of sockeye smolt outmigrants for this and past years. Howie Wright then presented on the Hatchery Feasibility Study that was implemented to choose suitable sites for expanding the capacity for rearing either at the Shuswap Falls facility or on the Penticton Indian Band Lands. Next steps are to develop a "basis of design" report and to review costs, permitting, and water source options. Wright then reviewed a summary of broodstock estimates for next year.

Keely Murdoch brought up the point that the concept of PIT-tagging sockeye to estimate adult returns was dropped as a discussion in the Hatchery Committees this year for the reason that not enough Skaha juveniles were being intercepted in the rotary screw traps and the number of fish intercepted was occurring in a very small timeframe. She pointed out that the number of Skaha fish collected in this year's trap was high enough and spread out over enough days that the Committees may want to reconsider PIT-tagging these fish. The Committees discussed that logistics would need to be considered in light of potential fish loss, but that it may make sense to look at this idea again.

B. Report on Fish/Water Management Tool for 2005-2006 and Update for 2006-2007 (Kim Hyatt)

Kim Hyatt (of Department of Fisheries and Oceans - Canada) updated the Committees on the use of the Fish Water Management Model used to minimize sockeye salmon redd scouring and desiccation in the Okanagan River. The results continue to show a significant benefit from using this in-season management tool.

XI HCP Administration

A. Next Meetings

The next scheduled meetings are as follows: July 18, August 15, and September 19, 2007, all at Chelan PUD in Wenatchee.

XII List of Attachments

Attachment A – List of Attendees

Attachment B – Statement of Agreement Regarding District's Coho Obligation

Attachment C – Statement of Agreement on Production Levels for Chelan County PUD's Steelhead Hatchery Program

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Kim Hyatt (ONA presentation only)	DFO Canada
Rick Klinge	Douglas PUD
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call)	NMFS
Deana Machin (ONA presentation only)	ONA
Howie Wright (ONA presentation only)	ONA
Ryan Benson (ONA presentation only)	ONA
Dave Carie *	USFWS
Tom Scribner * (by conference call – morning only)	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

ATTACHMENT B

STATEMENT OF AGREEMENT REGARDING DISTRICT'S COHO OBLIGATION

Rocky Reach and Rock Island HCP Hatchery Committees
Statement of Agreement
Regarding District's Coho Obligation
June 20, 2007

Statement

The Rocky Reach and Rock Island HCP Hatchery Committees (hereafter "Committees") agree to provide coho hatchery compensation as detailed in Section 8.4.3.a of the Rocky Reach and Rock Island HCPs and that the District shall began providing hatchery compensation no later than October 1, 2007.

The Committees further agrees that in the event the District must use its hatchery facilities to meet its coho obligations under Section 8.4.3.a of both HCPs, the District will not be required to use facilities at Eastbank Hatchery to raise coho due to concerns over water supply. However, this provision does not eliminate the use of these facilities if water issues are resolved. Further, this provision is not meant to remove the Committee from the decision process for determining where coho will be raised.

The Committees agree that the coho program will be included in the five-year evaluations for the M&E programs and other metrics as included in the HCPs. (Section 8.5)

Coho hatchery program production levels would be evaluated and adjusted by the Committees during the 10-year check in dates within the HCPs, following the same processes defined in the HCPs. The first 10-year check-in will occur in 2017.

The Committees agree that the performance of coho programs will be evaluated along with other District hatchery programs (following the 10-year schedule as described above), for consistency with the Endangered Species Act and will need to meet the appropriate standards and goals as established by the Committees to ensure protection of the Permit Species. If, as a result of the evaluations and program modifications either (a) the coho population is stable or increasing, or (b) the coho population is declining and other basin species populations are declining; then the District will continue to provide compensation pursuant to Section 8.4.3.a of the HCPs. If the coho population is declining and other basin species populations are stable or increasing, then the Committee should determine the viability of a coho program and if the program should remain a requirement of the HCPs. As part of this determination, the Hatchery Committee will discuss the status of the coho program with the Coordinating Committee to ensure the criteria for coho are being met as described in the related Statement of Agreement for the Coordinating Committees (SOA is tentatively dated June 26, 2007 at this time as it is currently up for Coordinating Committee approval at the June 26, 2007 Coordinating Committee meeting).

If the Committees determine that a coho program is no longer viable, the District will not be required to continue providing compensation pursuant to Section 8.4.3.a of the HCPs. Funding would continue through the end of the respective broodyear.

Background

Both of the HCPs describe the District's coho salmon hatchery compensation obligation (Section 8.4.3.a.). For the Rock Island Hatchery Committee to determine that the District has a coho salmon compensation obligation under the Rock Island HCP, it must identify a continuing coho hatchery program (by an entity other than the District and occurring outside of the HCP) and/or the establishment of a naturally reproducing population of coho. For the Rocky Reach Hatchery Committee to determine that the District has a coho salmon compensation obligation under the Rocky Reach HCP, it must identify a continuing coho hatchery program (by an entity other than the District and occurring outside the HCP) and/or the establishment of a Threshold Population of naturally reproducing coho in the Methow Basin.

Originally, the Rock Island HCP required the Hatchery Committee to make its compensation assessment in 2005; however, the Hatchery Committee chose to defer the decision until the end of 2006, thus aligning the timing of the decision with that specified for coho in the Rocky Reach HCP. A decision to defer both HCPs decision points had been delayed pending approval of this statement of agreement.

Although the conditions in 8.4.3.a of the HCPs have not been met, the District has agreed to extend the decision date and to provide hatchery compensation for coho under the Rocky Reach and Rock Island HCPs.

ATTACHMENT C

STATEMENT OF AGREEMENT ON PRODUCTION LEVELS FOR CHELAN COUNTY PUD'S STEELHEAD HATCHERY PROGRAM

Rocky Reach and Rock Island HCP Hatchery Committees
Statement of Agreement on Production Levels for
Chelan County PUD's Steelhead Hatchery Program
June 20, 2007

Statement

The HCP Hatchery Committees (HC) agree that a new facility constructed in the upper Wenatchee basin will have capacity for rearing 450,000 steelhead smolts (the current agreement, made on May 17th 2006, is to investigate the feasibility of expanding the existing Chiwawa rearing facility). This new facility will only be served by Wenatchee river water. The HC further agrees that the hatchery production levels for Upper Columbia Steelhead, raised at the new facility, will remain at 400,000 until 2013, and not exceed 450,000 yearling smolts following adjustment in 2013 (production levels will be reevaluated in the 2023 check-in).

The HC agrees to improve the methods for determining smolt-to-adult survival (SAR) for Wenatchee basin hatchery steelhead prior to 2013. If improved and robust SAR estimates are low, resulting in a 2013 production level calculation that exceeds 450,000 smolts, then the HC agrees to first seek measures to increase SAR (rearing practices, broodstock, etc.) prior to increasing production above 450,000 smolts.

Assuming the existing Chiwawa site will be utilized for this program; steelhead will be reared exclusively on Wenatchee River water in the new ponds. Post 2013, at the HC's discretion, steelhead can be reared on Chiwawa water in the existing spring Chinook ponds. If facilities currently used for spring Chinook become available, prior to the 2013 adjustment, Chelan PUD will, at the HC's direction, rear some steelhead on Chiwawa River water.

Modifications to the spring Chinook ponds will be based on modified production levels, HC's BKD management strategies and agreed upon fish rearing criteria.

Expansion of the Chiwawa Hatchery to accommodate over-winter acclimation for steelhead, as described above, does not preclude the development of satellite acclimation facilities in tributary locations for spring acclimation if it is later determined necessary by the HCP Hatchery Committee.

Background

The HCP suggests the formula developed in the BAMP should be used to recalculate hatchery production levels beginning in 2013, and then every ten years thereafter. The HCP is also specific in requiring the District to modify its current steelhead hatchery program to ensure final rearing is on surface waters, which the HCP HC has clarified as Wenatchee River surface water.

The District has conducted feasibility studies to determine site locations for rearing steelhead on Wenatchee River water. A subcommittee of the HC suggested, and the HC

agreed, that current best option is to expand the existing Chiwawa spring Chinook hatchery to include enough water and rearing space for over-winter rearing of steelhead. As such, the District is seeking concurrence from the HC on the total number of steelhead that should be raised at the facility so proper planning can occur.

Chelan PUD has provided the HC with a whitepaper and spreadsheet regarding the methodology for calculating the production level in 2013 and example calculations using the available run size and SAR data for steelhead production. As stated in the whitepaper, the 2013 calculation will only exceed 450,000 smolts if the run size is high with concurrent low SAR. Typically, large run sizes are associated with high survival rates, which result in higher than average SARs. The HC has reviewed these documents and determined that the existing SAR estimates may be biased low due to potential tag loss of elastomer tags and inability to account for adult steelhead taken in lower river commercial fisheries. The HC agrees to refine SAR data prior to 2013 and, if SARs are lower than desired for brood years released from the new facility, to begin investigations to improve SARs rather than increasing smolt production above 450,000 smolts.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: August 16, 2007

Re: Final Minutes of July 18, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on July 18, 2007, from 9:30 am to 3:15 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final June 20, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Todd Pearsons will provide an electronic copy of his presentation on Non-Target Taxa Process to Ali Wick to distribute to the Committees members (Item II).
- Tom Kahler will draft a Statement of Agreement (SOA) for the Wells Hatchery Committee to approve the Twisp Weir design (Item IV-A-iii).
- Shaun Seaman will distribute a final draft of the HCP Information Brochure (Item V-B).
- Kirk Truscott will provide the Committees with e-mail updates on the status of broodstock collection (Item VI-A).
- Jerry Marco will send Ali Wick the water temperature model to place on the FTP site (Item VIII).
- Ali Wick will send David Carie information on accessing the Anchor FTP site (Item VIII).

DECISION ITEM SUMMARY

- There were no decision items at this meeting.

I Meeting Minutes Approval

The Committees approved the June 20, 2007 Meeting Minutes pending clarification of the discussion regarding surplus summer/fall Chinook returning to Wells Hatchery; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Presentation: Non-Target Taxa Process (Todd Pearsons, WDFW)

Todd Pearsons (of Washington Department of Fish and Wildlife [WDFW]) presented an overview of the approach used to evaluate the effects of supplementation programs on non-target taxa in the Yakima River basin. He provided a detailed explanation of the factors to be considered when selecting which non-target taxa to monitor, and on establishing containment or risk levels for each of the taxa. He also discussed the importance of statistical power in interpreting results. He encouraged Committees members to follow up with him if they have any additional questions. Pearsons will provide an electronic copy of his presentation to Ali Wick to distribute to the Committees members.

III Hatchery Evaluation Technical Team (HETT) Update

A. Progress on Reference Streams

Chuck Peven updated the group that the Hatchery Evaluation Technical Team (HETT) met on June 29, and the group was on track to provide the Hatchery Committees with a recommendation on spring Chinook reference streams at the August 15 meeting. He indicated the HETT was continuing to compile information on steelhead.

B. Progress on BKD Issues

Mike Schiewe updated the group that a subgroup of the Hatchery Committees met by conference call shortly after the last Hatchery Committees meeting to discuss the path forward for revising and implementing Objective 9 of the Hatchery Monitoring and Evaluation (M&E) program. He noted that there were three issues that were discussed. First was the need for the Hatchery Committees to approve the revised Objective 9; the second was the need for a more detailed proposal for a hatchery study evaluating the effects of Bacterial Kidney Disease (BKD) segregation and rearing densities on hatchery return rates; and third was the development of a hatchery management plan that implements the

agreement to limit the rearing of progeny of female spring Chinook with high BKD antigen levels to a predetermined proportion of the total reared during each brood year.

With regard to the first issue, Schiewe distributed to the Committees a one-page summary of the original and revised Objective 9, and a brief explanation of the changes. The Committees will be asked to approve the revised Objective 9 at the August Hatchery Committee meeting.

With regard to the hatchery rearing study, Tom Kahler updated the group that he met with Tracy Hillman to review Hillman's initial thoughts on potential experimental design options. Of the two options considered, it appears that the regression or response-surface design is the most likely candidate. Kahler indicated there were several outstanding issues that needed to be considered, including the very important question of where to conduct the experiment. There was also a discussion of how fish were released from the Methow Hatchery and how this would have to be considered if an experiment were conducted at that facility. Mike Schiewe urged the Committees members to review Hillman's draft document on experimental design options to become familiar with the response-surface design option. Kahler will continue working on a draft study plan.

Chuck Peven briefed the Committees that Chelan and WDFW staff began reviewing data on BKD prevalence in the Chiwawa spring Chinook program to start the process of developing a new management strategy for BKD. Kirk Truscott indicated that the early discussion focused on the possibility of managing BKD levels in the hatchery at about the same level as that in the natural population. Kris Petersen indicated that National Marine Fisheries Service (NMFS) would like to be involved in this discussion at this early stage because of the implications for listed species and the Endangered Species Act (ESA) permits.

C. HETT Operating Protocols

Mike Schiewe introduced a draft charter for the HETT Subcommittee. He indicated that the intent of the document was to clearly describe the purpose of HETT, identify the participants, and in particular describe the process for assigning questions to HETT. Keely Murdoch raised a question about the involvement of Grant PUD staff in the HETT Subcommittee, noting that Grant PUD staff was regularly involved in the meetings.

Schiewe responded that the charter identified Grant PUD as an "observer" because, although they were free to participate in discussions, they were not involved in the process of assigning questions to HETT for consideration. It was decided that the text of the charter would be modified to state that "PRCC-HC representatives may participate in development of HETT recommendations." The revised charter will be on the agenda for approval at the August Hatchery Committee meeting.

IV Douglas PUD

A. Project Updates

i. Well #5 at Methow Hatchery

Tom Kahler updated the Committees that the new well at Methow Hatchery was producing about 2,100 gallons per minute (gpm) and would be plumbed into the existing delivery system by the end of the month.

ii. Wells Hatchery Surface Water Intake Screen

Tom Kahler updated the Committees that the bid had been awarded to construct and install the new intake screen for the Wells Hatchery, and that installation will begin between mid-October and mid-December, with completion by February 2008.

iii. Twisp Weir – Final Designs for Review

Tom Kahler indicated that he had forwarded a final draft of the design drawings for the Twisp Weir to Ali Wick for distribution to the Committees. He also sent "hard copies" to Bruce Heiner (WDFW engineer) and Bryan Nordlund for engineering design review. In order to keep the project on schedule for construction this fall, Douglas PUD will need the Committees' approval of the design by August 5. Tom Kahler will draft a SOA to be provided to the full Committee after any comments or changes recommended by Heiner or Nordlund have been incorporated. Kris Petersen urged Committee members to look at the design from the perspective of biological function.

iv. Debris Boom at Wells Dam

Tom Kahler briefed the Committees that a new debris boom would be installed in the forebay of Wells Dam this winter. The design and installation of the debris boom was reviewed and approved by the Coordinating Committee last year.

V Chelan PUD

A. Engineering Report

i. East Bank Hatchery

Julie Pyper reported that construction of the new adult steelhead holding pond at East Bank Hatchery is nearing completion, and that it should be ready for service in the next couple of weeks. Because of earlier construction problems, Chelan PUD is still determining if additional work is needed.

ii. Chelan Falls Hatchery

Julie Pyper briefed the Committees that Chelan PUD was moving forward on the new well water supply and pipeline at the Chelan Falls Hatchery.

iii. Chelan Falls Rearing Ponds

Julie Pyper indicated that planning and preliminary design work was underway for the new rearing ponds for summer/fall Chinook at Chelan Falls. Pyper indicated that she was planning to meet with Kris Petersen and Kirk Truscott to review permit issues, and that she was planning to share preliminary drawings with Committees in August or September for review.

iv. Chiwawa Steelhead Ponds

Julie Pyper informed the Committees that she expected the feasibility report along with initial design criteria to be completed by August 17. Pyper indicated that the Committees should plan on a more detailed discussion of plans for the Chiwawa steelhead ponds at the August Hatchery Committees meeting.

Also regarding the Chiwawa steelhead rearing facility, Mike Schiewe noted that he received e-mail approval for the SOA setting the production capacity for the Chiwawa Rearing Ponds at 450,000 steelhead from all Committees members except

NMFS. Kris Petersen confirmed that NMFS was also approving the production limit; hence the SOA has been approved by all HCP signatories.

v. East Bank Aquifer

Julie Pyper briefed the Committees that U.S. Geological Survey (USGS) was conducting a "quiet test" on the East Bank Aquifer today. She indicated that she would continue to provide the Committees with regular updates on study progress.

B. HCP Brochure

Shaun Seaman updated the group that he incorporated the suggested editorial changes in the HCP Brochure, and that he would be distributing a final draft version in the next couple of weeks for final review.

C. Ultrasound Field Test

Chuck Peven and Kirk Truscott reported that the field trial of the ultrasound unit used to determine gender of returning adult spring Chinook salmon had gone quite well. Females were readily identifiable; males were a little more difficult to distinguish, but they had only one male available at the time of testing. Peven indicated that Chelan PUD is planning to purchase one unit for use in extended testing this year, and, depending on results, will plan on purchasing additional units next year. Tom Kahler indicated that, depending upon the results of this year's extended testing by Chelan PUD, Douglas PUD would also plan on purchasing one or more units in its next budget cycle. Truscott indicated that a total of four units would be needed in the long term to cover the different HCP program needs.

VI WDFW

A. Status of Broodstock Collections

Kirk Truscott briefed the Committees that the collection of broodstock was behind schedule for most HCP programs, and the trapping/collections frequencies were being increased to reduce the deficit. For example, WDFW staff has collected only three wild spring Chinook at the Chiwawa Weir, so operation of the weir has been changed to 7 days per week. Truscott indicated he will conduct a snorkel survey next week to see if adults are holding below the weir. Collections are also behind schedule at Dryden Dam, Tumwater Dam, and Wells Dam, but the shortfall is much smaller than at Chiwawa and he expects to see the

collection status improve in the coming weeks. Because trapping is subject to ESA permitting, Truscott is working closely with Kris Petersen on this, and will be providing the Committees with regular updates by e-mail. Petersen also noted that the Committees should be thinking about possible changes to the Chiwawa Weir (or its operation) that would allow operation earlier in the season. This year, the operation of the weir was delayed by large stones lodging in the pickets. Shaun Seaman indicated he will raise this issue with Chelan PUD engineers.

Truscott also reported that, with more favorable flow conditions, they are planning to begin operation of the temporary collection weir on the Twisp River in the coming weeks. Tom Kahler noted that installation would occur on July 19.

B. Recruitment of New WDFW Staff

Kirk Truscott noted that WDFW was planning to hire a new fishery biologist to assist him with the management of the HCP and other hatchery programs in the upper Columbia.

VII Colville Tribes

A. Bonaparte Pond Water Supply

Jerry Marco briefed the Committees that the Colville Tribes' engineering consultant developed a spreadsheet model to estimate the volume and temperature of additional water needed to prevent the Bonaparte Pond from freezing over in the winter months. The model allowed estimating these parameters over a range of air temperature. Based on experience in the area, a local well driller believes that a well producing 200 to 300 gallons per minute of 55°C water is realistic. The Colville Tribes are currently discussing the possibility of developing such a well with the Washington State Department of Ecology. Marco will forward the spreadsheet model to Ali Wick to place on the FTP site.

VIII HCP Administration

A. Three-year Evaluation of Hatchery Committee Chair

Mike Schiewe reminded the group that the HCP required that the Hatchery Committees evaluate the performance of the Chair at least every three years. Because Schiewe has served as Chair since September 2004, it is time for the Committees to set aside some time

for this review at the next meeting. The Committee agreed that Rick Klinge would take the lead on the review.

B. USFWS Representative

David Carie will be the new Hatchery Committees representative, and Ali Wick will send him the information on accessing the Anchor FTP site.

C. Next Meetings

The next scheduled meetings are as follows: August 15, September 19, and October 17, 2007, all in Wenatchee.

IX List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Chuck Peven	Chelan PUD
Steve Hayes	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call)	NMFS
Rob Jones (by conference call)	NMFS
Dave Carie *	USFWS
Andrew Murdoch	WDFW
Todd Pearsons	WDFW
Rick Stillwater	WDFW
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: September 20, 2007

Re: Final Minutes of August 15, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on August 15, 2007, from 9:30 am to 3:45 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final July 18, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Mike Schiewe will request a scope and budget for PUD review from John Skalski regarding a power analysis for a potential Bacterial Kidney Disease (BKD) study (Item III).
- Mike Schiewe will follow up with Kris Petersen regarding National Marine Fisheries Service (NMFS) approval of the Hatchery Evaluation Technical Team (HETT) Operating Protocols (Item IV-A).
- Ali Wick will update the Hatchery Monitoring and Evaluation (M&E) Plan with the new Objective 9 of the M&E Plan on the FTP site, and will send the link out to the group (Item IV-B).
- Rick Klinge will follow up with Bryan Nordlund on the suggestion by Tom Scribner to only reduce the bar spacing on the side of the trap boxes that the fish contact at the Twisp Weir (IV-C).
- Shaun Seaman will see that the edits to the HCP Informational Brochure are made and will work with Ali Wick to send this out soon (Item VI-A).
- Committees members will send comments on the 2008 M&E Implementation Plan to Chuck Peven by September 5, 2007 (Item VI-B).

- Julie Pyper will draft a Statement of Agreement (SOA) regarding the Yakama Nation program fulfilling Chelan PUD's coho obligation; Pyper will send it out by the end of the week for review by Mike Schiewe. Schiewe will then review it and circulate it to the Committees for email approval (Item VI-D).
- Kirk Truscott will meet with Washington Department of Fish and Wildlife (WDFW) hatchery staff to discuss logistics of handling the different fish groups that will be reared in the new ponds at Chiwawa Facility (Item VI-E).
- Julie Pyper will send out an updated schedule on Chelan PUD's hatchery projects (VI-F).
- Julie Pyper will initiate internal discussions with Chelan PUD on funding water supply changes at Bonaparte Pond and will report back to the Committees (Item VIII).
- Julie Pyper will contact Howie Wright and ask him to call Mike Schiewe to discuss further the option to Passive Integrated Transponder tag (PIT-tag) a subset of the Skaha sockeye (Item IX).
- Ali Wick will send out the HETT recommendation regarding the Skaha PIT-tagging discussion last year (Item IX).
- Rick Klinge will provide text for the Meeting Minutes on the 3-year HCP Committees Chair Review (Item X-A).

DECISION ITEM SUMMARY

- The Committees provisionally approved the HETT Operating Protocols as revised prior to the meeting and the SOA, and will confirm NMFS approval by email (Item IV-A).
- The Committees approved the Objective 9 text for the M&E Plan as revised prior to the meeting, as well as the SOA (Item IV-B).
- The Committees gave their approval for the plans and the SOA for the Twisp Weir Modifications, with the exception of Tom Scribner (Yakama Nation), who abstained from voting (Item IV-C).

I Meeting Minutes Approval

The Committees approved the July 18, 2007 Meeting Minutes pending revisions provided in the revised version; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II HETT Recommendations for Reference Streams for Spring Chinook (Andrew Murdoch, WDFW)

Andrew Murdoch presented the HETT document "Investigation in the Use of Spatial Controls for Hatchery Evaluations in the Upper Columbia River Basin: Control Stream Recommendations for Spring Chinook," which is the HETT's recommendation report to the Hatchery Committees on reference streams for spring Chinook salmon. Murdoch provided an overview of the development of the recommendations. He explained that this is a living document, and will be updated as needed as analyses continue and as other species are evaluated (sockeye, steelhead, and summer Chinook).

Tracy Hillman confirmed that habitat factors will be considered in the selection of reference streams primarily by using Analysis of Covariance (ANCOVA) to evaluate data collected by remote sensing. Hillman also confirmed that reference stream comparisons would be included in annual reports beginning next year; additional reports would follow annually for the next 5 years.

The Committees endorsed the work to date by the HETT and agreed to the process and the 'next steps' listed in the document as the path forward. The Committees will discuss the timeline for completing these steps at the next Hatchery Committees meeting. Tom Scribner asked whether there was any additional information that currently was not being collected that the HETT thought would be useful for the M&E Program. This opened a discussion of the potential need for smolt data from the Little Wenatchee. The result was that the Hatchery Committees asked the HETT to summarize the potential use of smolt trapping data and the technical merits of installing a smolt trap in the Little Wenatchee River, and report back to the Hatchery Committee at the September meeting.

III Development of BKD Study Plan

Mike Schiewe discussed recent work by a subcommittee of the Hatchery Committees (Mike Schiewe, Tom Kahler, Tracy Hillman) in thinking through potential experimental strategies for a BKD study, as discussed at the last Hatchery Committees meeting. Schiewe has conferred with John Skalski on statistical design, and Skalski said that he believes that a regression approach may be appropriate, but also thought an Analysis of Variance (ANOVA) design needed to be considered as well. Skalski also recommended that a power analysis be performed

to better understand the usefulness of the design, but he will need funding in order to do this. Schiewe will request a scope and budget for a power analysis from Skalski for PUD review.

IV Decision Items

A. HETT Operating Protocols

Mike Schiewe introduced the previously provided draft Operating Protocols for the HETT Subcommittee for the Committees approval. The Committees provisionally approved the charter as revised prior to the meeting and the SOA (Attachment B); Mike Schiewe will follow up with Kris Petersen regarding NMFS approval.

B. New Objective 9

Mike Schiewe asked for approval of the recent version of the new Objective 9 for the M&E Plans. The Committees approved the Objective text as revised prior to the meeting, as well as the SOA (Attachment C). Ali Wick will update the M&E Plans (and Analytical Framework document) on the FTP site, and will send the link out to the group.

C. Douglas PUD – Twisp Weir Construction Plans

Rick Klinge introduced this topic by stating that the PUD had presented new drawings for the Twisp Weir at the July Hatchery Committees meeting and is now requesting concurrence with these plans, with the exception of a change to the spacing in the bars on the aluminum trap boxes (both proposed and existing), which will now be reduced to 1 inch from 1.25 inches. Also, Rick Klinge will follow up with Bryan Nordlund on the suggestion by Tom Scribner to potentially only reduce the bar spacing on the side of the trap boxes that the fish make contact with. The Committees gave their approval for the plans and the SOA (Attachment D), with the exception of Tom Scribner (Yakama Nation), who abstained from voting.

V Douglas PUD

A. Methow Hatchery Raceway Screen

Rick Klinge updated the group that Douglas PUD recently experienced problems with Methow Hatchery raceway screens, one of which had lost the foam that was used to close a gap between the screen and the floor of the raceway. Because of the loss of the foam piece, fish were able to enter the space behind the screen resulting in the escape of approximately

16,000 unmarked spring Chinook. Douglas PUD has identified the cause of the foam-loss problem and is working to construct a remedy so that it does not occur again. This incident, occurring in January 2007, was not reported to Douglas PUD, who only learned of the incident when it was described on 8 June 2007 in the May Hatchery and Natural Production Report memo from WDFW M&E staff. Douglas PUD has discussed this communication failure with hatchery staff, who have agreed to timely reporting of any future atypical hatchery losses.

B. Methow Hatchery Well Production

Rick Klinge updated the group that a new well has been completed at Methow Hatchery. The target capacity for the well was 1,500 gallons per minute (gpm), and the performance has so far been at 2,600 gpm. Kirk Truscott asked whether the pump had been sized to take full advantage of the 2,600 gpm; Klinge indicated that it was sized to deliver about 2,500 gpm.

C. Spring Chinook and Summer Steelhead Broodstock Collection at Wells Dam

Rick Klinge updated the group that collection of spring Chinook broodstock at Wells Dam resulted in low numbers of females and that there will be a shortfall of eggs. As is typical in this case, Chelan, Douglas, and Grant County PUDs plan to divide the eggs proportionally between the three PUD programs.

D. Douglas PUD M&E Annual Report Development

Tom Kahler informed the group that Douglas PUD is meeting on August 29, 2007, with WDFW to discuss WDFW's responses to Douglas PUD's comments on the draft 2006 M&E Annual Report. Kahler indicated that a review draft should be available for the Committees within a few weeks. Keely Murdoch expressed interest in having data reported in one regular report similar to Chelan PUD's format; Kahler confirmed that this will be done.

VI Chelan PUD

A. HCP Informational Brochure

Julie Pyper distributed the final draft of the HCP Informational Brochure, and the Committees provided some small edits. Shaun Seaman will see that these edits are made and will work with Ali Wick to send this out soon.

B. 2008 M&E Implementation Plan

Julie Pyper reminded the group that the draft 2008 M&E Implementation Plan has been sent out by email and requested that any comments be sent to Chuck Peven by September 5, 2007. Committee members submitting comments agreed to copy the entire Committees with their individual comments.

C. Spring Chinook Holding Pond at Eastbank Hatchery

Julie Pyper reported that resolving the problems with the new spring Chinook adult holding pond at Eastbank Hatchery is under negotiation with the contractor. At this time and until these issues are resolved, Chelan PUD plans to hold spring Chinook adults as previously done by sharing a pond with summer Chinook.

D. Mechanism to Fulfill HCP Coho Obligation

Julie Pyper updated the group that Chelan PUD would like to formally document with the Hatchery Committees that funding the Yakama Nation's coho program fulfills the HCP coho obligation for the PUD. Pyper will draft an SOA for approval and will send it out by the end of the week for review and comment by Mike Schiewe. Schiewe will circulate it for email approval by the Committees.

E. Chiwawa Steelhead Pond Design Criteria

Sam Dilly presented design criteria for the new steelhead holding ponds at Chiwawa Facility. He indicated that the water right application will be submitted as soon as possible, as it is a relatively simple submittal and does not require drawings. The Committees discussed some of the design pros and cons that influence the functionality of the ponds, including the number of smolt traps and screens and the potential effect of these on the mechanics of volitional releases. Next steps are that Chelan PUD will be investigating the setup at Wells Hatchery and consulting with WDFW and Douglas PUD. Review drawings for the Hatchery Committees will be available at the next Hatchery Committee meeting, and the Feasibility Report will be presented at the September Hatchery Committee meeting. Kirk Truscott will meet with WDFW hatchery staff to discuss handling the fish groups that are proposed for rearing in these new ponds.

F. Engineering Report

Julie Pyper discussed the Engineering Report and answered questions regarding the projects on the list. Pyper will send out an updated schedule on Chelan PUD's hatchery projects.

VII WDFW

A. Status of Broodstock Collections

Kirk Truscott updated the group on the status of broodstock collections for the HCP hatchery programs. Collection of spring Chinook for the Chiwawa and Methow programs are both short of their goal. He indicated that there are currently 80 females on station for Chiwawa spring Chinook, which should yield over 300,000 eggs. Truscott indicated that there are currently 220 total fish in the brood for Methow spring Chinook, which is about 56% of the program goal. All other collections are on schedule and are expected to meet program goals.

B. Blackbird Island Pond

Kirk Truscott briefed the Committees on recent discussions regarding the use of the existing golf course water rights for developing a steelhead acclimation facility at Blackbird Island Ponds. He indicated that initial discussions with Washington State Department of Ecology (Ecology) indicated that permitting this use would be relatively straightforward. Truscott also indicated that a WDFW engineer would conduct the design and engineering work when his work load allowed.

VIII Colville Tribes

A. Bonaparte Pond

Jerry Marco updated the Committees that the Colville Tribes are continuing to discuss with Ecology the possibility of developing a well at Bonaparte Pond. Recent updates are that Ecology has reported that it could provide a temporary permit for this year, and would expect a 120-day turnaround for a regular permit. The Committees discussed that moving forward with permitting and drilling was an appropriate direction for the Colvilles and WDFW, and that Chelan PUD should begin discussing funding this effort. Julie Pyper will

initiate internal discussions with Chelan PUD on funding water supply changes at the site and will report back to the Committees.

IX Yakama Nation

A. Skaha Lake Sockeye Salmon Monitoring

Tom Scribner distributed a draft SOA for reconsidering having the Okanagan Nation Alliance (ONA) PIT-tag up to 10,000 juvenile Skaha Lake sockeye salmon to provide monitoring and evaluation information for these fish. Scribner indicated that he has been attempting to contact Howie Wright of the ONA to gauge the feasibility of tagging these fish. The Committees discussed this, and WDFW, U.S. Fish and Wildlife Service (USFWS), and the Colvilles were in agreement that tagging these fish would be an appropriate idea to consider. Julie Pyper will discuss this internally with Chelan PUD. Pyper will call Howie Wright and ask him to call Mike Schiewe to discuss further. Ali Wick will send out the HETT recommendation on this topic from earlier this year.

X HCP Administration

A. Three-year Evaluation of Hatchery Committee Chair

The HCP Hatchery Committee preformed a three year evaluation of the facilitator position held by Mike Schiewe of Anchor Environmental at the August 2007 monthly meeting. Performance discussions included ability to foster inclusive solutions among the parties, manner of addressing members, ability to guide the discussion, ability to accurately record intent of the meeting and timeliness of minutes and annual reports

The response in all areas was very favorable. The parties to the HCP appreciated the organization of the facilitator. High complements were paid to Ali Wick and Mike Schiewe as a team for guiding, facilitating and note taking. It is recommended that Anchor Environmental continue their services with Schiewe and Wick.

B. Next Meetings

The next scheduled meetings are as follows: September 19, October 17, November 14, and December 12, 2007. The December meeting location may be SeaTac, but the rest are planned to occur in Wenatchee.

XI List of Attachments

Attachment A – List of Attendees

Attachment B – Statement of Agreement for Hatchery Evaluation Technical Team Operating Procedures

Attachment C – Statement of Agreement for Proposed Changes to M&E Plan Objective 9

Attachment D – Statement of Agreement for Twisp Weir Modifications

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental L.L.C.
Tracy Hillman	BioAnalysts
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge*	Douglas PUD
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call – afternoon)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Andrew Murdoch	WDFW
Tom Scribner*	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

ATTACHMENT B

STATEMENT OF AGREEMENT FOR HATCHERY EVALUATION TECHNICAL TEAM OPERATING PROCEDURES

Statement of Agreement
Hatchery Evaluation Technical Team Operating Procedures
Wells, Rocky Reach, and Rock Island HCP Hatchery Committees
August 15, 2007

The Wells, Rocky Reach, and Rock Island HCP Hatchery Committees have reviewed and hereby approve the Hatchery Evaluation Technical Team (HETT) Operating Procedures.

ATTACHMENT C

STATEMENT OF AGREEMENT FOR PROPOSED CHANGES TO M&E PLAN OBJECTIVE 9

Statement of Agreement
Proposed Changes to M&E Plan Objective 9
Wells, Rocky Reach, and Rock Island HCP Hatchery Committees
August 15, 2007

The Wells, Rocky Reach, and Rock Island HCP Hatchery Committees have reviewed and hereby approve the below changes to Monitoring and Evaluation (M&E) Plan Objective 9.

Background:
The following is a brief explanation of the changes to Objective 9 of the Chelan and Douglas PUD M&E plans proposed by HETT for consideration by the HC, and includes the new Objective 9 text.

Existing Objective 9

The original Objective 9 focused exclusively on the potential of supplementation programs to increase the prevalence of disease (and specifically BKD caused by *Renibacterium salmoninarum [Rs])* in natural populations. To answer this question, the approach contemplated addressing the following types of questions:

- Is the concentration of *Rs* in a supplemented stream different from that in a non-supplemented stream?
- Does the concentration of *Rs* in hatchery effluent change over time?
- Does the prevalence of *Rs* antigen in hatchery fish change over time?
- Is the concentration of *Rs* in hatchery effluent different from that upstream of the hatchery?

Proposed New Objective 9 Revisions

The proposed revision of Objective 9 is designed to (1) broaden the scope to include an experimental evaluation of the effects of hatchery management of BKD (and particularly the current practice of rearing the progeny of "high" *Rs* antigen females at reduced density) on life-stage survival rates, and (2) reduce the emphasis on comparing *Rs* concentrations in streams containing supplemented versus non-supplemented populations. The reduced emphasis on supplemented vs. non-supplemented comparisons is a function of both (1) the limited ability to non-lethally monitor BKD and (2) to meaningfully correlate observed concentrations of *Rs* in either effluent or streams with rates or prevalence of BKD infection in fish, and the desire to first define and implement an interim BKD hatchery management strategy before extensive field monitoring is initiated.

With regard to (1), the HETT is developing a preliminary study plan for the hatchery experiment, with the goal of including enough detail so the HC can evaluate potential impacts on HCP hatchery programs. As a way to begin addressing (2), the HETT has

proposed continued *Rs* antigen monitoring of all returning spring Chinook broodstock, and evaluating trends in Rs antigen prevalence over time in both hatchery and natural origin recruits.

Proposed New Objective 9 Text

Objective 9: Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.

The hatchery environment has the potential to amplify diseases that are typically found at low levels in the natural environment. Amplification could occur within the hatchery population (i.e., vertical and horizontal transmission) or indirectly from the hatchery effluent or commingling between infected and non-infected fish (i.e., horizontal transmission). Potential impacts to natural populations have not been extensively studied, but should be considered for programs in which the hatchery fish are expected to commingle with natural fish. This is particularly important for supplementation type programs. Specifically, the causative agent of bacterial kidney disease (BKD), *Renibacterium salmoninarum* (Rs), could be monitored at selected acclimation ponds, both in the water and fish, in which the risk and potential for transmission from the hatchery is highest. Although it is technologically possible to measure the amount of Rs in water or Rs DNA in smolts and adults non-lethally sampled, the biological meaning of these data are uncertain. Currently, the only metric available for M & E purposes is measuring the antigen level from kidney/spleen samples (i.e., ELISA). When available, non-lethal sampling may replace or be used in concert with lethal sampling.

Implementation of this objective will be conducted in a coordinated approach within the hatchery and natural environment. BKD management within the hatchery population (e.g., broodstock or juveniles) has the potential to reduce the prevalence of disease through various actions (e.g., culling or reduced rearing densities). BKD management must also take into account and support other relevant objectives of the M & E program (e.g., Hatchery Return Rate [HRR], number of smolts released). Hence, the goal of BKD management is to decrease the prevalence of disease and maintain hatchery production objectives (i.e., number and HRR).

As previously discussed, disease transmission from hatchery to naturally produced fish may occur at various life stages and locations. Of these, horizontal transmission from hatchery effluent, vertical transmission on the spawning grounds, and horizontal transmission in the migration corridor have been identified as disease interactions that could be examined under this objective, although others may also be relevant. Experimental designs addressing this objective may require technology not yet available, although in some instances samples may be collected, but not analyzed until a link can be established between bacteria levels in samples and disease prevalence.
Developing a complete set of questions and hypotheses statements for this objective may not be practical at this time, because there is currently no BKD Management Plan.

However, while developing experimental designs for this objective, it may be feasible to incorporate both hatchery and natural environment monitoring under a single study design. Integration of the different aspects of the objective would likely result in a more robust approach into understanding the effectiveness of disease management strategies.

9.1 Disease Monitoring

Monitoring Questions:

Q1: What is the effect of BKD disease management on BKD disease prevalence?

Q2: Are study fish exposed to hatchery effluent infected to a greater extent than control fish?

Q3: *Is Rs infection transferred at various life stages from hatchery fish to naturally produced fish or appropriate surrogates?*[1]

Target Species/Populations:

- Q1 and Q2 both apply to spring Chinook (primary focus) and summer Chinook programs.

Hypotheses Q1:

- Ho_1: Rearing density has no effect on survival rates of hatchery fish.
- Ha_1: Rearing density has an effect on survival rates of hatchery fish.

- Ho_2: Antigen level has no effect on survival rates of hatchery fish.
- Ha_2: Antigen level has an effect on survival rates of hatchery fish.

- Ho_3: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish.
- Ha_3: Interaction between antigen level and rearing density has an effect on survival rates of hatchery fish.

Hypothesis Q2:

- Ho_1: Rs infection is not transferred from hatchery effluent to study fish.
- Ha_1: Rs infection is transferred from hatchery effluent to study fish.

Measured Variables:

- Hypotheses Q1:
  - Numbers of fish (at different life stages)

- Hypothesis Q2:
  - Numbers of Rs+ fish

Derived Variables:

- Survival rates
- SARs

[1] Hypothesis statements for these monitoring questions will be developed.

- HRRs

Spatial/Temporal Scale:

- Hypotheses Q1:
  - Analyze annually based on brood year.
- Hypothesis Q2:
  - Analyze annually.

Statistical Analysis:

- Hypotheses Q1: either 2-way ANOVA or response-surface design.
- Hypothesis Q2: ANOVA.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

ATTACHMENT D

STATEMENT OF AGREEMENT FOR TWISP WEIR MODIFICATIONS

Wells Habitat Conservation Plan - Hatchery Committee
Statement of Agreement
Twisp Weir Modifications
August 6, 2007

At the July 18, 2007 Wells HCP Hatchery Committee meeting, Public Utility District No. 1 of Douglas County (Douglas PUD) presented to the committee for their review and approval, design drawings for the proposed Twisp River Fish Trap Weir Modifications (dated July 2007). Also on July 18, 2007, the design drawings were submitted electronically to committee members and engineering staff (NOAA National Marine Fisheries Service [Bryan Nordlund] and the Washington Department of Fish and Wildlife [Bruce Heiner]). The July 2007 design drawings included the modifications from the review of Bryan Nordlund and Bruce Heiner of design drawings previously submitted to the committee during the fall of 2006.

Douglas PUD proposes to finalize the July 2007 design drawings with the following modification requested by Bryan Nordlund: the spaces between the bars of the aluminum trap boxes (both proposed and existing) will be reduced from 1¼ inches to 1 inch. Douglas PUD is requesting HCP HC approval of the final design drawings as modified.

By acceptance of this Statement of Agreement, the members of the Wells HCP-HC approve of the July 2007 design drawings (with requested modification by Bryan Nordlund, as described above) for the proposed Twisp River Fish Trap Weir Modifications, and request that Douglas PUD proceed with the implementation of this project.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Keely Murdoch, and Tom Kahler

Date: October 22, 2007

Re: Final Minutes of September 19, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on September 19, 2007, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final August 15, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Mike Schiewe will work with Kirk Truscott and the PUDs to prepare a summary of the current management strategy for Bacterial Kidney Disease (BKD) in the Methow and Wenatchee spring Chinook hatchery programs for discussion at the upcoming Policy Committees meeting (Item II-B).
- Chuck Peven will prepare a draft study plan for determining Wenatchee sockeye spawner residency time and counter efficiency for use in Area-Under-the-Curve (AUC) estimates of spawner abundance for the November meeting (Item II-C).
- Ali Wick will follow up with Tracy Hillman to identify a schedule for completing next steps to determine reference streams as laid out in the Hatchery Evaluation Technical Team's (HETT's) recommendation report (Item II-D).
- Kirk Truscott will provide information to Tom Kahler on Chinook salmon body widths for use in the design of the trap box at the Twisp Weir; Truscott will also research hatchery staff concerns over the current 8-inch spacing on the fyke that is used for collecting spring Chinook (Item III-B).

- Tom Scribner will provide Tom Kahler data on coho salmon body widths from their recent research study; these data will also be considered in the design of the Twisp Weir trap box (Item III-B).
- Tom Kahler will distribute copies of the draft Douglas PUD Monitoring and Evaluation (M&E) Annual Report to the Committees members (either hard copies or CDs) by Monday, September 24. Committees members will provide comments to Douglas PUD by Friday, November 16 (Item III-C).
- Jerry Marco will get back to the Committees on whether Colvilles are willing to have the Committees agree on the Okanogan spring Chinook decision prior to the Colvilles receiving a decision from the Northwest Power and Conservation Council (NWPPC), and if so, Marco will provide a draft Statement of Agreement (SOA) for the Committees prior to the November meeting (Item V).
- Chuck Peven will send a final copy of the 2008 Chelan PUD M&E Implementation Plan to Ali Wick for posting to the ftp site (Item VI).
- The Joint Fisheries Parties (JFP) will work with Chelan PUD to develop preliminary options for acclimation and planting of Wenatchee steelhead reared at the Chiwawa ponds. Preliminary plans are needed to continue design of smolt trapping facilities at the pond site; these plans are needed in advance of the October meeting in order for design work to proceed on schedule (VII-A).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

ITEMS APPROVED

- The Committees approved the 2008 Chelan PUD M&E Implementation Plan (Item VI).

I Meeting Minutes Approval

The Committees approved the August 15, 2007 Meeting Minutes pending revisions provided at today's meeting; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II HETT Update

A. Input on Usefulness of a Smolt Trap on the Little Wenatchee River

Ali Wick updated the Committees that the HETT began compiling a list of the technical merits of collecting smolt outmigrant information on the Little Wenatchee River, as requested by the Hatchery Committees at the last Committees meeting. The HETT still needs to consider input from several members who were unable to attend the last HETT meeting. The Committees discussed clarifying the charge to the HETT on this request. Shaun Seaman pointed out that the HETT's discussions should focus on the technical merits of a smolt trap as it relates to the PUD's hatchery programs. The Hatchery Committees asked the HETT to provide their input at the next Hatchery Committees meeting on the potential use of smolt trapping data in determining the usefulness of the Little Wenatchee as a Hatchery M&E reference stream. A decision at the next Hatchery Committees meeting will be made on whether the Hatchery Committees will pursue installing the trap for the purpose of considering the Little Wenatchee River as a reference stream.

B. BKD Study

Mike Schiewe has been working with John Skalski and Robin Waples regarding potential experimental strategies for a BKD rearing density study. Schiewe discussed the input from Skalski and Waples, which indicated that the study would be a large project involving approximately 180,000 study fish over a 3-year period. Waples cautioned that study results may still leave questions unanswered about potential loss of biodiversity, but that there is no scientific consensus on general guidelines or thresholds that would apply. Schiewe indicated that he will continue working with Skalski and others on a preliminary experimental design. Schiewe also noted that he will be working with Kirk Truscott and the PUDs to summarize the current management strategies for BKD in the Methow and Wenatchee spring chinook programs for discussion at the next Policy Committees meeting.

C. Sockeye Spawning Ground Surveys and Path Forward

Keely Murdoch introduced the topic of comparing redd counts and AUC estimates for surveying spawning adults. The Hatchery Committees discussed this topic last year, but never reached a decision about how to proceed. Murdoch indicated that her understanding was that both techniques were to be used in 2007 as a basis for making the comparison. Ali Wick said that she had referenced the meeting minutes to clarify how Committees

discussions were captured on this, but found that at that time the Committees did not, in fact, come to an agreement regarding the path forward for survey techniques. Shaun Seaman indicated that his understanding was that both techniques would be used, but that they would not be used with the intention of making comparisons between techniques, because there were some key assumptions in the AUC technique (e.g., key constant value in AUC, observer efficiency) that would need to be validated prior to making any comparisons. Kirk Truscott pointed out that redd counts tend to be less accurate than AUC during years with large escapement because of redd superimposition. The Committees agreed that Chuck Peven will develop a proposed study plan to determine sockeye spawner residency and counter efficiency for AUC estimates of spawner abundance to be discussed at the November meeting. If approved, the study would be conducted during the 2008 spawning period.

D. Update on Next Steps in the Reference Stream Recommendation Report

Ali Wick updated the Committees that Tracy Hillman is contacting HETT members about moving forward on the next steps to determine reference streams as laid out in the HETT's recommendation report. Wick will follow up with Hillman to identify a schedule for completing next steps.

III Douglas PUD

A. Coho Compensation Update

Tom Kahler updated the Committees that Douglas PUD staff has been discussing with the Yakama Nation the potential for Douglas PUD to provide some level of funding for the Yakama's coho reintroduction program as a means of meeting their potential coho mitigation obligation. Depending on progress, this may be described in an SOA for consideration at the October meeting. Any agreement will be subject to Hatchery Committee approval.

B. Update on Construction Projects

Tom Kahler indicated that the contractor for the Wells Hatchery Surface Water Screens will have the work completed by February 28, 2008. He also indicated that permitting for the Twisp weir is going well; the Corps of Engineers has received notification from the Services that they will not require re-consultation on this project, and the Corps intends to issue a Nationwide Permit 3 for the project as maintenance of a previously permitted action. The

project qualifies as a Shoreline exemption per Okanogan County, and the Hydraulic Project Approval (HPA) will be issued soon. Kahler indicated that he had received questions from Washington Department of Fish and Wildlife (WDFW) hatchery staff about the bar spacing on the fyke portion of the trap box. To assist in resolving this issue, Kirk Truscott will provide information to Tom Kahler on Chinook salmon body widths for fish currently at the hatchery, and will discuss with hatchery staff their concerns over the current 8-inch spacing on the fyke section of the trap box at the weir. Also, Tom Scribner will send Tom Kahler the Yakama Nation's data on coho salmon body widths from a recent research study.

C. M&E Annual Report Update

Tom Kahler updated the group that Douglas PUD will distribute copies of the M&E Annual Report to the Committees members according to their preference in report media (e.g., hard copies or CDs) by Monday, September 24; Committees comments are due back to Douglas PUD by Friday, November 16.

IV Yakama Nation

Mike Schiewe updated the group that he had been in touch with Kim Hyatt and Howie Wright on the potential to Passive Integrated Transponder tag (PIT-tag) Skaha sockeye salmon smolts. Both Hyatt and Wright indicated that the hydro acoustic surveys and spawning ground counts already planned would be used to estimate smolt-to-adult return rates, and that any PIT-tagging of smolts for this purpose was not necessary. However, Hyatt indicated that at some future time it might be useful to use PIT-tags to investigate survivals during different live stages (e.g., inriver versus marine survival). He cautioned that PIT-tagging of sockeye was still very experimental, and they do not tolerate the procedure well. Shaun Seaman said that Chelan PUD would like it to be clear that the collection of this information relates directly back to the PUD's programs under the HCP.

V Colville Tribes

Mike Schiewe introduced the topic of a schedule for the Committees to decide whether Okanogan spring Chinook are a Plan Species requiring compensation under the HCP. Jerry Marco updated the group that the Colvilles had submitted their Step 2 document to the NWPCC in August, and it was not likely that they would get a final decision on whether to

proceed until January or February of 2008. He suggested that the HCP decision will need to follow this NWPCC decision. Mike Schiewe asked if the Committee might be about to provisionally agree on a mitigation agreement, which would be subject to project approval by the NWPCC and funding by the Bonneville Power Administration (BPA). Marco indicated he would get back to the Committees on whether Colvilles are willing to have the Committees agree on the Okanogan spring Chinook decision prior to the Colvilles receiving a decision from the NWPCC, and if so, Marco will provide a draft SOA for the Committees prior to the November meeting.

VI ITEM FOR APPROVAL: 2008 Chelan PUD M&E Implementation Plan

Chuck Peven introduced the draft 2008 Chelan PUD M&E Implementation Plan. Kirk Truscott indicated that most comments from WDFW were editorial in nature, and Peven indicated that the changes had already been incorporated into the Plan. Peven also noted that he had added some text to further clarify the general approach for sockeye spawning surveys; he further agreed to add text indicating that in 2008 there would be an investigation of sockeye spawning ground residence time and observer error. Both parameters are used in AUC estimates of adult returns. With these changes, the Committees approved the plan, and Peven will send a final copy of the plan to Ali Wick for posting to the ftp site.

VII Chelan PUD

A. Chiwawa Steelhead Pond – Design Considerations

Shaun Seaman briefed the Committees that Chelan PUD is moving forward on design of the Chiwawa Ponds. As this work proceeds, Chelan PUD is looking to the Committees for input on several design issues and facility features. One such issue is the design of outmigrant trapping facilities because the ponds will ultimately be used to rear different parental crosses (i.e., HxH, HxW, and WxW) of volitionally-released fish targeted for out-planting. Currently, Chelan PUD is preparing a scoping document for design. Sam Dilly described to the group the engineers' current thoughts on design and how the proposed three ponds would be used. Kirk Truscott verified that he estimates a total of three release groups will need to be reared at the ponds, but noted that he is not able to confirm this exact number of groups for each year into the future. Tom Scribner asked what flexibility there may be to design the ponds as divisible units for varied numbers of fish/rearing groups. Dilly confirmed that this could be investigated. After some discussion of number of ponds

and accompanying traps, the Committees agreed to keep discussing these ideas and the needs that volitional release groups may require. The JFP will meet with Chelan PUD to draw up a range of rearing group configurations that might be needed in the future. The intention will be for the Committees to be able to make a decision on the general management strategy for outplanting Chiwawa steelhead at the October meeting.

B. Use of Bonaparte Ponds for Rearing a Portion of Okanogan Summer Chinook

Shaun Seaman introduced the topic that Chelan PUD has been working with the Colville Tribes to evaluate the feasibility of drilling a deep well as a source of warmer water to be used to prevent icing over of the Bonaparte Ponds. Seaman indicated that this evaluation would not be completed in time for any construction this year, but would be a possibility for next year. Seaman asked whether the Committees supported this plan. The Committees agreed that Chelan PUD can proceed in this manner.

C. Engineering Report

Julie Pyper discussed the August Chelan PUD Engineering Report and answered questions regarding the projects on the list. Kirk Truscott asked about the status of the adult spring Chinook holding pond at Eastbank; Chelan PUD confirmed that legal discussions are ongoing and the pond will be operational in time for next year's brood collection. Truscott also asked about the Integrated Hatchery Improvement Plan (IHIP), and cautioned that the document showed that criteria currently being used in the model are based on stock-specific performance, but the document does not take into account other parameters in the model, such as BKD information. Finally, at the last meeting, Chelan PUD was going to provide an updated schedule on Chelan PUD's hatchery projects; Pyper updated the group today that this information will be provided by December or January, and that it is delayed in order to take into account the IHIP analyses and recent hydrogeology studies.

VIII WDFW

A. Blackbird Island Pond Update

Kirk Truscott briefed the Committees that Bruce Heiner (WDFW engineer) and the Leavenworth-area project proponents have met to sketch out the potential design for acclimation facilities for steelhead at Blackbird Island. Art Viola (WDFW) will be investigating Endangered Species Act (ESA) permit issues for post-release pond

management for non-volitionally released fish. Kris Petersen said that she has not been involved in this discussion at this time. Kirk Truscott will be meeting with Rollie Schmitten and said that he would mention that a numerical abundance model is used to manage any fishery (and not just the number of marked fish returning), and hence, for any given year, there is no assurance that there would be a fishery even if marked fish returned from a Blackbird Island Pond release. The group discussed that Trout Unlimited had mentioned that the goal of the pond project was to provide support for recovery.

IX HCP Administration

A. Meeting Agreements

The following are Committee agreements made at the meeting that did not merit finalization with a formal statement of agreement:

- The Committees agreed that Chelan PUD and the Colville's should continue to investigate ground water sources and finalize pond improvements prior to implementing necessary upgrades to Bonaparte Ponds and over-wintering fish in the ponds.

B. Next Meetings

The next scheduled meetings are as follows: October 7, November 14, and December 12, 2007. All meetings will be in Wenatchee.

X List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental L.L.C.
Chuck Peven	Chelan PUD
Sam Dilly (afternoon only)	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call – afternoon only)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, and Tom Kahler

Date: November 15, 2007

Re: Final Minutes of October 17, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on Wednesday, October 17, 2007, from 9:30 am to 2:50 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final September 19, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- The PUDs will ask their legal staff to review HCP section 8.4.5.2 (Wells) and section 8.4.3(b) (Rocky Reach and Rock Island) to determine whether approving a Statement of Agreement (SOA) with a "contingent on funding" clause in 2007 and then agreeing to the nature of the mitigation (if funded) at a later date (e.g., in 2008) would satisfy the requirements of the HCPs regarding a determination on Okanogan spring Chinook as a Plan Species requiring mitigation (Item III-A).
- Julie Pyper will coordinate a meeting between Washington Department of Fish and Wildlife (WDFW) and Chelan PUD to discuss arrangements for sampling in cold-weather conditions at Tumwater Dam for the steelhead genetics study (III-C).
- Sam Dilly will coordinate a meeting with Kirk Truscott and the WDFW fish health specialists to discuss a proposal for a partial water re-use study (Item III-E).
- Julie Pyper will provide the Partial Water Re-use Analysis memorandum to Ali Wick for distribution to the Committees (Item III-E).
- Julie Pyper will work with Chelan PUD staff to submit the water rights applications for the Chiwawa Rearing Ponds (Item III-F).

- Mike Schiewe will work with Kirk Truscott to package the bacterial kidney disease (BKD) Management Strategy as a proposal for the Hatchery Committees' consideration (Item III-H).
- Kirk Truscott will provide a final version of a memorandum describing the Joint Fisheries Parties' (JFP's) recommended strategic approach for Wenatchee River steelhead smolt releases from the Chiwawa facility for use in the facility design process (Item IV-A).
- Julie Pyper will meet with Sam Dilly to discuss the JFP's memorandum and will have a revised design by the December meeting (Item IV-A).
- Mike Schiewe will get in touch with John Skalski regarding a potential misunderstanding about the role of density groupings in the draft BKD study plan (Item V-C).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Committees approved the September 19, 2007 Meeting Minutes pending revisions provided at today's meeting; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Douglas PUD

A. Reminder about Fish-Water Management Reports Edits Due 10/29

Rick Klinge reminded the group that the Fish-Water Management reports are currently out for review by the Committees, and that comments are due on October 29. Douglas PUD is still awaiting the 2005 and 2006 Record of Decision reports from Kim Hyatt and will be sending those out when available. Klinge also noted that the Douglas PUD Hatchery Monitoring and Evaluation (M&E) Report is out for review and that comments are due by November 16.

B. Update on Construction Projects

Tom Kahler reported that the Twisp Weir broodstock trap box design has been modified so that the fyke openings will be infinitely adjustable from 2.5 inches to 8 inches in width. Douglas PUD will look at the data on the widths of returning fish to set the initial fyke width. Kahler also noted that Douglas PUD has been working with the property owner to resolve some outstanding permitting issues. The project goes out to bid on Monday, October 22, to be awarded in November for this year's winter construction season.

III Chelan PUD

A. Draft Okanogan Spring Chinook SOA for Discussion

Mike Schiewe introduced this topic and noted that the Colville Tribes have now submitted their Step 2 package on the Chief Joseph Hatchery Program to the Northwest Power and Conservation Council (NPCC); a decision on this step is expected by February 2008. A decision to go ahead with construction of the hatchery would (along with a favorable Biological Opinion from NMFS) effectively establish a long-term hatchery program. In anticipation of this decision, and because the HCPs require a determination on whether there is a continuing spring Chinook hatchery program and/or a Threshold Population of naturally reproducing spring Chinook population in the Okanogan Watershed in 2007, Jerry Marco has developed a draft SOA stating that the Hatchery Committees have determined that Okanogan spring Chinook are an HCP Plan Species requiring mitigation based on the existence of a continuing hatchery program developed outside of the HCP. The approval of this SOA will be contingent on NPCC approval of funding.

A potentially separate component of the decision process on Okanogan spring Chinook is Hatchery Committees approval of the nature of the mitigation. After considerable discussion, the Committees agreed to consider this decision in two steps with two SOAs; one SOA would deal with the determination of Okanogan spring Chinook as a Plan Species requiring mitigation, and the other SOA would deal with approving the nature of the mitigation. Marco will revise the SOA into these two documents. The PUDs will ask their legal staff to look at the HCPs to clarify whether having these two SOAs is consistent with the intent and spirit of the HCPs, given that the first SOA would be approved in 2007 and the second would likely be approved in 2008.

B. Coho Funding Update

Julie Pyper explained that the previously agreed to start date for Chelan PUD's support of the Yakama Nation's coho program was October 1. This was delayed due to internal approval processes within Chelan PUD, gathering signatures on the final agreement between Chelan and the YN and receiving the 2007-2008 funding request. Pyper confirmed that the signed agreement and other components have now been received by Chelan PUD and is expected to be effective soon.

Rick Klinge updated the group that the Yakama Nation and Douglas PUD are actively engaged in discussions regarding funding of the Yakama Nation's coho program, and those discussions are expected to continue past the end of October. Klinge clarified that these discussions are focused on the nature of the forthcoming compensation, as the determination of the presence of a long-term hatchery program has already been resolved by the Committees. Considering that the program's existence has already been determined, Klinge stated that Douglas PUD did not believe that an interim SOA specifically regarding compensation was necessary since agreement between the Yakama Nation and Douglas PUD on the details of compensation was imminent. Schiewe asked the Committee whether they concurred with Douglas PUD's belief that no interim SOA was necessary, and all concurred.

C. Steelhead Study at Tumwater Dam

Kirk Truscott updated the group that the collection of tissue samples from steelhead at Tumwater Dam had begun on August 10 per the protocol previously agreed to by the Committees. Tissue samples have been collected from adults passing the dam and collected from juveniles during remote Passive Integrated Transponder tagging (PIT-tagging) activities. The latter collections included juvenile steelhead that had residualized in the tributaries upstream of the dam. Julie Pyper will coordinate a meeting between WDFW and Chelan PUD to discuss arrangements for sampling during the upcoming cold-weather conditions. The Hatchery Committees agreed that at the January meeting, they would discuss the potential steelhead reproduction study that is a requirement of the HCP.

D. Engineering Report

Julie Pyper provided the Engineering Report and requested that any Committees members with questions get in touch with her to discuss them.

E. Pilot Study for Partial Water Re-use

Julie Pyper introduced this topic and Sam Dilly provided a memorandum describing the background and reasons that Chelan PUD would like to perform a pilot study on partial water re-use to meet some of its hatchery needs. Dilly described some current partial water re-use facilities in the Pacific Northwest that are used to rear Atlantic salmon, recognizing that the test species for Chelan PUD would be Pacific salmon (steelhead and/or spring Chinook). Steve Hays presented some of the reasons for his interest in performing the study, as well as some of his concerns. He mentioned the possibility of rearing more fish using less water, as well as concerns about fish health. Kirk Truscott said that he will send this document to WDFW's fish health experts for review; Truscott's early comments included concerns about fish quality and disease potential. He also said that he would like to incorporate some measure of downstream migration success, smolt-to-adult survival rates (SARs), or smolt-to-smolt (a.k.a., juvenile passage survival) information, in order to evaluate fish survival after rearing in a water re-use system. Shaun Seaman commented that the scale and timeframe of smolt-to-adult or SAR comparisons might render the pilot study unworkable with regard to project timing and cost.

Curt Dodson from Grant PUD commented that evaluating whether water re-use is a workable technology for facilities in this area would be useful to know given the current water issues in the hatchery environment. Tom Scribner asked why these studies are not being done elsewhere in the west with Pacific salmonids already; the Committees discussed some of the reasons why this would be the case, including institutional barriers and the configuration of existing facilities. The Committees agreed that Chelan PUD could move forward to prepare a proposal for a pilot study. Sam Dilly will coordinate a meeting with Kirk Truscott and the WDFW fish health specialists to discuss some of the concerns with regard to fish health and water quality. Julie Pyper will provide Sam Dilly's memorandum to Ali Wick for distribution to the Committees.

F. Water Rights Applications for Chiwawa Ponds

Shaun Seaman and Kirk Truscott clarified that WDFW's recent comments on design at Chiwawa steelhead rearing ponds did not impact the ability to move forward on the water rights applications. Julie Pyper noted that she will work with Chelan PUD staff to submit these applications soon.

G. Sockeye Counter Efficiency and Spawning Ground Residence Time Proposal Update

Chuck Peven described progress in developing a proposed study plan to determine sockeye spawning ground residency time and counter efficiency for Area-Under-the-Curve (AUC) estimates of spawner abundance. In this study plan, Peven suggests using a recently developed method for sockeye redd counter efficiency that uses concurrent helicopter photography and on-the-ground redd counts. He also described recent research that supported the use of redd residence time as a surrogate for spawner residency time; an alternative to this would be a mark-recapture study. Peven will soon be providing a study plan for the Committees' review.

H. Progress on BKD Management Plan

Mike Schiewe updated the group that he has been working with Kirk Truscott on summarizing progress on developing a BKD Management Plan for HCP hatchery programs. Schiewe indicated that once agreements had been reached for the Methow and Chiwawa rivers spring Chinook programs, SOAs would be drafted for Hatchery Committees' approvals. Any changes or agreements would be subject to approval of the National Marine Fisheries Service (NMFS) and may require modification of Endangered Species Act (ESA) permits.

IV WDFW

A. JFP Summary of Wenatchee Steelhead Rearing and Release Strategies

Kirk Truscott has been coordinating with the JFP to develop a summary of rearing and release strategies for Wenatchee Basin steelhead; the draft strategies will be used by Chelan PUD in planning and design of the new steelhead rearing ponds at the Chiwawa Rearing Location. Truscott provided a memorandum today describing the recommended strategic approach. Truscott will provide a final version of this memorandum to Ali Wick for distribution. Julie Pyper will meet with Sam Dilly to discuss this information, and Chelan PUD will have a revised design by the December meeting.

B. PIT-Tagging of Steelhead at Priest Rapids Dam

Kirk Truscott provided an update on WDFW's PIT-tagging of adult steelhead at Priest Rapids Dam. He updated the group that there were 1,501 PIT tags applied, of which 328 were natural-origin fish and the rest were hatchery origin fish.

V HETT Update

A. Recommendation on Little Wenatchee Trap for Juvenile Production Data

Tom Kahler updated the group on the Hatchery Evaluation Technical Team's (HETT's) discussions regarding the potential use of information from a smolt trap on the Little Wenatchee River. Kahler relayed that the HETT's recommendation is that collecting juvenile production data for the Little Wenatchee River would be required under the current M&E program only if the Hatchery Committees select the Little Wenatchee as a reference stream. Kahler also noted that the HETT review of this question generated discussion about the fact that a smolt trap is not the only method available for estimating juvenile production. Noteworthy for this discussion is the decade-long time series of data from juvenile snorkel surveys that have been conducted in the Little Wenatchee River.

B. Progress on Reference Streams

Ali Wick summarized HETT's progress in finalizing its recommendations on spring Chinook reference streams. Wick gave a timeline from the HETT of approximately 6 months to complete the recommendations. The Committee discussed that this timeline is a reasonable one for completing the remaining steps. Kirk Truscott noted that one of the potential reference streams under consideration (Asotin Creek) is in jeopardy of losing funding for monitoring, and suggested that WDFW could draft a letter on the Hatchery Committees' behalf to recommend continued Bonneville Power Administration (BPA) funding. The Committee agreed to consider a draft letter.

C. Progress on Draft BKD Study Plan

Mike Schiewe updated the group that he has been working with John Skalski on a draft study plan for a BKD rearing density survival study. There may have been a misunderstanding regarding the role of density groupings in the preliminary analysis, so Schiewe will get in touch with him to clarify. The Committees agreed that once this issue was sorted out, the Hatchery Committees may want to invite Skalski to attend a HETT meeting so that Skalski and the HETT can collaboratively develop a detailed study plan.

VI HCP Administration

A. Meeting Agreements

The following are Committee agreements made at the meeting that did not merit finalization with a formal Statement of Agreement:

- The Committees agreed that Chelan PUD can move forward to prepare a proposal for a plan for a partial water re-use study.

B. Next Meetings

The next scheduled meetings are as follows: November 14 and December 12 in Wenatchee; January 16 in SeaTac.

VII List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental L.L.C.
Chuck Peven	Chelan PUD
Sam Dilly	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco * (by conference call)	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Russell Langshaw	Grant PUD
Curt Dodson	Grant PUD
Kris Petersen * (by conference call)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Tom Scribner *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, and Tom Kahler

Date: December 13, 2007

Re: Final Minutes of November 14, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD in Wenatchee, Washington, on Wednesday, November 14, 2007, from 9:30 am to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final October 17, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- The Hatchery Evaluation Technical Team (HETT) will discuss the *Study Plan to Measure Sockeye Spawner Life and Counter Efficiency in 2008* at the December 11 meeting and will bring comments to the next Hatchery Committees meeting on December 12 for a decision on the acceptability of the study plan at the January Hatchery Committees meeting (Item II-A).
- Sam Dilly will check on whether there are data from the eastern United States on fish returns for fish raised in circular ponds with a re-circulating water supply as compared to fish raised in single-use systems (Item II-B).
- Sam Dilly will send to the Committees detailed plans and protocols for the water re-use pilot study (plans for fish condition Monitoring and Evaluation (M&E), mechanical system M&E, and loading and testing protocol for the pilot system) prior to the next meeting, in time for Hatchery Committees members to review these plans (Item II-B).
- Douglas PUD and the Yakama Nation will attempt to provide by December a Statement of Agreement (SOA) for coho compensation for Hatchery Committees' approval (Item III-E).

- Shaun Seaman and Mike Schiewe will edit the Chelan PUD Okanogan Spring Chinook SOA and will send out a red-line version before the end of the week of November 19 (Item IV-A).

DECISION ITEM SUMMARY

- There were no decision items approved at this meeting (see Item VI-A, below).

I Meeting Minutes Approval

The Committees approved the September 19, 2007 Meeting Minutes pending revisions provided at today's meeting; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Chelan PUD

A. DECISION ITEM: SOA for Sockeye Spawner Efficiency

Chuck Peven introduced the draft *Study Plan to Measure Sockeye Spawner Life and Counter Efficiency in 2008*. The wrong version of this was inadvertently sent out to the Committees earlier, and the correct version was just sent out last Thursday, November 8. Thus, some Committees members had not had the opportunity to review the document yet. Peven gave an overview of the plan today, noting that according to the studies he had reviewed during the preparation of the draft study plan, helicopter counts had the highest efficiency compared to ground or fixed-wing counts, using weir counts as the base. Peven also noted that other research has shown that redd life (how long a specific fish is on a redd) can be used as a surrogate for stream life (how long a specific fish is alive on the spawning grounds in the stream).

The Committees agreed to table this SOA until the next meeting; the Committees agree that the HETT should review the study plan and help to refine it, and then the plan and SOA would come back for Committees' approval. The Committees would like HETT input on these two aspects: 1) whether the plan uses the right approach and 2) any other comments that the HETT may have regarding the timing or implementation of the study. The HETT will review the study plan at their next meeting and will bring comments to the next Hatchery Committees meeting on December 12, for a decision at the January Hatchery

Committees meeting. Rick Klinge noted that this plan applies only to Wenatchee sockeye and thus does not apply to sockeye under the Wells HCP.

B. DECISION ITEM: SOA for Water Re-Use Pilot Study

Julie Pyper introduced this topic, stating that Chelan PUD is seeking agreement from the Hatchery Committees to perform a water re-use pilot study. At this time, the PUD has decided not to pursue a pilot study for steelhead at the Chiwawa facility, but to limit the pilot study to summer Chinook at Eastbank. Sam Dilly provided a draft study plan at today's meeting. Dilly indicated that the PUD would provide more detail by the December meeting, namely a fish condition M&E plan, a mechanical system M&E plan, and a loading and testing protocol for the pilot system.

Mike Schiewe invited Committees' comment on the draft study plan. Kirk Truscott commented that early comments from Washington Department of Fish and Wildlife (WDFW) fish health specialists indicated some skepticism that water re-use would be successful, and that Bob Rogers would like to be involved in the development of the fish health monitoring plan. Kris Petersen requested additional details on how review by fish pathologists that is mentioned in the draft study plan would be addressed as the study proceeds. Dilly responded that progress reports would be prepared and pathologists would be invited to provide comment and review on these as well as any other incoming results. Jerry Marco noted that the Colville Tribes were generally skeptical of water re-use; they considered and rejected water re-use as a viable option for the proposed Chief Joseph hatchery because of concerns regarding fish health and survival to release. In response to the Committees' questions on long-term evaluation of fish reared in the pilot study, Shaun Seaman said that a component of the study plan likely would be evaluation of fish survival to McNary Dam using Passive Integrated Transponder tags (PIT-tags). Tom Scribner asked whether there were data from the eastern United States on fish returns for fish raised in water re-use systems as compared to fish raised in single-use systems; Dilly agreed to look into this issue and report back to the Committees. Rick Klinge commented that Douglas PUD supports the Committees moving forward with this pilot study.

The Committees agreed not to treat the draft SOA as a decision item at this time, but rather agreed that Chelan PUD can proceed with the development of a pilot study plan for water re-use for 100,000 summer Chinook out of the current production at Eastbank Hatchery in 2008, but

that the agreement to proceed was subject to the development of acceptable plans for the fish condition M&E, mechanical system M&E, and loading and testing protocol for the pilot system. The Wenatchee stock was among the stocks discussed for potential use. Sam Dilly will be sending these plans to the Committees prior to the next meeting, in time for Committees members to review these plans.

C. Engineering Report

Julie Pyper reported that she will be distributing a new Engineering Report to the Committees next week, and requested that Committees members get in touch with her to discuss any questions.

D. November 29 Meeting with PUDs and BPA

Shaun Seaman updated the group that Chelan PUD (and presumably the rest of the Mid-Columbia PUDs) had been invited to meet with Bonneville Power Administration (BPA) and the YN to discuss coordination of Upper Columbia hatchery programs with Federal Columbia River Power System (FCRPS) Reasonable and Prudent Actions (RPAs).

III Douglas PUD

A. Reminder: Review Deadline for 2006 M&E Report Edits on November 20

Rick Klinge reminded the group that the 2006 M&E Reports are currently out for review by the Committees, and that comments are due on November 20. Douglas PUD has not received any comments so far.

B. Draft Summary Sheet; 2007 Releases from Wells and Methow Hatcheries

Rick Klinge updated the group that he will soon be sending out the draft summary sheet of 2007 releases from Wells and Methow Hatcheries. Klinge said that he will also be sending out the 2007 Hatchery Production Compliance Report.

C. 2008 WDFW Proposed M&E Activities for the Methow and Wells Hatcheries

Rick Klinge will, by the end of this week, send out the 2008 WDFW Proposed M&E Implementation Plan for the Methow and Wells Hatcheries. This document is still in preparation and is essentially the same as last year. A section describing a proposed

steelhead reproductive success study was part of the original draft from WDFW, but this had been removed and will be presented to the Committees separately from the M&E plan.

D. Status of Construction Projects (Twisp Weir and Wells Hatchery Screens)

Tom Kahler provided an update on the Twisp Weir. There was a pre-bid contractor meeting yesterday at the weir site, and this project will be put out to bid on November 26. On the Wells Hatchery screens, the contractor will be working to install an emergency gate, beginning the week of November 26. The entire screen project is on track to be completed as scheduled by the end of February 2008.

E. Update on Discussions with Yakama Nation on Coho Compensation

Rick Klinge updated the group that Douglas PUD has been in discussions with the Yakama Nation regarding coho compensation. Tom Scribner noted that the PUD and the Yakama Nation will attempt to provide an SOA on coho compensation by December to the Committees for their approval.

IV Colville Tribes

A. Discussion Item for Near-Term Decision: Draft Okanogan Spring Chinook SOAs

Mike Schiewe introduced this topic, saying that at the last meeting, Committees members were to check with legal staff on any HCP conflict with the idea of splitting the decision on Okanogan Spring Chinook into these two SOAs: 1) declaring the Okanogan Spring Chinook a plan species requiring mitigation and 2) a decision on the nature of mitigation. Schiewe noted today that legal counsel for Chelan PUD indicated that the HCPs did not contemplate separating the two decisions and that they should be treated as one coupled decision. Schiewe and Shaun Seaman agreed to edit the draft Chelan PUD SOA to address these and other comments from today's discussion, and will send out a red-line version before the end of the week of November 19.

V HETT Updates

A. Progress on Reference Streams

Ali Wick discussed that the HETT is working on the reference stream analysis, and will be providing an update on results for Chiwawa spring Chinook at the February Hatchery Committees meeting.

Related to this, Mike Schiewe noted that the Wells Hatchery Committee provided a letter this week to the BPA to encourage them to continue funding the Asotin Creek Assessment Project in the Grand Ronde basin; this project is of concern to the Wells Committee because

Asotin Creek has been identified as a potential reference stream for HCP-supplemented populations.

B. Progress on Draft BKD Study Plan

Mike Schiewe updated the group that HETT invited John Skalski to join the last HETT meeting to work toward collaboratively developing a detailed study plan for testing the effects of bacterial kidney disease (BKD) antigen levels and rearing density on life cycle survival. Skalski will be preparing this plan once he receives additional information on within-hatchery variation in returns of similarly handled and treated fish. The HETT should have an update on the study plan at the December or January meeting. The experiment will be a logistically challenging undertaking, with about 120,000 spring Chinook, 8 to 16 individual rearing groups, and release strategies carried out over at least 3 years.

VI HCP Administration

A. Meeting Agreements

The following are Committee agreements made at the meeting:

- The Committees agreed that HETT should review the *Study Plan to Measure Sockeye Spawner Life and Counter Efficiency in 2008* and help to refine it, and then the plan and SOA would come back for Committees' approval (Item II-A).
- The Committees agreed that Chelan PUD can proceed in the development of a water re-use pilot study for 100,000 summer Chinook at Eastbank in 2008, subject to Committees' approval of plans for the fish condition M&E, mechanical system M&E, and loading and testing protocol for the pilot system (Item II-B).

B. Next Meetings

The next scheduled meetings are as follows: December 12 in Wenatchee (location TBA), January 16 in SeaTac, and February 20 in Wenatchee.

VII List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Chuck Peven	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper	Chelan PUD
Sam Dilly	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Curt Dodson	Grant PUD
Kris Petersen *	NMFS
Kirk Truscott *	WDFW
Tom Scribner * (by conference call)	Yakama Nation

* Denotes Hatchery Committees member or alternate

ANCHOR ENVIRONMENTAL, L.L.C.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, and Tom Kahler

Date: January 17, 2008

Re: Final Minutes of December 12, 2007 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Douglas PUD in Wenatchee, Washington, on Wednesday, December 12, 2007, from 9:00 am to 2:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final November 14, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Kirk Truscott will check with Ron Warren, Bob Rogers, and John Kerwin on their availability to meet with Chelan PUD at the beginning of next week to discuss the partial water re-use pilot study; he will verify this availability by the end of this week (Item II-A).
- If necessary, Julie Pyper will provide a revised proposal and Statement of Agreement (SOA) for Committee agreement for the water re-use pilot study (Item II-A).
- Sam Dilly will provide the feasibility report and drawings for the Wenatchee steelhead rearing ponds at the Chiwawa River site to Ali Wick for distribution; an SOA will be drafted for approval at the next meeting. Dilly will verify that the design includes production level plus 10 percent (Item II-D).
- Tom Scribner will present the Yakama Nation's smolt acclimation concept proposal to the Tributary Committees for their input. Mike Schiewe will check with Tracy Hillman to see if this could be added to the Tributary Committees agenda (Item III-A).
- Keely Murdoch will send the PowerPoint sides of the Yakama Nation's smolt acclimation concept proposal to Ali Wick for distribution to the Committees (Item III-A).

- Rick Klinge will send a final copy of the Douglas PUD 2008 Monitoring and Evaluation (M&E) Implementation Plan to Ali Wick for posting to the FTP site (Item IV-A).
- Keely Murdoch will provide input to Tom Kahler on the Douglas PUD 2008 M&E Implementation Plan by no later than this Friday, December 14 (Item IV-A).
- Rick Klinge will provide the draft steelhead reproductive study plan prepared for Douglas PUD by Washington Department of Fish and Wildlife (WDFW) to Ali Wick for distribution to the Committees (Item IV-A).
- The Committees will review and provide comments on the 2008 Wells HCP Action Plan before the next meeting (Item IV-E).
- Jerry Marco will provide a list to Ali Wick of publicly-available HCP reports dealing with Okanogan anadromous fish for posting to the Okanogan Basin Monitoring and Evaluation Program (OBMEP) web site (Item VI-A).

DECISION ITEM SUMMARY

- The Committees approved Douglas PUD's SOA Regarding the District's Okanogan Spring Chinook Obligation (Item II-C; Attachment B).
- The Committees approved Chelan PUD's SOA Regarding the District's Okanogan Spring Chinook Obligation (Item II-C; Attachment C).
- The Committees approved the SOA Regarding Fulfilling the Douglas County PUD's Coho Obligation (Item IV-F;Attachment D).

I Meeting Minutes Approval

The Committees approved the November 14, 2007 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Chelan PUD

A. DECISION ITEM: SOA for Partial Water Re-Use Pilot Study

Keith Truscott introduced this topic that Chelan PUD has been continuing to investigate the potential for a pilot study of partial water re-use at the Eastbank Hatchery. Mike Schiewe opened the discussion by inviting comments on the study reviews that had been provided by U.S. Fish and Wildlife Service (USFWS) and WDFW. Kris Petersen commented that there seems to be two issues at play, water and space, and that National Marine Fisheries Service (NMFS) recognizes the water issues and appreciates the District's work to explore ways to

lessen the hatcheries water needs. She was concerned that the study design may not provide results that are useful because the study compounds the water and density issues. Additionally, she noted the fish health monitoring plan is a very important part of the study and the PUD should be sure it is designed apropriately; she also noted that NMFS would require results from a multiple years of study before any decisions were made on application of the water re-use technology in an HCP hatchery program rearing ESA-listed fish. Petersen then indicated that NMFS would be concerned if the study shifted funding or delayed activities related to improvements of programs rearing ESA-listed fish such as the work currently being done to move the Upper Columbia steelhead program to the Chiwawa Ponds facility. Finally, Petersen indicated that if those issues where addressed, then NMFS would approve the study.

Kirk Truscott summarized WDFW's comments on fish health and commented that one key concern that WDFW had was that the study plan did not contain a provision for sterilizing the water during the recirculation process. Along with that, another key concern was that there were no contingencies identified for outbreaks of disease, such as the ability to convert to a flow-through system to facilitate chemotherapy. Truscott indicated that WDFW is also concerned about the duration of the study and the lack of multiple-year monitoring and evaluation. In addition, WDFW would want to see smolt-to-adult returns (SARs) evaluated with the latter particularly important if the fish were reared at the higher density proposed. WDFW fish health specialists also had concerns that changing multiple variables (i.e., higher rearing densities [higher than in traditional raceways] and no water sterilization in this study) may limit the ability to interpret the results.

In further discussion, the Committees agreed that Wells stock summer Chinook would be the preferred test species (because of their non-listed status), but cautioned that the results would not be applicable to spring Chinook. Sam Dilly discussed that based on engineering considerations, Chelan PUD does not at this time propose to add water sterilization to the proposal.

Most of the other Committees members shared concerns that were similar to those of WDFW and USFWS. To complete the discussion, Mike Schiewe polled the members of the Committees individually, and each one except for Kirk Truscott of WDFW was in

agreement that the pilot study could proceed. Truscott indicated that he needed the opportunity to review the fish health concerns with WDFW staff in Olympia. Hence, in order for the study to proceed with a Committee consensus, WDFW and Chelan PUD will need to work out the outstanding study elements not yet agreed to by both Chelan PUD and WDFW. Kirk Truscott agreed to check with Ron Warren, Bob Rogers, and John Kerwin on their availability to meet with Chelan PUD at the beginning of next week to review WDFW concerns; Truscott will verify this availability by the end of this week. If necessary, following this meeting, Julie Pyper will provide a revised proposal and SOA for Committees agreement.

B. DECISION ITEM: SOA Study Plan to Estimate Counter Efficiency and Spawner Resident Time for Sockeye Salmon Report

Chuck Peven updated the group that the Hatchery Evaluation Technical Team (HETT) had discussed yesterday the study plan to measure sockeye spawner residence time and counter efficiency in 2008. The HETT agreed to modify the existing study plan to a basic mark-recapture program rather than the helicopter surveys that were previously proposed. The details are still to be worked out. Thus, today's SOA will be deferred; Peven will revise the study plan for HETT concurrence and will provide a new SOA for Hatchery Committees approval at the January meeting.

C. DECISION ITEM: SOA Regarding the District's Okanogan Spring Chinook Obligation

Mike Schiewe introduced this topic and commented that the SOAs are similar for Chelan and Douglas PUDs, so these will be discussed at the same time. Jerry Marco provided a revision to the text. The Committees agreed with this change and approved both the Douglas and Chelan PUD SOAs (Attachments B and C, respectively).

D. Engineering Report

1. Feasibility Report and Concept Drawings for Chiwawa Rearing Facility

Sam Dilly discussed the most recent concept-level drawings for the new steelhead ponds at Chiwawa rearing facility. He said that the plans include a way for fish to be volitionally released using dam boards; however, the density of the pond is based on not having the dam boards in, so when the dam boards are in, the pond area is decreased. He also pointed out that the design for volitional release currently includes an

underground 1,500-foot-long pipeline to the Wenatchee River, but the Committees may want to investigate other options for releasing fish such as releasing them to the Chiwawa River. Kirk Truscott commented that the Wenatchee pipe would and should really only be used as an emergency exit because the slope of the pipe is relatively flat. Dilly will provide the engineering feasibility report and drawings to Ali Wick for distribution to the Committees; an SOA will be drafted for approval at the next meeting. Dilly said that he will verify that the design would accommodate the number of fish equal to production level plus 10 percent. Further, Dilly will be meeting with WDFW hatchery managers (e.g., John Penny) to discuss the design.

2. Water Right Applications

Julie Pyper noted that the water right applications for the new steelhead ponds at the Chiwawa Rearing Facility are currently being reviewed for final sign-off by the Chiwawa Homeowners Associations and the U.S. Forest Service.

3. Remainder of Engineering Report

Kris Petersen asked whether the adult holding pond and spawning facilities at Eastbank Hatchery would be useable next year; this year, there were concrete problems that required repair. Dilly confirmed that the concrete ponds will be fixed and would be available next year for spring Chinook brood stock collection and spawning. For the steelhead holding pond, Chelan PUD would like to wait until the Integrated Hatchery Improvement Plan is available before designing the solution. Petersen asked that Dilly keep the Hatchery Committees updated on the progress of these actions.

Sam Dilly updated the group that information from a well driller that Chelan PUD has been working with indicated that a well could be drilled in the area that would yield water of an appropriate temperature and volume to prevent icing of Bonaparte ponds during the winter.

Sam Dilly said that Committees members could get in touch with him regarding any questions they may have with the recent Engineering Report. Dilly noted that Chelan PUD is close to finishing the Eastbank aquifer study and Integrated Hatchery Improvement Plan.

E. White Paper on Hatchery Database

Julie Pyper updated the group that Chelan PUD is working toward developing a database on hatchery information. The database will be ready for use and data input in January 2008. Chelan PUD would eventually like to integrate all of the M&E data into this database.

III Yakama Nation

A. PUD BPA Cost-Sharing and Update

Tom Scribner explained that Bonneville Power Administration (BPA) had recently initiated discussions with the Tribes and the PUDs on projects that would be mutually beneficial to all parties. One such area of discussion was a concept proposal by the Yakama Nation to integrate habitat and hatchery actions in the Upper Columbia River to help achieve recovery goals. Keely Murdoch gave a summary of the proposed approach, which includes establishing smaller, more natural-like acclimation sites in the upper Wenatchee basin, reconnecting habitats, and releasing smaller numbers of fish in more locations similar to natural conditions. The Yakama Nation was providing the concept proposal to the Committees as a way to begin a dialogue on this subject, and was not seeking approval, but rather was asking whether there was interesting in further developing this approach. Murdoch will send the PowerPoint slides of the Yakama Nation's concept proposal to Ali Wick for distribution to the Committees.

Kirk Truscott expressed a concern that such an approach might lead to developing facilities in areas currently being used by naturally spawning populations. Tom Scribner replied that the goal would be to minimize impact on in-water habtat in creating these new sites. Kris Petersen commented that the plan would need to consider the implications of adding hatchery-origin fish onto a spawning ground used by natural-origin fish. Murdoch discussed that these sites would not generally be appropriate for overwintering acclimation because of site and water temperature conditions, but it might be appropriate for some warmer sites. She also confirmed that feeding would be necessary at some of the sites, but that this would be a site-specific decision. Scribner also confirmed that it is not anticipated that there would be an additional cost to the PUDs for this approach; rather, funding for operations and maintenance would be expected to be provided by BPA. Tom Kahler commented that Douglas PUD would want to point out that if implemented, this action would be considered as BPA's action using Douglas PUD's fish, in that if fish were released to the BPA/Yakama Nation facility, the PUD's obligation would at that point be considered to be met. The Committees discussed that despite these

concerns, they agreed that the Yakama Nation was free to continue developing this approach. Scribner indicated that the Yakama Nation's next step would be to develop a concept using Nason Creek as a template for what a program like this could look like. Mike Schiewe and Keith Truscott suggested that Scribner might want to consider presenting this concept proposal to the Tributary Committees for their information. Schiewe indicated he would check with Tracy Hillman to see if this can be added to the Tributary Committees agenda tomorrow.

IV Douglas PUD

A. ITEM FOR APPROVAL: Douglas PUD M&E Implementation Plan for 2008

Rick Klinge introduced the Douglas PUD 2008 M&E Implementation Plan for committee acceptance. The Committees (with the exception of the Yakama Nation) agreed that the plan was ready for implementation; Keely Murdoch request a few extra days for review. Murdoch will provide input to Tom Kahler by no later than this Friday, December 14. Pending acceptance by the Yakama Nation, Klinge will send a final copy of the plan to Ali Wick for posting to the FTP site.

Rick Klinge also discussed that, in association with the draft M&E Implementation Plan, WDFW had prepared a draft steelhead reproductive success study plan that Douglas PUD staff were currently reviewing internally. It was further noted that Chelan and Douglas PUD were both reviewing the HCP requirement for conducting a steelhead reproductive success study and hoped to coordinate their efforts. Mike Schiewe reminded the Committees that the topic of steelhead reproductive success studies would be on the agenda for the January 2008 meeting. Rick Klinge agreed to send out the draft WDFW proposal as an FYI for the Committees.

B. HCP 2007 Hatchery Compliance Report

Rick Klinge distributed the Wells HCP Hatchery Compliance Report for 2007, and invited Committee members to get in touch with him with any questions.

C. Twisp Weir

Tom Kahler updated the group that the construction contract for the Twisp weir was awarded on Monday. The estimated completion date is April 1.

D. Wells Hatchery Screens

Tom Kahler updated the group that construction work on the Wells Hatchery water intake screens is currently progressing, and the contractor will be mobilizing for forebay work on January 8. The screens are scheduled for delivery on January 22, with an estimated installation completion date of February 28.

E. 2008 Wells HCP Action Plan

Rick Klinge updated the group that Douglas PUD distributed the 2008 Wells HCP Action Plan at yesterday's Coordinating Committees meeting. Douglas PUD is requesting review and input from the Hatchery Committees as well, with a request for approval anticipated at the next meeting.

F. DECISION ITEM: SOA Regarding Fulfilling Douglas PUD Coho Obligation

Tom Scribner updated the group that Douglas PUD is proposing to fulfill the Douglas PUD coho obligation by providing funding to support its coho program. The Committees approved the SOA as provided today (Attachment D).

V HETT Updates

A. Progress on Reference Streams

Ali Wick discussed that the HETT is working on the reference stream analysis, and will be providing an update on results for spring Chinook at the February Hatchery Committees meeting.

B. Progress on Draft BKD Study Plan

Ali Wick and Mike Schiewe updated the group that the HETT is working on a bacterial kidney disease (BKD) study plan using the statistical information provided by John Skalski, and the HETT is exploring potential hatchery facilities and locations where such a study could be conducted.

VI Colville Tribes

A. Posting Reports to the OBMEP Website

Jerry Marco brought up the question of whether the Hatchery Committees would be willing to allow re-posting of publicly-available HCP reports dealing with Okanogan anadromous fish.

The Committees agreed that it would be acceptable for this web site to post these reports. Marco will provide a list of these reports to Ali Wick to be provided to the OBMEP web master.

VII HCP Administration

A. Meeting Agreements

The following are Committee agreements that were made at the meeting:

- The Committees approved the Douglas PUD 2008 M&E Implementation Plan, pending Keely Murdoch's review (Item IV-A).
- The Committees agreed that it would be acceptable for the OBMEP web site to post publicly-available HCP reports dealing with Okanogan anadromous fish (Item VI-A).

B. Next Meetings

The next scheduled meetings are as follows: January 16 in SeaTac, February 20 at Chelan PUD in Wenatchee, and March 19 at Chelan PUD in Wenatchee.

VIII List of Attachments

Attachment A – List of Attendees

Attachment B – Wells HCP Hatchery Committee Statement of Agreement Regarding the District's Okanogan Spring Chinook Obligation

Attachment C - Rocky Reach and Rock Island HCP Hatchery Committees Statement of Agreement Regarding the District's Okanogan Spring Chinook Obligation

Attachment D – Statement of Agreement Regarding Fulfilling the Douglas County PUD's Coho Obligation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Chuck Peven	Chelan PUD
Keith Truscott *	Chelan PUD
Julie Pyper	Chelan PUD
Sam Dilly	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Russell Langshaw	Grant PUD
Curt Dodson	Grant PUD
Kris Petersen *	NMFS
David Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer	WDFW
Keely Murdoch	Yakama Nation
Tom Scribner * (by conference call)	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

WELLS HCP HATCHERY COMMITTEE STATEMENT OF AGREEMENT REGARDING THE DISTRICT'S OKANOGAN SPRING CHINOOK OBLIGATION

December 12, 2007

Wells HCP Hatchery Committee
Statement of Agreement
Regarding the District's Okanogan Spring Chinook Obligation

Statement

Contingent on the Northwest Power and Conservation Council (NPCC) approving and the Bonneville Power Administration (BPA) funding the Colville Tribes' Chief Joseph Hatchery, the Wells Habitat Conservation Plan (HCP) Hatchery Committee (hereafter "Committee") agrees that Okanogan Basin spring Chinook salmon are a Plan Species that requires mitigation as detailed in Section 8.4.5.2 of the Wells HCP. Further, based on this determination, Douglas County PUD (hereafter "the District") shall begin providing hatchery O&M funding based on a 3.8% Wells Project passage loss for the Chief Joseph Hatchery Program (CJHP) upon completion of the Chief Joseph Hatchery

The Committee further agrees that in the event the CJHP is not approved and/or funded, the District will not be required to provide compensation at this time.

The Committee agrees that this Okanogan Basin spring Chinook program will be included in the five-year evaluations for the Monitoring and Evaluation (M&E) program and other metrics as included in the HCP. (Section 8.5).

The District's hatchery obligation for the Okanogan Basin spring Chinook hatchery program would be evaluated and adjusted by the Committee following the processes and at the 10-year check-in dates defined in the HCP. The first 10-year check-in will occur 10 years after the Chief Joseph Hatchery begins operation.

The Committee agrees that the performance of the Okanogan Basin spring Chinook program will be evaluated along with other District hatchery programs (following the 10-year check-in schedule as described above), and will need to meet the appropriate standards and goals established by the Committee to ensure protection of the Plan Species.

Consistent with the expectation that Okanogan spring Chinook salmon survive passage of Wells Project at a level similar to other spring migrant salmonids, the Hatchery Committee anticipates that, after appropriate consideration by the Wells Coordinating Committee, Okanogan spring Chinook would be designated a Phase III (Standard Achieved) Plan Species upon NPCC approval and BPA funding of the CJHP.

Background

Section 8.4.5.2 of the Wells HCP requires the Hatchery Committee to make a determination in 2007 on the status of Okanogan Basin spring Chinook salmon as a Plan Species that requires mitigation, and to describe the District's compensation obligation. According to the HCP, the Committee will require mitigation if there is a continuing spring Chinook hatchery program and/or a Threshold Population of naturally reproducing spring Chinook in the Okanogan watershed (established by an entity other than the District and occurring outside of the HCP).

A major objective of the CJHP is to reintroduce extirpated spring Chinook salmon to historical habitats in the Okanogan River for the purpose of providing for a tribal ceremonial and subsistence fishery, as well as recreational fishing. The Colville Tribe's Chief Joseph Hatchery Program has been an approved project within the NPCC's Fish and Wildlife Program since 2002. Following the NPCC's 3-Step Process, the CJHP has completed Step 1 (Master Plan Development) and is awaiting a decision on the approval of Step 2, which should occur early in 2008. An element of the Step-2 Process involved negotiating conceptual cost-sharing agreements for funding the CJHP among BPA (the major funding entity) and other interested parties. The District has been involved in discussions with the Colville Tribe and has conceptually agreed to cost sharing for their Okanogan Basin spring Chinook salmon hatchery compensation obligation.

Although the conditions in 8.4.5.2 of the HCP have not yet been achieved (i.e., the existence of a long-term hatchery program), the Hatchery Committee has expressed interest in pursuing this conditional Statement of Agreement in an attempt to address this issue within the current HCP schedule.

ATTACHMENT C

ROCKY REACH AND ROCK ISLAND HCP HATCHERY COMMITTEES STATEMENT OF AGREEMENT REGARDING THE DISTRICT'S OKANOGAN SPRING CHINOOK OBLIGATION

December 12, 2007

Rocky Reach and Rock Island HCP Hatchery Committees
Statement of Agreement
Regarding the District's Okanogan Spring Chinook Obligation

Statement

If the Northwest Power and Conservation Council (NPCC) approves and the Bonneville Power Administration (BPA) funds the Colville Tribes' Chief Joseph Hatchery Program (CJHP), then

(1) the Rocky Reach and Rock Island Habitat Conservation Plan (HCP) Hatchery Committees (Committees) agree that Okanogan Basin spring Chinook salmon will be considered a Plan Species that requires mitigation as detailed in Section 8.4.3.b of the HCPs ; and

(2) Chelan PUD ("the District") shall provide hatchery compensation as approved by the Committees and described in the District's cost sharing agreement currently under negotiation among the District, BPA, and the Colville Tribes; this shall satisfy the District's hatchery obligation for Okanogan spring Chinook salmon.

The Committees further agree that in the event the CJHP is not approved by NPCC and/or funded by BPA, Okanogan Basin spring Chinook salmon will not be considered a Plan Species and the District will not be required to provide any hatchery mitigation at this time.

If the CJHP is approved by NPCC and funded by BPA, the Committees further agree that:

(A) This Okanogan Basin spring Chinook hatchery program will be included in the five-year evaluations for the Monitoring and Evaluation (M&E) programs and other metrics as included in the HCPs. (HCPs Section 8.5),

(B) The hatchery production levels for this program will be established through the program's Hatchery Genetic Management Plan and the NPCC's three-step hatchery process. The District's hatchery obligation, until the first HCP appropriate scheduled check in, will be set at 7% per project and will be in the form of cost sharing at a 14% level relative to the cost for operation and maintenance and other aspects defined in the cost sharing agreement between the District, BPA, and the Colville Tribes of the spring Chinook component of the CJHP. This funding mechanism is consistent with Section 8 of the HCPs.

(C) Future cost sharing levels may be adjusted, based on schedules established in the HCPs, and on measured juvenile spring Chinook project survival levels for Rocky Reach

and Rock Island. If the total production of Okanogan spring Chinook increases because of natural production, then the cost share sum would increase accordingly."

(D) The Committees agree that the performance of the Okanogan Basin spring Chinook hatchery program will be evaluated along with other District hatchery programs (following the 10-year check in schedule as described above), and will need to meet the appropriate standards and goals as established by the Committees to ensure protection of the Permit Species.

(E) Juvenile project survival studies performed by the District for Rocky Reach and Rock Island hydro projects are performed using run-of-river fish. Future planned survival studies for HCP purposes will continue to use run-of-river fish collected at the Rocky Reach Juvenile Bypass Sampling Facility which would include Okanogan basin spring Chinook and therefore will meet the survival study requirements of Section 8.4.3.b.

Background

Section 8.4.3.b of the HCPs require the Committees to make a determination in 2007 on the status of Okanogan Basin spring Chinook salmon as a Plan Species that requires mitigation, and to describe the District's compensation obligation. According to the HCPs, the Committees will require mitigation if there is a continuing spring Chinook hatchery program and/or a Threshold Population of naturally reproducing spring Chinook in the Okanogan watershed (established by an entity other than the District and occurring outside of the HCP).

A major objective of the CJHP is to reintroduce extirpated spring Chinook salmon to historical habitats in the Okanogan River for the purpose of providing for a tribal ceremonial and subsistence fishery, as well as recreational fishing. The Colville Tribe's CJHP has been an approved project within the NPCC's Fish and Wildlife Program since 2002. Following the NPCC's 3-Step Process, the CJHP has completed Step 1 (Master Plan Development) and is awaiting a decision on the approval of Step 2, which should occur early in 2008. An element of the Step-2 Process involved negotiating conceptual cost sharing agreements for funding the CJHP among BPA (the major funding entity) and other interested parties, including the Mid-Columbia PUDs. The District has been involved in these discussions and has conceptually agreed to cost sharing for their Okanogan Basin spring Chinook salmon hatchery compensation obligation using this process.

Although the conditions in 8.4.3.b of the HCPs have not yet been achieved (i.e., the existence of a long-term hatchery program), the Committees have expressed interest in pursuing this Statement of Agreement in an attempt to address this issue within the current HCP schedules.

ATTACHMENT D

STATEMENT OF AGREEMENT REGARDING FULFILLING THE DOUGLAS COUNTY PUD'S COHO OBLIGATION

Wells HCP Hatchery Committee
Statement of Agreement
Regarding Fulfilling the Douglas County PUD's
Coho Obligation
December12, 2007

Statement

The Wells HCP Hatchery Committee (hereafter "Committee") has agreed that the criterion pursuant to Section 8.4.5.1 of the Wells Project HCP for a long-term coho hatchery program has been met.

The Committee agrees that:

1. Pursuant to Section 8.4.5.1, the interim juvenile coho survival of 96.2% will be assumed.
2. In lieu of juvenile coho survival studies during the first 10-years of the funding agreement with the Yakama Nation, Douglas County PUD will provide funding for a coho hatchery program equivalent to an assumed 7% mortality rate. Priority for measurement and hydro-related operations will be based on co-migrating Permit Species.

In order to meet this obligation, the Douglas County PUD and the Yakama Nation (YN) intend to enter into an agreement whereby Douglas County PUD will provide funding to the YN to support a coho program. As long as Douglas County PUD is meeting the terms of the agreement by providing the funding, the Committee agrees that Douglas County PUD is fulfilling its coho hatchery obligation for this 10-year period.

Background

The HCP describes the District's coho salmon compensation obligation (Section 8.4.5.1). For the Wells Hatchery Committee to determine that the District has a coho salmon compensation obligation under the HCP, the Hatchery Committee must determine the existence of a long-term coho hatchery program and/or the establishment of a Threshold Population of naturally reproducing coho in the Methow Basin. The funding of the hatchery program must be by an entity other than the District and outside the HCP. Originally, the HCP required the Hatchery Committee to make an assessment in 2006. However, on December 27, 2006 the Hatchery Committee chose to defer the decision until October 2007.

On June 20th 2007, under the Rock Island and Rocky Reach HCP, the Hatchery Committees approved a statement of agreement that provided for Chelan County PUD to provide hatchery mitigation for unavoidable juvenile coho mortality at the Rocky Reach and Rock Island hydro projects. This decision satisfied the criterion for the long-term funding for a coho hatchery program.

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Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Hatchery and Coordinating Committees

From: Michael Schiewe, Chair, HCP Hatchery and Coordinating Committees

CC: Ali Wick, Chuck Peven, Julie Pyper, Tom Kahler, Bob Clubb, Keely Murdoch, Shane Bickford

Date: February 22, 2007

Re: Final Minutes of December 27, 2006 Wells, Rocky Reach and Rock Island Hatchery and Coordinating Committees Conference Call

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCP) Hatchery and Coordinating Committees met by conference call on Wednesday, December 27, 2006 from 10:00 am to 12:00 pm to review and approve Statements of Agreement for deferral of decisions regarding the status of coho salmon as a Plan Species with HCP mitigation requirements. Attendees are listed in Attachment A.

ACTION ITEM SUMMARY

- Mike Schiewe will work with the PUDs to revise the SOAs consistent with today's discussion and circulation to the Committees for email approval by January 2, 2007.

I Welcome (Mike Schiewe)

Mike Schiewe opened the meeting by stating that the purpose of today's call was to review and attempt to reach agreement on the Statements of Agreement (SOAs) deferring or delaying a determination on whether the PUDs have mitigation requirements for coho salmon as described in the Wells, Rocky Reach, and Rock Island HCPs.

II Review of Douglas PUD Statements of Agreement

Rick Klinge introduced the discussion of the proposed Wells HCP SOAs for the coho decision by describing the development of the proposal and its review and approval by the Douglas PUD mangers and the Commissioners. The SOA, 1) proposed a deferral of a decision until October 2007, on whether or not Douglas PUD would be required to meet NNI for coho salmon;

2) required the Wells Hatchery Committee to define the mitigation requirement prior to November 2007; and 3) proposed that, should it be determined that Douglas PUD be required to meet NNI for coho as per Section 8.4.5.1 of the Wells HCP, coho would be designated to be in Phase III (Standards Achieved).

Tom Scribner indicated that the Yakama Nation (YN) had some proposed changes to the SOA that he incorporated by redline in the version that was distributed to the Committees on December 26, 2006. The proposed change required that the mitigation (if required) would be consistent with the Coho Master Plan that the YN was developing. After considerable discussion by members of both the Coordinating and Hatchery Committees, it was agreed that *in lieu* of a reference to the Coho Master Plan that a statement would be added to the SOA requiring Douglas PUD to work with the Yakama Nation, the Bonneville Power Administration, Chelan and Grant PUDs, and the Wells Hatchery Committee to work out details of any potential mitigation. It was also agreed that, if the Wells Hatchery Committee determines that Douglas PUD must compensate for coho passage losses as per Section 8.4.5.1 of the Wells HCP, the Coordinating Committee would designate it as Phase III (Additional Juvenile Studies), and not as Phase III (Standards Achieved) as initially suggested by Douglas PUD. The latter would preserve the option for the Coordinating Committee to require survival studies if existing information did not support the use of a surrogate species (e.g., spring Chinook salmon) for Phase designation.

Mike Schiewe agreed to make the changes to the SOAs and to circulate the drafts to the Committee members by the end of the day. Approval of the new drafts would occur by email no later than January 2, 2007. A tentative conference call was scheduled for January 3, 2007, if necessary, to resolve any outstanding issues. Approval by all parties was emailed or phoned in by January 3, 2007.

III Review of Chelan PUD's proposed SOA for Delay/deferral of Coho Decision

Shaun Seaman introduced the proposed SOA for the coho decision under the Rock Island and Rocky Reach HCPs. The proposed Hatchery Committees SOA was structured as a decision to delay the decision until January 31, 2007, with a decision to defer until October 2007 if certain conditions were met. The conditions of the SOA were that the following issues were to be resolved: 1) the use of a surrogate species for coho salmon to determine juvenile passage

survival and hydro operations; 2) the clarification of options available for meeting any hatchery mitigation obligation; and 3) the definition of out-year conditions or situations that would lead to terminating a HCP coho obligation.

Tom Scribner suggested several changes to the SOAs. He indicated that the YN was looking for a commitment from Chelan PUD that any mitigation would be consistent with the YN's Coho Master Plan. He also indicated that he felt that the January 31, 2007 date for working through the conditions was too short a time period. After a lengthy discussion, the Committees agreed to adding a statement to the SOA requiring Chelan PUD to work with BPA, the Douglas and Grant PUDs, and the HCP Committees (similar to that approved for the Wells HCP coho SOA) as the approach to defining a potential mitigation program. The Committees agreed that the January 31 date was inadequate to work through the issues raised by Chelan PUD, and changed the proposed date to March 31, 2007. The balance of the discussion served primarily to clarify expectations by Chelan PUD regarding what could be accomplished prior to March 31, 2007.

Mike Schiewe agreed to incorporate the agreed-to changes into the draft SOA for the Hatchery Committee to review. He also agreed to draft a companion SOA for the Coordinating Committee that addresses approval of the schedule change and acknowledges the commitment to evaluate the potential use of surrogate species for determining initial phase designation and hydro operations. Both documents will be distributed later today and Committees approval would be requested by email response no later than January 2007.

Attachment A
List of Attendees

Name	Organization
Michael Schiewe	Anchor Environmental, L.L.C.
Jerry Marco ***	Colville Tribes
Chuck Peven	Chelan PUD
Shaun Seaman ***	Chelan PUD
Julie Pyper	Chelan PUD
Bob Clubb	Douglas PUD
Tom Kahler	Douglas PUD
Rick Klinge ***	Douglas PUD
Shane Bickford	Douglas PUD
Bryan Nordlund **	NMFS
Brian Cates ***	USFWS
Kirk Truscott *	WDFW
Carmen Andonaegui **	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch	Yakama Nation

* Denotes Hatchery Committees member

** Denotes Coordinating Committees members

*** Denotes member of both Committees

APPENDIX C

HABITAT CONSERVATION PLAN TRIBUTARY COMMITTEES MEETING MINUTES

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 11 January 2007

Members Present:	Bob Rose (Yakama Nation), David Morgan (USFWS), Chris Parsons (WDFW), Dale Bambrick (NMFS), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD), Bob Bugert (Committee Chair)
Others Present:	Julie Pyper (HCP Project Coordinator), Becky Gallaher (Chelan PUD), Katharine Bill (Methow Conservancy; for agenda item 8 only), Ben Lenz (Grant PUD; for items 12 and 13), Denny Rohr PRHC facilitator; for items 12 and 13)

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1. Review and adopt agenda

The Committees adopted the proposed agenda with five additional items (modification to the Gagnon/Reiman Small Project scope of work, collection of rootwad/boles, the Wells HCP 2007 Action Plan, the 24 January joint meeting with the Priest Rapids Committees, and Small Project Application: *Lower Beaver Livestock Exclusion Project*) and one deletion (demonstration of the EKO-System project management system).

2. Review and adopt meeting notes

The Committees adopted the December 2006 meeting notes, with revisions suggested by David Morgan.

3. HCP Project Coordinator monthly report

Becky Gallaher reviewed the monthly report that she and Julie Pyper developed for the Committees.

Status of contracts with 2005 sponsors

Becky noted that little project activity has occurred since the December meeting, but noted a couple new developments:

- Becky distributed a draft pamphlet describing the *Okanagan River Restoration Initiative III* project. In general, the work is progressing well. This project will be discussed at the upcoming meeting of the Bilateral Okanagan Basin Technical Work Group (BOBTWG) on 20 February.
- Chelan County is expecting 75% drawings for the *Nason Creek Oxbow Reconnection* project; Becky will post them on the ftp site when they are received (which is expected to be on 15 January). They have received landowner access permit from WDOT and the permit applications are submitted. The Committees saw no need to have a separate meeting with the project sponsors on this work, but wish to keep apprised of its progress.
- The landowner agreements for the *Entiat Instream Structures* project have been completed, and will be provided to the Committees.
- Design drawings for the *Alder Creek Culvert Replacement* project are available on the ftp site; comments are due 18 January.

Approval of payment requests
The following committees approved these payment requests:

- The Wells Tributary Committee approved the Okanagan Nation Alliance request for $ 36,186.61USD the Okanagan River Restoration Initiative III project, specifically for public outreach, brochure development, and site preparation.
- The Rocky Reach Tributary Committee approved the Chelan County PUD request for partial invoice for $5,934.00 for the *Entiat PUD Canal Fish Enhancement* project. The final report will be available in February.

Julie notified the Committees that the 2007 contribution to the Rocky Reach and Rock Island Plan Species Accounts will be made in January. The exact amounts will be provided at the February meeting.

4. Modification to the Reiman Small Project

Becky informed the group about the status of the Reiman Property (formerly known as the Gagnon Property). Apparently, Bureau of Reclamation (BOR) and Chelan County met with the landowner to discuss the county's project to create a back-channel rearing area from an existing groundwater-fed pond. During the meeting the landowner expressed his desire to relocate his irrigation withdrawal from the current location to the pond, which is a change from the work described in their original application. A pump test will be conducted (at the landowners expense) in August to determine if the pond's groundwater recharge is sufficient to supply the water necessary for fish and irrigation. If the test comes back favorably, the landowner would like to pursue the option of moving his withdrawal to the pond. If the test is not supportive, then it is unlikely that he will proceed with the planned project at the new location.

The Committee agreed that the applicant should provide an amended scope of work and design drawing that identifies how the withdrawal would function in low-flow periods, so as to not impact the county's back-channel project. The Committees agreed to review the addendum, yet may withdraw the funding if it appears to be inconsistent with the original intent of the project, or if it deleteriously affects the back-channel project. Julie and Becky will advise Chelan County Conservation District on the need for a revised scope of work once the well test is done.

5. Collection of rootwad/boles

Keith suggested that the Committees provide funds to secure some rootwad/boles from trees that have fallen from the recent windstorm. He said that there may be up to 150 trees available on city property. He said Chelan County is contracting with Pipkin Construction to gather the materials. Chelan PUD can provide trucks to haul the boles to Rocky Reach Dam for storage. He estimated the hourly cost to be $150/hr (which includes personnel and equipment). He would like to begin the work as soon as possible, before the city starts the removal process. Keith proposed that the committees allocate $5,000 from Rocky Reach and $5,000 from Rock Island Plan Species Accounts. Tom proposed $5,000 from Wells Plan Species Account. The three committees approved these expenses, and authorized Keith to begin this work.

6. Programmatic permitting for SRFB projects

Bob Bugert notified the group that the Limit 8 exclusion to the NOAA-Fisheries 4d rule for projects funded by the Salmon Recovery Funding Board (SRFB) is essentially completed and will be adopted at the March SRFB meeting. This will provide coverage for threatened anadromous salmonids throughout the state. The next step will be to extend this coverage for Upper Columbia spring Chinook salmon, listed as endangered. Bob will work with Dale to determine the feasibility of this approach.

7. Current status of 2006 BPA project funding

The group discussed their collective understanding of the funding decisions to be made by BPA. The understanding is that the decision will be made in late January. This decision will affect the status of projects funded by the SRFB, but will only impact one decision made by the Tributary Committees: the *Elbow Coulee Floodplain Restoration* project, which was approved for funding for $83,080. If this project is approved for funding by Bonneville, the sponsor may decide to accept the funds from Bonneville rather than the Tributary Fund.

8. Methow riparian protection

The Committees welcomed Katharine Bill of the Methow Conservancy, who was asked to attend the meeting to discuss whether there are ways to modify their conservation easements to protect riparian areas only, with smaller buffer areas of non-riparian land. In addition, the Committees are looking for alternative ways to protect riparian habitat, and she was asked to provide suggestions along those lines. Katharine proposed two conceptual approaches:

- Severe Channel Migration Zone (SCMZ) Lot Purchase, where parcels are completely within the SCMZ as defined in the analysis by Okanogan County. The Conservancy proposes offering to purchase lots directly from landowners, and then would either hold these lots in perpetuity or would sell them to neighboring landowners restricted by "forever-wild" no-build conservation easements.
    - Advantages: this approach targets properties that are all riparian habitat, regardless of size, and simplifies the protection mechanism to a standard purchase and sale agreement.
    - Cost: if all landowners in the SCMZ participated, the assessed value of the property involved (in 2005 dollars) is $2.6 million, but it is likely that only 20% to 30% of landowners would participate. Assessed value is typically less than appraised value, as well. Staff time and transaction costs would also need to be covered to make this approach feasible.
- Riparian-restricted Conservation Easements; where parcels have both riparian and non-riparian habitat, the Conservancy could develop a program to restrict use of the riparian zone only, and not reduce development rights. Valuation of riparian zone protection would need only to be done using a new method, since standard conservation easement valuation using an appraisal depends on giving up development rights. The Conservancy proposes to establish a program method that meets the requirements of the Tributary Committees.
    - Advantages: this approach focuses project dollars on riparian protection and not on reducing development overall. This may be more appealing for some landowners, and it focuses the Tributary Committees' involvement strictly to riparian areas.
    - Costs: this would cost less than standard conservation easement purchases, but the exact amount is not known at this time.

The Committee members agreed that both options are viable, as long as the methods and procedures are clearly outlined prior to proceeding with this work. They notified Katharine that they wish to continue this dialogue with the Conservancy. Katharine responded that she will advise the Methow Conservancy Board of Directors of her discussions with the Committees, and get back to the group.

9. DECISION ITEM: *Methow Riparian Protection Phase IV*

The Committees decided not to fund the Methow Conservancy's conservation easements of the Lehman, Freidrich and Coon properties, proposed in the application *Riparian Protection Phase*

IV. Of the three parcels, the Committees saw the greatest conservation benefit from the Lehman property, because of the potential for development of the side channel on that property, and the pending cost-share with the state's Farmland Protection Program. Bugert reminded the Committees that the SRFB agreed to fund half the cost of the conservation easement for these three parcels, and suggested that the Conservancy could request the SRFB funds be directed only to the Lehman property, and the Committees could provide the 15% match.

The Committees directed the chairperson to notify the Methow Conservancy of its decision not to fund these easements, and that the Committees wish to focus its future funding efforts on the potential alternative tools to protect riparian areas.

10. Small Project Application: *Lower Beaver Livestock Exclusion Project*

Julie Pyper said the Committees received a small-project application for livestock fencing on Beaver Creek (Methow River) to match with EQIP funds. The intent is to provide off-channel watering and restricted livestock access to the stream. Becky will distribute this application to the group, who agreed to review it at the February and March meetings with the intent of reaching a decision at the March meeting.

11. Wells Action Plan

Tom Kahler described the development of the 2007 action plan for the HCP Committees. This year's action plan for the Tributary Committees within that document will reflect the 2006 funding policies and procedures, since there have not been any changes made to date. Julie said the action plans for Rocky Reach and Rock Island HCP Committees will also be available soon.

12. Joint meeting of the HCP Committees with the Priest Rapids Committees

Denny Rohr said the PUD HCP and Priest Rapids Committees will have a joint meeting on 24 January, specifically focused on habitat and hatchery functions. The meeting is from 10:00 to 4:00 at Chelan PUD Auditorium. Bob Rose added that his goal for the meeting is to encourage integration of habitat and hatchery programs.

13. Tributary Committees' funding policies and procedures

The Committees reviewed the current policies and procedures and evaluated the strengths and weaknesses of the current approach. Their intent is to review the program direction and agree to completion of the review by the March meeting.

The group reviewed an example "Implementation Schedule" for the watersheds, which were developed as a means to identify near-term (3-year) and long-term (10-year) actions to carry out the recovery plan. These schedules identify the proposed project type, location, expected benefit, and cost. Some members expressed concern about assumption by project sponsors that the Tributary Committees will fund a given project, if the Tributary Fund is identified on an Implementation Schedule. The group agreed on the benefits of maintaining flexibility in the decision-making process, so it was suggested that the Tributary Committees should support the objectives of the recovery plan, rather than the specific support of the implementation schedule.

The Committees also discussed whether to proactively identify those types of actions they intend to fund in a given cycle. The group saw advantages in this approach (primarily in their capability to direct funds to priority areas), but also recognized disadvantages (primarily in constraining the flexibility of the Committees' decision-making process).

At this time, the Committees agreed to the following approaches:

- Retain the Small Projects Program, but perhaps raise the maximum amount to $50,000.

- Retain the General Fund Program, but explore the implications of retaining a single-year funding cycle versus having a continuous open-application period.
- Encourage leveraging with other funding organizations.
- Set up long-term agreements with land trusts to build or maintain capacity.
- Use the pre-proposal process to eliminate inappropriate projects early, rather than waiting for a complete application.
- Establish policies that discourage "hedging" of applications by sponsors who submit them to multiple funding sources.

The Committees agreed to discuss these concepts in detail at the February meeting, and asked Julie, Becky, and Bob to revise the Funding Policies document to reflect the discussions held in this meeting. They will also provide an analysis of the implications of some timelines and approaches for funding decisions.

14. Next steps

The next meeting of the Tributary Committees will be Thursday, 8 February at the Chelan PUD Auditorium; from 9:00 to 2:00. Tentative agenda items include:

- Status of 2005 projects, and
- Discussion of the small project proposal
- Funding strategies for 2007 and beyond.

Bob notified the Committees of several meetings that would be of interest to them:

- BOR Wenatchee assessment 22 Feb 3:00 to 5:00 at the Red Lion in Wenatchee
- Project debriefing workshop 26 Feb 9:00 to 3:00 at Campbell's in Chelan
- BOR Methow assessment: date and location to be determined
- BOBTWG meeting 20 February in Penticton, BC

Meeting notes by Bob Bugert (BobBugert@nwi.net)

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 8 February 2007

Members Present: Bob Rose (Yakama Nation), David Morgan (USFWS), Chris Parsons (WDFW), Dale Bambrick (NMFS), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD), Bob Bugert (Committee Chair)

Others Present: Julie Pyper (HCP Project Coordinator), Becky Gallaher (Chelan PUD)

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1. Review and adopt agenda

The Committees adopted the proposed agenda with additions requested by Keith Truscott and Tom Kahler; status of the Plan Species Accounts (agenda item 4), and by Bob Bugert; Methow riparian protection (agenda item 9) and funding coordination (agenda item 10).

2. Review and adopt meeting notes

The Committees adopted the January 2007 meeting notes, with revisions suggested by Tom Kahler and Julie Pyper.

3. HCP Project Coordinator monthly report

Becky Gallaher reviewed the status of contracts with 2005 sponsors:

- Chelan/Douglas Land Trust (CDLT) is working on a conservation easement on at least one property (Dally-Wilson) and the acquisition of another property (Wagner). Neither of these deals is imminent, but they are hopeful that the deals may be ready by the summer.
- Chelan County Natural Resources Department posted the 75% design drawings for the Nason Creek Oxbow Reconnection Project on 7 February. Comments on the drawings are due to the chairperson on 16 February, so that a response to the project sponsor can be provided within the specified ten-day period. The final drawings are expected on 1 March.
- The Committees received the project drawings for the Milne, Hanan-Detwiler and Knapp-Wham sites. Chelan County Conservation District submitted the permits for the Entiat Instream Structures Project. The District is in the process of completing two JARPA/permitting packages that will cover the installation of numerous instream habitat treatments in 0.2 miles of the Entiat River between RM 2.75-2.95, and the installation of an additional rock-cross vane and large woody debris.
- The Methow Conservancy is working on determination of the ownership of an island that may or may not be included in the MacDonald easement. Legal property descriptions written in the 1970's do not clearly define whether the island is included in the MacDonald property or is part of the property across the river. WDFW has a signed letter of intent to acquire the property across the river; however, their policies will require them to resolve the ownership issue prior to fee acquisition. Because of the unresolved ownership issue, the appraisal has been delayed. There is no activity on the conservation easement for the Prentice Property.
- Keith gave an update on the work to collect rootwads. The City and County are in the process of setting up a contract with the vendor to haul the trees. Chelan PUD is

prepared to use their trucks and trailers to haul the materials to Rocky Reach Dam once the vendor is chosen.

4. Fiscal status of Plan Species Accounts

Keith Truscott notified the Committees that Chelan PUD made the 2007 contribution to the Rocky Reach and Rock Island Plan Species Accounts (PSA) in January. With the Consumer Price Index adjustments, the contributions to the Rocky Reach PSA were $284,475.00 and $600,641.00 to the Rock Island PSA.

Tom Kahler informed the Committees that the 31 December 2006 balance for the Wells Plan Species Account is $1,496,539.42, based on an initial-year balance of $2,353,757.94, with $109,933.77 in accrued interest for 2006, and expenses of $967,152.29. The next contribution will be in September 2009.

5. Current status of 2006 BPA project funding

The Committees briefly discussed the status of the BPA funding decisions. The understanding is that BPA would soon release a statement of intent for off-site mitigation. This may affect the Committees' deliberation on funding future projects.

6. Review the small project proposal *Lower Beaver Livestock Exclusion Project*

The Committees began their review of the small-project application for livestock fencing on Beaver Creek (Methow River) to match with EQIP funds. The intent is to provide off-channel watering and restricted livestock access to the stream. The group asked for clarification on two items: the minimum buffer width set by the proposed fence, and whether it will connect with the fences of adjacent landowners to exclude livestock from the stream. Julie and Becky will contact the project sponsor and report to the Committees, who intend to make a decision on funding this project in March.

7. EKOSystem project management software

Becky Gallaher demonstrated the EKOSystem project management software that Chelan County Natural Resources is now using for their projects. She suggested that the Committees could use this system to monitor the progress of the sponsor in completing the milestones of the projects. Reports will be available for any project funded by the Salmon Recovery Funding Board (SRFB) and all projects that the county is working on, including those funded by the Tributary Committees. Becky provided the access code to access the read-only component of the system; the "read-only" subscription to the software does not require a fee.

Bob Bugert said that WDFW selected Paladin Data Systems, the group that developed the EKOSystem software, to develop the Habitat Work Schedule (HWS) System. The HWS System will be a centralized, web-accessible salmon habitat project-tracking database, with GIS mapping and reporting functionality. This system will be jointly managed by WDFW and Lead Entity Watersheds and is intended to serve the broader salmon recovery community including Regional Recovery Boards, watersheds, project sponsors, grantors, and the public. The HWS System will share information with existing databases, including IAC PRISM, Lead Entities with advanced systems, and the Conservation Commission's Watershed Data Pilot Project system, to reduce duplication and data entry.

8. Logistical arrangements for White River tour

The group made arrangements for a 28 February visit of the recent work by Chelan/Douglas Land Trust to protect riparian areas on the White River, a tributary to the Wenatchee. Bugert will provide maps of the completed and proposed acquisitions prior to the trip.

9. Methow Riparian Protection

Bob Bugert notified the Committees that the Methow Conservancy proposed a modification of their pending contract with SRFB to allocate their entire award ($425,000) to the Lehman Conservation Easement, and forego the funding for the Coon and Freidrich properties. The overall Lehman project is 203 acres, and they applied for State Farmland Protection Funding for the upland, farmland component (128 acres). If awarded, this funding must go to Okanogan County, who would hold the conservation easement and the Conservancy would be responsible for monitoring the easement. Bob Bugert said that the Conservancy might request approximately $75,000 in matching funds from the Tributary Committees for the Lehman riparian easement, if the SRFB agrees to allow them to allocate all of the $425,000 awarded in Round 7 on the Lehman project.

The Committees directed the chairperson to contact the Conservancy and inquire about the likelihood of using other sources (particularly the Farmland Protection grant) as the matching funds. The Committees also directed the chairperson to ask the Conservancy to submit a proposal for development of a program to protect riparian areas along the Methow River (described in detail in the January meeting notes).

10. Funding Coordination

Bob Bugert gave an update on the efforts of several funding entities to coordinate funding strategies and approaches. There have been a series of meetings of several state and federal programs with funding authority to coordinate and direct efforts, with particular focus on the habitat implementation schedules developed by the regional salmon recovery boards in Washington State. The key areas of coordination are cost-sharing, identification of priorities, proposal submission and review procedures, and reporting. Bob will apprise the Committees of this effort as it progresses.

11. Reach-scale assessments to integrate habitat and hatchery actions

Bob Rose reviewed the recent discussions on the means to focus the efforts of all hatchery and habitat committees for Douglas, Chelan, and Grant PUDs. In particular, Bob discussed the concept of using the Ecosystem Diagnosis and Treatment (EDT) model to help refine the estimates of habitat quality and quantity in some key reaches. These estimates could then assist all committees in their decisions on both habitat restoration and artificial production. Bob and Casey Baldwin (WDFW) have been setting up the mechanism to update the data for the Level 2 attributes for the EDT model to help structure some of the hatchery goals. With well-established hatchery goals, specific habitat restoration actions may then be possible to support this effort. They would like to use some recently acquired field and aerial data to refine the parameters for the EDT modeling.

The group recognized the general need to have a better understanding of habitat conditions that could guide decisions on hatchery and habitat actions. The Committees discussed the uncertainties related to survival and production of salmonids in the North Central Washington streams, and the role of the hatchery monitoring and evaluation programs to help identify limiting habitat factors. The group also recognized the importance of the project effectiveness monitoring work, such as the Integrated Status and Effectiveness Monitoring Program (ISEMP), which will help them make informed decisions on habitat restoration. Some members questioned whether the EDT outputs would provide any additional scenarios for consideration in some rivers like the Chiwawa and Twisp rivers, where there are not many options available.

Bob Rose proposed two steps; 1) populate the EDT Level 2 attributes with the newly-acquired data from the ongoing monitoring work (plus additional information from photointerpretation), and 2) compare the outputs from the EDT scenarios with the implementation schedules being developed for specified HUC-5 watersheds. He suggested that, in the long term, this information would help in the refinement of artificial production objectives. The Committees suggested that Bob submit a proposal for this work through the Priest Rapids Habitat Committee. Some members felt that the Hatchery Committees might support this proposal, but others were unsure if those committees are structured in a way to provide financial support. The group asked Bob Rose to review the language from the Priest Rapids Biological Opinion to clarify the consistency of this effort with that plan.

12. Tributary Committees' funding policies and procedures

The Committees continued their discussions from the January meeting regarding the strengths and weaknesses of the current approach for both the Small Projects Program and the General Program. The Committees agreed to the following revisions to their policies and procedures:

- Raise the maximum amount in the Small Projects Program to $50,000; and
- Use the pre-proposal process in the General Program to eliminate inappropriate projects early, rather than waiting for a complete application.

The Committees directed Julie, Becky, and Bob to the following: 1) revise the funding policies and procedures document, 2) establish draft timelines and milestones for the 2007 funding cycle, 3) revise the application forms, and if necessary, 4) revise the review procedures. The Committees will review these products for potential adoption at the March meeting.

13. Upcoming meetings of interest

The Bureau of Reclamation (BOR) rescheduled its Wenatchee assessment workshop from 3:00 to 1:00 on 22 February, at the Red Lion in Wenatchee. The purpose of this meeting is to solicit input from the Upper Columbia Regional Technical Team on the biological merits of several projects in the Wenatchee River under consideration by the BOR.

The Upper Columbia Lead Entity project workshop will be on 26 February, from 9:00 to 3:00 at the Fire Station in Chelan. The purpose of this meeting is to evaluate the procedures used in the 2006 SRFB funding cycle, and to prepare for the 2007 cycle.

14. Next steps

The next meeting of the Tributary Committees will be Thursday, 8 March at the Chelan PUD Auditorium, from 9:00 to 2:00. Tentative agenda items include:

- Status of 2005 projects;
- Discussion of the small project proposal; and
- Review and potential adoption of Committees' funding policies and related documents.

Meeting notes by Bob Bugert (BobBugert@nwi.net)

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 8 March 2007

Members Present:	David Morgan (USFWS), Chris Parsons (WDFW), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD), Bob Bugert (Committee Chair)
Members Absent:	Dale Bambrick (NMFS), Bob Rose (Yakama Nation)[1]
Others Present:	Julie Pyper (HCP Project Coordinator), Becky Gallaher (Chelan PUD), Ben Lenz (Grant PUD, for agenda item 11)

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1. Review and adopt agenda

The Committees adopted the proposed agenda with three additions requested by Keith Truscott: carryover funds from Chelan Conservation District (agenda item 6), the status of the large woody debris collection (agenda item 7), and status of the *Elbow Coulee Floodplain Restoration Project* (agenda item 8).

2. Review and adopt meeting notes

The Committees adopted the February 2007 meeting notes, with revisions suggested by Tom Kahler.

3. Discussions with Chelan-Douglas Land Trust

Bob Bugert notified the group that he has applied for a full-time position with the Chelan-Douglas Land Trust, and will likely know whether he is appointed to the position by the April meeting. He stressed that he has found his work with the Tributary Committees to be very productive and rewarding, but the constraints of balancing separate part-time jobs has been a challenge. He also said that—if he is appointed— the Land Trust will give him an extended period to phase out of his responsibilities with the Committees, allowing a smooth transition.

4. DECISION ITEM: The small project proposal *Lower Beaver Livestock Exclusion Project*

Julie distributed a map that portrays the extent of the fence for the Beaver Creek project, which indicates complete cattle exclusion on the west side of the creek. On the east side, the fence will adjoin an existing fence owned by a different property owner. The riparian buffer width would be consistent with the NRCS Field Office Technical Guide. The total cost of the project is $24,670, with a request to the Tributary Committees of $18,559. The cost-share is provided through NRCS administrative funds and EQIP. The Wells Tributary Committee approved this request with the stipulation that the fence provides full exclusion of livestock and meets WDFW standards for wildlife passage. They directed Julie and/or Becky to conduct a site visit in spring.

[1] Dale Bambrick notified the chair in advance of his inability to attend, and provided his votes on the decision items prior to the meeting. Bob Rose could not attend because of an illness. All decisions made at this meeting were conditioned on approval by Bob, who was able to cast his votes on the decisions via phone the following day.

5. HCP Project Coordinator monthly report

Becky Gallaher reviewed the status of the contracts with the following 2005 sponsors:

- The *Okanagan River Restoration Phase III Project* is progressing on schedule. The preliminary report on the channel design is on the ftp site. The project sponsor noted that an analysis of two less-expensive alternative designs was under consideration; they will set up a meeting of the technical work group in Penticton to discuss those alternatives.

- The final drawings for the *Nason Creek Off-channel Reconnection Project* are delayed because the contractor is examining alternative culvert designs, based on the modeling of different velocities in the culvert. These drawings will also be posted on the ftp site when available.

- For the *Methow Riparian Protection Project*, the Methow Conservancy cannot take action on the MacDonald easement until the uncertainty regarding the ownership of the adjacent island is resolved by WDFW. Also, the easement for the Prentice property will likely not move forward until late spring.

- Chelan County Natural Resources will release the bid requests for the *Alder Creek Culvert Project* in mid April. The costs may be less than anticipated if several of the culverts to be corrected this field season can be batched under one contractor. The county will notify the Committees of this possibility.

- The *Entiat PUD Canal Fish Enhancement Project* was completed and final report is on the ftp site.

The following committees approved these respective payment requests:

- The Rocky Reach HCP Tributary Committee approved payment of the final invoice for $197.34 submitted by Chelan County Conservation District for the *Entiat PUD Canal Fish Enhancement Project* for completion of final report.

- The Rocky Reach HCP Tributary Committee approved payment of the final invoice for $87.09 submitted by Chelan PUD, to pay the sales tax for district labor for work on site for the *Entiat PUD Canal Fish Enhancement Project.*

- The Rocky Reach HCP Tributary Committee approved payment of the invoice for $600.00 submitted by LeMaster and Daniels for general accounting and administrative work for the Rocky Reach Plan Species Account.

- The Rock Island HCP Tributary Committee approved payment of the invoice for $600.00 submitted by LeMaster and Daniel for general accounting and administrative work for the Rock Island Plan Species Account. Becky noted that this expense may be reduced next year, since there are no funded 2006 projects.

- The Rocky Reach HCP Tributary Committee approved payment of the invoice for $19,246.77 submitted by Chelan PUD for administrative support provided to the Rocky Reach Plan Species Account, from July 05 through December 06.

- The Rock Island HCP Tributary Committee approved payment of the invoice for $17,835.70 submitted by Chelan PUD for administrative support provided to the Rock Island Plan Species Account, from July 05 through December 06.

- The Wells HCP Tributary Committee approved payment of the invoice for $19,856.48 submitted by Chelan PUD for administrative support provided to the Wells Plan Species Account, from July 05 through December 06.

Keith said that Chelan PUD is required to submit a report to FERC on actions undertaken under each settlement agreement. Becky is working with LeMaster and Daniels to compile a year-ending 2006 financial report for the Rock Island and Rocky Reach Plans Species Accounts. The financial summary will be submitted with the narrative written by the chair and approved by the Committees in January. Keith notified the Committee members that Becky will send them an email with a financial statement on each Plan Species Account. Keith asked the Committees to approve these statements in a timely manner, since Chelan PUD must submit the report to FERC by 31 March 2007. Given the short time frame for this action, the Committees agreed that Chelan PUD proceed with the submission of this financial information to FERC without review by the members. In a related manner, Keith emphasized Becky's increased role in Tributary Committee activities as an effective manner of managing work-load elements from Julie as she continues to support the overall HCP goals and programs. Specific administrative tasks delegated by the Committees will continue to be eligible for reimbursement from the appropriate HCP Plan Species Account ($80K admin/account), and that reimbursement would only be sought in the singular form (Becky **or** Julie, not both).

Bob Bugert recommended that the Tributary Committees discontinue rental of their post office box, as essentially all correspondence and project applications are sent to the Committees electronically. The rental of the box is an unnecessary expense, and the Chelan PUD box could be used in lieu of one specifically paid for by the Tributary Committees. The group agreed to terminate rental of the box and to rely on Chelan PUD box number (P.O. Box 1231) instead; Becky will place this address on the 2007 project applications.

6. Chelan Conservation District request for funds rollover

Keith notified the group that the cost for the Entiat PUD canal project came in under budget by about $17,000. The project sponsor, Chelan Conservation District, asked for authorization to use these extra funds to secure a local contractor to haul trees to future project sites for storage. The Committees agreed on the benefit of doing this proactive work, but were concerned that the accounting for this transaction would be difficult to manage. They were also concerned that this allowance may set a difficult precedent, whereby project sponsors may overestimate project costs. The Committees decided to close this project, but will support a request by the Conservation District to secure materials if available, based on the budget provided to them. When the time is appropriate to collect materials, the district should notify the committee chair, who will then get verbal approval from the Committees for the district to proceed.

7. Collection of large woody debris

On a related issue, Keith said the work to salvage the trees and boles from the January storm went well. They collected and transported about 100 tree stumps (with about twenty full trees); the total cost for the work will be about $3,500. The Committees should receive an invoice soon.

8. Status of *Elbow Coulee Floodplain Restoration Project*

Bob Bugert notified the Committees that the Methow Salmon Recovery Foundation (MSRF) will receive funding from Bonneville Power Administration (BPA) for the *Elbow Coulee Floodplain*

Restoration Project, on the lower Twisp River. At their November 2006 meeting, the Tributary Committees agreed to fund this project if the funding from BPA was not available. This obviates the need for financial support by the Committees.

9. Update on Lead Entity Coordination meeting

Bob Bugert said that the Upper Columbia Lead Entities held a project workshop on 26 February to evaluate the procedures used in the 2006 SRFB funding cycle, and to prepare for the 2007 cycle. The meeting was not well attended by project sponsors, but was productive nonetheless. He said the RTT requested that the Lead Entities require project sponsors to submit pre-proposals, with the intent of improving communication and overall project quality. They also requested that tours be earlier in the season, and to lengthen the technical review time to two weeks. The Lead Entities, project sponsors, and RTT agreed on the benefits of having the SRFB Review Panel attend the technical reviews, citizen reviews, and tours.

10. Rescheduling the White River tour

The Committees agreed on the importance of viewing the proposed easements and purchases on the White River, and identified 7 May as the preferred date for the tour. Bob Bugert will contact the CDLT to arrange a tour on this date.

11. Proposals by Methow Conservancy

David Morgan described the work of the Methow Conservancy to negotiate the acquisition of 16 acres in the Upper Twisp River, adjacent to the national forest. The property is predominantly floodplain and contains four beaver ponds. Significant cleanup of trash on the property will be required. The Committees agreed that this request is more appropriately handled by the Priest Rapids Habitat Committee. David volunteered to gather background information on the proposal.

The Committees discussed the proposal by the Methow Conservancy to identify and purchase privately owned riparian parcels in order to insure that the Methow River can permanently migrate within its natural channel, unobstructed by dikes, hardened banks, or other man-made channel-limiting structures. The proposal identifies the process to contact owners of parcels that may be of interest, conduct the necessary appraisals and legal reviews, and then to have funds available to acquire easements for these parcels. The Conservancy requested $109,750 for staffing capacity to conduct this work over a two-year period, plus $900,000 for eventual acquisition, and $16,000 per year for ongoing administration and monitoring of these parcels. The Committees declined the request for acquisition and the ongoing costs, but agreed to fund—in concept—the request for the two-year staffing to identify the parcels. This commitment to fund is contingent upon the clarification of several issues, identified below:

- The identification of target parcels should include an assessment of the property's development potential, in addition to the condition of the riparian habitat.
- The appraisals and legal reviews should be done in a manner that meets the funding criteria of BPA and SRFB.
- The Conservancy should clarify the language on the sale of easements to adjacent landowners.
- Funds from the sale of easements by the Conservancy should be applied to this program in a "revolving fund" format, to extend the duration of the program.
- The Conservancy will provide regularly-scheduled check-ins (probably quarterly reports), and seek Committees' review on key elements of the program.
- The Conservancy should consider expanding this work to the Chewuch and Twisp rivers, using the recently-acquired LIDAR information in their floodplain analyses.

The Committees directed the chair to advise the Methow Conservancy of this decision and the above conditions, and to ask the Conservancy to provide a more detailed proposal on this work, with a request no larger than $120,000 for the two-year program.

Tom Kahler discussed the work on the Lehman property, where the Washington Rivers Conservancy is working to place 4.1 cfs into trust for instream flow benefits; the water would be conveyed to a side channel on an adjoining property downstream from the Lehman property. There may be potential (through participation by other property owners) to increase this amount to 8 cfs, all of which would be diverted from May through October from the Barklay ditch. This has potential for providing off-channel rearing, but may cause stranding. The BOR, MSRF, and the Methow Conservancy may seek support from the Tributary Committees to design and implement this project. Tom suggested that Greg Knott and/or Chris Johnson come to the Tributary Committees to explain the entire project, and other pending channel complexity projects in the Methow.

12. DECISION ITEM: Tributary Committees' Funding Policies

The Committees reviewed, modified, and approved the changes to the funding policies for the 2007 project cycle. There are two notable changes this year: 1) an increase in the maximum funding amount for the Small Projects Program to $50,000, and 2) a requirement that all project sponsors submit a pre-proposal for the General Salmon Habitat Program. Tom Kahler volunteered to make some editorial changes to improve the readability of the document. The Committees directed the chair to distribute the policies document to project sponsors by Friday, 16 March.

13. DECISION ITEM: Tributary Committees' Application Packages

The Committees reviewed and adopted the changes that Becky and Julie proposed for the application forms for the Small Project Program, the General Salmon Habitat Program, and the pre-proposals for the General Salmon Habitat Program. Becky will distribute these products for final review; if she receives no additional comments, she will make them available on the web site for project sponsors on 16 March.

14. DECISION ITEM: Tributary Committees' funding timeline

The Committees reviewed and adopted the 2007 funding timeline and authorized the chair to distribute this to project sponsors.

15. Next steps

The next meeting of the Tributary Committees will be Thursday, 12 April at the Chelan PUD Service Building, from 9:00 to 2:00. Tentative agenda items include:

- Status of 2005 projects;
- Discussion of the Lehman Project and other channel complexity issues; and
- Discussion of the *Methow Severe Channel Migration Zone Protection Project*

Meeting notes by Bob Bugert (BobBugert@nwi.net)

FINAL DRAFT (7 May 2007)HCP-Trib 07-04

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 12 April 2007

Members Present:	Bob Rose (Yakama Nation), Chris Parsons (WDFW), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD), Bob Bugert (Committee Chair)
Members Absent:	David Morgan (USFWS), Dale Bambrick (NMFS),[1]
Others Present:	Julie Pyper (HCP Project Coordinator), Becky Gallaher (HCP Project Coordinator), Chris Johnson (MSRF), Bob Hassmiller (BOR), Greg Knott (BOR), Lisa Pelly (Washington Rivers Conservancy), Jenny Molesworth (USFS)

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1. Review and adopt agenda

The Committees adopted the proposed agenda with two additions requested by Bob Bugert: pending small project proposals (agenda item 10), and an update on SRFB Lead Entity coordination (item 11).

2. Review and adopt meeting notes

The Committees adopted the March 2007 meeting notes, with revisions suggested by Tom Kahler and Keith Truscott.

3. Discussions with Chelan-Douglas Land Trust

Bob Bugert formally notified the Committees that he accepted the full-time position with the Chelan-Douglas Land Trust (CDLT). He said that the CDLT would give him an extended period to phase out of his responsibilities with the Committees, probably until the end of the funding cycle (November or December 2007). The group discussed some options for appointment of a new chairperson, and the means to make the transition smooth. One notable issue is the authorization of payment requests by the CDLT for the *White River Project.* If this occurs, the Committees will ask Mike Schiewe (the alternate signatory for the Plan Species Accounts) to act on behalf of the payment authorizations.

4. Use of the *GoToMeeting* web site

Bob Rose discussed the advantages of using a website (www.gotomeeting.com) to assist in teleconferencing for the meetings. The group agreed on this need (particularly during winter, since many Committee members have to travel a long distance to attend these meetings) and felt that perhaps the increased use of the Mid-Columbia HCP ftp site and web site may be used in lieu of this commercially available site to share files during teleconferencing.

5. Discussion of the Lehman Project and other channel complexity issues

The Committees welcomed Greg Knott, Bob Hassmiller, Jenny Molesworth, Chris Johnson, and Lisa Pelly to discuss the work on the Lehman property, where the Washington Rivers Conservancy is working to place 4.1 cfs into trust for instream flow benefits; the water may be

[1] Dale Bambrick and David Morgan notified the chair in advance of their inability to attend, and provided their votes on the decision items prior to the meeting.

conveyed to a side channel on an adjoining property downstream from the Lehman property. There may be potential (through participation by other property owners) to increase this amount to 8 cfs, all of which would be diverted from May through October from the Barkley ditch. This has potential for providing off-channel rearing, but may cause stranding. The BOR, MSRF, and the Methow Conservancy may seek support from the Tributary Committees for the design and implementation this project.

This project has many considerations to be addressed prior to submission of a funding request. The Methow Restoration Council (an *ad hoc* group that coordinates among various agencies and entities on project development) is working with the BOR Interdisciplinary Team (IDT) to look at alternatives for the Lehman project. This multiple-party project is now in the conceptual stage, and if implemented, could involve conservation and agricultural easements, side channel development, riparian re-establishment, and perhaps instream flows. In particular, there are questions about best use for the water: should it be used for in-channel flows, versus instream flows, versus re-establishment of riparian vegetation? The IDT will develop draft plans by summer 2008, with construction likely to occur in 2009.

After the presenters left the meeting, Bob Bugert reminded the group of the Methow Conservancy's request to the Committees for the match to the Salmon Recovery Funding Board (SRFB) funding for the Lehman Property. The SRFB granted the Methow Conservancy a modification of their contract to allocate their entire award ($425,000) to the Lehman Conservation Easement, and forego the funding for the Coon and Freidrich properties. The Conservancy requires 15% match (about $64,000) for the Lehman riparian easement as part of their SRFB contract. The Committees deferred a decision on this issue until all members have had an opportunity to consider the information presented at today's meeting.

On another matter, Chris Johnson of the Methow Salmon Recovery Foundation (MSRF) described a situation where channel migration on the Methow River upstream of Wolf Creek is causing erosion and eminent loss of two homes that were built prior to the County's identification of the channel migration zone. He said that MSRF is brokering an arrangement with the homeowners to move their homes out of the floodplain and place conservation easements on their lands. The homeowners would use the value of the easements to finance the removal of the homes.

The Committees were somewhat ambivalent of this request. They did not want to create a precedent in which homeowners perceive the Tributary Fund as a mechanism to obtain compensation for poor decisions on placement of structures. However the Committees recognized that, if no action were taken, the likely scenario would be an emergency action to armor the bank, causing degradation of riverine habitat in that important reach. After some deliberation, the Committees agreed that MSRF should apply for funding to broker this arrangement, but gave no assurances that they will approve the request. The application should describe the actions to restore the habitat from the building footprint, septic system, and road development, in addition to the conservation easement. This application should also describe the potential effects to the Heath Property from this action, or lack thereof.

6. HCP Project Coordinator monthly report

Becky Gallaher reviewed the status of the contracts with the following 2005 and 2007 sponsors with projects that were active over the past month:

- It appears that the water rights issue will be resolved for the *Clees Well and Pump Project* so the pump may be installed and the project will be completed in the near future

- The *Lower Beaver Livestock Exclusion Project* is beginning. Julie and Becky will do a site visit and will provide a report at the May meeting.

- The design drawing for the *Entiat Instream Structure and Engineering, Milne Project* is on the ftp site. Bob will notify the project sponsor that the Committees have no comments on the design drawing. The County needs six large trees for the project, which are not available. The Tributary Committees have retained several rootwads from the January storm, but none is large enough to accommodate this need. The Committees had a couple suggested locations for obtaining trees: Becky will contact the project sponsor to discuss options.

The following committees approved these respective payment requests:

- The Rocky Reach Tributary Committee approved the payment request for the *Entiat Instream Structure & Engineering Project*, submitted by Chelan County Conservation District for a total amount of $5,249.44. This payment request is for the compilation of permit materials for the Hanan Detwiler, Knapp-Wham, and Milne project sites, as well as some riparian planting pre-work and design.

- The Rocky Reach Tributary Committee approved the payment request by LeMaster & Daniels for a total amount of $480.00 for their work on compilation of the Rocky Reach Annual Report to FERC.

- The Rock Island Tributary Committee approved the payment request by LeMaster & Daniels for a total amount of $480.00 for their work on compilation of the Rock Island Annual Report to FERC.

7. Protective Covenants for White River Properties

Bob Bugert reported on his discussions with the Chelan-Douglas Land Trust regarding language in the proposed protective covenants for properties on the White River, which the Rock Island Tributary Committee funded in 2005. Within that document, there is language regarding the Grant PUD easement for a water line that is included in the covenant. The seller of the property (Two Rivers, Inc.) previously granted the easement to Grant PUD, who—at that time—was exploring the option of placing the acclimation pond in the gravel borrow pits. To do this, they would need to convey White River water across the parcel being sold. The Committees agreed that given the low likelihood of Grant PUD pursuing this option and the low "impact" to the conservation easement of having a waterline traversing it, that this easement should be retained.

8. Discussion of the *Methow Severe Channel Migration Zone Protection Project*

Bugert said the detailed proposal on the Channel Migration Zone Protection program by the Methow Conservancy is not available at this time. This will likely be available for the May or June meetings.

9. Tour of the White River

The Committees discussed the importance of viewing the proposed easements and purchases on the White River, and identified 7 May as the preferred date for the tour. Bob Bugert will contact the CDLT to arrange a tour on this date. The purpose of this meeting is to view the proposed acquisitions of the Wagner, Teagle, and Daly-Wilson properties, but there is a likelihood that the CDLT may also request funds for an easement (or fee simple purchase) of the Schmitten Property on the White River. The Committees may view this property if feasible. The Committees also

decided to conduct their May meeting in conjunction with this tour, and forego their regularly scheduled meeting on 10 May.

10. Small Project Proposals

Bob Bugert notified the group that Chelan County Natural Resources Department would likely submit two small project proposals; one to evaluate the effectiveness of the *Nason Creek Oxbow Reconnection Project*, and the other will evaluate the effectiveness of the *Gagnon Backchannel Project*, funded by the SRFB. The Upper Columbia Regional Technical Team (RTT) is currently evaluating these projects, which may be available by the May meeting.

Greg Knott notified the group that there are two pending small project proposals for the Methow: modification of the Red Shirt irrigation diversion on Beaver Creek and a passage project on the Heath Ranch. These may also be available in May.

11. Update on Lead Entity Coordination meeting

Bob Bugert said that the Upper Columbia Lead Entities will hold another project workshop on 24 April (10:00 to 3:00 at Chelan Fire Station) to coordinate the 2007 SRFB and Tributary Fund cycles. He noted a couple recent developments in this process:

- Casey Baldwin (WDFW) was appointed as the chairperson of the RTT, and will be the point of contact for reviews of the project applications.
- The RTT has revised both the biological strategy and the project review criteria to match the Viable Salmonid Population criteria in the salmon recovery plan. Bob recommended that the Committees invite Casey to an upcoming meeting to describe the review criteria—perhaps in June. He will provide the Committees with the criteria in advance.
- The RTT asked that pre-proposals for SRFB projects be required this year, similar to the Tributary Committees' stipulation; the Trib Fund pre-proposal forms will be used for SRFB projects.

12. Next steps

The next meeting of the Tributary Committees will be Monday, 7 May after the tour of the White River. The meeting will be in Leavenworth, likely from 2:00 to 4:00. Tentative agenda items include:

- Status of 2005 projects;
- Discussion of the *Methow Severe Channel Migration Zone Protection Project;*
- Update on the *Beaver Creek Livestock Exclusion Project;*
- Review of small project proposals; and
- Search for new Committee Chairperson.

Meeting notes by Bob Bugert (BobBugert@nwi.net)

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 7 May 2007

Members Present:	Chris Parsons (WDFW), Chris Fisher (Colville Tribes), Dale Bambrick (NOAA-Fisheries), David Morgan (USFWS), Tom Kahler (Douglas PUD—on phone), Keith Truscott (Chelan PUD), Bob Bugert (Committee Chair)
Members Absent:	Bob Rose (Yakama Nation)[1]
Others Present:	Becky Gallaher (HCP Project Coordinator)

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1. Review and adopt agenda

The Committees adopted the proposed agenda without the items considering the payment requests and the small project proposals. Bob Bugert said the sponsors did not submit the pending proposals and payment requests for the May meeting, but will likely submit them in June.

2. Review and adopt meeting notes

The Committees adopted the April 2007 meeting notes, with revisions suggested by Tom Kahler.

3. Debrief from tour of White River properties

On the morning of 7 May, the Tributary Committees visited the following properties considered for protection by the Chelan-Douglas Land Trust (CDLT) using the 2005 funding from the Rock Island Tributary Committee:

- The Dally-Wilson property (12 acres) is proposed for a conservation easement and includes riverfront, with a probable price range of $110,000.
- The Wagner property (36 acres) is proposed as a fee simple purchase. It contains no riverfront, but is entirely in the floodplain and is bordered by property owned by USFS, WDFW, and CDLT.
- The Tiegle property (9 acres) is proposed as a fee simple purchase (110,000 to $150,000 depending on appraisal) and is next to Quintana-Leon on the Lake Wenatchee Highway.
- The Quintana-Leon phase II property (38 acres) is proposed as a fee simple purchase (250,000 to $300,000 depending on appraisal).
- The Schmitten property (116-123 acres) is being considered as a future protection site, but will not be a part of the current contract with CDLT.
- The Cummings property (about three acres on the Napeequa River) is being considered as a future protection site, but will not be a part of the current contract with CDLT.

The CDLT received $686,000 and has completed the transactions for the Kincaid, Twin Rivers, and Quintana-Leon, phase I properties. Given the cost for the three near-term purchases (Dally-Wilson; Tiegle; and Quintana-Leon, phase II) the overall expense could be up to $560,000, which is very likely over the remaining balance from the 2005 contract, so not all properties can be

[1] Bob Rose notified the chair in advance of his inability to attend, and provided his input on the discussion items prior to the meeting.

protected. The Committees agreed on the importance of each parcel, with the exception of Cummings, and directed the chair to notify the CDLT to proceed with any of the properties considered until the 2005 contract funds are spent. Becky said she would review the account to determine the remaining balance and notify the Committees.

The Committee members expressed concern about the possible transfer of title of these parcels to USFS from the CDLT, as the long-term management of these parcels may change under various federal administrations. The members decided not to take action on this issue at this time, but agreed that they may stipulate conditions on a transfer if this appears imminent.

4. Update on *Beaver Creek Livestock Exclusion Project*

Becky reported that she and Julie Pyper visited the Stokes Ranch on Beaver Creek and were satisfied that the proposed fence will meet the objectives of the project. She also said that the landowner would rather install a fence that meets NRCS standards instead of WDFW standards, which are stipulated in the project sponsor agreement. Both standards specify the same height and allow for wild ungulate passage, but the former is three-strand instead of four. She recommended that the Committees modify the agreement accordingly and to proceed with the project. The Committees concurred with these recommendations and authorized the project to proceed.

5. Review scope of work and selection procedures for Tributary Committees' Chair

The Tributary Committees reviewed the current scope of work for the chairperson and made minor updates. They then discussed the process to recommend their choice of the primary and alternate candidates to the HCP Coordinating and Policy Committees. The group reviewed the qualifications of about ten candidates for the position. After a review of the candidates' qualifications, facilitation skills, and fit to the scope of work, the Committees identified their primary choice, but could not identify an alternate choice. The Committees directed the chair to contact the primary candidate to review the scope of work, describe the responsibilities in detail, and ascertain his/her interest in the position.

Some members of the Committees requested time to conduct internal reviews of the primary candidate (as well as the selection process). They will report to the other Committee members if there are additional considerations that should be addressed prior to making the recommendation. The Tributary Committees also directed the chairperson to contact Mike Schiewe (Coordinating and Policy Committees' chairperson) to apprise him of the selection process.

6. Status of current projects

Becky notified the Committees of several issues related to two projects approved in 2005:

- Chelan County Conservation District requested that the remaining funds from the *Entiat Instream Structures and Permitting Project* be allocated to scoping work for the proposed *Stillwaters Restoration Project.* Noting the need to keep the accounts for projects distinct, the Committees denied this request and directed the chair to notify the project sponsor.

- Becky also notified the Committees that the Okanagan Nations Alliance requested a site visit of their project *Okanagan River Restoration, Phase III* during the June tours of the Tributary Committees and the Regional Technical Team. Noting the difficulty in traveling the distance and crossing the international border, the group decided this would not be logistically feasible during that tour. Some members will make an effort to visit the site in the near term.

7. Next steps

The next meeting of the Tributary Committees will be Thursday 14 June (9:00 to 4:00) at the Chelan PUD Auditorium in Wenatchee. Tentative agenda items include:

- Status of 2005 projects;
- Discussion of the *Methow Severe Channel Migration Zone Protection Project;*
- Review of pre-proposals for General Salmon Habitat Fund;
- Review of small project proposals; and
- Status of selection of new Committee Chairperson.

Meeting notes by Bob Bugert (BobBugert@nwi.net)

Wells, Rocky Reach, and Rock Island HCP
Tributary Committees
Meeting Notes, 14 June 2007

Members Present:	Chris Parsons (WDFW), Chris Fisher (Colville Tribes), Dale Bambrick (NOAA-Fisheries), David Morgan (USFWS), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD—on phone), Bob Bugert (Committee Chair)
Members Absent:	Bob Rose (Yakama Nation)[1]
Others Present:	Becky Gallaher (HCP Project Coordinator), Julie Pyper (Chelan PUD), Tracy Hillman (BioAnalysts, Inc), except for agenda item 5.

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1. Review and adopt agenda

The Committees adopted the proposed agenda, with the addition of one item: Becky notified the group that she received two small-project proposals on the day of the meeting (discussed in agenda item 7).

2. Review and adopt meeting notes

The Committees adopted the May 2007 meeting notes, with revisions suggested by Tom Kahler.

3. Payment authorizations

The Wells Tributary Committee approved the payment of $11,494.15 USD to the Okanagan Nations Alliance for completion of the *Okanagan River Restoration Initiative, Phase III*. The sponsor completed this project under budget. Becky posted their final report on the Tributary Committees' ftp site.

The Rock Island Tributary Committee approved the payment of $16, 710.98 to Chelan County Natural Resources Department for completion of the design drawings for the *Nason Creek Oxbow Reconnection Project.* This payment was for work conducted from March 2006 through April 2007. They had a contractor "walk through" of the project in early June, and bids are due 18 June. Becky will distribute the design drawings when she receives them.

The Rock Island Tributary Committee approved the payment of $52.50 to LeMaster and Daniels for administrative support in April and May.

The Rocky Reach Tributary Committee approved the payment of $52.50 to LeMaster and Daniels for administrative support in April and May.

The Rock Island Tributary Committee approved the payment of $870.75 to Chelan County PUD for salvaging downed trees in January 2007.

The Rocky Reach Tributary Committee approved the payment of $870.75 to Chelan County PUD for salvaging downed trees in January 2007.

[1] The decisions made by the Committee members in this meeting are contingent on the concurrence of Bob Rose. The Committees' chair will contact Bob to solicit his input on the items discussed at the meeting.

4. Monthly update on ongoing projects

Becky gave an update on the funded projects. Most are progressing well—or had no salient activity in the past month. One notable exception is the small project related to the *Reiman (aka Gagnon) Irrigation Diversion*. The landowner is not ready to move the diversion this year and may consider moving it next year following the completion of the SRFB-funded *Gagnon Backchannel* project, which is nearby. This small project has not made any progress since it was approved in September 2005; the Committees discussed the notion of terminating this project and having the sponsor resubmit the proposal when the landowner is ready. The conditions of this project may have changed enough to warrant a new application.

5. Status of appointment of Committee Chairperson

The Tributary Committees recommended the appointment of Dr. Tracy Hillman as their chairperson. Depending on approval by the "Signatories," Tracy and outgoing chair Bob Bugert will work together in the near term to ensure a smooth transition. If approved, Tracy will secure professional liability insurance, and will begin the process of receiving the delegation of signatory authority for the Committees.

6: Review of Pre-Proposals

Prior to review of the pre-proposals, Becky gave an update on the amount of funds available from each plan species account for the 2007 funding cycle:

- Wells Plan Species Account has $1,468,161.00 available
- Rock Island Plan Species Account has $1,347,374 available
- Rocky Reach Plan Species Account has $841,315 available.

The committees reviewed each project and selected those that they believe warranted a full proposal in August. Projects that the Committees dismissed were either inconsistent with the intent of the Tributary Fund or did not have strong technical merit. The Committees directed the chairperson to notify sponsors with appropriate projects to submit a full proposal, with a discussion of the questions identified for each pre-proposal below:

Harrison Side Channel

The committees discussed whether all the structures in the mainstem Entiat are necessary. The sponsor should provide more information on the types and placement of structures. The application should discuss why the entire floodplain is not accessed in this project. Only one map showing the preferred alternative is needed; maps of the other alternatives are not necessary. A map that shows the land ownership would help. Consider using a walking excavator for access, although the bucket size of that excavator may be too small to remove the levees. There may be issues related to stranding in the side channel; please address this.

Stormy Creek Passage Program

The sponsor removed this project proposal for consideration, so it was not reviewed.

Nason Creek Complexity Projects-Phase 1 Design

This project should not be submitted as a full proposal. The Bureau of Reclamation and Grant PUD are engaged in work on Nason Creek; information on this work should be made available first. More detail is needed on this proposal to understand the complete scope of the project objectives, but the Committees feel that it would be very difficult for the sponsor to provide the necessary detail by August for the Committees to warrant full consideration. Last, the Committees prefer to allocate funds toward implementation, rather than plan development; this could become a costly venture.

Nason Creek Oxbow Reconnection Project Monitoring
This project should not be submitted as a full proposal. The focus of these funds is to mitigate for losses, and therefore should be directed toward project implementation. Also, it is premature to evaluate the effectiveness of one project as an indicator of this type of restoration action. Each settlement agreement has $200,000 available for effectiveness monitoring; the Committees agreed that it may be appropriate to consider using these funds at a later date on this type of project.

Peshastin Irrigation District Pipeline
The sponsor should provide more information on the instream flow benefits and the assurance that this would be placed in trust. There needs to be an assurance that additional water from the Icicle Creek would not be used to supplement the Peshastin Irrigation District, if the latter is reducing withdrawal. More detail in budget is necessary, including the contribution of the Peshastin Irrigation District. Describe how this project will proceed at lesser level if not fully funded, particularly with assumed funding by the Conservation Commission. The project timeline needs to be adjusted to accurately reflect known grant funding timing.

Gagnon Off-channel Habitat Monitoring
This project should not be submitted as a full proposal. The focus of the Tributary Fund is to mitigate for losses, and therefore should be directed toward project implementation. Also, it is premature to evaluate the effectiveness of one project as an indicator of this type of restoration action. Each settlement agreement has $200,000 available for effectiveness monitoring; the Committees agreed that it may be appropriate to consider using these funds at a later date on this type of project.

Entiat PUD Canal Conversion Project
The sponsor should provide more information on the instream flow benefits and the assurance that the saved water would be placed in trust.

Knapp-Wham Irrigation System and Habitat Improvements
The sponsor should provide more information on the instream flow benefits and the assurance that the saved water would be placed in trust.

Roaring Flow Enhancement/Barrier Removal Project
The sponsor should provide more information on the instream flow benefits and the assurance that the saved water would be placed in trust. Please specify whether this project includes removal of the diversion structures.

Stillwater Engineering Alternatives Analysis
This project should not be submitted as a full proposal. This project should focus on protection and development of stream and riparian habitat within the bounds of natural rates of channel migration to occur (which may require the development of a fairly large riparian zone), rather than exploring alternatives for stabilizing the bank or arresting lateral migration with the objective of protecting personal property.

Keystone Canyon Habitat Restoration Project
Please provide more information on the durability and effectiveness of these structures. Some Committee members are skeptical of using wood as the scour-forming structure, but feel the rootwads should be incorporated as cover in the scour pool.

Wildhorse Spring Creek Steelhead Habitat Acquisition
The Committees would like a more developed plan for the use of the house, and the description of the staff time required for this transaction. Please provide an analysis of the cost for the land versus the cost of the house. The Committees do not want to have long-term ownership of the house.

Reestablish Steelhead in Loup Loup Creek
The Committees are not willing to support a long-term lease. The applicant should provide an estimate of the amount of water to be saved for Loup Loup Creek from this action. Please provide more detail on the one-time cost payment.

Remove impediment on Loup Loup Creek
Please provide information on the type of culvert to be used and the budget.

Fire Restoration Strategies for the Methow Subbasin
This project should not be submitted as a full proposal. The Committees feel this project is not directly tied to the objectives of the Tributary Fund.

Fish Passage Provisions at McIntyre Dam
Please provide information, if any, on downstream migrant survival at McIntyre Dam.

Okanagan River Restoration Initiative—Construction (Phase IV)
What are the implications of leaving the extra spoil material within the channel migration zone? Is this design consistent with the geomorphic process of the reference reach?

Confluence Habitat Restoration and Bank Stabilization
This project should not be submitted as a full proposal. The Committees feel this project is focused on bank stabilization and the protection of personal property and does not benefit salmon.

Methow Ecological and Salmonid Restoration Program
This project should not be submitted as a full proposal. The Committees agree on the need for more information on salmonid productivity in nutrient-poor watersheds, but this is not consistent with Tributary Fund objectives. The Committees recommend this application should be refined and submitted to another funding source.

7. Small project proposals

Becky notified the Tributary Committees that she received two small project proposals in June, described below:

- The Chelan County Conservation District submitted the application *LWD/Rootwad Acquisition and Transport* with a requested amount of $24,600. The Committees contacted the sponsors to ascertain the species, complexity, and size of the trees and the means to transport and store the trees. After garnering this information, the Committees approved the small project proposal. They authorized Chelan PUD to identify which Plan Species Account was the appropriate source of funds.

- The Methow Salmon Recovery Foundation submitted the application *Heath Floodplain Restoration* for the amount of $48,695. The sponsors will present the project to the group at the Priest Rapids Habitat Subcommittee meeting on 22 June.

8. Next steps

The Tributary Committees cancelled their 12 July meeting and tentatively rescheduled their August meeting to 23 August (9:00 to 3:00) at the Chelan PUD Auditorium in Wenatchee. Tentative agenda items include:

- Status of 2005 projects;
- Review of the full proposals for General Salmon Habitat Fund; and
- Review of small project proposals.

Meeting notes by Bob Bugert (BobBugert@nwi.net)

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 13 August 2007

Members Present: Chris Parsons (WDFW), Chris Fisher (Colville Tribes), Dale Bambrick (NOAA-Fisheries), David Morgan (USFWS), Tom Kahler (Douglas PUD), Keith Truscott (Chelan PUD), Bob Rose (Yakama Nation), Bob Bugert (past Committee Chair), and Tracy Hillman (current Committee Chair)

Others Present: Becky Gallaher (HCP Project Coordinator) and for agenda items 10 and 11: Greg Knott (BOR), Jeff McClaughlin (BOR), Jennifer Molesworth (BOR), John Crandall (Wild Fish Conservancy), and Nick Gayesky (Wild Fish Conservancy)

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Monday, 13 August 2007 from 9:00 am to 3:30 pm.

I. Review and Adopt Agenda

Bob Bugert and Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following changes:

- Discussion on the *Knapp-Wham Irrigation System and Habitat Improvement* proposal was dropped from the agenda because the sponsor withdrew the proposal.
- Discussion on a proposal submitted by Chelan County titled *Lower Wenatchee River Complexity Site 12/13—Alternative Analysis, Design, and Permitting* was added to the agenda.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the June 2007 meeting notes with revisions suggested by Tom Kahler, Tracy Hillman, and Mike Schiewe. In addition, Becky Gallaher and Keith Truscott updated the amount of funds available from each Plan Species Account. The following changes were made to the June Meeting Minutes:

- Rock Island Plan Species Account changed from $764,952 to $1,371,836.65 available as of 31 August 2007.
- Rocky Reach Plan Species Account changed from $1,444,844 to $835,887.41 available as of 31 August 2007.

III. Misc. Business

Keith Truscott informed the Committees that Mr. Chuck Peven will serve as the representative for Chelan PUD on the Rock Island and Rocky Reach Tributary Committees. Keith will serve as the alternate.

IV. Small Projects Program Discussion

Tracy Hillman described the discussions that he and Becky Gallaher had with sponsors regarding the meaning of the maximum contract allowance under the Small Projects Program. Some sponsors do not understand clearly the intent of the maximum allowance under the Small Projects Program. The Committees asked Tracy to add language (in a footnote) to the Policies and Procedures for Funding Projects document that describes the intent of the maximum allowance under the Small Projects Program. Tracy will send the revised document to the Committee members for review before the September meeting.

V. Payment Authorizations

The Wells Tributary Committee authorized the following payments:

- $1,242.53 to Chelan County PUD for project coordination and support provided to the Wells Tributary Committee during the period January through July 2007.

The Rock Island Tributary Committee authorized the following payments:

- $43.00 to LeMaster and Daniels for administrative support in June.
- $1,242.02 to Chelan County PUD for project coordination and support provided to the Rock Island Tributary Committee during the period January through July 2007.

The Rocky Reach Tributary Committee authorized the following payments:

- $1,017.76 to Chelan County PUD for project coordination and support provided to the Rocky Reach Tributary Committee during the period January through July 2007.
- $43.00 to LeMaster and Daniels for administrative support in June.
- $2,913.23 to Cascadia Conservation District for the compilation of permit materials for the Hanan-Detwiler, Knapp-Wham, and Milne project sites.
- $1,482.42 to Chelan County Natural Resources Department for work associated with the Entiat Instream Structure project.

The Committees requested that Tracy Hillman and Becky Gallaher check with LeMaster and Daniels about the possibility of billing administration fees quarterly.

VI. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well—or had no salient activity in the past month. The Committees had some concern that Mr. John Clees had not yet purchased a water pump. The Committees requested that Becky contact the project sponsor (Okanogan Conservation District) to expedite the purchase of the pump.

VII. Status of Appointment of Committee Chairperson

Keith Truscott reported that the "Signatories" had unanimously approved the appointment of Tracy Hillman as Chairperson for the Tributary Committees. Contracts between BioAnalysts and Douglas and Chelan PUDs were signed with an effective date of 1 August 2007. BioAnalysts also secured the required amount of professional liability insurance. All is well in the world.

VIII. Delegation of Authority

Becky Gallaher circulated for Committee member signatures the Delegation of Authorities for BioAnalysts, Inc. Most members from each of the Committees signed the Delegation of Authority forms. The Yakama Nation did not sign the documents and therefore did not delegate their authority to the Chairperson. These signed documents provide a delegation of some of the authorities of each Committee to the Chairperson for the transaction of Committee business.

IX. Review of General Salmon Habitat Program Proposals

The Committees reviewed each proposal submitted for funding under the General Salmon Habitat Program. Committee members evaluated each proposal and assigned them to one of three preliminary tiers: Tier 1—fund, Tier 2—fund with questions, and Tier 3—do not fund. It is important to note that these are "preliminary ratings" and ratings may change after further discussion and evaluation. What follows are current funding recommendations (which may change after further discussions) and pertinent questions and comments raised by members during the evaluation process.

Harrison Side Channel

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees would like to know where exactly the rock barb is to be located. They are also interested in the condition and stability of the bank where the barb is to be located.

The Committees would like to visit this site on 13 September and will invite the sponsor to present their project to the Committees on 26 September.

Peshastin Irrigation District Pipeline

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees had questions about the number of members in the District, the extent of flow monitoring at the upstream and downstream end of the pipeline, and the likelihood that the water savings (1.2 cfs) could be put into trust for perpetuity (not 25 years as noted in the proposal).

The Committees will invite the sponsor to present their project to the Committees on 26 September.

Lower Wenatchee River Complex Site 12/13

The Committees classified this project as a Tier 3 Project (do not fund).

The Committees would like to see LiDAR work before funding off-channel habitat assessments. The Committees prefer to use money in the General Salmon Habitat Program to fund on-the-ground restoration actions rather than fund monitoring and assessment projects.

The Committees discussed the possibility of retaining a fluvial-geomorphologist to consult with the Committees on issues related to the interaction of stream-dynamics/sediment transport processes and restoration actions.

Entiat PUD Canal Conversion Project

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees questioned why the PUD does not intend to fund the entire project, whether water produced from the proposed wells would affect stream flows in the Entiat River, and if reduced flows within the canal will provide suitable spawning and rearing habitat for Chinook salmon and steelhead.

The Committees will invite the sponsor to present their project to the Committees on 26 September.

Roaring Flow Enhancement/Barrier Removal Project

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees questioned if production from the proposed wells will affect stream flows and water quality (temperature) within the Entiat River.

The Committees would like to visit Roaring Creek on 13 September and will invite the sponsor to present their project to the Committees on 26 September.

Keystone Canyon Habitat Restoration Project

The Committees classified this project as a Tier 1 Project (fundable with no questions).

Wildhorse Spring Creek Steelhead Habitat Acquisition

The Committees classified this project as a Tier 1 Project (fundable with no questions).

Reestablish Steelhead in Loup Loup Creek

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees would like more information on the water diversion rate, whether or not there are junior water rights, and what will happen to the water that is left in the stream (e.g., will it be diverted by another water user).

The Committees will invite the sponsor to present their project to the Committees on 26 September.

Remove Impediment on Loup Loup Creek

The Committees classified this project as a Tier 1 Project (fundable with no questions).

The Committees noted that funding for this project is contingent on securing and protecting the water that may be acquired under the proposal titled *Reestablish Steelhead in Loup Loup Creek.*

Fish Passage Provisions at McIntyre Dam

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees need additional information on the structure and function of the backwater riffle, and would like the sponsor to identify the preferred alternative (installation of two overshot gates or decommissioning). The Committees would also like more information on the source of the $1,001,000 identified in the proposal as “proposed from other applications.”

The Committees will invite the sponsor to present their project to the Committees on 26 September.

Okanagan River Restoration Initiative—Construction (Phase IV)

The Committees classified this project as a Tier 2 Project (fundable with questions).

The Committees would like the sponsor to address the implications of leaving the extra spoil material within the channel migration zone. The Committees also voiced concern over the high cost of contingencies and administration (>$200,000).

The Committees will invite the sponsor to present their project to the Committees on 26 September.

X. Review of Small Projects Program Proposals

The Committees heard presentations from the Bureau of Reclamation (BOR on behalf of the Methow Salmon Recovery Foundation) and the Wild Fish Conservancy (WFC). The BOR described the Heath Floodplain Restoration Project, which proposes to provide access to spring-fed ponds and streams and improve channel conditions at road crossings. The request from the Tributary Committees for this project was $48,695 with no other contributions or matches. The WFC described the Methow Monitoring Coordination Project, which proposes to coordinate monitoring activities within the Methow Basin. The request from the Tributary Committees for this project was $49,560. After the presentations, the Committees evaluated the proposals and reached the following conclusions.

Heath Floodplain Restoration

The Committees supported this project. The Wells Plan Species Account will cover the total cost of the project ($48,695).

Methow Monitoring Coordination

The Committees did not support this project. Although the Committees acknowledge the importance of this work and see a need for coordination among agencies and entities conducting monitoring work in the Methow Basin, they rejected the project for the following reasons:

(1) The Committees believe that this work can be completed without the use of Plan Species funds. The Monitoring Subcommittee of the Regional Technical Team annually hosts meetings to assist agencies and entities in organizing and coordinating monitoring activities throughout the Upper Columbia Basin. The Committees believe that this forum should be used to establish more coordination among agencies and entities in the Methow Basin. In addition, the Data Steward may be able to assist with coordination.

(2) Funds requested under the Small Projects Program and General Salmon Habitat Program are typically not used to fund monitoring and assessment projects. The Committees intend to use these programs to support on-the-ground restoration projects and activities.

(3) The total cost (including contributions and matches) exceeded the maximum allowed under the Small Projects Program. The total cost of the project, including other contributions and matches, was $92,560, which exceeded the maximum allowance of $50,000 under the Small Projects Program.

The Committees directed the chairperson to notify the sponsors of the Committees decision to fund the Heath Floodplain Restoration Project, but not the Methow Monitoring Coordination Project.

XI. SRFB Funding

Chris Parsons reported that the total amount of money requested from the Salmon Recovery Funding Board will result in a surplus of about $650,000 in the Upper Columbia region (i.e., of the $2,750,000 available, only 2,100,000 has been requested). The Committees directed the chairperson to contact Julie Morgan, Director of the Upper Columbia Salmon Recovery Board, and discuss the possibility of sponsors reallocating funding requests so that funds requested from the Tributary Committees do not exceed 15% of the total amount of money requested.

XII. Next Steps

The Tributary Committees will meet in September for supplemental tours and project presentations.

Supplemental Tours

The Committees will attend supplemental tours on 13 September. Members will meet at Chelan PUD at 9:00 am and tour the following projects:

- Harrison Side Channel (Entiat Basin)
- Roaring Flow Enhancement/Barrier Removal Project (Entiat Basin)

Project Presentations

The Tributary Committees will invite sponsors to present their projects to the Committees on 26 September. The Committees would like to hear from sponsors of the following projects:

- Harrison Side Channel (Chelan County Natural Resources Department)
- Peshastin Irrigation District Pipeline (Chelan County Natural Resources Department)
- Entiat PUD Canal Conversion Project (Cascadia Conservation District)
- Roaring Flow Enhancement/Barrier Removal Project (Cascadia Conservation District)
- Reestablish Steelhead in Loup Loup Creek (Colville Confederated Tribes)
- Fish Passage Provisions at McIntyre Dam (Okanagan Nation Alliance Fisheries Department)
- Okanagan River Restoration Initiative—Construction (Phase IV) (Canadian Okanagan Basin Technical Working Group)

Meeting notes respectively submitted by Tracy Hillman (tracy.hillman@bioanalysts.net) and Bob Bugert (bob@cdlandtrust.org).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 13 September 2007

Members Present: Dale Bambrick (NOAA-Fisheries), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Chris Parsons (WDFW), Chuck Peven (Chelan PUD), Bob Rose (Yakama Nation), and Tracy Hillman (Committee Chair).

Others Present: Becky Gallaher (HCP Project Coordinator) and for agenda item VII: Joy Juelson (Chelan County NRD), John Soden (Jones & Stokes), Phil Archibald (USFS), and Rich Malinowski (Cascadia Conservation District).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Safety and Risk Conference Room in Wenatchee, Washington, on Thursday, 13 September 2007 from 10:00 am to 11:15 am. The Committees then attended site visits from 11:15 am to 3:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the August 2007 meeting notes with revisions suggested by Tom Kahler, Tracy Hillman, David Morgan, and Becky Gallaher.

The Committees discussed the necessity of reporting preliminary rankings of proposals in the meeting notes. It was decided that the preliminary rankings should be included in the notes, but posting of the final draft notes on the web site should be postponed until December, after the Committees have made their final decisions regarding funding of proposals. The Committees directed Tracy to add language to the draft notes reflecting the "preliminary" nature of the rankings.

III. Review of Revisions to the Policies and Procedures Document

The Committees unanimously accepted the footnote added to Section 3.6 (The Small Projects Program) of the Policies and Procedures for Funding Projects document. The footnote clarifies the meaning of the $50,000 cap on small projects.

IV. Payment Authorizations

The Wells Tributary Committee authorized the following payment:

- $2,304.00 to Douglas County PUD for administrative work for fiscal year ending 31 August 2007.

The Rock Island Tributary Committee authorized the following payment:

- $58.00 to LeMaster and Daniels for administrative support in July and August.

The Rocky Reach Tributary Committee authorized the following payment:

- $58.00 to LeMaster and Daniels for administrative support in July and August.

V. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well—or had no salient activity in the past month. Becky reported that John Clees will purchase a water pump within a few weeks. Becky also informed the Committees that the sponsor of the Peshastin Irrigation District Pipeline project (Chelan County NRD) has withdrawn their proposal from consideration by the Tributary Committees. The sponsor is seeking funding only from the Salmon Recovery Funding Board (SRFB). Finally, Becky reported that the Cascadia Conservation District (CCD) updated the amount of funding they are requesting from different funding entities. The following table reflects the amount of money requested from different entities for each CCD proposed projects.

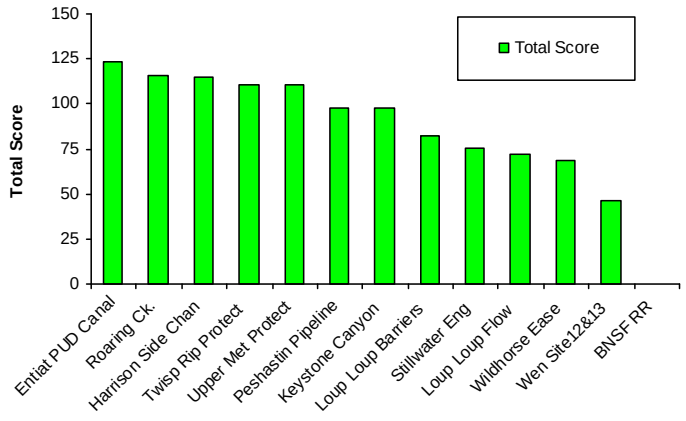
CCD Proposed Project	Funding entity			Total
	SRFB	Trib Funds	Other	
Entiat Irrigation System Ownership Transfer	$283,824	$99,360	$113,400	$496,584
Roaring Creek Flow Enhancement and Barrier Removal	$122,069	$25,000	$0	$147,069
Stillwater Engineering Alternatives Analysis	$155,280	$0	$52,750	$208,030
Keystone Canyon Habitat Restoration	$164,705	$29,100	$0	$193,805
Total Request	***$725,878***	***$153,460***	***$166,150***	***$1,045,488***

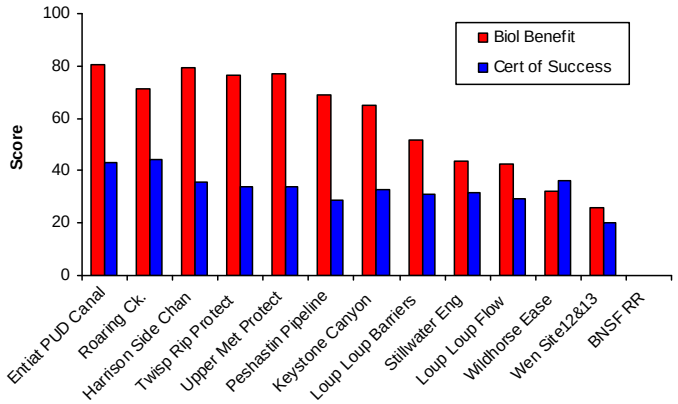
VI. Regional Technical Team Project Reviews

Tracy Hillman briefed the Committees on the outcome of the Upper Columbia Regional Technical Team (RTT) review of proposed projects. The table and figures on the following page summarize RTT scores.

The Committees discussed the need for the RTT to review the technical merits of the two Canadian projects: *Fish Passage Provisions at McIntyre Dam* and *Okanagan River Restoration Initiative—Construction (Phase IV)*. The Committees decided that RTT review of these two projects is not necessary.

PROJECT	TITLE	Biological Benefit Subtotal (100 pts total)	Certainty of Success Subtotal (50 pts total)	Total Score (150 pts total)
Chelan 5	Entiat PUD Canal	**80.3**	**43.3**	**123.5**
Chelan 6	Roaring Ck Flow & Barriers	**71.0**	**44.5**	**115.5**
Chelan 1	Harrison Side Channel	**79.5**	**35.5**	**115.1**
Okanogan 4	Twisp Riparian Protection	**76.7**	**33.8**	**110.5**
Okanogan 5	Upper Methow Protection	**76.8**	**33.7**	**110.4**
Chelan 2	Peshastin Pipeline	**69.1**	**28.9**	**98.0**
Chelan 7	Keystone Canyon Structures	**64.7**	**32.7**	**97.4**
Okanogan 3	Loup Loup Ck Barriers	**51.9**	**30.8**	**82.7**
Chelan 8	Stillwater Engineering	**43.4**	**31.8**	**75.2**
Okanogan 2	Loup Loup Ck Flow	**42.8**	**29.1**	**71.9**
Okanogan 1	Wildhorse Spring Easement	**32.4**	**36.0**	**68.4**
Chelan 4	Lower Wen Site12&13	**26.0**	**20.0**	**46.0**
Chelan 3	Burlington N. RR	**NS**	**NS**	**NS**





VII. Site Visits

The Committees visited the following three sites:

Lower Wenatchee River Complex Site 12/13

The Committees visited Site 13 (proposed off-channel, high-flow, refugia habitat) on the Lower Wenatchee River. At this site the sponsor (Chelan County NRD) intends to breach a dike that will create about 1.7 acres of off-channel refugia during high flows. Although Site 12 was not visited by the Committees (Site 12 is located just downstream of Site 13), work at Site 12 should create about 835 feet of high-flow channel habitat. The sponsor proposes to add large woody debris at both sites to enhance habitat complexity. The total cost of the proposed project will be about $400,000. This includes the cost of design, permitting, and implementation (the sponsor indicated that they will send the final proposal to the Committees). Note that the total cost in the original proposal ($141,691) only included estimates for alternatives analysis, design, and permitting.

Harrison Side Channel

The Committees visited the Harrison Side Channel project on the Entiat River. Chelan County NRD is the sponsor of this project. This project is designed to reconnect about 1,375 feet of relict channel to the mainstem Entiat River. The intent is to create perennial flow in the side channel by removing a portion of the levee. A barb may be placed on the opposite side of the river to direct flow into the side channel. It is possible, however, that the upstream end of the channel will become disconnected at mainstem flows less than 100 cfs. The downstream end of the channel will remain connected to the river at all flows. The sponsor estimates that the project could provide habitat for 5,348 fish.

Roaring Flow Enhancement/Barrier Removal Project

The Committees visited both diversions on Roaring Creek, a tributary to the Entiat River. Cascadia Conservation District is the sponsor of this project. The purpose of this project is to increase instream flows and connectivity in the lower 6,950 feet of Roaring Creek by removing two irrigation diversions and their associated structures. Irrigators will convert to groundwater wells, which should increase surface flows in Roaring Creek by more than 0.5 cfs (current baseflow is about 1 cfs). According to the sponsor, the pumping of groundwater should have no effect on surface flows in Roaring Creek or the Entiat River. Numerous juvenile steelhead of different size classes currently use the creek and diversion channels. The USFS reported that steelhead place 1-5 redds per year within the survey reach on Roaring Creek.

VIII. Next Steps

The Tributary Committees will meet on 26 September to hear presentations on the following projects (tentative):

- Harrison Side Channel (Chelan County Natural Resources Department)
- Lower Wenatchee River Complexity Site 12/13 (Chelan County Natural Resources Department)
- Entiat PUD Canal Conversion Project (Cascadia Conservation District)
- Roaring Flow Enhancement/Barrier Removal Project (Cascadia Conservation District)
- Reestablish Steelhead in Loup Loup Creek (Colville Confederated Tribes)

- Fish Passage Provisions at McIntyre Dam (Okanagan Nation Alliance Fisheries Department)
- Okanagan River Restoration Initiative—Construction (Phase IV) (Okanagan Nation Alliance/Canadian Okanagan Basin Technical Working Group)

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 26 September 2007

Members Present:	Dale Bambrick (NOAA-Fisheries), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Chris Parsons (WDFW), Chuck Peven (Chelan PUD), and Tracy Hillman (Committee Chair).
Members Absent:	Bob Rose (Yakama Nation).
Others Present:	Becky Gallaher (HCP Project Coordinator) and for agenda item IV: Joy Juelson and Mike Kaputa (Chelan County NRD), John Soden and Martin Fisher (Jones & Stokes), Keith Truscott and Waikele Hampton (Chelan PUD), Mike Rickel (Cascadia Conservation District), Ryan Benson (Okanagan Nation Alliance Fisheries Department), and Chris Bull (Glenfir Resources).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Wednesday, 26 September 2007 from 9:30 am to 3:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the addition of two items:

- Mike Kaputa, Chelan County NRD, asked for time during the morning to inform the Committees of the County's desire to hold a workshop on the costs of restoration work.
- Discussion on the Budget Amendment Request from the Methow Conservancy for the Methow Riparian Protection Phase III: MacDonald Property.

II. Payment Authorizations

The Rock Island Tributary Committee authorized the following payment:

- $11,211.93 to Chelan County NRD for the Alder Creek Culvert Replacement project.
- $2,076.02 to Chelan County NRD for the Nason Creek Off-Channel Habitat project.

The Rocky Reach Tributary Committee authorized the following payment:

- $1,780.08 to Chelan County NRD for the Entiat Instream Structures project.

III. Misc. Business

The following items were discussed during the meeting.

Project-Cost Workshop

Mike Kaputa with the Chelan County NRD discussed with the Committees the desire of the County to hold a one-day workshop in early December on the cost of restoration work. The purpose of the workshop is to provide contractors, funding entities, scientific review teams, sponsors, and others with information on the cost of implementing various types of stream restoration projects. The Committees acknowledged the importance of the workshop, but stressed that it should be interactive (i.e., allow open dialog among groups). The Committees also requested that the workshop occur on the date of their December meeting (13 December).

Budget Amendment Request

Becky Gallaher briefed the Committees on a recent request by the Methow Conservancy to amend the budget of the Methow Riparian Protection Phase III: MacDonald Property. The cost of the easement increased from $345,400 (original estimate) to $630,500, largely because of the increase in property value over time. The Conservancy estimated the original easement value over two years ago. The Committees will invite the Methow Conservancy to the October meeting to discuss the budget amendment and cost-benefits of protection programs.

IV. Project Presentations

The Committees listened to presentations on the following projects.

Entiat PUD Canal Conversion Project

Mike Rickel with the Cascadia Conservation District gave a presentation on the Entiat PUD Canal Conversion Project. The intent of this project is to decommission an inefficient irrigation pipeline and delivery system and convert existing water users to wells. This should create a water savings of 2.7-3.3 cfs. In addition, the irrigation canal will remain watered year-round (albeit at a reduced flow) to provide off-channel habitat for fish. The total cost of the project is $496,584. The sponsor is requesting $99,360 from HCP Tributary Funds.

According to Mike, the conversion of water users to wells should have no negative effect on surface flows in the Entiat River. He also noted that the flow of water into the canal and the geometry of the channel should preclude extensive anchor ice formation; however, surface ice and ice damming could be a potential problem. The sponsor intends to monitor flows and icing conditions in the canal during the winter. Finally, Mike indicated that the flow savings (2.7-3.3 cfs) will be put into a trust.

Lower Wenatchee River Complexity Site 12/13

John Soden with Jones and Stokes gave a presentation on the Lower Wenatchee River Complexity Site 12/13 project. The purpose of this project is to create flow-through, off-channel habitat during high flows at two locations on the lower Wenatchee River. At Site 12, the intent is to enhance habitat within an existing 835-foot-long high-flow channel. At Site 13, the intent is to breach a dike that will create about 1.7 acres of off-channel refugia during high flows. The sponsor proposes to add large woody debris at both sites to enhance habitat complexity. The total cost of the project is $408,231. The sponsor is requesting $25,000 from HCP Tributary Funds.

John indicated that both sites will be “flow-through” and therefore the possibility of fish stranding should be minimal. However, the Committees noted that any depressions in Site 13 that are below bar height will likely strand fish. John also indicated that the design of the project should

eliminate long-term maintenance. The Committees questioned the need for several tasks outlined in the proposed budget (e.g., dewatering a dry site, planting riparian vegetation, monitoring, and extensive erosion control). In addition, the Committees were concerned about the high cost of several tasks (e.g., mobilization, erosion and sediment control, dewatering, woody debris, temporary access road, plantings, topographic surveys, baseline hydrogeomorphic data collection/analysis, and design report). The Committees asked Tracy Hillman to send a letter to Chelan County NRD requesting a more detailed budget that itemizes each activity with proposed equipment to be used, estimated man- and machine-hours, and justification for the hours and proposed rates. The Committees would also like to see justification for each item listed in the proposed budget and a separate breakdown of costs for each site.

Reestablish Steelhead in Loup Loup Creek

Chris Fisher with the Colville Tribes gave an update on a project to Reestablish Steelhead in Loup Loup Creek, a tributary to the Okanogan River. The purpose of the project is to transfer the water withdrawal for the Helensdale Group from Loup Loup Creek to the Okanogan River. This transfer would provide continuous flow in Loup Loup Creek from the current point of diversion (RM 1) to the confluence with the Okanogan River. Chris reported that he is working with the WDOE, but the agency has not responded formally to the requests made by the Committees. Recall that the Committees would like more information on the water diversion rate, whether or not there are junior water rights, and what will happen to the water that is left in the stream (e.g., will it be diverted by another water user). Chris will continue to work with (pester) the agency and report back to the Committees with his findings in October or November. The total cost of this project is $32,093. The sponsor is requesting $24,893 from HCP Tributary Funds.

Fish Passage Provisions at McIntyre Dam

Ryan Benson with the Okanagan Nation Alliance Fisheries Department gave a presentation on Fish Passage Provisions at McIntyre Dam. The purpose of the project is to provide upstream fish passage and improve downstream passage at McIntyre Dam. The preferred alternative is to replace the five existing undershot gates with overshot gates (the original proposal included only two overshot gates), backwater the new gates with a constructed riffle, and screen the intake to the Town of Oliver irrigation canal (screen costs to be covered by the Town of Oliver). The sponsor dismissed alternatives such as removal or decommissioning the dam because of high costs relative to benefits and resultant difficulties in maintaining the lake surface elevation within the necessary operating range. The proposed project would benefit sockeye salmon, steelhead, and Chinook salmon. The total cost of this project is $2,716,880 (the original cost was $1,716,880). The sponsor is requesting $491,000 from HCP Tributary Funds.

Ryan indicated that the jump height that fish would experience at the overshot gates would range from 1.5 to 2.5 feet depending on flows. This height should not limit upstream passage of fish. Ryan also reported that the backwater riffle may require some maintenance over time. He noted that the existing budget does not include costs for riffle maintenance. The purpose of the riffle is to backwater the apron of the dam to provide a plunge pool of sufficient depth to allow fish to leap over the gates. Finally, Ryan indicated that the cost of the project increased $1,000,000 over the original estimate because of engineering and construction costs, the recommendation to install five overshot gates, and the cost of screen. The original estimate only included two overshot gates.

Okanagan River Restoration Initiative—Construction (Phase IV)

Chris Bull, representing the Canadian Okanagan Basin Technical Working Group, gave a presentation on the Okanagan River Restoration Initiative—Construction (Phase IV) project. The purpose of this project is to return part of the channelized river back to a natural meandering path.

To accomplish this, the sponsor intends to set back existing dykes, restore river meanders, restore riparian vegetation, and create pool-riffle sequences. This should provide spawning and rearing habitat for Chinook salmon and steelhead, and spawning habitat for sockeye salmon. The project is designed to be self-sustaining and ecosystem based. The total cost of this project is $1,022,000. The sponsor is requesting $411,000 from HCP Tributary Funds.

Chris explained why they are proposing to split the construction into two phases. In the first phase, the channel would be modified only on the downstream half of the property where construction would re-connect the channel with two historic meanders. The intention is to "prove" the concept to project stakeholders before completing the more controversial second phase where the channel would be routed through the historic floodplain rather than through old meanders.

In response to a question from the Committees, Chris indicated that it is unlikely that the extra spoil material left within the channel migration zone would move, primarily because of regulated flows and the relatively low gradient of the channel. He also noted that existing islands within the river have moved very little over the past several years. Although this phase of the project focuses on the southern portion of the property, Chris reported that there is a high probability that restoration work on the northern portion will occur in the future. This will connect the restored channel with relatively good habitat upstream from the project site. Finally, Chris indicated that they should have all necessary permits for this project by late December 2007.

V. Next Steps

The Tributary Committees will meet on Friday, 12 October to discuss two budget amendment requests, review a Small Project Application, and conduct a question-answer session with the Methow Conservancy.

Meeting notes submitted by Tracy Hillman, Ph.D. (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 12 October 2007

Members Present: Dale Bambrick (NOAA-Fisheries), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Chris Parsons (WDFW), Chuck Peven (Chelan PUD), Bob Rose (Yakama Nation), and Tracy Hillman (Committee Chair).

Others Present: Becky Gallaher (HCP Project Coordinator) and for agenda item VIII: Jason Paulsen and John Sunderland (Methow Conservancy) and Ben Lenz (Grant PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Safety and Risk Conference Room in Wenatchee, Washington, on Friday, 12 October 2007 from 1:00 pm to 4:00 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the addition of one item:

- Discussion on information to present to the HCP Policy Committees, which will meet on 23 October from 1:00 pm to 4:00 pm at the Radisson Gateway Hotel in SeaTac, WA.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 and 26 September 2007 meeting notes with revisions suggested by Tom Kahler and Tracy Hillman.

III. Payment Authorizations

The Wells Tributary Committee authorized the following payment:

- $592.92 to Chelan County PUD for third-quarter administrative work.

The Rock Island Tributary Committee authorized the following payment:

- $732.37 to Chelan County PUD for third-quarter administrative work.

The Rocky Reach Tributary Committee authorized the following payments:

- $732.35 to Chelan County PUD for third-quarter administrative work.
- $29,646.74 to Chelan County NRD for Entiat Instream Structures.

IV. Budget Amendment Requests

The Committees received two budget amendment requests from the Chelan County Natural Resource Department.

Entiat Instream Habitat Improvements

Chelan County NRD requested a modification to the budget for the Entiat Instream Habitat Improvements project. They asked to move $25,000 from the Salaries and Benefits task to the Excavation/Heavy Equipment task. The amendment requested no additional funds, only a reshuffling of funds between the two tasks. ***The Rocky Reach Tributary Committee approved the budget amendment request.***

Alder Creek Culvert Replacement

Chelan County NRD requested a modification to the budget for the Alder Creek Culvert Replacement project. They asked to move $19,664.19 from the Indirect/Overhead/Administration task to the Excavation/Heavy Equipment task. The amendment requested no additional funds, only a reshuffling of funds between the two tasks. ***The Rock Island Tributary Committee approved the budget amendment request.***

V. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well—or had no salient activity in the past month.

VI. Review of Small Projects Program Proposal

The Committees reviewed a small project application submitted by Cascadia Conservation District titled "WRIA's 45/46 Riparian Restoration Project." The purpose of the project was to continue landowner and community outreach and coordinate the implementation of riparian restoration projects. The total cost of the project was $50,000; the request from the Tributary Committees was $25,000.

After considerable discussion, ***the Committees elected not to support this project***. Although the Committees favor continued education, landowner outreach, coordination, and the involvement of local high schools, the Committees found that the application was (1) inconsistent with the general intent of the Small Projects Program; (2) lacked specifics regarding where the restoration work would occur and what threats to instream and riparian habitat currently exist in areas to be treated; and (3) lacked sufficient information on the suitability of the proposed actions for the sites to be selected, such as riparian buffer widths, the types of plants that would be used in restoration projects, and what measures would be in place at those sites to reduce or eliminate continued threats to in-stream and riparian habitats. The Committees were uneasy about covering non-project, administrative (capacity) costs to develop unspecified and unevaluated actions that may provide only temporary benefits (i.e., short-term, band-aid projects that do not address primary threats). However, in recognition of the importance of continued education, landowner outreach, and coordination, the Committees will invite the sponsor to an upcoming meeting to discuss in detail the types of projects that these funds would support. The sponsor may then submit another application to the Tributary Committees.

VII. Information for the HCP Policy Committees

Tracy Hillman informed the Committees that the HCP Policy Committees will meet on 23 October from 1:00 pm to 4:00 pm at the Radisson Gateway Hotel in SeaTac, WA. The Policy Committees would like the Tributary Committees to provide an update on Plan Species Accounts, Changes to Policies and Procedures, General Salmon Habitat Program, Small Projects Program, and Regional Coordination. The Committees suggested that Tracy provide the following information:

- Number of projects funded under each Plan Species Account (including projects funded under the General Salmon Habitat Program and the Small Projects Program).
- Number of funded projects of different habitat-action types or "classes" (e.g., number of fish screening projects, number of fish passage projects, number of instream flow projects, number of instream structure projects, number of riparian habitat projects, etc.). The classification of projects will follow the approach of the Pacific Northwest Aquatic Monitoring Partnership.
- Recent updates to the Policies and Procedures for Funding Projects document. Specifically, report that the maximum contract allowed under the Small Projects Program increased from $25,000 to $50,000.
- Coordination with the Upper Columbia Salmon Recovery Board, the Salmon Recovery Funding Board, the Upper Columbia Regional Technical Team, the Priest Rapids Coordinating Committee, and the Okanagan Nation Alliance.

VIII. Methow Conservancy Presentation/Discussion

John Sunderland and Jason Paulsen with the Methow Conservancy discussed with the Committees the goals and objectives of the Conservancy and addressed questions about the budget amendment request for the Methow Riparian Protection Phase III: MacDonald Property. Recall that in September the Committees received a budget amendment request from the Methow Conservancy on the MacDonald Property asking for $630,500 (a $285,100 increase from the original estimate of $345,400). What follows is a summary of information gleaned from the discussion.

- Preservation is a primary goal of the Conservancy. While working with local biologists, the Conservancy developed a method for prioritizing areas to be protected. The method, which considers factors such as size, habitat quality, landowner willingness, connectivity, risk, and others, helps the Conservancy generate a prioritized list of easements. These scores are also based on estimated losses in biological benefit if the property is developed.
- The Conservancy is establishing relationships with landowners and the County. These relationships build trust among the parties and are vital to the conservation of the resources. Relationships established with landowners have led to conservation easements and restoration projects within the easements. The Conservancy is currently working with the County in an effort to revise the Shoreline Master Program.
- The Conservancy believes that in the long-term, protection is more important than restoration. The Committees noted, however, that protection does not increase abundance and productivity of listed stocks. Recovery must include restoration. A balance between protection and restoration is needed to recover listed stocks. The Conservancy noted that protection and restoration must occur together. They reported

that they have successfully implemented restoration actions in areas with conservation easements. The easement is important in protecting restoration actions. They also noted that money spent on easements has effects beyond the easement.

- The Conservancy reported that riverfront property is in high demand in the Methow Basin. This demand has caused the mean and median value of riverfront property in the Methow Basin to increase more than 40% per year. As a result, the costs of easements in the Methow Basin have increased. They stated that there is a waiting list of potential buyers for riverfront property in the Methow Basin. The Conservancy sees the increasing demand for riverfront property as a threat to conservation and recovery of listed stocks.
- The Committees indicated that the Conservancy should be taking a more reach-scale approach to protection and restoration. The Conservancy stated that protecting reaches was a goal (e.g., they have protected about 4/5th of the shoreline along the Big Valley reach of the Upper Methow); however, in many cases they must purchase easements on smaller available parcels in order to achieve reach-scale protection.
- The Conservancy indicated that they monitor easements to make sure the landowner is compliant with the agreement.
- Because of the high value of riverfront property, the Committees wondered if landowners, who have no intention of disturbing or developing the riparian area, approach the Conservancy to establish easements. The Conservancy's approach is to purchase easement that last forever. Thus, even if the land changes ownership, the easement remains with the property.
- The Conservancy noted that they try to purchase easements rather than purchase property.
- With regard to the MacDonald Property, uncertainty in who owned the island delayed the purchase of the easement.
- The Conservancy noted that if the Tributary Committees elect not to support the amendment request, the Conservancy would seek funding from other sources.

IX. Next Steps

The Tributary Committees will meet on 15 November to visit the Nason Creek Off-Channel project and review proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 15 November 2007

Members Present: Dale Bambrick (NOAA-Fisheries), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Chris Parsons (WDFW), Chuck Peven (Chelan PUD), Bob Rose (Yakama Nation), and Tracy Hillman (Committee Chair).

Others Present: Becky Gallaher (HCP Project Coordinator).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Leavenworth, Washington, on Thursday, 15 November 2007 from 10:45 am to 3:00 pm. Several members visited the Nason Creek Off-Channel Habitat Project between 9:30 and 10:45 am.

I. Visit Nason Creek Off-Channel Project

Prior to meeting at the Chelan PUD Auditorium in Leavenworth, several members of the Committees visited the Nason Creek Off-Channel Habitat Project. Chelan County NRD guided the field trip. Members were generally impressed with the off-channel reconnection project. The project should benefit ESA-listed fish species as well as other salmonids.

II. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following changes:

- Dropped item 7 (review of a Small Projects Application) because the sponsor did not submit the application for Committees review.
- Added a discussion on amending the General Salmon Habitat and Small Projects applications to include a Project Summary statement.
- Added a discussion on monitoring.

III. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 12 October 2007 meeting notes with revisions suggested by Tom Kahler and Tracy Hillman.

IV. Update on Policy Committees Meeting

Tracy Hillman provided an update on the HCP Policy Committees meeting that was held at the Radisson Gateway Hotel in SeaTac on 23 October. Tracy reported that the Policy Committees were please with the performance of the Tributary Committees.

V. Payment Authorizations

The Wells Tributary Committee authorized the following payment:

- $3,423.16 to Stokes and Stokes Ranch (Okanogan Conservation District is the sponsor) for the Lower Beaver Creek Livestock Exclusion project.

The Rock Island Tributary Committee authorized the following payment:

- $78,592.06 to Chelan County NRD for the Alder Creek Culvert Replacement project.

The Rocky Reach Tributary Committee authorized the following payments:

- $99.60 to Cascadia Conservation District for the Entiat Instream Structures Engineering and Permitting project.
- $8,705.21 to Cascadia Conservation District for LWD/Rootwad Acquisition and Transport project.

VI. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well—or had no salient activity in the past month.

- The Nason Creek Off-Channel project is complete.
- Milne project is complete; permitting for Knapp Wham is 80% complete.
- The pump for Clees well has been purchased but not installed.
- The Alder Creek Culvert Replacement project is complete.
- Fencing and off-site stock-water supplies have been purchased for the Lower Beaver Creek Livestock Exclusion project, but no fieldwork will occur until next spring.

VII. Budget Amendment Requests

The Committees reviewed a budget amendment request from the Methow Conservancy.

Methow Riparian Protection Phase III (MacDonald Property)

The Methow Conservancy requested a modification to the budget for the Methow Riparian Protection Phase III project (MacDonald Property). The Conservancy asked for an additional $285,100 for the project. The cost of the easement increased from $345,400 to $630,500, largely because of the increase in property value over time. This increase exceeded the 15% cost increase limit identified in Section 6.2 of The Tributary Fund Policies and Procedures for Funding Projects, September 2007. Section 6.2 does allow consideration of cost increases beyond 15% provided certain conditions are satisfied. After careful consideration, the Committees concluded that the proposed request was of such a magnitude that would constitute a new project that should be submitted through the annual application process for the General Salmon Habitat Program. ***Therefore, the Tributary Committees rejected the budget amendment request.*** The original funded amount ($345,400) for the easement remains dedicated and is not affected by this decision.

After reviewing the budget amendment, the Committees decided that it would be wise to have a couple members visit with the Methow Conservancy to discuss ways to identify areas with high biological benefits to aquatic resources. Dale Bambrick volunteered to lead this effort.

VIII. Addition of "Project Summary" to Applications

Tracy Hillman shared with the Committees a recent discussion that the RTT had about including a "Project Summary" on applications. The idea is to have project sponsors include a succinct summary of their proposed project. The Committees agreed to add "Project Summary" to the General Salmon Habitat Program and Small Projects Program applications. On the applications, "Project Summary" will fall between "Project Title" and "Project Budget." The summary should include the following elements:

- Name and location of project
- Identification of watershed category and major spawning area(s)
- Objectives and limiting factors addressed
- Quantity of action to be implemented (deliverables)
- Species and life stages affected
- Timeline for implementation and completion of project

The Committees directed Tracy to draft an example summary for a restoration project and a protection project.

IX. Review of 2007 General Salmon Habitat Program Proposals

The Committees reviewed seven General Salmon Habitat Program applications. Two applications, *Reestablish Steelhead in Loup Loup Creek* and *Remove Impediment on Loup Loup Creek*, were withdrawn by the project sponsors.

Harrison Side Channel

Chelan County NRD is the sponsor of the Harrison Side Channel project. The intent of the project is to create perennial flow in the side channel by removing a portion of the levee. A barb may be placed on the opposite side of the river to direct flow into the side channel. The sponsor estimated that the project could provide habitat for 5,348 fish. The total cost of the project is $797,300. The sponsor is requesting $90,105 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Lower Wenatchee River Complexity Site 12/13

Chelan County NRD is the sponsor of the Lower Wenatchee River Complexity Site 12/13 Project. The purpose of this project is to create flow-through, off-channel habitat during high flows at two locations on the lower Wenatchee River. At Site 12, the intent is to enhance habitat within an existing 835-foot-long high-flow channel. At Site 13, the intent is to breach a dike that will create about 1.7 acres of off-channel refugia during high flows. The sponsor proposes to add large woody debris at both sites to enhance habitat complexity. The total cost of the project is $341,635. The sponsor is requesting $51,245 from HCP Tributary Funds.

The Committees were concerned that this project could strand fish and therefore the expected benefits may not justify the cost of the project. In addition, the Committees questioned the need to spend large amounts of money on reconnection projects that provide only temporary (during high

flows) habitat for fish. They would rather see reconnection projects that provide perennial flows in side channels and off-channel ponds. The Committees also noted that natural conditions (natural high-flow events) may eventually reconnect Sites 12 and 13 with the main channel. Based on these concerns, ***the Tributary Committees elected not to fund this project.***

Entiat PUD Canal System Conservation Project

Cascadia Conservation District is the sponsor of the Entiat PUD Canal System Conservation Project. The intent of this project is to decommission an inefficient irrigation pipeline and delivery system and convert existing water users to wells. This should create a water savings of 2.7-3.3 cfs. In addition, the irrigation canal will remain watered year-round (albeit at a reduced flow) to provide off-channel habitat for fish. The total cost of the project is $496,584. The sponsor is requesting $99,360 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Roaring Creek Flow Enhancement and Barrier Removal Project

Cascadia Conservation District is the sponsor of the Roaring Creek Flow Enhancement and Barrier Removal Project. The purpose of this project is to increase instream flows and connectivity in the lower 6,950 feet of Roaring Creek by removing two irrigation diversions and their associated structures. Irrigators will convert to groundwater wells, which should increase surface flows in Roaring Creek by more than 0.5 cfs (current baseflow is about 1 cfs). The total cost of the project is $147,069. The sponsor is requesting $25,000 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Keystone Canyon Habitat Restoration Project

Cascadia Conservation District is the sponsor of the Keystone Canyon Habitat Restoration Project. The purpose of this project is to add instream structures to restore habitat complexity (e.g., juvenile edge refugia and resting pools for juveniles and adults) in the lower Entiat River (between RM 2.3 and 2.7), and promote localized recruitment and retention of spawning gravels for adult steelhead. The total cost of the project is $193,805. The sponsor is requesting $29,100 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Wildhorse Spring Creek Steelhead Habitat Acquisition

The Confederated Tribes of the Colville Indian Reservation is the sponsor of the Wildhorse Spring Creek Steelhead Habitat Acquisition Project. The sponsor intends to purchase a conservation easement on 5 acres of a 7.65-acre parcel that borders the lower 0.25 miles of Wildhorse Spring Creek. The easement will protect the lower portion of the spring-fed stream from development, livestock grazing, and other agricultural activities. Steelhead currently use the stream for spawning and rearing. The total cost of the project is $67,826. The sponsor is requesting $62,826 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Okanagan River Restoration Initiative—Construction (Phase IV)

The Canadian Okanagan Basin Technical Working Group is the sponsor of the Okanagan River Restoration Initiative—Construction (Phase IV) Project. The purpose of this project is to return part of the channelized river back to a natural meandering path. To accomplish this, the sponsor intends to set back existing dikes, reconnect two existing oxbows, restore river meanders, restore riparian vegetation, and create pool-riffle sequences. This should provide spawning and rearing habitat for Chinook salmon and steelhead, and spawning habitat for sockeye salmon. The project is designed to be self-sustaining and ecosystem based. The total cost of this project is $1,022,000. The sponsor is requesting $411,000 from HCP Tributary Funds. ***The Tributary Committees approved funding for this project.***

Tom Kahler and Chuck Peven will work together to determine which Plan Species Accounts should fund each approved project. They will present their recommendations to the Tributary Committees in December.

X. Monitoring Discussion

Dale Bambrick introduced the topic of monitoring. Dale indicated that the Committees will likely see more proposals seeking funding for monitoring. Therefore, it is important for the Committees to decide what type of monitoring they will potentially fund and how it will be funded. The Committees had the following discussions:

- Of the different kinds of monitoring (e.g., implementation/compliance, status/trend, effectiveness, etc.), the Committees agreed to focus on effectiveness monitoring.
- The Committees discussed the feasibility of different levels of effectiveness monitoring. At the highest level, the experimenter would control when, where, and what type of habitat actions are implemented within a stream or watershed. Under this ideal situation, the experimenter would measure changes in physical/environmental and biological indicators before and after the implementation of actions within treatment and control streams (a type of BACI design). At this level, restoration actions are built into the monitoring design (in contrast to monitoring built around the actions). This approach requires considerable control over activities that occur within control and treatment streams. Although this level of effectiveness monitoring is the most powerful and robust, it is also extremely difficult to maintain the integrity of the design for a long period of time (≥ 10 yrs).

  At the other extreme, the experimenter does not control when, where, or the types of actions that are implemented. At this level, the experimenter decides which actions should be monitored and then measures physical/environmental and biological indicators at the scale of the project (habitat or reach scale). Projects are usually selected in a non-random manner and monitoring results may not be generalized to other areas or similar projects. At this level of monitoring there is little control over the integrity of the monitoring design and therefore it carries less certainty in inference than more robust designs (higher levels of effectiveness monitoring). This design only allows inferences at the project scale, not at the population (basin) or subpopulation scale (watershed).

  Between these two extremes lies a continuum of levels of effectiveness monitoring. The Committees will continue to evaluate the level of effectiveness monitoring needed to address their monitoring questions.
- The Committees discussed the types of questions that they would like to answer with effectiveness monitoring. Monitoring questions are linked directly to the level of monitoring that is used to answer the questions. For example, if one is interested in determining the effects of a specific type of habitat action on VSP parameters, then one must use higher levels of effectiveness monitoring (ISEMP in the Entiat is an example). On the other hand, if one is interested in assessing local habitat and biological conditions at the project scale, then lower levels of monitoring could be used.

  No consensus was reached by the Committees on what questions should be answered. However, several members seemed to think that monitoring the effectiveness of certain types of habitat actions at the project scale is important. For example, recovery planners have stressed the importance of reconnecting off-channel habitat (a process-based approach) in the Upper Columbia. There is, however, little information on the effects of

these actions on listed species in the Upper Columbia basin. The addition of instream structures (sticks and stones) is another restoration technique with considerable uncertainty. Local watershed groups and recovery planners have recommended the use of instream structures in locations where natural watershed and stream/riparian processes cannot easily be reestablished (e.g., Peshastin Creek and the lower Entiat River). Some members are concerned that these short-term, band-aid treatments may not carry enough biological benefit to justify the cost of this type of work. Therefore, monitoring the effectiveness of a random subset of instream structures may provide information on the benefits of these treatments.

- The Committees discussed the spatial scale of effectiveness monitoring. Most members seemed to think effectiveness monitoring should be at the project or reach scale. Bob Rose, on the other hand, pointed out that there may be opportunities to do high-level effectiveness monitoring within high priority areas such as Nason Creek or within watersheds in the Methow basin. He also suggested that the Committees wait to see where the Action Agencies implement effectiveness monitoring projects under the FCRPS BiOp. The Bureau of Reclamation (BOR) is currently looking at the Methow basin as an area for funding effectiveness monitoring. The Tributary Committees may be able to cost-share with the BOR in developing a high-level, effectiveness-monitoring program in the Methow basin.
- As part of the HCP process, a separate Tributary Assessment Fund was established to evaluate the effectiveness of restoration projects. This Fund has $600,000 available for monitoring ($200,000 from each HCP project). The Committees discussed whether funding for monitoring should come from this account only, or if money from the Plan Species Accounts could also be used to fund monitoring. The Committees reached no consensus on this issue.

The Committees will revisit monitoring in January and address the following questions:

(1) What are the "key" questions or hypotheses that need to be addressed?

(2) What level of effectiveness monitoring is needed to address the questions and hypotheses?

   a. What study design is most appropriate (before-after, BACI, etc.)?

   b. How will treatments and controls be assigned to sampling units?

(3) What physical/environmental and biological parameters need to be measured?

(4) What response design should be used (i.e., number of sites and years to monitor)?

   a. What is the statistical population(s) to be sampled?

   b. What is the spatial scale of the population?

(5) How will the data be managed and used by the Committees?

(6) How will monitoring be funded?

XI. Next Steps

The Tributary Committees will meet on 13 December to conduct regular business in the morning. In the afternoon they will attend a workshop on the costs of restoration work.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

APPENDIX D

HABITAT CONSERVATION PLAN POLICY COMMITTEES MEETING MINUTES

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Final Memorandum

To: Wells, Rocky Reach, and Rock Island HCP Policy Committees

From: Michael Schiewe and Tracy Hillman, Facilitators

CC: Ali Wick, Shaun Seaman, Chuck Peven, Jerry Marco, Shane Bickford, Kris Petersen, Bryan Nordlund, Jeff Koenings, Carmen Andonaegui, Dennis Beich, Tom Kahler, Bob Rose

Date: January 7, 2008

Re: Final Revised Minutes of October 23, 2007 HCP Policy Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Policy Committees met at the Radisson Hotel Gateway in SeaTac, Washington on Tuesday, October 23, 2007, from 1:00 pm to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

I Introductions and Review of Agenda (Mike Schiewe)

Mike Schiewe opened the meeting and thanked everyone for attending. The Committees reviewed the agenda and there were no additions.

II Welcome to the Attendees (Policy Committees members)

Bill Tweit welcomed the attendees and commented that Washington Department of Fish and Wildlife (WDFW) would like to express its appreciation for the work that the various committees have been doing this year and the innovative approaches that are being taken to solve HCP issues. Keith Kirkendall expressed thanks from National Marine Fisheries Service (NMFS) in the successes that have been achieved thus far for the HCP. He also indicated that he was "down" 40% in staff and that the draft Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) would be out on October 31, 2007. Wayne Wright confirmed Chelan PUD's support for the HCP Committees and gave his thanks for those involved in the HCP programs who have contributed to its success thus far. Randy Lowe commented that implementation of the HCP remains a priority for Chelan PUD in the face of rising costs and the current regulatory environment. Joe Peone said that he has been pleased with what the HCP

has offered the Colville Tribes in terms of regional support at the policy level. Steve Parker said that the Yakama Nation has realized some important benefits of the HCP and supports the ongoing collaborative process. Bob Clubb commented that Douglas PUD has relied on the HCP to define their anadromous fish program over the last several years and has been very appreciative of the work provided by committees.

III Update and Third-Year Check-in on HCP Implementation (Mike Schiewe)

A. Progress Toward No Net Impact (NNI)

Mike Schiewe introduced the HCP brochure handed out today, which outlines the process and recent accomplishments of the HCP thus far. He also called everyone's attention to a handout which summarizes current phase designations for the HCP (Attachment B; *this handout was updated in December 2007 and is provided as revised*). Keith Truscott provided a handout summarizing spring spill and survival at Rock Island and Rocky Reach in the past several years.

B. Hatchery Programs/Issues

Mike Schiewe noted that the Hatchery Scientific Review Group is reviewing Columbia River basin hatchery programs, and it is expected to be working on North Central Washington hatcheries during the summer of 2008. The exact timing would be dependent on availability of federal funding.

Tracy Yount commented that Chelan PUD was actively coordinating its hatchery programs with Bonneville Power Administration (BPA) and actively seeking cost-share opportunities.

Mike Schiewe discussed the use of genetics information in broodstock management and noted that recent DNA-based techniques have increased the ability to identify fish as to population of origin at locations other than their natal streams.

Rick Klinge discussed recent Douglas PUD hatchery improvements. At Wells Hatchery, new surface water intake screens are currently being fabricated for installation this winter. Douglas PUD has developed a new well at Methow Hatchery to improve the water

supply. A new Twisp Weir has been designed and permitting is in progress; construction is expected this winter.

Shaun Seaman summarized accomplishments for Chelan PUD in the past year, as well as some of the issues that the PUD is tracking. These accomplishments include fulfilling Chelan PUD's production obligations; design of new facilities at the Chiwawa Pond Rearing Site and at Chelan Falls; and development of a comprehensive management and planning program linking production, staffing, and facility use. Challenges include availability of water and space for rearing fish.

Chuck Peven introduced the Hatchery Monitoring and Evaluation (M&E) Program, indicating that 2006 was the first year of implementation. He noted that the Hatchery Evaluation Technical Team (HETT), a subcommittee of the Hatchery Committees, has developed an Analytical Framework to evaluate M&E results, as well as worked to develop a suite of reference streams for comparisons of supplemented populations. Tom Kahler then discussed the HETT's strategy for selecting reference streams, which includes using spawner data to compare productivity in reference streams to existing supplemented streams. Tracy Yount suggested that there be some follow-up discussion by the Policy Committees about how results of monitoring will be used in evaluating the PUD's programs. Yount wished to convey that he would like to have a policy discussion about how the reference stream idea would be used by others from a process perspective. He also wanted to understand how the information gathered to guide Chelan PUD's programs will be used in other forums such as the Recovery Planning process. For example, he would like to know what the implications to objectives or actions described in the recovery plan would be if the M&E data guided the PUD in a particular direction.

C. Tributary Committees

Tracy Hillman introduced himself as the new chair of the Tributary Committees, replacing Bob Bugert who recently moved on to a new position. Hillman described the work of the Tributary Committees over the past several years; there have been seven projects funded under the Rocky Reach Plan Species Account, five under Rock Island, and six under Wells. As a whole, the funds requested of the Tributary Committees have been a little less than half the total project costs. This is because these projects were pursuing matching funding

elsewhere (for example, from the Salmon Recovery Funding Board [SRFB]). The Tributary Committees will be making decisions on this year's funding in the next few weeks. Hillman confirmed that the quality of applications has greatly improved since the inception of the program, and that one task for the Tributary Committees next year will be deciding how to use some monitoring funds that are available as part of the respective Tributary Conservation Plans for each HCP.

Bill Tweit asked the Tributary Committees members to comment on the rate at which the Committees were allocating funds relative to the total dollar amount in the Plan Species Accounts. Hillman and others responded that to date they had allocated about half the funding available, and that new funds would be deposited in all accounts over the next several years.

Hillman indicated that the Tributary Committees are coordinated with the SRFB, Upper Columbia Regional Technical Team, Priest Rapids Coordinating Committee, as well as the Okanagan Nation Alliance. The Policy Committees indicated their interest in keeping tabs on how much time coordination takes and making sure that it doesn't usurp the Committees' time and commitments.

IV Bacterial Kidney Disease Management (Mike Schiewe)

Mike Schiewe updated the group that the Hatchery Committees have been working to develop a bacterial kidney disease (BKD) Management Plan for HCP hatchery programs. Schiewe indicated that once agreements had been reached for the Methow and Chiwawa spring Chinook programs, Statements of Agreement (SOAs) would be drafted for Hatchery Committees' approval. Schiewe also noted that the Committees were developing an experimental plan for evaluating the overall survival (including adult return rates) of spring Chinook salmon with different BKD histories being reared at normal and reduced densities in HCP hatchery programs.

V Status of Coho Salmon as a Plan Species (Mike Schiewe)

Mike Schiewe introduced this topic and invited Steve Parker to give an update on the Yakama Nation's (YN) coho program. Parker indicated that Chelan PUD and the YN have recently

signed an agreement to provide funding to the coho program, and the YN will be meeting with Douglas PUD soon to discuss a similar agreement. He indicated that the YN was excited about the prospect of 2007 being a year in which more than 18,000 coho had already been counted passing Priest Rapids Dam.

VI Status of the Okanogan Spring Chinook Program (Mike Schiewe)

Mike Schiewe invited Joe Peone to give an update on the status of the Okanogan spring Chinook program and the planning for the Chief Joseph Hatchery by the Colville Tribes. Peone discussed that the Colville Tribes have now submitted their Step 2 package on the Chief Joseph Hatchery Program to the Northwest Power and Conservation Council (NPCC); a decision on this step is expected by spring 2008. A decision to go ahead with construction of the hatchery would (along with a favorable Biological Opinion from NMFS) effectively establish a long-term hatchery program. Cost-sharing partners that have expressed interest include Chelan, Douglas, and Grant PUDs. Schiewe indicated that the Hatchery Committees are working on approval of an agreement that would establish Okanogan spring Chinook as a Plan Species requiring mitigation contingent upon the acceptance of the Step 2 program.

VII Other Items (Mike Schiewe)

Mike Schiewe asked if there were other topics that attendees wanted to discuss.

A. Risk Management

Tracy Yount asked whether there has been an explicit consideration of events, actions or processes outside the HCP which could limit progress in implementing the HCPs and meeting the 2013 milestones. Examples cited included the availability of agency staff to deal with the growing workload, particularly in light of demands from other projects or activities; implementation of the Federal Columbia River Power System (FCRPS) Biological Opinion; results of ongoing monitoring and evaluation of hatchery programs; and new Washington Department of Ecology rules regarding the rearing of fish in net pens. Bill Tweit commented that there were many such risks and that the Policy Committees members might want to further discuss these issues and how they could affect HCP programs during a conference call.

VIII List of Attachments

Attachment A – List of Attendees

Attachment B – Summary of Phase Designation for HCP Projects

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Tracy Hillman	BioAnalysts
Tracy Yount *	Chelan PUD
Keith Truscott	Chelan PUD
Wayne Wright	Chelan PUD
Randy Lowe	Chelan PUD
Shaun Seaman	Chelan PUD
Chuck Peven	Chelan PUD
Jerry Marco	Colville Tribes
Joe Peone *	Colville Tribes
Bob Clubb *	Douglas PUD
Tom Kahler	Douglas PUD
Rick Klinge	Douglas PUD
Tom Dresser	Grant PUD
Keith Kirkendall *	NMFS
Bryan Nordlund	NMFS
Mark Miller *	USFWS
Jim Craig	USFWS
Bill Tweit *	WDFW
Carmen Andonaegui	WDFW
Dennis Beich	WDFW
Steve Parker *	Yakama Nation
Bob Rose	Yakama Nation

* Denotes Policy Committees member or alternate

ATTACHMENT B

SUMMARY OF PHASE DESIGNATION FOR HCP PROJECTS

Wells, Rocky Reach and Rock Island HCPs

(Updated December 2007)

Summary of phase designations for HCP projects

Plan Species	Wells Dam	Rocky Reach Dam	Rock Island Dam
Yearling (spring) Chinook salmon	Phase III – Standards Achieved (22-Feb-05)	Phase I (Testing)	Phase III – Standards Achieved with 20% spill (17-Dec-04). Survival testing using 10% spill began in 2007.
Subyearling (summer/fall) Chinook salmon	Phase III – Additional Juvenile Studies (22-Feb-05)	TBD	TBD
Steelhead	Phase III – Standards Achieved (22-Feb-05)	Phase III -- Standards Achieved) (24-Oct-06)	Phase III – Standards Achieved with 20% spill (24-Oct-06). Future survival testing with 10% spill TBD
Sockeye salmon	Phase III – Additional Juvenile Studies (22-Feb-05)	Phase II – Additional Tools	Phase III – Standards Achieved with 20% spill (24-Oct-06). Future survival testing with 10% spill TBD.
Coho salmon	Phase III – Additional Juvenile Studies (12-Dec-07)	Phase III – (Standards Achieved -- Interim Value) (June 20, 2007)	Phase III – (Standards Achieved -- Interim Value based on 20% spill) June 20, 2007)

Phase I = Three years of testing to determine plan species survival
Phase II = Dam survival < 95% or project survival <93% or combined juvenile and adult survival <91% (Additional tools to improve survival)
Phase III = Dam survival > 95% or project survival >93% or combined juvenile and adult survival >91% (Standard Achieved)

APPENDIX E

LIST OF WELLS HCP COMMITTEE MEMBERS

Wells Dam Mid-Columbia HCP Committees

Coordinating Committee

Name	Organization
Michael Schiewe (Chair)	Anchor Environmental, L.L.C.
Jerry Marco	Colville Tribes
Rick Klinge	Douglas PUD
Bryan Nordlund	NOAA Fisheries
Jim Craig (as of 6/1/07)	USFWS
Carmen Andonaegui	WDFW
Steve Parker	Yakama Nation

Hatchery Committee

Name	Organization
Michael Schiewe (Chair)	Anchor Environmental, L.L.C.
Jerry Marco	Colville Tribes
Rick Klinge	Douglas PUD
Kristine Petersen	NOAA Fisheries
David Carie (as of 6/1/07)	USFWS
Kirk Truscott	WDFW
Tom Scribner	Yakama Nation

Tributary Committee

Name	Organization
Tracy Hillman (Chair)	BioAnalysts
Chris Fisher	Colville Tribes
Tom Kahler	Douglas PUD
Dale Bambrick	NOAA Fisheries
David Morgan	USFWS
Dennis Beich	WDFW
Bob Rose	Yakama Nation

Policy Committee

Name	Organization
Michael Schiewe (Facilitator)	Anchor Environmental, L.L.C.
Joe Peone	Colville Tribes
Bob Clubb	Douglas PUD
Keith Kirkendall	NOAA Fisheries
Mark Miller	USFWS
Bill Tweit	WDFW
Virgil Lewis	Yakama Nation

APPENDIX F

STATEMENTS OF AGREEMENT FOR COORDINATING COMMITTEES

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County

Recommendation to proceed with plans
for baffle placement in east fishway of Wells Dam
and development of a telemetry study for evaluation of passage time in 2007

23 January 2007

Statement

The Wells HCP Coordinating Committee recommends that Douglas PUD proceed with placement of flow guiding baffles in the east fishway at Wells Dam to improve passage time of ascending adult fish through the east fishway. A study plan for 2007 radio telemetry study will be submitted for approval in February 2007.

Background: Douglas PUD has been working with Northwest Hydraulic Consultants to improve flows through the collection chamber at the bottom of the fishways at Wells Dam to improve passage times for ascending salmonids. Radio telemetry studies in the 1990's show some delay in passage occurring in the collection chamber of the fishways as fish move from the tailrace to the ladder environment. The District perceived part of the problem for the fish was the inability to detect flows coming down the fishway. Large amounts of water are introduced into the collection chamber to provide attraction flows for fish at the fishway entrance. Telemetry studies have shown this area to be one of some confusion or delay for salmonids ascending the fishway. Telemetry studies have also shown that once fish are committed beyond the first several steps in the ladder, they ascend with little delay.

A model of the lower portions of the Wells fishway was built in the Northwest Hydraulic Consultants hydraulic lab in North Vancouver, British Columbia. This model helped show how flows between the various wall diffusion grates were fairly balanced. A series of baffles were placed in the model just below pool No. 1 of the fishway. Dye tests showed that the flow stream from the upper portions of the ladder was detectable much further into the attraction gallery when the baffles were in place. It is hoped this improvement in the flow stream may help guide fish earlier to the first several pools of the fishway. A demonstration of this model was made available to the members of the HCP Coordinating Committee on January 18, 2007. The recommendation from the members that witnessed the demonstration was to proceed with the construction of the baffles and develop a telemetry test for 2007.

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County
Acceptance of the 2007 Bypass Plan
23 January 2007

Statement

The Wells HCP Coordinating Committee accepts the draft 2007 Juvenile Bypass Operating Plan as submitted by Douglas County PUD on 14 December 2006.

Background: Operation of the bypass system throughout the 2007 season will be guided by the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan (Wells Juvenile Bypass Plan) found in Section 4.3 of the Wells HCP. One of the main goals of the Wells Juvenile Bypass Plan is to provide bypass operation for at least 95% of the spring and at least 95% of the summer migration of juvenile plan species.

During the last three years, bypass operations have been implemented based upon an analysis of 21 years of hydroacoustic and 14 years of species composition information collected on juvenile run patterns at Wells Dam. Based upon this analysis, Douglas PUD has proposed bypass operating dates there have been broader than those contained within the Wells HCP Agreement. The HCP Agreement originally directed the District to operate the bypass continuously from April 10th to August 15th.

However, based upon the District's 21-year run-timing analysis, presented and agreed to by both the Wells HCP Hatchery and Coordinating Committees in February 2004, initiation of the Wells bypass system on April 12th and termination on August 26th will conservatively provide bypass operations for 95% of both the spring and summer outmigrations.

Historically, initiation of the bypass system on April 12th would provide a non-turbine passage alternative for 95.5% of the spring migration. Similarly, shutting down the bypass system on August 26th, on average would provide bypass operation for 95.0% of the summer migration. Similar to the past 7 years and for accounting purposes, the end of the 2006 spring bypass season will be June 13th at 2400 hours and the beginning of the summer bypass season will be June 14th at 0000 hours.

Wells HCP Coordinating Committee
Statement of Agreement
PUD No. 1 of Douglas County

Approval of Study Plan "Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007", (revised March 15, 2007)

27 March 2007

Statement

The Wells HCP Coordinating Committee approves the study plan, "Evaluation of Summer Chinook Passage Times through the Wells Dam Fishway Collection Gallery 2007", dated March 15, 2007 (as revised) to evaluate passage times of summer Chinook in the Wells Dam ladder Collection Gallery.

Background: The District has worked with the Wells HCP Coordinating Committee (HCP-CC) to develop a simple flow-guidance improvement to the Wells ladder Collection Gallery for ascending fish. In December 2006, a demonstration of a guidance baffle was tested by Northwest Hydraulic Consultants in North Vancouver, British Columbia. This demonstration was attended by some of the membership of the HCP-CC. The tests demonstrated that the placement of a flow guiding baffle at the upper portions of the collection chamber will provide an improvement to attraction flow for fish to locate the series of weirs and pools of the ladder. The HCP-CC approved the design of a baffle and recommended the construction of this baffle in the East Ladder for the 2007 fish passage season to allow a comparison of travel times between the East ladder with baffles and the West Ladder without baffles (HCP-CC SOA on January 23, 2007). A draft study to compare travel times of ascending fish through the collection galleries was submitted to the HCP-CC for review on February 27, 2007. This plan was discussed during a HCP-CC conference call on March 15. Modifications to the draft plan were made per recommendation of the HCP-CC, and a second draft was submitted on March 15. The HCP-CC is supportive of this study to evaluate the expected improvements to passage time for summer Chinook at Wells Dam in 2007.

APPENDIX G

STATEMENTS OF AGREEMENT FOR HATCHERY COMMITTEES

Statement of Agreement
Hatchery Evaluation Technical Team Operating Procedures
Wells, Rocky Reach, and Rock Island HCP Hatchery Committees
August 15, 2007

The Wells, Rocky Reach, and Rock Island HCP Hatchery Committees have reviewed and hereby approve the Hatchery Evaluation Technical Team (HETT) Operating Procedures.

Statement of Agreement
Proposed Changes to M&E Plan Objective 9
Wells, Rocky Reach, and Rock Island HCP Hatchery Committees
August 15, 2007

The Wells, Rocky Reach, and Rock Island HCP Hatchery Committees have reviewed and hereby approve the below changes to Monitoring and Evaluation (M&E) Plan Objective 9.

Background:
The following is a brief explanation of the changes to Objective 9 of the Chelan and Douglas PUD M&E plans proposed by HETT for consideration by the HC, and includes the new Objective 9 text.

Existing Objective 9

The original Objective 9 focused exclusively on the potential of supplementation programs to increase the prevalence of disease (and specifically BKD caused by *Renibacterium salmoninarum [Rs])* in natural populations. To answer this question, the approach contemplated addressing the following types of questions:

- Is the concentration of *Rs* in a supplemented stream different from that in a non-supplemented stream?
- Does the concentration of *Rs* in hatchery effluent change over time?
- Does the prevalence of *Rs* antigen in hatchery fish change over time?
- Is the concentration of *Rs* in hatchery effluent different from that upstream of the hatchery?

Proposed New Objective 9 Revisions

The proposed revision of Objective 9 is designed to (1) broaden the scope to include an experimental evaluation of the effects of hatchery management of BKD (and particularly the current practice of rearing the progeny of "high" *Rs* antigen females at reduced density) on life-stage survival rates, and (2) reduce the emphasis on comparing *Rs* concentrations in streams containing supplemented versus non-supplemented populations. The reduced emphasis on supplemented vs. non-supplemented comparisons is a function of both (1) the limited ability to non-lethally monitor BKD and (2) to meaningfully correlate observed concentrations of *Rs* in either effluent or streams with rates or prevalence of BKD infection in fish, and the desire to first define and implement an interim BKD hatchery management strategy before extensive field monitoring is initiated.

With regard to (1), the HETT is developing a preliminary study plan for the hatchery experiment, with the goal of including enough detail so the HC can evaluate potential impacts on HCP hatchery programs. As a way to begin addressing (2), the HETT has

proposed continued *Rs* antigen monitoring of all returning spring Chinook broodstock, and evaluating trends in Rs antigen prevalence over time in both hatchery and natural origin recruits.

Proposed New Objective 9 Text

Objective 9: Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.

The hatchery environment has the potential to amplify diseases that are typically found at low levels in the natural environment. Amplification could occur within the hatchery population (i.e., vertical and horizontal transmission) or indirectly from the hatchery effluent or commingling between infected and non-infected fish (i.e., horizontal transmission). Potential impacts to natural populations have not been extensively studied, but should be considered for programs in which the hatchery fish are expected to commingle with natural fish. This is particularly important for supplementation type programs. Specifically, the causative agent of bacterial kidney disease (BKD), *Renibacterium salmoninarum* (Rs), could be monitored at selected acclimation ponds, both in the water and fish, in which the risk and potential for transmission from the hatchery is highest. Although it is technologically possible to measure the amount of Rs in water or Rs DNA in smolts and adults non-lethally sampled, the biological meaning of these data are uncertain. Currently, the only metric available for M & E purposes is measuring the antigen level from kidney/spleen samples (i.e., ELISA). When available, non-lethal sampling may replace or be used in concert with lethal sampling.

Implementation of this objective will be conducted in a coordinated approach within the hatchery and natural environment. BKD management within the hatchery population (e.g., broodstock or juveniles) has the potential to reduce the prevalence of disease through various actions (e.g., culling or reduced rearing densities). BKD management must also take into account and support other relevant objectives of the M & E program (e.g., Hatchery Return Rate [HRR], number of smolts released). Hence, the goal of BKD management is to decrease the prevalence of disease and maintain hatchery production objectives (i.e., number and HRR).

As previously discussed, disease transmission from hatchery to naturally produced fish may occur at various life stages and locations. Of these, horizontal transmission from hatchery effluent, vertical transmission on the spawning grounds, and horizontal transmission in the migration corridor have been identified as disease interactions that could be examined under this objective, although others may also be relevant. Experimental designs addressing this objective may require technology not yet available, although in some instances samples may be collected, but not analyzed until a link can be established between bacteria levels in samples and disease prevalence.
Developing a complete set of questions and hypotheses statements for this objective may not be practical at this time, because there is currently no BKD Management Plan.

However, while developing experimental designs for this objective, it may be feasible to incorporate both hatchery and natural environment monitoring under a single study design. Integration of the different aspects of the objective would likely result in a more robust approach into understanding the effectiveness of disease management strategies.

9.1 Disease Monitoring

Monitoring Questions:

Q1: What is the effect of BKD disease management on BKD disease prevalence?

Q2: Are study fish exposed to hatchery effluent infected to a greater extent than control fish?

Q3: *Is Rs infection transferred at various life stages from hatchery fish to naturally produced fish or appropriate surrogates?*[1]

Target Species/Populations:

- Q1 and Q2 both apply to spring Chinook (primary focus) and summer Chinook programs.

Hypotheses Q1:

- Ho_1: Rearing density has no effect on survival rates of hatchery fish.
- Ha_1: Rearing density has an effect on survival rates of hatchery fish.

- Ho_2: Antigen level has no effect on survival rates of hatchery fish.
- Ha_2: Antigen level has an effect on survival rates of hatchery fish.

- Ho_3: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish.
- Ha_3: Interaction between antigen level and rearing density has an effect on survival rates of hatchery fish.

Hypothesis Q2:

- Ho_1: Rs infection is not transferred from hatchery effluent to study fish.
- Ha_1: Rs infection is transferred from hatchery effluent to study fish.

Measured Variables:

- Hypotheses Q1:
  - Numbers of fish (at different life stages)

- Hypothesis Q2:
  - Numbers of Rs+ fish

Derived Variables:

- Survival rates
- SARs

[1] Hypothesis statements for these monitoring questions will be developed.

- HRRs

Spatial/Temporal Scale:

- Hypotheses Q1:
  - Analyze annually based on brood year.
- Hypothesis Q2:
  - Analyze annually.

Statistical Analysis:

- Hypotheses Q1: either 2-way ANOVA or response-surface design.
- Hypothesis Q2: ANOVA.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

Wells Habitat Conservation Plan - Hatchery Committee
Statement of Agreement
Twisp Weir Modifications
August 6, 2007

At the July 18, 2007 Wells HCP Hatchery Committee meeting, Public Utility District No. 1 of Douglas County (Douglas PUD) presented to the committee for their review and approval, design drawings for the proposed Twisp River Fish Trap Weir Modifications (dated July 2007). Also on July 18, 2007, the design drawings were submitted electronically to committee members and engineering staff (NOAA National Marine Fisheries Service [Bryan Nordlund] and the Washington Department of Fish and Wildlife [Bruce Heiner]). The July 2007 design drawings included the modifications from the review of Bryan Nordlund and Bruce Heiner of design drawings previously submitted to the committee during the fall of 2006.

Douglas PUD proposes to finalize the July 2007 design drawings with the following modification requested by Bryan Nordlund: the spaces between the bars of the aluminum trap boxes (both proposed and existing) will be reduced from 1¼ inches to 1 inch. Douglas PUD is requesting HCP HC approval of the final design drawings as modified.

By acceptance of this Statement of Agreement, the members of the Wells HCP-HC approve of the July 2007 design drawings (with requested modification by Bryan Nordlund, as described above) for the proposed Twisp River Fish Trap Weir Modifications, and request that Douglas PUD proceed with the implementation of this project.

December 12, 2007

Wells HCP Hatchery Committee
Statement of Agreement
Regarding the District's Okanogan Spring Chinook Obligation

Statement

Contingent on the Northwest Power and Conservation Council (NPCC) approving and the Bonneville Power Administration (BPA) funding the Colville Tribes' Chief Joseph Hatchery, the Wells Habitat Conservation Plan (HCP) Hatchery Committee (hereafter "Committee") agrees that Okanogan Basin spring Chinook salmon are a Plan Species that requires mitigation as detailed in Section 8.4.5.2 of the Wells HCP. Further, based on this determination, Douglas County PUD (hereafter "the District") shall begin providing hatchery O&M funding based on a 3.8% Wells Project passage loss for the Chief Joseph Hatchery Program (CJHP) upon completion of the Chief Joseph Hatchery

The Committee further agrees that in the event the CJHP is not approved and/or funded, the District will not be required to provide compensation at this time.

The Committee agrees that this Okanogan Basin spring Chinook program will be included in the five-year evaluations for the Monitoring and Evaluation (M&E) program and other metrics as included in the HCP. (Section 8.5).

The District's hatchery obligation for the Okanogan Basin spring Chinook hatchery program would be evaluated and adjusted by the Committee following the processes and at the 10-year check-in dates defined in the HCP. The first 10-year check-in will occur 10 years after the Chief Joseph Hatchery begins operation.

The Committee agrees that the performance of the Okanogan Basin spring Chinook program will be evaluated along with other District hatchery programs (following the 10-year check-in schedule as described above), and will need to meet the appropriate standards and goals established by the Committee to ensure protection of the Plan Species.

Consistent with the expectation that Okanogan spring Chinook salmon survive passage of Wells Project at a level similar to other spring migrant salmonids, the Hatchery Committee anticipates that, after appropriate consideration by the Wells Coordinating Committee, Okanogan spring Chinook would be designated a Phase III (Standard Achieved) Plan Species upon NPCC approval and BPA funding of the CJHP.

Background

Section 8.4.5.2 of the Wells HCP requires the Hatchery Committee to make a determination in 2007 on the status of Okanogan Basin spring Chinook salmon as a Plan Species that requires mitigation, and to describe the District's compensation obligation. According to the HCP, the Committee will require mitigation if there is a continuing spring Chinook hatchery program and/or a Threshold Population of naturally reproducing spring Chinook in the Okanogan watershed (established by an entity other than the District and occurring outside of the HCP).

A major objective of the CJHP is to reintroduce extirpated spring Chinook salmon to historical habitats in the Okanogan River for the purpose of providing for a tribal ceremonial and subsistence fishery, as well as recreational fishing. The Colville Tribe's Chief Joseph Hatchery Program has been an approved project within the NPCC's Fish and Wildlife Program since 2002. Following the NPCC's 3-Step Process, the CJHP has completed Step 1 (Master Plan Development) and is awaiting a decision on the approval of Step 2, which should occur early in 2008. An element of the Step-2 Process involved negotiating conceptual cost-sharing agreements for funding the CJHP among BPA (the major funding entity) and other interested parties. The District has been involved in discussions with the Colville Tribe and has conceptually agreed to cost sharing for their Okanogan Basin spring Chinook salmon hatchery compensation obligation.

Although the conditions in 8.4.5.2 of the HCP have not yet been achieved (i.e., the existence of a long-term hatchery program), the Hatchery Committee has expressed interest in pursuing this conditional Statement of Agreement in an attempt to address this issue within the current HCP schedule.

Wells HCP Hatchery Committee
Statement of Agreement
Regarding Fulfilling the Douglas County PUD's
Coho Obligation
December12, 2007

Statement

The Wells HCP Hatchery Committee (hereafter "Committee") has agreed that the criterion pursuant to Section 8.4.5.1 of the Wells Project HCP for a long-term coho hatchery program has been met.

The Committee agrees that:

1. Pursuant to Section 8.4.5.1, the interim juvenile coho survival of 96.2% will be assumed.
2. In lieu of juvenile coho survival studies during the first 10-years of the funding agreement with the Yakama Nation, Douglas County PUD will provide funding for a coho hatchery program equivalent to an assumed 7% mortality rate. Priority for measurement and hydro-related operations will be based on co-migrating Permit Species.

In order to meet this obligation, the Douglas County PUD and the Yakama Nation (YN) intend to enter into an agreement whereby Douglas County PUD will provide funding to the YN to support a coho program. As long as Douglas County PUD is meeting the terms of the agreement by providing the funding, the Committee agrees that Douglas County PUD is fulfilling its coho hatchery obligation for this 10-year period.

Background

The HCP describes the District's coho salmon compensation obligation (Section 8.4.5.1). For the Wells Hatchery Committee to determine that the District has a coho salmon compensation obligation under the HCP, the Hatchery Committee must determine the existence of a long-term coho hatchery program and/or the establishment of a Threshold Population of naturally reproducing coho in the Methow Basin. The funding of the hatchery program must be by an entity other than the District and outside the HCP. Originally, the HCP required the Hatchery Committee to make an assessment in 2006. However, on December 27, 2006 the Hatchery Committee chose to defer the decision until October 2007.

On June 20th 2007, under the Rock Island and Rocky Reach HCP, the Hatchery Committees approved a statement of agreement that provided for Chelan County PUD to provide hatchery mitigation for unavoidable juvenile coho mortality at the Rocky Reach and Rock Island hydro projects. This decision satisfied the criterion for the long-term funding for a coho hatchery program.

APPENDIX H

2007 JUVENILE BYPASS OPERATING PLAN

Commissioners:
T. JAMES DAVIS
LYNN M. HEMINGER
RONALD E. SKAGEN

General Manager:
WILLIAM C. DOBBINS

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Memorandum

TO: Wells HCP Coordinating Committee

FROM: Rick Klinge, Douglas PUD

DATE: January 23, 2007

SUBJECT: 2007 Juvenile Bypass Operating Plan

The 2007 spring outmigration at Wells Dam will consist of naturally produced stream-type fish spawned during brood years 2005 and 2006. Counts at Wells Dam included 4,996 adult and jack spring Chinook, 55,559 adult sockeye and 9,317 adult steelhead in 2004 and 7,203 adult steelhead in 2005.

Scheduled hatchery releases, above Wells Dam, include yearling spring Chinook from the Chewuch (250,000), Twisp (27,000) and Methow Acclimation Ponds (170,000), Winthrop National Fish Hatchery (602,000). Coho will once again be released from the Winthrop National Fish Hatchery (265,000) and summer Chinook yearlings will be released from the Carlton (267,000), Similkameen (285,000), and Bonapart Ponds (100,000). Hatchery summer steelhead will be released throughout the Methow and Okanogan rivers. Hatchery steelhead released above Wells Dam are from Wells Hatchery (500,000), Winthrop NFH (120,000) and Omak steelhead programs (31,000). In general, the hatchery yearling Chinook and steelhead are scheduled to be released on April 15th with Winthrop coho scheduled to be released on April 20th. By the end of April, all of the Chinook and coho will be released. The steelhead releases historically continue into the middle of May.

The summer outmigration expected to pass Wells Dam in are 100% naturally produced ocean-type summer/fall Chinook spawned during brood year 2006. Natural escapement of summer / fall Chinook in 2006 was a combined total of 27,196 counted at Wells Dam.

Operation of the bypass system throughout the 2007 season will be guided by the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan (Wells Juvenile Bypass Plan) found in Section 4.3 of the Wells HCP. One of the main goals of the Wells Juvenile Bypass Plan is to provide bypass operation for at least 95% of the spring and at least 95% of the summer migration of juvenile plan species.

During the last three years, bypass operations have been implemented based upon an analysis of 21 years of hydroacoustic and 14 years of species composition information collected on juvenile

run patterns at Wells Dam. Based upon this analysis, Douglas PUD has proposed bypass operating dates there have been broader than those contained within the Wells HCP Agreement. The HCP Agreement originally directed the District to operate the bypass continuously from April 10th to August 15th.

However, based upon the District's 21-year run-timing analysis, presented and agreed to by both the Wells HCP Committee and the Wells Coordinating Committee in February 2004, initiation of the Wells bypass system on April 12th and termination on August 26th will conservatively provide bypass operations for 95% of both the spring and summer outmigrations.

Historically, initiation of the bypass system on April 12th would provide a non-turbine passage alternative for 95.5% of the spring migration. Similarly, shutting down the bypass system on August 26th, on average would provide bypass operation for 95.0% of the summer migration. Similar to the past 7 years and for accounting purposes, the end of the 2006 spring bypass season will be June 13th at 2400 hours and the beginning of the summer bypass season will be June 14th at 0000 hours.

APPENDIX I

BROODSTOCK COLLECTION PROTOCOLS

MID-COLUMBIA COHO BROODSTOCK COLLECTION PROTOCOLS 2007

Yakama Nation
Fisheries Resource Management
Mid-Columbia Field Office
7051 Hwy. 97
Peshastin, Washington 98847

This draft broodstock collection protocol targets smolt release numbers anticipated for 2009. This document provides for sufficient operational planning as required to achieve broodstock collection goals and spawning protocols outlined herein.

BROODSTOCK COLLECTION GOALS

In preparation for continuing the proposed long-term plan for coho reintroduction in mid-Columbia tributaries in 2009, the 2007 brood year production goals are currently set for 1,000,000 and 500,000 smolts. These releases would occur in the Wenatchee and Methow River basins, respectively. Coho returning to the Wenatchee River will primarily be collected at Dryden Dam and Tumwater Dam with supplemental collection occurring at Leavenworth NFH. In the Methow River, coho will be collected at Wells Dam and Winthrop National Fish Hatchery (WNFH) with Wells Fish Hatchery as a supplemental brood source.

Collection goals are based on pre-spawn mortality, average female fecundity, eye-up rates, and hatching rates observed during the past three brood years (2004-2006). Previously, the protocols were derived from means for all the programs' brood years. During the most recent three brood years, trends have revealed an increase in average fish fecundity and eye-up rate with a decline in pre-spawn mortality. Using all brood years collectively may overestimate actual adults needed to meet program goals and create a problematic gamete overage. In the Wenatchee River Basin, a maximum of 941 coho (418 viable females) will be necessary to produce 1,000,000 smolts (Table 1). These collection goals are reduced from 1157 in 2006. In the Methow Basin, 267 female coho (545-850 total coho depending upon collection site and associated gender ratios) will be necessary to produce 500,000 smolts (Table 2). Similar to the Wenatchee basin, these collection goals have been reduced due to increased survival. If insufficient numbers return to the Methow River, two alternatives are available for brood supplementation. The first alternative would require broodstock to be collected from Wells Fish Hatchery (FH) via their adult trap. This collection point would target adult coho that originated from the 2006 release at Wells FH. The second alternative would be to collect additional gametes in the Wenatchee River Basin to compensate for Methow project shortfalls.

The Methow River broodstock collection goals are expressed as the number of adult coho needed if broodstock was collected solely at Wells Dam or as swim-ins to WNFH (Table

2). The disparities in collection goals are due to observed differences in sex ratios at Wells Dam and WNFH. Ultimately, the combination of females collected at both facilities will drive the total number of broodstock needed for the Methow River program.

Table 1. Wenatchee River Broodstock Collection Goals: 2007

Program Goal (smolts)	% Eyed *	Eyed egg-to-release survival rate	Eggs required for program goal	Eggs per female**	Pre-spawn mortality rate***	Adult Females Required ***(viable)***	Total Broodstock Collection ****
1.0 million	.86	.92	1.264 million	3,026	.0575	***442 (418)***	***941***

** Observed mean eyed egg rate for the 2004-2006 brood years.*
*** Observed mean fecundity for the 2004-2006 brood years.*
**** Observed pre-spawn mortality rate for the 2004-2006 brood years.*
***** Based on mean male-to-female ratio (53.0%M: 47.0%F) observed in 2000-2006.*

Table 2. Methow River Broodstock Collection Goals: 2007

Program Goal (smolts)	% Eyed*	Eyed egg-to-release survival rate	Eggs required for program goal	Eggs per female**	Pre-spawn Mortality rate***	Adult Females Required ***(viable)***	Total Broodstock Collection Swim –in/ Wells Dam****
500,000	.82	.90	677,105	2,721	.0680	***267 (249)***	***850/545***

** Observed mean eyed-egg rate for 2001-2003 and 2005- 2006 brood years. BY 2004 eyed-egg rate was excluded due to a change in the protocols which resulted in poor survival.*
*** Observed mean fecundity for 2004-2006 brood years.*
**** Observed pre-spawn mortality rate for the 2004-2006 brood years.*
***** Based on a mean male-to-female ratio for Winthrop NFH (68.6%M: 31.4%F) for the 2001-2006 BY and Wells Dam (51.0%M: 49.0%F) observed for the 2002-2006 BY.*

BROODSTOCK COLLECTION PROTOCOL

Wenatchee River Basin

To maximize genetic diversity, we will collect a representative sample of returning coho from throughout the run. Based on information collected from 2000-2006, we expect the first coho to arrive at Dryden Dam during the first week of September. The run typically continues through the first week of December with peak migration normally occurring between mid-October and mid-November. We have developed bi-weekly broodstock collection goals for 2007 based on historical spatial distribution of returning coho over Dryden Dam (Table 3). If during any two-week period, the broodstock collection goals are not met, the deficit will be carried over to the following week. Bi-weekly goals are

intended to serve as a guide for collection from throughout the run but may be adjusted mid-season if necessary to ensure that the broodstock collection goal is being met. A minimum of one male will be collected for each female to adhere to spawning protocols.

Table 3. Wenatchee Coho Broodstock Collection Goals, 2007

Week ending	**9/4-9/17**	**9/18-10/1**	**10/2-10/15**	**10/16-10/29**	**10/30-11/12**	**11/13-11/26**	**11/27-12/10**	**Total**
Estimated % of run	5	15	40	25	10	4	1	100
Broodstock Collection Goal (cumulative totals)	46	138 (**184**)	369 (**553**)	230 (**783**)	92 (**875**)	37 (**912**)	9 (**921**)	921

Typically, between September 1 and November 14, broodstock collection at Dryden Dam will take place daily in coordination with Eastbank Fish Hatchery Complex personnel (WDFW). Yakama Nation will provide a minimum of two people each day during this time period to assist in operation and collection at Dryden Dam fish trapping facilities. After November 14th, Yakama Nation personnel usually operate the trapping facility independently but will coordinate with Eastbank FH and CCPUD personnel regarding trap maintenance and operation.

As in 2006, Tumwater Dam collection efforts will be maximized so that we may incorporate upper basin coho at a higher rate in hopes to further propel broodstock development. If we are unable to meet our bi-weekly broodstock collection goals through trapping efforts at Dryden and Tumwater dams, adult coho will concurrently be trapped at Leavenworth NFH adult ladder. Tumwater Dam operation will be coordinated with Eastbank Fish Hatchery personnel (if the facility is being concurrently used for steelhead collection) or may be operated independently by YN personnel. Trapping operations at Tumwater Dam in 2007 will proceed at 3 days/week, up to 16 hours/day between September 1st and December 7th, 2007.

BROODSTOCK COLLECTION PROTOCOL

Methow River Basin

Beginning in 2005, the primary collection site for the Methow program became Wells Dam. The shift in collection from WNFH to Wells Dam was due to insufficient numbers of broodstock that volitionally entered the hatchery. WNFH volunteer swim-ins will supplement Wells Dam collections in 2007. Although swim-in coho comprise a smaller portion of the broodstock, successful spawning of these individuals is considered a high priority for future broodstock development. At Wells Dam, we propose to trap coho three days per week, coinciding and coordinating with WDFW steelhead collections, between September 15th and October 9th at both east and west ladder traps. Between October 10th and December 7th, trapping will increase to 7 days per week and up to 16 hours/day. If during this timeframe WDFW is not operating one or both of the traps,

whether meeting steelhead collection goals or agency decision, YN personnel will operate the facility for coho broodstock collection. All trapping operations will be coordinated with WDFW and DCPUD. When YN personnel are required to manage the traps, active operation will occur. All non-target fish will be passed upstream and properly documented with minimal handling. YN personnel will be responsible for transportation of coho broodstock to WNFH. After November 1st, if fish numbers warrant further collection, the west ladder facility may be operated passively. YN personnel will monitor trap operations on a regular basis.

When operating the west ladder trap, coho salmon will be shunted directly from the ladder into the holding facility at Wells Fish Hatchery (FH). Removal of coho from the temporary holding area will be coordinated with Wells FH personnel. No more than 50 coho will be held at a time (1 fish / 10 cu. ft.). When operating the east ladder facility, trapped coho will be placed directly into a transport tank. All coho transported from Wells Dam will have a unique mark to differentiate them from volunteer swim-ins at WNFH.

Bi-weekly collection goals can be found in Table 4. If during any two-week period, the broodstock collection goals are not met, the deficit will be carried over to the following week. The bi-weekly collection goals are intended to serve as a guide to ensure collection from throughout the run but may be adjusted mid-season if necessary to ensure that the total collection goal is met.

The bi-weekly collection goals are expressed in numbers of adult coho needed if broodstock is collected solely at Wells Dam. Due to the difference in sex ratio's observed at Wells Dam and Winthrop NFH, the actual number of adult coho collected may need adjustment. Ultimately, the combined number of females collected from both facilities will drive the total number of broodstock collected. A minimum of one male will be collected for each female to adhere to spawning protocols.

For 2007, a broodstock collection contingency plan is being developed for the Methow program. In the event that insufficient numbers of broodstock are trapped at the aforementioned collection sites, the Yakama Nation has proposed that Wells FH adult trap be used as a supplemental collection point. Fish trapping posiblities were discussed with WDFW prior to acclimating coho at Wells FH in 2006. The hatchery adult trap, which is located at the lowermost end of the hatchery prior to entering the Columbia River, has been used as the broodstock collection site for the Wells summer Chinook program. Typically, during the coho return in mid-to-late fall, the trap is de-watered and inoperable. Yakama Nation and WDFW are in agreement that the adult trap would be operational if broodstock needs warranted an additional trapping location. Operation and collection dates are currently undetermined and would be coordinated with WDFW and DCPUD. Expected operation would be minimal and likely late in the season once collection shortfalls were identified.

Table 4. Methow Coho Collection Goals, 2007.

Week ending	**9/15-10/1**	**10/2-10/15**	**10/16-10/29**	**10/30-10/29**	**10/30-11/12**	**11/13-11/26**	**Total**
Estimated % of run	5	15	40	25	10	5	100
Broodstock Collection Goal	27	82 **(109)**	218 **(327)**	136 **(463)**	55 **(518)**	27 **(545)**	545

REFERENCES

HGMP. 1999. Hatchery and genetics management plan: Mid-Columbia coho reintroduction program. Yakama Nation, Washington Department of Fish and Wildlife, Bonneville Power Administration.

HGMP. 2002. Hatchery and genetics management plan: Mid-Columbia coho reintroduction program. Yakama Nation, Washington Department of Fish and Wildlife, Bonneville Power Administration.

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Mid-Columbia Field Office
3515 Chelan Hwy 97-A Wenatchee, WA 98801 (509) 664-1227 FAX (509) 662-6606

To: Mid-Columbia HCP Hatchery Committee

From: Kirk Truscott

Subject: **DRAFT 2007 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

This protocol was developed for hatchery programs rearing spring Chinook salmon, sockeye salmon, summer Chinook salmon and summer steelhead associated with the mid-Columbia Habitat Conservation Plans (HCPs), spring Chinook salmon and steelhead programs associated with the Biological Opinion for Section 7 Consultation of the Interim Operation for the Priest Rapids Hydroelectric Project (FERC No. 2114) and fall Chinook consistent with Grant County Public Utility District and Federal mitigation obligations associated with Priest Rapids and John Day dams, respectively. These programs are funded by Chelan, Douglas, and Grant County Public Utility Districts (PUDs) and are operated by the Washington Department of Fish and Wildlife (WDFW). Additionally, the Yakama Nation's Coho Reintroduction Program broodstock collection protocol, when provided by the Yakama Nation, will be included in this protocol because of the overlap in trapping dates and locations.

This protocol is intended to be a guide for 2007 collection of salmon and steelhead broodstocks in the Methow, Wenatchee, and Columbia River basins. It is consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation), mitigation production levels, and to comply with ESA permit provisions and the Priest Rapids Dam 2004 Biological Opinion.

Notable in this years protocols are: (1) Wenatchee spring Chinook broodstock collection strategies targeting Chiwawa hatchery origin Chinook at Tumwater Dam, intended to provide improved hatchery origin broodstock collection and reduce the number of Chiwawa hatchery-origin strays in other Wenatchee basin UCR spring Chinook spawning aggregates; (2) Natural origin Chiwawa spring Chinook collection at the Chiwawa Weir, consistent with ESA Section 10 Permit 1196; (3) Methow spring Chinook broodstock protocol targeting hatchery and natural origin spring Chinook at Wells Dam; (4) utilization of genetic sampling/assessment to differentiate Twisp River and non Twisp River origin adults and CWT interrogation of hatchery spring Chinook collected at Wells Dam during spawning to differentiate Twisp and Methow Composite hatchery fish to aid in maintaining discrete Twisp and Methow Composite production components and (5) use of ultra-sound technology to determine sex of summer Chinook during collection to aid in achieving the appropriate female equivalents to meet programmed production. These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and other sampling locations.

Above Wells Dam

Spring Chinook

Natural-origin fish inclusion into the broodstock will be a priority, with natural-origin fish specifically being targeted; however, natural-origin fish collections will not exceed 33 percent of natural origin run escapement at Wells Dam. All hatchery origin fish retained for broodstock will be adipose-present and coded-wire tagged.

The 2007, Methow spring Chinook broodstock collection will occur predominantly at Wells Dam. Damage to the Twisp weir as a result of 2006 floods, delays in design and implementation of both a Twisp replacement weir and a Chewuch weir coupled with the decommission of Fulton Dam, and limited on-station release of smolts from the Methow FH preclude reasonable certainty of meeting adult collection requirements via tributary and hatchery outfall collections and are the principle reasons for broodstock collection at Wells Dam during 2007.

Additionally, recent WDFW genetic assessment of natural origin Methow spring Chinook (Small et al. 2007) suggest that Twisp natural origin spring Chinook can be identified with sufficient confidence that natural origin collections can occur at Wells Dam, thereby facilitating natural origin inclusion in the broodstock, while maintaining the ability to manage separately the Twisp origin spring Chinook spawning aggregate. Although Twisp natural origin fish can be assigned to the Twisp population with confidence, some gene flow between the Twisp and Methow Composite spawning aggregates are anticipated as a result of collecting natural origin broodstock at Wells Dam. Based on maximum Proportion Natural Origin (pNOB) broodstock composition for Twisp (70.2%) and Methow Composite (28.3%) programs, and assignment errors provided in Small et al. (2007), maximum percent non-source fish contributions of 6.90% and 1.86% would have occurred for the Twisp and Methow Composite programs, respectively, had this broodstock collection strategy been implemented. For 2007, the pNOB for the Twisp and Methow Composite is expected to be approximately 1.5% and 5% respectively, providing an expected non-source contribution of to the Twisp of .014% and 0.43% for the Methow Composite program. In this instance, percent non-source fish contribution may be considered a gene flow estimate between the two program production elements (Twisp and Methow Composite) and is an unavoidable consequence associated with natural origin broodstock collection at Wells Dam during 2007. Furthermore, it is unlikely that the program in 2007 would result in an unacceptable non-source contribution even if returns are substantially larger than projected. Assignment errors comparable to those presented in Small et al. (2007) and pNOBs less than or equal to 20.0% would result in less than 2.0% gene flow within both the Twisp and Metcomp programs. Given the low projected escapement of natural origin spring Chinook to the Methow Basin in 2007 (Table 1) and a collection objective to limit natural origin extraction to no greater than 33% it is highly unlikely that pNOBs will approach 20.0%. Although gene flow between the two hatchery production components is likely, it is expected to be relatively low in 2007 and supports a hatchery broodstock collection program objective to infuse natural origin fish into the hatchery program to maintain/improve genetic diversity and reduced domestication. For complete discussion regarding Methow Spring Chinook genetic monitoring and evaluation see Small et al. (2007).

Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non CWT, non-adipose clipped, non-ventral clipped spring Chinook (suspected natural origin spring Chinook) and adipose present, CWT hatchery origin spring Chinook passing

Wells Dam for origin analysis. Natural and hatchery origin fish retained for broodstock will be tagged with a PIT tag (dorsal sinus) and with an alphanumeric VI tag placed in the posterior of the left eye for tissue sample/genetic analysis cross-reference. Tissue samples will be preserved and sent to WDFW genetics lab in Olympia Washington for genetic/stock analysis. The spring Chinook sampled will be retained at Methow FH and will be sorted as Twisp or non-Twisp natural and hatchery origin fish prior to spawning. The number of natural origin Twisp and Methow Composite (non-Twisp) spring Chinook retained will be dependent upon the number of natural origin adult return and the collection objective to limit extraction no greater than 33% of the natural origin spring Chinook return past Wells Dam. Based on broodstock collection schedule (every third day and 16 hours/day), natural origin spring Chinook extraction is expected to be 33% or less. Adipose present, CWT hatchery origin spring Chinook will be collected from the East and West ladder traps, consistent with natural origin collection and transferred to the Methow FH.

The Methow FH rears spring Chinook salmon for three acclimation/release sites in the Methow River Basin, including: (1) Methow River (Methow FH); (2) Twisp River (Twisp Acclimation Pond) and (3) Chewuch River (Chewuch Acclimation Pond). The total production level target is 550,000 smolts divided equally among the three release sites (approximately 183,000 smolts per site).

Although in recent years, broodstock collection objectives have been achieved, Bacterial Kidney Disease (BKD) management strategies, including but not limited to lower density rearing of progeny from higher ELISA parents have effectively limited the Methow FH smolt production to levels less than the 550,000 smolt objective. Although no specific BKD management strategy has been developed and agreed upon through the HCP HC, the parties to the HCP have acknowledged that limited culling 1/, targeting broodstock collection objectives at levels that provide variance for BKD management to meet production levels and prioritizing natural origin fish for rearing to yearling smolt stage may be a viable approach to balance the promotion of fish health while preventing inadvertent reductions in genetic diversity and reduced program production, particularly ESA listed supplementation programs. For 2007, the Wells HCP Hatchery Committees have agreed that collection of adult fish at levels to achieve 100,000 eggs in excess to programmed production and is an acceptable 2007 strategy to address programmed production and BKD management. Furthermore the Committees agree that progeny in excess to facility capacity as determined by stock composition and BKD ELISA levels and WDFW recommended ELISA level rearing criteria will be reared separately at Methow FH, adipose clipped and released into the Methow River near the Methow FH and Winthrop NFH at approximately 500-400 FPP during December 2007 – January 2008.

Pre-season run-escapement of Methow origin spring Chinook past Wells Dam totals 1,399 spring Chinook, including 1,346 hatchery and 53 wild Chinook (96% and 4%, respectively, (Table 1). In-season estimates of natural-origin spring Chinook will be adjusted proportional to the estimated returns to Wells Dam at the 50% and 75% passage dates and may result in adjustments to the broodstock collection targets presented in this document.

1/- "culling" implies removal from the hatchery population in a manner consistent with achieving program goals (including but not limited to destruction of eggs and early release strategies).

Based on current juvenile rearing capacity at Methow FH, current permit take authorizations, Wells HCP Hatchery Committee agreement to collect 100,000 eggs in excess to that required to attain 550,000 full programmed production (550,000 smolts) and projected return for BY 2007 Methow Basin spring Chinook at Wells Dam (Table 1), the following broodstock collection protocol was developed.

Based on the preceding elements above and assumptions listed in Table 2, below, adult collections at Wells Dam, during 2007, will target 375 adult spring Chinook.

Based on the pre-season run forecast, Twisp fish are expected to represent 15% of the adipose present, CWT tagged hatchery adults and 8% of the natural origin spring Chinook passing above Wells Dam (Table 1). Based on this proportional contribution, the 2007 Twisp origin broodstock collection will be predominantly hatchery origin and total 55 fish (1 wild and 54 Hatchery), representing 54% of the broodstock necessary to meet Twisp program production of 183,000 smolts.

Based on the pre-season run forecast, Methow Composite fish are expected to represent 85% of the adipose present CWT tagged hatchery adults and 92% of the natural origin spring Chinook passing above Wells Dam (Table 1). Based on this proportional contribution, the 2007 Methow Composite origin (combined Methow and Chewuch river spawning aggregates) broodstock collection will be predominantly hatchery origin and total 320 fish (16 wild and 304 Hatchery), representing 100% of the broodstock necessary to meet Methow Composite program production of 367,000 smolts (combined Methow and Chewuch production), sufficient to backfill the programmed shortfall of 91,000 fish expected in the Twisp program and sufficient to provide 100,000 eggs in excess to programmed production allowing for ELISA selection for the yearling production. The Twisp Pond release group is limited to releasing progeny of broodstock identified as wild Twisp and or known Twisp hatchery origin fish. The Chewuch Pond and Methow FH releases will include progeny of broodstock identified as wild non-Twisp origin and known Methow Composite hatchery origin fish.

Table 1. BY 2002-2004 age-class and origin 2007 run-escapement projection for spring Chinook at Wells Dam

	Projected Escapement											
	Origin								**Total**			
	Hatchery				**Wild**				**Methow Basin**			
Stock	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**
MetComp	118	786	239	1,143	2	24	23	49	120	810	262	1,192
% Total				85%				92%				85%
Twisp	22	171	10	203	1	1	2	4	23	172	12	207
% Total				15%				8%				15%
Total	140	957	249	1,346	3	25	25	53	143	982	274	1,399
				96%				4%				100%

Table 2. Assumptions and calculations to determine number of broodstock needed for BY 2007 production of 550,00 smolts

Smolt release		**550,000**	**Smolts**
Fertilization-to-release survival	90%		
Egg-take (Production)		611,000	Eggs
Egg-take (BKD allowance)		100,000	Eggs
Total Egg Take		**711,000**	**Eggs**
Fecundity	4,000 [1/]	178	Females spawned
Female to male ratio	1 to 1	356	Total spawned
Pre-spawn survival	**95%**	**375**	**Broodstock collection target**

[1/]- Based on historical program age-4 fecundities and expected 2007 return age structure (Table 1).

Trapping at Wells Dam will begin on 01 May and is expected to be completed by 27 June. Salmon will be retained from the run consistent with estimated spring Chinook run timing at Wells Dam and weekly collection quotas. Once the weekly quota target is reached, broodstock collection will cease until the beginning of the next week. If a shortfall occurs in the weekly trapping quota, the shortfall will carry forward to the following weeks collection quota.

If required to meet Methow FH broodstock collection for Methow Composite stock, adipose-present code-wire tagged hatchery fish may be collected at Methow FH. Methow Composite spring Chinook may also be collected at WNFH, if required to achieve broodstock collection objectives, consistent with availability of Chinook that are excess to WNFH requirements. Trapping at these sites, if required to meet broodstock collection may occur between May 1 and 21 August 2007.

To better assure adequate males in the broodstock for outcrossing with Twisp females, collection of male hatchery fish from the Twisp River will occur at the Twisp Weir between 01 May and 31 August, pending successful weir installation. In addition to the aforementioned Twisp collections, hatchery origin Twisp fish will also be transferred from the Winthrop NFH to Methow FH during spawning.

Steelhead

The U.S. v Oregon Technical Advisory Committee (TAC) 2007 estimate for A-run summer steelhead to the Columbia River (Appendix A), indicates sufficient UCR steelhead should be available to provide the 380 adult steelhead broodstock required to meet mitigation program objectives. Steelhead mitigation programs above Wells Dam utilize adult broodstock collections at Wells Dam and incubation/rearing at Wells Fish Hatchery (FH). Based on mitigation program

production objectives (Table 3) and program assumptions (Table 4), the following broodstock collection protocol was developed.

Trapping at Wells Dam will selectively retain 380 steelhead (east and west ladder collection). The collection will retain no greater than 33% natural origin broodstock for the mitigation programs and 100% hatchery origin within the Ringold FH production component. Overall collection will be limited to no more than 33% of the entire run or 33% of the natural origin return. The east and west ladder trapping at Wells Dam will begin on 01 August and terminate by 31 October and will be operated concurrently three days per week, up to 16 hours per day, if required to meet broodstock objectives. Trapping on the east ladder will be concurrent with summer Chinook broodstocking efforts through 14 September and will continue through 31 October, concurrent with west ladder steelhead collections. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments may be made based on in-season monitoring and evaluation.

Table 3. Adult steelhead collection objectives for programs supported through adult steelhead broodstock collection at Wells Dam.

Program	# Smolts	# eyed eggs	% Wild	# Wild	# Hatchery	Total Adults	
DCPUD [1/]	349,000	405,814	33%	59	119	178	
GCPUD [1/]	80,000	93,023	33%	14	27	41	
USFWS [1/]	100,000	125,000	33%	18	37	55	[3/]
Sub-Total	**529,000**	**623,837**	**33%**	**91**	**183**	**274**	
Ringold	180,000	240,000	0%	0	106	106	[3/]
Sub-Total	**180,000**	**240,000**	**0%**	**0**	**106**	**106**	
Grand Total [2/]	**709,000**	**863,837**	**24%**	**91**	**289**	**380**	

[1/]- Above Wells Dam releases. Target HxW parental adults as the hatchery component

[2/]- Based on steelhead production consistent with Mid Columbia HCP's, GCPUD BiOp and Section 10 Permit 1395.

[3/]- Based on adults required for eyed egg allotment

Table 4. Program assumptions used to determine adult collection required to meet steelhead production objectives for programs above Wells Dam and at Ringold Springs Fish Hatchery.

Program assumption	Standard
Pre-spawn survival	97%
Female to male ratio	1.0 : 1.0
Fecundity	5,400
Propagation survival	
87% fertilization to eyed egg	87%
86% eyed egg to yearling release	86% [1/]
75% fertilization to yearling release	75% [1/]

[1/]- Not applicable to Ringold Springs Fish Hatchery

Summer/fall Chinook

Summer/fall Chinook mitigation programs above Wells Dam utilize adult broodstock collections at Wells Dam and incubation/rearing at Eastbank Fish Hatchery. The total production level target is 976,000 summer/fall Chinook smolts for two acclimation/release sites on the Methow and Similkameen rivers (Carlton Pond and Similkameen Pond, respectively).

The TAC 2007 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2002, 2003 and 2004 spawn escapement to tributaries above Wells Dam indicate sufficient summer Chinook will return past Wells Dam to achieve full broodstock collection for supplementation programs above Wells Dam. Based on initial run expectations of summer Chinook to the Columbia River, program objectives and program assumptions (Table 5); the following broodstock collection protocol was developed.

WDFW will retain 556 natural-origin summer/fall Chinook at Wells Dam east ladder, including 278 females. To better assure achieving the appropriate females equivalents for programmed production, the collection will utilize ultra-sound equipment to determine the sex of each fish retained for broodstock. Collection will be proportional to return timing between 01 July and 13 September. Trapping will occur 3-days/week, 16 hours/day. The 3-year old component will be limited to 10 percent of the broodstock collection. If the probability of achieving the broodstock goal is reduced based on actual natural-origin escapement levels, broodstock origin composition will be adjusted to meet the broodstock collection objective.

Table 5. Assumptions and calculations to determine number of broodstock needed for summer/fall Chinook production at Carlton and Similkameen ponds.

Program Assumption		Carlton Pond	Similkameen Pond	Total
Smolt release		**400,000**	**576,000**	**976,000**
Fertilization-to-release survival	90%			
Eggtake Target		**512,821**	**738,462**	**1,251,282**
Fecundity	5,000			
Female target		**103**	**148**	**250**
Female to male ratio	1 to 1			
Broodstock target		**205**	**295**	**501**
Pre-spawn survival	95%			
Total collection target		**228**	**328**	**556**

Columbia River Mainstem below Wells Dam

Summer/fall Chinook

Summer/fall Chinook mitigation programs that release juveniles directly into the Columbia River between Wells and Rocky Reach dams are supported through adult broodstock collections at Wells Dam. The total production level supported by this collection is 520,000 yearling and 1,562,000 sub-yearling Chinook.

Adults returning from this program are to support harvest opportunities and are not intended to

increase natural production and have been termed segregated harvest programs. These programs have contributed to harvest opportunities; however, adults from these programs have been documented contributing to the adult spawning escapement in tributaries upstream and downstream from their release locations. Because adults from these programs contribute to the natural spawn escapement, the broodstock collection will incorporate 10 percent natural-origin fish into the broodstock to reduce the potential genetic risk to the naturalized summer/fall Chinook stocks in the upper Columbia River region. Based on mitigation objectives and program assumptions (Table 6), the following broodstock collection protocol was developed.

WDFW will collect 1,274 run-at-large summer Chinook including 1,146 hatchery fish from the volunteer ladder trap at Wells Fish Hatchery outfall and 128 natural-origin fish from the Wells Hatchery outfall, and/or Wells Dam east and west ladders. Overall extraction of natural-origin fish passing Wells Dam (Wells program and above Wells Dam summer/fall Chinook programs) will not exceed 33 percent. West ladder collections will begin 01 July and completed by 14 September and will be consistent with run timing past Wells Dam. Due to fish health concerns associated with the volunteer collection site, the volunteer collection will begin 10 July and terminate by 31 August, or when the summer Chinook broodstock collection objective is met, which ever is earliest. The 3-year old component will be limited to 10 percent of the broodstock collection.

Table 6. Assumptions and calculations to determine number of broodstock needed for summer/fall Chinook production at Wells and Turtle Rock Island hatcheries.

	Standard		Wells FH		Turtle Rock FH		Lake Chelan [1/]	Total		
Program Assumption	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**eye- egg**	**Sub-yearling**	**Yearling**	**Total**
Smolt release			484,000	320,000	1,078,000	200,000	NA	1,562,000	520,000	2,082,000
Fertilization-to-release survival	81%	78%					NA			
Eggtake Target			597,531	410,256	1,330,864	256,410	100,000	1,928,395	666,667	2,695,062
Fecundity	4,700	4,700								
Female target			127	87	283	55	21	432	142	573
Female to male ratio	1 to 1	1 to 1								
Broodstock target			254	175	566	110	42	820	285	1,105
Pre-spawn survival	90%	90%								
Total collection target			**282**	**194**	**629**	**122**	**47**	**958**	**316**	**1,274**

[1/]- Lake Chelan eggs will be incorporated into the last egg take and incubated at Wells Hatchery until eyed stage and then shipped to the Lake Chelan RSI program.

Coho

Yakama Nation will provide broodstock collection objectives for the coho reintroduction program in the Methow River basin. WDFW will work collaboratively with the Yakama Nation to facilitate coho collections at Wells Dam.

Wenatchee River Basin

Spring Chinook

The Eastbank Fish Hatchery (FH) rears spring Chinook salmon for the Chiwawa River acclimation pond located on the Chiwawa River. The program production level target is 672,000 smolts, requiring a total broodstock collection of 379 fish (Table 7).

Table 7. Assumptions and calculations to determine number of broodstock needed for Chiwawa program release of 672,000 smolts.

Program Assumption	Standard	Chiwawa program
Smolt release		**672,000**
Fertilization-to-release survival	83%	
Eggtake Target		**809,639**
Fecundity	4,400	
Female target		**184**
Female to male ratio	1 to 1	
broodstock target		**368**
Pre-spawn survival	97%	

Natural-origin fish inclusion into the broodstock will continue to be a priority, with natural-origin fish specifically being targeted. Consistent with ESA Section 10 Permit 1196, natural-origin fish collections will not exceed 33 percent of the return to the Chiwawa River and will provide, at a minimum, 33 percent of the total broodstock retained.

In addition to production levels and ESA permit provisions, the 2007 broodstock collection, will again, as in 2006, target hatchery origin Chinook at Tumwater Dam and will translocate hatchery origin spring Chinook from Tumwater Dam to the Chiwawa River as a interim measure to reduce straying of Chiwawa River spring Chinook to other spring Chinook spawning aggregates in the Wenatchee Basin. These types of measures were implemented in 2006 and were successful in obtaining sufficient hatchery fish for the broodstock purposes and resulted in 0% stray rate of the translocated fish. Additionally, the translocated fish had no significant difference in survival to spawn when compared to non-translocated fish.

Pre-season estimates have 882 spring Chinook destine for the Chiwawa River, of which 123 fish

(14%) are expected to be natural-origin (Table 8). Based on the projected Chiwawa River run-size and origin composition, and provisions in ESA Section 10 Permit 1196, WDFW will retain 163 spring Chinook for broodstock purposes, representing 43% of the program broodstock objective. One hundred and twenty-three (123) coded-wire tagged, hatchery-origin Chinook will be retained from Tumwater Dam and 40 natural-origin spring Chinook will be retained at the Chiwawa Weir. In-season assessment of the magnitude and origin composition of the spring Chinook return above Tumwater Dam will be used to provide in-season adjustments to the total broodstock collection,

Table 8. BY 2002-2004 age-class return projection for wild and hatchery spring Chinook above Tumwater Dam, based on wild smolt production, hatchery releases and Chiwawa wild and hatchery SARs (2007 return year in bold).

				Adult Return									
		Smolt Estimate		Tumwater				Chiwawa					
BY	Origin	Chiwawa	Wen. basin [3/]	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	SAR	
2002	Wild	152,547 [1/]	342,034	9	256	**143**	408	4	114	**64**	182	0.0012	[4/]
	Hatchery	149,668 [2/]		213	516	**30**	759	149	361	**21**	531 [6/]	0.0051	[5/]
2003	Wild	27,997 [1/]	62,493	8	**101**	59	169	4	**45**	26	76	0.0027	[3/]
	Hatchery	222,131 [2/]		138	**747**	37	922	97	**523**	26	645 [6/]	0.0042	[7/]
2004	Wild	101,171 [1/]	206,051	**28**	334	195	556	**14**	164	96	273	0.0027	[3/]
	Hatchery	494,517 [2/]		**308**	1662	82	2,052	**215**	1,164	57	1,437 [6/]	0.0042	[7/]
Total 2007 Return				**336**	**848**	**173**	**1,357**	**229**	**568**	**85**	**882**		
Proportion wild				**0.08**	**0.12**	**0.83**	**0.20**	**0.06**	**0.08**	**0.75**	**0.14**		
Proportion Hatchery				**0.92**	**0.88**	**0.17**	**0.80**	**0.94**	**0.92**	**0.25**	**0.86**		

[1/]- Smolt estimate based on yearling emigration, including 1+ estimate from subyearling emigration

[2/]- Chiwawa Hatchery releases, 2004-2006

[3/]- Expanded Chiwawa smolt production estimate (I.e. Chiwawa Basin estimate/proportion basin-wide redd deposition in the Chiwawa River).

[4/]- Projected BY 2002 SAR, based on known age-3 and age-4 returns and expected age-5; assuming a 30% age-5 contribution (WDFW unpublished data).

[5/]- Projected By 2002 SAR, based on known age-3 and age-4 returns and expected age-5; assuming a 4% age-5 contribution, (WDFW unpublished data).

[6/]- Projected Chiwawa River, Chiwawa hatchery spawn escapement. Assumes a "within basin" homing fidelity return rate to the Chiwawa River of 0.70 for Chiwawa hatchery-origin, spring Chinook (I.e. expected stray rate of 0.30 (BY 1989-1998 mean, WDFW unpublished data).

[7/]- 1991-2002 average Chiwawa wild SAR, excluding brood years 1997 and 1998 (these two brood years were excluded due the high survival attributable to extremely good ocean conditions. More recent brood year survival estimates indicate a down-turn in ocean survival for UCR spring Chinook

consistent ESA Section 10 Permit 1196.

Trapping at Tumwater Dam will begin 01 May and will be concurrent with trapping for the Spring Chinook Reproductive Success Study. Collection at both Tumwater Dam and Chiwawa Weir will based on weekly quotas, consistent with average run timing at Tumwater Dam. If the weekly quota is attained prior to the end of the week, retention of spring Chinook for broodstock will cease. If the weekly quota is not attained, the shortfall will carry forward to the next week. To reduce Chiwawa River hatchery origin fish in other sub-basins, coded-wire tagged spring Chinook that are in excess to weekly quota requirements will be captured and translocated to the Chiwawa River at a location approximately 10 miles upstream from the Chiwawa Weir. The number of hatchery-origin fish retained at Tumwater Dam will be adjusted in-season, based on estimated Chiwawa River natural-origin returns provided through extrapolation of returns past Tumwater Dam. If hatchery-origin Chinook are retained excess to that required to maintain a minimum 33 percent natural-origin composition in the broodstock, excess fish will be returned to the Chiwawa River beginning the third week of July. Capture and translocation of coded-wire tagged spring Chinook from Tumwater Dam to the Chiwawa River will require additional staff and equipment (distribution trucks).

Broodstock collection at the Chiwawa Weir will begin 01 June and terminate no later than 10 September. Spring Chinook trapping at the Chiwawa Weir will follow a 4-days up and 3-days down schedule, consistent with weekly broodstock collection quotas that approximate the historical run timing and a maximum 33 percent retention of the projected natural-origin escapement to the Chiwawa River. If the weekly quota is attained prior to the end of the 4-day trapping period, trapping will cease. If the weekly quota is not attained within the 4- day trapping period, the shortfall will carry forward to the next week.

All bull trout and spring Chinook in excess of broodstock needs trapped at the Chiwawa weir will be transported by tank truck and released into a resting/recovery pool at least 1.0 km upstream from the Chiwawa River weir.

Steelhead

Based on the TAC 2007 estimate for A-run summer steelhead to the Columbia River (Appendix A), sufficient UCR steelhead should be available to provide the 208 adult steelhead broodstock required to meet mitigation program objectives. The steelhead mitigation program in the Wenatchee Basin use broodstock collections at Dryden and Tumwater dams located on the Wenatchee River. Broodstock collection will target 50% natural origin fish and 50% hatchery origin fish, not to exceed 33% of the natural origin steelhead return to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 9), the following broodstock collection protocol was developed.

WDFW will retain 208 mixed origin steelhead at Dryden and Tumwater dams. Collection will be proportional to return timing between 01 July and 12 November. Collection may also occur between 13 November and 3 December at both traps, concurrent with the Yakama Nation coho broodstock collection activities. Hatchery x hatchery parental cross and unknown hatchery parental cross adults will be excluded from the broodstock collection. Hatchery steelhead parental origins

will be determined through evaluation of VIE tags and PIT tag interrogation during collection.

In the event that steelhead collections fall substantially behind schedule, WDFW may capture some adult steelhead from the mainstem Wenatchee River by hook and line. In addition to trapping and hook and line collection efforts, Tumwater and Dryden dams may be operated between February and early April to supplement broodstock numbers if the fall trapping effort provides fewer than 208 adults.

Table 9. Assumptions and calculations to determine number and origin of adult steelhead needed for Wenatchee Basin Steelhead program release of 400,000 smolts.

Program Assumption	Standard	Wenatchee program
Smolt release		**400,000**
Fertilization-to-release survival	75%	
Eggtake Target		**533,333**
Fecundity	5,400	
Female target		**99**
Female to male ratio	1 to 1	
broodstock target		**198**
Pre-spawn survival	95%	
Total broodstock collection		**208**
Natural : hatchery ratio	1 to 1	
Natural origin collection total		**104**
Hatchery origin collection total		**104**

Summer/fall Chinook

Summer/fall Chinook mitigation programs in the Wenatchee River Basin utilize adult broodstock collections at Dryden and Tumwater dams, incubation/rearing at Eastbank Fish Hatchery (FH) and acclimation/release from the Dryden Acclimation Pond. The total production level target is 864,000 smolts.

The TAC 2007 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2002, 2003 and 2004 spawn escapement to the Wenatchee River indicate sufficient summer Chinook will return to the Wenatchee River to achieve full broodstock collection for the Wenatchee River summer Chinook supplementation program. Review of recent summer/fall Chinook run-timing past Dryden and Tumwater dam indicates that previous broodstock collection activities have omitted the early returning summer/fall Chinook, primarily due to limitations imposed by ESA Section 10 Permit 1347 to minimize impacts to listed spring Chinook. In an effort to incorporate broodstock that better represent the summer/fall Chinook run timing in the Wenatchee Basin, the broodstock collection will front-load the collection to account for the disproportionate collection timing. Approximately 43 percent of the summer/fall Chinook passage to the upper Basin occurs prior to the end of the first week of July; therefore, the collection will provide 43 percent of the objective by the end of the first week of July. Weekly collection after the first week of July will be consistent with run timing of summer/fall Chinook during the remainder of the trapping period. Collections will be limited to a 33 percent extraction of the estimated

natural-origin escapement to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 10), the following broodstock collection protocol was developed.

WDFW will retain 492 natural-origin, summer Chinook at Dryden and Tumwater dams, including 246 females. To better assure achieving the appropriate females equivalents for programmed production, the collection will utilize ultra-sound equipment to determine the sex of each fish retained for broodstock. Trapping at Dryden Dam will begin 01 July and terminate no later than 31 August and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam may begin 15 July and terminate no later than 31 October and operate 3-days/week, 8-hours/day. Up to 25 percent (123) of the total broodstock collection may occur at Tumwater Dam.

If the probability of achieving the broodstock goal is reduced, based on the estimated escapement levels, broodstock composition will be adjusted to meet the broodstock collection objective of 492 fish.

Table 10. Assumptions and calculations to determine number of summer Chinook broodstock needed for Wenatchee Basin program release of 864,000 smolts.

Program Assumption	Standard	Wenatchee program
Smolt release		**864,000**
Fertilization-to-release survival	78%	
Eggtake Target		**1,107,692**
Fecundity	5,000	
Female target		**222**
Female to male ratio	1 to 1	
broodstock target		**443**
Pre-spawn survival	90%	
Total broodstock collection		**492**

Sockeye

Sockeye Salmon mitigation in the Wenatchee River Basin utilizes adult broodstock collections at Tumwater Dam, incubation/rearing at Eastbank Fish Hatchery (FH) and rearing/pre-smolt releases from the net pens in Lake Wenatchee. The total production level for the 2006 BY is 200,000 pre-smolts. 1/

The TAC 2007 UCR sockeye return projection to Columbia River (Appendix A) indicates sufficient Lake Wenatchee sockeye will be available to meet broodstock collection objectives. Based on TAC projected return, 100% natural-origin broodstock composition and assumptions listed below (Table 11), the following broodstock collection protocol was developed.

WDFW will retain 260 natural origin sockeye, proportional to run timing at Tumwater Dam. Due to the unequal sex ratio in previous years, attempts will be made to collect an equal number of males and females. Trapping may begin on 15 July and terminate by 15 August. Trapping will occur no more than 3-days/week, 8- hours/day.

If the probability of achieving the broodstock goal is reduced, based on the estimated escapement levels, broodstock number and composition will be adjusted consistent the retention of 260 sockeye with no more than 10% of the broodstock composed of adipose absent hatchery origin fish and an overall broodstock collection of no more than 10% of the total return past Tumwater Dam.

1/- Chelan HCP Hatchery Committee has agreed to future production level of 280,000 fish, pending appropriate infrastructure improvements.

Table 11. Assumptions and calculations to determine number of sockeye salmon broodstock needed for Wenatchee Basin program release of 200,000 pre-smolts.

Program Assumption	Standard	Wenatchee program
Smolt release		**200,000**
Fertilization-to-release survival	78%	
Eggtake Target		**256,410**
Fecundity	2,615	
Female target		**99**
Female to male ratio	1 to 1	
broodstock target		**198**
Pre-spawn survival	76%	
Total broodstock collection		**260**

Coho

Yakama Nation will provide broodstock collection objectives and program assumptions for the coho reintroduction program in the Wenatchee River basin. WDFW will work collaboratively with the Yakama Nation to facilitate coho broodstock collections at Dryden and Tumwater Dam.

White River Spring Chinook Captive Brood

Smolt production associated with the White River Captive Broodstock Program (150,000 smolts) will be separate from the smolt production objective associated with the Chiwawa River adult supplementation program. Spawning, incubation, rearing acclimation and release are components of Grant PUD ESA Section 7 Consultation on Interim Operations for Priest Rapids Hydroelectric Project (FERC 2114) NOAA Fisheries Consultation No. 19999/01878.

Broodstock collection efforts for brood year 2007 will be addressed in a document separate from this 2007 broodstock collection/protocol document and developed through the Priest Rapids Coordinating Committee Hatchery Committee (PRCC HC).

Priest Rapids Fall Chinook

Collection of fall Chinook broodstock at Priest Rapids Hatchery will generally begin in early September and continue through mid November. Smolt release objectives specific to Grant PUD (5,000,000 sub-yearlings) and Federal (1,700,000 sub-yearlings) mitigation commitments and biological assumptions are detailed in Table 12.

Table 12. Assumptions and calculations to determine the number of fall Chinook broodstock needed for the Priest Rapids program release of 6,700,000 sub-yearling fall Chinook		
Biological Assumptions	**Standard**	**Program Objective**
Smolt Production level:		
Grant PUD Mitigation-PUD Funded		**5,000,000**
John Day Mitigation- Federally Funded		**1,700,000**
Fert.-to-release survival	87%	
Eggtake Target		**7,700.000**
Fecundity	*4,500*	
Female requirement		**1,711**
Sex ratio	*1:1*	
Pre-Spawn Survival	*88%*	
Broodstock Required		**3,91**

APPENDIX A

Columbia River Salmon and Steelhead - 2007 Forecasts: Spring Chinook, Summer Chinook and Sockeye

2007 Forecasts For Columbia River Spring Chinook, Summer Chinook, Sockeye and Steelhead			
	2006 Forecast	**2006 Return**	**2007 Forecast**
Upriver Spring Chinook [1/]	88,400	132,100	78,500
Snake River Spring/Summer Chinook [2/]	*46,200*	*53,000*	*38,500*
Snake River Wild Spring/Summer Chinook [3/]	*14,600*	*16,700*	*13,100*
Upper Columbia Spring Chinook [2/]	*12,600*	*21,100*	*9,200*
Upper Columbia Wild Spring Chinook [4/]	*1,600*	*2,800*	*1,200*
Upper Columbia Summer Chinook	49,000	76,200	45,600
Willamette Spring Chinook	46,500	59,700	52,000
Cowlitz, Kalama, Lewis River Spring Chinook[6/]	15,200	20,100	15,900
Yakima Spring Chinook[6/]	6,700	6,000	4,100
Klickitat Spring Chinook[6/]	1,300	1,700	1,200
Wind[6/]	7,500	4,700	2,100
Little White Salmon[6/]	12,500	10,500	6,000
Sockeye[5/]	31,100	37,100	27,300
Wenatchee Stock	*7,800*	*10,300*	*6,600*
Okanogan Stock	*23,300*	*26,700*	*20,700*
Snake River Sockeye	*21*	*79*	*300*
Steelhead			
Wild Winter Steelhead	16,000	16,600	16,200
Summer Steelhead			
Skamania Hatchery	*11,800*	*7,700*	*12,300*
Skamania Wild	*3,800*	*2,200*	*4,400*
A-Index Hatchery	*187,300*	*181,400*	*199,900*
A-Index Wild	*66,100*	*63,700*	*41,600*
APPENDIX A Cont.			

	45,600	*65,700*	*45,600*
B Index Wild	*9,800*	*8,500*	*10,800*
Total Summer Steelhead	324,400	329,200	314,600

[1/] Includes Snake River Summer Chinook.
[2/] Included in Upriver Spring Chinook number.
[3/] Included in Snake River Spring/Summer Chinook number.
[4/] Included in Upper Columbia Spring Chinook number.
[5/] Includes Wenatchee, Okanogan, and Snake River stocks.
[6/] To mouth of tributary

Prepared by *U.S. v Oregon* Technical Advisor Committee
December 11, 2006
Revised January 10, 2007

APPENDIX J

WELLS HATCHERY COMPLIANCE REPORT

Wells HCP Hatchery Production Compliance Report
2007 Wells HCP Action Plan
HCP Hatchery Committee

Inundation Compensation Program

The FERC license to operate the Wells Hydroelectric Project requires Douglas PUD to raise and release fish to compensate for original impacts associated with the development of the Wells Reservoir. All of the fish for this program are raised at the Wells Fish Hatchery. The number and pounds of fish to be release each year, for the Inundation Compensation Program, can be found in Section 8.4.6 of the Wells HCP Agreement.

Inundation Compensation Program	Numeric Target	Poundage Target	Target Wt.	Number Released	Fish per Pound	Pounds Released
Yearling Summer/Fall Chinook (2005 BY)	320,000	32,000	10 fpp	333,587[1]	10.7	31,176
Subyearling Summer/Fall Chinook (2006 BY)	484,000	24,200	20 fpp	396,538[2]	39.9	9,927
Yearling Summer Steelhead (2006 BY)	300,000	50,000	6 fpp	301,681[3]	6.7	45,027

[1] C. Snow, June 2007 Memo for the total released.

[2] C. Snow June 2007 and July 2007 show an early release on May 16, 17 of 204,525 (58 fpp) and a late release on June 13 of 192,013 (30 fpp). The numbers of sub yearling releases were low due to an outbreak of coagulated yolk disease (Snow, January 2007). The poundage obligation was affected by the experimental early release of fish conducted by WDFW hatchery evaluation staff. The HCP-HC supported the experimental release on March 21, 2007.

[3] C. Snow June 2007 Memo shows total release of 451,374 steelhead smolts at 67,369 lbs, which is 100.6% of the numerical target for release. The small overage was equally assigned to Wells Inundation, 301,681; to NNI 49,151 and to Grant Group 3 steelhead, 100,600 under the Grant PUD Sharing Agreement.

No Net Impact Compensation Program

Section 8.4.3 of the Wells HCP contains specific numbers and pounds of juvenile plan to be produced to meet Douglas PUD's No Net Impact production levels for unavoidable juvenile losses at the Wells Project. Juvenile passage losses are off-set through the production of juvenile plan species at three facilities (Wells Fish Hatchery, Methow Fish Hatchery and Eastbank Fish Hatchery) and through the implementation of mitigation options identified in the Sockeye Enhancement Decision Tree.

No Net Impact Compensation Program	Numeric Target	Poundage Target	Target Wt.	Number Released	Fish Per Pound	Pounds Released
Yearling Summer Steelhead (2006 BY)	48,858	8,143	6 fpp	49,151[4]	6.7	7,336
Yearling Summer/Fall Chinook (2005 BY)	108,570	10,857	10 fpp	71,576[5]	10.0	7,158
Yearling Spring Chinook (2005 BY)	61,071	4,071	15 fpp	46,292[6]	17.2	2,691
Yearling Osoyoos Lake Sockeye[7]	7%	NA	NA	55%	NA	NA

[4] See footnote 3.

[5] Carlton Pond Summer Chinook released by Chelan PUD for Douglas PUD as part of Douglas-Chelan Hatchery Sharing Agreement. Program was short because of a low proportion of females in the 2005 brood.

[6] There were 417,102 spring Chinook smolts released at an average of 17.2 fpp from the Methow Hatchery (May 2007 Memo from C. Snow). The target release of 550,000 fish was a combination of Wells NNI (61,071) and the sharing agreements with Chelan PUD (288,000) and Grant PUD (201,000). This is 75.8% of the numerical target for release for 2007. The shortfall was equally applied to the three programs giving Wells NNI 46,292; Chelan PUD 218,304 and Grant PUD 152,358 fish in 2007.

[7] Okanogan Sockeye obligation for NNI is handled through the Fish/Water Management Tool program managed through the Okanagan Nation Alliance. The HCP Hatchery and Coordinating committees have agreed that the continued implementation of this program will satisfy Douglas PUD's 7% hatchery compensation requirement for sockeye.

APPENDIX K

2007 ACTION PLAN: WELLS HCP

2007 ACTION PLAN
WELLS HCP

HCP COORDINATING COMMITTEE

1. BYPASS OPERATING PLAN
    a. Draft to Committee: January 2007.
    b. Approval Deadline: March 2007.
    c. Period Covered: April to August 2007.
    d. Report Deadline: October 2007.

2. BULL TROUT MONITORING AND MANAGEMENT PLAN
    a. Period Covered: March 2005 to July 2008.
    b. Report Deadline: March 2007, March 2008 and December 2008

3. Predator Control Programs
    a. Northern Pikeminnow Removal Program in Wells Reservoir (March – July 2007)
    b. Avian Predator Hazing at Wells Dam (April – May 2007)

4. Ladder Passage Improvements
    a. Tour of Hydraulics Lab and Model (January 2007)
    b. Approval of Ladder Baffle Concept and Plans (January 2007)
    c. Installation of Baffle in East Ladder (February 2007)
    d. Approval of Telemetry Evaluation Study Plan (March 2007)
    e. Telemetry Evaluation (July – August 2007)
    f. Evaluation Draft Report (November 2007)
    g. Approval of Ladder Baffle and Installation of Baffle for West Ladder (Dec. 2007)

HCP HATCHERY COMMITTEE

1. 5-YEAR HATCHERY MONITORING AND EVALUATION PLAN
    a. Implementation: 2006 to 2010.
    b. Draft Annual Report: March 2007
    c. Final Annual Report: April 2007

2. HCP ANNUAL HATCHERY PRODUCTION COMPLIANCE REPORT
    a. Period Covered: January 2007 to December 2007.
    b. Draft to Committee: November 2007.
    c. Approval Deadline: December 2007.
    d. Submission Deadline: December 2007.

3. 2007 BROOD STOCK PROTOCOL
    a. Draft to Committee: February 2007.
    b. Approval Deadline: April 2007.
    c. Implementation: May 2007 to May 2008.

4. ANNUAL IMPLEMENTION REPORT - SOCKEYE FLOW MANAGEMENT
    a. Period Covered: Linked to Brood Years (incubation through emergence).
    b. Draft to Committee: One report per year.
    c. Final Reports Due: 60-days after comments received from committee.

5. HATCHERY CONSTRUCTION RELATED PROJECTS
    a. Upgrade of Wells Hatchery Surface Water Screens
        1. Project out for Bids (summer 2007)
        2. Award bids (fall 2007)
        3. Construction activities (October 2007 – February 2008)
    b. Methow Hatchery Ground Water Well Upgrade
        1. Re-drill well #5 (May 2007)
    c. Twisp Broodstock Collection Weir
        1. Inform local residents of preferred design (Spring 2007)
        2. Develop design and seek permits for construction (May 2007)
        3. Begin construction (October 2007)
        4. Completed (December 31,2007)
    d. Chewuch Broodstock Collection weir
        1. Inform local residents of preferred location (February 2007)
        2. Look for alternative locations (January – March 2007)
        3. Develop design and seek permits for construction (May 2007)
        4. Begin construction (Dec 2007)

6. Decision on Okanogan Spring Chinook (per Section 8.4.5.2; December 2007)

7. Decision on Coho (per Section 8.4.5.1 and SOAs from HC and CC of December 27, 2006)

HCP TRIBUTARY COMMITTEE

1. ANNUAL REPORT - PLAN SPECIES ACCOUNT STATUS
    a. Draft to Committee: February 2007.
    b. Approval Deadline: March 2007.
    a. Period Covered: January to December 2006; note: assignment of the funding responsibilities among the three accounts (Wells, Rock Island, and Rocky Reach) for projects selected in 2006 was deferred by the respective committees until the 11 January 2007 meeting.

2. THIRD-ROUND REVIEW AND FUNDING DECISIONS
    a. RFP: *To be determined*
    b. Approval Deadline: *To be determined*
    c. Implementation: *To be determined*

APPENDIX L

HATCHERY EVALUATION TECHNICAL TEAM

OPERATING PROCEDURES

HATCHERY EVALUATION TECHNICAL TEAM OPERATING PROCEDURES

WELLS, ROCKY REACH, AND ROCK ISLAND HABITAT CONSERVATION PLANS

July 31, 2007

I. OVERVIEW AND PURPOSE

The Hatchery Evaluation Technical Team (HETT) is an informal subcommittee under the Hatchery Committees of the Wells, Rocky Reach, and Rock Island Projects Anadromous Fish Agreements and Habitat Conservation Plans (HCPs). It is not a standing committee identified in or required by any of the HCPs. The primary purpose of the HETT is to address technical issues related to implementation of the HCP Hatchery Monitoring and Evaluation (M&E) Programs. The HETT receives all assignments from the Hatchery Committees. The HETT communicates its findings to the Hatchery Committees in the form of recommendations.

These Operating Procedures have been drafted to provide general guidance and understanding of the functions of the HETT to members of the HETT and to the Hatchery Committees. These Operating Procedures are subject to periodic review and revision at the discretion of the Hatchery Committees, and are under the authority of the Operating Procedures of the Hatchery Committees.

II. ATTENDANCE

HETT attendance is open and voluntary for representatives from signing parties of the Wells, Rocky Reach, and Rock Island HCPs. As of April 2007, the HETT has the following regular attendees:

- Kris Petersen, National Marine Fisheries Service
- Andrew Murdoch, Washington Department of Fish and Wildlife
- Chuck Peven, Chelan County Public Utility District
- Steve Hays, Chelan County Public Utility District
- Tom Kahler, Douglas County Public Utility District
- Matt Cooper, U.S. Fish and Wildlife Service
- Keely Murdoch, Yakama Nation
- Tracy Hillman, Bioanalysts
- Ali Wick, Anchor Environmental, L.L.C. (facilitator)

Technical staffs supporting the signing parties may participate in HETT discussions and the development of recommendations at the discretion of the signing parties. In addition, for coordination with the Priest Rapids Coordinating Committee - Hatchery Subcommittee (PRCC-HSC), representatives from the PRCC-HSC may also participate in HETT discussions and development of recommendations.

V. FACILITATOR

During periods of high work load, the HETT may utilize a third party to facilitate meetings. In addition to facilitating meetings, this individual is expected to manage between-meeting communications, prepare and distribute agendas, assist the HETT in developing recommendations, and coordinating with the Hatchery Committees as needed.

IV. MEETINGS

Initially, the HETT members have agreed to meet monthly from 9:00 am to 5:00 pm on the second Tuesday of each month, unless otherwise agreed to by the HETT. Additional meetings may be scheduled as needed. As the number of technical issues arising from implementation of the HCP Hatchery M&E Programs diminish over time, the HETT Subcommittee will adjust its' meeting schedule accordingly.

The facilitator will distribute the meeting notice and preliminary agenda one week prior to the meeting. The notice and agenda will identify matters to be addressed during the meeting. The agenda can be updated at the meeting with current topics arising after agenda distribution. Because this is a technical working group with no decision authority, there are no formal meeting minutes.

VI. ASSIGNMENTS

The HCP Hatchery Committees are solely responsible for assigning questions and/or issues for analysis and deliberation to the HETT. These assignments will typically be made via discussion at the regular Hatchery Committees meetings and will be documented in the Hatchery Committees meeting minutes. The Hatchery Committees shall, at the time of the assignment, provide general guidelines for addressing the questions or issues, and a timeline for completing the assignment.

VII. PRODUCTS

HETT consensus conclusions or alternative conclusions shall be provided to the Hatchery Committees in the form of recommendations. These recommendations will be provided to the Hatchery Committees in writing (email or summary report). The HETT may initiate discussions with the Hatchery Committees regarding these recommendations in meetings or calls prior to providing a final recommendation. The HETT shall construct recommendations in a collaborative, team manner, incorporating technical knowledge and tools as needed.

APPENDIX M

MONITORING AND EVALUATION OF WELLS AND METHOW HATCHERY PROGRAMS IN 2006

(Appendix M is provided only in the CD-ROM versions of this report and in the submittal to FERC. This appendix is available from Douglas PUD upon request.)

MONITORING AND EVALUATION OF WELLS AND METHOW HATCHERY PROGRAMS IN 2006

for

Douglas County Public Utility District

and

Wells Habitat Conservation Plan Hatchery Committee

by

Charlie Snow
Charles Frady
Andrew Fowler
Andrew Murdoch

Washington Department of Fish and Wildlife
Supplementation Research Team
Methow Field Office
Twisp, WA

and

Maureen Small
Kenneth I. Warheit
and Cheryl Dean

Washington Department of Fish and Wildlife
Conservation Unit, Genetics Lab
Olympia, WA

1 March 2007

Executive Summary

The Public Utility District No. 1 of Douglas County funds hatchery programs intended to supplement natural populations of spring Chinook and summer steelhead, and to produce summer Chinook salmon for harvest augmentation. These hatchery programs collect, rear, and release salmonids in accordance with protocols governing the number, origin, and timing of adult salmon and steelhead collected, thereby affecting the subsequent number and genetic composition of the juveniles released. For the 2004 brood spring and summer Chinook and 2005 brood steelhead, adult collections closely resembled the total number of fish required for each species, but too few wild fish were collected to achieve specified goals for most programs. Pre-spawn survival of all adult fish was above the set standards for each program, but only Methow spring Chinook exceeded all juvenile survival standards during hatchery rearing. Spawning of adult fish produced enough progeny for juvenile releases to achieve 95% of program goals for steelhead and summer Chinook. Spring Chinook smolt releases were 67% of the specified release goal despite adequate broodstock collection because 202,763 fish were released as age-0 fish to decrease rearing densities and assist in BKD management at the hatchery. Recent brood years of salmon and steelhead exhibited hatchery replacement rates great enough to replace parent broods (i.e., > 1), but each species examined had at least one release group that did not meet the expected hatchery replacement rate.

Harvest of supplementation fish may be appropriate after hatchery broodstock and spawning ground escapement objectives have been met. Salmon released for production purposes are appropriate fish for fisheries to target after hatchery broodstock requirements have been reached. Returning salmon and steelhead, regardless of production type, may stray into non-target areas potentially altering the genetic composition of the receiving stock, and leaving target spawning grounds under-seeded. All stocks of salmon and steelhead covered in this chapter were subject to commercial, sport, or tribal fisheries in ocean or freshwater environments. Based on analysis of coded-wire tag data, most Wells summer Chinook adults were recovered in fisheries, while most Methow spring Chinook stocks were recovered in hatchery broodstocks or on spawning grounds. Although the numbers of summer Chinook released as yearlings and subyearlings was similar, yearling releases returned 14 adults for every adult returning from subyearling releases. Harvest of adult hatchery steelhead occurring in the upper Columbia River ESU was monitored through local creel census. An estimated 1,706 hatchery steelhead and 16 wild steelhead were lethally removed from the 2005 brood of returning adults through sport fisheries. Overall, Wells Complex hatchery fish provided commercial and recreational harvest while meeting broodstock and spawning ground requirements.

Until the carrying capacity of the target stream is reached, the increased abundance of spawning adults should result in an increased number of smolts. The number of smolts produced per each redd is a metric used to compare the relative productivity of target species during freshwater rearing. We used rotary screw traps to estimate the number of spring Chinook and summer steelhead smolts emigrating from the Twisp and Methow River basins. We captured a total of 552 wild spring Chinook smolts at the Methow River trap and 835 smolts at the Twisp River trap. A total of 362 and 504 wild steelhead emigrants were captured at the Methow and Twisp River traps, respectively. The number of these species captured each day was expanded by trap

efficiency estimates derived from mark/recapture efficiency trials. Using this methodology, we estimate that a total of 15,869 wild spring Chinook smolts emigrated from the Methow River, including 5,092 smolts emigrating from the Twisp River. An estimated 13,783 wild steelhead emigrated from the Methow River, including 4,970 fish from the Twisp River. Utilizing data gathered during spring Chinook spawning ground surveys in 2004, we estimated that the mean number of smolts produced from each spring Chinook redd in Methow River Basin excluding the Twisp River (24), was 47% lower the than the mean number of smolts produced from the Twisp River (45). Because juvenile steelhead migrate over a four-year period, we were unable to produce completed smolt-per-redd values for steelhead in the Methow or Twisp Rivers. While data for spring Chinook for each trapping location were similar, we were unable to assess the relative contribution of naturally spawning hatchery fish to smolt production without similar data from non-supplemented reference populations.

The Methow River basin was divided into four distinct sub-basins and index areas of steelhead spawning activity were developed within each sub-basin. Spawning-ground surveys were performed by walking or rafting the index areas weekly between 21 March and 1 June. To account for redds outside of index areas, non-index-area redd counts were expanded by a ratio of visible to non-visible redds from index area surveys. Spawning within the tributaries of each sub-basin was estimated by expanding tributary index areas as with mainstem areas, or by randomly choosing one tributary to serve as an index tributary for redd density for other similar tributaries within each sub-basin. We estimated a minimum of 810 steelhead redds were constructed in the Methow River basin in 2006. High river discharge and poor visibility in some mainstem reaches limited observer efficiency in locating redds. The greatest number of redds were found in the Twisp River sub-basin ($N = 391$). Both the Upper Methow River ($N = 171$) and Lower Methow River ($N = 181$) had a similar number of redds. Redd abundance in the Chewuch River sub-basin ($N = 67$) was most affected by poor water visibility during the survey period. Peak spawning was observed the week of 3April in the Lower Methow River sub-basin and the week of 17 April in the remaining three sub-basins. The spawning population in 2006 was composed primarily of hatchery origin steelhead (90.7%). Based on biological sampling of steelhead during broodstock collection at Wells Hatchery, 7.9% of the hatchery origin escapement was composed of out-of-basin stray hatchery fish, primarily releases from the Wenatchee River basin. Wild fish composed 9.3% of the escapement and were primarily fish from the 2001 brood escapement. Based on estimates of run escapement, the mean natural replacement rate for the five most-recent broods of steelhead spawning above Wells Dam (1996-2000) was 0.27 recruits per adult.

The Methow River basin was divided into three geographic sub-basins; Methow River (upstream of Twisp), Chewuch River, and Twisp River with designated index areas in each sub-basin to determine spring Chinook spawn timing, distribution, and abundance. Spawning ground surveys were performed on foot between 31 July and 29 September. We estimated a minimum of 929 Chinook redds were constructed in the Methow River basin in 2006. The Methow River sub-basin, which includes the Lost River, Early Winters Creek, and both hatchery outfalls had the greatest number of redds ($N = 569$). The Chewuch River ($N = 273$) had fewer redds than the mainstem Methow River ($N = 395$), and the fewest redds were located in the Twisp River ($N = 87$). Peak spawning occurred between 27 August and 8 September in index areas of all three sub-basins. An estimated 4,365 spring Chinook migrated past Wells Dam in 2006. No estimates

of dam fallback, poaching, or pre-spawn mortality were made. Based on male-to-female ratios at Wells Dam (0.88:1.0), an estimated 1,748 fish spawned in the Methow River Basin. After removing fish collected for hatchery broodstock (N = 780), and fish bound for the Okanogan River (N =110), the estimated spawning population represents only 50.3% of the estimated escapement to the Methow River Basin of 3,475 fish. The estimated overall spawning population in 2006 was composed primarily of hatchery origin Chinook (81.2%). However, differences in the estimated proportion of wild fish were evident among sub-basins with the Twisp and Chewuch Rivers having greater proportions of wild fish (39.4% and 26.3%, respectively) than the Methow River and tributaries (12.0%). Age-4 fish were the majority of local-hatchery Chinook (95.5%) and wild Chinook (68.0%) carcasses recovered in the Methow Basin. The proportion of age-5 fish was much greater for wild Chinook (32.0%) than for hatchery fish (4.5%). The Natural Replacement Rate (NRR) for the most recent brood of spring Chinook with complete recovery data (2000 brood) was highest in the Twisp River sub-basin (1.45 fish per spawning adult). The geometric mean NRR for brood years 1992 to 1999 was less than 1.0 fish per spawning adult in each sub-basin. Of all the identified coded-wire tagged hatchery fish recovered on spawning grounds in 2006, 30.5% were within-basin strays and 5.5% were stray fish from other basins.

Temporal tissue samples from 1992 through 2006 of fish from the Winthrop National Fish Hatchery (WNFH), and hatchery- and natural-origin fish from the Methow, Twisp, and Chewuch rivers were genetically characterized. Twisp hatchery- and natural-origin collections formed a discrete group distinct from a Methow-Chewuch-WNFH group. Methow collections were genetically very similar to the WNFH collections and differentiated from 1992 and 1993 Chewuch collections. The Methow and Chewuch became more similar after implementing the hatchery broodstock developed from a combination of Methow and Chewuch spawners. Collections were examined for signals indicating negative effects from hatchery supplementation, which was started in 1992 and a genetic bottleneck experienced by all fish in 1996-1997. Genetic diversity measures, heterozygosity and allelic richness, and genetic differences between Twisp and other collections were unchanged following hatchery supplementation and the bottleneck. Effective population sizes were difficult to compare pre- and post-supplementation and bottleneck since values differed significantly between 1992 and 1993 collections. When comparing only collections from 2001 and beyond, effective population sizes remained stable in Methow and Chewuch and declined in the Twisp, although supplementation has slowed the decline in Twisp fish. Assignment tests indicated that if natural-origin fish were collected at Wells Dam for broodstocks and assigned with a moderate probability threshold (10 times more likely to have come from one collection as from another), there is low risk of incorrectly identifying a Methow-Chewuch fish as a Twisp fish and even lower risk of incorrectly identifying a Twisp fish as a Methow-Chewuch fish.

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General Introduction

The Public Utility District No. 1 of Douglas County (DCPUD) funds hatchery programs to compensate for inundation of spawning habitat related to the construction of the Wells Hydroelectric Project and for mortality associated with operation and passage at the Project as part of the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Wells Hydroelectric Project (Wells HCP 2002). The Joint Fishery Parties (JFP) developed specific goals for these hatchery programs, which are described in the Monitoring and Evaluation Plan (Wells HCP HC 2005).

1. Support the recovery of ESA-listed species by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity (i.e., Methow spring Chinook, Methow summer steelhead, Okanogan summer steelhead).

2. Increase the abundance of the natural adult population of unlisted plan species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest (i.e., Methow summer/fall Chinook, Okanogan sockeye).

3. Provide salmon for harvest and increase harvest opportunities, while segregating returning adults from natural spawning populations (i.e., Wells summer/fall Chinook).

These programs occur at either Wells Hatchery located on the west bank of the Columbia River adjacent to Wells Dam (rkm 830) or Methow Hatchery located on the Methow River (rkm 83) upstream of the town of Winthrop. At Wells Hatchery, summer steelhead adults are collected at the adjacent Wells Dam fishways, spawned, and reared as part of what the JFP have labeled a supplementation program. Subsequently, juvenile steelhead are released into the Methow and Okanogan River basins in an effort to increase the abundance of naturally produced populations (Snow 2004). Summer Chinook are also collected, spawned, reared, and released directly from Wells Hatchery into the Columbia River as part of a harvest augmentation program (Snow 2005). Methow Hatchery operates as a spring Chinook supplementation facility. Broodstock are collected from the Methow, Chewuch and Twisp rivers or in some years from Wells and/or Methow hatcheries. Juvenile spring Chinook are reared on Methow, Twisp, and Chewuch River surface water through the use of acclimation ponds prior to release (Humling 2005; Figure 1).

The Wells HCP Hatchery Committee (HC) developed and adopted a conceptual monitoring and evaluation plan for the hatchery programs that consists of 10 objectives (Wells HCP HC 2005). This report summarizes activities and data collected during 2006 required to address the program-specific objectives and is consistent with the implementation plan proposed by the Supplementation Research Team (SRT) of the Washington Department of Fish and Wildlife (WDFW) and approved by the HCP HC (SRT 2005). Hence, annual reports are based on activities conducted during the calendar year or, as necessary, directly related activities from previous years. These activities are reported by subject within each chapter of the report.

Analysis of the data and results for each objective in the monitoring and evaluation plan will be presented in a separate five-year report.

Specific Monitoring and Evaluation Objectives

Objective 1: Determine if supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e., reference stream) and the changes in the natural replacement rate (NRR) of the supplemented population is similar to that of the non-supplemented population.

Objective 2: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the target population are similar.

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate, HHR) is greater than the natural adult-to-adult survival (i.e., natural replacement rate, NRR) and equal to or greater than the program specific HRR expected value (BAMP1998).

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

Objective 6: Determine if hatchery fish were released at the programmed size and number.

Objective 7: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate.

Regional Objectives

Objective 9: Determine if the incidence of disease has increased in the natural and hatchery populations.

Objective 10: Determine if the release of hatchery fish impact non-target taxa of concern (NTTOC) within acceptable limits.

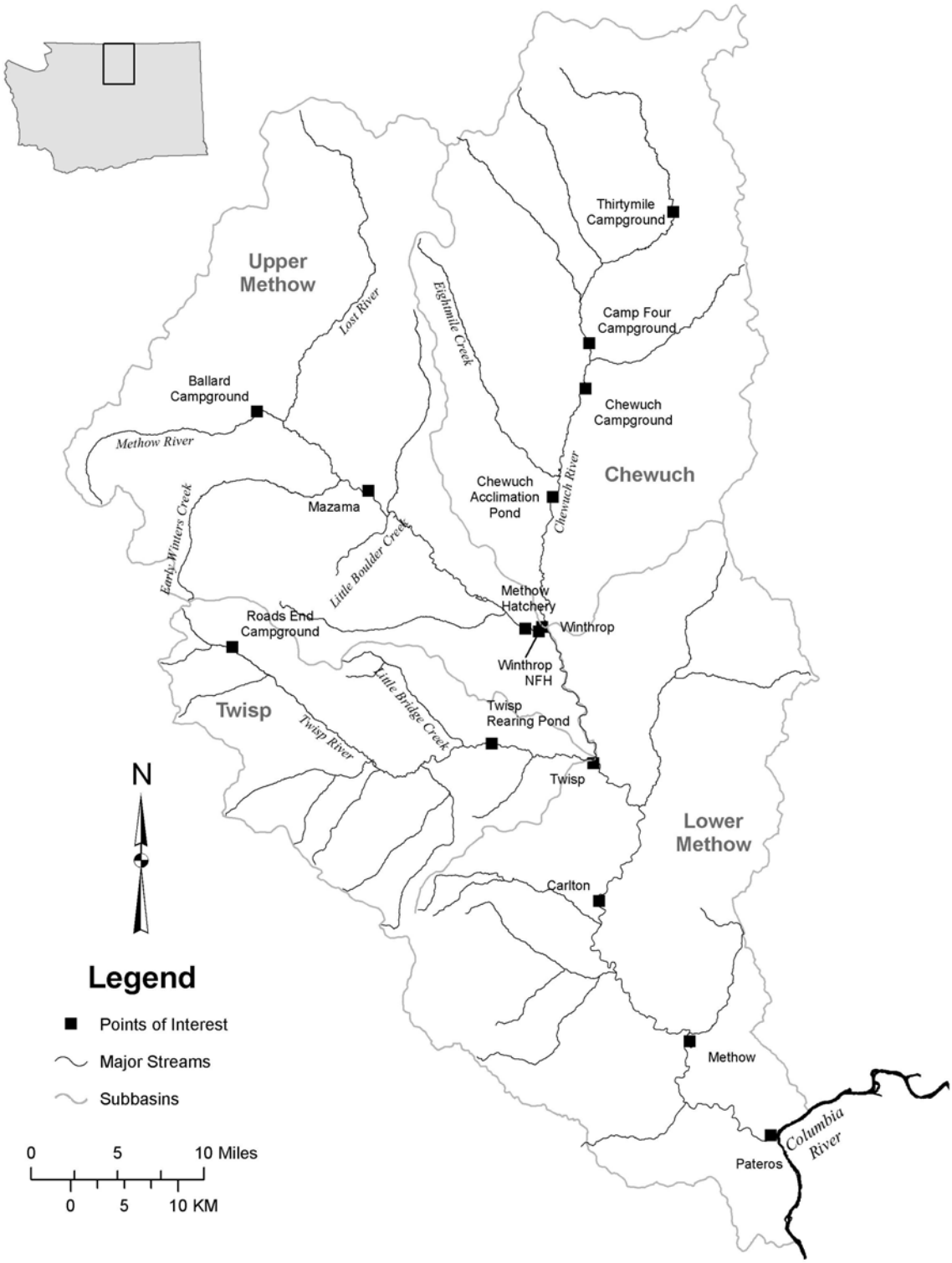

Figure 1. Map of Methow River Basin hatchery facilities and rearing ponds.

Chapter 1

2004 Brood Spring and Summer Chinook and 2005 Brood Summer Steelhead reared at Methow and Wells Hatchery Facilities

Abstract

The Public Utility District No. 1 of Douglas County funds hatchery programs intended by the JFP to supplement natural populations of spring Chinook and summer steelhead, and to produce summer Chinook salmon for harvest augmentation. These hatchery programs collect, rear, and release salmonids in accordance with protocols governing the number, origin, and timing of adult salmon and steelhead collected, thereby affecting the subsequent number and genetic composition of the juveniles released. For the 2004 brood spring and summer Chinook and 2005 brood steelhead, adult collections approximated the total number of fish required for each species, but too few wild fish were collected to achieve specified goals for most programs. Pre-spawn survival of all adult fish was above the set standards for each program, but only Methow spring Chinook exceeded all juvenile survival standards during hatchery rearing. Spawning of adult fish produced enough progeny for juvenile releases to achieve 95% of program goals for steelhead and summer Chinook. Spring Chinook smolt releases were 67% of the specified release goal despite adequate broodstock collection because 202,763 fish were released as age-0 fish to decrease rearing densities and assist in BKD management at the hatchery. Recent brood years of salmon and steelhead exhibited hatchery replacement rates great enough to replace parent broods (i.e., > 1), but each species examined had at least one release group that did not meet the expected hatchery replacement rate.

Introduction

Supplementation programs must achieve a minimum survival rate of fish in the hatchery and after release such that a greater number of fish return as adults than were collected for broodstock. Release goals for DCPUD-funded hatchery programs are based on mitigation for mortality associated with inundation of spawning habitat resulting from the construction of the Wells Hydroelectric Project and mortality resulting from the operation of the Wells Hydroelectric Project (Wells HCP 2002). Hatchery mitigation is a critical component of achieving no net impact (NNI) from the Wells Hydroelectric Project on anadromous fish populations. The number of broodstock required for each hatchery program was derived from biological assumptions related to the sex ratio, broodstock survival, fecundity, and juvenile survival within the hatchery. The ratio of the number of returning hatchery fish from a particular brood year to the number of broodstock collected for that brood is referred to as the hatchery replacement rate (HRR). A minimum expected HRR for each hatchery program was calculated using these data and listed in the Monitoring and Evaluation Plan (Wells HCP HC 2005). The HRR of hatchery programs must also be greater than the number of naturally produced fish that would have been produced if the broodstock were allowed to spawn naturally. The ratio of the number of naturally produced adults to the number of spawners of the parent brood is referred to as the natural replacement rate (NRR) or recruits per spawner. Should the survival of hatchery

fish decline such that the actual HRR falls below the expected HRR or the NRR of the target population, a reassessment of the hatchery program may be required.

Harvest augmentation programs were developed to replace lost natural production due to the loss of habitat from inundation and lost harvest opportunities resulting from the construction of the hydroelectric project. While the Wells summer Chinook program remains a harvest augmentation program, the ESA listing of steelhead required a shift from harvest augmentation to supplementation in order to assist in the recovery of the populations upstream of Wells Dam (Wells HCP HC 2005). The survival standards of hatchery fish in harvest augmentation programs are identical to those in supplementation programs. However, since the returning hatchery adults are not intended to spawn naturally, comparisons between HRR and NRR are not applicable.

The Wells HCP outlines the number and size (fish per pound) of fish that are to be released from each hatchery program. While the M & E Plan lists target length and weight goals for each program consistent with the size goals in the HCP (Wells HCP HC 2005, Appendix C, Table 5). Modifications to the number of fish released in NNI hatchery compensation or supplementation programs may occur based on the survival studies conducted at each hydroelectric project or as a result of monitoring and evaluation activities. Monitoring the number and size of fish released is critical in evaluating the hatchery programs and ensuring the conditions of the HCP are being met.

This chapter addresses hatchery activities related to the 2004 brood Wells summer Chinook, 2004 brood Methow spring Chinook, and the 2005 brood Wells summer steelhead. The information presented is applicable to many of the M & E Plan objectives, but will specifically report primary indicators (hatchery replacement rate, number of fish released and size of fish released) for the following objectives and associated hypothesis statements:

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

- Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$
- Ho: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific expected value (BAMP 1998).

- Ho: HRR ≥ Expected value per assumptions in BAMP

Objective 6. Determine if hatchery fish were released at the programmed size and number.

- Ho: Hatchery fish $_{\text{Size}}$ = Programmed $_{\text{Size}}$
- Ho: Hatchery fish $_{\text{Number}}$ = Programmed $_{\text{Number}}$

Methods

Broodstock Collection and Spawning

Salmon and steelhead broodstock were collected in accordance with protocols designed to ensure enough fish of a desired genetic composition were collected to satisfy specific program release goals (Praye et al. 2004a; Appendix A). Although broodstock was collected for Wells HCP hatchery programs and other unrelated programs (i.e., Turtle Rock Summer Chinook Program [Chelan PUD], Winthrop Summer Steelhead Program [USFWS], and Ringold Hatchery Steelhead Program [WDFW]), this chapter only describes and reports on activities related to hatchery programs funded by Douglas County PUD.

Broodstock were collected as specified in collection protocols. Hatchery summer Chinook were collected as volunteers to Wells Hatchery. Wild summer Chinook were collected from the west ladder at Wells Dam. Summer steelhead were also collected from the east and west ladders of Wells Dam. Tributary collection of spring Chinook occurred at sites on the Methow (Foghorn Dam, Methow and Winthrop Hatchery outfalls), Chewuch (Fulton Dam), and Twisp rivers (Twisp Weir). In addition to specifying the collection location and target numbers, the collection protocols also designated a maximum extraction rate for most hatchery broodstocks. Extraction rates are expressed as a proportion of the escapement that may be retained for hatchery broodstocks.

Run escapement estimates for Wells Hatchery summer Chinook were calculated as the difference between the number of summer Chinook counted at Wells and Rocky Reach Dams. Although some mainstem spawning occurs and tributaries enter the Columbia River between the two dams (e.g., Entiat and Chelan rivers), natural production of summer Chinook in these areas is limited (Hamstreet 2005, 2006; Miller 2006). The Methow spring Chinook run escapement at Wells Dam was estimated by removing summer Chinook passing Wells Dam during the spring Chinook migration period (Humling and Snow 2005). Spawning escapement estimates for spring Chinook in individual tributaries were calculated from expanded redd counts.

Broodstock were scanned for marks or tags during trapping to assess the number of hatchery and naturally produced fish collected. Spring Chinook were held in separate ponds depending on collection location, or were externally marked (e.g., opercle punch) prior to mixing in order to facilitate mating by collection location at spawning. During spawning, broodstock were crowded to one end of a holding pond and sexually mature fish were sorted to separate holding pens. Spring Chinook, steelhead, and summer Chinook females utilized for yearling programs were given a unique number at spawning to allow tracking of biological samples (e.g., age, fecundity, ELISA), and to facilitate genetic crossing based on coded-wire tag data. Spawning occurred weekly until the broodstock were exhausted or egg collection goals had been satisfied. Spring Chinook adults and gametes were transferred between Methow Hatchery (MH) and Winthrop National Fish Hatchery (WNFH) as necessary to meet program or rearing requirements. In addition to locally collected broodstock, some Twisp stock spring Chinook gametes were received from a captive brood program at Aquaseed Corporation. Conversely, locally collected Twisp stock male fish were spawned and their gametes transferred as necessary to Aquaseed Corporation to ensure adequate milt availability for female Twisp Chinook held at the facility.

Biological sampling of broodstock occurred after the gametes were collected. Personnel collected length, sex, mark, scale, and origin data in addition to recovering CWTs. Tissue samples were also collected from both spring Chinook and steelhead broodstock. The unique sample number assigned to each fish at spawning allowed for the correlation of health sample (i.e., ELISA), fecundity, and egg mortality data provided by hatchery or WDFW fish health personnel.

Juvenile Rearing and Release

A description of the rearing facilities at Methow and Wells hatcheries can be found in the Integrated Hatchery Operations Team (1995) manual and described in detail by Snow (2003) and Jateff (2001). The marking scheme for each program varied depending on ESA status or study purpose. All fish released received a coded wire tag (CWT) and/or an external mark (adipose fin-clip or elastomer tag). Spring Chinook were initially reared on well water, but were transferred to acclimation ponds (Methow, Chewuch, and Twisp rivers) in the spring and reared on river water prior to release. Rearing anadromous salmonids on ambient-temperature surface water versus warm well water was intended to promote the smoltification process and provide a survival advantage (Bjornn and Ringe 1984). Acclimation ponds located on natal rivers in the vicinity of good spawning habitat were used to decrease stray rates and ensure adequate spatial distribution. Yearling summer Chinook and steelhead released from Wells Hatchery were reared on Columbia River water prior to release. Wells subyearling summer Chinook was the only anadromous hatchery program reared entirely on well water prior to release.

Juvenile Hatchery Survival

Juvenile hatchery survival is not a primary indicator in the M & E Plan, but may help explain why program release goals (i.e., primary indicator) were not met despite adequate broodstock. Survival rates were calculated based on the complete inventory of the population at tagging and any mortality that occurred prior to or after tagging was complete, depending on the specific stage of development.

Number of Juvenile Fish Released

All juvenile fish receive either an internal and/or external tag or mark during rearing (i.e., 100% inventory). The number of juvenile fish released was calculated based on the number of fish tagged or marked and subtracting mortality that occurred between marking and release.

Size of Juvenile Fish Released

The size of juvenile fish released was based on data randomly collected from no less than 100 fish and sampled immediately prior to release. Fork length is measured to the nearest millimeter and weight is measured to the nearest 0.1 gram.

Hatchery Replacement Rate

Program-specific target hatchery replacement rates (HRR) were derived from the Biological Assessment and Management Plan (BAMP 1998). These rates were calculated by dividing the number of returning adults estimated from CWT recoveries (i.e., spring and summer Chinook) or run escapement estimates at Wells Dam (i.e., steelhead) by the number of broodstock (including prespawn mortality).

Results

Adult Collection and Spawning

Broodstock collection is dependent on the run size and timing of the target stock. Pre-season estimates of upper Columbia River salmon and steelhead runs were calculated to assist managers in determining trapping location, duration, and in developing weekly quotas to extract broodstock in proportion to the run-at-large (Table 1). Pre-season run estimates were large enough to recommend tributary collection of spring Chinook, instead of mainstem Columbia River trapping at Wells Dam (Praye et al. 2004b). Furthermore, both in-season and final run estimates were sufficient to provide the required number of broodstock for all programs. For spring Chinook, low trap efficiency at tributary traps precluded using stock-specific run timing.

Table 1. Cumulative passage dates, pre-season, in-season and actual run estimates for selected upper Columbia salmon and steelhead runs during the broodstock collection period (MEOK = Methow and Okanogan).

Stock (brood)	Pre-season run estimate	Cumulative passage dates during trapping period and in-season run estimates				Actual run return
		25%	50%	75%	100%	
MEOK summer Chinook (2004)		15-Jul	27-Jul	18-Aug	28-Aug	
29 Jun – 28 Aug	16,000	61,032	46,902	41,980	32,847	32,847
MEOK summer steelhead (2005)		24-Aug	11-Sep	27-Sep	29-Oct	
1 Jun – 29 Oct	11,000	6,116	5,384	6,279	6,974	6,974
Methow spring Chinook (2004)		10-May	21-May	2-Jun	28-Jun	
1 May – 28 Jun	3,838	2,692	3,152	3,072	4,794	2,846

Low trap efficiency from tributary spring Chinook collection locations resulted in the majority of the broodstock being collected as volunteers to Methow Hatchery via the hatchery outfall channel. Hence, a large majority of the spring Chinook broodstock was of hatchery origin (Table 2). The number of broodstock spawned for each program is listed in Appendix B.

Table 2. Broodstock collection results from Wells Complex hatcheries for steelhead (2005 brood) and Chinook (2004 brood). Estimated escapement and required extraction rates for Wells summer Chinook are based on the difference in Chinook counts between Rocky Reach and Wells Dams, and combine hatchery (H) and wild (W) fish.

	Wells summer Chinook		Wells steelhead		Spring Chinook					
					Methow		Chewuch		Twisp	
	H	W	H	W	H	W	H	W	H	W
Est. run escapement	16,778		8,939	842	623	198	287	48	110	231
Broodstock Goal	1,077	121	296	94	0	121	0	121	0	121
Required extraction rate	0.071		0.03	0.11	0.0	0.61	0.0	2.52	0.0	0.52
Broodstock collected	892	151	316	69	270	1	16	1	20	43
Actual extraction rate	0.062		0.04	0.08	0.43	0.01	0.06	0.02	0.18	0.19

Age Composition and Size at Maturity

Biological sampling of adult broodstock occurred at spawning. Mean length, age, origin, and fecundity data were used to calculate egg deposition from naturally spawning fish (Chapters 4 and 5), and were used in part to determine replacement rates for hatchery and wild stocks. Broodstock were intended to serve as a representative sample of the spawning population from which comparisons of biological variables by origin could be made. Because of the low number of wild fish within the spring and summer Chinook broodstocks, it was also necessary to include carcasses recovered on the spawning grounds in the analysis.

Hatchery Chinook were generally larger than wild fish at age-3, but smaller than wild fish as age increased (Table 3; Appendix C). Sample sizes of wild fish were small or non-existent for some ages and origins, affecting our ability to make comparisons for all ages of each stock. Based on salt-water age, wild steelhead had a greater mean fork length than hatchery steelhead (Table 4), although only comparisons of female steelhead were significantly greater (two-sample t-test, $P < 0.05$).

Table 3. Mean fork length (cm; *N*; SD) by age, sex, and origin of 2004 Chinook salmon broodstocks sampled at Wells Hatchery Complex facilities (Wells – 0 = subyearling life history; Wells – 1 = yearling life history).

Stock	Sex	Age-3		Age-4		Age-5		Age-6
		H	W	H	W	H	W	H
Spring Chinook								
Met Comp	M	48 (75; 3)		72 (42; 6)				
Met Comp	F			73 (136; 3)		76 (1; 0)		
Twisp	M	49 (1; -)	47 (2; 0)	72 (6; 9)	71 (19; 7)			
Twisp	F			73 (16; 3)	75 (20; 6)			
Summer Chinook								
Wells – 0	M	73 (10; 4)	67 (4; 12)	84 (12; 4)	84 (11; 2)	91 (19; 7)	98 (25; 7)	
Wells – 0	F	68 (1; -)	65 (1; -)	84 (12; 6)	84 (6; 1)	90 (69; 4)	93 (62; 5)	
Wells – 1	M	53 (2; 2)		79 (255; 5)	77 (5; 6)	88 (108; 7)	93 (8; 9)	99 (39; 10)
Wells – 1	F			79 (94; 5)	85 (3; 2)	89 (128; 4)	92 (17; 4)	97 (104; 5)

Table 4. Mean fork length (cm; *N*; SD) by age, sex, and origin of 2005 steelhead broodstock sampled at Wells Hatchery Complex facilities.

Sex	1-salt		2-salt	
	H	W	H	W
M	60 (89; 3.2)	62 (15; 3.2)	74 (51; 3.2)	75 (7; 2.8)
F	59 (30; 2.4)	62 (15; 2.5)	71 (135; 3.5)	73 (25; 4.2)

Fecundity of salmon and steelhead is directly related to fish size (Quinn et al. 2004; Campbell et al. 2006). Most spring Chinook sampled for fecundity were age-4 hatchery fish with a mean fecundity of 3,510 eggs per female (Table 5). Most steelhead sampled for fecundity were 2-salt hatchery fish with a mean fecundity of 6,577 eggs per female (Tables 6). Mean fecundity values for previous broods are reported in Appendix D. No fecundity data was recorded for 2004 summer Chinook individual females at Wells Hatchery. The overall mean fecundity of the 2004 summer Chinook estimated from pooled egg samples was 3,611 eggs per female ($N = 121$).

Results from ELISA sampling of kidney and spleen tissue collected from female spring and summer Chinook at spawning indicated that the prevalence of the antigen for BKD was much greater in spring Chinook than summer Chinook (Table 7). This trend was apparent in each brood year examined (Appendix E).

Table 5. Mean fecundity (*N*; SD) by total age and origin of 2004 brood spring Chinook sampled at Wells Complex hatchery facilities.

Stock	Origin	Age-4	Age-5
Met Comp spring Chinook	H	3,510 (144; 745)	3,510 (1; --)
Met Comp spring Chinook	W	3,565 (1; --)	
Twisp spring Chinook	H	3,496 (16; 633)	
Twisp spring Chinook	W	3,970 (19; 806)	

Table 6. Mean fecundity (*N*; SD) by total age and origin of 2005 brood summer steelhead sampled at Wells Complex hatchery facilities.

Origin	1-salt	2-salt
H	4,512 (27; 787)	6,577 (126; 1,328)
W	5,370 (13; 1,084)	6,627 (24; 1,455)

Table 7. Results of ELISA sampling of 2004 brood female Chinook by category and value.

Program	Below-low	Low	Med	High	Total
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	
Wells summer Chinook	100.0	0.0	0.0	0.0	132
Methow spring Chinook	45.9	13.5	10.8	29.7	148
Twisp spring Chinook	63.9	22.2	11.1	2.8	36

Juvenile Hatchery Survival

Pre-spawn survival of all broodstocks was above the set standards (Table 8). The Wells steelhead program was below the survival standard for all juvenile rearing stages, while the Wells summer Chinook program only failed to meet the survival standard for 30 d after ponding. Only the Methow spring Chinook program exceeded all survival standards prior to release. The Twisp spring Chinook program experienced lower than expected survival during rearing due to BKD and subsequently did not meet the unfertilized-egg to-release survival standard. Overall, Chinook programs typically exceeded survival standards in most categories, while the Wells steelhead program typically did not (Appendix F). Lower than expected fertilization rates and survival during rearing (e.g., avian predation from dirt ponds) were the primary causes that lead to lower survival rates of steelhead at Wells FH.

Table 8. Hatchery life-stage survival rate standards, 5-year mean (SD), and survival achieved for current brood year. Revised survival standards are shown in italics.

Life stage	Survival standard	Wells steelhead		Wells summer Chinook		Methow spring Chinook		Twisp spring Chinook	
		5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved
Collection-to-spawning	*90.0 female*	98.3 (0.5)	96.4	96.7 (1.5)	98.3	96.0[a] (1.3)	98.2	93.7 (5.8)	97.4
Collection-to-spawning	*85.0 male*	99.1 (0.4)	99.5	96.2 (1.7)	98.1	94.7[a] (3.6)	99.3	88.4 (6.3)	88.6
Unfertilized egg-to-eyed	92.0	84.2 (1.5)	87.4	92.1 (3.7)	93.1	95.0 (2.8)	94.8	93.4 (6.4)	95.5
Eyed egg-to-ponding	98.0	97.2 (2.3)	95.9	94.9 (6.0)	99.1	99.8 (0.2)	98.3	98.2 (2.1)	96.2
30 d after ponding	97.0	97.5 (2.3)	96.9	95.7 (2.9)	96.2	99.4 (0.5)	99.2	97.4 (2.9)	99.1
100 d after ponding	93.0	93.5 (8.9)	92.2	95.4 (2.9)	95.7	99.1 (0.6)	99.2	96.2 (3.3)	98.8
Ponding-to-release	*90.0*	91.1 (9.9)	85.7	89.7 (8.9)	94.8	97.3 (2.3)	97.0	80.8 (20.4)	79.5
Transport-to-release	95.0	NA	NA	NA	NA	99.5[a,b] (6.6)	99.5	84.5 (34.4)	99.5
Unfertilized egg-to-release	*81.0*	74.5 (7.4)	71.8	78.4 (10.5)	87.4	92.5 (3.4)	91.3	74.0 (18.8)	73.0

[a] 4-year mean from 2000-2003.

[b] All data from Chewuch acclimation pond releases.

Number of Juvenile Fish Released

The number of steelhead and summer Chinook released from Wells Hatchery were within 10% of target release goals, while spring Chinook releases from Methow Hatchery were 67% of the target goal (Table 9). The 2004 brood spring Chinook releases from Methow Hatchery were below target goals because too few broodstock were collected from the Twisp River, and because a large number of progeny from females with elevated ELISA values were released either as subyearling fish or as unmarked fry. Annual release numbers for each program are listed in Appendix G.

Table 9. Target and actual release numbers for anadromous fish releases from Wells Complex hatchery facilities in 2006.

Stock/Program (BY)	Target	Number released (% of target)	13-year (1994 – 2006)		
			Min.	Max.	Mean
Wells summer Chinook					
Yearling	320,000	312,980 (98)	185,200	457,770	334,228
Subyearling[a]	484,000	471,123 (97)	187,382	541,923	419,957
Methow spring Chinook	550,000	366,513 (67)	28,878	611,763	328,467
Methow River	183,334	65,146 (36) [b]	4,477	332,484	139,289
Chewuch River	183,333	204,906 (112)	11,854	284,165	166,044
Twisp River	183,333	96,461 (53) [c]	15,470	125,707	64,344
Wells summer steelhead	450,000[d]	473,505 (99)	309,900	710,992	455,352
Methow River	120,000	99,898 (83)	80,580	359,170	184,395
Chewuch River	120,000	119,500 (100)	78,205	138,300	106,954
Twisp River	80,000	107,245 (134)	84,475	136,680	110,801
Okanogan River	130,000	146,862 (113)	67,500	228,770	120,204

[a] Summary data reflects the lack of a 1992 brood subyearling program.

[b] Does not include 199,120 fish released as fry or subyearlings.

[c] Does not include 3,643 fish released as subyearlings.

[d] Includes 350,000 fish per Wells HCP and 100,000 fish per Priest Rapids BiOp.

All juvenile anadromous salmonids released from Wells Complex hatchery facilities are marked prior to release, except some fry releases from Methow Hatchery. Marks include elastomer (Wells steelhead), adipose fin-clips (summer chinook), coded-wire tags (spring and summer Chinook), and Passive Integrated Transponder (PIT) tags. These marks are applied singly or in combination with other marks or tags depending on the requirements of individual stocks or studies. Marking allows the identification of stray hatchery fish, and provides the means to calculate survival rates and fishery contribution rates of specific hatchery stocks (Chapter 2). For Wells summer steelhead, hatchery marking also identifies the parental origin of the fish (e.g., H x H, H x W). Coded-wire tags are inserted into all Chinook prior to release, but subsequent tag loss during rearing typically results in a mark rate less than 100% (Appendix H).

Size of Juvenile Fish Released

Target release sizes specified in the M & E Plan (HC 2005) are designed to ensure that hatchery fish populations attain a size at release that contributes to a higher post-release survival rate while minimizing negative aspects (i.e., residualism, precocity). Weights at release exceeded target weights for Wells yearling summer Chinook and Methow and Chewuch spring Chinook, but not for Wells subyearling Chinook or steelhead. Mean fork lengths prior to release were less than the specified target for all anadromous populations released in 2006 (one-sample t-test, $P < 0.05$; Table 10). Size-at-release for historic broods are listed in Appendix I.

Table 10. Target size-at-release goals and the actual mean fork length (mm), coefficient of variation (CV) and weight (g) for anadromous fish released from Wells and Methow hatcheries in 2006 (BY = brood year).

Stock/Program (BY)	Target			Actual		
	Fork length (CV)	Weight		Fork length (CV)	Weight	
		Mean (g)	FPP		Mean (g)	FPP
Wells summer Chinook (2004)						
Yearling	176 (9.0)	45.4	10	171 (6.4)	52.0	8.7
Early subyearling	140 (9.0)	22.7	20	95 (7.5)	10.1	45.0
Normal subyearling	140 (9.0)	22.7	20	110 (5.6)	15.0	30.3
Methow spring Chinook (2004)						
Methow River	154 (9.0)	30.2	15	137 (5.4)	32.1	14.1
Chewuch River	154 (9.0)	30.2	15	144 (14.5)	42.4	10.7
Twisp River	154 (9.0)	30.2	15	130 (11.2)	27.9	16.3
Wells summer steelhead (2005)						
Methow River	198 (9.0)	75.6	6	168 (9.7)	53.3	8.5
Chewuch River	198 (9.0)	75.6	6	168 (9.7)	53.3	8.5
Twisp River	198 (9.0)	75.6	6	168 (9.7)	53.3	8.5
Okanogan River	198 (9.0)	75.6	6	171 (10.9)	56.8	8.0

Hatchery Replacement Rate

One of the primary benefits of hatchery programs is the increased survival of progeny compared to naturally produced fish. Adult broodstock spawned for supplementation or production programs should yield a subsequent adult return great enough to replace the parent brood and provide additional fish to contribute to natural production or fisheries. Program-specific hatchery replacement rates (HRR) were derived from the Biological Assessment and Management Plan (BAMP 1998). All Wells FH Complex programs returned enough adults to replace the parent brood (i.e., HRR >1). Both the most recent completed brood year and the previous five-year mean for the Wells summer chinook yearling program exceeded expected HRR goals (Table 11; Appendix B). While the most recent completed brood year for the Wells subyearling summer Chinook program also met expected HRR goals, the previous five-year mean was lower than the expected HRR goal, as was the case for Methow spring Chinook. The Twisp spring Chinook program has not met the expected HRR goal in most years. Conversely, Wells steelhead has exceeded the expected HRR goal in most years, except the most recent completed brood year.

Numerous factors may contribute to the low survival of hatchery fish released from Wells FH Complex (e.g., juvenile survival, ocean survival, low sample rates, or incomplete adult return data). Additional research may be required to determine which life stage(s) is responsible for the low adult return rates and is not the focus of this report.

Table 11. The expected and actual smolt-to-adult (SAR) and HRR or adult-to-adult survival rates for Wells FH Complex programs.

Program	Brood year	Number of Broodstock	Smolts released	SAR (%)	Adult equivalents	# smolts/ adult	HRR
Wells summer Chinook							
Yearling program	Expected	164	320,000	0.300	960	333	5.9
Actual	1999	176	312,098	0.495	1,544	202	8.8
Mean	1994-1998	184	370,269	1.213	4,886	627	25.2
Median	1994-1998	189	365,000	0.463	1,652	216	8.6
Subyearling program	Expected	190	384,000	0.120	461	833	2.4
Actual	1999	212	363,600	0.144	524	694	2.5
Mean	1994-1998	253	448,895	0.065	293	7,433	1.2
Median	1994-1998	238	429,467	0.037	184	2,723	0.8
Twisp spring Chinook	Expected	121	183,024	0.300	549	333	4.5
Actual	2000	69	75,704	0.194	147	515	2.1
Mean[a]	1992-1999	25	51,245	0.137	69	1,779	2.4
Median[a]	1992-1999	18	35,853	0.091	27	1,105	1.5
Methow spring Chinook	Expected	121	183,024	0.300	549	333	4.5
Actual	2000	162	266,392	0.307	818	326	5.0
Mean[b]	1993-1999	85	160,068	0.191	317	1,303	3.7
Median[b]	1993-1999	102	191,861	0.169	169	752	3.2
Wells steelhead	Expected	301	580,000	1.000	5,800	100	19.3
Actual	2002	288	580,498	0.767	4,452	130	16.0
Mean	1997-2001	311	667,871	1.37	9,288	130	29.2
Median	1997-2001	310	653,874	1.58	11,218	63	37.3

[a] Does not include 1995 brood.

[b] Does not include 1998 brood.

Discussion

Most releases of current broods covered in this Chapter were close to their programmed production levels. The Wells steelhead and summer Chinook were within 5% of their release goals, but the total release of spring Chinook from Methow Hatchery was only 67% of the specified goal of 550,000 smolts. Hatchery spring Chinook were below production goals due to the early release of un-fed fry into the hatchery outfall channel (N = 156,868), or as subyearling fish into the Methow (N = 42,252), and Twisp rivers (N = 3,643). The early released fish were progeny of females exhibiting elevated ELISA values.

Historical data related to HRR of all stocks must be reviewed carefully to ensure the effort to recover CWTs was similar across years. Given the high proportion of CWTs recovered from spawning grounds (i.e., spring Chinook), disproportionate levels of effort to recover CWTs

would bias HRR values. A detailed review of historical spawning ground survey data (i.e., survey dates and locations and corresponding sample rates) would provide the information required to assess which data should be included in the analysis.

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Appendix A

Upper Columbia River salmon and steelhead broodstock collection protocols.

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20 April 2004

To: Joint Fishery Parties / Mid-Columbia Coordinating Committee

From: Laura Praye, Andrew Murdoch and Kirk Truscott

Subject: **UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

Upper Columbia River Broodstock Collection Targets by Program and Species

Douglas County PUD Programs

This protocol was developed for hatchery programs associated with the Wells Dam Settlement Agreement. Hatchery programs or facilities operated by other agencies or tribes are not addressed in the document with the exception of the Methow Basin spring chinook production and supplementation programs, and the Northwest Power Planning Council (NWPPC) Coho Reintroduction Program. Using the trapping period outlined in the 2003 protocol, stock specific daily and cumulative passage dates (i.e. 25%, 50%, 75%) were calculated (Table 1). Weekly collection goals were calculated based on the proportion of the broodstock goal expected to migrate upstream of the collection location (Table 2). In-season escapement estimates will also be used to estimate the probability of achieving broodstock collection goals.

Table 1. Cumulative passage dates of salmon and steelhead stocks based on the trapping period.

Stock	Cumulative passage dates during trapping period[1]			
	25%	50%	75%	100%
Wells Summer[2]	15 Jul	27 Jul	18 Aug	28 Aug
Wells Steelhead[2]	24 Aug	11Sep	27 Sep	29 Oct

1- 1994 – 2003 data
2- Wells Dam counts

Table 2. Weekly collection quotas for Wells steelhead and summer Chinook in 2004.

Week	Wells Summer Chinook		Wells Steelhead [1/]	
	Hatchery (Volunteer trap)	Wild (West ladder)	Hatchery	Wild
11 Jul	232	26		
18 Jul	195	22		
25 Jul	195	22		
1 Aug	195	22	18	6
8 Aug	154	17	24	8
15 Aug	69	8	39	12
22 Aug	37	4	39	12
29 Aug			39	12
5 Sep			39	12
12 Sep			60	21
19 Sep			42	13
26 Sep			33	11
3 Oct			30	10
10 Oct			18	6
17 Oct			6	4
24 Oct			3	1
31 Oct				
7 Nov				
Total	1077	121	390	128

[1/] - Includes broodstock for survival studies

Methow Basin

The spring chinook collection protocols will target specific populations of fish in the Methow Basin through broodstock collections in tributary locations and the remainder collected at Methow Hatchery. Fish will be collected from tributaries in an attempt to increase the number of wild fish incorporated into the broodstock and reduce the number of non-ESA listed fish in the broodstock. In 2002 and 2003, the proportion of wild fish incorporated into the broodstock was 0% and 8%, respectively.

Consistent with the BAMP (1998), Biological Opinion for ESA Section 10 Permit 1196, Permit 1196, and the NWPPC Methow River Subbasin Summary, WDFW proposes to collect broodstock consistent with the production level of 550,000 smolts, development of local tributary attributes and in a manner that reduces the Carson lineage within the supplementation production. The 550,000 smolt production level is identified in ESA Section 10 Permit 1196, BAMP and US v Oregon; however, beginning with the 04 BY, the production obligation identified in the Wells Settlement agreement is 225,000 smolts and Rock Island Settlement Agreement is 288,000 for a total of 513,000 smolts. Concurrent with the FERC approval of the HCP's, the Wells Dam HCP obligation is reduced to 61,000 spring chinook, while the Rock Island Dam HCP production obligation remains at 288,000 smolts, providing a HCP production level of 349,000 smolts. While the Methow Fish Hatchery production obligations through the HCP's are less than 550,000 smolts, Grant County PUD projected production obligations

stemming from the ESA Section 7 Consultation on Interim Operations for Priest Rapids Hydroelectric Project (FERC 2114) NOAA Fisheries Consultation No. 19999/01878 (200,000 smolts) would compensate for the reduction associated with the Wells Dam HCP and continue to provide a 550,000 smolt production level at the Methow FH. Considering the potential production variances associated with the HCP and Grant County PUD's production obligation under Consultation No. 19999/01878, WDFW proposes to collect sufficient adults (363) to meet a projected smolt production level for 550,000 yearling smolts. The actual smolt production would be contingent upon FERC approval of the HCP's and initiation of production associated with Grant Count PUD production obligation. If terms necessary to rear, full-term, 550,000 smolts fail to be agreed upon by the affected parties, WDFW may reduce, accordingly, the number of brood retained for spawning or the number of gametes retained for smolt production.

The collection protocol outlines trapping at the Methow FH outfall and tributary trapping on the Methow, Chewuch, and Twisp rivers. In conjunction with the tributary trapping activities, Twisp River captive broodstock gametes provided from the last remaining brood year held at the AquaSeed facility will also be incorporated into the adult supplementation program. Less than 5,000 smolts are projected from the Twisp Captive Brood Program and will be reared to minimize the effect of reduced rearing capacity at Methow Fish Hatchery.

Critical to meeting program objectives (smolt production, reduction of Carson ancestry, preservation/enhancement of tributary populations and development of local tributary attributes), WDFW may collect up to 363 adult spring chinook. The WDFW will attempt to reduce the overall Carson ancestry influence within the Methow spring chinook broodstock by minimizing the number of crosses that contain high Carson ancestry (>50%).

Site specific broodstock collection numbers and origin may vary due to unknown tributary trap efficiency, origin composition, extent of the return, and variable production obligation scenarios; however, the maximum number of broodstock collected will not exceed 363 fish. The 363 fish account for 15% reduction expected due to ELISA culling, 5% pre-spawn mortality and maximum facility production of 550,000 smolts. The number of wild fish available for broodstocking purposes will be revised "in-season" and will be proportional, based on the initial forecast provided in Table 3 of the 2004 upper Columbia River Salmon and Steelhead Escapement and Broodstock Forecast.

Current estimates have 7,558 Chinook destine above Wells Dam, 25% or 1,890 are expected to be wild (recent TAC forecast revisions have no effect on this estimate, since the estimate was derived from hatchery releases, natural production estimates and SAR's and not based on the TAC estimate). "In-season" estimates of wild chinook to individual tributaries will be estimated based on proportion wild returns to Twisp, Chewuch and upper Methow (Table 3 of the 2004 upper Columbia River Salmon and Steelhead Escapement and Broodstock Forecast) and 25% proportion of wild fish in the total return past Wells Dam. Wild fish inclusion into the broodstock will also be a priority, with wild fish specifically being targeted; however, wild fish collections will not exceed 33% of the projected return to any tributary spawning population.

Methow FH Spring Chinook

Biological Assumptions

Production level	550,000 yearling smolts, @ 30g/fish
Propagation survival	90% fertilization to release
Maximum broodstock required	363
Wild/hatchery broodstock composition	90% / 10%
Pre-spawn survival	95%
Female to male ratio	1 to 1
Fecundity	4,200 eggs/female
ELISA cull rate	15%

Winthrop NFH spring chinook program (BAMP):

Production Objective	600,000 yearling smolts @ 30g/fish
Broodstock required	352 (BAMP)

Trapping Locations

Methow River

Foghorn Dam1 May – 1 September

Trap 7-days/week- Operated by WDFW personnel. Adipose present and adipose absent spring chinook will be retained at this site. All fish collected at this site will be held at the Methow FH. Additionally, WDFW personnel will seine the pool directly below Foghorn Dam twice a week in an effort to force fish into the trap. If seining fails to provide broodstock, angling may also be used to collect broodstock. Up to121 fish (5.3% of the projected return of 2,278 fish) may be retained for broodstock purposes; of which, a goal of 121 fish may be wild origin (10.2% of the projected wild return of 1,183). If other trap locations experience collection shortfalls, additional fish may be collected over and above the 121 fish to affectively minimize the shortfall. In-season estimates of wild fish returning to the upper Methow River will be provided through initial estimates provided in Table 3 of the 2004 escapement and broodstock forecast and observed passage at Wells Dam. Overall broodstock collection and number of wild fish retained will be modified, in-season, as necessary to maintain a collection protocol that removes no more than 33% of the return. Fish collected at from the Methow River will be held at the Methow FH.

Chewuch River

Fulton Dam Trap and Chewuch Dam Trap 1 May – 1 September

Trap 7-days/week- Operated by WDFW personnel. The WDFW will also attempt to seine broodstock once a week at locations determined to be effective and where fish can be safely transported to Methow Hatchery. Angling will be used as a last resort if all other methods do not provide adequate broodstock.

Adipose present and adipose absent spring chinook will be retained from the Chewuch River. Up to 121 fish (7.7% of the projected return to the Chewuch River) may be retained for broodstock purposes, of which, up to 86 wild fish or 33% of the estimated wild return may be retained for broodstock purposes. If other trap locations experience collection shortfalls, additional fish may be collected over and above the 121 fish to affectively minimize the shortfall. In-season estimates of run size and origin of spring Chinook to the Chewuch River will be made, similar to that described for the Upper Methow River. The collection protocols will be modified as necessary to maintain an extraction of no more than 33% of the projected return. Fish collected at the Chewuch Dam trap site(s) will be held at the Methow FH.

Until the 2001 season, the Fulton irrigation diversion dam on the Chewuch River had not been used since 1994. The trapping efficiency of the Fulton facility averaged 30% between 1992 and 1994, ranging from a low of 9.2 in 1992 to a high of 58.2% in 1993. Significant river flows in 1996 and 1997 disrupted the configuration of the dam, likely reducing the potential trapping efficiencies from those observed between 1992 and 1994. Maintenance work completed in the spring of 2001 was expected to return trapping efficiencies to approximately 60%. Unfortunately, the 2001 trapping efficiencies were approximately 3.5%, significantly less than anticipated. During the late winter/early spring of 2002, minor construction was again performed at the Fulton Dam site, seeking improvements to trapping efficiencies. Trapping efficiencies during the 2002 broodstock collection fell to just 0.3%, a clear indication that the modifications completed in 2001 and 2002 failed to return the trap to pre-1994 trapping efficiencies.

Twisp River

Twisp Weir 1 May – 1 September

Trap 7-days/week- Operated by WDFW personnel. A floating weir on the Twisp River provides for collection of Twisp stock spring chinook. Historically, trap efficiency at this facility has been low, averaging 16% (range 10.4% – 23.7%) between 1992 and 1994. During the 2001 trapping season, the trap efficiency was just 6% and fell to just 0.2% in 2002. The modified V-trap installed along the weir sill, adjacent to the trap entrance, significantly increased the trap efficiency in 2003 (42%). Once additional modifications to the Twisp Weir are completed by Douglas Co. PUD, trap efficiency is expected to increase again.

Based on an escapement estimate of 1,167 fish, including 445 wild and 722 hatchery origin (2004 escapement and broodstock forecast), up to 121 fish (10.4% of the projected return to the Twisp River.) may be retained for broodstock purposes, of which a goal of 121 fish (27% of the projected wild return to the Twisp River) may be wild origin. In-season estimates of run size and origin of spring Chinook to the Twisp River will be made, similar to that described for the Upper Methow River. The collection protocols will be modified as necessary to maintain an extraction of no more than 33% of the projected return. Expectations are that all Twisp origin spring chinook trapped at this site will be retained for the Twisp program and held at the Methow FH.

The Twisp weir poses several operating constraints, including stranding of steelhead and spring chinook on the weir pickets during upstream and downstream movement. The weir will be

closely monitored and at the first indication of kelt migration difficulties or spring chinook fallback that cannot be adequately addressed operationally, the trapping will cease and the weir removed (pending appropriate flow conditions). Operation of this weir will include 24-hour on site monitoring throughout the trapping season.

Methow FH

Collection at the Methow Fish Hatchery outfall will be variable and dependent upon success of tributary collections. Outfall trapping will be used in conjunction with tributary traps, seining and angling to achieve a production level of 550,000 ESA-listed upper Columbia River spring Chinook smolts.

Winthrop NFH

Trapping is expected to occur at the Winthrop NFH and will be consistent with collection protocols provided by the USFWS.

Wells Dam

No spring chinook trapping at Wells Dam will occur unless the total annual adult return to Wells Dam is predicted to be 668 or less as identified in Section 10 Permit 1196.

Twisp River Captive Brood:

The fish currently being held as captive broodstock at Aquaseed may be reared until maturity and the resultant gametes may be included in the Twisp program at Methow FH. Because the Twisp Captive Brood Program is being phased-out, the 04 Brood Year currently at AquaSeed represents the last Twisp origin Captive Brood Year to be incorporated into the adult supplementation program.

<u>Columbia River Mainstem below Wells Dam</u>

Wells Hatchery Summer Chinook

Biological Assumptions

Wells program	320,000 yearling smolts (182 adults) 484,000 subyearlings (266 adults)
Lake Chelan program	100,000 green eggs (44 adults)
Rocky Reach program	200,000 yearling smolts (114 adults) 628,000 subyearlings (345 adults) 450,000 accel. subyearling (247 adults)
Grant Co. PUD survival study (Columbia River)	None
Broodstock required	1,198
Wild/hatchery broodstock composition	10% wild from west ladder
Pre-spawn survival	90%

Female to male ratio	1 to 1
Fecundity	5,000 eggs per female
Propagation survival	81% unfertilized egg to 0+ release 78% unfertilized egg to 1+ release

Trapping Assumptions

Trapping period	14 July – 28 August
# Days/week	3
# Hours/day	16 (Monday-Wednesday)
Broodstock composition	10% wild from west ladder
Broodstock number	Not to exceed 33% of the population
Other	Ladder open to passage at night between 7 July and 28 August.

The goal of the Wells/Turtle Rock summer chinook program is to provide harvest augmentation. Those fish that are not harvested have the potential and have been documented to spawn in tributaries where supplementation is currently ongoing. Until a terminal fishery is developed or methods to reduce the number of Wells/Turtle Rock fish that spawn in tributaries are found, infusing wild genes into the broodstock will minimize the risk of inbreeding depression, genetic drift, and domestication selection. This is consistent with the objectives of the Harvest and Genetic Reserve program as outlined by NOAA Fisheries (Rob Jones, NOAA Fisheries, personal communication).

Collect 1,198 run-at-large summer Chinook from the volunteer ladder trap at Wells Fish Hatchery outfall (1,078 hatchery fish) and west ladder (120 wild fish). The 3-year old component will be limited to 10% of the broodstock collection to minimize the potential of reduced production as a result of a strong 3-year-old age class, as was the case in 2001. In the event excess fish are collected, they will be returned to the Columbia River below Wells Dam.

Methow River Basin

Wells Hatchery Steelhead

Biological Assumptions

Methow/Okanogan	480,000 yearling smolts (244 adults)
WNFH transfer (Methow River)	125,000 eyed eggs for 100,000 smolts (55 adults)
Ringold transfer (Columbia River)	240,000 eyed eggs for 180,000 smolts (88 adults)
Chelan PUD Survival Study (Columbia River)	125,000 eyed eggs for 100,000 smolts (55 adults)
Grant PUD Survival Studies	200,000 eyed eggs for 150,000 smolts (76 adults)
Broodstock required	518 Adults

Wild/hatchery broodstock composition	
Wells Production [1/]	33% / 67%
Survival Studies	0% / 100%
Pre-spawn survival	97%
Female to male ratio	1 to 1
Fecundity	5,400 eggs per female
Propagation survival	87% fertilization to eyed egg
	86% eyed egg to yearling release
	75% fertilization to yearling release

[1/]- Includes Wells, Winthrop NFH and Ringold production.

Trapping Assumptions

Trapping period	7 July – 29 October
# Days/week	3
# Hours/day	16
Broodstock number/composition	
Wells Production	387 - (33% wild / 67% hatchery)
Survival Studies	131 - (0% wild / 100% hatchery)
Total Broodstock	518 - (25% wild / 75% hatchery)

Trapping efforts will selectively retain 518- steelhead at Wells Dam (East and West ladder collection), to attain a 33% wild origin component within the "Wells production" broodstock (128 wild steelhead) and 100% hatchery origin within the survival study production components. Overall collection will not exceed 33% of the expected return (hatchery or wild). Increasing the wild origin component within the broodstock to near 33% will provide opportunities to increase the HxW and WxW parental cross proportion from what has occurred previously under random run-at-large collections. Increasing the number of HxW and WxW parental crosses within the Wells Program is consistent with management objectives described in WDFW's ESA Section 10 Permit 1395 Application and consistent with other upper Columbia River summer steelhead supplementation efforts (Wenatchee Basin). Collection within the "Wells Production" component will also be selective for adipose present hatchery origin steelhead (HxW parental crosses), consistent with production objectives. The east and west ladder traps at Wells Dam will be operated concurrently, three days per week, up to 16 hours per day. Trapping on the east ladder will be commensurate with summer chinook brood stocking efforts through 28 August and will continue through 29 October, concurrent with west ladder collections. All steelhead excluded from the broodstock will be directly passed upstream at the trapping site or captured, examined and released upstream from the trap site.

The WDFW will conduct spring steelhead trapping at the Twisp weir to determine run timing and composition. This data will allow the Department to assess the **feasibility** of incorporating a localized Twisp River wild broodstock in future years. This would require operating the Twisp weir starting 1 March and examining fish to determine sex and origin until spring chinook collection begins 1 May.

Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments will be made consistent with the estimated return of wild steelhead to Wells Dam and production objectives. Adjustments to the broodstock collection objective may also occur in conjunction with the Federal Energy Regulation Commission (FERC) decisions resulting from the Wells HCP and through initiation of Grant County PUD production obligations identified in ESA Section 7 Consultation on Interim Operations for Priest Rapids Hydroelectric Project (FERC 2114) NOAA Fisheries Consultation No. 19999/01878 and those resulting from changes in survival study requests.

Appendix B. Number of broodstock spawned (including pre-spawn mortalities) and smolts released by brood year from Wells Complex hatchery facilities. Wells summer steelhead include releases from WNFH.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
			Wells yearling summer Chinook			
1992	205	331,353	836	0.252	396	4.1
1993	225	388,248	2,011	0.518	193	8.9
1994	185	365,000	141	0.039	2,589	0.8
1995	144	290,000	1,144	0.395	253	7.9
1996	193	356,707	1,652	0.463	216	8.6
1997	189	381,867	10,941	2.865	35	57.9
1998	207	457,770	10,550	2.305	43	51.0
1999	176	312,098	1,544	0.495	202	8.8
			Wells subyearling summer Chinook			
1993	173	187,382	40	0.021	4,685	0.2
1994	255	450,935	15	0.003	30,062	0.1
1995	221	408,000	128	0.031	3,188	0.6
1996	336	473,000	704	0.149	672	2.1
1997	274	541,923	240	0.044	2,258	0.9
1998	179	370,617	376	0.102	986	2.1
1999	212	363,600	524	0.144	694	2.5
			Twisp spring Chinook			
1992	18	35,853	21	0.059	1,707	1.2
1993	39	116,749	27	0.023	4,324	0.7
1994	5	19,835	5	0.025	3,967	1.0
1995	0	0	0	-	-	-
1996	45	76,687	278	0.363	276	6.2
1997	15	26,714	67	0.251	399	4.5
1998	12	15,470	23	0.149	673	1.9
1999	40	67,408	61	0.091	1,105	1.5
			Methow spring Chinook			
1992	0	0	0	-	-	-
1993	105	210,849	192	0.091	1,098	1.8
1994	2	4,477	1	0.022	4,477	0.5
1995	14	28,878	122	0.423	237	8.7
1996	110	202,947	500	0.246	406	4.5
1997	180	332,484	945	0.284	352	5.3
1998	160	435,670	2,300	0.528	189	14.4
1999	99	180,775	145	0.08	1,247	1.5

[a] Merged with Methow spring Chinook after 1997.

Appendix B, continued.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
			Chewuch spring Chinook[a]			
1992	25	40,881	39	0.095	1,048	1.6
1993	103	284,165	116	0.041	2,450	1.1
1994	12	11,854	2	0.017	5,927	0.2
1995	0	0	0	-	-	-
1996	65	91,672	37	0.040	2,478	0.6
1997	64	132,759	360	0.271	369	5.6
			Wells summer steelhead			
1996	207	531,798	2,779	0.52	191	13.4
1997	316	543,028	4,702	0.87	115	14.9
1998	377	888,180	14,076	1.58	63	37.3
1999	310	712,822	14,691	2.06	49	47.4
2000	277	653,874	1,752	0.27	373	6.3
2001	277	541,453	11,218	2.07	48	40.5
2002	288	580,498	4,452	0.77	130	15.5

Appendix C. Mean fork length (cm; *N*; SD) by age, sex, and brood of Wells Hatchery complex broodstocks.

Brood	Sex	Age-3		Age-4		Age-5		Age-6		Age-7
		H	W	H	W	H	W	H	W	H
Wells summer Chinook-yearling migrants										
2003	M	59.1 (9; 5.7)	- -	76.6 (32; 5.8)	74.5 (2; 16.3)	92.4 (343; 7.8)	94 (2; 24.0)	97.7 (6; 14.7)	- -	- -
2003	F	- -	- -	80.2 (18; 4.3)	- -	92.4 (488; 4.7)	- -	97.4 (23; 4.2)	- -	- -
2002	M	51.5 (6; 3.3)	- -	80.1 (266; 6.1)	- -	95.4 (278; 7.2)	- -	99.5 (6; 5.9)	- -	- -
2002	F	- -	- -	84.3 (66; 4.5)	- -	94.3 (519; 4.8)	- -	100 3 (10; 2.8)	- -	- -
2001	M	54.9 (12; 3.8)	- -	81 (437; 6.4)	84 (1; - -)	94.6 (84; 8.0)	97.7 (16; 8.3)	99.5 (2; 7.8)	- -	- -
2001	F	- -	- -	82.7 (302; 4.6)	- -	93.9 (179; 5.3)	98.7 (3; 1.5)	98.5 (12; 6.1)	92 (1; - -)	- -
2000	M	53.2 (63; 5.1)	68 (1; - -)	75.9 (303; 6.6)	81.9 (13; 8.7)	91.6 (130; 8.0)	97.8 (12; 6.4)	109 0 (1; - -)	- -	- -
2000	F	- -	- -	81.7 (68; 5.3)	85.5 (4; 4.2)	92.1 (208; 5.0)	95.1 (30; 4.5)	98.1 (8; 11.5)	- -	- -
1999	M	51.8 (42; 6.9)	- -	76.8 (172; 7.9)	81.6 (26; 8.7)	93.8 (80; 8.5)	99.6 (8; 6.9)	99.1 (16; 8.7)	- -	- -
1999	F	- -	- -	81.5 (79; 6.1)	84 (12; 4.6)	91.4 (169; 5.5)	94.5 (29; 4.6)	98 (58; 6.4)	- -	89.5 (2; 2.1)
1998	M	55.7 (30; 5.9)	61 (2; 2.8)	74.7 (125; 8.9)	83 (19; 6.2)	94.9 (213; 10.1)	100 5 (2; 2.1)	101 2 (19; 9.9)	- -	- -
1998	F	- -	- -	79.4 (30; 5.2)	86 (5; 4.2)	95.2 (418; 5.4)	97.6 (8; 5)	97.9 (32; 8.7)	- -	101.0 (1; - -)
1997	M	47 (2; 0.0)	68 (1; - -)	78.7 (46; 6.4)	79.5 (2; 4.9)	91.3 (43; 9.6)	98 (18; 5.6)	108 3 (3; 6.8)	109 (1; - -)	- -
1997	F	- -	- -	81.2 (26; 5.5)	87.5 (4; 3.7)	92.1 (96; 4.9)	96.2 (9; 5.7)	98 (10; 8.5)	- -	- -
1996	M	49.3 (9; 5.4)	57.3 (4; 6.6)	76.4 (87; 7.0)	81 (19; 7.5)	90.4 (49; 7.5)	94.9 (24; 6.6)	98.4 (10; 8.1)	102.3 (3; 11.6)	- -
1996	F	- -	- -	80.6 (40; 4.0)	86.9 (10; 3.2)	89.4 (68; 4.5)	94.7 (26; 3.6)	96.3 (39; 7.4)	- -	92.7 (3; 5.9)
1995	M	53.4 (19; 4.4)	62 (3; 5.6)	73.1 (71; 8.2)	84.4 (12; 7.3)	90.2 (115; 7.7)	107 0 (1; - -)	98.3 (130; 8.2)	96 (1; - -)	- -
1995	F	71 (1; - -)	- -	81.9 (22; 6.4)	84.5 (2; 7.8)	90.7 (126; 5.2)	94.7 (65; 4.4)	96.6 (333; 5.8)	- -	- -
1994	M	- -	- -	77.1 (16; 7.9)	- -	89.6 (104; 6.6)	- -	- -	- -	- -
1994	F	- -	- -	71.3 (3; 2.3)	- -	89.7 (137; 5.3)	91.3 (4; 10.2)	- -	- -	- -

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5		Age-6	
		H	W	H	W	H	W	H	W
				Wells summer Chinook-subyearling migrants					
2003	M	63.0 (5; 4.7)	65.0 (1; - -)	83.0 (29; 6.5)	83.6 (18; 4.2)	- -	98.7 (3; 11.0)	- -	- -
2003	F	- -	- -	84.7 (53; 4.7)	86.4 (11; 4.2)	90.0 (6; 5.5)	95.0 (2; 7.1)	- -	- -
2002	M	67.6 (7; 5.9)	70.5 (2; 4.9)	86.3 (15; 9.3)	73.0 (2; 19.8)	- -	- -	- -	119.0 (1; - -)
2002	F	78.0 (2; 7.1)	- -	88.3 (15; 3.5)	81.0 (1; - -)	90.8 (5; 5.2)	- -	- -	- -
2001	M	74.1 (8; 6.3)	- -	85.4 (19; 7.8)	91.7 (10; 8.8)	99.0 (1; - -)	99.6 (10; 8.7)	- -	- -
2001	F	- -	- -	87.6 (14; 5.1)	88.0 (6; 6.5)	97.7 (19; 4.4)	98.0 (1; - -)	- -	- -
2000	M	65.5 (4; 9.6)	72.4 (14; 3.5)	82.8 (60; 6.8)	86.1 (27; 5.9)	109.0 5 (2; 2.1)	101.0 0 (11; 8.5)	- -	- -
2000	F	72.0 (1; - -)	- -	87.5 (146; 4.7)	87.8 (32; 5.9)	92.1 (19; 6.1)	94.3 (29; 4.4)	- -	- -
1999	M	68.0 (73; 7.0)	69.6 (18; 6.3)	81.6 (30; 9.6)	85.2 (37; 5.9)	102.0 0 (6; 5.1)	97.7 (3; 2.1)	84.0 (1; - -)	- -
1999	F	74.1 (20; 6.1)	66.5 (2; 0.7)	85.5 (41; 4.7)	84.7 (52; 5.8)	89.3 (3; 9.5)	96.0 (13; 4.0)	- -	- -
1998	M	67.3 (9; 4.5)	66.1 (9; 3.9)	81.4 (5; 11.9)	89.3 (10; 6.2)	96.0 (3; 7.5)	102.0 5 (4; 6.0)	- -	- -
1998	F	- -	- -	83.3 (4; 5.6)	85.2 (13; 7.4)	93.8 (6; 5.8)	98.0 (1; - -)	- -	- -
1997	M	- -	- -	90.0 (1; - -)	96.8 (4; 8.4)	- -	101.0 5 (2; 3.5)	- -	- -
1997	F	- -	- -	85.0 (1; - -)	87.7 (6; 6.0)	- -	100.0 4 (5; 4.7)	- -	- -
1996	M	59.0 (1; - -)	68.3 (6; 2.7)	80.0 (1; - -)	82.8 (12; 8.5)	- -	103.0 4 (46; 5.9)	- -	- -
1996	F	- -	- -	- -	87.3 (16; 5.2)	92.0 (1; - -)	94.5 (6; 4.7)	- -	- -
1995	M		69.5 (11; 5.8)	- -	90.1 (8; 8.0)	104.0 5 (2; 2.1)	99.7 (12; 7.8)	- -	101.5 (2; 2.1)
1995	F	72.0 (1; - -)	63.0 (1; - -)	- -	92.9 (8; 6.3)	97.8 (4; 4.1)	96.2 (102; 4.6)	- -	99.0 (1; - -)
1994	M	- -	- -	75.0 (2; 8.5)	87.3 (7; 8.4)	89.5 (4; 11.3)	- -	- -	- -
1994	F	- -	- -	78.0 (1; - -)	86.0 (6; 5.7)	92.0 (1; - -)	95.4 (27; 4.8)	- -	- -

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5	
		H	W	H	W	H	W
				Methow / Methow Composite spring Chinook			
2003	M	49.0 (36; 3.7)	51.0 (1; - -)			96.7 (9; 2.6)	
2003	F			75.3 (17; 3.4)			
2002	M	48.3 (7; 6.4)		79.0 (88; 6)		100.0 (1; - -)	
2002	F			76.3 (145; 3.5)		87.3 (6; 7.5)	
2001	M	60.0 (1; - -)		80.6 (10; 4.7)			
2001	F			76.9 (67; 3.7)			
2000	M	51.2 (40; 4.2)		73.0 (59; 6.7)			
2000	F			74.5 (74; 3.4)			
1999	M						
1999	F			78.0 (27; 3.1)	77.6 (13; 5.1)		86.5 (4; 6.6)
1998	M						
1998	F			76.3 (8; 3.7)	76.1 (27; 3.5)	84.9 (23; 8.7)	88.9 (42; 6.2)
				Twisp spring Chinook			
2003	M	50.7 (3; 3.1)	50.0 (4; 3.2)		67.0 (1; - -)		
2003	F			70.7 (3; 7.5)			93.4 (5; 0.9)
2002	M	46.3 (4; 5.3)					
2002	F			75.0 (5; 2.7)			
2001	M	63.0 (2; 2.8)	52.5 (2; 2.1)	79.3 (4; 5.6)	75.3 (22; 4.5)		
2001	F			76.9 (7; 2.1)	79.6 (7; 1.5)	92.5 (2; 9.2)	88.0 (1; - -)
2000	M		45.0 (1; - -)				98.0 (2; 1.4)
2000	F			75.1 (38; 3.6)			91.0 (3; 1)
1999	M						
1999	F				78.5 (13; 3.1)		89.3 (3; 2.1)
1998	M						
1998	F			77.0 (2; 1.4)		76.5 (4; 16.3)	
				Chewuch spring Chinook			
1996	F			76.4 (5; 2.9)			
1994	M				80.0 (1; - -)		
1994	F				74.0 (1; - -)		80.5 (4; 2.6)

Appendix C, continued.

Brood	Male				Female			
	1-salt		2-salt		1-salt		2-salt	
	H	W	H	W	H	W	H	W
				Wells Hatchery summer steelhead				
2004	60.9	64.2	73.0	- -	60.1	62.2	67.5	73.4
	(183; 2.8)	(53; 3.4)	(3; 6.6)		(118; 2.6)	(55; 3.5)	(6; 3.4)	(9; 6.2)
2003	61.9	- -	78.6	81.6	60.4	- -	74.7	75.8
	(30; 3.8)		(89; 4.9)	(9; 3.7)	(17; 3.7)		(133; 3.9)	(18; 3.7)
2002	64.3	63.7	78.3	76.0	62.9	63.8	73.6	74.7
	(106; 3.1)	(3; 2.9)	(68; 3.3)	(1; - -)	(50; 2.3)	(5; 5.1)	(150; 3.5)	(9; 4.8)
2001	61.2	60.9	76.1	82.5	60.2	59.4	72.9	73.3
	(120; 3.4)	(14; 3.7)	(27; 5.1)	(2; 4.9)	(66; 2.5)	(7; 3.0)	(106; 3.4)	(3; 2.5)
2000	63.4	62.9	77.8	76.0	61.4	62.5	73.8	76.8
	(113; 2.9)	(13; 3.4)	(28; 5.0)	(4; 10.7)	(87; 2.4)	(13; 2.4)	(98; 3.6)	(11; 7.8)
1999	63.3	64.0	80.0	80.8	62.3	61.8	74.3	73.8
	(123; 2.9)	(5; 2.9)	(41; 2.8)	(4; 7.4)	(66; 2.4)	(5; 2.4)	(141; 3.6)	(13; 2.9)
1998	64.8	65.6	79.3	- -	62.1	64.0	75.3	74.3
	(122; 3.7)	(5; 3.0)	(64; 4.8)		(78; 3.1)	(4; 1.4)	(169; 3.6)	(3; 0.6)
1997	64.2	63.8	76.6	74.5	62.3	61.6	71.9	74.3
	(145; 3.1)	(18; 3.5)	(20; 3.6)	(10; 8.0)	(94; 3.3)	(14; 2.3)	(53; 4.5)	(15; 5.7)
1996	- -	- -	- -	- -	- -	- -	- -	- -
1995	66.0	64.3	80.0	77.6	60.3	63.8	74.8	74.2
	(1; - -)	(8; 4.2)	(1; - -)	(5; 3.8)	(9; 2.6)	(12; 4.4)	(16; 4.1)	(11; 5.8)

Appendix D. Mean fecundity (*N*; SD) of Wells Complex hatchery broodstocks by total age and origin.

Brood	Age-3	Age-4 (1-salt steelhead)		Age-5 (2-salt steelhead)		Age-6	Brood total
	Hatchery	Hatchery	Wild	Hatchery	Wild	Hatchery	
				Wells summer Chinook			
2003	- -	3,907 (12; 851)	4,427 (3; 1,662)	4,711 (104; 832)	4,190 (1; - -)	4,872 (8; 495)	4,635 (128; 862)
2002	- -	4,742 (13; 648)	- -	5,287 (105; 869)	- -	5,186 (3; 404)	5,226 (121; 853)
2001	- -	4,320 (96; 732)	5,356 (3; 749)	5,011 (91; 896)	5,474 (3; 437)	4,951 (7; 658)	4,689 (200; 878)
2000	2,371 (1; - -)	4,126 (72; 829)	4,582 (10; 998)	4,695 (76; 921)	4,754 (11; 720)	6,598 (1; - -)	4,450 (171; 937)
1999	2,818 (2; 531)	3,848 (30; 925)	3,243 (7; 824)	3,802 (24; 1,197)	4,345 (5; 1,364)	4,736 (15; 946)	3,949 (83; 1,099)
				Twisp spring Chinook			
2004	- -	3,496 (16; 633)	3,811 (20; 1,060)	- -	- -	- -	3,671 (36; 898)
2003	- -	3,195 (11; 519)	- -	- -	5,867 (5; 512)	- -	4,012 (17; 1,332)
2002	- -	4,652 (2; 664)	- -	- -	- -	- -	4,652 (2; 664)
2001	- -	3,922 (7; 579)	4,617 (6; 534)	4,941 (1; - -)	4,902 (2; 612)	- -	4,369 (16; 657)
2000	- -	3,820 (38; 698)	- -	- -	5,292 (3; 997)	- -	3,927 (41; 807)
				Methow Composite spring Chinook			
2004	- -	3,510 (144; 745)	3,565 (1; - -)	3,510 (1; - -)	- -	- -	3,506 (148; 735)
2003	- -	3,795 (17; 759)	- -	4,839 (31; 1,403)	- -	- -	4,469 (48; 1,306)
2002	- -	3,905 (125; 682)	- -	3,318 (4; 342)	- -	- -	3,887 (129; 681)
2001	- -	3,938 (90; 764)	3,753 (10; 706)	- -	- -	- -	3,920 (100; 758)
2000	- -	3,759 (74; 678)	- -	- -	- -	- -	3,759 (74; 678)

Appendix D, continued.

Brood	Age-3	Age-4 (1-salt steel)		Age-5 (2-salt steel)		Age-6	Brood total
	Hatchery	Hatchery	Wild	Hatchery	Wild	Hatchery	
				Wells summer steelhead			
2005	- -	4,547 (28; 795)	5,370 (13; 1,084)	6,575 (129; 1,317)	6,627 (24; 1,455)	- -	6,208 (194; 1,457)
2004	- -	4,543 (111; 814)	4,517 (54; 1,072)	5,865 (6; 885)	4,832 (9; 1,222)	- -	4,594 (180; 947)
2003	- -	4,241 (17; 600)	- -	6,545 (130; 1,210)	6,954 (18; 1,357)	- -	6,352 (165; 1,382)
2002	- -	4,786 (48; 1,048)	4,721 (5; 1,051)	6,744 (144; 1,221)	6,586 (9; 1,859)	- -	6,232 (206; 1,477)
2001	- -	4,356 (65; 1,093)	3,865 (6; 1,436)	6,624 (94; 1,411)	6,714 (3; 1,155)	- -	5,650 (168; 1,721)
2000	- -	4,837 (26; 1,485)	5,760 (3; 405)	6,049 (31; 1,360)	- -	- -	5,509 (60; 1,495)

Appendix E. Results of ELISA sampling conducted on Wells Complex hatchery Chinook broodstocks by category. The value listed within each category is the percent of the total number of female Chinook sampled within each brood.

Brood	Below-low	Low	Med	High	Total
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	number
			Wells summer Chinook		
2004	95.0	5.0	0.0	0.0	20
2003	94.9	2.0	2.0	1.0	99
2002	93.9	2.4	0.0	3.7	82
2001	99.3	0.0	0.0	0.7	139
2000	87.9	8.8	3.3	0.0	91
1999	99.1	0.9	0.0	0.0	106
1998	91.7	5.5	1.8	0.9	109
1997	88.6	7.6	1.1	2.7	185
1996	99.0	0.5	0.0	0.5	196
1995	78.8	12.9	1.8	6.5	170
1994	97.2	1.7	0.0	1.1	181
1993	100.0	0.0	0.0	0.0	132
			Methow spring Chinook		
2004	45.9	13.5	10.8	29.7	148
2003	34.0	34.0	6.4	25.5	47
2002	59.2	30.3	1.3	9.2	152
2001	76.8	10.5	2.1	10.5	95
2000	78.4	18.9	1.4	1.4	74
1999	70.5	20.5	2.2	6.8	44
1998	72.8	7.8	3.9	15.5	103
1997	30.5	46.8	12.1	10.6	141
1996	83.6	10.9	0.0	5.5	55
1995	14.3	42.9	14.3	28.6	7
1994	100.0	0.0	0.0	0.0	1
1993	38.8	46.9	4.1	10.2	49
			Twisp spring Chinook		
2004	63.9	22.2	11.1	2.8	36
2003	52.9	29.4	5.9	11.8	17
2002	50.0	50.0	0.0	0.0	2
2001	93.3	0.0	0.0	6.7	15
2000	82.9	17.1	0.0	0.0	41
1999	81.3	6.3	0.0	12.5	16
1998	50.0	33.3	0.0	16.7	6
1997	36.4	36.4	18.2	9.1	11
1996	68.2	18.2	4.5	9.1	22
1995	-	-	-	-	-
1994	25.0	50.0	0.0	25.0	4
1993	4.3	52.2	26.1	17.4	23
1992	0.0	77.8	11.1	11.1	9

Appendix E, continued.

Brood	Below-low	Low	Med	High	Total number
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	
		Chewuch spring Chinook			
1997	35.0	35.0	22.5	7.5	40
1996	71.9	15.6	3.1	9.4	32
1995	- -	- -	- -	- -	- -
1994	33.3	50.0	0.0	16.7	6
1993	30.5	33.9	6.8	28.8	59
1992	8.3	83.3	0.0	8.3	12

Appendix F. Hatchery life stage survival-rate standards and level achieved (%) by stock and broodyear. Pre-spawn survival of adult summer Chinook is listed under the yearling life history stage category.

Brood	Collection to spawning		Unfertilized egg to eyed	Eyed egg to ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg to release
	90.0 female	85.0 male	92.0	98.0	97.0	93.0	90.0	95.0	81.0
					Wells summer Chinook yearling				
2004	98.3	98.2	92.0	100.0	99.0	98.9	96.7	- -	89.0
2003	96.8	98.4	86.4	99.8	99.2	99.2	97.7	- -	84.4
2002	94.2	97.0	94.1	100.0	99.6	99.6	92.4	- -	87.0
2001	97.1	93.9	95.3	98.8	99.4	99.4	35.9	- -	33.8
2000	98.3	95.2	93.8	99.9	99.5	99.4	99.0	- -	92.9
1999	97.3	96.3	92.3	97.1	98.0	98.0	97.5	- -	87.4
					Wells summer Chinook subyearling				
2004	- -	- -	93.6	98.4	94.3	94.4	94.3	- -	87.0
2003	- -	- -	85.7	100.0	87.9	87.9	87.8	- -	75.3
2002	- -	- -	93.8	99.9	88.1	87.3	87.1	- -	81.7
2001	- -	- -	94.6	100.0	95.6	94.2	94.1	- -	89.1
2000	- -	- -	94.1	100.0	97.6	97.4	97.1	- -	91.4
1999	- -	- -	90.9	100.0	96.7	96.3	96.2	- -	87.5
					Wells summer steelhead				
2005	96.4	99.5	87.4	95.9	96.9	92.2	85.7	- -	71.8
2004	98.6	98.4	86.2	94.0	99.4	95.5	94.0	- -	76.1
2003	99.0	99.3	83.5	99.9	93.6	77.6	73.5	- -	61.3
2002	98.0	99.5	82.2	96.2	99.0	98.7	97.8	- -	77.3
2001	98.0	99.0	83.9	98.6	97.0	96.9	95.0	- -	78.6
2000	98.0	99.2	85.2	97.4	98.1	98.7	95.3	- -	79.1
1999	99.3	99.8	77.0	98.0	97.1	96.6	92.8	- -	70.0
					Methow spring Chinook				
2004	98.2	99.3	94.8	98.3	99.2	99.2	97.0	99.5	91.3
2003	96.3	97.2	89.9	100.0	99.0	98.2	93.7	99.8	86.8
2002	97.7	95.4	95.4	100.0	98.6	98.6	97.5	99.8	92.7
2001	95.7	89.5	96.4	99.5	99.7	99.6	96.8	98.5	92.8
2000	94.4	96.7	96.5	99.8	99.8	99.6	99.2	99.8	95.6
1999	96.4	96.4	96.6	99.8	99.7	99.7	99.5	99.9	94.7
					Twisp spring Chinook				
2004	97.4	88.6	95.5	96.2	99.1	98.8	79.5	99.5	73.0
2003	100.0	92.3	98.2	97.4	96.8	95.1	90.0	99.9	87.6
2002	83.3	77.8	95.2	94.7	92.7	91.8	88.7	100.0	80.0
2001	94.4	93.9	82.2	99.4	97.8	94.8	80.0	99.8	65.3
2000	96.9	89.5	97.1	99.8	99.8	99.6	46.3	22.9	45.4
1999	- -	- -	94.3	99.5	99.7	99.5	99.1	99.9	91.7

Appendix G. Annual releases by program from Wells Complex Hatchery facilities. All Wells summer Chinook were released into the Columbia River directly adjacent to Wells Hatchery.

Brood	Wells Hatchery steelhead						Wells summer Chinook		
	Methow	Twisp	Chewuch	Okanogan	Columbia R.	Total	Subyearling	Yearling	Total
				Wells Hatchery steelhead					
2005	99,820	107,245	119,500	146,826	- -	473,391	430,203	- -	
2004	86,041	96,405	82,280	78,940	- -	343,666	471,123	312,980	784,103
2003	80,580	117,545	78,205	79,605	- -	355,935	425,271	313,509	738,780
2002	96,420	105,323	117,495	141,890	- -	461,128	473,100	306,810	779,910
2001	94,020	84,475	85,615	126,855	- -	390,965	376,027	185,200	561,227
2000	116,830	109,950	99,490	228,770	- -	555,040	498,500	343,423	841,923
1999	139,900	136,680	138,300	144,650	47,782	607,312	363,600	312,098	675,698
1998	320,250	113,583	116,403	160,756	64,280	775,272	370,617	457,770	828,387
1997	127,020	126,000	125,300	100,005	64,703	543,028	541,923	381,867	923,790
1996	310,480	- -	- -	99,720	17,500	427,700	473,000	356,707	829,707
1995	242,400	- -	- -	67,500	18,200	328,100	408,000	290,000	698,000
1994	359,170	- -	- -	91,225	- -	450,395	450,935	365,000	815,935
1993	324,200	- -	- -	95,910	- -	420,110	187,382	388,248	575,630
1992	392,815	- -	- -	118,408	- -	511,223	- -	331,353	331,353
				Methow Hatchery spring Chinook					
2004	65,146	96,461	204,906	- -	- -	366,513			
2003	48,831	136,998	127,614	- -	- -	313,443			
2002	181,235	58,074	254,238	- -	- -	493,547			
2001	130,887	57,471	261,284	- -	- -	449,642			
2000	66,454	75,704	199,938	- -	- -	342,096			
1999	180,775	67,408	--	- -	- -	248,183			
1998	218,499	15,470	217,171	- -	- -	451,140			
1997	332,484	26,714	132,759	- -	- -	491,957			
1996	202,947	76,687	91,672	- -	- -	371,306			
1995	28,878	--	--	- -	- -	28,878			
1994	4,477	19,835	11,854	- -	- -	36,166			
1993	210,849	116,749	284,165	- -	- -	611,763			
1992	--	35,853	40,881	- -	- -	76,734			

Appendix H. Coded-wire tagged releases from Wells Complex Hatchery facilities. Spring Chinook releases include high ELISA (HE) progeny. Mixed releases were those where a single tagcode was used for more than one release site. They are listed as Chewuch River fish by default.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
				Wells summer Chinook					
2004	Subyearling	13-Jun-05	0	Ad-clip	632285	235,256	5,218	0.9783	240,474
2004	Subyearling	18-May-05	0	Ad-clip	632286	222,069	8,580	0.9628	230,649
2003	Subyearling	14-Jun-04	0	Ad-clip	632370	201,200	9,570	0.9546	210,770
2003	Subyearling	11-May-04	0	Ad-clip	632371	192,558	21,943	0.8977	214,501
2002	Subyearling	16-Jun-03	0	Ad-clip	631368	233,322	1,882	0.9920	235,204
2002	Subyearling	16-Jun-03	0	Ad-clip	631370	233,431	4,466	0.9812	237,897
2001	Subyearling	17-Jun-02	0	Ad-clip	631423	368,533	7,494	0.9801	376,027
2000	Subyearling	20-Jun-01	0	Ad-clip	630775	498,500	-	1.0000	498,500
1999	Subyearling	19-Jun-00	0	Ad-clip	630267	350,361	13,239	0.9636	363,600
1998	Subyearling	18-Jun-99	0	Ad-clip	631018	362,362	8,255	0.9777	370,617
1997	Subyearling	4-Jun-98	0	Ad-clip	630602	528,438	13,485	0.9751	541,923
1996	Subyearling	18-Jun-97	0	Ad-clip	636054	232,232	5,214	0.9780	237,446
1996	Subyearling	18-Jun-97	0	Ad-clip	636323	230,381	5,173	0.9780	235,554
1995	Subyearling	13-Jun-96	0	Ad-clip	635841	229,757	11,110	0.9539	240,867
1995	Subyearling	13-Jun-96	0	Ad-clip	636044	159,424	7,709	0.9539	167,133
1994	Subyearling	15-Jun-95	0	Ad-clip	635546	211,875	6,047	0.9723	217,922
1994	Subyearling	15-Jun-95	0	Ad-clip	635703	226,547	6,466	0.9723	233,013
1993	Subyearling	28-Jun-94	0	Ad-clip	635145	183,199	4,813	0.9777	188,012
2003	Yearling	11-Apr-05	166	Ad-clip	632580	306,894	6,615	0.9789	313,509
2002	Yearling	19-Apr-04	166	Ad-clip	631890	302,905	3,905	0.9873	306,810
2001	Yearling	21-Apr-03	166	Ad-clip	631549	183,591	1,609	0.9913	185,200
2000	Yearling	15-Apr-02	166	Ad-clip	630995	337,913	7,591	0.9780	345,504
1999	Yearling	16-Apr-01	166	Ad-clip	630468	305,947	6,151	0.9803	312,098
1998	Yearling	18-Apr-00	166	Ad-clip	631061	437,235	20,535	0.9551	457,770
1997	Yearling	15-Apr-99	166	Ad-clip	630611	374,268	7,419	0.9806	381,687
1996	Yearling	15-Apr-98	166	Ad-clip	630134	199,585	3,306	0.9837	202,891
1996	Yearling	15-Apr-98	166	Ad-clip	630217	143,295	2,373	0.9837	145,668
1995	Yearling	1-Apr-97	166	Ad-clip	634129	187,847	3,153	0.9835	191,000
1995	Yearling	1-Apr-97	166	Ad-clip	634130	96,720	2,280	0.9770	99,000
1994	Yearling	1-Apr-96	166	Ad-clip	635324	109,034	7,966	0.9319	117,000
1994	Yearling	1-Apr-96	166	Ad-clip	635838	242,786	5,214	0.9790	248,000
1993	Yearling	15-Apr-95	166	Ad-clip	634610	131,625	3,594	0.9734	135,219
1993	Yearling	15-Apr-95	166	Ad-clip	635702	241,202	11,827	0.9533	253,029
1992	Yearling	27-Apr-94	166	Ad-clip	635005	209,245	122,108	0.6315	331,353
				Chewuch River spring Chinook					
2004	MC Chewuch	18-Apr-06	27	None	632899	202,468	2,438	0.988	204,906
2003	MC Chewuch	18-Apr-05	39	None	632566	54,598	341	0.994	54,939
2003	MC Chewuch	18-Apr-05	39	None	632569	71,432	1,243	0.983	72,675
2002	MC Chewuch	14-Apr-04	22	None	631976	249,763	4,475	0.982	254,238
2001	MC Chew. HE	23-Apr-03	0	None	631494	15,808	1,433	0.917	17,241
2001	MC Chewuch	21-Apr-03	26	None	631384	145,698	2,039	0.986	147,737

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
2001	MC Chewuch	21-Apr-03	26	CWTO	631440	94,977	1,329	0.986	96,306
2000	MC Mixed	16-Apr-02	18	CWTO	630776	255,124	11,268	0.958	266,392
1998	MC Mixed	17-Apr-00	36	Ad-clip	631024	412,613	23,057	0.947	435,670
1997	Chewuch	19-Apr-99	27	Ad-clip	630614	128,404	4,355	0.967	132,759
1996	Chewuch	15-Apr-98	21	Ad-clip	630233	79,493	12,179	0.867	91,672
1994	Chewuch	21-Apr-96	31	Ad-clip	635132	2,361	21	0.991	2,382
1994	Chewuch	21-Apr-96	31	Ad-clip	635416	3,805	33	0.991	3,838
1994	Chewuch	21-Apr-96	31	Ad-clip	635863	967	9	0.991	976
1994	Chewuch	21-Apr-96	31	Ad-clip	635903	310	3	0.990	313
1994	Chewuch	21-Apr-96	31	Ad-clip	635905	656	5	0.992	661
1994	Chewuch HE	21-Apr-96	31	Ad-clip	635415	3,652	32	0.991	3,684
1993	Chewuch	17-Apr-95	18	Ad-clip	634127	174,761	4,114	0.977	178,875
1993	Chewuch	17-Apr-95	18	Ad-clip	635350	23,236	461	0.981	23,697
1993	Chewuch HE	17-Apr-95	18	Ad-clip	635161	79,804	1,789	0.978	81,593
1992	Chewuch	18-Apr-94	3	Ad-clip	634331	2,577	10	0.996	2,587
1992	Chewuch	18-Apr-94	3	Ad-clip	634332	2,511	25	0.990	2,536
1992	Chewuch	18-Apr-94	3	Ad-clip	634848	4,148	- -	1.000	4,148
1992	Chewuch	18-Apr-94	3	Ad-clip	634850	4,432	43	0.990	4,475
1992	Chewuch	18-Apr-94	3	Ad-clip	635121	5,165	31	0.994	5,196
1992	Chewuch	18-Apr-94	3	Ad-clip	635123	4,051	25	0.994	4,076
1992	Chewuch	18-Apr-94	3	Ad-clip	635124	4,417	-	1.000	4,417
1992	Chewuch	18-Apr-94	3	Ad-clip	635133	3,414	27	0.992	3,441
1992	Chewuch	18-Apr-94	3	Ad-clip	635138	3,580	-	1.000	3,580
1992	Chewuch	18-Apr-94	3	Ad-clip	635139	3,120	6	0.998	3,126
1992	Chewuch	18-Apr-94	3	Ad-clip	635140	3,228	71	0.978	3,299
				Methow River spring Chinook					
2004	MC Methow	18-Apr-06	169	CWTO	631187	63,270	1,876	0.971	65,146
2004	MC Methow	18-Apr-06	169	CWTO	632694	42,252	- -	1.000	42,252
2003	MC Methow	18-Apr-05	169	CWTO	632568	46,521	2,310	0.953	48,831
2002	MC Methow	2-Apr-04	7	CWTO	631524	35,075	694	0.981	35,769
2002	MC Methow	14-Apr-04	42	CWTO	631891	142,804	2,662	0.982	145,466
2001	MC Methow	21-Apr-03	82	CWTO	630976	49,960	312	0.994	50,272
2001	MC Methow	21-Apr-03	82	CWTO	631179	32,152	4,080	0.887	36,232
2001	MC Methow	21-Apr-03	82	CWTO	631477	43,273	1,110	0.975	44,283
1999	MC Methow	17-Apr-01	171	Ad-clip	630377	161,827	5,454	0.967	167,281
1999	MC HE	17-Apr-01	171	Ad-clip	630380	13,198	296	0.978	13,494
1997	Methow	15-Apr-99	300	Ad-clip	630613	315,441	17,043	0.949	332,484
1996	Methow	15-Apr-98	300	Ad-clip	630130	182,343	3,962	0.979	186,305
1996	Methow	15-Apr-98	300	Ad-clip	630246	2,987	57	0.981	3,044
1996	Met. (Snake R)	15-Apr-98	300	Ad-clip	636315	8,763	167	0.981	8,930
1996	Methow HE	15-Apr-98	300	Ad-clip	630248	4,581	87	0.981	4,668
1995	Methow	15-Apr-97	350	Ad-clip	636037	5,218	4	0.999	5,222
1995	Methow	15-Apr-97	350	Ad-clip	636038	4,747	4	0.999	4,751
1995	Methow	15-Apr-97	350	Ad-clip	636039	4,035	5	0.999	4,040
1995	Methow	15-Apr-97	350	Ad-clip	636041	4,001	5	0.999	4,006

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
1995	Methow	15-Apr-97	350	Ad-clip	636042	3,536	5	0.999	3,541
1995	Methow HE	15-Apr-97	350	Ad-clip	636040	3,617	29	0.992	3,646
1995	Methow HE	15-Apr-97	350	Ad-clip	636043	3,647	25	0.993	3,672
1994	Methow	22-Apr-96	29	Ad-clip	635417	4,460	17	0.996	4,477
1993	Methow	15-Apr-95	227	Ad-clip	635551	187,496	2,235	0.988	189,731
1993	Methow HE	15-Apr-95	227	Ad-clip	635410	20,758	360	0.983	21,118
				Twisp River spring Chinook					
2004	Twisp	18-Apr-06	27	CWTO	631508	3,643	- -	1.000	3,643
2004	Captive HE	22-Apr-06	4	CWTO	632878	69,717	1,744	0.976	71,461
2004	Twisp HE	22-Apr-05	0	CWTO	632988	24,380	620	0.975	25,000
2003	Twisp	18-Apr-05	35	CWTO	632567	42,750	984	0.978	43,734
2003	Captive and HE	25-Apr-05	2	CWTO	632499	44,660	2,114	0.955	46,774
2003	Captive and HE	25-Apr-05	2	CWTO	632564	35,390	1,675	0.955	37,065
2003	Captive and HE	25-Apr-05	2	CWTO	632565	8,999	426	0.955	9,425
2002	Twisp	13-Apr-04	27	CWTO	631582	20,377	164	0.992	20,541
2002	Twisp Captive	13-Apr-04	28	CWTO	631076	11,876	517	0.958	12,393
2002	Twisp Captive	13-Apr-04	28	CWTO	631077	10,088	439	0.958	10,527
2002	Twisp Captive	13-Apr-04	28	CWTO	631694	8,504	308	0.965	8,812
2002	Twisp Captive	13-Apr-04	0	CWTO	631695	5,599	202	0.965	5,801
2001	Twisp	21-Apr-03	27	CWTO	631478	50,454	1,198	0.977	51,652
2001	Twisp Captive	21-Apr-03	27	CWTO	631068	5,656	163	0.972	5,819
2000	Twisp Captive	23-Apr-02	0	CWTO	630994	978	9	0.991	987
2000	Twisp	15-Apr-02	20	CWTO	630182	74,045	672	0.991	74,717
1999	Twisp	17-Apr-01	36	Ad-clip	630378	28,808	589	0.980	29,397
1999	Twisp	17-Apr-01	36	Ad-clip	630379	27,743	828	0.971	28,571
1999	Twisp HE	17-Apr-01	36	Ad-clip	630381	9,357	83	0.991	9,440
1998	Twisp	17-Apr-00	36	Ad-clip	631041	14,752	718	0.954	15,470
1997	Twisp	15-Apr-99	30	Ad-clip	630434	25,557	1,157	0.957	26,714
1996	Twisp	15-Apr-98	26	Ad-clip	636114	62,239	2,479	0.962	64,718
1996	Twisp	15-Apr-98	26	Ad-clip	636317	4,394	205	0.955	4,599
1996	Twisp HE	15-Apr-98	26	Ad-clip	636316	7,041	329	0.955	7,370
1994	Twisp	21-Apr-96	36	Ad-clip	634515	6,197	71	0.989	6,268
1994	Twisp	21-Apr-96	36	Ad-clip	635419	4,457	51	0.989	4,508
1994	Twisp	21-Apr-96	36	Ad-clip	635420	4,457	51	0.989	4,508
1994	Twisp HE	21-Apr-96	36	Ad-clip	635418	4,499	52	0.989	4,551
1993	Twisp	17-Apr-95	20	Ad-clip	635329	96,319	3,709	0.963	100,028
1993	Twisp HE	17-Apr-95	20	Ad-clip	635609	16,638	83	0.995	16,721
1992	Twisp	15-Apr-94	3	Ad-clip	634849	4,194	94	0.978	4,288
1992	Twisp	15-Apr-94	3	Ad-clip	634851	4,032	24	0.994	4,056
1992	Twisp	15-Apr-94	3	Ad-clip	635122	5,150	52	0.990	5,202
1992	Twisp	15-Apr-94	3	Ad-clip	635125	4,197	260	0.942	4,457
1992	Twisp	15-Apr-94	3	Ad-clip	635134	3,835	69	0.982	3,904
1992	Twisp	15-Apr-94	3	Ad-clip	635135	3,169	25	0.992	3,194
1992	Twisp	15-Apr-94	3	Ad-clip	635136	3,316	80	0.976	3,396

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
1992	Twisp	15-Apr-94	3	Ad-clip	635137	3,821	167	0.958	3,988
1992	Twisp	15-Apr-94	3	Ad-clip	635141	3,355	13	0.996	3,368

Appendix I. Mean fork length (mm), coefficient of variation (CV), weight (g), and fish per pound (FPP) for anadromous fish released from Wells and Methow hatcheries.

Brood	Fork length			Weight			
	Mean	SD	CV	Mean	SD	CV	FPP
Wells yearling Chinook							
2004	170.8	11.0	6.4	52.0	10.4	20.0	8.7
2003	157.0	19.8	12.6	45.0	16.4	36.4	10.1
2002	156.0	13.4	8.6	46.7	11.8	25.3	9.7
2001	155.7	12.3	7.9	43.8	10.0	22.8	10.3
2000	161.2	11.6	7.2	47.9	11.1	23.2	9.5
1999	159.5	9.8	6.1	44.5	8.3	18.7	10.2
1998	183.6	13.6	7.4	74.1	16.6	22.4	6.1
1997	202.1	19.5	9.6	75.6	- -	- -	6.0
Wells subyearling Chinook							
2004	109.5	6.1	5.6	15.0	2.8	18.7	30.2
2003	115.4	7.2	6.2	18.9	4.4	23.5	24.0
2002	108.1	8.0	7.4	14.7	3.6	25.0	30.9
2001	116.9	7.6	6.5	20.6	4.8	23.5	21.9
2000	111.3	8.5	7.6	16.9	4.9	28.9	26.7
1999	122.1	9.2	7.5	24.5	6.6	27.1	18.5
1998	116.5	8.0	6.9	18.3	5.1	27.9	24.7
Wells H x H steelhead							
2005	171.4	18.7	10.9	56.8	17.1	30.1	7.9
2004	192.4	21.7	11.3	82.4	28.8	34.9	5.4
2003	189.9	19.4	10.2	79.9	23.4	29.3	5.6
2002	188.5	19.6	10.4	75.9	22.6	29.8	5.9
2001	194.7	15.4	7.9	87.3	20.7	23.7	5.1
2000	172.9	22.4	13.0	60.0	21.3	35.5	7.5
1999	189.4	18.1	9.6	76.8	20.8	27.1	5.9
Wells H x W steelhead							
2005	168.4	16.4	9.7	53.3	15.0	28.3	8.5
2004	184.5	24.3	13.1	72.2	29.1	40.2	6.2
2003	163.2	29.7	18.2	62.1	--	--	7.3
2002	187.9	24.1	12.8	73.1	26.7	36.5	6.2
2001	181.8	26.9	14.8	72.9	30.5	41.9	6.2
2000	178.6	20.9	11.7	66.7	21.7	32.5	6.7
1999	195.4	18.2	9.3	83.0	21.3	25.7	5.4
1998	191.8	18.9	9.9	79.4	23.6	29.7	5.7

Appendix I, continued.

Brood	Fork length			Weight			
	Mean	SD	CV	Mean	SD	CV	FPP
			Twisp River spring Chinook				
2004	130.2	14.6	11.2	27.9	12.0	43.0	16.2
2003	132.8	11.1	8.4	28.2	7.9	28.0	16.1
2002	135.9	9.6	7.1	30.3	7.2	23.8	15.0
2001	122.5	10.0	8.2	21.6	- -	- -	21.0
2000	133.4	6.8	5.1	27.2	- -	- -	16.7
1999	155.9	15.5	9.9	47.7	15.7	32.9	9.5
1998	138.0	10.6	7.7	30.3	7.6	25.1	15.0
1997	133.4	- -	- -	28.2	- -	- -	16.1
1996	137.2	- -	- -	30.7	- -	- -	14.8
1995	na	na	na	na	na	na	na
1994	138.5	- -	- -	31.4	- -	- -	14.4
1993	132.9	- -	- -	29.8	- -	- -	15.2
1992	135.0	- -	- -	30.0	- -	- -	15.1
			Methow River spring Chinook				
2004	137.3	7.3	5.3	32.1	5.7	17.7	14.1
2003	135.0	10.9	8.1	28.4	6.5	23.0	16.0
2002	132.5	12.5	9.4	28.7	8.1	28.2	15.8
2001	132.8	- -	- -	28.4	- -	- -	16.0
2000	131.3	6.8	5.2	26.8	4.8	18.0	16.9
1999	151.0	14.3	9.5	40.9	13.1	100.0	11.0
1998	133.9	6.7	5.0	28.3	5.6	19.8	16.0
1997	126.5	- -	- -	24.7	- -	- -	18.3
1996	128.2	- -	- -	25.0	- -	- -	18.1
1995	134.9	- -	- -	32.2	- -	- -	14.1
1994	132.0	- -	- -	31.2	- -	- -	14.5
1993	134.8	- -	- -	28.5	- -	- -	15.9
1992	na	na	na	na	na	na	na
			Chewuch River spring Chinook				
2004	144.1	20.8	14.4	42.4	21.0	49.6	10.7
2003	131.0	11.7	8.9	27.6	7.9	28.6	16.4
2002	142.5	16.1	11.3	35.0	13.2	37.7	12.9
2001	133.8	6.7	5.0	30.2	- -	- -	15.0
2000	131.3	6.8	5.2	26.8	4.8	18.0	16.9
1999	na	na	na	na	na	na	na
1998	127.9	8.7	6.8	24.6	5.0	20.1	18.4
1997	132.7	- -	- -	27.9	- -	- -	16.2
1996	129.8	- -	- -	22.7	- -	- -	20.0
1995	na	na	na	na	na	na	na
1994	145.7	- -	- -	35.7	- -	- -	12.7
1993	134.5	- -	- -	27.7	- -	- -	16.4
1992	141.8	- -	- -	30.0	- -	- -	15.1

Chapter 2

Harvest and exploitation of naturally produced and hatchery origin fish released from Wells Complex hatchery facilities.

Abstract

Hatchery salmon and steelhead released for supplementation purposes are intended to increase the abundance of spawning adults of the target species. Harvest of supplementation fish may be appropriate after objectives have been met for hatchery broodstock and spawning ground escapement. Salmon released for production purposes are appropriate fish for fisheries to target after hatchery broodstock requirements have been reached. Returning salmon and steelhead, regardless of production type, may stray into non-target areas potentially altering the genetic composition of the receiving stock, and leaving target spawning grounds under-seeded. All stocks of salmon and steelhead covered in this chapter were subject to commercial, sport, or tribal fisheries in ocean or freshwater environments. Based on analysis of coded-wire tag data, most Wells summer Chinook adults were recovered in fisheries, while most Methow spring Chinook stocks were recovered in hatchery broodstocks or on spawning grounds. Although the numbers of summer Chinook released as yearlings and subyearlings was similar, yearling releases returned 14 adults for every adult returning from subyearling releases. Harvest of adult hatchery steelhead occurring in the upper Columbia River ESU was monitored through local creel census. An estimated 1,706 hatchery steelhead and 16 wild steelhead were lethally removed from the 2005 brood of returning adults through sport fisheries. Overall, Wells Complex hatchery fish provided commercial and recreational harvest while meeting broodstock and spawning ground requirements.

Introduction

Wells Complex hatchery facilities are funded by DCPUD to release juvenile salmonids as compensation for the inundation of mainstem spawning habitat resulting from the construction of the Wells Hydroelectric Project (original inundation compensation), and for mortality associated with passage at the Wells Hydroelectric Project (NNI compensation). Hatchery releases are intended to supplement natural populations (Methow spring Chinook; Methow summer steelhead, Okanogan summer steelhead), or to produce fish for commercial and recreational harvest (Wells summer Chinook). Some hatchery fish released from Wells Complex facilities are heavily exploited in marine areas along the Pacific coast from Washington to Alaska. This exploitation occurs in the manner of sport, commercial, and tribal harvest. In years of high post-release survival, returning hatchery fish can exceed the level necessary for broodstock and natural spawning purposes, thereby providing excess fish for local harvest. The information presented in this chapter will specifically address the following M & E Plan objectives:

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

- Ho: Stray rate $_{\text{Hatchery fish}} < 5\%$ total brood return

- Ho: Stray rate $_{\text{Hatchery fish}} < 10\%$ of the spawning escapement of independent populations (Wells summer chinook only)

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate.

- Ho: Harvest rate ≤ Maximum level to meet program goals

Hatchery fish released from Wells Complex facilities were marked prior to release to identify stock, genetic origin, or release location. Hatchery marking differs by stock depending on management requirements of each species, or as mandated by federal permits (ESA section 10). The primary mark used by most agencies to denote hatchery origin is the adipose fin-clip. In Chinook stocks, an adipose-fin clip typically identifies the presence of a coded-wire tag (CWT).

Local Chinook fisheries target non-listed summer Chinook, and are temporally and spatially designed to avoid impacting ESA-listed spring Chinook. Through the use of data from CWT recoveries, the effectiveness of this segregation can be estimated. Coded-wire tag data from fisheries, spawning grounds, or from hatcheries in the Pacific Region is stored in the Regional Mark Processing Center (RMPC) database. The RMPC is the central repository for all coded-wire tagged and otherwise associated release, catch, sample, and recovery data regarding anadromous salmonids in the greater Pacific Coast Region of the United States of America (RMPC Strategic Plan 2006-2009). The Regional Mark Information System database (RMIS) within the RMPC provides specific recovery data for individual tag codes, along with the sample rate used to derive the total number of recoveries by fishery type. The RMIS database is the primary tool for estimating the survival and extraction rate of adipose fin-clipped and CWT hatchery releases.

When the return of hatchery fish is greater than that needed to meet objectives for broodstock and spawning escapement, selective fisheries may target the adipose fin-clipped portion of an ESA listed population to decrease the number of hatchery origin fish on the spawning grounds (e.g., Wells summer steelhead) or non-selective fisheries may target both hatchery and wild origin fish of non-ESA listed populations (e.g., summer Chinook).

In addition to providing harvest estimates, CWT recoveries from spawning ground surveys provide the data necessary to estimate hatchery stray rates. Hatchery fish may stray within their basin of release, or to other river basins, and may contribute to the loss of genetic variation within or between populations. In the upper Columbia River Basin comprehensive spawning ground surveys are conducted in all tributaries for all Chinook stocks. The notable exception is the Columbia River between Wells Dam and the Chelan River (i.e., summer Chinook). Coded-wire tags extracted from carcasses and the overall carcass sample rates are stored in the RMIS database.

Estimating the extraction or harvest of wild fish is problematic. Although wild steelhead and spring Chinook are ESA-listed species, some fish are undoubtedly captured in sport and commercial fisheries either as target species or as unintended by-catch. Estimating the extraction of wild stocks is necessary to make survival comparisons equal between hatchery and wild fish,

and to weigh the risk associated with specific fisheries. Because fish released for supplementation purposes are intended to contribute to natural spawning populations, and therefore aid in ESA recovery efforts, many of the Wells Complex hatchery fish are marked with only a CWT or visual-implant elastomer, to prohibit fishery extraction (i.e., Wells steelhead).

Methods

Hatchery Chinook

Fishery extraction and natural escapement rates of hatchery Chinook, whether adipose fin-clipped or not, were calculated from CWT data available within the RMIS database. The data for each CWT code was sorted by fishery type, year of capture, and reporting agency. In the case of spawning ground and hatchery data, the specific stream or hatchery was also recorded. The RMIS database reports the number of fish observed and estimated for individual fishery codes. Some of these codes (e.g., spawning ground) may themselves contain multiple listings.

Coded-wire tag data reported to RMIS is expanded by a sample rate generated by the Agency reporting the data. In some cases, the expanded number of tags reported is less than the number actually observed. This typically occurs when the sample rate is unknown or not reported. In these instances, the observed number was used instead of the estimated number when calculating contribution rates. The sum of the estimated CWT recoveries was then expanded by the marking rate for the population to yield the total number of fish recovered. Mark rates for tagged populations were determined from quality control sampling of juvenile fish prior to release. These data were obtained from the RMIS website or from local quality control sampling documentation. Expanded recovery data was sorted by fishery code and site name, and grouped into four categories:

1. Broodstock
2. Spawning ground
3. Ocean fishery
4. Freshwater fishery

Within each of the broodstock and spawning ground categories, subcategories were employed to designate target areas (i.e., stream or hatchery of release), and non-target areas (i.e., stray locations). Within the ocean and freshwater categories, subcategories were developed to designate commercial, sport, or tribal harvests. The spawning ground subcategories of target and non-target stream were based on the release location of populations of fish where the entire tagged group was released in the same stream. Releases of 1998 and 2000 brood spring Chinook in the Chewuch River were accomplished with Methow Composite stock fish that were not uniquely tagged by release site. Thus, returning adults from these broods could not be identified by release site.

Wells summer Chinook are propagated for harvest augmentation and released into the mainstem Columbia River. Because the purpose of the program is harvest, all spawning ground recoveries were considered to be in non-target areas.

Wild Chinook

All of the spring Chinook broods covered in this chapter were subject to sport, commercial, or tribal fisheries. Prior to 2001, these fisheries were able to retain spring Chinook regardless of the presence or absence of an adipose fin (i.e., non-selective). Beginning in 2001, Columbia River sport fisheries have required that sport anglers be allowed to retain only adipose fin-clipped Chinook (i.e., selective). Since 2002, both non-tribal sport and commercial fisheries in the Columbia River have been conducted as selective fisheries. Because non-selective fisheries (i.e., tribal and ocean) retain spring Chinook regardless of origin, the exploitation rate of specific hatchery stocks (e.g., Methow River) should be the same as for naturally produced fish from the same locale. The number of wild fish harvested in non-selective fisheries can therefore be estimated from the exploitation rate of hatchery fish, as long as the two stocks are similarly exposed to the open fishery (i.e., same migration timing).

The exploitation rate of a hatchery stock was used to estimate the number of wild fish of a similar stock harvested in selective fisheries. Even thought they do not allow the retention of wild fish, selective fisheries impact wild fish through indirect mortality. To estimate this mortality, the proportion of hatchery fish harvested was multiplied by the rate of indirect mortality calculated for specific fishery types (Cindy Lafleur, WDFW, personal communication.). Rates of indirect mortality have been determined for Columbia River selective fisheries (Table 1).

Table 1. Indirect mortality rates for selective fisheries in the Columbia River.

Fishery	Indirect mortality
Sport	10.0 %
Commercial – small mesh	18.5 %
Commercial – large mesh	40.0 %

Summer Chinook Sport Fishery

A non-selective sport fishery on summer Chinook upstream of Priest Rapids Dam began in 2001, but creel surveys were not conducted until 2004. The objective of the creel surveys were to:

1) Estimate sport harvest of both wild and hatchery summer Chinook.

2) Estimate incidental "take" of any ESA listed fishes, primarily steelhead.

3) Estimate incidental catch and release of coho and sockeye salmon.

We used a two-stage non-uniform probability sampling method (Malvestuto et al. 1978). This method minimizes some of the problems associated with sampling large rivers containing disproportional angler effort per river section (Table 2). A more detailed description of the methodologies used can be found in Appendix A.

Table 2. River section descriptions used for summer Chinook creel surveys.

River section code	River section description
539	Wanapum Dam – Rock Island Dam
541	Rock Island Dam – Rocky Reach Dam
543	Rocky Reach Dam to Wells Dam
545	Wells Dam to Chief Joseph Dam
627/629	Okanogan and Similkameen rivers

Summer Steelhead Sport Fishery

Since ESA listing in 1997, steelhead returns have had to meet specific abundance and genetic composition requirements before a local sport fishery (i.e., upper Columbia ESU) could be considered. Because hatchery steelhead were not coded-wire tagged, no stock-specific fishery harvest estimate could be generated from the RMIS database. Instead, creel census was used to estimate harvest and indirect mortality (i.e., hooking mortality) associated with local fisheries. Creel census was conducted consistent with methodologies described by Malvestuto et al. (1978) for roving creel-census. An estimated 5%-rate of hooking mortality was used to estimate mortality of wild and hatchery fish released by sport anglers. Angler interviews produced a catch-per-unit-effort (CPUE) statistic where one unit of effort was equal to one angler fishing for one hour. The total number of steelhead captured was determined by multiplying the total angler effort by the overall CPUE for each fishery location.

Results

Hatchery Chinook

Fishery contribution rates for individual brood years were combined for hatchery spring (1992 – 2000) and summer Chinook (1992 – 1999). Hatchery Chinook of these brood years, regardless of race, were adipose fin clipped and CWT prior to release (Chapter 1). Thus, fish intended for supplementation did not receive any protection from fishery retention afforded by selective fisheries. Mark rates for the years examined ranged from 95% to 100% for spring Chinook, and from 93% to 98% for summer Chinook. Most hatchery Chinook stocks contributed to fisheries at similar rates, albeit in different locations geographically. For the current brood examined, summer Chinook were more likely to be captured in ocean fisheries, while spring Chinook were more likely to be captured in freshwater fisheries (Table 3). For the broods examined, spring Chinook released into the Twisp River contributed to fisheries at a much lower rate than other spring Chinook stocks, and subsequently contributed to spawning ground recoveries at a much higher rate (Table 4; Appendix B).

Table 3. Percent of total hatchery Chinook recoveries by race and recovery category. Spring and summer Chinook recoveries include the 2000 and 1999 brood years, respectively. Chewuch River releases are included in the Methow spring category. Recoveries are expanded by mark rate and sample rate for each category (NA = not applicable).

Recovery category	Methow spring	Twisp spring	Wells summer yearling	Wells summer subyearling
Total recoveries (*N*)	857	148	1,544	523
Broodstock target stream	25.2[a]	14.9	8.2	16.8
Broodstock non-target stream	- -	8.1	1.0	0.4
Broodstock from Wells Dam	- -	- -	- -	- -
Spawning ground target stream	70.6[a]	45.3	NA	NA
Spawning ground non-target stream	0.5	27.0	3.6	5.9
Ocean fishery-commercial	0.6	- -	53.0	56.4
Ocean fishery-sport	- -	- -	9.5	7.1
Ocean fishery-tribal	- -	- -	3.2	1.5
Freshwater fishery-commercial	2.4	4.8	6.2	5.9
Freshwater fishery-sport	0.7	- -	15.0	5.7
Freshwater fishery-tribal	- -	- -	0.4	0.2

[a] Includes all Methow and Chewuch River locations.

Table 4. Percent of total hatchery Chinook recoveries by race and recovery category. Methow spring Chinook includes the 1992 – 1997, and 1999 broods. Twisp spring Chinook include the 1992 – 2000 broods and Chewuch spring Chinook include the 1992 –1997 broods. Summer Chinook include the 1992 –1999 broods. Recoveries are expanded by mark rate and sample rate for each category (NA = not applicable).

Recovery category	Methow spring	Twisp spring	Chewuch spring	Wells summer-year	Wells summer-sub
Total recoveries (*N*)	2,863	626	518	28,841	2,026
Broodstock target stream	25.0	8.1	10.4	18.1	26.3
Broodstock non-target stream	0.0	17.9	15.3	2.1	1.6
Broodstock from Wells Dam	12.4	13.3	28.8	- -	- -
Spawning ground target stream	9.8	38.5	2.3	NA	NA
Spawning ground non-target stream	0.6	12.8	6.6	10.0	8.9
Ocean fishery-commercial	0.5	0.2	1.4	52.0	47.5
Ocean fishery-sport	- -	- -	- -	9.9	6.7
Ocean fishery-tribal	- -	- -	- -	1.8	1.2
Freshwater fishery-commercial	26.8	6.0	5.8	1.7	2.7
Freshwater fishery-sport	22.8	2.1	27.8	3.9	4.6
Freshwater fishery-tribal	2.0	1.1	1.7	0.6	0.6

For the 1992 – 2000 brood years, 28% of the spring Chinook recovered were harvested in fisheries. Most spring Chinook hatchery releases covered in this chapter occurred prior to ESA-listing of the species in the upper Columbia ESU and all were marked with an adipose-fin clip and tagged with a CWT. This marking combination did not allow upper Columbia ESU spring Chinook to be exempted from selective fisheries that target hatchery fish based on the absence of an adipose fin.

Adult returns of hatchery summer Chinook were great enough to provide fish for broodstock and harvest. Harvest of summer Chinook occurred primarily in ocean fisheries. Of which, the yearling releases provided 93.3% of all summer Chinook recoveries. Because they are a production stock, no target stream was designated for Wells summer Chinook and consequently, all spawning ground recoveries were considered to be in non-target areas. Because of this designation, greater than 5% of the total brood return for the 1992 – 1999 broods has been recovered in non-target areas (Figure 1; Appendix C1). Summer Chinook are known to spawn in the Columbia River downstream of Wells Dam (Miller 2006), but redds in this area are difficult to quantify and no carcasses have been recovered from this spawning area. Because of this, spawning ground recovery data and smolt-to-adult survival should be considered minimum values. When CWT recoveries were examined by return year, stray rates of Wells summer chinook were inversely correlated with distance from Wells Hatchery (Figure 2; Appendix C2). Of the independent summer chinook populations in the Upper Columbia ESU (Wenatchee, Methow, and Okanogan), Wells summer Chinook has averaged less than 10% of the spawning population. The highest proportion of Well summer Chinook are consistently recovered in the Chelan River, which is currently not identified as a summer Chinook population.

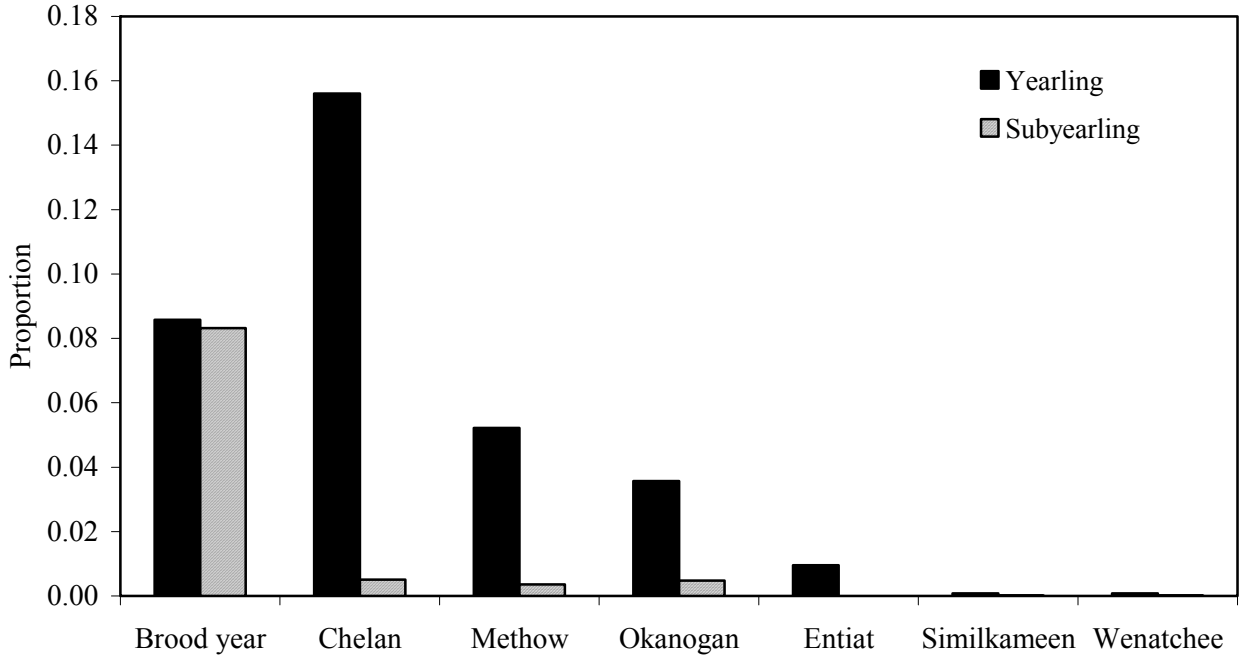

Figure 1. Mean proportion of Wells summer Chinook hatchery adults from yearling (1992-1999 broods) and subyearling (1995-1999 brood) programs that strayed and the proportion of the spawning escapement composed of Wells summer Chinook recovered in spawning areas within the upper Columbia River ESU (1997-2005).

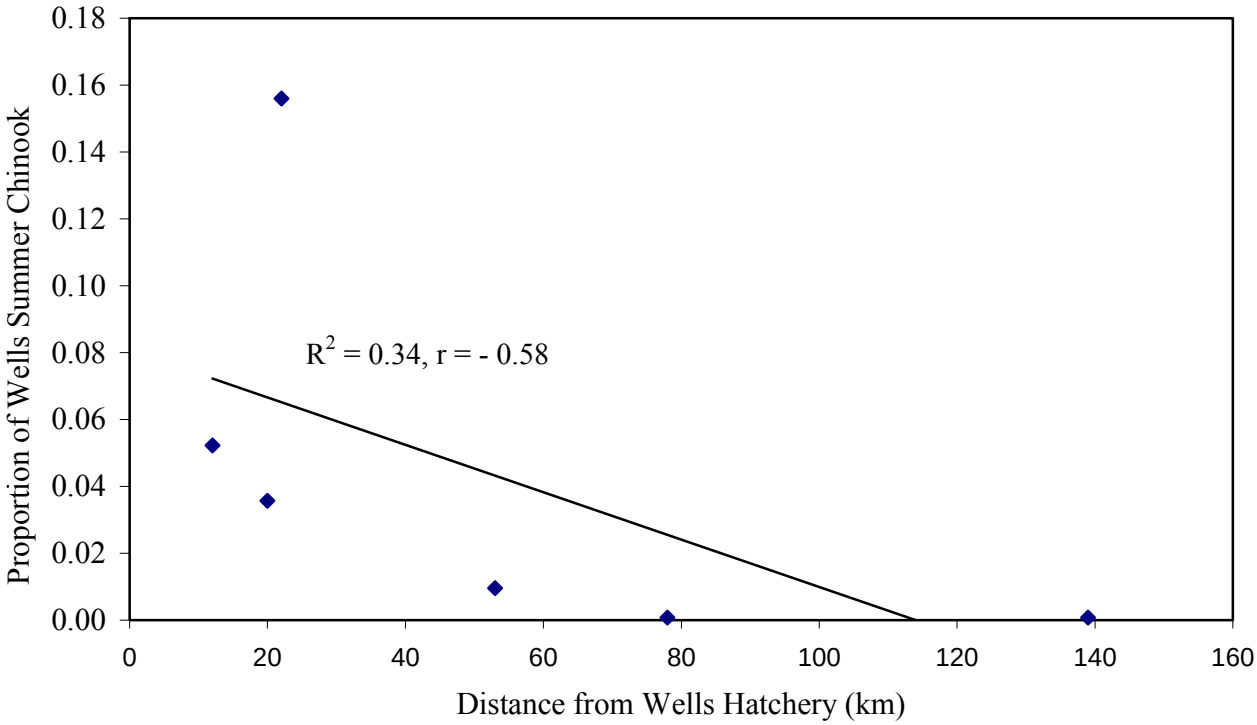

Figure 2. Relationship between the proportion of Wells summer Chinook (yearling program) found on the spawning grounds and the distance from Wells Hatchery.

Wild Chinook

Because Wells Hatchery summer Chinook are a production program with no reciprocal wild stock, no estimate of wild Chinook harvest was appropriate. For brood years 1992 though 1995, harvest of wild spring Chinook was estimated for the Methow River Basin using a surrogate spring Chinook stock released from Leavenworth National Fish Hatchery (LNFH) because hatchery releases from Methow Hatchery (MH) were too small or did not include enough adipose fin-clipped fish. The percent of wild fish harvested from the 1992 – 2000 broods ranged from 1.7% to 22.0% (Table 5).

Based on the harvest rates of local hatchery stocks, an estimated 638 wild fish were harvested from the 1992 – 2000 broods (Table 6). The 1997 brood provided the majority of wild fish harvested (88.2%). Although escapement of wild spring Chinook in most recent run years has been low, the addition of harvested fish to the run escapement would have been unlikely to result in escapements meeting tributary-specific escapement goals (Chapter 5).

Table 5. Summary of spring Chinook selective (S) and non-selective (NS) fisheries by broodyear. Harvest rate is based on harvest of local hatchery stocks determined through CWT analysis.

Brood	Fishery Type by total age									Harvest rate	
	Sport			Commercial			Tribal				
	3	4	5	3	4	5	3	4	5	%	Source
1992	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.00	LNFH
1993	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.64	LNFH
1994	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.53	LNFH
1995	NS	NS	NS	NS	NS	NS	NS	NS	NS	4.52	LNFH
1996	NS	NS	S	NS	NS	NS	NS	NS	NS	2.85	MH
1997	NS	S	S	NS	NS	S	NS	NS	NS	22.07	MH
1998	S	S	S	NS	S	S	NS	NS	NS	12.24	MH
1999	S	S	S	S	S	S	NS	NS	NS	2.63	MH
2000	S	S	S	S	S	S	NS	NS	NS	1.70	MH

Table 6. Harvest impacts (direct and indirect mortality) on Methow River wild spring Chinook by population and brood year.

Brood year	Methow R.		Twisp R.		Chewuch R.		Lost R.		Brood	
	Total	Harvest	Total	Harvest	Total	Harvest	Total	Harvest	Total	Harvest
1992	89	4	44	2	57	3	3	0	193	9
1993	117	3	51	1	71	2	4	0	243	6
1994	39	1	18	0	16	0	2	0	75	1
1995	99	4	34	2	33	1	2	0	168	7
1996	32	1	97	3	50	1	29	1	208	6
1997	384	85	801	177	1,301	287	80	18	2,566	567
1998	47	6	118	14	51	6	39	5	255	31
1999	6	0	7	0	5	0	3	0	21	0
2000	228	4	370	6	76	1	17	0	691	11
Total	1,041	108	1,540	205	1,660	301	179	24	4,420	638

Summer Chinook Sport Fishery

Creel surveys have been conducted during the summer Chinook sport fishery since 2004. Effort has generally increased over time to ensure all river sections were surveyed. Numbers of fish harvested have been the greatest in the upper most river sections (Table 7). Coded-wire tag analysis of the 2006 fishery is currently not available.

Table 7. Summary of creel surveys conducted during summer Chinook sport fisheries in the Upper Columbia River.

Year	River section	Hours fished	Chinook harvested	Sockeye released	Steelhead released
2004	545	38,378	2,803	112	3
	543	28,499	2,139	0	76
	541	23,643	907	0	0
	539	NA			
	627/629	NA			
	Total	90,520	5,849	112	79
2005	545	20,964	1,419	163	45
	543	7,649	411	21	16
	541	14,844	362	3	61
	539	NA			
	627/629	NA			
	Total	43,457	2,192	187	122
2006	545	41,353	1,973	69	15
	543	20,411	1,444	0	1
	541	16,305	446	0	10
	539	1,065	1	0	0
	627/629	1,129	145	0	0
	Total	80,263	4,009	69	26

Summer Steelhead

Steelhead returns met abundance and composition requirements necessary to conduct local sport fisheries on the 2002 – 2006 broods of returning adults. Creel census data was used to estimate the number of hatchery fish harvested and the indirect mortality rate for both hatchery and wild fish. Most steelhead were harvested in the Methow and Columbia River fisheries (Table 8), but the CPUE for these areas has decreased over time. This is probably due to an increase in angling effort during a period of decreasing adult returns (Chapter 4). Steelhead harvest in local fisheries has not impacted broodstock collection because harvest typically occurs after steelhead have escaped the collection location (Wells Dam) or after collection has ceased. Because local steelhead fisheries were based on local escapement goals (i.e., above Priest Rapids Dam), all hatchery fish harvested were considered fish in excess of escapement goals. In many brood years, retention of hatchery steelhead did not achieve desirable levels because too few fish were adipose fin-clipped or too many fish were released by anglers, resulting in target impact levels to wild fish being reached.

Table 8. Total number of steelhead removed in upper Columbia River sport fisheries by fishery location and brood. The total CPUE was calculated from the total number of fish captured divided by the total number of hours fished in each fishery.

Brood	Methow R.			Okanogan R.			Similkameen R.			Columbia R.			Total		
	H	W	CPUE	H	W	CPUE	H	W	CPUE	H	W	CPUE	H	W	CPUE
2006	683	8	0.108	229	3	0.332	263	2	0.309	437	4	0.055	1,612	17	0.050
2005	680	9	0.114	243	2	0.087	290	2	0.245	493	4	0.067	1,706	17	0.104
2004	336	10	0.151	328	1	0.149	57	0	0.071	298	4	0.081	1,019	15	0.140
2003	254	13	0.362	57	1	0.074	63	1	0.147	455	9	0.146	829	24	0.189
2002[a]	--	--	--	--	--	--	--	--	--	--	--	--	694	73	0.167

[a] Fishery occurred in Okanogan and Similkameen Rivers only. Data reflects the total number of fish captured, including those released.

Stray rate data is currently unavailable for steelhead released into the Methow and Okanogan rivers. Juvenile steelhead are not differentially marked based on release location. Regardless, no mechanism exists (e.g., weir or PIT tag detector array) to detect stray steelhead in tributaries. Additional research is needed to determine the homing fidelity of hatchery steelhead reared at Wells Hatchery and subsequently trucked to various release locations upstream of Wells Dam.

Discussion

Wells summer Chinook are an appropriate stock for commercial and recreational fisheries to target during years of high abundance. For the years examined, the majority of the hatchery adult CWT recoveries came from fishery harvest. While most of these fish were harvested outside of the Columbia River Basin, freshwater fisheries in the lower Columbia River and upstream of Rock Island Dam have been initiated in recent years. As these fisheries evolve, the exploitation rate of hatchery summer Chinook in freshwater areas may increase.

Hatchery releases intended to supplement natural populations should result in an increased number of adult fish on the spawning grounds of the target (supplemented) stream. For those brood years examined, spring Chinook were adipose fin clipped prior to release and as a result some returning adults (> 28%) were harvested in fisheries (i.e., primarily Columbia River). To protect these fish from exploitation, recent releases of Methow spring Chinook have not been adipose fin-clipped, which should result in a decrease in harvest rates and an increase in spawning ground recoveries.

Stray rates of Twisp and Chewuch hatchery spring Chinook were high for the broods examined in this chapter. Releases in both these basins are accomplished through the use of acclimation ponds, but both ponds rely on local irrigation withdrawal for their water supply. Stray rates may decrease with a longer acclimation time, which may be feasible if agreements with local irrigation districts could be achieved.

For the brood years examined, an estimated 2.8 million subyearling and 2.7 million yearling summer Chinook were released. Despite similar release numbers, yearling fish returned approximately 14 adults for each adult returned from subyearling releases. Yearling Chinook were larger and were released in mid-April instead of mid-June as were subyearling fish. These factors may influence survival of hatchery fish in the Columbia River system. Stray rates based on brood year were similar for both yearling and subyearling programs. Change sin harvest regulations (e.g., increase daily limit) or hatchery operations (e.g., surplus fish from volunteer trap) may contribute in reducing stray rates to natural populations.

References

Malvestuto, S.P, W.D. Davies, and W. L. Shelton. 1978. An evaluation of the roving creel survey with non uniform probability sampling. Transactions of the American Fisheries Society 107(2): 255 –262.

Miller, T. 2006. 2005 Upper Columbia River summer Chinook spawning ground surveys. Memorandum dated 19 January 2006 to HCP Hatchery Committee Members.

Appendix A

2006 Columbia River Summer Chinook Sport Fishery Creel Survey

Criteria used to determine if a summer Chinook season was warranted is described in the Draft WDFW Harvest Framework for Non-treaty Fisheries directed at Salmonids originating above Priest Rapids Dam (April 2006). The 2006 predicted Columbia River run size of summer Chinook satisfied those criteria. Accordingly, WDFW allowed a summer Chinook fishery in the Columbia River from Priest Rapids Dam up-river to Wells Dam during July 1 - October 15 2006. The Daily limit was six Chinook salmon, no more than two adults. All steelhead, coho and sockeye must be released. Complete descriptions of the Columbia River 2006 fishing regulations are on pages 72 and 73 of the 2006/2007 WDFW Sport Fishing Rules.

The Okanogan River and the lower Similkameen River were also opened for Chinook fishing July 22nd through Sept 15$^{th.}$ Angling was allowed on the Okanogan River from the Highway 97 Bridge near the mouth to the Highway 97 Bridge just south of Oroville. The Similkameen River was opened to angling from the mouth upstream to the county road bridge in Oroville. The Daily limit for these two rivers was also six Chinook salmon, no more than two adults. All steelhead, coho and sockeye must be released. Plus a Non-buoyant lure restriction and night closure was in effect for all species

Methods

A creel survey was conducted to collect information that will allow the calculation of certain estimates. These estimates will help us to make wise decisions concerning future summer Chinook fisheries management in the upper Columbia River and to assist in evaluating the efficiency of the Chelan PUD hatchery mitigation program.

The results of the survey are intended to:

1) Estimate sport harvest of both wild and hatchery summer Chinook.

2) Estimate incidental “take” of any ESA listed fishes, primarily steelhead.

3) Estimate incidental catch and release of coho and sockeye salmon.

4) Help evaluate the success of summer Chinook mitigation efforts.

It is assumed that the survey will also provide other information that will assist us.

We used a two-stage non-uniform probability sampling (Malvestuto et. al. 1978). This method minimizes some of the problems associated with sampling large rivers containing disproportional angler effort per river section.

Primary Sampling Units (PSU)

Within the PSU was a number of Secondary Sampling Units (SSU). For this survey a PSU = a stratified random sample of days by week (Monday – Sunday). All or most weekend days and two consecutive weekdays were sampled per week. Mondays were designated for data entry, equipment repair etc. The workweek was Thursday through Monday to minimize costs and to allow the technicians to have two consecutive days off per week. Each survey day only one of two sample strata: AM (7AM – 1PM) or PM (1PM – 9PM) was sampled. Daily sample times were adjusted according to the local fishing activities and time required traveling to sample locations. For weekends the AM and PM time periods sampled were alternated. For weekdays time periods to be sampled were randomly chosen, but at least one AM and one PM time period must be sampled during each week.

Secondary Sampling Units (SSU)

Within the PSU was a number of SSUs. A SSU = a random sampling of rivers sections by monthly units proportional to the expected level of use. Monthly each river section was assigned an expected use score; sampling effort was increased or decreased according to this score. Our sampling effort was the highest in the SSU containing the highest use score thus reducing variability (i.e. to reduce variability increased sample size is needed when the population you are sampling increases).

River sections =	537	Priest Rapids Dam – Wanapum Dam
	539	Wanapum Dam – Rock Island Dam
	541	Rock Island Dam – Rocky Reach Dam
	543	Rocky Reach Dam to Wells Dam
	545	Wells Dam to Chief Joseph Dam

For example, if during the July 16 – August 16 we expected that five different river sections would receive 10%, 5%, 35%, 20%, and 30% of the total angling effort, respectively, our sampling effort would be scheduled to correspond to the expected angling effort in each of those sections.

Objective 1. Collect information angler effort

Task1.1, Count, at three-hour intervals, all boats and bank anglers, two times per sampling period. Counts were done as quickly and safely possible. I estimate that a single count took less than one hour. The beginning of first effort count per day was chosen at random to start either at the downstream end or the upstream end of the river section. The second count began where the first count left off.

Objective 2. Collect information on angler catch per unit effort (CPUE) and harvest per unit effort (HPUE)

Task 2.1 Interview as many anglers as possible during a sample period. Timing, method and location of interviews was set to interview as many completed anglers as possible.

Task 2.2 we used the standard WDFW creel sample form. Information recorded included: number of anglers per group, time that they began fishing, time of the interview, whether they were completed or not, angler type (boat or shore) species, number kept, number released (all species), for any fish kept we recorded fork length in cm, sex, all marks the fish may have. Snouts were collected from all adipose fin clipped fish; all tags found in fish were collected and recorded.

Objective 3. Collect information concerning incidental capture and release of steelhead, sockeye and coho salmon.

Tasks 3.1. During interviews anglers were specifically asked if they caught and released steelhead, sockeye or coho.

Objective 4. Use estimates of angler effort and HPUE to calculate harvest for both wild and hatchery fish.

Task 4.1 Use the methods outlined in the WDFW Methods Manual Creel survey information Hahn et al. (2000).

Objective 5. Collect coded wire tagged (CWT) snouts from adipose fin clipped hatchery fish encountered during the creel survey.

Tasks: 5.1 Anglers were asked for permission to remove the snouts from adipose fin clipped summer Chinook. If the anglers did not approve the snout was not collected.

Task: 5.2. Upon angler approval snouts were cut from adipose fin clipped Chinook, and put into a plastic bag. A tag containing the date, species, and fork length in centimeters, sex and an identifying number was attached to the bag. The tag number and all the other information were also recorded on the creel survey from.

Objective 6) Estimate the total catch and harvest of CWT fish during the season.

Task: 6.1. The exact task needs to be determined. However in general we would use number of CWT fish sampled in the creel survey divided by the sample rate (percentage), i.e., (the total number of fish sampled during the creel survey divided by the total estimated catch) to estimate the total harvest of CWT fish. This method should be designed and calculated by the Hatchery Evaluation crew since the information that results is of special interest to them.

All estimates were calculated by the methods described in Hahn et al. (2000).

Degree of precision:

Obviously we attempted to be as precise as conditions allow. However, there are some factors inherent to this effort that limited the precision that we can reach. The area to be covered is very large; days at this time of year are very long. Insufficient technician help was available at times. Angler effort differs greatly between sections of the river. The catch rate has been historically

very low on most days thus making it difficult to sample fish caught. The design used was structured to minimize variability resulting from the factors just listed.

Personnel:

This effort required at least four Scientific Technicians at the 2 level working from July 1 – October 15.

2006 Schedule:	Action:
Prior to July 1, 2006	create and finalize creel survey methods. Create a creel survey database
Prior July 1, 2006	hire four scientific technicians
July 1 – July 15	train the technicians prior to the season opener and continue training during the first week or two of the survey
July 1 – October 15	collect and enter information into the database, prepare the data for analysis
November 2006	statistical analysis of data
February 2007	write the report.

Results

River Section 545

We estimate that during the entire 2006 season in River Section 545, (Wells Dam upriver to Chief Joseph Dam) 7,608 $\pm$ 269 anglers fished for 41,353 $\pm$ 5,074 hours and caught 2,155 $\pm$ 60 Chinook, 1,973 (91.6%) of these fish were harvested. Anglers also incidentally caught and released 69 $\pm$ 9 sockeye, 15 $\pm$ 1.5 steelhead. No coho were encountered during the survey (Table 1). Additional information by month can be found in District 7 files.

Table 1. 2006 River Section 545, summer Chinook creel survey results (95% CI).

Average Angler Day (95% CI)	Estimated		Anglers Interviewed (Sample Rate)	Chinook Catch (95% CI)	Chinook Harvested (%)	Chinook Released (%)	Sockeye Released (95% CI)	Steelhead Released (95% CI)	Coho Released (95% CI)
	Total Anglers (95% CI)	Total Hours (95% CI)							
5.44	7,607.5	41,352.67	1,817	2,155.34	1,973.34	182.00	68.64	15.00	0.00
(1.11)	(268.55)	(5,073.81)	(0.24)	(59.5)	(91.55)	(8.45)	(9.3)	(1.5)	0.00

River Section 543

We estimate that during the entire 2006 season in River Section 543, (Rocky Reach dam to Wells) 4,197 ± 31 anglers fished for 20,411 ± 159 hours and caught 1,594 ± 40 Chinook, 1,444 (90.6%) of these fish were harvested. Anglers also incidentally caught and released 1 ± 0.12 steelhead. No sockeye or coho were encountered during the survey (Table 2). Additional information by month can be found in District 7 files.

Table 2. 2006 River Section 543, summer Chinook creel survey results (95% CI).

Average Angler Day	Estimated		Anglers Interviewed (Sample Rate)	Chinook Catch	Chinook Harvested	Chinook Released	Sockeye Released	Steelhead Released	Coho Released
	Total Anglers	Total Hours							
4.91	4,196.9	20,410.5	1,423	1,594	1,444	150	0	1	0
(0.57)	(31.1)	(158.7)	(0.34)	(40.4)	(90.6)	(9.4)	0	(0.12)	0

River Section 541

We estimate that during the entire 2006 season in River Section 541, (Rock Island to Rocky Reach Dam) 4,584± 129 anglers fished for hours 16,305 ± 581 and caught 495 Chinook, 446 (90.16%) of these fish were harvested. Anglers also incidentally caught and released 10 ± 0.84 steelhead. No sockeye or coho were encountered during the survey (Table 3). Additional information by month can be found in District 7 files.

Table 3. 2006 River Section 541, summer Chinook creel survey results (95% CI).

Average Angler Day	Estimated		Anglers Interviewed (Sample Rate)	Chinook Catch	Chinook Harvested	Chinook Released	Sockeye Released	Steelhead Released	Coho Released
	Total Anglers	Total Hours							
3.40	4,583.85	16,304.75	2,076	494.94	446	49	0	9.6	0
(0.45)	(129)	(581.1)	(0.45)	(16.5)	(90.16)	(9.84)	0	(0.84)	0

River Section 539

We estimate that during the entire 2006 season in River Section 539, (Rock Island Dam - Wanapum Dam) 241± 17 anglers fished for hours 1,065 ± 40 and caught and harvested 1 Chinook. No steelhead, sockeye or coho were encountered during the survey (Table 4). Additional information by month can be found in District 7 files.

Table 4. 2006 River Section 539, summer Chinook creel survey results (95% CI).

Average Angler Day	Estimated		Anglers Interviewed (Sample Rate)	Chinook Catch	Chinook Harvested	Chinook Released	Sockeye Released	Steelhead Released	Coho Released
	Total Anglers	Total Hours							
3.8	240.6	1,065.4	33	1	1	0	0	0	0
(1.17)	(16.7)	(40.0)	(0.14)	(0.18)	(100)	(0)	(0)	(0)	(0)

Okanogan and Similkameen Rivers:

We estimate that during the entire 2006 season in the Okanogan and Similkameen Rivers 298 anglers fished for 1,129 hours and caught and harvested 145 Chinook. No steelhead, sockeye or coho were encountered during the survey, Table 5.

Table 5. 2006 River code 627 and 629, Okanogan and Similkameen river summer Chinook creel survey results.

Average Angler Day	Estimated		Anglers Interviewed (Sample Rate)	Chinook Catch	Chinook Harvested	Chinook Released	Sockeye Released	Steelhead Released	Coho Released
	Total Anglers	Total Hours							
3.79	298	1,129	26	145	145	0	0	0	0

We estimate that during the entire 2006 season in all waters open to angling 16,927 anglers fished 80,262 hours and harvested 4,009 - summer Chinook. Anglers incidentally caught and released 26 steelhead and 69 sockeye. Either no coho were caught during the season or coho were caught so infrequently that we were unable to detect it during the survey (Table 6). Harvest of Chinook in 2006 (4,009 fish) was approximately 180% of the harvest in 2005 (2,192 fish) but, only 68% of what was harvested in 2004 (5,849 fish) (Tables 6, 7 and 8).

Table 6. 2006 summer Chinook season totals by Columbia River section and the Okanogan and Similkameen Rivers (HPUE = Harvest per unit effort).

River Codes			Chinook Catch	Chinook Harvest	Chinook Release	Caught and Released			Chinook HPUE
	Anglers	Hours				Sockeye	Steelhead	Coho	
545	7,607	41,352	2,155	1,973	182	69	15	0	0.048
543	4,196	20,410	1,594	1,444	150	0	1	0	0.071
541	4,583	16,304	494	446	49	0	10	0	0.027
539	240	1,065	1	1	0	0	0	0	0.0009
627/629	298	1,129	145	145	0	0	0	0	0.128
Totals	16,927	80,262	4,390	4,009	381	69	26	0	0.05

Table 7. 2005 summer Chinook season totals by river section

Section	Anglers (%)	Hours	Chinook	Sockeye	Steelhead	Coho	Chinook HPUE
545	4,562 -42.9	20,964	1,419	163	45	0	0.068
543	2,183 -20.5	7,649	411	21	13	0	0.054
541	3,899 -36.6	14,844	362	3	61	0	0.024
Totals	10,644	43,457	2,192	187	119	0	0.05

Table 8. 2004 summer Chinook season totals by river section.

Section	Anglers (%)	Hours	Chinook	Sockeye	Steelhead	Coho	Chinook HPUE
545	7,631 -34.9	38,378	2,803	112	3	0	0.073
543	8,308 -37.9	28,499	2,139	0	76	0	0.075
541	5,953 -27.2	23,643	907	0	0	0	0.038
Totals	21,892	90,520	5,849	112	79	0	0.065

Sport season timing change:

During the fall of 2002 – 2005 the returns of un-harvested summer Chinook were well above spawning escapement goals. In some cases this abundance lead to high densities in the Similkameen River resulting in disease out-breaks that killed most if not all of the fish present. In an effort to decrease excessive spawning escapement and to provide anglers additional sport-fishing opportunity WDFW opened the 2006 season on July 1 as opposed to a July 15 opener in 2004 and 2005. The mid July opener was too late to effectively fish river sections 541 and 543, many of the fish had passed these areas before the season opened (Figure 1). The 2006, July 1 opener allowed anglers to fish while more of the summer Chinook run passed between Rock Island to Wells Dam, and also provided a chance to fish for summer Chinook when water temperatures were considerably lower (Figure 2). Field observations strongly suggest that catch per unit effort is inversely related to water temperature.

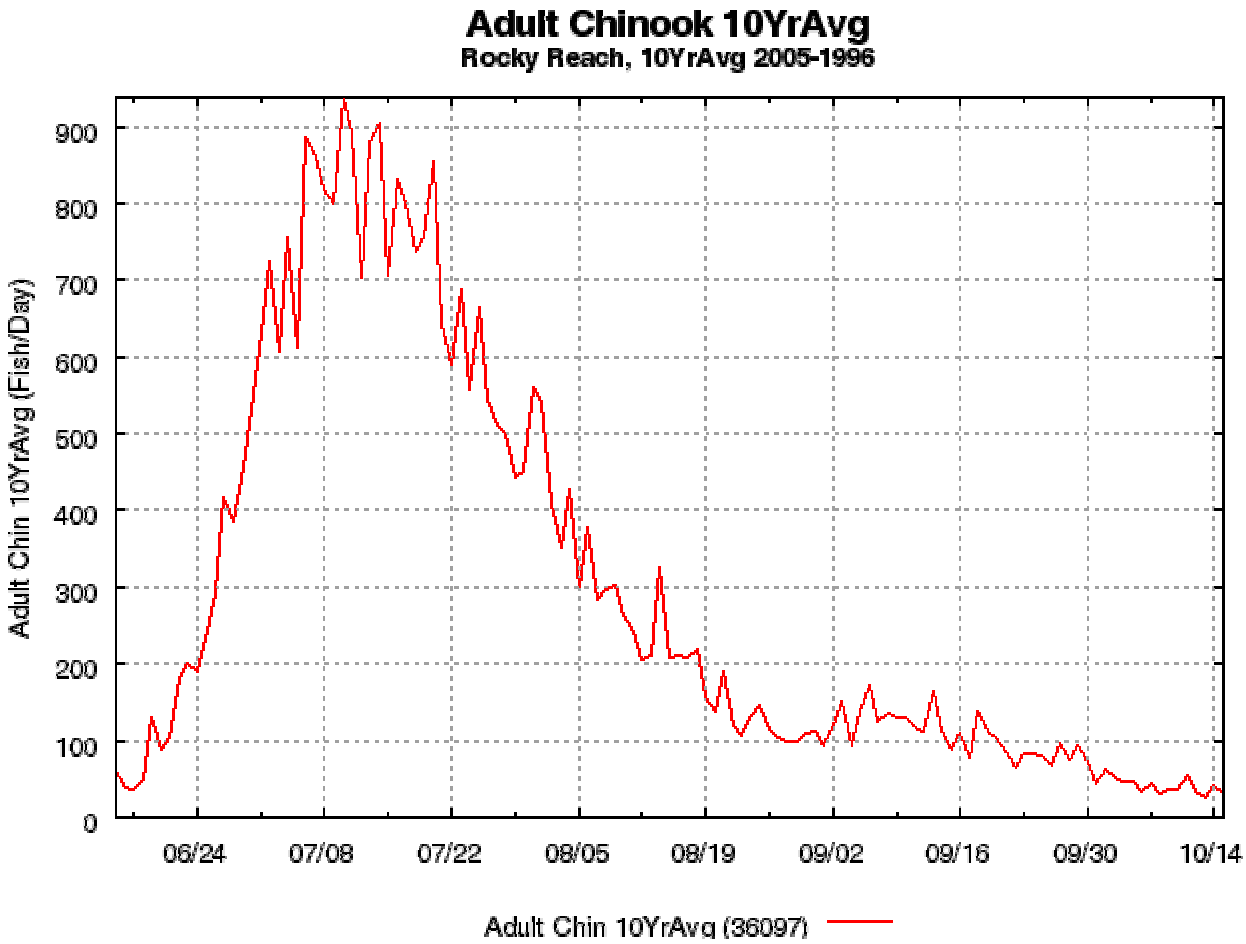

Figure 1. The ten-year average summer Chinook passage at Rocky Reach Dam 2005 –1996. Columbia River DART School of Aquatic & Fishery Sciences University of Washington http://www.cbr.washington.edu/dart/dart.html

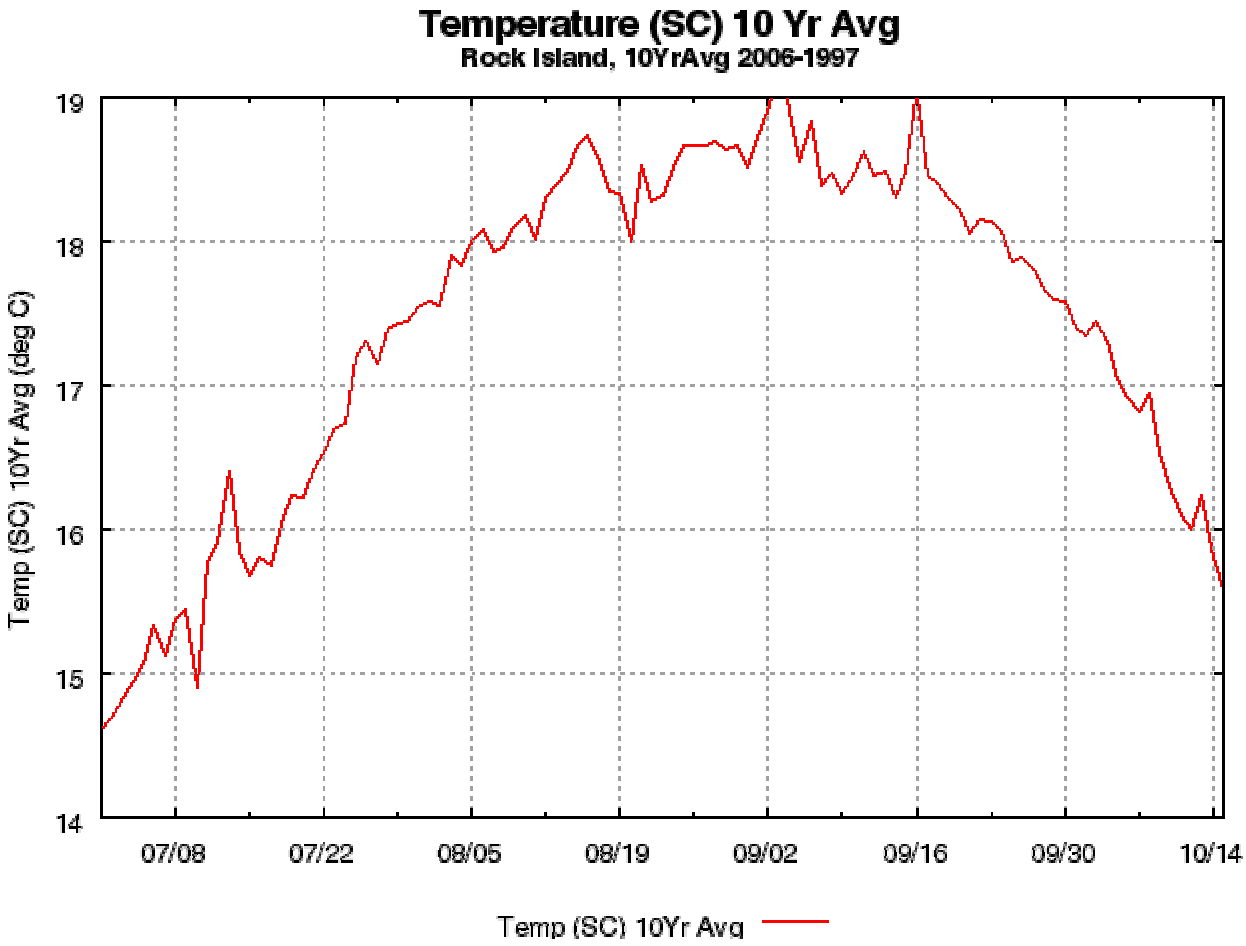

Figure 2. Average water temperatures at Rocky Reach Dam during 1997-2006. Columbia River DART School of Aquatic & Fishery Sciences University of Washington http://www.cbr.washington.edu/dart/dart.html.

Endangered Species Act considerations:

The upper Columbia River summer Chinook population is healthy and is not listed under the ESA. However, to minimize the incidental hooking and release of listed steelhead and spring Chinook WDFW sets the dates and locations of this fishery to ensure the fewest number of ESA listed fishes are present.

Spring Chinook:

WDFW considered whether opening the season on July 1 in 2006 as opposed to July 15 as in previous years would increase "take" of ESA listed Upper Columbia River spring Chinook. Passage timing of spring Chinook through the sport fishing area was examined. Based on our analysis we concluded that spring Chinook would have cleared the sport fishing area by July 1 (Table 9). Run timing was also examined using a graphical frequency distribution by time without considering the set run dates used by the PUDs for fish counting purposes. This is not

presented here to save space but, results confirmed that spring Chinook have indeed cleared the area prior to July 1. Consequently, we were confident that opening the season earlier in 2006 would not increase take of ESA listed spring Chinook. Also during the entire 2006 season, creel-survey personnel reported seeing no fish retained by anglers that they would identify (based on size and color) as a spring Chinook.

Table 9. General passage dates of spring Chinook past Columbia River Hydro – project dams.

Columbia River Dams	Spring Chinook run dates
Priest Rapids	4/15-6/13
Rock Island	4/15-6/17
Rocky Reach	4/16-6/19
Wells	5/1-6/28

Steelhead:

In 2006, we estimate that anglers incidentally caught and released only 26 steelhead. Based on an October 2006 estimate of the 2006/2007 steelhead run size and composition only 1,666 (15.8%) of a total run of 10,542 fish were of natural origin. Consequently 15.8 % (4 fish) of the 26 steelhead caught and released may have been of natural origin. Using a 5% hooking mortality we estimate that 0.20 natural origin steelhead were killed during the 2006 summer Chinook sport fishing season.

The contribution of hatchery reared summer Chinook to the sport fishery:

Snouts from 265 coded wire tagged hatchery summer Chinook were collected during the survey. Tags will be read in Olympia at the WDFW Head lab. Harvest per tag code will be expanded by the WDFW Hatchery Evaluation Crew and reported at a later date.

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Appendix B. Coded wire tag recoveries from the RMIS database by broodyear and stock expanded by sample rate and tag rate (NA = Not applicable).

Brood	Broodstock			Spawning ground		Ocean fishery			Freshwater fishery		
	Target	Non-target	Wells	Target	Non-target	Comm.	Sport	Tribal	Comm.	Sport	Tribal
Wells summer Chinook yearling											
1992	359	9	- -	NA	40	81	37	6	0	4	16
1993	1,141	346	- -	NA	56	645	54	2	14	16	50
1994	89	5	- -	NA	2	30	6	0	0	0	9
1995	392	23	- -	NA	183	332	122	19	22	44	5
1996	501	28	- -	NA	308	593	182	6	2	32	0
1997	1,412	132	- -	NA	1,733	5,757	1,102	308	118	317	61
1998	1,192	42	- -	NA	500	6,736	1,191	141	230	474	39
1999	126	15	- -	NA	55	818	147	50	96	231	6
Wells summer Chinook subyearling											
1993	19	2	- -	NA	0	15	0	0	3	0	0
1994	9	0	- -	NA	0	3	0	0	0	0	3
1995	62	4	- -	NA	2	42	6	6	3	1	0
1996	267	21	- -	NA	78	266	54	5	2	8	3
1997	44	3	- -	NA	30	115	9	3	7	29	0
1998	44	0	- -	NA	40	226	30	1	7	25	4
1999	88	2	- -	NA	31	295	37	8	31	30	1
Methow spring Chinook											
1993	43	0	134	6	1	0	0	0	0	4	3
1994	0	0	1	0	0	0	0	0	0	0	0
1995	3	0	114	3	0	2	0	0	0	0	0
1996	200	0	58	221	8	0	0	0	2	0	11
1997	422	0	3	16	1	3	0	0	280	209	12
1998	- -	- -	- -	- -	- -	3	0	0	462	428	30
1999	93	0	- -	35	7	1	0	0	3	6	0
2000	- -	- -	- -	- -	- -	5	0	0	21	6	0
Twisp spring Chinook											
1992	0	0	21	0	0	0	0	0	0	0	0
1993	0	3	18	1	1	0	0	0	0	4	0
1994	0	0	4	0	0	0	0	0	0	0	0
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	4	58	40	151	17	0	0	0	1	0	6
1997	21	6	- -	14	0	0	0	0	14	9	1
1998	1	8	- -	0	2	0	0	0	11	0	0
1999	3	25	- -	8	20	1	0	0	4	0	0
2000	22	12	- -	67	40	0	0	0	7	0	0
Chewuch spring Chinook											
1992	0	1	38	0	0	0	0	0	0	0	0
1993	0	19	79	8	3	5	0	0	0	0	1
1994	0	0	3	0	0	0	0	0	0	0	0
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	- -	15	15	0	4	0	0	0	6	0	1
1997	54	44	14	4	27	2	0	0	24	144	7

Appendix C1. Proportion by brood year of Wells Hatchery summer Chinook that strayed onto spawning grounds of other Chinook populations. All recoveries are considered to be non-target areas.

Brood year	Summer Chinook spawning population					
	Methow	Okanogan	Similkameen	Chelan	Entiat	Wenatchee
			Wells summer Chinook yearlings			
1992	0.000	0.072	0.000	0.000	0.000	0.000
1993	0.021	0.006	0.000	0.000	0.000	0.002
1994	0.014	0.000	0.000	0.000	0.000	0.000
1995	0.014	0.036	0.000	0.104	0.000	0.004
1996	0.083	0.056	0.000	0.043	0.000	0.000
1997	0.073	0.043	0.001	0.036	0.003	0.000
1998	0.022	0.009	0.000	0.013	0.000	0.001
1999	0.012	0.000	0.001	0.008	0.000	0.009
2000	0.010	0.010	0.010	0.010	0.010	0.010
2001	0.002	0.002	0.002	0.002	0.002	0.002
2002	0.021	0.021	0.021	0.021	0.021	0.021
			Wells summer Chinook subyearlings			
1995	0.016	0.000	0.000	0.000	0.000	0.000
1996	0.026	0.058	0.007	0.015	0.000	0.004
1997	0.068	0.056	0.000	0.000	0.000	0.000
1998	0.041	0.054	0.000	0.011	0.000	0.000
1999	0.016	0.028	0.000	0.016	0.000	0.000
2000	0.043	0.055	0.000	0.000	0.000	0.000
2001	0.005	0.000	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.000

Appendix C2. Proportion by return year of Wells Hatchery summer Chinook that strayed onto spawning grounds of other Chinook populations. All recoveries are considered to be non-target areas.

Return year	Summer Chinook spawning population					
	Methow R.	Okanogan R.	Similkameen R.	Chelan R.	Entiat R.	Wenatchee R.
			Wells summer Chinook yearlings			
1997	0.000	0.074	0.000	0.000	0.000	0.000
1998	0.062	0.044	0.000	0.000	0.000	0.001
1999	0.004	0.000	0.000	0.110	0.000	0.000
2000	0.023	0.051	0.000	0.243	0.000	0.001
2001	0.173	0.070	0.002	0.339	0.000	0.000
2002	0.113	0.046	0.000	0.283	0.086	0.001
2003	0.037	0.010	0.001	0.212	0.000	0.001
2004	0.018	0.014	0.002	0.059	0.000	0.001
2005	0.040	0.012	0.002	0.158	0.000	0.002
			Wells summer Chinook subyearlings			
1997	0.000	0.000	0.000	0.000	0.000	0.000
1998	0.000	0.000	0.000	0.000	0.000	0.000
1999	0.002	0.000	0.000	0.000	0.000	0.000
2000	0.010	0.031	0.000	0.022	0.000	0.001
2001	0.011	0.003	0.001	0.000	0.000	0.000
2002	0.002	0.005	0.000	0.014	0.000	0.000
2003	0.000	0.000	0.000	0.010	0.000	0.000
2004	0.004	0.002	0.000	0.000	0.000	0.000
2005	0.003	0.002	0.000	0.000	0.000	0.000

Chapter 3

Methow River basin spring Chinook and steelhead smolt monitoring in 2006.

Abstract

Hatchery supplementation programs are intended to increase the abundance of the naturally spawning population. Until the carrying capacity of the target stream is reached, the increased abundance of spawning adults should result in an increased number of smolts. The number of smolts produced per each redd is a metric used to compare the relative productivity of target species during freshwater rearing. We used rotary screw traps to estimate the number of spring Chinook and summer steelhead smolts emigrating from the Twisp and Methow River basins. We captured a total of 552 wild spring Chinook smolts at the Methow River trap and 835 smolts at the Twisp River trap. A total of 362 and 504 wild steelhead emigrants were captured at the Methow and Twisp River traps, respectively. The number of these species captured each day was expanded by trap efficiency estimates derived from mark/recapture efficiency trials. Using this methodology, we estimate that a total of 15,869 wild spring Chinook smolts emigrated from the Methow River, including 5,092 smolts emigrating from the Twisp River. An estimated 13,783 wild steelhead migrants emigrated from the Methow River, including 4,970 fish from the Twisp River. Utilizing data gathered during spring Chinook spawning ground surveys in 2004, we estimated that the mean number of smolts produced from each spring Chinook redd in Methow River Basin excluding the Twisp River (24), was 47% lower the than the mean number of smolts produced from the Twisp River (45). Because juvenile steelhead migrate over a four year period, we were unable to produce completed smolt per redd values for steelhead in the Methow or Twisp Rivers. While data for spring Chinook for each trapping location were similar, we are unable to assess the relative productivity of naturally spawning hatchery fish contribute to naturally produced smolts without similar data from non-supplemented reference populations.

Introduction

An important component of both past and present monitoring and evaluation programs has been monitoring the freshwater productivity of spring Chinook *Oncorhynchus tshawytscha* and steelhead *O. mykiss* in the Methow River Basin (MBSCSP 1995; Wells HCP HC 2005). Estimates of natural production by spring Chinook and steelhead coupled with characteristics of the spawning population (i.e., abundance and composition) should provide some of the data necessary to assess the efficacy of hatchery supplementation programs for these species.

Although rotary smolt traps have proved to be a reliable, cost-effective, and minimally invasive method of producing species-specific production estimates (Thedinga et al.1994; Murdoch et al. 2001), limited information exists on smolt production in the Methow Basin. Smolt traps have been operated sporadically on the upper Methow and Chewuch rivers (Hubble and Sexauer 1994; Hubble and Harper 1999; Hubble et al. 2003). However, estimates of smolt production for the entire Methow Basin were not calculated because monitoring was intermittent or occurred

primarily in tributaries (i.e., Chewuch River). Beginning in 2004, the WDFW Supplementation Research Team implemented a smolt-monitoring program on the Methow River and expanded the program to the Twisp River in 2005. The primary objective in conducting this work was to estimate juvenile production of spring Chinook and steelhead and to estimate stage-specific survival rates. These objectives were incorporated into the development and implementation of the Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas County PUD (M&E Plan; Wells HCP HC 2005), for which this report focuses on the following objective:

Objective 7: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

- H_O: Δ smolts/redd $_{\text{Supplemented population}} \geq \Delta$ smolts/redd $_{\text{Non-supplemented population}}$

The M&E Plan requires that smolt-production data from supplemented populations is compared to similar data from non-supplemented reference populations (Wells HCP HC 2005). Comparisons using a non-supplemented population or populations (i.e., reference stream) will reduce annual variation associated with these data so only the treatment effect (i.e., supplementation fish) can be tested. Reference populations for Methow spring Chinook and steelhead have not yet been identified, comprising a data gap with respect to these populations.

Methods

Methods used in trap operation and population estimates are provided in more detail in Appendix E of the Monitoring and Evaluation Plan (Wells HCP HC 2005).

Smolt Trap Operation

Two rotary smolt traps of different sizes were operated in several configurations depending on the specific requirements of each site. At the Twisp River site, a single trap with a 1.5-m cone diameter was used because of low stream flow and a relatively narrow stream channel. At the Methow River site, traps with cone diameters of 2.4 m and 1.5 m were used to increase trap efficiency at greater ranges of river discharge. Large variation in discharge in the Methow River also required the use of two different trapping positions due to the channel configuration and safety for personnel and fish. At this site, a single 1.5-m trap was deployed in the lower position of the trapping site at discharges below 56.6 cms. At discharges greater than 56.6 cms, an additional 2.4-m trap was installed and operated in tandem with the 1.5-m trap in the upper position of the trapping site.

Smolt trapping occurred mostly during the evening. Trap cones were lowered 1-2 hours before sunset and raised 1-2 hours after sunrise. Smolt traps were pulled to the bank during the day to avoid debris as well as to allow easier access for boaters and recreational users as stated in our Okanogan County Conditional Use Permit. During periods of low discharge and smolt

abundance, fish were removed from the traps a minimum of every morning. During periods of greater discharge and/or smolt abundance, traps were monitored periodically throughout the night to minimize mortality of captured fish and avoid equipment damage from debris. Discharge and velocity influenced trap position and frequency of sampling, and were the most important factors affecting trap efficiency. Cheng and Gallinat (2004) reported similar conclusions.

Debris was removed by a small rotating drum-screen powered directly by the rotation of the cone (2.4-m trap) or by the cone contacting a rubber wheel that caused the drum-screen to rotate (1.5-m traps). Smolt traps were either connected to a main cable spanning the river (Methow River site), or to a single point on the right bank (Twisp River site). A more detailed description of the configuration at each site can be found in Snow and Perry (2005), and Snow and Fowler (2006).

Biological Sampling

Captured fish were retained in a 0.37 m^3 live box and were sorted, counted by species, and classified as hatchery or wild origin at each trap. Fish utilized for mark/release trials or for PIT tagging were held in 0.11 m^3 or 1.0 m^3 auxiliary live boxes affixed to the rear section of each trap. Salmonids were anesthetized in a solution of MS-222 prior to sampling and allowed to recover prior to release. Salmonids were visually classified as fry, parr, transitional, or smolt. Fry were defined as newly emerged fish without a visible yolk sac and largely underdeveloped pigmentation, with a fork length less than 50 mm. Parr had a fork length greater than 50 mm and distinct parr marks on their sides. Transitional migrants had faded parr marks, bright silver coloration, and some scale loss. Salmonids lacking or having highly faded parr marks, bright silver color, and deciduous scales were classified as smolts.

Because hatchery spring Chinook and some hatchery steelhead are not adipose fin clipped, the origin of adipose-present migrating salmonids was determined from the presence of coded-wire tags (e.g., spring Chinook and coho [*O. kisutch*]), or elastomer tags and dorsal fin erosion (e.g., steelhead). All hatchery summer Chinook released in the Methow River were adipose fin clipped. Salmonids lacking any visible marks, tags, or fin erosion were considered wild.

Sampling protocols differed by origin and species, although all fish were scanned for PIT tags prior to release. Hatchery origin fish were counted by mark type, while most wild-origin fish were counted, measured to the nearest mm, and weighed to the nearest 0.1 g. Scale sampling was conducted on a proportion of the wild steelhead smolt and transitional fish collected throughout the migration period. Scale samples were analyzed by the WDFW Scale Lab to estimate the contribution of different age classes to the migrating population. Most wild spring Chinook, steelhead, and bull trout were PIT tagged prior to release. Non-salmonids were counted by species or by family if they were too small to identify to species (e.g., Catostomidae).

Because juvenile spring and summer Chinook are indistinguishable, we used location, size, and age to determine race. All Chinook captured in the Twisp River trap were considered spring Chinook, regardless of size (i.e., summer chinook do not spawn upstream of the trap). Because spring Chinook are yearling migrants and summer Chinook are typically subyearling migrants, all yearling Chinook captured at the Methow River trap during the spring migration period were

considered spring Chinook. All fry and parr captured during that time were considered summer Chinook. Spring Chinook juveniles often migrate as fry or parr from natal areas and some summer Chinook may migrate as yearlings. Hence, a small yet unknown proportion of spring Chinook may be misclassified as summer Chinook and vice versa. Although the number of misclassified spring Chinook should be relatively small compared with the numerically dominant summer Chinook, production estimates for the less abundant spring Chinook could be profoundly influenced by such misclassifications. Because of this, subyearling Chinook captured during the fall trapping period at the Methow River site were tissue sampled for DNA analysis to determine the proportion of spring and summer Chinook in the total catch. In future years, yearling migrants and possibly fry will also be DNA sampled to determine the proportion summer Chinook migrants. Tissue samples were transported to the WDFW genetics lab for processing.

During periods when the trap was not operating (e.g., mechanical problems, high debris, or high discharge) the number of spring Chinook, summer Chinook, and summer steelhead captured was estimated. The estimated number of fish captured was calculated using the average number of fish captured two days prior and two days after the break in operation.

Population Estimates

Groups of salmonids used for trap efficiency trials were marked using a top or bottom caudal fin-clip, PIT tag, or were stained with Bismark Brown dye. Fish used in trap efficiency trials were anesthetized prior to marking and held in an auxiliary live box until the day of the trial. Marked fish were transported upstream of the trap and released in the evening of the next trapping period. Marked groups of fish were released over the greatest range of discharge possible in order to increase the utility of the efficiency-flow regression model used to estimate the daily trap efficiency. The mean daily discharge for each trapping period was calculated based on the start and end time of trap operation. Discharge was measured and recorded every 15 min at USGS gauging station No. 12449950 (Methow River near Pateros, Washington) and station No. 12448998 (Twisp River near Twisp, Washington).

At the Methow River trap, marked fish were transported and released approximately 5.6 km upstream of the trap (rkm 34). Marked fish in the Twisp River were transported and released approximately 0.81 km upstream of the trap (rkm 3). The following morning recaptured fish were recorded by mark type, measured, and released.

Emigration estimates were calculated using estimated daily trap efficiency, which was derived from a regression formula using trap efficiency (dependent variable) and discharge (independent variable). Trap efficiency was calculated using the following formula:

Trap efficiency = $E_i = R_i / M_i$

Where E_i is the trap efficiency during time period i; M_i is the number of marked fish released during time period i; and R_i is the number of marked fish recaptured during time period i. The number of fish captured was expanded by the estimated daily trap efficiency (e) to estimate the daily number of fish migrating past the trap (N_i) using the following formula:

Estimated daily migration $= \hat{N}_i = C_i / \hat{e}_i$

Where N_i is the estimated number of fish passing the trap during time period i; C_i is the number of unmarked fish captured during time period i; and e_i is the estimated trap efficiency for time period i based on the regression equation. The variance for the total daily number of fish migrating past the trap was calculated using the following formula:

$$\text{Variance of daily migration estimate} = \text{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{\text{MSE}\left(1 + \frac{1}{n} + \frac{(X_i - \overline{X})^2}{(n-1)s_X^2}\right)}{\hat{e}_i^2}$$

Where X_i is the discharge for time period i, and n is the sample size. If a relationship between discharge and trap efficiency was not present (i.e., $P < 0.05$; r^2 . 0.5), a pooled trap efficiency was used to estimate daily emigration:

Pooled trap efficiency $= E_p = \sum R / \sum M$

The daily emigration estimate was calculated using the formula:

Daily emigration estimate $= \hat{N}_i = C_i / E_p$

The variance for daily emigration estimates using the pooled trap efficiency was calculated using the formula:

$$\text{Variance for daily emigration estimate} = \text{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{E_p(1 - E_p)/\sum M}{E_p^2}$$

The total emigration estimate and confidence interval were calculated using the following formulas:

Total emigration estimate $= \sum \hat{N}_i$

95% confidence interval $= 1.96 \times \sqrt{\sum \text{var}\left[\hat{N}_i\right]}$

A valid estimate would require the following assumptions to be true concerning the trap efficiency trials:

1. All marked fish passed the trap or were recaptured during time period i.
2. The probability of capturing a marked or unmarked fish is equal.
3. All marked fish recaptured were identified.
4. Marks were not lost between the time of release and recapture

Juveniles Per Redd

Completed production estimates by age at migration and trapping location were summed to produce a total emigration estimate. For spring Chinook, the estimate of fall migrant parr was added to the smolt estimate from the following spring to produce a total emigrant estimate for each brood year. Because a single brood of steelhead may require four or more years to completely migrate, the smolt production estimate at each trap location was multiplied by the proportion of smolts from each brood determined through scale analysis. The total number of smolts produced from one brood of spawning adults thus required at least four years of emigration estimates. The number of emigrants per redd for each brood year was calculated by dividing the total emigrant production estimate by the total number of redds estimated through spawning ground surveys.

Results

Smolt Trap Operation

Trapping in the Methow River basin in 2006 began at the Methow River site on 16 February and at the Twisp River site on 11 March. Smolt trapping at both locations was interrupted on occasion over the course of the trapping season because of unfavorable environmental conditions (e.g., flooding, low flow, ice). Discharge during the spring was above annual mean values at both sites, and approached historic record levels (Figures 1-2). Because of this, trapping at both sites was halted during peak flows to prevent damage to the traps. The Methow River basin experienced higher than average discharge in the fall that also required cessation of trapping at both locations for a short duration.

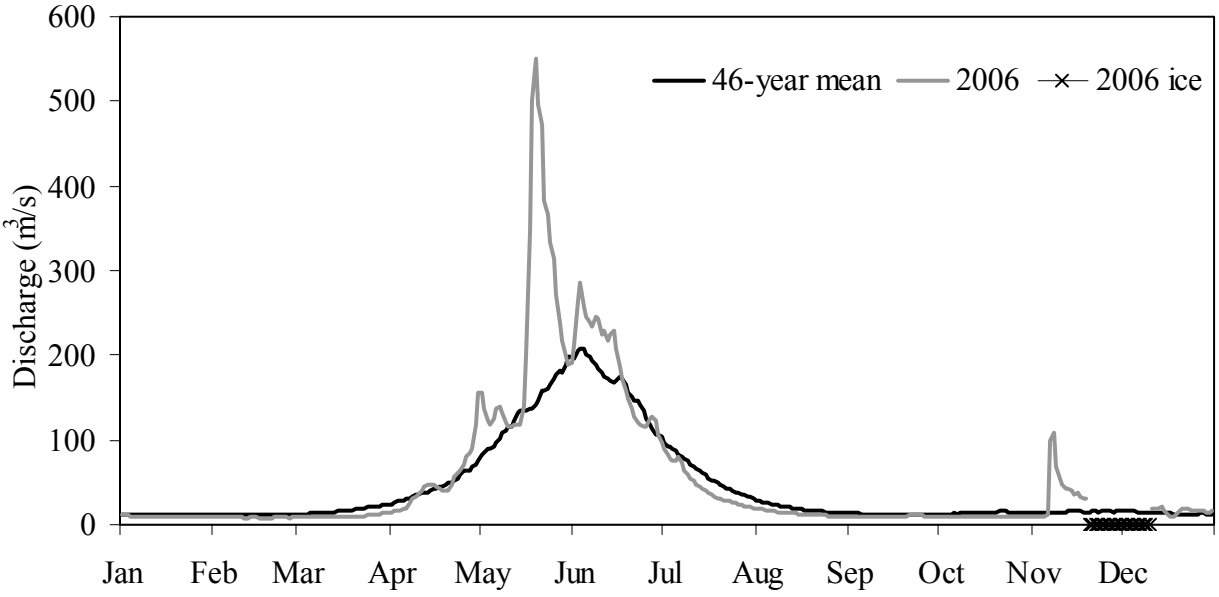

Figure 1. Methow River 2006 daily discharge and 46-year mean as measured at the USGS monitoring station No. 12449950 (Methow River near Pateros, Washington).

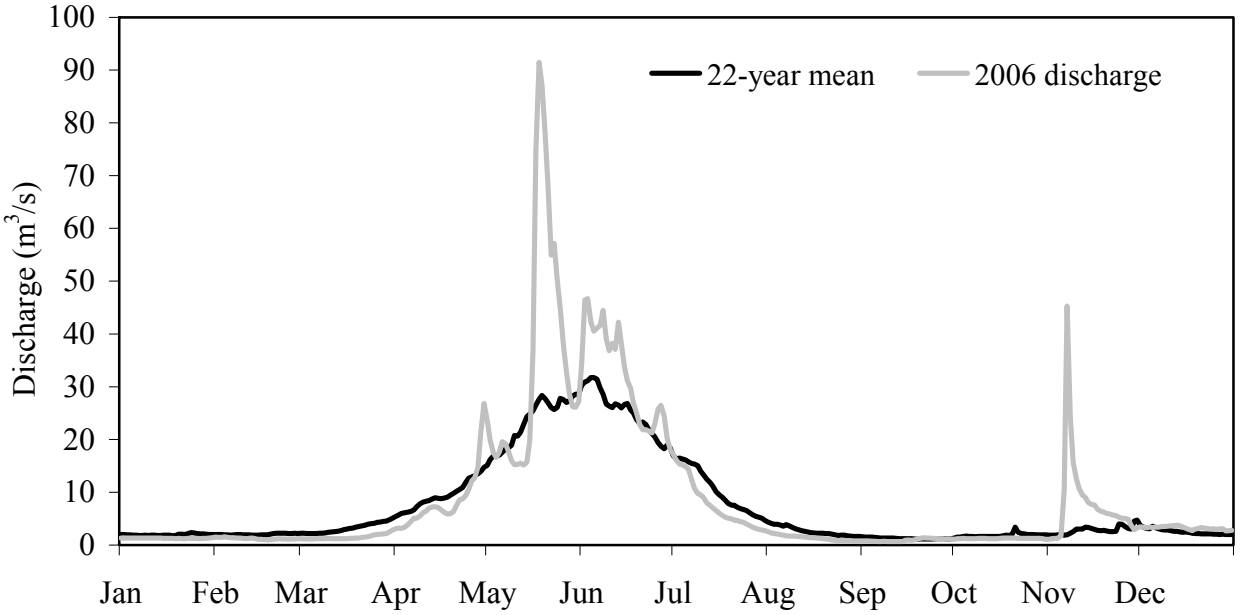

Figure 2. Twisp River 2006 daily discharge and 22-year mean as measured at the USGS gauging station No.12448998 (Twisp River near Twisp, Washington).

Daily Captures and Biological Sampling

Methow River Trap

2004 Brood Chinook

A total of 552 wild yearling Chinook smolts were captured between 16 February and 30 June. Peak captures occurred on 8 April ($N = 43$; Figure 3). We estimate that we would have captured an additional 13 smolts had the trap operated without interruption (Appendix A1). No attempt was made to determine race (spring versus summer) of these fish in 2006 (i.e., DNA sampling). Passive integrated transponder (PIT) tags were implanted into 485 wild smolts, but only 479 fish were released with PIT tags after mortalities ($N = 6$) were subtracted (Appendix B1). For survival comparison, we also implanted PIT tags into 1,003 of the 7,533 hatchery Chinook captured. Of which, three hatchery Chinook shed their tags before release. A total of 1,000 hatchery Chinook were released with PIT tags. Mortalities of wild Chinook smolts totaled 2.5% ($N = 14$) of the wild smolts captured. Hatchery spring Chinook were significantly greater in fork length at migration than wild Chinook ($P < 0.01$; Table 1).

Table 1. Summary of length and weight sampling conducted on Chinook captured at the Methow River smolt trap (wild) or at Methow Hatchery (hatchery) in 2006.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2004	Wild smolt	103.1	537	11.2	12.1	537	3.8	1.1
2004	Hatchery smolt	137.5	100	8.2	32.0	100	5.9	1.2
2005	Wild fall parr	94.7	178	7.9	9.5	178	2.4	1.1

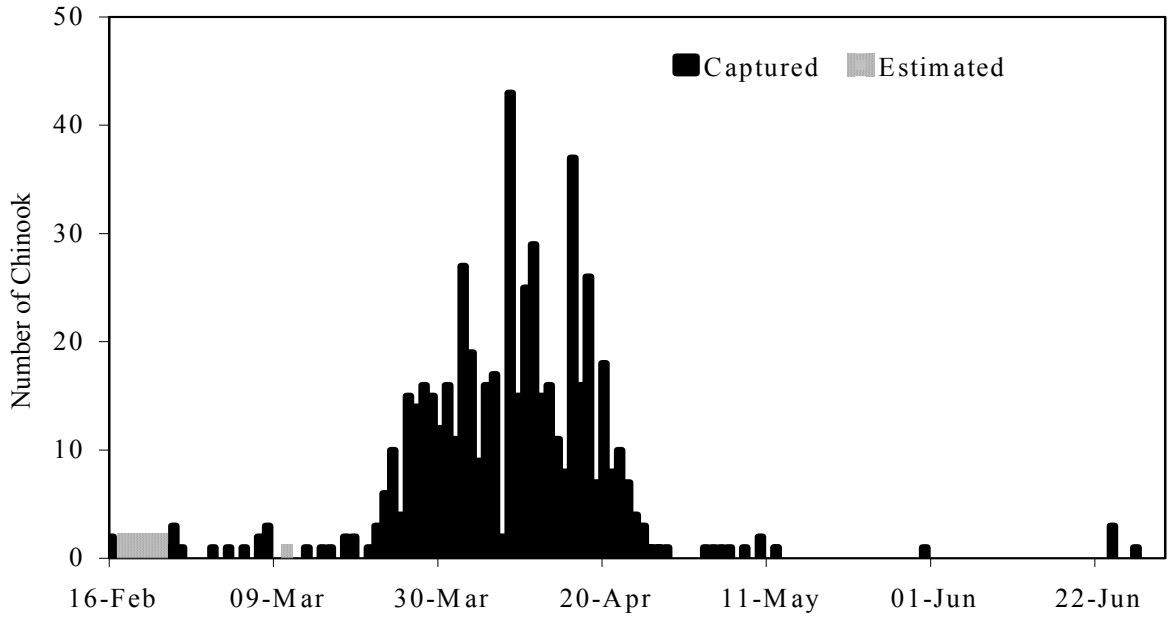

Figure 3. Daily capture of wild Chinook smolts at the Methow river smolt trap during 2006.

2005 Brood Chinook

Chinook fry were captured at the Methow trap between 23 February and 30 June (*N* = 6,207). No attempt was made to determine race (spring versus summer) of these fish in 2006 (i.e., DNA sampling). Mortality of Chinook fry during the spring period totaled 36 fish (0.57%). Trapping ended on 30 June at the completion of the smolt emigration, but was reinitiated on 27 September in order to determine the extent and magnitude of the fall/winter migration. A total of 187 Chinook parr were captured during the fall trapping period between 27 September and 28 November. These fish had a mean fork length of 94.7 mm (Table 1). During a fall freshet, the trap was not operated for five days due to high debris levels. An estimated 90 additional Chinook parr would have been captured had the trap operated during the entire period (Appendix A2). Peak capture of Chinook during the fall period occurred on 14 November (*N* = 27; Figure 4). The number of Chinook parr captured in the fall was correlated with the increase in discharge ($r = 0.75$). PIT tags were inserted into 166 Chinook parr, of which only 165 fish were released with PIT tags (Appendix B2). No mortalities of Chinook parr occurred during the fall trapping period. To determine race of the Chinook captured during the fall period, tissue

samples (i.e., fin clip) were collected for DNA analysis and transferred to the WDFW genetics lab (Appendix C).

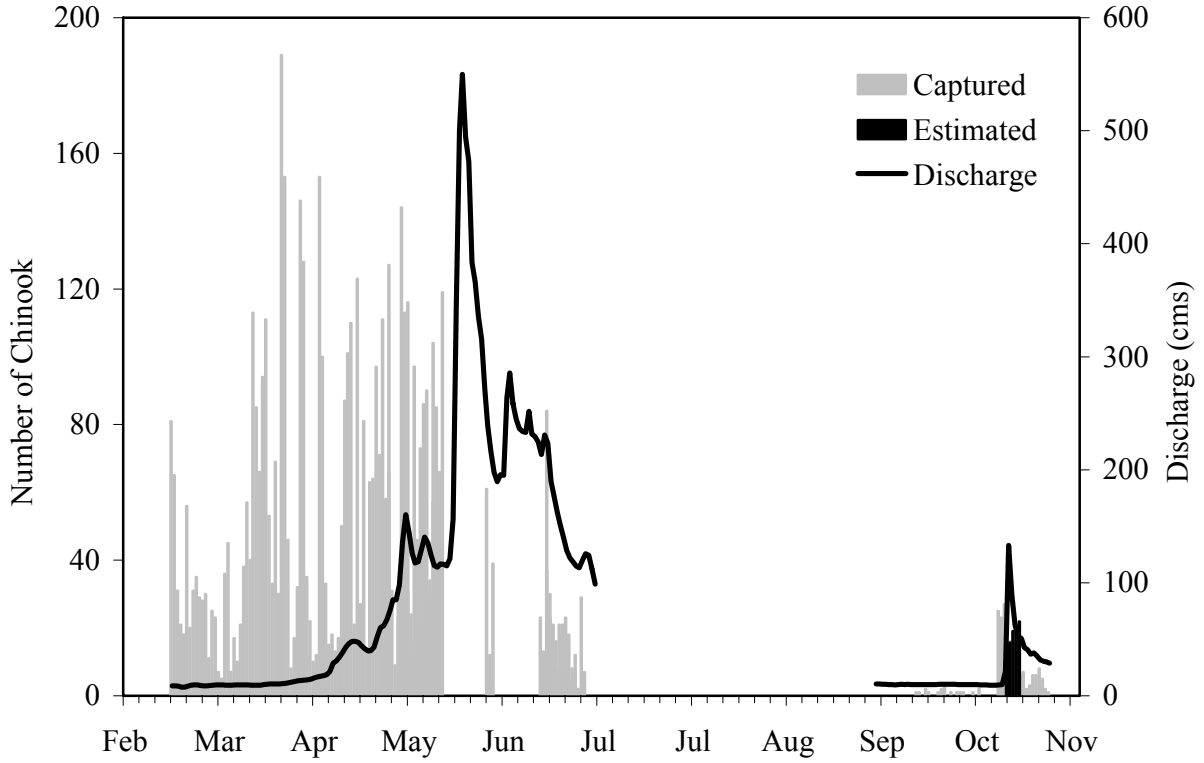

Figure 4. Daily capture of wild Chinook subyearling fry (Feb – Jul) and parr (Sep – Nov) at the Methow River smolt trap in 2006.

Summer Steelhead

We captured 362 wild summer steelhead migrants (smolt and transitional) between 23 February and 30 June in the Methow River trap. Peak capture of migratory steelhead occurred on 27 April ($N = 40$; Figure 5). We estimate an additional nine steelhead would have been captured if the traps had operated during the entire period (Appendix A3). We PIT tagged 321 wild migrating steelhead, but only 318 were released with PIT tags after shed tags ($N = 1$) and mortalities ($N = 2$) were removed (Appendix B3). For survival comparison, we inserted PIT tags into 1,496 of the 5,226 hatchery origin steelhead captured at the trap. We released 1,493 hatchery origin summer steelhead with PIT tags after removing three fish that died.

Juvenile wild steelhead were designated fry (< 50 mm) or parr (> 50 mm) based on fork length. We captured 5 fry and 65 parr between 16 February and 28 November. Steelhead parr greater than 65 mm in good physical condition were PIT tagged ($N = 57$) prior to release (Appendix B4). Wild steelhead parr had a mean fork length (N; SD) of 94.5 mm (63; 22.3) and mean weight of 10.5 g (62; 7.5). No steelhead parr mortalities occurred during Methow River trapping.

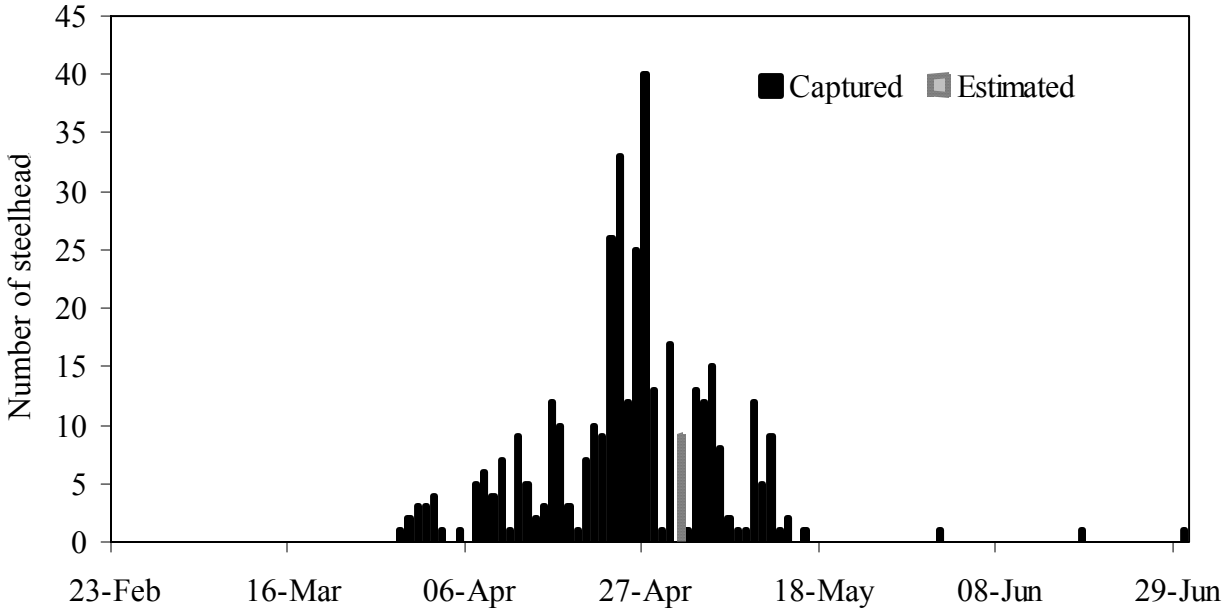

Figure 5. Daily capture of wild steelhead smolt and transitional migrants at the Methow River smolt trap in 2006.

Wild summer steelhead migrants were primarily age-2 fish (65.8%) with a mean fork length of 168 mm. Age-1 and age-3 fish also contributed significantly to the 2006 migration (Table 2). Hatchery steelhead released by WDFW in the Methow River had a mean fork length of 168 mm at release (Chapter 1). Total mortalities of natural-origin smolt and transitional summer steelhead from trapping activities comprised 0.5% of all fish captured ($N = 2$).

Table 2. Mean length at migration age of wild transitional and smolt summer steelhead captured at the Methow River trap.

Age	*N* (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
1	19 (14.7)	143	19	16	29.4	19	9.4	1.00
2	85 (65.8)	168	85	20	48.0	85	15.8	1.00
3	22 (17.0)	170	22	19	47.7	22	15.8	0.97
4	3 (2.3)	184	3	5	60.0	3	5.6	0.96

Twisp River Trap

2004 Brood Spring Chinook

Between 11 March and 15 May, 835 wild yearling spring Chinook smolts were captured at the Twisp River trap. Peak capture occurred on 7 April (N = 109; Figure 6). We estimate that an additional 26 smolts would have been captured if the trap had operated without interruption during the entire period (Appendix A4). We inserted PIT tags into 819 of the captured fish, and released 818 smolts after subtracting a single mortality (Appendix B5). No shed tags were observed from wild spring Chinook smolts.

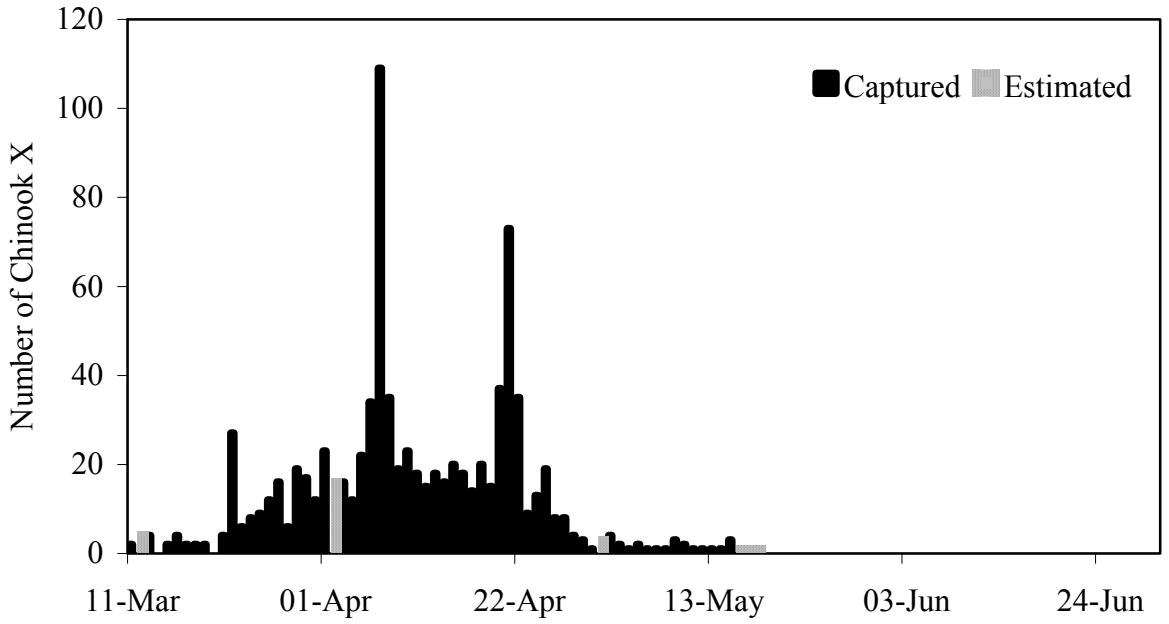

Figure 6. Daily capture of wild spring Chinook smolts at the Twisp River smolt trap in 2006.

For survival comparison, we inserted PIT tags into 966 of the 15,061 hatchery spring Chinook captured. No shed tags were recorded from PIT tagged hatchery spring Chinook. Wild spring Chinook had a mean fork length (N; SD) of 94.4 mm, and a mean condition factor of 1.0 (Table 3). Hatchery spring Chinook had a mean fork length (N; SD) of 130.2 mm, and a mean condition factor of 1.3 (Table 3). Only one wild and one hatchery spring Chinook died during trapping or 0.12% and 0.006% of the total fish captured, respectively.

Table 3. Summary of length and weight sampling conducted on Chinook captured at the Twisp River smolt trap (wild) or at the Twisp acclimation pond (hatchery) in 2006.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2004	Wild smolt	94.4	835	8.1	8.7	835	2.5	1.0
2004	Hatchery smolt	130.2	100	14.6	27.8	100	11.9	1.3
2005	Wild fall parr	90.1	559	8.5	8.0	558	2.6	1.1

2005 Brood Spring Chinook

We captured 400 subyearling spring Chinook between 11 March and 17 August. Of these fish, 237 were classified as fry (< 50 mm) and 163 as parr (> 50 mm) based on fork length. An additional 560 parr were captured in the fall between 22 September and 28 November. Peak capture of Chinook parr during the fall occurred on 9 November (N = 59; Figure 7). We estimated that an additional 116 Chinook parr would have been captured had the trap operated during the entire fall emigration period (Appendix A5). PIT tags were implanted in 563 parr during trapping in 2006. Of those, 562 PIT tagged parr were released after subtracting a single shed tag (Appendix B6). Fall migrant parr had a mean fork length of 90 mm (see Table 3).

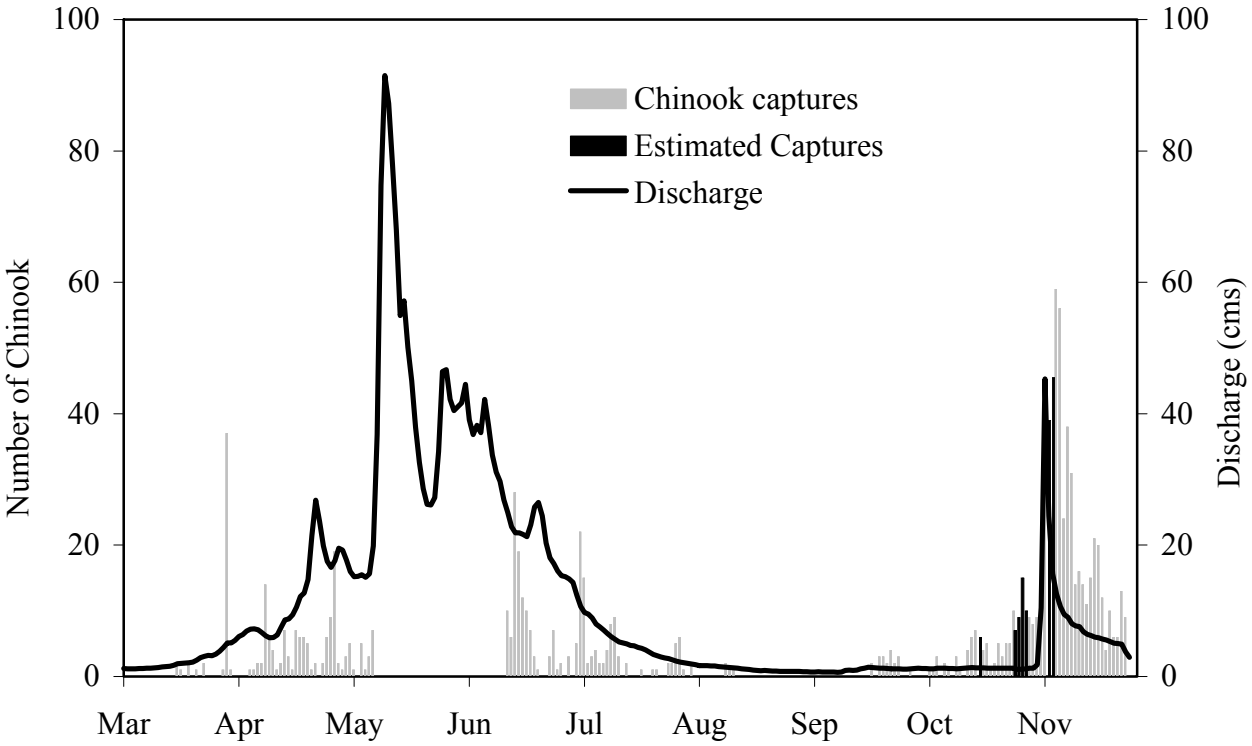

Figure 7. Daily capture of wild spring Chinook subyearling fry (Mar – Sep) and parr (Sep – Nov) at the Twisp River smolt trap in 2006.

Summer Steelhead

We captured 504 wild summer steelhead migrants (smolt and transitional) between 11 March and 31 July. Peak capture occurred on 22 April (N = 57; Figure 8). We estimated that 72 additional steelhead would have been captured if the trap had operated without interruption (Appendix A6). A total of 467 PIT tags were implanted in wild steelhead migrants and 466 were released with tags after subtracting a single shed tag (Appendix B7). For survival comparison, we inserted PIT tags into 1,410 of the 12,006 hatchery origin steelhead captured at the trap. Most wild summer steelhead migrants were age-2 fish (63.8%), but age-3 fish also contributed significantly to the 2006 migration (Table 4). No mortality of wild summer steelhead migrants occurred during trapping. Hatchery steelhead released into the Twisp River had a mean fork

length of 168 mm and mean weight of 53.3 g (Chapter 1) at release. Four hatchery summer steelhead died during trapping activities (0.03%).

A total of 102 wild summer steelhead fry and 706 wild parr were captured at the Twisp trap between 12 March and 28 November. Steelhead parr greater than 65 mm and in good condition were PIT tagged (N = 690). A total of 689 steelhead parr were released with PIT tags after deducting a single mortality (Appendix B8). Wild summer steelhead parr had a mean fork length (N; SD) of 102 mm (736; 32), and mean weight of 14.4 g (735; 17.7). Mortalities of wild summer steelhead parr from trapping totaled 0.1% (N = 1) of the parr captured.

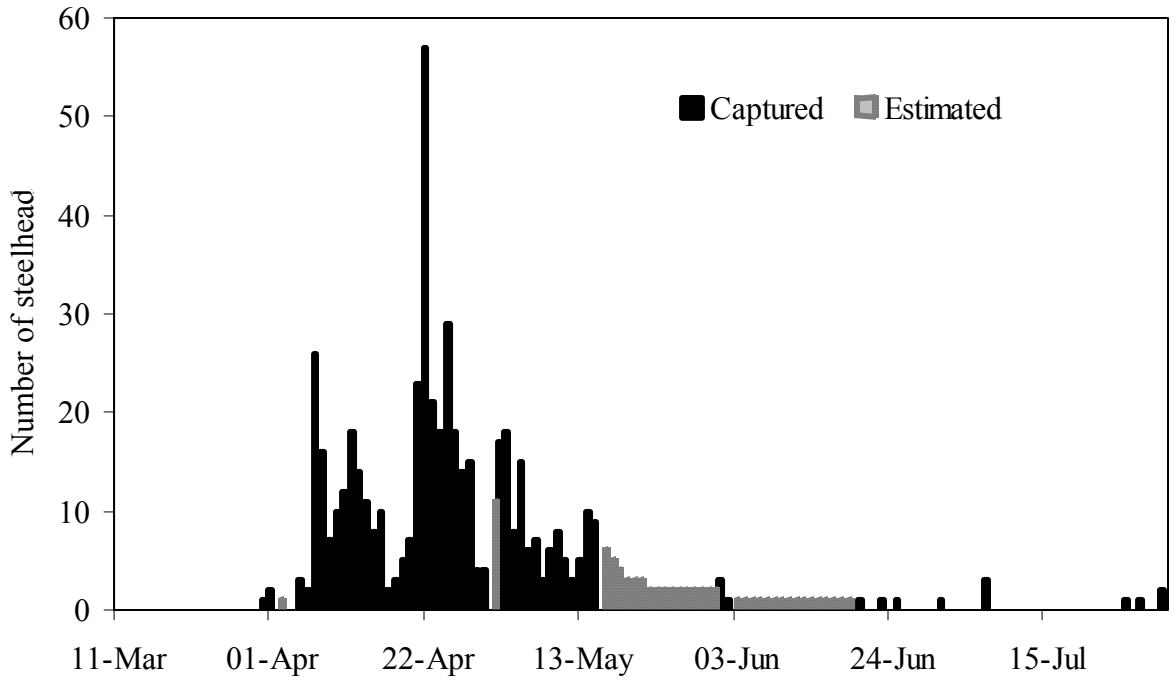

Figure 8. Daily capture of wild steelhead smolt and transitional migrants at the Twisp River smolt trap in 2006.

Table 4. Mean length at migration age of wild transitional and smolt summer steelhead captured at the Twisp River trap in 2006.

Age	N (%)	Fork (mm)			Weight (g)			K-factor
		Mean	N	SD	Mean	N	SD	
1	28 (6.4)	124.7	28	13	20.0	28	6.8	1.00
2	276 (63.8)	154.6	276	14	35.3	276	9.5	0.96
3	117 (27.0)	164.7	117	18	42.8	117	14.4	0.96
4	11 (2.5)	169.4	11	12	47.9	11	8.8	0.99

Population Estimates

Methow River Basin

2004 Brood Chinook

Mark/recapture efficiency trials should have been conducted with wild Chinook smolts. Due to their low abundance, hatchery spring Chinook were used when too few wild Chinook were available. Regression models developed to estimate trap efficiency were not significant. The frequency and size of mark/recapture efficiency trials were insufficient given the observed trap efficiency. Therefore, the 2006 migration estimate was calculated using the pooled trap efficiency from mark/recapture efficiency trials conducted in 2006 (Table 5). We estimated that a total of 15,869 (± 1,476, 95% CI) wild Chinook of the 2004 brood emigrated from the Methow River basin between 23 February and 30 June. This estimate does not include any subyearling migrants because the proportion of subyearling migrants captured in 2005 that were spring Chinook is unknown (i.e., trap was not operated in the fall).

Table 5. Mark/recapture efficiency trials used to estimate emigration of 2004 brood spring Chinook (YCH = yearling Chinook hatchery origin; YCW = yearling chinook wild origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCW	2-Apr-06	Low-0	25	1	4.00	15.9
YCW	5-Apr-06	Low-0	43	1	2.33	17.8
YCW	9-Apr-06	Low-0	18	1	5.56	30.8
	Pooled		86	3	3.48	
YCH	25-Apr-06	High	199	11	5.53	67.4
	Pooled		199	11	5.53	

2005 Brood Chinook

Three mark/recapture efficiency trials were conducted with Chinook parr during the fall period at the Methow River trap site. As was the case with yearling Chinook, the total number of fish captured and released was low and all trials occurred during a very short time frame (Table 6). No significant relationship existed between discharge and capture efficiency of Chinook parr at the Methow River trapping site. The pooled trap efficiency was used to estimate the total number of fall migrants. We collected 189 tissue samples for DNA analysis (Appendix C), which was greater than the number of parr used to generate population estimates because two fish recaptured from efficiency trials were inadvertently sampled twice. Based on the results of the DNA analysis, an estimated 177 of the parr captured in the fall were spring Chinook (93.6%), and 8 parr were summer Chinook (4.3%). Four samples were not included because they were efficiency recaptures (samples 06GS0096 and 06GS0160), the DNA did not amplify (sample 06GS0175), or the fish was identified as a coho (sample 06GS0082). Based on the DNA

assignment results, we estimate that 17,500 (± 5,923, 95% CI) spring Chinook parr (Appendix A2) and 825 (± 343, 95% CI) summer Chinook parr emigrated past the Methow River trap during fall trapping in 2006.

Table 6. Mark/recapture efficiency trials used to estimate emigration of Chinook parr at the Methow River smolt trap in 2006 (SBC Parr = subyearling Chinook wild origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC Parr	15-Nov-06	Low-2	71	1	1.41	36.7
SBC Parr	19-Nov-06	Low-2	46	0	0.00	30.6
SBC Parr	22-Nov-06	Low-2	15	1	6.67	28.5
	Pooled		132	2	1.52	

Summer Steelhead

Hatchery summer steelhead (SHH) and wild yearling Chinook were used as surrogates for wild steelhead when too few wild fish were available. The frequency and size of mark/recapture efficiency trials were insufficient to generate a robust regression model. Steelhead emigration estimates were calculated using pooled trap efficiency from mark/recapture efficiency trials conducted in 2006 (Table 7). We estimated 13,780 (± 1,900 CI 95%) summer steelhead emigrated from the Methow River basin in 2006, the majority of which were age-2 fish of the 2004 brood (Table 8).

Table 7. Mark/recapture efficiency trials used to estimate emigration of wild summer steelhead at the Methow River smolt trap in 2006.

Species	Date	Trap	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCW	2-Apr-06	5	Low-0	25	1	4.00	15.9
YCW	5-Apr-06	5	Low-0	43	1	2.30	17.8
YCW	9-Apr-06	5	Low-0	18	1	5.56	30.8
	Pooled			86	3	3.48	
SHH	05/06/2006	5+8	High	205	0	0.00	129.3
SHH	05/04/2006	5+8	High	221	11	4.90	115.1
	Pooled			426	11	2.58	

Table 8. Number of steelhead emigrants from the Methow River basin in 2006 by age and brood.

Age	Brood	% of total migrants	Number
1	2005	14.7	2,030
2	2004	65.9	9,082
3	2003	17.1	2,351
4	2002	2.3	320
Total			13,784

Twisp River

2004 Brood Spring Chinook

Capture efficiency of wild spring Chinook smolts was significantly related to discharge ($r^2 = 0.9$, $P < 0.01$) at the Twisp River trapping site. Most mark/recapture efficiency trials were accomplished with wild spring Chinook smolts although one trial was conducted with hatchery spring Chinook (Table 9). We estimated that 5,092 (± 264, CI 95%) smolts emigrated from the Twisp River between 03 March and 30 June.

Table 9. Mark/recapture efficiency trials used to estimate emigration of wild spring Chinook smolts from the Twisp River (YCH = yearling Chinook hatchery origin; YCW = yearling Chinook wild origin).

Species	Date	Trap	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCH	04/24/05	5	High	100	20	20.0	4.6
YCW	04/13/06	5	High	33	5	15.2	7.9
YCW	04/11/06	5	High	94	13	13.8	7.2
YCW	04/07/06	5	High	134	23	17.2	5.5
YCW	04/04/06	5	High	45	8	17.8	4.0
YCW	03/18/06	5	High	8	2	25.0	1.4
Total				414	71	17.1	

Snow and Fowler (2006) used a pooled trap efficiency to estimate that the 2005 fall emigration of 2004 brood spring Chinook totaled 1,181 (± 75, CI 95%) fish. An error was found in the published emigration estimate. The corrected 2004 brood subyearling estimate was 1,184 (± 75, CI 95%) fall migrants. Combining the subyearling and yearling emigration estimates resulted in a total estimate of 6,276 (± 339, CI 95%) for the 2004 brood Twisp spring Chinook.

2005 Brood Spring Chinook

For the 2005 brood subyearling estimate, trap efficiency was not significantly related to discharge. In most cases, the number of spring Chinook available for mark/recapture trials was

too small (i.e., < 100). A total of six mark/recapture efficiency trials were used to generate the pooled trap efficiency (Table 10). Using this methodology, an estimated 3,188 (± 115, 95% CI) spring Chinook parr emigrated past the Twisp trap between 22 September and 28 November.

Table 10. Mark/recapture efficiency trials used to estimate emigration of 2005 brood wild spring Chinook parr at the Twisp River trap (SBC = subyearling Chinook wild origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC	09/29/06	Low-1	12	3	25.0	1.2
SBC	11/03/06	Low-1	34	6	17.6	1.2
SBC	11/10/06	Low-1	59	7	11.8	13.9
SBC	11/15/06	Low-1	164	42	25.6	7.6
SBC	11/19/06	Low-1	56	8	14.3	6.3
SBC	11/22/06	Low-1	53	13	24.5	5.8
	Pooled		378	79	20.9	

Summer Steelhead

No significant relationship existed between discharge and capture efficiency of wild summer steelhead at the Twisp River trap site. In most cases, the number of steelhead available for mark/recapture trials was too small (i.e., < 100). Six mark/recapture efficiency trials used to generate the pooled trap efficiency estimate were primarily conducted with wild steelhead (Table 11). The estimated wild steelhead smolt emigration in 2006 from the Twisp River basin was 4,970 (± 196, CI 95%) fish, the majority of which were age-2 fish from the 2004 brood (Table 12). No attempt was made to estimate the contribution of parr to basin production.

Table 11. Mark/recapture efficiency trials used to estimate emigration of wild summer steelhead migrants from the Twisp River (SHR = steelhead wild origin; SHH = steelhead hatchery origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SHR	04/07/2006	Low	26	1	3.8	3.8
SHR	04/11/2006	Low	43	2	4.7	4.7
SHR	04/13/2006	Low	32	4	12.5	12.5
SHR	04/23/2006	Low	78	8	10.3	10.3
SHH	05/03/2006	Low	198	24	12.1	12.1
SHH	05/14/2006	Low	200	28	14.0	14.0
	Pooled		577	67	11.6	

Table 12. Number of steelhead emigrants from the Twisp River in 2006 by age and brood.

Age	Brood	% of total emigrants	Number
1	2005	5.9	292
2	2004	64.2	3,192
3	2003	27.3	1,357
4	2002	2.6	129
Total			4,970

Smolts Per Redd

The number of smolts or emigrants per redd for the 2004 brood spring Chinook in the Twisp River was greater than that value for the entire Methow Basin (Table 13). Although, subyearling fall emigrants may have been missed because the Methow trap was not operated in the fall of 2005. A more detailed analysis of smolt per redd data comparing Twisp spring Chinook to the Methow /Chewuch rivers was performed by subtracting the number of yearling smolts emigrating from the Twisp River from the Methow Basin estimate. Subyearling were not included because the survival of Twisp subyearling emigrants to smolt and the number of subyearling emigrants at the Methow trap was unknown for most years. Smolt-per-redd values for the Twisp River were 56% and 54% greater than Methow/Chewuch rivers for brood years 2003 and 2004, respectively. These values should be considered minimum differences because the proportion of subyearling emigrants at the Twisp trap is most likely much greater than at the Methow trap.

Table 13. Estimated egg-to-emigrant survival and smolts per redd for Methow basin spring Chinook. Emigrant-per-redd values were not calculated for incomplete brood years. Mean fecundity of 4,200 eggs per female was used for all brood years. DNOT = Did Not Operate Trap.

Basin	Brood	Number of redds	Estimated number of eggs	Number of emigrants			Egg-to-emigrant (%)	Emigrants per redd
				Age-0[a]	Age-1	Total		
Twisp	2003	18	75,600	DNOT	900	900	1.2	--
Twisp	2004	139	583,800	1,184	5,092	6,276	1.1	45
Twisp	2005	55	231,000	3,188				--
Methow	2002	1192	5,006,400	DNOT	28,099	28,099	0.6	24
Methow	2003	474	1,990,800	570	15,306	15,876	0.8	33
Methow	2004	543	2,280,600	DNOT	15,869	15,869	0.7	29
Methow	2005	566	2,377,200	17,500				--

[a] Estimate is based on capture of fall parr (95% assumed spring Chinook in the Methow) and does not include captures of fry or parr prior to September.

Because a portion of each steelhead brood emigrates as age-4 smolts, no complete smolt-per-redd values are available. However, using the same methodology as described for spring Chinook, smolt-per-redd values for the Twisp River (5) are similar to the Methow/Chewuch rivers (4) for the 2003 brood (Table 14).

Table 14. Estimated egg-to-emigrant survival and smolts per redd of Methow basin steelhead. Emigrant-per-redd values were not calculated for incomplete brood years. Mean fecundity of 5,000 eggs per female was used for all brood years. DNOT = Did Not Operate Trap.

Basin	Brood	Number of redds	Estimated number of eggs	Number of emigrants					Egg-to-emigrant (%)	Emigrant per redd
				Age-1	Age-2	Age-3	Age-4	Total		
Twisp	2003	696	3,480,000	DNOT	2,053	1,354		3,407	0.10	--
Twisp	2004	256	1,280,000	179	3,186			3,265	0.26	--
Twisp	2005	483	2,415,000	292				292	0.01	--
Methow	2003	2,019	10,095,000	1,526	4,657	2,351		8,534	0.09	--
Methow	2004	1,001	5,005,000	1,883	9,082			11,022	0.22	--
Methow	2005	1,780	8,900,000	2,030				2,043	0.02	--

Incidental Species

Longnose dace were the most common incidental species captured at the Twisp River, while hatchery coho were the most common incidental species at the Methow River trap in 2006 (Table 15). Nine wild coho smolts were captured at the Methow River trap in 2006. Utilizing the same mark/recapture efficiency trial data used at the site for spring Chinook, we estimate that 194 (± 31 CI 95%) wild coho from the 2004 brood emigrated from the Methow River in 2006. Some species (e.g., Pacific lamprey, coho) were abundant at the Methow River trap, but were not encountered in the Twisp River.

Table 15. Biological sampling conducted on selected incidental species at Methow Basin smolt traps in 2006.

Species	Captured	Fork length (mm)			Weight (g)		
		Mean	*N*	SD	Mean	*N*	SD
Twisp River trap							
Longnose dace (*Rhinichthys cataractae*)	1,463	88.5	1,173	20.8	9.8	1,159	7.4
Sculpin (*Cottus spp*.)	172	55.6	133	23.3	4.4	131	9.3
Whitefish (*Prosopium williamsoni*)	74	40.1	60	12.0	1.0	38	1.2
Bull trout (*Salvelinus confluentus*)	22	200.0	20	33.7	83.1	20	41.8
Cutthroat trout (*O. clarki*)	18	194.3	18	34.9	88.7	18	44.9
Sucker fry (*Catostomus spp.*)	5	113.4	5	30.5	18.1	5	13.7
Redside shiner (*Richardsonius balteatus*)	2	28.5	2	2.1	- -	0	- -
Umatilla dace (*R. umatilla*)	2	83.5	2	12.0	7.6	2	4.0
Brown bullhead (*Ictalurus nebulosus*)	1	112.0	1	- -	24.8	1	- -
Methow River trap							
Hatchery coho (*O. kisutch*)	2,695	120.0	1	- -	16.8	1	- -
Pac. lamprey ammocoete (*Lampetra tridentata*)	2,671	119.3	217	18.8	2.9	121	1.0
Pacific lamprey juvenile (*L. tridentata*)	831	140.7	4	3.5	4.5	4	0.7
Sockeye fry (*O. nerka*)	388	24.9	189	1.6	- -	0	- -
Sucker fry (*Catostomus spp.*)	211	60.7	87	24.5	5.1	49	14.0
Redside shiner (*Richardsonius balteatus*)	189	27.5	127	4.1	0.4	18	0.2
Longnose dace (*Rhinichthys cataractae*)	166	44.4	94	23.2	2.1	55	3.7
Sculpin (*Cottus spp.*)	23	56.4	18	26.4	4.7	15	7.6
Wild coho parr (*O. kisutch*)	14	47.0	4	11.2	1.3	3	0.9
Wild coho smolt (*O. kisutch*)	9	77.4	19	28.1	8.5	12	6.4
Whitefish (*Prosopium williamsoni*)	4	49.2	4	30.2	8.9	1	- -
Cutthroat trout (*O. clarki*)	3	174.3	3	34.9	47.8	3	22.4
Bull trout (*Salvelinus confluentus*)	2	144	2	5.6	27.8	2	4.8

Discussion

High river discharge and low juvenile abundance limited trap operation and the ability to conduct trap efficiency trials over a broad range of river conditions. As a result, inadequate trap efficiency-to-discharge regression models forced the use of pooled trap efficiencies in most cases. All smolt-production estimates should be considered provisional until proper regression models are developed for each trap and species. Because the Methow River smolt traps have been operated in identical positions each year, trap efficiency trials can be pooled over time to develop trap-efficiency relationships more rapidly. Once regression models have been developed for the Methow trap, previous smolt-production estimates can be recalculated. However, despite moderate observed trap efficiencies for salmon and steelhead (range 2-6%), the relatively low abundance of wild yearling Chinook and steelhead severely limit the number and size of trials that can be conducted. The use of hatchery fish as surrogates should also be carefully examined, because of potential behavioral and size differences between wild and hatchery fish. Hatchery fish are typically larger at a comparable age than their wild counterparts; thus, size-related biases related to trap efficiency might preclude the use of some hatchery fish. Changes in river morphology at the Twisp trapping site due to heavy flooding and ice flows required movement of the trap to a slightly different position in the fall of 2006. Because of this, mark/recapture efficiency trials from previous years utilizing fall parr were not utilized in 2006 for trap efficiency estimation. High trap efficiency (range 10-25%) at the Twisp River trap should provide the necessary number of Chinook and steelhead to develop regression models of trap efficiency.

Establishing the relationship between trap efficiency and discharge may be accomplished in a single year provided abundance of the target species is adequate. However, multiple years of data are required to calculate an estimate of egg-to-emigrant survival for a single brood year (e.g., steelhead). Trap locations in the Methow and Twisp rivers appear appropriate for the target species and expected environmental conditions. Observed trap efficiencies are within the acceptable level of the ESA permit conditions (i.e., < 20%). Once trap efficiency models have been established, a retrospective analysis of data from previous years should provide more robust smolt-production estimates. Developing life-stage survival estimates and models of endangered species is challenging due to their relatively low abundance, complex life history, and the desire to avoid negative impacts to the species on which research is focused. Low catch rates of spring Chinook and steelhead limited the number of PIT tags deployed in 2006. Low sample sizes of PIT-tagged fish may preclude any statistical analysis of overwinter mortality and subsequent smolt survival of PIT tagged subyearling Chinook.

In sub-basins with both summer and spring Chinook populations, smolt traps are intentionally located far downstream of spring Chinook spawning areas to minimize encounters with subyearling spring Chinook emigrating from spawning tributaries. Hence, all yearling Chinook are assumed to be spring Chinook and subyearling Chinook are assumed to be summer Chinook. Based on this assumption, spring Chinook may be misclassified as summer Chinook if subyearling spring Chinook migrate downstream of the Methow smolt trap. Conversely, summer Chinook may be misclassified if the yearling life history is more prevalent than adult scale samples suggest or subyearling summer Chinook are misclassified as yearling Chinook. Ongoing studies (e.g., DNA analysis) should determine to what extent spring Chinook migrate as

subyearling fish and summer Chinook as yearlings. Tissue samples collected from subyearling Chinook at the Methow trap during the fall period indicated that the vast majority of fish were spring Chinook. The number of spring Chinook parr may have been substantially greater than what would be observed in typical years because of flooding that occurred during the trapping period. Additional years of trapping and DNA analysis will be required to estimate emigration and species-composition trends for spring and fall migrant Chinook at the Methow River site.

The low freshwater production of yearling Chinook and steelhead suggest severe density dependent mortality, low reproductive success, or both are factors contributing to the observed survival rates. Egg deposition estimates for spring Chinook were based on total ground counts of redds throughout the basin. Error associated with spring Chinook redd counts is likely small (i.e., low water levels, high water clarity, large redds). Conversely, steelhead egg deposition estimates are based on redd counts of an unknown fraction of the total number of redds (i.e., incomplete surveys, high water discharge, poor water clarity, and small redds). Actual egg deposition may potentially be much higher, thus reducing already low survival rates further.

Preliminary comparisons between the Twisp and Methow/Chewuch rivers suggest for spring Chinook, the Twisp River population may be twice as productive as the Methow/Chewuch population. Steelhead productivity appears to be similar in both subbasins, based solely on estimates of smolt production. Causation of differences in productivity between populations and the overall low level of juvenile production is unknown. Additional research is necessary to better understand the reproductive success and carrying capacity of spring Chinook and steelhead in the Methow Basin. In additional, estimating the proportion of hatchery steelhead that spawn in each subbasin would also provide important insight in determining why productivity is relatively low throughout the basin.

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Appendix A1. Daily capture of wild spring Chinook smolts emigrating from the Methow River, 16 February through 20 June 2006. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
16-Feb-06	2	0.035	57	21-Mar-06	1	0.035	29
17-Feb-06	**2**	0.035	57	22-Mar-06	3	0.035	86
18-Feb-06	**2**	0.035	57	23-Mar-06	6	0.035	172
19-Feb-06	**2**	0.035	57	24-Mar-06	10	0.035	287
20-Feb-06	**2**	0.035	57	25-Mar-06	4	0.035	115
21-Feb-06	**2**	0.035	57	26-Mar-06	15	0.035	430
22-Feb-06	**2**	0.035	57	27-Mar-06	14	0.035	401
23-Feb-06	1	0.035	29	28-Mar-06	16	0.035	459
24-Feb-06	3	0.035	86	29-Mar-06	15	0.035	430
25-Feb-06	1	0.035	29	30-Mar-06	12	0.035	344
26-Feb-06	0	0.035	0	31-Mar-06	16	0.035	459
27-Feb-06	0	0.035	0	01-Apr-06	11	0.035	315
28-Feb-06	0	0.035	0	02-Apr-06	27	0.035	774
01-Mar-06	1	0.035	29	03-Apr-06	19	0.035	545
02-Mar-06	0	0.035	0	04-Apr-06	9	0.035	258
03-Mar-06	1	0.035	29	05-Apr-06	16	0.035	459
04-Mar-06	0	0.035	0	06-Apr-06	17	0.035	487
05-Mar-06	1	0.035	29	07-Apr-06	2	0.035	57
06-Mar-06	0	0.035	0	08-Apr-06	43	0.035	1,233
07-Mar-06	2	0.035	57	09-Apr-06	15	0.035	430
08-Mar-06	3	0.035	86	10-Apr-06	25	0.035	717
09-Mar-06	0	0.035	0	11-Apr-06	29	0.035	831
10-Mar-06	**1**	0.035	29	12-Apr-06	15	0.035	430
11-Mar-06	0	0.035	0	13-Apr-06	16	0.035	459
12-Mar-06	0	0.035	0	14-Apr-06	11	0.035	315
13-Mar-06	1	0.035	29	15-Apr-06	8	0.035	229
14-Mar-06	0	0.035	0	16-Apr-06	37	0.035	1,061
15-Mar-06	1	0.035	29	17-Apr-06	16	0.035	459
16-Mar-06	1	0.035	29	18-Apr-06	26	0.035	745
17-Mar-06	0	0.035	0	19-Apr-06	7	0.035	201
18-Mar-06	2	0.035	57	20-Apr-06	18	0.035	516
19-Mar-06	2	0.035	57	21-Apr-06	8	0.035	229
20-Mar-06	0	0.035	0	22-Apr-06	10	0.035	287

Appendix A1, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
23-Apr-06	7	0.055	127	**28-May-06**	**0**	0.035	0
24-Apr-06	4	0.055	72	**29-May-06**	**0**	0.035	0
25-Apr-06	3	0.055	54	**30-May-06**	**0**	0.035	0
26-Apr-06	2	0.055	36	31-May-06	1	0.035	29
27-Apr-06	2	0.055	36	01-Jun-06	0	0.035	0
28-Apr-06	1	0.055	18	**02-Jun-06**	**0**	0.035	0
29-Apr-06	0	0.055	0	**03-Jun-06**	**0**	0.035	0
30-Apr-06	0	0.055	0	**04-Jun-06**	**0**	0.035	0
01-May-06	**0**	0.055	0	**05-Jun-06**	**0**	0.035	0
02-May-06	0	0.035	0	**06-Jun-06**	**0**	0.035	0
03-May-06	1	0.055	18	**07-Jun-06**	**0**	0.035	0
04-May-06	1	0.055	18	**08-Jun-06**	**0**	0.035	0
05-May-06	1	0.055	18	**09-Jun-06**	**0**	0.035	0
06-May-06	1	0.055	18	**10-Jun-06**	**0**	0.035	0
07-May-06	0	0.035	0	**11-Jun-06**	**0**	0.035	0
08-May-06	1	0.035	29	**12-Jun-06**	**0**	0.035	0
09-May-06	0	0.035	0	**13-Jun-06**	**0**	0.035	0
10-May-06	2	0.055	36	**14-Jun-06**	**0**	0.035	0
11-May-06	0	0.055	0	**15-Jun-06**	**0**	0.035	0
12-May-06	2	0.055	36	**16-Jun-06**	**0**	0.035	0
13-May-06	0	0.055	0	17-Jun-06	0	0.035	0
14-May-06	0	0.055	0	18-Jun-06	0	0.035	0
15-May-06	0	0.055	0	19-Jun-06	0	0.035	0
16-May-06	0	0.035	0	20-Jun-06	0	0.035	0
17-May-06	**0**	0.035	0	21-Jun-06	0	0.035	0
18-May-06	**0**	0.035	0	22-Jun-06	0	0.035	0
19-May-06	**0**	0.035	0	23-Jun-06	0	0.035	0
20-May-06	**0**	0.035	0	24-Jun-06	3	0.055	54
21-May-06	**0**	0.035	0	25-Jun-06	0	0.055	0
22-May-06	**0**	0.035	0	26-Jun-06	0	0.055	0
23-May-06	**0**	0.035	0	27-Jun-06	1	0.055	18
24-May-06	**0**	0.035	0	28-Jun-06	0	0.035	0
25-May-06	**0**	0.035	0	29-Jun-06	0	0.035	0
26-May-06	**0**	0.035	0	30-Jun-06	0	0.055	0
27-May-06	**0**	0.035	0				

Appendix A2. Daily capture of wild spring Chinook parr emigrating from the Methow River, 27 September through 28 November 2006. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation. Race of captured Chinook was determined through DNA analysis.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
27-Sep-06	**0**	0.015	0	**8-Nov-06**	**15**	0.015	969
28-Sep-06	**0**	0.015	0	**9-Nov-06**	**18**	0.015	1,212
29-Sep-06	**0**	0.015	0	**10-Nov-06**	**20**	0.015	1,321
30-Sep-06	**0**	0.015	0	**11-Nov-06**	**21**	0.015	1,409
1-Oct-06	**0**	0.015	0	12-Nov-06	25	0.015	1,650
2-Oct-06	**0**	0.015	0	13-Nov-06	22	0.015	1,452
3-Oct-06	**0**	0.015	0	14-Nov-06	27	0.015	1,782
4-Oct-06	**0**	0.015	0	15-Nov-06	8	0.015	528
5-Oct-06	0	0.015	0	16-Nov-06	16	0.015	1,056
6-Oct-06	0	0.015	0	17-Nov-06	14	0.015	924
7-Oct-06	0	0.015	0	18-Nov-06	10	0.015	660
8-Oct-06	0	0.015	0	19-Nov-06	6	0.015	396
9-Oct-06	0	0.015	0	20-Nov-06	7	0.015	462
10-Oct-06	0	0.015	0	21-Nov-06	2	0.015	132
11-Oct-06	0	0.015	0	22-Nov-06	2	0.015	132
12-Oct-06	0	0.015	0	23-Nov-06	5	0.015	330
13-Oct-06	0	0.015	0	24-Nov-06	5	0.015	330
14-Oct-06	0	0.015	0	25-Nov-06	8	0.015	528
15-Oct-06	0	0.015	0	26-Nov-06	5	0.015	330
16-Oct-06	0	0.015	0	27-Nov-06	2	0.015	132
17-Oct-06	1	0.015	66	28-Nov-06	1	0.015	66
18-Oct-06	1	0.015	66				
19-Oct-06	0	0.015	0				
20-Oct-06	2	0.015	132				
21-Oct-06	1	0.015	66				
22-Oct-06	0	0.015	0				
23-Oct-06	0	0.015	0				
24-Oct-06	1	0.015	66				
25-Oct-06	2	0.015	132				
26-Oct-06	2	0.015	132				
27-Oct-06	0	0.015	0				
28-Oct-06	1	0.015	66				
29-Oct-06	0	0.015	0				
30-Oct-06	0	0.015	0				
31-Oct-06	1	0.015	66				
1-Nov-06	1	0.015	66				
2-Nov-06	0	0.015	0				
3-Nov-06	0	0.015	0				
4-Nov-06	1	0.015	66				
5-Nov-06	0	0.015	0				
6-Nov-06	0	0.015	0				
7-Nov-06	**12**	0.015	776				

Appendix A3. Daily capture of wild steelhead smolt and transitional fish emigrating from the Methow River, 23 February to 30 June 2006. Estimated number of steelhead captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
23-Feb-06	0	0.0349	0	29-Mar-06	1	0.0349	29
24-Feb-06	0	0.0349	0	30-Mar-06	2	0.0349	57
25-Feb-06	0	0.0349	0	31-Mar-06	3	0.0349	86
26-Feb-06	0	0.0349	0	1-Apr-06	3	0.0349	86
27-Feb-06	0	0.0349	0	2-Apr-06	4	0.0349	115
28-Feb-06	0	0.0349	0	3-Apr-06	1	0.0349	29
1-Mar-06	0	0.0349	0	4-Apr-06	0	0.0349	0
2-Mar-06	0	0.0349	0	5-Apr-06	1	0.0349	29
3-Mar-06	0	0.0349	0	6-Apr-06	0	0.0349	0
4-Mar-06	0	0.0349	0	7-Apr-06	5	0.0349	143
5-Mar-06	0	0.0349	0	8-Apr-06	6	0.0349	172
6-Mar-06	0	0.0349	0	9-Apr-06	4	0.0349	115
7-Mar-06	0	0.0349	0	10-Apr-06	7	0.0349	201
8-Mar-06	0	0.0349	0	11-Apr-06	1	0.0349	29
9-Mar-06	0	0.0349	0	12-Apr-06	9	0.0349	258
10-Mar-06	0	0.0349	0	13-Apr-06	5	0.0349	143
11-Mar-06	0	0.0349	0	14-Apr-06	2	0.0349	57
12-Mar-06	0	0.0349	0	15-Apr-06	3	0.0349	86
13-Mar-06	0	0.0349	0	16-Apr-06	12	0.0349	344
14-Mar-06	0	0.0349	0	17-Apr-06	10	0.0349	287
15-Mar-06	0	0.0349	0	18-Apr-06	3	0.0349	86
16-Mar-06	0	0.0349	0	19-Apr-06	1	0.0349	29
17-Mar-06	0	0.0349	0	20-Apr-06	7	0.0349	201
18-Mar-06	0	0.0349	0	21-Apr-06	10	0.0349	287
19-Mar-06	0	0.0349	0	22-Apr-06	9	0.0349	258
20-Mar-06	0	0.0349	0	23-Apr-06	26	0.0258	1007
21-Mar-06	0	0.0349	0	24-Apr-06	33	0.0258	1278
22-Mar-06	0	0.0349	0	25-Apr-06	12	0.0258	465
23-Mar-06	0	0.0349	0	26-Apr-06	25	0.0258	968
24-Mar-06	0	0.0349	0	27-Apr-06	40	0.0258	1549
25-Mar-06	0	0.0349	0	28-Apr-06	13	0.0258	503
26-Mar-06	0	0.0349	0	29-Apr-06	1	0.0258	39
27-Mar-06	0	0.0349	0	30-Apr-06	17	0.0258	658
28-Mar-06	0	0.0349	0	**1-May-06**	8	0.0258	310

Appendix A3, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
2-May-06	1	0.0258	39	**8-Jun-06**	0	0.0258	0
3-May-06	13	0.0258	503	**9-Jun-06**	0	0.0258	0
4-May-06	12	0.0258	465	**10-Jun-06**	0	0.0258	0
5-May-06	15	0.0258	581	**11-Jun-06**	0	0.0258	0
6-May-06	8	0.0258	310	**12-Jun-06**	0	0.0258	0
7-May-06	2	0.0258	77	**13-Jun-06**	0	0.0258	0
8-May-06	1	0.0258	39	**14-Jun-06**	0	0.0258	0
9-May-06	1	0.0258	39	**15-Jun-06**	0	0.0258	0
10-May-06	12	0.0258	465	**16-Jun-06**	0	0.0258	0
11-May-06	5	0.0258	194	17-Jun-06	0	0.0258	0
12-May-06	9	0.0258	349	18-Jun-06	1	0.0258	39
13-May-06	1	0.0258	39	19-Jun-06	0	0.0258	0
14-May-06	2	0.0258	77	20-Jun-06	0	0.0258	0
15-May-06	0	0.0258	0	21-Jun-06	0	0.0258	0
16-May-06	1	0.0258	39	22-Jun-06	0	0.0258	0
17-May-06	1	0.0258	39	23-Jun-06	0	0.0258	0
18-May-06	1	0.0258	39	24-Jun-06	0	0.0258	0
19-May-06	1	0.0258	39	25-Jun-06	0	0.0258	0
20-May-06	1	0.0258	39	26-Jun-06	0	0.0258	0
21-May-06	1	0.0258	39	27-Jun-06	0	0.0258	0
22-May-06	1	0.0258	39	28-Jun-06	0	0.0258	0
23-May-06	1	0.0258	39	29-Jun-06	0	0.0258	0
24-May-06	1	0.0258	39	30-Jun-06	1	0.0258	39
25-May-06	1	0.0258	39				
26-May-06	1	0.0258	39				
27-May-06	1	0.0258	39				
28-May-06	1	0.0258	39				
29-May-06	1	0.0258	39				
30-May-06	1	0.0258	39				
31-May-06	0	0.0258	0				
1-Jun-06	1	0.0258	39				
2-Jun-06	0	0.0258	0				
3-Jun-06	0	0.0258	0				
4-Jun-06	0	0.0258	0				
5-Jun-06	0	0.0258	0				
6-Jun-06	0	0.0258	0				
7-Jun-06	0	0.0258	0				

Appendix A4. Daily capture of wild spring Chinook smolts emigrating from the Twisp River, 11 March to 30 June 2006. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
11-Mar-06	2	0.241	8	21-Apr-06	73	0.144	507
12-Mar-06	**4**	0.241	17	22-Apr-06	35	0.139	252
13-Mar-06	4	0.241	17	23-Apr-06	9	0.139	65
14-Mar-06	0	0.241	0	24-Apr-06	13	0.139	94
15-Mar-06	2	0.241	8	25-Apr-06	19	0.139	137
16-Mar-06	4	0.241	17	26-Apr-06	8	0.139	58
17-Mar-06	2	0.241	8	27-Apr-06	8	0.139	58
18-Mar-06	2	0.241	8	28-Apr-06	4	0.139	29
19-Mar-06	2	0.241	8	29-Apr-06	3	0.139	22
20-Mar-06	0	0.241	0	30-Apr-06	1	0.139	7
21-Mar-06	4	0.241	17	**1-May-06**	**3**	0.139	22
22-Mar-06	27	0.239	113	2-May-06	4	0.139	29
23-Mar-06	6	0.239	25	3-May-06	2	0.139	14
24-Mar-06	8	0.236	34	4-May-06	1	0.139	7
25-Mar-06	9	0.230	39	5-May-06	2	0.139	14
26-Mar-06	12	0.230	52	6-May-06	1	0.139	7
27-Mar-06	16	0.230	70	7-May-06	1	0.139	7
28-Mar-06	6	0.229	26	8-May-06	1	0.139	7
29-Mar-06	19	0.225	84	9-May-06	3	0.139	22
30-Mar-06	17	0.222	76	10-May-06	2	0.139	14
31-Mar-06	12	0.217	55	11-May-06	1	0.139	7
1-Apr-06	23	0.210	109	12-May-06	1	0.139	7
2-Apr-06	**16**	0.208	77	13-May-06	1	0.139	7
3-Apr-06	16	0.208	77	14-May-06	1	0.139	7
4-Apr-06	12	0.205	59	15-May-06	3	0.139	22
5-Apr-06	22	0.198	111	**16-May-06**	**1**	0.139	7
6-Apr-06	34	0.191	178	**17-May-06**	**1**	0.139	7
7-Apr-06	109	0.177	617	**18-May-06**	**1**	0.139	7
8-Apr-06	35	0.174	201	**19-May-06**	**0**	0.139	0
9-Apr-06	19	0.170	111	**20-May-06**	**0**	0.139	0
10-Apr-06	23	0.161	143	**21-May-06**	**0**	0.139	0
11-Apr-06	18	0.156	116	**22-May-06**	**0**	0.139	0
12-Apr-06	15	0.148	101	**23-May-06**	**0**	0.139	0
13-Apr-06	18	0.140	129	**24-May-06**	**0**	0.139	0
14-Apr-06	16	0.139	115	**25-May-06**	**0**	0.139	0
15-Apr-06	20	0.139	144	**26-May-06**	**0**	0.139	0
16-Apr-06	18	0.143	126	**27-May-06**	**0**	0.139	0
17-Apr-06	14	0.152	92	**28-May-06**	**0**	0.139	0
18-Apr-06	20	0.157	127	**29-May-06**	**0**	0.139	0
19-Apr-06	15	0.158	95	**30-May-06**	**0**	0.139	0
20-Apr-06	37	0.155	239	**31-May-06**	**0**	0.139	0

Appendix A4, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate
1-Jun-06	0	0.139	0
2-Jun-06	0	0.139	0
3-Jun-06	0	0.139	0
4-Jun-06	0	0.139	0
5-Jun-06	0	0.139	0
6-Jun-06	0	0.139	0
7-Jun-06	0	0.139	0
8-Jun-06	0	0.139	0
9-Jun-06	0	0.139	0
10-Jun-06	0	0.139	0
11-Jun-06	0	0.139	0
12-Jun-06	0	0.139	0
13-Jun-06	0	0.139	0
14-Jun-06	0	0.139	0
15-Jun-06	0	0.139	0
16-Jun-06	0	0.139	0
17-Jun-06	0	0.139	0
18-Jun-06	0	0.139	0
19-Jun-06	0	0.139	0
20-Jun-06	0	0.139	0
21-Jun-06	0	0.139	0
22-Jun-06	0	0.139	0
23-Jun-06	0	0.139	0
24-Jun-06	0	0.139	0
25-Jun-06	0	0.139	0
26-Jun-06	0	0.139	0
27-Jun-06	0	0.139	0
28-Jun-06	0	0.139	0
29-Jun-06	0	0.139	0
30-Jun-06	0	0.139	0

Appendix A5. Daily capture of wild spring Chinook parr emigrating from the Twisp River, 22 September to 27 November 2006. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
22-Sep-06	2	0.209	10	26-Oct-06	3	0.209	14
23-Sep-06	0	0.209	0	27-Oct-06	5	0.209	24
24-Sep-06	3	0.209	14	28-Oct-06	5	0.209	24
25-Sep-06	3	0.209	14	**29-Oct-06**	7	0.209	34
26-Sep-06	2	0.209	10	29-Oct-06	10	0.209	48
27-Sep-06	4	0.209	19	**30-Oct-06**	9	0.209	42
28-Sep-06	2	0.209	10	**31-Oct-06**	15	0.209	72
29-Sep-06	3	0.209	14	**01-Nov-06**	10	0.209	48
30-Sep-06	0	0.209	0	02-Nov-06	9	0.209	43
01-Oct-06	0	0.209	0	03-Nov-06	8	0.209	38
02-Oct-06	1	0.209	5	04-Nov-06	9	0.209	43
03-Oct-06	0	0.209	0	05-Nov-06	13	0.209	62
04-Oct-06	0	0.209	0	06-Nov-06	28	0.209	134
05-Oct-06	0	0.209	0	**07-Nov-06**	39	0.209	187
06-Oct-06	0	0.209	0	**08-Nov-06**	46	0.209	218
07-Oct-06	1	0.209	5	09-Nov-06	59	0.209	282
08-Oct-06	1	0.209	5	10-Nov-06	56	0.209	268
09-Oct-06	3	0.209	14	11-Nov-06	24	0.209	115
10-Oct-06	0	0.209	0	12-Nov-06	38	0.209	182
11-Oct-06	2	0.209	10	13-Nov-06	31	0.209	148
12-Oct-06	1	0.209	5	14-Nov-06	14	0.209	67
13-Oct-06	0	0.209	0	15-Nov-06	16	0.209	77
14-Oct-06	3	0.209	14	16-Nov-06	14	0.209	67
15-Oct-06	1	0.209	5	17-Nov-06	11	0.209	53
16-Oct-06	0	0.209	0	18-Nov-06	15	0.209	72
17-Oct-06	4	0.209	19	19-Nov-06	21	0.209	100
18-Oct-06	6	0.209	29	20-Nov-06	20	0.209	96
19-Oct-06	7	0.209	33	21-Nov-06	12	0.209	57
20-Oct-06	6	0.209	26	22-Nov-06	4	0.209	19
21-Oct-06	4	0.209	19	23-Nov-06	10	0.209	48
22-Oct-06	5	0.209	24	24-Nov-06	6	0.209	29
23-Oct-06	1	0.209	5	25-Nov-06	6	0.209	29
24-Oct-06	2	0.209	10	26-Nov-06	13	0.209	62
25-Oct-06	5	0.209	24	27-Nov-06	9	0.209	43

Appendix A6. Daily capture of wild steelhead smolt and transitional fish emigrating from the Twisp River, 11 March to 31 July 2006. Estimated number of steelhead captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
03/11/06	0	0.116	**0**	04/21/06	27	0.116	233
03/12/06	**0**	0.116	**0**	04/22/06	57	0.116	491
03/13/06	0	0.116	**0**	04/23/06	21	0.116	181
03/14/06	0	0.116	**0**	04/24/06	18	0.116	155
03/15/06	0	0.116	**0**	04/25/06	29	0.116	250
03/16/06	0	0.116	**0**	04/26/06	18	0.116	155
03/17/06	0	0.116	**0**	04/27/06	14	0.116	121
03/18/06	0	0.116	**0**	04/28/06	15	0.116	129
03/19/06	0	0.116	**0**	04/29/06	4	0.116	34
03/20/06	0	0.116	**0**	04/30/06	4	0.116	34
03/21/06	0	0.116	0	**05/01/06**	**11**	0.116	95
03/22/06	0	0.116	0	05/02/06	17	0.116	146
03/23/06	0	0.116	0	05/03/06	18	0.116	155
03/24/06	0	0.116	0	05/04/06	9	0.116	78
03/25/06	0	0.116	0	05/05/06	16	0.116	138
03/26/06	0	0.116	0	05/06/06	6	0.116	52
03/27/06	0	0.116	0	05/07/06	7	0.116	60
03/28/06	0	0.116	0	05/08/06	3	0.116	26
03/29/06	0	0.116	0	05/09/06	6	0.116	52
03/30/06	0	0.116	0	05/10/06	8	0.116	69
03/31/06	1	0.116	9	05/11/06	6	0.116	52
04/01/06	2	0.116	17	05/12/06	3	0.116	26
04/02/06	**1**	0.116	9	05/13/06	5	0.116	43
04/03/06	0	0.116	0	05/14/06	10	0.116	86
04/04/06	0	0.116	0	05/15/06	10	0.116	86
04/05/06	3	0.116	26	**05/16/06**	**6**	0.116	52
04/06/06	2	0.116	17	**05/17/06**	**5**	0.116	43
04/07/06	26	0.116	224	**05/18/06**	**4**	0.116	34
04/08/06	16	0.116	138	**05/19/06**	**3**	0.116	26
04/09/06	7	0.116	60	**05/20/06**	**3**	0.116	26
04/10/06	10	0.116	86	**05/21/06**	**3**	0.116	26
04/11/06	12	0.116	103	**05/22/06**	**2**	0.116	17
04/12/06	18	0.116	155	**05/23/06**	**2**	0.116	17
04/13/06	14	0.116	121	**05/24/06**	**2**	0.116	17
04/14/06	11	0.116	95	**05/25/06**	**2**	0.116	17
04/15/06	8	0.116	69	**05/26/06**	**2**	0.116	17
04/16/06	10	0.116	86	**05/27/06**	**2**	0.116	17
04/17/06	2	0.116	17	**05/28/06**	**2**	0.116	17
04/18/06	3	0.116	26	**05/29/06**	**2**	0.116	17
04/19/06	5	0.116	43	**05/30/06**	**2**	0.116	17
04/20/06	7	0.116	60	**05/31/06**	**2**	0.116	17

Appendix A6, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
06/01/06	3	0.116	26	07/15/06	0	0.116	0
06/02/06	1	0.116	9	07/16/06	0	0.116	0
06/03/06	**1**	0.116	9	07/17/06	0	0.116	0
06/04/06	**1**	0.116	9	07/18/06	0	0.116	0
06/05/06	**1**	0.116	9	07/19/06	1	0.116	9
06/06/06	**1**	0.116	9	07/20/06	0	0.116	0
06/07/06	**1**	0.116	9	07/21/06	0	0.116	0
06/08/06	**1**	0.116	9	07/22/06	0	0.116	0
06/09/06	**1**	0.116	9	07/23/06	0	0.116	0
06/10/06	**1**	0.116	9	07/24/06	0	0.116	0
06/11/06	**1**	0.116	9	07/25/06	0	0.116	0
06/12/06	**1**	0.116	9	07/26/06	1	0.116	9
06/13/06	**1**	0.116	9	07/27/06	0	0.116	0
06/14/06	**1**	0.116	9	07/28/06	1	0.116	9
06/15/06	**1**	0.116	9	07/29/06	0	0.116	0
06/16/06	**1**	0.116	9	07/30/06	0	0.116	0
06/17/06	**1**	0.116	9	07/31/06	2	0.116	17
06/18/06	**1**	0.116	9				
06/19/06	0	0.116	0				
06/20/06	1	0.116	9				
06/21/06	0	0.116	0				
06/22/06	0	0.116	0				
06/23/06	1	0.116	9				
06/24/06	0	0.116	0				
06/25/06	1	0.116	9				
06/26/06	0	0.116	0				
06/27/06	0	0.116	0				
06/28/06	0	0.116	0				
06/29/06	0	0.116	0				
06/30/06	0	0.116	0				
07/01/06	1	0.116	9				
07/02/06	0	0.116	0				
07/03/06	0	0.116	0				
07/04/06	0	0.116	0				
07/05/06	0	0.116	0				
07/06/06	0	0.116	0				
07/07/06	3	0.116	26				
07/08/06	0	0.116	0				
07/09/06	0	0.116	0				
07/10/06	0	0.116	0				
07/11/06	0	0.116	0				
07/12/06	0	0.116	0				
07/13/06	0	0.116	0				
07/14/06	0	0.116	0				

Appendix B1. Loss of PIT tags inserted into hatchery and wild spring Chinook smolts at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06047.KAF	Wild Sp. Chinook	S	N	2	0	0	2
CGS06055.KAF	Wild Sp. Chinook	S	N	4	0	0	4
CGS06059.KAF	Wild Sp. Chinook	S	N	1	0	0	1
CGS06062.KAF	Wild Sp. Chinook	S	N	2	0	0	2
CGS06067.KAF	Wild Sp. Chinook	S	N	5	0	0	5
CGS06074.KAF	Wild Sp. Chinook	S	N	1	0	0	1
CGS06081.KAF	Wild Sp. Chinook	S	N	4	0	0	4
CGS06082.KAF	Wild Sp. Chinook	S	N	6	0	0	6
CGS06083.KAA	Wild Sp. Chinook	S	Y	10	0	0	10
CGS06086.KAA	Wild Sp. Chinook	S	Y	30	3	0	27
CGS06088.KAA	Wild Sp. Chinook	S	Y	27	0	0	27
CGS06090.KAA	Wild Sp. Chinook	S	Y	28	3	0	25
CGS06093.KAA	Wild Sp. Chinook	S	Y	42	0	0	42
CGS06095.KAA	Wild Sp. Chinook	S	Y	19	0	0	19
CGS06097.KAA	Wild Sp. Chinook	S	Y	19	0	0	19
CGS06100.KAF	Wild Sp. Chinook	S	N	72	0	0	72
CGS06102.KAA	Wild Sp. Chinook	S	Y	54	0	0	54
CGS06105.KAA	Wild Sp. Chinook	S	Y	18	0	0	18
CGS06107.KAA	Wild Sp. Chinook	S	Y	52	0	0	52
CGS06108.KAA	Wild Sp. Chinook	S	Y	25	0	0	25
CGS06111.KAA	Wild Sp. Chinook	S	Y	31	0	0	31
CGS06113.KAA	Wild Sp. Chinook	S	Y	5	0	0	5
CGS06114.KAF	Wild Sp. Chinook	S	N	14	0	0	14
CGS06117.KAF	Wild Sp. Chinook	S	N	5	0	0	5
CGS06120.KAF	Wild Sp. Chinook	S	N	1	0	0	1
CGS06124.KAF	Wild Sp. Chinook	S	N	1	0	0	1
CGS06128.KA2	Wild Sp. Chinook	S	N	1	0	0	1
CGS06130.KA3	Wild Sp. Chinook	S	N	2	0	0	2
CGS06133.KA1	Wild Sp. Chinook	S	N	2	0	0	2
CGS06153.KAF	Wild Sp. Chinook	S	N	1	0	0	1
CGS06179.KAF	Wild Sp. Chinook	S	N	1	0	0	1
Total				485	6	0	479
CGS06110.KAF	Hatchery Sp. Chin.	S	N	547	0	3	544
CGS06114.KAA	Hatchery Sp. Chin.	S	Y	199	0	0	199
CGS06114.KA1	Hatchery Sp. Chin.	S	N	257	0	0	257
Total				1,003	0	3	1,000
Grand total				1,488	6	3	1,479

Appendix B2. Loss of PIT tags inserted into wild Chinook parr at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06291.KAF	Wild Chinook	P	N	1	0	0	1
CGS06293.KAF	Wild Chinook	P	N	2	0	0	2
CGS06294.KAF	Wild Chinook	P	N	1	0	0	1
CGS06295.KAF	Wild Chinook	P	N	0	0	0	0
CGS06296.KAF	Wild Chinook	P	N	1	0	0	1
CGS06297.KAF	Wild Chinook	P	N	1	0	0	1
CGS06298.KAF	Wild Chinook	P	N	1	0	0	1
CGS06299.KAF	Wild Chinook	P	N	2	0	0	2
CGS06303.KAF	Wild Chinook	P	N	1	0	0	1
CGS06304.KAF	Wild Chinook	P	N	1	0	0	1
CGS06305.KAF	Wild Chinook	P	N	1	0	0	1
CGS06308.KAF	Wild Chinook	P	N	1	0	0	1
CGS06310.KAF	Wild Chinook	P	N	2	0	0	2
CGS06317.KAA	Wild Chinook	P	Y	45	0	0	45
CGS06318.KAA	Wild Chinook	P	Y	26	0	1	25
CGS06319.KAA	Wild Chinook	P	Y	8	0	0	8
CGS06320.KAF	Wild Chinook	P	N	14	0	0	14
CGS06321.KAA	Wild Chinook	P	Y	14	0	0	14
CGS06322.KAA	Wild Chinook	P	Y	10	0	0	10
CGS06323.KAF	Wild Chinook	P	Y	6	0	0	6
CGS06324.KA1	Wild Chinook	P	Y	7	0	0	7
CGS06325.KAF	Wild Chinook	P	Y	2	0	0	2
CGS06326.KAF	Wild Chinook	P	N	3	0	0	3
CGS06331.KAF	Wild Chinook	P	N	15	0	0	15
CGS06332.KAF	Wild Chinook	P	N	1	0	0	1
Total				166	0	1	165

Appendix B3. Loss of PIT tags inserted into hatchery and wild steelhead migrants at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06088.KAF	Wild Steelhead	S - T	N	1	0	0	1
CGS06090.KAF	Wild Steelhead	S - T	N	5	2	0	3
CGS06093.KA1	Wild Steelhead	S - T	N	6	0	0	6
CGS06097.KA1	Wild Steelhead	S - T	N	2	0	0	2
CGS06100.KA2	Wild Steelhead	S - T	N	13	0	0	13
CGS06103.KAB	Wild Steelhead	S - T	Y	15	0	0	15
CGS06105.KA2	Wild Steelhead	S - T	N	3	0	0	3
CGS06107.KAB	Wild Steelhead	S - T	Y	25	0	1	24
CGS06108.KAB	Wild Steelhead	S - T	Y	3	0	0	3
CGS06111.KAB	Wild Steelhead	S - T	Y	10	0	0	10
CGS06113.KAB	Wild Steelhead	S - T	Y	13	0	0	13
CGS06114.KA4	Wild Steelhead	S - T	N	45	0	0	45
CGS06117.KAB	Wild Steelhead	S - T	Y	70	0	0	70
CGS06120.KA2	Wild Steelhead	S - T	N	26	0	0	26
CGS06124.KA3	Wild Steelhead	S - T	N	24	0	0	24
CGS06125.KA1	Wild Steelhead	S - T	N	14	0	0	14
CGS06128.KA1	Wild Steelhead	S - T	N	9	0	0	9
CGS06130.KA2	Wild Steelhead	S - T	N	14	0	0	14
CGS06133.KAF	Wild Steelhead	S - T	N	18	0	0	18
CGS06137.KA1	Wild Steelhead	S - T	N	4	0	0	4
CGS06153.KA2	Wild Steelhead	S - T	N	1	0	0	1
Total				321	2	1	318
CGS06117.KA1	Hatch. Steelhead	S - T	N	1	0	0	1
CGS06124.KA1	Hatch. Steelhead	S - T	N	232	0	0	232
CGS06125.KAB	Hatch. Steelhead	S - T	Y	222	0	0	222
CGS06128.KAB	Hatch. Steelhead	S - T	Y	199	0	0	199
CGS06130.KAB	Hatch. Steelhead	S - T	Y	217	0	0	217
CGS06130.KAF	Hatch. Steelhead	S - T	N	124	0	0	124
CGS06136.KAF	Hatch. Steelhead	S - T	N	501	3	0	498
Total				1,496	3	0	1,493
Grand total				1,817	5	1	1,811

Appendix B4. Loss of PIT tags inserted into wild steelhead parr at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06083.KAF	Wild Steelhead	P	N	1	0	0	1
CGS06093.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06097.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06100.KA1	Wild Steelhead	P	N	9	0	0	9
CGS06103.KAF	Wild Steelhead	P	N	4	0	0	4
CGS06105.KA1	Wild Steelhead	P	N	2	0	0	2
CGS06114.KA3	Wild Steelhead	P	N	4	0	0	4
CGS06117.KA2	Wild Steelhead	P	N	2	0	0	2
CGS06120.KA1	Wild Steelhead	P	N	1	0	0	1
CGS06124.KA2	Wild Steelhead	P	N	9	0	0	9
CGS06125.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06128.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06130.KA1	Wild Steelhead	P	N	2	0	0	2
CGS06137.KAF	Wild Steelhead	P	N	1	0	0	1
CGS06153.KA1	Wild Steelhead	P	N	4	0	0	4
CGS06173.KAF	Wild Steelhead	P	N	1	0	0	1
CGS06177.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06183.KAF	Wild Steelhead	P	N	1	0	0	1
CGS06226.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06280.KAF	Wild Steelhead	P	N	1	0	0	1
CGS06317.KAF	Wild Steelhead	P	N	2	0	0	2
CGS06324.KAF	Wild Steelhead	P	N	1	0	0	1
Total				57	0	0	57

Appendix B5. Loss of PIT tags inserted into wild spring Chinook smolts at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06072.LAA	Wild Sp. Chin.	S	Y	6	0	0	6
CGS06074.LA1	Wild Sp. Chin.	S	N	2	0	0	2
CGS06075.LAA	Wild Sp. Chin.	S	Y	4	0	0	4
CGS06076.LAA	Wild Sp. Chin.	S	Y	2	0	0	2
CGS06077.LAA	Wild Sp. Chin.	S	Y	2	0	0	2
CGS06080.LAA	Wild Sp. Chin.	S	Y	6	0	0	6
CGS06081.LAA	Wild Sp. Chin.	S	Y	27	0	0	27
CGS06082.LAA	Wild Sp. Chin.	S	Y	6	0	0	6
CGS06083.LAA	Wild Sp. Chin.	S	Y	8	0	0	8
CGS06086.LAA	Wild Sp. Chin.	S	Y	37	0	0	37
CGS06088.LAA	Wild Sp. Chin.	S	Y	25	0	0	25
CGS06090.LAA	Wild Sp. Chin.	S	Y	28	0	0	28
CGS06093.LAA	Wild Sp. Chin.	S	Y	45	0	0	45
CGS06095.LAA	Wild Sp. Chin.	S	Y	33	0	0	33
CGS06097.LAA	Wild Sp. Chin.	S	Y	134	0	0	134
CGS06100.LAA	Wild Sp. Chin.	S	Y	76	0	0	76
CGS06101.LAA	Wild Sp. Chin.	S	Y	18	0	0	18
CGS06102.LAA	Wild Sp. Chin.	S	Y	15	0	0	15
CGS06103.LAA	Wild Sp. Chin.	S	Y	18	0	0	18
CGS06104.LAA	Wild Sp. Chin.	S	Y	16	0	0	16
CGS06107.LAF	Wild Sp. Chin.	S	N	52	0	0	52
CGS06108.LAF	Wild Sp. Chin.	S	N	20	0	0	20
CGS06109.LA1	Wild Sp. Chin.	S	N	16	0	0	16
CGS06110.LAF	Wild Sp. Chin.	S	N	37	0	0	37
CGS06111.LA1	Wild Sp. Chin.	S	N	69	0	0	69
CGS06112.LAA	Wild Sp. Chin.	S	Y	44	0	0	44
CGS06116.LAA	Wild Sp. Chin.	S	Y	38	0	0	38
CGS06118.LAA	Wild Sp. Chin.	S	Y	11	0	0	11
CGS06119.LAA	Wild Sp. Chin.	S	Y	3	0	0	3
CGS06120.LAF	Wild Sp. Chin.	S	N	1	0	0	1
CGS06122.LAF	Wild Sp. Chin.	S	N	3	0	0	3
CGS06123.LAF	Wild Sp. Chin.	S	N	2	1	0	1
CGS06125.LAF	Wild Sp. Chin.	S	N	3	0	0	3
CGS06126.LAF	Wild Sp. Chin.	S	N	1	0	0	1
CGS06127.LAF	Wild Sp. Chin.	S	N	1	0	0	1
CGS06128.LAF	Wild Sp. Chin.	S	N	1	0	0	1
CGS06129.LAF	Wild Sp. Chin.	S	N	3	0	0	3
CGS06134.LAF	Wild Sp. Chin.	S	N	6	0	0	6
Total				819	1	0	818
CGS06109.LAF	Hatch. Sp. Chin.	S	N	444	0	0	444
CGS06111.LAF	Hatch. Sp. Chin.	S	N	421	0	0	421
CGS06115.LAA	Hatch. Sp. Chin.	S	Y	72	0	0	72
CGS06115.LAF	Hatch. Sp. Chin.	S	N	29	0	0	29
Total				966	0	0	966
Grand total				1,785	1	0	1,784

Appendix B6. Loss of PIT tags inserted into wild spring Chinook parr at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06194.LAF	Wild Sp. Chin.	P	N	3	0	0	3
CGS06198.LAF	Wild Sp. Chin.	P	N	4	0	0	4
CGS06199.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06200.LA1	Wild Sp. Chin.	P	N	2	0	0	2
CGS06208.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06212.LA1	Wild Sp. Chin.	P	N	2	0	0	2
CGS06213.LA1	Wild Sp. Chin.	P	N	2	0	0	2
CGS06214.LA1	Wild Sp. Chin.	P	N	5	0	0	5
CGS06215.LA1	Wild Sp. Chin.	P	N	4	0	0	4
CGS06216.LA1	Wild Sp. Chin.	P	N	1	0	0	1
CGS06219.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06227.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06228.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06229.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06265.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06267.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06268.LAB	Wild Sp. Chin.	P	Y	3	0	0	3
CGS06269.LAB	Wild Sp. Chin.	P	Y	3	0	0	3
CGS06270.LAB	Wild Sp. Chin.	P	Y	3	0	0	3
CGS06271.LAB	Wild Sp. Chin.	P	Y	2	0	0	2
CGS06275.LA1	Wild Sp. Chin.	P	N	4	0	0	4
CGS06280.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06281.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06282.LAF	Wild Sp. Chin.	P	N	3	0	0	3
CGS06284.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06285.LAF	Wild Sp. Chin.	P	N	1	0	0	1
CGS06288.LAF	Wild Sp. Chin.	P	N	4	0	1	3
CGS06290.LAF	Wild Sp. Chin.	P	N	3	0	0	3
CGS06291.LAF	Wild Sp. Chin.	P	N	6	0	0	6
CGS06296.LAF	Wild Sp. Chin.	P	N	10	0	0	10
CGS06297.LAF	Wild Sp. Chin.	P	N	2	0	0	2
CGS06298.LAF	Wild Sp. Chin.	P	N	5	0	0	5
CGS06299.LAF	Wild Sp. Chin.	P	N	3	0	0	3
CGS06303.LAA	Wild Sp. Chin.	P	Y	18	0	0	18
CGS06304.LAA	Wild Sp. Chin.	P	Y	14	0	0	14
CGS06305.LAA	Wild Sp. Chin.	P	Y	10	0	0	10
CGS06306.LAA	Wild Sp. Chin.	P	Y	9	0	0	9
CGS06307.LAF	Wild Sp. Chin.	P	N	8	0	0	8
CGS06310.LAF	Wild Sp. Chin.	P	Y	49	0	0	49
CGS06313.LAA	Wild Sp. Chin.	P	Y	59	0	0	59
CGS06317.LAA	Wild Sp. Chin.	P	Y	150	0	0	150
CGS06318.LAA	Wild Sp. Chin.	P	Y	14	0	0	14
CGS06319.LAA	Wild Sp. Chin.	P	Y	16	0	0	16
CGS06320.LAA	Wild Sp. Chin.	P	Y	14	0	0	14
CGS06321.LAA	Wild Sp. Chin.	P	Y	11	0	0	11
CGS06322.LAA	Wild Sp. Chin.	P	Y	15	0	0	15
CGS06323.LAA	Wild Sp. Chin.	P	Y	21	0	0	21

Appendix B6, continued.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06322.LAA	Wild Sp. Chin	P	Y	15	0	0	15
CGS06323.LAA	Wild Sp. Chin	P	Y	21	0	0	21
CGS06324.LAA	Wild Sp. Chin	P	Y	20	0	0	20
CGS06325.LAA	Wild Sp. Chin	P	Y	12	0	0	12
CGS06326.LAF	Wild Sp. Chin	P	N	4	0	0	4
CGS06331.LA1	Wild Sp. Chin	P	N	28	0	0	28
Total				563	0	1	562

Appendix B7. Loss of PIT tags inserted into hatchery and wild steelhead migrants at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06093.LA1	Wild Steel	S - T	N	2	0	0	2
CGS06095.LA1	Wild Steel	S - T	N	3	0	0	3
CGS06097.LAB	Wild Steel	S - T	Y	25	0	0	25
CGS06101.LAB	Wild Steel	S - T	Y	12	0	0	12
CGS06102.LAB	Wild Steel	S - T	Y	18	0	0	18
CGS06103.LAB	Wild Steel	S - T	Y	14	0	0	14
CGS06104.LAF	Wild Steel	S - T	N	11	0	0	11
CGS06107.LA1	Wild Steel	S - T	N	20	0	0	20
CGS06108.LA1	Wild Steel	S - T	N	3	0	0	3
CGS06109.LA2	Wild Steel	S - T	N	5	0	0	5
CGS06110.LA2	Wild Steel	S - T	N	6	0	0	6
CGS06111.LA3	Wild Steel	S - T	N	25	0	0	25
CGS06112.LAB	Wild Steel	S - T	Y	78	0	0	78
CGS06116.LAB	Wild Steel	S - T	Y	66	0	0	66
CGS06118.LAB	Wild Steel	S - T	Y	26	0	0	26
CGS06119.LAB	Wild Steel	S - T	Y	4	0	0	4
CGS06120.LA2	Wild Steel	S - T	N	4	0	0	4
CGS06122.LA3	Wild Steel	S - T	N	13	0	0	13
CGS06123.LA2	Wild Steel	S - T	N	18	0	0	18
CGS06125.LA2	Wild Steel	S - T	N	24	0	0	24
CGS06126.LAB	Wild Steel	S - T	Y	6	0	0	6
CGS06127.LAB	Wild Steel	S - T	Y	7	0	0	7
CGS06128.LA3	Wild Steel	S - T	N	3	0	1	2
CGS06129.LA2	Wild Steel	S - T	N	7	0	0	7
CGS06134.LAB	Wild Steel	S - T	Y	30	0	0	30
CGS06153.LA1	Wild Steel	S - T	N	4	0	0	4
CGS06100.LAB	Wild Steel	S - T	Y	33	0	0	33
Total				467	0	1	466
CGS06122.LAB	Hatch Steel	S - T	Y	198	0	0	198
CGS06124.LAF	Hatch Steel	S - T	N	164	0	0	164
CGS06125.LAB	Hatch Steel	S - T	Y	96	1	0	95
CGS06128.LA1	Hatch Steel	S - T	N	245	0	0	245
CGS06129.LAB	Hatch Steel	S - T	Y	227	3	0	224
CGS06130.LAF	Hatch Steel	S - T	N	280	0	0	280
CGS06134.LAB	Hatch Steel	S - T	N	204	0	0	204
Total				1,414	4	0	1,410
Grand total				1,881	4	1	1,876

Appendix B8. Loss of PIT tags inserted into wild steelhead parr at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06072.LAF	Wild Steel	P	N	2	0	0	2
CGS06074.LAF	Wild Steel	P	N	1	0	0	1
CGS06075.LAF	Wild Steel	P	N	1	0	0	1
CGS06081.LAF	Wild Steel	P	N	1	0	0	1
CGS06082.LAF	Wild Steel	P	N	1	0	0	1
CGS06083.LAF	Wild Steel	P	N	1	0	0	1
CGS06086.LAF	Wild Steel	P	N	3	0	0	3
CGS06088.LAF	Wild Steel	P	N	1	0	0	1
CGS06090.LAF	Wild Steel	P	N	3	0	0	3
CGS06093.LAF	Wild Steel	P	N	6	1	0	5
CGS06095.LAF	Wild Steel	P	N	5	0	0	5
CGS06097.LAF	Wild Steel	P	N	45	0	0	45
CGS06100.LAF	Wild Steel	P	N	44	0	0	44
CGS06101.LAF	Wild Steel	P	N	17	0	0	17
CGS06102.LAF	Wild Steel	P	N	10	0	0	10
CGS06103.LAF	Wild Steel	P	N	17	0	0	17
CGS06104.LAB	Wild Steel	P	Y	4	0	0	4
CGS06107.LA2	Wild Steel	P	N	8	0	0	8
CGS06108.LA2	Wild Steel	P	N	3	0	0	3
CGS06109.LA3	Wild Steel	P	N	2	0	0	2
CGS06110.LA1	Wild Steel	P	N	7	0	0	7
CGS06111.LA2	Wild Steel	P	N	14	0	0	14
CGS06112.LAF	Wild Steel	P	N	14	0	0	14
CGS06116.LAF	Wild Steel	P	N	16	0	0	16
CGS06118.LAF	Wild Steel	P	N	11	0	0	11
CGS06119.LAF	Wild Steel	P	N	4	0	0	4
CGS06120.LA1	Wild Steel	P	N	3	0	0	3
CGS06122.LA2	Wild Steel	P	N	18	0	0	18
CGS06123.LA1	Wild Steel	P	N	22	0	0	22
CGS06125.LA1	Wild Steel	P	N	44	0	0	44
CGS06126.LA1	Wild Steel	P	N	18	0	0	18
CGS06127.LA1	Wild Steel	P	N	11	0	0	11
CGS06128.LA2	Wild Steel	P	N	7	0	0	7
CGS06129.LA1	Wild Steel	P	N	11	0	0	11
CGS06134.LA2	Wild Steel	P	N	25	0	0	25
CGS06153.LAF	Wild Steel	P	N	19	0	0	19
CGS06173.LAF	Wild Steel	P	N	27	0	0	27
CGS06177.LAF	Wild Steel	P	N	23	0	0	23
CGS06179.LAF	Wild Steel	P	N	3	0	0	3
CGS06183.LAF	Wild Steel	P	N	3	0	0	3
CGS06188.LAF	Wild Steel	P	N	4	0	0	4
CGS06200.LAF	Wild Steel	P	N	1	0	0	1
CGS06202.LAF	Wild Steel	P	N	2	0	0	2
CGS06205.LAF	Wild Steel	P	N	1	0	0	1
CGS06207.LAF	Wild Steel	P	N	1	0	0	1
CGS06209.LAF	Wild Steel	P	N	1	0	0	1
CGS06210.LAF	Wild Steel	P	N	1	0	0	1

Appendix B8, continued.

Tag file	Species	Stage	Eff. trial?	Tagged	Mortalities	Shed	Released
CGS06212.LAF	Wild Steel	P	N	2	0	0	2
CGS06213.LAF	Wild Steel	P	N	1	0	0	1
CGS06214.LAF	Wild Steel	P	N	4	0	0	4
CGS06215.LAF	Wild Steel	P	N	4	0	0	4
CGS06216.LAF	Wild Steel	P	N	1	0	0	1
CGS06220.LAF	Wild Steel	P	N	1	0	0	1
CGS06222.LAF	Wild Steel	P	N	2	0	0	2
CGS06223.LAF	Wild Steel	P	N	1	0	0	1
CGS06229.LA1	Wild Steel	P	N	1	0	0	1
CGS06265.LA1	Wild Steel	P	N	1	0	0	1
CGS06270.LA1	Wild Steel	P	N	5	0	0	5
CGS06271.LA1	Wild Steel	P	N	1	0	0	1
CGS06275.LAF	Wild Steel	P	N	1	0	0	1
CGS06276.LAF	Wild Steel	P	N	1	0	0	1
CGS06279.LAF	Wild Steel	P	N	1	0	0	1
CGS06288.LA1	Wild Steel	P	N	0	0	0	0
CGS06290.LA1	Wild Steel	P	N	1	0	0	1
CGS06303.LAF	Wild Steel	P	N	1	0	0	1
CGS06306.LAF	Wild Steel	P	N	1	0	0	1
CGS06310.LA1	Wild Steel	P	N	12	0	0	12
CGS06313.LAB	Wild Steel	P	Y	56	0	0	56
CGS06317.LAB	Wild Steel	P	Y	74	0	0	74
CGS06318.LAB	Wild Steel	P	Y	8	0	0	8
CGS06319.LAB	Wild Steel	P	Y	7	0	0	7
CGS06320.LAB	Wild Steel	P	Y	3	0	0	3
CGS06321.LAB	Wild Steel	P	Y	2	0	0	2
CGS06322.LAB	Wild Steel	P	Y	2	0	0	2
CGS06323.LAF	Wild Steel	P	N	6	0	0	6
CGS06324.LA1	Wild Steel	P	N	2	0	0	2
CGS06326.LA1	Wild Steel	P	N	1	0	0	1
CGS06331.LAF	Wild Steel	P	N	1	0	0	1
Total				690	1	0	689

Appendix C

Methow Chinook Salmon Juvenile Assignments

Prepared by

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Summary

In fall 2006, emigrating natural-origin subyearling Chinook salmon were collected in the Methow River smolt trap. Since two genetically distinct types of Chinook salmon with different run-timings spawn in the Methow River, a spring run and summer run, the juveniles could be from either run type. We investigated the genetic identity of the juvenile Chinook salmon through comparisons to adult spring and summer Chinook salmon collections from the Methow River. We found that the majority of juveniles were spring type, a minority were summer type, and one appeared to share ancestry with both spring and summer Chinook salmon.

Methods

We genotyped 189 juvenile Chinook salmon (Table 1) at the 13 standardized GAPS loci (Table 2) as described in Small et al. (2007) and compared them to Methow River spring (collection code 05HW, Small et al. 2007) and summer Chinook salmon genotyped at the same loci. The summer-run Methow River collection was from the GAPS v2.1 database archive (Scott Blankenship, WDFW, personal communication). Juvenile identities were examined from three perspectives. We used assignment tests implemented in GENECLASS (Piry et al. 2004) with the Rannala and Mountain algorithm (Rannala and Mountain 1997) to calculate the likelihood that a juvenile came from either the Methow spring or summer collection based upon the genotype of the individual and the allele frequencies of the two baseline collections. We examined individual ancestry in a Bayesian analysis using STRUCTURE (Pritchard et al. 2000). In this analysis, we hypothesized that there were two groups in the data set, spring and summer Chinook salmon, and estimated individual ancestry in two groups. Without knowledge of the identity of individuals the program sorts the data set in order to achieve Hardy-Weinberg equilibrium and minimize linkage disequilibrium in each hypothesized group. In the last examination, individuals were plotted in a factorial correspondence analysis plot using the program GENETIX (Belkhir et al. 2004). This analysis constructs composite axes based upon allele frequencies that best describe the variation in the data set and plots individuals within the allelic space based upon their individual genotype. Individuals that are similar genetically plot near each other and individuals that are different genetically plot far from each other. In this analysis, we hypothesized that juveniles plotting in the space occupied by Methow adult spring or summer Chinook salmon were spring or summer Chinook salmon offspring, respectively.

Results and discussion

One juvenile was eliminated from the analysis because the DNA failed to amplify. The GENECLASS assignment test assigned 179 juveniles to the Methow spring Chinook salmon collection and 9 juveniles to the Methow summer Chinook salmon collection (Table 2). We plotted the negative log likelihood assignment values for the juveniles and for the adult spring and summer Chinook salmon collections (Figure 1). The plot shows that, with a few exceptions, the adult spring and summer Chinook salmon assigned well to their respective groups, indicating high power for distinguishing genetically between the run types. The juvenile fish assigned clearly to either the spring or summer group (Figure 1), and all posterior probabilities were at least 1000 times more likely assignment to one group than to the other. Although their assignments were strong, two juveniles (06GS0082, 06GS0166) plotted between the spring and

summer clusters. They were missing data for their genotypes (5 and 6 loci missing, respectively) but 06GS0082 assigned to the summer collection and 06GS0166 assigned to the spring collection. The plot also shows that one adult summer Chinook salmon was more likely to have been from the spring Chinook salmon baseline collection and that two adult spring Chinook salmon were more likely to have been from the summer Chinook salmon baseline collection.

The STRUCTURE results paralleled the GENECLASS results in that the adult spring and summer Chinook salmon divided into two distinct clusters (Figure 2). The same juveniles that assigned to spring or summer adult baseline collections in GENECLASS shared ancestry with the spring or summer cluster in STRUCTURE (Table 3). Juveniles 06GS0082 and 06GS0166 were assigned over 90% ancestry in the summer and spring Chinook salmon clusters, respectively. Ancestry appeared mixed in juvenile 06GS0036, which had 25% ancestry in the summer Chinook salmon cluster and 75% ancestry in the spring Chinook salmon cluster. This individual assigned to the spring Chinook salmon baseline collection in the GENECLASS analysis (Table 3). The same adults that "mis-assigned" in the GENECLASS analysis (Figure 1) also assigned to the other run group in the STRUCTURE analysis (Figure 2).

The FCA results corroborated the GENECLASS and STRUCTURE analyses. Most juveniles plotted on the right side of axis 1 in the space occupied by the adult spring Chinook salmon (Figure 3). With the exception of 06GS0082, the same juveniles that assigned to the summer Chinook salmon baseline collection in GENECLASS and STRUCTURE plotted in the space occupied by the summer Chinook salmon in the FCA. We removed juvenile 06GS0082 from the FCA since it plotted in its own space on the second axis, between the spring and summer clusters in the first axis in the FCA and its presence in the analysis compressed the other samples onto the second and third axes (not shown). Juveniles 06GS0036 and 06GS0166 plotted within the "spring" space.

The microsatellite locus G474 appears to be diagnostic for distinguishing between spring and summer Chinook salmon (Narum et al. 2004). In Narum et al. (2004), spring Chinook salmon were nearly fixed for the *156 allele. After conducting assignment tests, we examined juvenile genotypes at this locus. We found that 171/178 juveniles assigned as spring Chinook salmon were homozygous for *156 and the other 7 juveniles were heterozygous for *156. None of the juveniles that assigned as summer Chinook salmon possessed *156. Juvenile 06GS0036 was homozygous for *156, supporting that it was a spring Chinook salmon and suggesting that alleles at other loci were common in summer Chinook salmon, generating the introgressed signal in STRUCTURE. Juvenile 06GS0082 was homozygous for *152, supporting that it was a summer Chinook salmon, and 06GS0166 had no data at G474.

Conclusions

The different genetic perspectives offered congruent results: 95% of the emigrating juvenile Chinook salmon were offspring of spring Chinook salmon and 5% were offspring of summer Chinook salmon.

Acknowledgments

Juvenile samples were provided by Andrew Fowler and Charlie Snow (WDFW). Funding was provided by Douglas Co. PUD and Washington State General Funds. Scott Blankenship supplied genotypes for the summer Chinook salmon from the GAPS v2.1 database. Denise Hawkins (WDFW) contributed helpful comments.

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Figure 1. Graph of negative log likelihood assignment scores from GENECLASS. Methow summers (pink) are abbreviated Met Su, Methow springs (yellow) are abbreviated Met Sp, and Methow juveniles (blue) are abbreviated Met Juv.

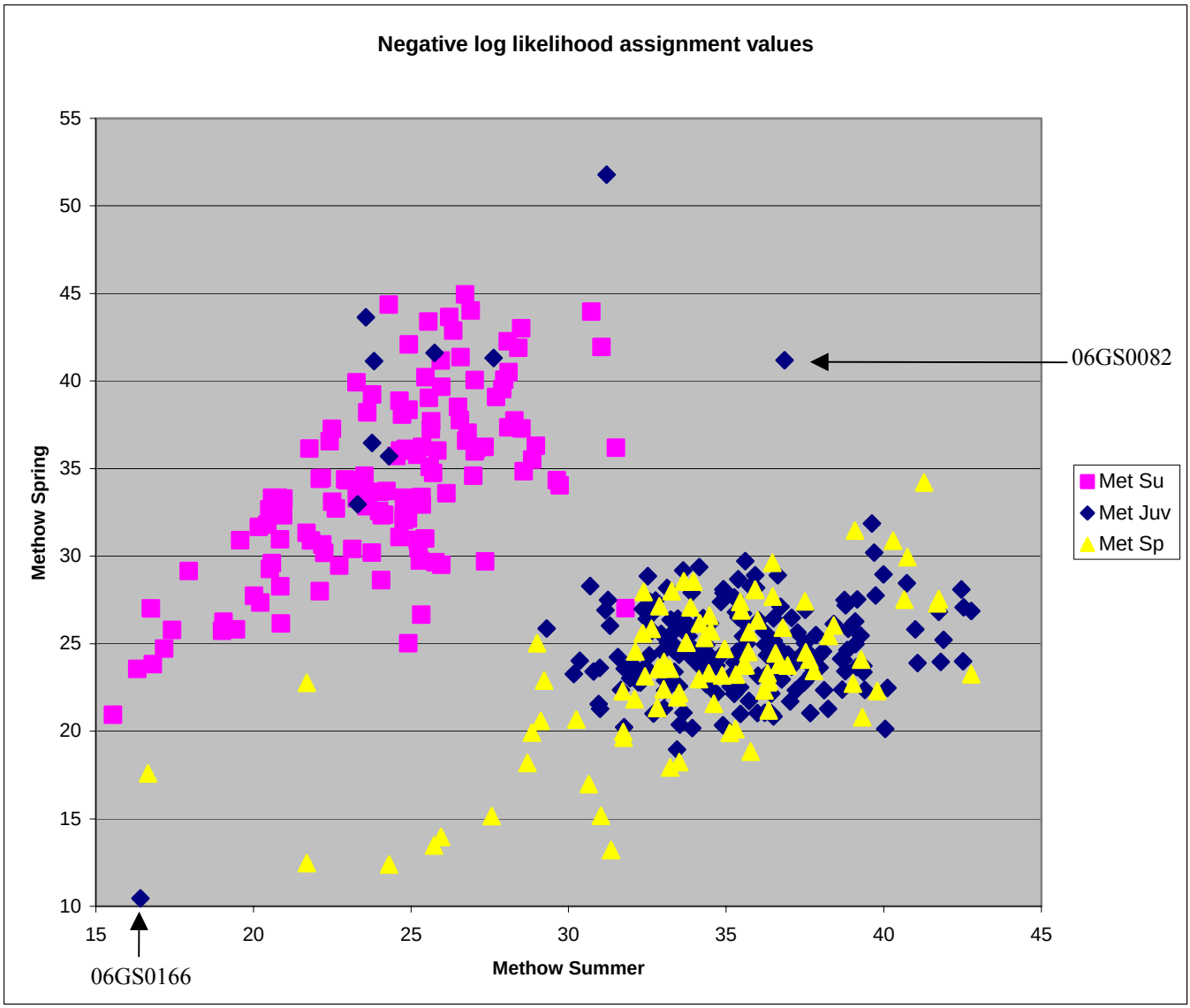

Figure 2. Ancestry values for individual fish calculated in STRUCTURE. Each fish is represented by a bar of color with red corresponding to summer Chinook salmon ancestry and green corresponding to spring Chinook salmon ancestry. Individuals with "pure" ancestry have a single color in their bar and individuals with "mixed" ancestry have two colors in their bar. Individuals are in order of the collection code number so juveniles with summer ancestry can be matched with assignments in Table 3.

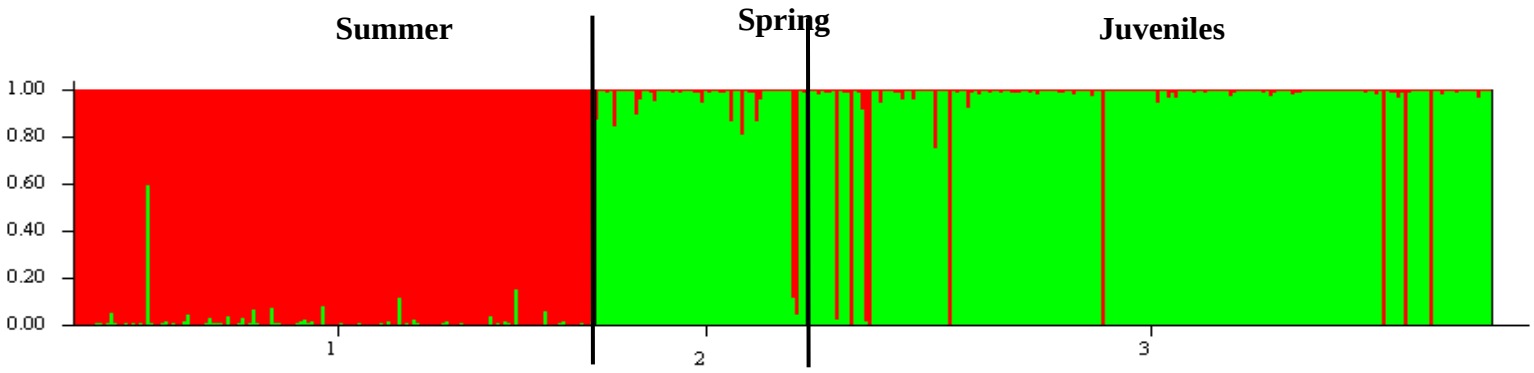

Figure 3. Factorial correspondence analysis plot from GENETIX. Adult spring and summer Chinook salmon are white boxes and juveniles are red boxes. Circles are drawn around boxes representing adult spring and summer Chinook salmon.

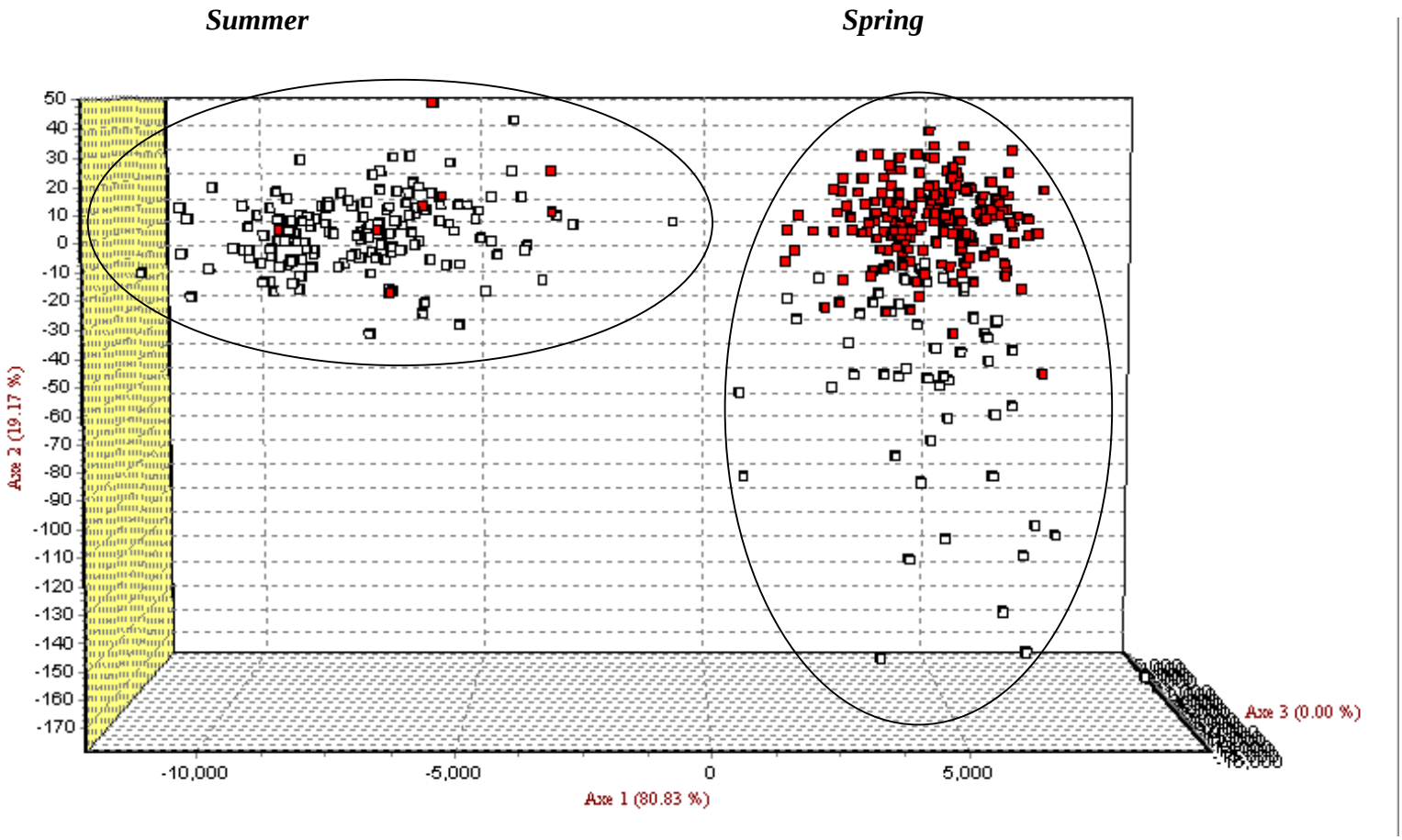

Table 1. List of samples used in the Methow Chinook salmon juvenile assignment tests.

Code	Name	N
06GS	Methow juveniles	189
05HW	Methow Spring	42
93EC	GAPS Methow Summer	143

Table 2. Information for multiplexes and loci including annealing temperature (°C) primer concentration, number of alleles observed, size range (in basepairs). References for primer sequences are under Citation.

	CTC standardized loci					
Multiplex	Locus	Anneal temp	conc [uM]	Alleles Observed	Size Range	Citation
Ots-M	*Oki100*	50	0.37	24	164-353	Miller, Department of Fish and Oceans, unpublished
	Ots201b		0.35	29	133-342	Banks, Oregon State University, unpublished
	Ots208b		0.2	29	142-378	Grieg et al. 2003
	Ssa408		0.2	20	180-320	Cairney et al. 2000
Ots-N	*Ogo2*	60	0.15	16	200-258	Olsen et al. 1998
	Ssa197[a]		0.25	28	171-318	O'Reilly et al. 1996
Ots-O	*Ogo4*	56	0.18	14	132-170	Olsen et al. 1998
	Ots213		0.18	29	178-378	Grieg et al. 2003
	OtsG474		0.16	8	144-220	Williamson et al. 2002
Ots-R	*Omm1080*	53	0.26	46	162-458	Rexroad et al. 2001
	Ots3M		0.12	10	122-170	Banks et al. 1999
Ots-S	*Ots211*	60	0.2	29	196-337	Grieg et al. 2003
	Ots212		0.3	21	123-263	Grieg et al. 2003
	Ots9		0.1	5	99-115	Banks et al. 1999

[a] We collected data at Ssa197 for the juveniles and adult spring Chinook salmon, but Ssa197 is not a CTC-GAPS locus and was not run in the adult summer Chinook salmon collection so it was excluded from the analysis.

Table 3. Juvenile assignment data from GENECLASS. Adult baseline categories are labeled MetSU for summer and 05MetSp for spring. Juveniles assigned to summer Chinook salmon baseline are highlighted in yellow.

sample	MetSU '-log(L)	05MetSp '-log(L)	sample	MetSU '-log(L)	05MetSp '-log(L)	sample	MetSU '-log(L)	05MetSp '-log(L)
06GS0001	33.502	24.362	06GS0064	34.824	24.293	06GS0127	39.102	24.981
06GS0002	32.556	24.326	06GS0065	41.806	23.961	06GS0128	34.177	26.227
06GS0003	38.07	24.552	06GS0066	37.952	24.326	06GS0129	35.943	28.189
06GS0004	39.156	27.534	06GS0067	36.033	26.343	06GS0130	32.279	22.775
06GS0005	37.352	24.3	06GS0068	35.536	26.718	06GS0131	34.688	23.746
06GS0006	32.645	25.737	06GS0069	35.535	25.438	06GS0132	30.99	23.622
06GS0007	40.732	28.46	06GS0070	34.147	29.375	06GS0133	30.957	21.548
06GS0008	33.994	24.638	06GS0071	32.939	25.564	06GS0134	37.262	25.64
06GS0009	27.62	41.312	06GS0072	35.996	21.035	06GS0135	34.92	28.09
06GS0010	38.786	27.187	06GS0073	41.077	23.898	06GS0136	34.92	28.09
06GS0011	35.604	29.714	06GS0074	33.361	24.901	06GS0137	42.52	23.985
06GS0012	37.7	23.254	06GS0075	40.116	22.477	06GS0138	32.618	26.694
06GS0013	23.832	41.138	06GS0076	35.92	28.904	06GS0139	37.967	23.639
06GS0014	35.329	23.943	06GS0077	39.137	23.667	06GS0140	35.6	26.184
06GS0015	34.372	24.93	06GS0078	32.144	23.569	06GS0141	37.671	21.029
06GS0016	30.358	24.032	06GS0079	33.057	22.9	06GS0142	33.025	21.287
06GS0017	23.312	32.965	06GS0080	33.793	24.88	06GS0143	38.104	22.337
06GS0018	23.568	43.639	06GS0081	35.254	22.133	06GS0144	38.681	22.38
06GS0019	37.477	22.793	06GS0082	36.856	41.181	06GS0145	33.148	25.065
06GS0020	36.505	20.846	06GS0083	37.215	22.352	06GS0146	34.693	22.146
06GS0021	31.173	26.92	06GS0084	35.144	22.561	06GS0147	33.203	22.636
06GS0022	37.646	24.393	06GS0085	41.9	25.224	06GS0148	39.262	25.457
06GS0023	38.416	26.126	06GS0086	35.444	22.5	06GS0149	35.391	26.516
06GS0024	32.691	20.998	06GS0087	34.618	23.677	06GS0150	37.073	26.488
06GS0025	36.634	28.899	06GS0088	33.645	21.048	06GS0151	30.796	23.408
06GS0026	30.686	28.289	06GS0089	34.376	22.66	06GS0152	32.979	24.536
06GS0027	32.481	26.41	06GS0090	33.243	26.376	06GS0153	33.904	27.927
06GS0028	39.09	26.275	06GS0091	33.243	26.376	06GS0154	33.465	26.435
06GS0029	36.427	22.148	06GS0092	31.001	21.277	06GS0155	34.895	20.345
06GS0030	34.837	27.389	06GS0093	31.952	23.019	06GS0156	33.563	25.87
06GS0031	37.496	25.024	06GS0094	38.781	23.424	06GS0157	35.38	28.675
06GS0032	37.634	23.813	06GS0095	36.294	24.35	06GS0158	37.849	25.492
06GS0033	35.306	22.303	06GS0096	34.618	23.677	06GS0159	23.766	36.47
06GS0034	36.708	24.074	06GS0097	31.25	27.504	06GS0160	39.4	22.358
06GS0035	37.079	23.678	06GS0098	32.437	23.665	06GS0161	34.203	23.649
06GS0036	33.127	28.176	06GS0099	38.846	24.638	06GS0162	34.498	26.154
06GS0037	37.032	21.698	06GS0100	29.303	25.866	06GS0163	35.254	27.647
06GS0038	30.17	23.267	06GS0101	32.579	27.399	06GS0164	31.314	26.033
06GS0039	39.353	23.378	06GS0102	33.214	25.484	06GS0165	31.21	51.781
06GS0040	24.3	35.708	06GS0103	35.721	21.725	06GS0166	16.42	10.449
06GS0041	33.531	20.366	06GS0104	36.965	24.381	06GS0167	33.499	22.564
06GS0042	36.205	25.694	06GS0105	40.047	20.135	06GS0168	35.267	23.936
06GS0043	39.619	31.868	06GS0106	31.782	23.577	06GS0169	32.35	26.975
06GS0044	42.78	26.876	06GS0107	31.971	23.652	06GS0170	34.6	23.947
06GS0045	33.633	29.184	06GS0108	36.229	21.057	06GS0171	39.69	30.19
06GS0046	35.773	28.273	06GS0109	36.512	25.174	06GS0172	25.744	41.597
06GS0047	31.663	22.36	06GS0110	32.205	22.793	06GS0173	42.539	27.081
06GS0048	36.76	22.96	06GS0111	31.561	24.235	06GS0174	36.631	23.728
06GS0049	35.063	22.946	06GS0112	36.238	24.942	06GS0176	32.51	28.852

Table 3, continued.

sample	MetSU '-log(L)	05MetSp '-log(L)	sample	MetSU '-log(L)	05MetSp '-log(L)	sample	MetSU '-log(L)	05MetSp '-log(L)
06GS0050	33.754	26.171	06GS0113	36.639	24.824	06GS0177	39.357	23.734
06GS0051	33.961	24.09	06GS0114	35.308	26.806	06GS0178	36.435	21.015
06GS0052	33.894	24.58	06GS0115	33.349	24.603	06GS0179	33.439	18.954
06GS0053	39.991	28.955	06GS0116	33.057	22.329	06GS0180	41.745	26.825
06GS0054	35.654	24.999	06GS0117	32.759	27.465	06GS0181	36.502	26.441
06GS0055	35.345	24.54	06GS0118	42.465	28.103	06GS0182	31.764	20.232
06GS0056	38.722	24.069	06GS0119	39.742	27.756	06GS0183	37.508	26.928
06GS0057	38.752	27.505	06GS0120	41	25.817	06GS0184	36.35	23.355
06GS0058	34.269	26.46	06GS0121	38.645	24.14	06GS0185	36.731	27.109
06GS0059	32.489	23.48	06GS0122	36.423	23.433	06GS0186	33.373	26.293
06GS0060	33.359	23.387	06GS0123	35.454	20.989	06GS0187	34.915	27.9
06GS0061	33.921	20.177	06GS0124	34.478	24.311	06GS0188	33.802	25.428
06GS0062	38.866	25.855	06GS0125	36.014	23.163	06GS0189	38.235	21.279
06GS0063	34.273	24.252	06GS0126	35.172	23.218			

Chapter 4

2006 Brood Summer Steelhead Spawning Ground Surveys conducted in the Methow River Basin

Abstract

The Methow River basin was divided into four distinct sub-basins and index areas of spawning activity were developed within each sub-basin. Spawning-ground surveys were performed by walking or rafting the index areas weekly between 21 March and 1 June. To account for redds outside of index areas, non-index-area redd counts were expanded by a ratio of visible to non-visible redds from index area surveys. Spawning within the tributaries of each sub-basin was estimated by expanding tributary index areas as with mainstem areas, or by randomly choosing one tributary to serve as an index tributary for redd density for other similar tributaries within each sub-basin. We estimated a minimum of 810 steelhead redds were constructed in the Methow River basin in 2006. High river discharge and poor visibility in some mainstem reaches limited observer efficiency in locating redds. The greatest number of redds were found in the Twisp River sub-basin ($N = 391$). Both the Upper Methow River ($N = 171$) and Lower Methow River ($N = 181$) had a similar number of redds. Redd abundance in the Chewuch River sub-basin ($N = 67$) was most affected by poor water visibility during the survey period. Peak spawning was observed the week of 3April in the Lower Methow River sub-basin and the week of 17 April in the remaining three sub-basins. The spawning population in 2006 was composed primarily of hatchery origin steelhead (90.7%). Based on biological sampling of steelhead during broodstock collection at Wells Hatchery, 7.9% of the hatchery origin escapement was composed of out-of-basin stray hatchery fish, primarily from Wenatchee River basin releases. Wild fish composed 9.3% of the escapement and were primarily fish from the 2001 brood escapement. Based on run escapement estimates, the mean natural replacement rate for the five most recent broods of steelhead spawning above Wells Dam (1996-2000) was 0.27 recruits per adult.

Introduction

Summer steelhead are propagated at Wells Hatchery and used to supplement the natural spawning populations in the Methow and Okanogan populations. As such, hatchery adults returning to supplemented streams should have similar migration timing, spawn timing, and redd distribution to that of naturally produced fish. Deviations from these life-history traits may have deleterious effects on the overall reproductive success of the integrated population. The number of spawners, derived from estimates of redd abundance, provides critical information not only for survival and spawner-recruit analysis, but also for assessing freshwater smolt production. A determination of the productivity of the population as a function of total abundance of spawners and the proportion of hatchery fish on the spawning grounds should provide valuable insight on the factors limiting the number of naturally produced adults. In addition to spawner abundance, determining the proportion of stray fish on the spawning grounds would also be helpful in explaining observed levels of productivity.

Steelhead released from Wells Hatchery are not uniquely marked by release location and tributary adult traps on the lower Methow and Okanogan rivers do not exist. Hence, the migration timing, spawner composition, and stray rates of the respective spawning populations were estimated from sampling steelhead from the run-at-large passing Wells Dam during broodstock collection activities. Adult summer steelhead may be subjected to a selective fishery occurring both downstream and upstream of Wells Dam. Hence, estimates of spawner abundance were calculated from tributary specific estimates of redd abundance. The objective of the selective fishery is to reduce the abundance of hatchery origin steelhead on the spawning grounds (i.e., ad-clipped fish). Creel surveys conducted throughout the fishery provided estimates of harvest and indirect hooking mortality that are necessary to more accurately estimate the spawning escapement and composition (B. Jateff, WDFW, personal communication).

The implementation of the Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas County PUD (M&E Plan; Wells HCP HC 2005), included objectives designed to address key questions regarding supplementation. Steelhead spawning ground surveys and associated activities (i.e., broodstock collection and creel surveys) were used to evaluate the spawn timing, distribution, and tributary specific escapement levels within the Methow River Basin. While hatchery steelhead are released into both the Methow and Okanogan populations, this report focuses on the Methow population. Monitoring and Evaluation activities recently conducted in the Okanogan Basin by the Colville Confederated Tribes will not be discussed and are available in separate reports (Arterburn and Kistler 2006). This chapter addresses activities related to steelhead spawning ground surveys in 2006 and specific elements of the M & E Plan for the following objectives:

Objective 1: Determine if a) supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e. reference stream), and b) changes in the natural replacement rate (NRR) of the supplemented population are similar to that of the non-supplemented population.

- Ho: Δ Total spawners $_{\text{Supplemented population}} > \Delta$ Total spawners $_{\text{Non-supplemented population}}$
- Ho: Δ NOR $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$
- Ho: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$

Objective 2: Determine if run timing, spawn timing, and spawning distribution of both natural and hatchery components of the target population are similar.

- Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$
- Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$
- Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific expected value (BAMP 1998).

- Ho: $HRR_{Year\ x} \geq NRR_{Year\ x}$

Objective 5: Determine if the stray rate of hatchery fish is below acceptable levels to maintain genetic variation.

- Ho: Stray rate $_{Hatchery\ fish}$ < 5% total brood return
- Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations
- Ho: Stray rate Hatchery fish < 10% total within independent populations

Methods

Migration Timing and Spawner Composition

Broodstock were collected from the local populations passing Wells Dam. Adult fish were trapped a maximum of three days per week and were retained for broodstock based on pre-determined collection goals for hatchery and wild fish. All trapped fish were sampled for origin (scale samples), and hatchery marks were recorded. Migration timing was calculated using both fish collected and released during trapping (excluding strays).

Adipose fin-clipped steelhead have been released into both the Methow and Okanogan River basins. Therefore, returning adipose fin-clipped steelhead could not be assigned to a basin of origin based on sampling at Wells Dam. The number of adipose fin-clipped steelhead returning to either the Methow or Okanogan basins was calculated from the number of adipose fin-clipped juveniles released each year (assuming equal survival from release back to Wells Dam).

The total number of adipose fin-clipped steelhead passing Wells Dam in 2005 ($Ad\text{-}clip_{Wells}$) was multiplied by the age composition estimated from hatchery broodstock sampling to determine the total number of adipose fin-clipped adults from the 2002 (2-salt) and 2003 (1-salt) brood years (*BY*). Determining the number of adipose fin-clipped adults returning from the 2002 brood would be calculated using the following formula:

$$BY_{2002} = Ad\text{-}clip_{Wells} \times (BS_{2002} / Ad\text{-}clip_{Broodstock})$$

where BS_{2002} is the number of 2002 brood fish in the broodstock and $Ad\text{-}clip_{Broodstock}$ is the total number of ad-clipped fish in the broodstock. The product was then multiplied by the proportion of adipose fin-clipped fish released (*r*) in the Methow and Okanogan rivers for each brood year to derive the total number of adults returning to that river:

$$\text{Methow}_{2002} = BY_{2002} \text{ x } (r_{\text{Methow}} / \sum r)$$

This calculation was performed for each of two broods present in the run, and the total number of adipose fin-clipped adults returning to the Methow River (Ad-clip $_{\text{Methow}}$) was calculated as the sum of returning fish from each brood:

$$\text{Ad-clip}_{\text{Methow}} = \text{Methow}_{2002} + \text{Methow}_{2003}$$

All hatchery steelhead with yellow elastomer marks were assigned to the Methow Basin because no yellow elastomer steelhead were released in the Okanogan Basin. Stray hatchery fish were assigned equally to the Methow and Okanogan Basins.

Because the steelhead passing Wells Dam were subjected to a selective fishery, creel surveys were used to estimate the number of adipose fin-clipped steelhead removed from the Methow and Okanogan River basins during the fishery. Fishery removal and mortality estimates were applied to the basin-specific escapement estimates generated from hatchery sampling to yield the estimate of total run escapement. No estimates were made of pre-spawn mortality, illegal removal (i.e., poaching) or dam fallback.

English et al. (2001, 2003) conducted a steelhead migration study using steelhead tagged at Priest Rapids Dam in 1999 and 2001. Naturally produced fish passing Wells Dam were assigned to the Methow and Okanogan Basin based on the proportion of the naturally produced radio tagged steelhead passing Wells Dam that spawned in the Methow and Okanogan basins respectively.

Spawn Timing and Redd Distribution

The Methow River basin was divided into four geographic sub-basins; the upper Methow, lower Methow, Chewuch, and Twisp. Index areas of annual spawning activity were established within each sub-basin based on historic survey information (Tables 1 – 4). Index areas were surveyed weekly on foot or by raft throughout the spawning season. Steelhead redds were individually flagged with the date, redd number, and location recorded on each flag. Each location was also recorded with Global Positioning System (GPS) technology for subsequent mapping. When spawning was perceived to be near completion, non-index areas were surveyed for a total redd count, and index areas were surveyed to determine the proportion of total redds still visible. Redds observed outside of index areas were expanded by the visible proportion from index area counts. Expanded redd counts from outside the index areas were combined with total redd counts within the index areas to estimate the total number of redds for each stream as described in Appendix F, task 7-3 of the M & E Plan (Wells HCP HC 2005).

Table 1. Upper Methow River sub-basin survey reaches including both index (bold) and non-index areas.

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Upper Methow	Ballard CG. - Lost River Conf.	M15	120.8	116.8	4.0
	Lost River Conf. - Gate Creek	M14	116.8	112.0	4.8
	Gate Creek - Early Winters Cr.	M13	112.0	107.8	4.2
	Early Winters Cr. - Mazama Br.	M12	107.8	104.6	3.2
	Mazama Br. - Susp. Bridge	**M11**	**104.6**	**100.6**	**4.0**
	Susp. Br. - Weeman Bridge	**M10**	**100.6**	**95.4**	**5.3**
	Weeman Br. - Along Hwy 20	M9	95.4	86.4	9.0
	Along Highway 20 - Wolf Cr.	M8	86.4	84.2	2.2
	Wolf Cr. - Foghorn Dam	M7	84.2	82.4	1.8
	Foghorn Dam - Winthrop Br.	M6	82.4	79.7	2.7
Lost River	Sunset Cr. - Eureka Cr.	L3	11.2	6.6	4.6
	Eureka Cr. - Lost River Br.	L2	6.6	0.8	5.8
	Lost River Br. - Conf.	**L1**	**0.8**	**0.0**	**0.8**
Early Winters Cr.	Klipchuck CG. - Early Winters Br.	EW5	7.2	5.8	1.4
	Early Winters Br. - Hwy 20 Br.	EW4	5.8	3.7	2.1
	Highway 20 Br. – Div. Dam	EW3	3.7	0.8	2.9
	Div. Dam - Hwy 20 Br.	**EW2**	**0.8**	**0.5**	**0.3**
	Hwy 20 Br. - Conf.	**EW1**	**0.5**	**0.0**	**0.5**
Suspension Cr.	100m above fork - confluence	SP1	0.3	0.0	0.3
MH Outfall[1]	Hatchery to Methow River	MH1	0.4	0.0	0.4
WNFH Outfall[2]	Hatchery to Methow River	WN1	0.4	0.0	0.4

[1]Methow State Fish Hatchery outfall
[2]Winthrop National Fish Hatchery outfall

Table 2. Lower Methow River sub-basin survey reaches including both index (bold) and non-index areas.

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Lower Methow	Winthrop Br. - MVID Dam	M5	80.1	72.1	8
	MVID - Twisp Confluence	M4	72.1	64.9	7.2
	Twisp Confluence - Carlton Br.	M3	64.9	43.8	21.1
	Carlton Br. - Upper Burma Br.	**M2**	**43.8**	**20.1**	**23.7**
	Upper Burma Bridge - Pateros	M1	20.1	0	20.1
Beaver Creek	Lester Br. - Balky Hill Rd	BV3	14.2	9.3	5.0
	Balky Hill Rd - Hwy 20	BV2	9.3	3.4	5.9
	Hwy 20 - Confluence	**BV1**	**3.4**	**0.0**	**3.4**

Table 3. Twisp River sub-basin survey reaches including both index (bold) and non-index areas.

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Twisp River	Road's End CG. - South Cr. Br.	T10	46.4	41.8	4.6
	South Cr. Br. - Poplar Flats CG.	T9	41.8	38.6	3.2
	Poplar Flats CG. - Mystery Br.	T8	38.6	35.4	3.2
	Mystery Br. - War Cr. Br.	T7	35.4	28.5	6.9
	War Cr. Br. - Buttermilk Br.	T6	28.5	21.1	7.4
	Buttermilk Br. - Little Br. Cr.	**T5**	**21.1**	**15.2**	**5.9**
	Little Br. Cr. - Twisp Weir	**T4**	**15.2**	**11.4**	**3.8**
	Twisp Weir - Upper Poorman Br.	T3	11.4	7.8	3.5
	Up. P'man Br. - Low. P'man Br.	T2	7.8	2.9	5.0
	Lower Poorman Br. - Confluence	T1	2.9	0.0	2.9
Little Bridge Cr.	Vetch Cr. - Upper Bridge	LBC3	7.8	4.8	3.0
	Upper Bridge - Lower Bridge	LBC2	4.8	2.4	2.4
	Lower Bridge - Confluence	LBC1	2.4	0.0	2.4
MSRF pond outfall[1]	Acclimation pond to confluence	MSRF1	0.2	0.0	0.2

[1]Methow Salmon Recovery Foundation pond outfall

Table 4. Chewuch River sub-basin survey reaches including both index (bold) and non-index areas.

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Chewuch River	Chewuch Falls - 30 Mi. Br.	C13	54.4	50.2	4.2
	30 Mi. Br. - Road Side Camp	C12	50.2	45.6	4.6
	Road Side Camp - Andrews Cr.	C11	45.6	41.3	4.3
	Andrews Cr. - Lake Cr.	C10	41.3	37.3	4.0
	Lake Cr. - Buck Cr.	C9	37.3	35.0	2.2
	Buck Cr. - Camp 4	C8	35.0	32.6	2.4
	Camp 4 - Chewuch CG.	C7	32.6	27.5	5.1
	Chewuch CG. - Falls Cr. CG.	C6	27.5	21.8	5.8
	Falls Cr. CG. - 8 Mile Cr.	C5	21.8	18.1	3.7
	8 Mile Cr. - Boulder Cr.	**C4**	**18.1**	**14.4**	**3.7**
	Boulder Cr. - Chewuch Br.	C3	14.4	12.6	1.8
	Chewuch Br. - WDFW Land	C2	12.6	5.1	7.5
	WDFW Land - Confluence	C1	5.1	0.0	5.1
Eightmile Cr.	**500m above diversion – Conf.**	**EM1**	**0.8**	**0.0**	**0.8**

The large number of low-order tributaries in the Methow Basin precluded the use of annual index areas. A rotating panel methodology was used to estimate redd abundance in smaller streams without annual index areas. Initially, streams accessible to spawning steelhead were identified from the Washington State Conservation Commission's Salmon, Steelhead, and Bull Trout Habitat Limiting Factors Report (LFA 2000). Tributaries were randomly assigned a survey year to serve as an index stream for each respective sub-basin (Table 5). Selected tributaries were surveyed weekly during the spawning season and redd densities (redds/km) of index tributaries were expanded to other sub-basin tributaries based on length (km) of available spawning habitat. Subsequently, as each stream was surveyed, the length of suitable steelhead spawning was determined and adjusted based on data from the previous studies (LFA 2000).

While the current spawning ground methodology allows for estimating the total number of redds, spawn timing and redd distribution of hatchery and naturally produced steelhead has yet to be determined in the Methow Basin. Because all hatchery fish are not adipose fin-clipped, an external mark (i.e., adipose fin clip) is currently not available to make a distinction between hatchery and naturally produced fish on the spawning grounds. Spawn timing and redd distribution have been identified as data gaps.

Table 5. Low order tributaries included in the rotating panel sampling design by sub-basin and survey year.

Stream (section)	Survey year	Code	Dist (km)
Upper Methow sub-basin			
Little Boulder Creek (Hwy 20 - Conf.)	2004	LBO1	0.2
Wolf Creek (Rd 5505 access – footbridge)	2005	W2	1.9
Wolf Creek (footbridge - Conf.)	2005	W1	0.5
Goat Creek (FR 52 Br. - Conf.)	2006	GT1	2.2
Hancock Creek (Wolf Cr. Rd. - Conf.)	2007	HA1	0.2
Lower Methow sub-basin			
Gold Cr. Upper NF (11.4 rkm - Ranch)	2005	GD-N4	6.4
Gold Cr. Mid. NF (Ranch - N.F. Br.)	2005	GD-N3	0.9
Gold Cr. Mid. NF (N.F. Br. - Whispering Pines)	2005	GD-N2	1.1
Gold Cr. Lower NF (Whispering Pines - 2nd Br.)	2005	GD-N1	1.0
Gold Cr. SF (1st Br. - 1.7 rkm)	2005	GD-S3	4.4
Gold Cr. SF (1.7 rkm - 0.6 rkm)	2005	GD-S2	1.1
Gold Cr. SF (0.6 rkm - Conf.)	2005	GD-S1	0.6
Gold Cr. Mainstem (2nd Br. - Private Land)	2005	GD-M2	0.9
Gold Cr. Mainstem (Private Land - Conf.)	2005	GD-M1	1.1
Foggy Dew Creek (FR 200 - Conf.)	2005	FD1	4.2
Libby Creek (Lower Public Land)	2006	LB4	1.0
Libby Creek (Low Pub Land - Realty Land)	2006	LB3	1.1
Libby Creek (Realty Land)	2006	LB2	0.3
Libby Creek (Realty Land - Conf.)	2006	LB1	1.0
Black Canyon Cr. (2nd Br. - 0.8 rkm)	2007	BC2	1.0
Black Canyon Cr. (0.8 rkm - Conf.)	2007	BC1	0.8
Twisp sub-basin			
Eagle Creek (Trailhead - Conf.)	2004	EA1	1.3
War Creek (FR 4430 - Conf.)	2005	WR1	1.0
Buttermilk Cr. (Fork - Cattle Grd.)	2006	BM2	2.1
Buttermilk Cr. (Cattle Grd. - Conf.)	2006	BM1	2.0
South Creek (Falls - Conf.)	2007	SO1	0.6
Chewuch sub-basin			
Andrews Creek (Little Andrews Cr. – 1st Br.)	2004	AN2	0.3
Andrews Creek (1st Bridge - Conf.)	2004	AN1	0.2
Boulder Creek (Falls - 1st Bridge)	2005	BD2	0.8
Boulder Creek (1st Bridge - Conf.)	2005	BD1	0.8
Lake Creek (Black Lake - 1st Bridge)	2006	LK2	10.1
Lake Creek (1st Bridge - Conf.)	2006	LK1	0.8
Twentymile Creek (Falls – FR 5010)	2007	TW2	0.9
Twentymile Creek (FR 5010 - Conf.)	2007	TW1	0.1

Natural Replacement Rate (NRR) and Stray Rates

Tributary specific information on spawner composition for summer steelhead has not been collected because too few carcasses are found during spawning ground surveys and no tributary collection or run evaluation location has been identified. Furthermore, spawning escapement estimates are only available for recent years and the precision of those estimates has not been evaluated. Population-specific run escapement, spawning escapement, and composition have been identified as data gaps.

All populations above Wells Dam were combined and the NRR was calculated from run composition data gathered from sampling the run-at-large at Wells Dam. The NRR for each brood was calculated by adding the number of recruits (r) from successive return years (i) that originated from the same broodyear. The total number of recruits was divided by the number of spawners (S) for that brood year calculated from Wells Dam passage and fishery harvest information:

$$NRR = r_{i+1} + r_{i+2} + r_{i+3} + \ldots / S$$

Population-specific stray rates are currently unavailable for the Methow and Okanogan populations for the same reasons discussed above. Run composition monitoring currently ongoing in the Wenatchee Basin should provide information regarding elastomer-tagged groups only. However, because all Wenatchee hatchery steelhead are elastomer tagged, the contribution of stray hatchery steelhead to the Methow and Okanogan populations was assessed at Wells Dam. All stray elastomer-tagged steelhead (i.e., red, orange, pink, and green) sampled at Wells Dam were expanded by the elastomer tag rate and sample rate to estimate the total number of stray hatchery fish upstream of Wells Dam.

Results

Migration Timing and Spawner Composition

Collection and sampling of the 2006 brood Wells Hatchery steelhead broodstock occurred at Wells Dam between 1 August and 28 October 2005. During the sampling period, a total of 1,334 steelhead were sampled for hatchery marks or were scale sampled to determine origin. Of those fish trapped and sampled, 326 hatchery and 91 wild-origin steelhead were retained for hatchery broodstock purposes. The remaining 884 hatchery and 33 wild-origin steelhead were released upstream of Wells Dam. Based on the sampling results, wild steelhead migrated past Wells Dam approximately nine days earlier than hatchery steelhead (Figure 1; Mann Whitney U, $P < 0.05$). Comparison by age class was not possible because all hatchery fish were not scale sampled. A total of 6,572 steelhead passed the dam during the broodstock collection period (Table 6). The total run escapement upstream of Wells Dam for the 2006 brood was 7,163 steelhead (7,580 steelhead including fish collected for broodstock).

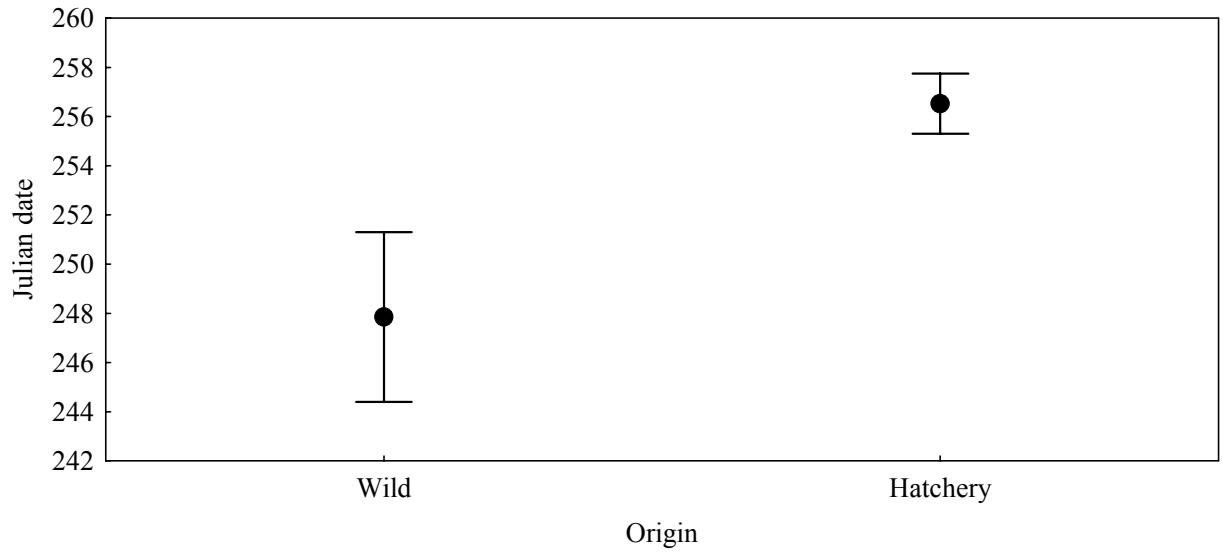

Figure 1. Mean migration timing of summer steelhead passing Wells Dam in 2005. Error bars are 95% confidence intervals.

Table 6. Passage of hatchery and wild steelhead over Wells Dam between 1 August and 28 October 2005.

Origin	*N*	Cumulative passage date			
		25%	50%	75%	100%
Hatchery	5,983	30-Aug	14-Sep	27-Sep	28-Oct
Wild	589	16-Aug	7-Sep	21-Sep	20-Oct

Analysis of scale samples and observations of hatchery marks indicated that 9.3% of the steelhead passing the dam were wild-origin fish. After removal of 91 wild fish for hatchery broodstock, 21% and 71% of the remaining wild fish were assigned to the Okanogan and Methow Basins, respectively (English et al. 2001, 2003). An estimated 3,182 and 1,266 adipose fin-clipped fish returned to the Methow and Okanogan basins, respectively. The abundance and genetic composition of the 2006 brood steelhead return was great enough to conduct a local sport fishery targeting adipose fin-clipped hatchery steelhead in the Methow, Okanogan, Similkameen, and Columbia Rivers. This fishery occurred between 8 October 2005 and 31 March 2006. A creel census conducted during the fishery estimated that 1,565 adipose fin-clipped steelhead were retained during the fishery (Jateff 2005). Mortality of steelhead during the fishery was estimated to be 5% of all fish captured and released. This value was applied to the estimated total number of fish captured by origin to estimate total fishery related mortalities. This methodology resulted in an estimated mortality of 17 wild steelhead during the open fishery (Table 7).

Table 7. Estimated number of steelhead captured, retained, or mortalities, from expanded creel census. Hatchery steelhead retained includes hooking mortality.

Species/disposition	Methow	Columbia	Okanogan	Similkameen	Total
Total steelhead caught	1,508	703	683	429	3,323
Hatchery steelhead retained	661	427	220	257	1,565
Wild steelhead mortality	8	4	3	2	17

After removal of fishery related mortality, an estimated 124, and 426 wild fish were available for natural spawning in the Okanogan and Methow River basins, respectively (Table 8). Stray hatchery fish were assigned to the Methow ($N = 260$) and Okanogan basins ($N = 260$) equally based on the assumption of equal probability of a stray fish spawning in either basin.

Table 8. Escapement and disposition of the 2006 brood summer steelhead passing Wells Dam. Hatchery ($N = 326$) and wild ($N = 91$) fish removed for broodstock at Wells Dam are not included in the escapement estimate above Wells Dam.

Area	Description (*Variable*)		Number
Above Wells Dam	Wild fish		614
	Local hatchery fish		6,029
	Stray hatchery fish		520
Okanogan Basin	Hatchery run escapement estimate	*(A)*	1,526
	Hatchery fish removed in fishery	*(B)*	474
	Revised hatchery run escapement estimate	*(C = A - B)*	1,052
	Wild run escapement estimate	*(D)*	129
	Wild fish removed in fishery	*(E)*	5
	Revised wild run escapement estimate	*(F = D - E)*	124
	Maximum spawning escapement estimate[a]	*(G = C + F)*	1,176
Methow Basin	Hatchery run escapement estimate	*(H)*	5,023
	Hatchery fish removed in fishery	*(I)*	985
	Revised hatchery run escapement estimate	*(J = H - I)*	4,038
	Wild run escapement estimate	*(K)*	436
	Wild fish removed in fishery	*(L)*	10
	Revised wild run escapement estimate	*(M = K - L)*	426
	Maximum spawning escapement estimate	*(N = J + M)*	4,464

[a] Reflects the removal of 10 fish from Omak Creek for CCT broodstock (C. Fisher, CCT, personal communication).

Overall, 78.9% of the hatchery fish passing Wells Dam were estimated to have returned to the Methow Basin. After broodstock and fishery removal, an estimated 4,038 hatchery and 426 wild steelhead were available for natural spawning in the Methow River basin (see Table 8). The estimated spawning escapement to the Okanogan River basin ($N = 1,176$) was approximately 26% greater than the maximum spawning escapement of 930 fish calculated from expanded redd counts reported by Arterburn and Kistler (2006).

Spawn Timing and Redd Distribution

Spawning timing in the natural environment could not be assessed because not all hatchery fish possessed an external mark (both local and stray hatchery fish). Spawn timing was assessed during normal spawning operations at Wells Hatchery. Although spawning typically occurs much earlier in the hatchery than the natural environment, any relative differences observed in the broodstock may also be present in the natural environment. In the hatchery environment, adult steelhead exhibited significantly different spawn timings depending on the genetic origin of the adult (Figure 2; KW ANOVA, $P < 0.01$). Females of H x W origin had a mean spawn date of 29 January. Mean spawn dates for H x H and wild females were 9 February and 28 February, respectively. Many of the wild females used in this analysis (62%) had been injected with hormones designed to increase maturation timing. Hence, real differences in spawn timing between hatchery and wild fish were greater than values reported.

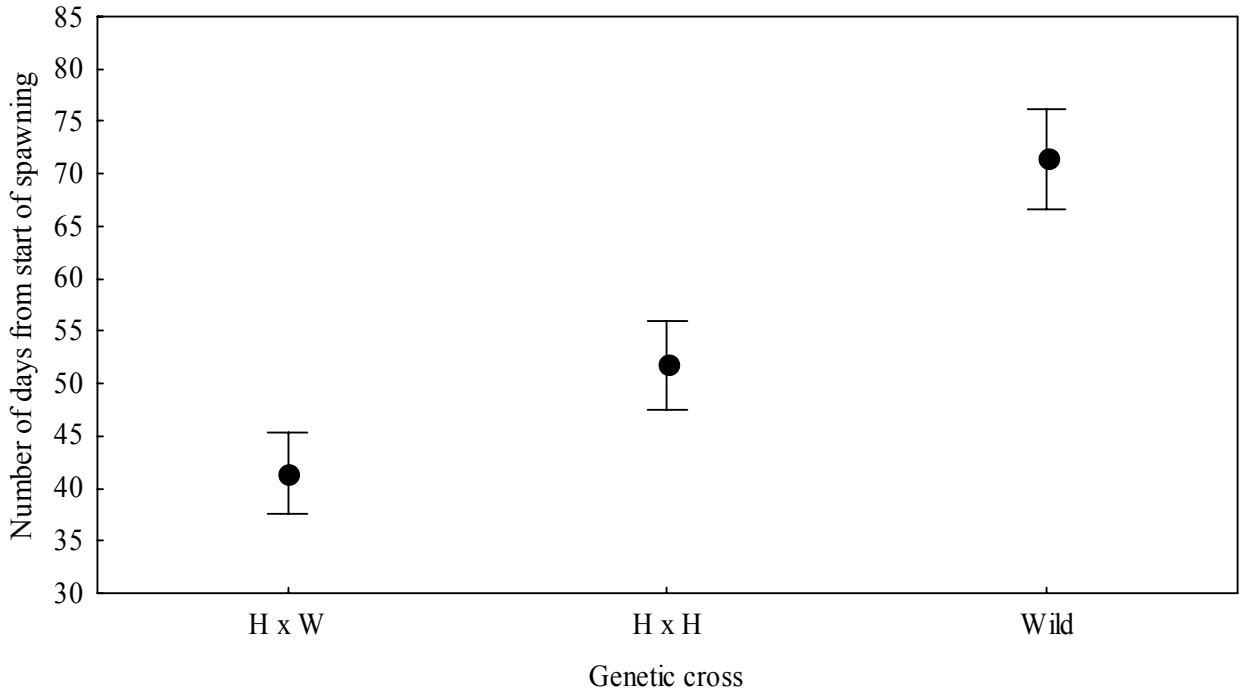

Figure 2. Spawn timing of female steelhead at Wells Hatchery by genetic cross. Spawning began on 20 December 2005 (Day 1).

In the natural environment, spawn timing within the index areas suggested that the peak spawn timing in the lower Methow sub-basin occurred during the week of 3 April. Peak spawning in the remaining three sub-basins all occurred during the week of 17 April (Table 9). Based on spawn timing difference observed in the hatchery, a bimodal spawning distribution should be present in the natural environment. High water late in the spawning season precluded some surveys from being conducted in consecutive weeks. However, for those index areas that were surveyed weekly, the temporal distribution of redds suggests a bimodal distribution is present (Figure 3). However, without the ability to determine origin on the spawning grounds, the large proportion of hatchery fish on the spawning grounds and the large observed variation in spawn timing may mask differences in spawn timing between hatchery and natural-origin fish.

Table 9. Methow River index area weekly redd counts by sub-basin and week beginning (ns = not surveyed).

Stream	Survey reach	Code	March		April				May					Total
			20	27	3	10	17	24	1	8	15	22	29	
Upper Methow sub-basin														
Methow R.	Susp. Br.-Weeman Br.	M11	ns	ns	ns	0	7	2	0	0	ns	ns	0	9
Methow R.	Mazama Br.-Susp. Br.	M10	ns	ns	0	6	8	4	2	6	ns	ns	0	26
E. Winters	Div. Dam -Hwy 20 Br.	EW2	ns	ns	0	0	1	1	1	0	ns	ns	ns	3
E. Winters	Hwy 20 Br.-Conf.	EW1	ns	ns	0	0	0	0	1	ns	ns	ns	ns	1
Lost R.	Lost River Br.-Conf.	L1	ns	ns	0	0	0	0	2	0	ns	ns	ns	2
Suspension	Entire length	SP1	ns	ns	0	2	15	3	4	6	ns	ns	1	31
	Sub-basin total		- -	- -	0	8	31	10	10	12	- -	- -	1	72
Lower Methow sub-basin														
Methow R.	Carlton-Upper Burma Br.	M2	0	9	10	1	7	ns	ns	1	ns	ns	ns	28
Beaver Cr.	Hwy 20-Confluence	BV1	0	6	14	1	ns	ns	ns	ns	ns	ns	ns	21
	Sub-basin total		0	15	24	2	7	- -	- -	1	- -	- -	- -	49
Twisp sub-basin														
Twisp R.	Buttermilk Br.-Little Br. Cr.	T5	ns	0	20	35	40	21	5	5	4	ns	0	130
Twisp R.	Little Br. Cr.-Twisp Weir	T4	ns	3	3	3	24	0	1	0	0	ns	0	34
	Sub-basin total		- -	3	23	38	64	21	6	5	4	- -	0	164
Chewuch sub-basin														
Chewuch R.	8 Mile Cr.-Boulder Cr.	C4	ns	0	ns	1	1	ns	ns	ns	ns	ns	ns	2
Eightmile	500m above div.-Conf.	EM1	ns	0	ns	1	3	ns	ns	ns	ns	ns	ns	4
	Sub-basin total		- -	0	- -	2	4	- -	- -	- -	- -	- -	- -	6

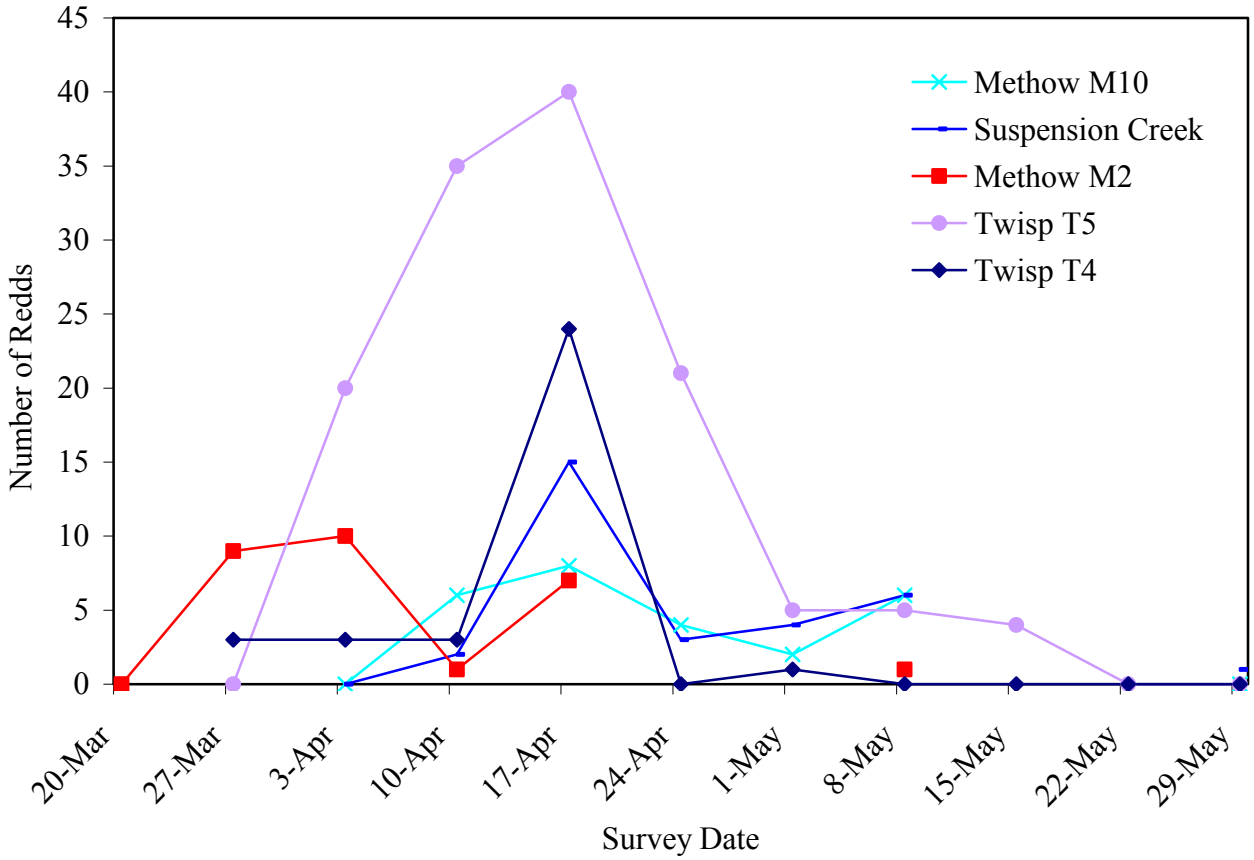

Figure 3. Temporal distribution of the steelhead spawning in selected index areas within the Methow Basin.

Using expanded index-area and rotating-panel redd counts, an estimated 810 steelhead redds were deposited in the Methow River basin in 2006 (Tables 10 – 13). The Twisp River had the greatest density of steelhead redds (6.4 per km) of the four sub-basins surveyed (Figures 4 – 7; Table 12). Based on the male-to-female ratio of hatchery (0.679) and wild fish (0.685) calculated during broodstock collection activities, the total redd count represents 1,360 fish, or 29.2% of the estimated spawning escapement to the Methow River basin of 4,664 fish. This proportion of the run escapement accounted for on the spawning grounds was lower in 2006 than 2004 (36.4%; Humling and Snow 2004) and 2005 (47.9%; Snow and Humling 2006) due primarily to high flows throughout the Methow Basin and poor survey conditions in the Chewuch River. Historic redd counts for each of the sub-basins surveyed are listed in appendices A1 – A4.

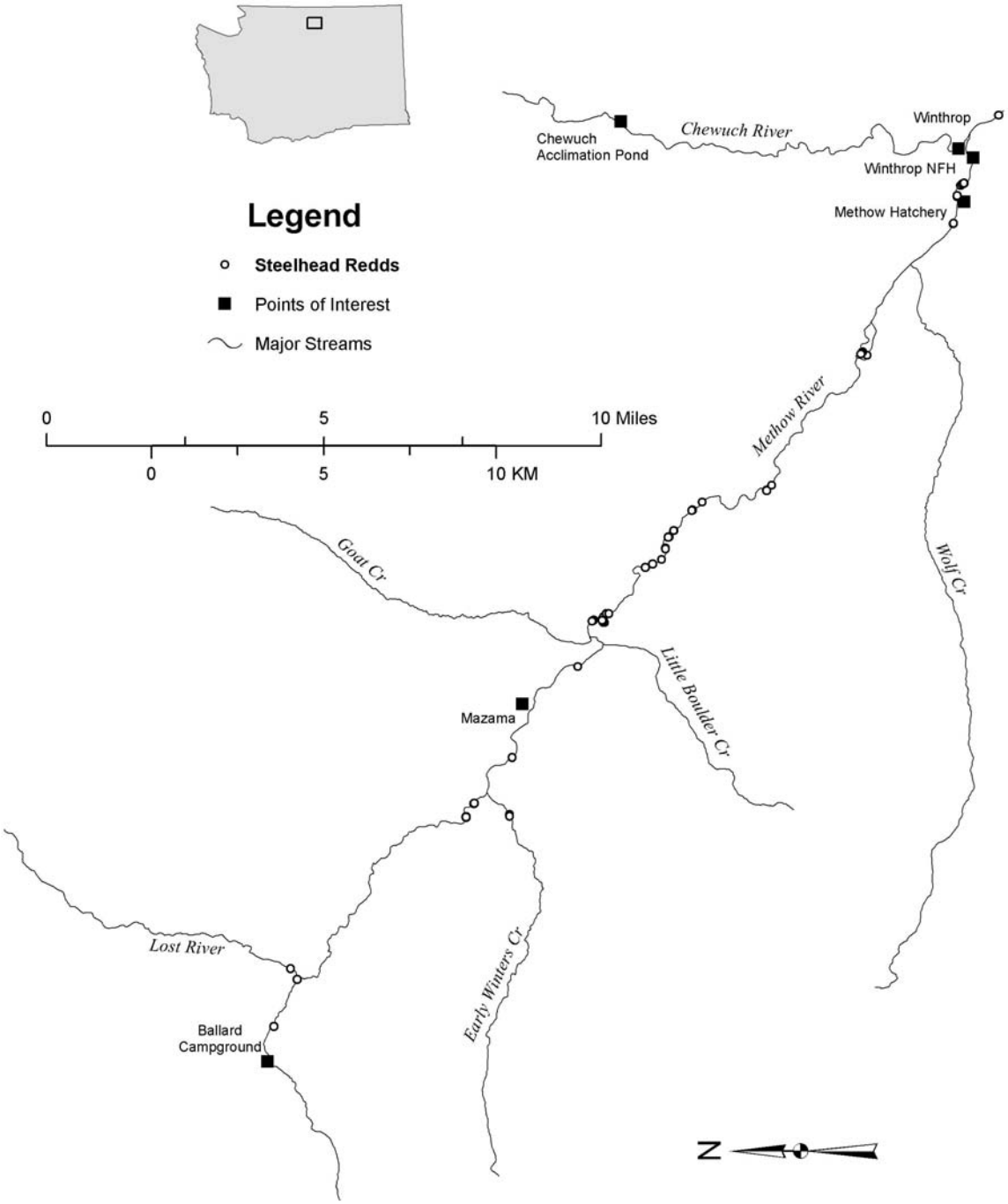

Figure 4. Spatial distribution of steelhead redds in the upper Methow River sub-basin based on GPS waypoints collected during 2006 surveys.

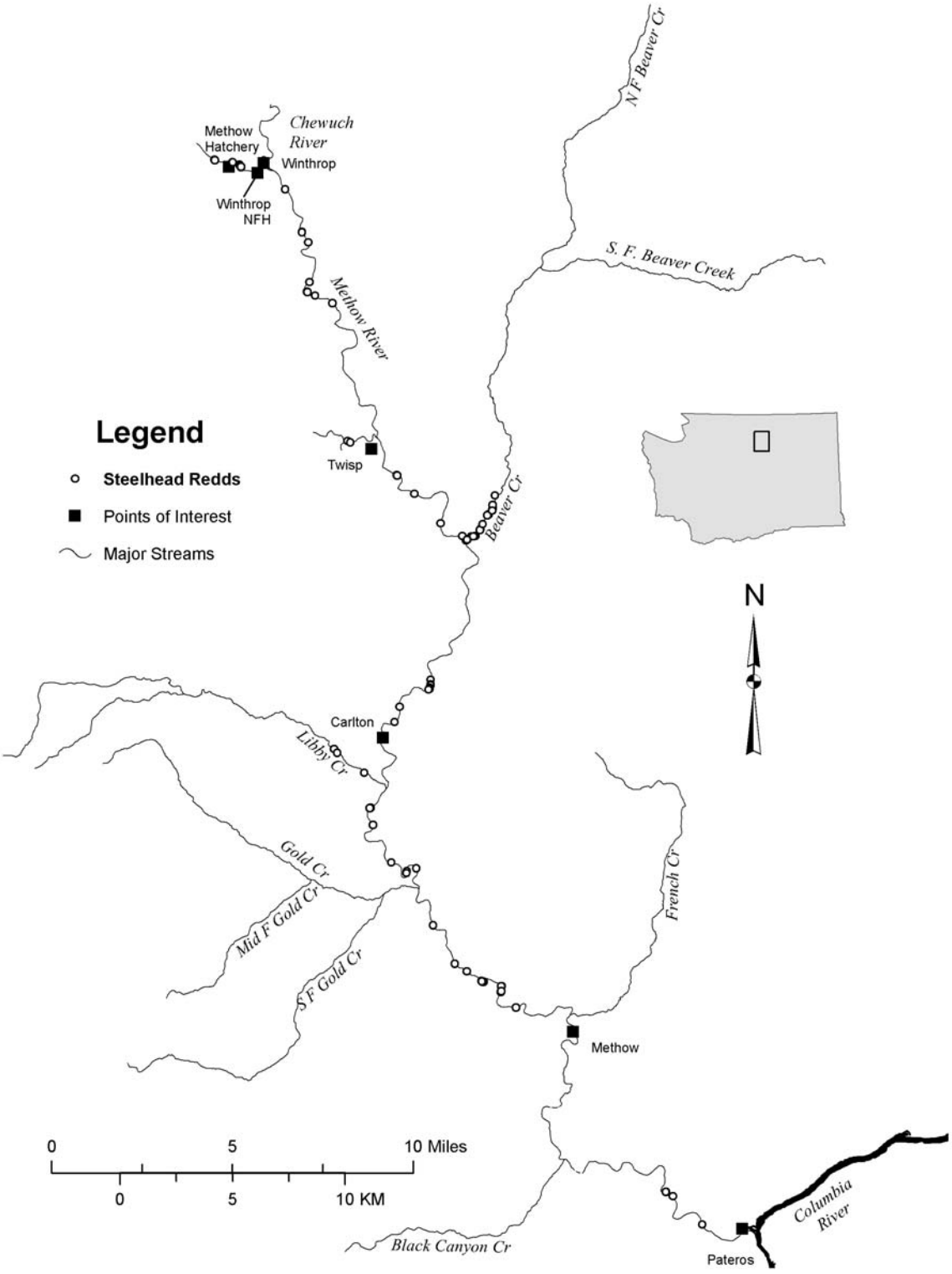

Figure 5. Spatial distribution of steelhead redds in the lower Methow River sub-basin based on GPS waypoints collected during 2006 surveys.

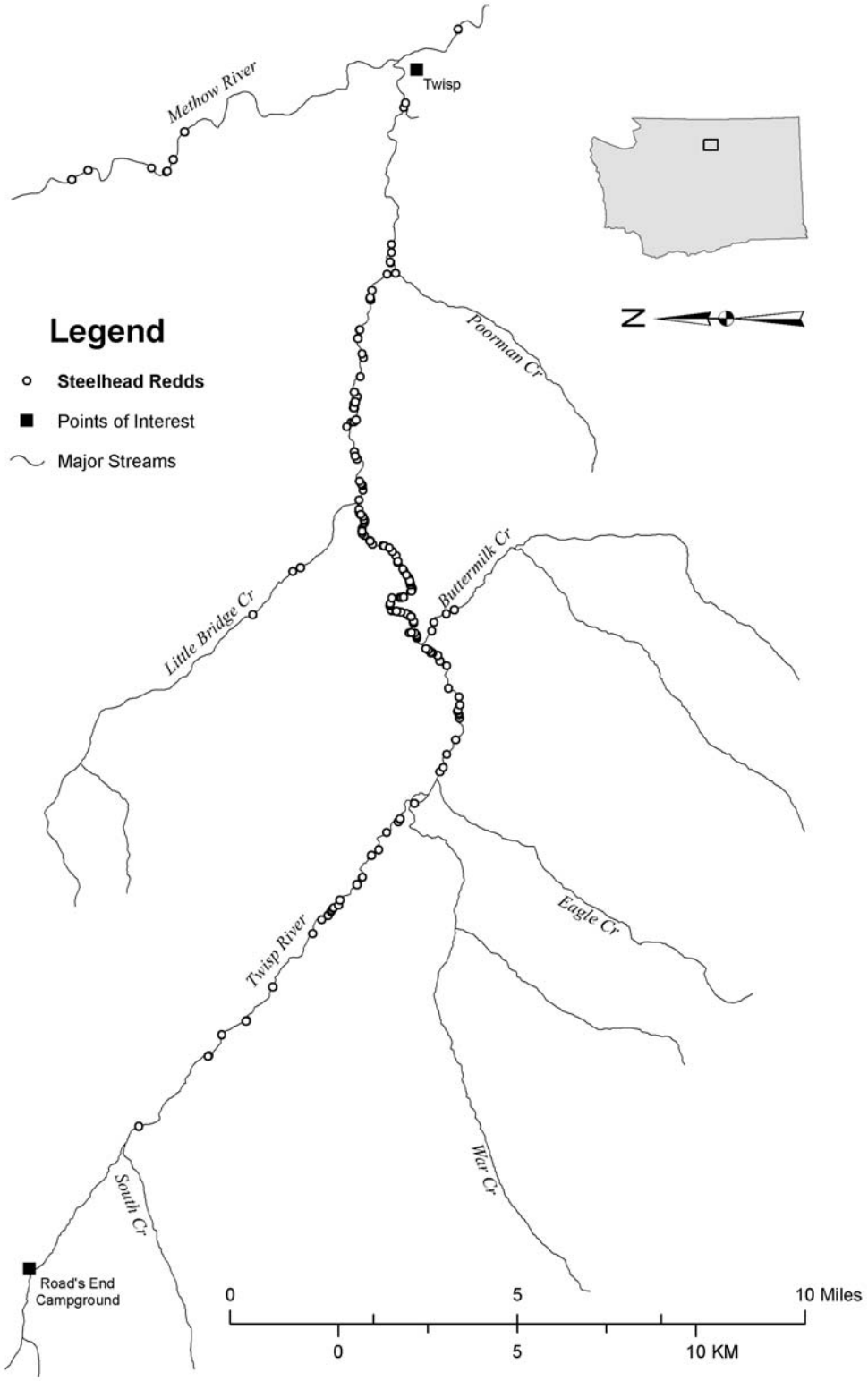

Figure 6. Spatial distribution of steelhead redds in the Twisp River sub-basin based on GPS waypoints collected during 2006 surveys.

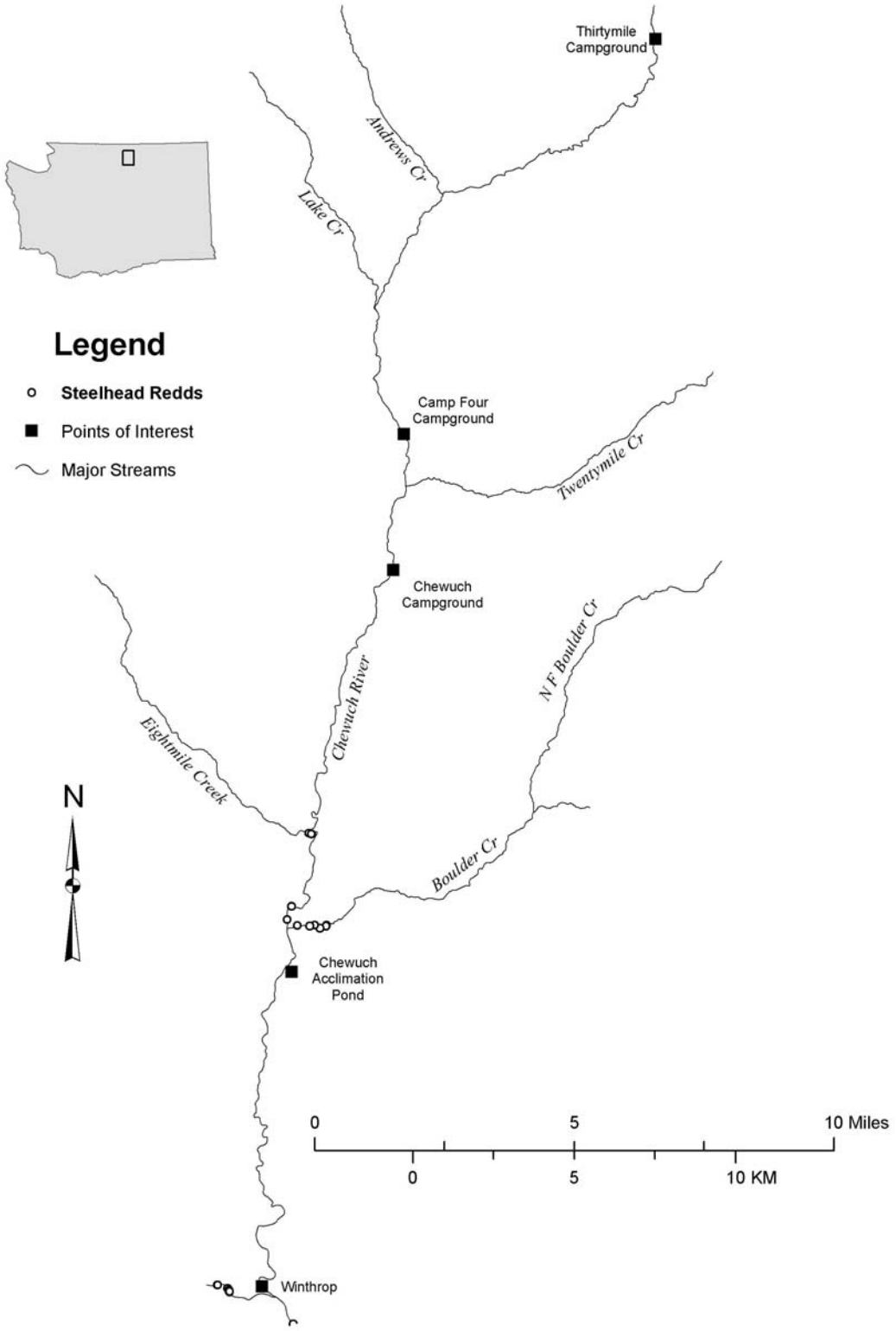

Figure 7. Spatial distribution of steelhead redds in the Chewuch River sub-basin based on GPS waypoints collected during 2006 surveys.

Table 10. Upper Methow River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP.

Stream reach	Code	Dist (km)	2004	2005	2006	
					Expand rate	Redds
Upper Methow River						
Ballard CG - Lost R.	M15	4.0	27	17	0.33	3
Lost R. - Gate Cr.	M14	4.8	10	51	none	0
Gate Cr. - Early Winters Cr.	M13	4.2	23	60	0.33	15
Early Winters Cr. - Mazama Br.	M12	3.2	0	43	0.33	3
Mazama Br. - Susp. Br.	M11	4.0	12	25	index	9
Susp. Br. - Weeman Br.	M10	5.3	8	52	index	26
Weeman Br. - Along Hwy 20	M9	9.0	93	180	0.38	30
Along Highway 20 - Wolf Cr.	M8	2.2	0	9	none	0
Wolf Cr. - Foghorn Dam	M7	1.8	0	9	0.38	5
Foghorn Dam - Winthrop Br.	M6	2.7	0	34	none	0
Upper Methow River total		41.1	173	480		91
Upper Methow River tributaries						
Suspension Creek (Entire length)	SP1	0.3	43	37	none	31
MH Outfall[1] (Entire length)	MH1	0.4	18	15	none	14
WNFH Outfall[2] (Entire length)	WN1	0.4	113	83	none	29
RP-Wolf Creek (Rd 5505 access - footbridge	W2	1.9	29	0	none	0
RP-Wolf Creek (footbridge - Conf.)	W1	0.5	8	0	none	0
RP-Little Boulder Creek (Hwy 20 - Conf.)	LBO1	0.2	3	3	none	0
RP-Goat Creek (FR 52 Br. - Conf.)	GT1	2.2	33	4	none	0
RP-Hancock Creek (Wolf Cr. Rd. - Conf.)	HA1	0.2	3	0	none	0
Lost River (Sunset Cr. - Eureka Cr.)	L3	4.6	17	6	none	ns
Lost River (Eureka Cr. - Lost River Br.)	L2	5.8	11	7	none	ns
Lost River (Lost River Br. - Confluence)	L1	0.8	3	7	none	2
Early Winters (Klipchuch - Early Winters Br.)	EW5	1.4	0	0	none	ns
Early Winters (Early Winters Br. - Hwy 20)	EW4	2.1	0	0	none	ns
Early Winters (Highway 20 - Div. Dam)	EW3	2.9	23	6	none	ns
Early Winters (Div. Dam - Hwy 20 Br.)	EW2	0.3	0	0	none	3
Early Winters (Hwy 20 Br. - Conf.)	EW1	0.5	1	0	none	1
Upper Methow River tributary total		24.5	305	168		80

[1]Methow Hatchery outfall.

[2] Winthrop National Fish Hatchery outfall; data courtesy of Chris Pasley, USFWS.

ns = not surveyed.

Table 11. Lower Methow River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP.

Stream reach	Code	Dist (km)	2004	2005	2006	
					Expand rate	Redds
Lower Methow River						
Winthrop Br. - MVID Dam	M5	8.0	14	44	0.59	15
MVID Dam - Twisp Confluence	M4	7.2	24	50	none	0
Twisp Conf - Carlton	M3	21.1	38	123	0.59	44
Carlton - Upper Burma Bridge	M2	23.7	33	79	index	28
Upper Burma Bridge - Mouth	M1	20.1	42	67	0.59	10
Lower Methow River total		80.1	151	363		97
Lower Methow River tributaries						
Beaver Cr. (Lester Rd. Br. - Balky Hill Rd.)	BV3	5.0	16 [a]	2	none	ns
Beaver Creek (Balky Hill Rd. - Hwy 20)	BV2	5.8		14	none	ns
Beaver Creek (Hwy 20 - Conf.)	BV1	3.4	21	39	none	21
RP-Gold Cr. Upper NF (11.4 rkm - Ranch)	GD-N4	6.4	0	22	2.3 r/km	15
RP-Gold Cr. Mid. NF (Ranch - N.F. Br.)	GD-N3	0.9	0	3	2.3 r/km	2
RP-Gold Cr. Mid. NF (N.F. Br. - Whisp. Pines)	GD-N2	1.1	0	16	2.3 r/km	3
RP-Gold Cr. Lower NF (Whisp. Pines - 2nd Br.)	GD-N1	1.0	0	15	2.3 r/km	2
RP-Gold Cr. SF (1st Br. - 1.7 rkm)	GD-S3	4.4	0	30	2.3 r/km	10
RP-Gold Cr. SF (1.7 rkm - 0.6 rkm)	GD-S2	1.1	0	8	2.3 r/km	3
RP-Gold Cr. SF (0.6 rkm - Conf.)	GD-S1	0.6	0	4	2.3 r/km	1
RP-Gold Cr. Mainstem (2nd Br. - Private Land)	GD-M2	0.9	0	12	2.3 r/km	2
RP-Gold Cr. Mainstem (Private Land - Conf.)	GD-M1	1.1	0	15	2.3 r/km	3
RP-Foggy Dew Creek (FR 200 - Conf.)	FD1	4.2	0	14	2.3 r/km	10
RP-Black Canyon Cr. (2nd Br. - 0.8 rkm)	BC2	1.0	0	7	2.3 r/km	2
RP-Black Canyon Cr. (0.8 rkm - Conf.)	BC1	0.8	0	6	2.3 r/km	2
RP-Libby Creek (Lower Public Land)	LB4	1.0	0	7	index	2
RP-Libby Creek (Low Pub Land - Realty Land)	LB3	1.1	0	8	2.0 r/km	2
RP-Libby Creek (Realty Land)	LB2	0.3	0	2	index	1
RP-Libby Creek (Realty Land - Conf.)	LB1	1.0	0	7	3.3 r/km	3
Lower Methow tributary total		51.4	37	231		84

[a] Sections combined in 2004.
ns = not surveyed.

Table 12. Twisp River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP.

Stream reach	Code	Dist (km)	2004	2005	2006	
					Expand rate	Redds
Twisp River						
Road End CG. - South Cr. Br.	T10	4.6	15	9	none	ns
South Cr. Br. - Poplar Flats CG.	T9	3.2	9	6	0.24	4
Poplar Flats CG. - Mystery Br.	T8	3.2	2	17	0.24	29
Mystery Br. - War Cr. Br.	T7	6.9	88	112	0.49	47
War Cr. Br. - Buttermilk Br.	T6	7.4	9	78	0.49	70
Buttermilk Br. - Little Br. Cr.	T5	5.9	22	87	index	130
Little Br. Cr. - Twisp Weir	T4	3.8	94	25	index	34
Twisp Weir - Upper Poorman Br.	T3	3.5	3	32	0.38	32
Upper to Lower Poorman Bridge	T2	5.0	1	29	0.38	18
Lower Poorman Br. - Confluence	T1	2.9	0	20	0.38	5
Twisp River total		46.4	243	415		369
Twisp River tributaries						
Little Br. Cr. (Vetch Cr. - Upper Br.)	LBC3	3.0	ns	3	none	0
Little Bridge Cr. (Upp. Br. - Lower Br.)	LBC2	2.4	ns	4	none	1
Little Bridge Cr. (Lower Br. - Conf.)	LBC1	2.4	11	20	none	3
MSRF pond outfall[1]	MSRF1	0.1	2	11	none	0
RP-War Creek (FR 4430 - Conf.)	WR1	1.0	0	2	2.5 r/km	3
RP-Eagle Creek (Trailhead - Conf.)	EA1	1.3	0	2	2.5 r/km	3
RP-Buttermilk Cr. (Fork - Cattle Grd.)	BM2	2.1	0	13	2.5 r/km	5
RP-Buttermilk Cr. (Cattle Grd. - Conf.)	BM1	2.0	0	13	index	5
RP-South Creek (Falls - Conf.)	SO1	0.6	0	1	2.5 r/km	2
Twisp River tributary total		14.9	13	69		22

[1]Methow Salmon Recovery Foundation pond outfall
ns = not surveyed.

Table 13. Chewuch River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP.

Stream reach	Code	Dist (km)	2004	2005	2006	
					Expand rate	Redds
Chewuch River						
Chewuch Falls - 30 Mi. Br.	C13	4.2	0	0	none	ns
30 Mi. Br. - Road Side Camp	C12	4.6	3	0	none	ns
Road Side Camp - Andrews Cr.	C11	4.3	8	0	none	ns
Andrews Cr. - Lake Cr.	C10	4.0	23	0	none	ns
Lake Cr. - Buck Cr.	C9	2.2	0	0	none	ns
Buck Cr. - Camp 4	C8	2.4	3	0	none	ns
Camp 4 - Chewuch CG.	C7	5.1	10	0	none	ns
Chewuch CG. - Falls Cr. CG.	C6	5.8	3	0	none	ns
Falls Cr. CG. - 8 Mile Cr.	C5	3.7	8	0	none	ns
8 Mile Cr. - Boulder Cr.	C4	3.7	5	20	index	2
Boulder Cr - Chewuch Br.	C3	1.8	0	0	none	ns
Chewuch Br. - WDFW Land	C2	7.5	8	0	none	ns
WDFW Land - Confluence	C1	5.1	3	0	none	ns
Chewuch River total		54.4	74	20		2
Chewuch River tributaries						
Eightmile Creek (500m abv. div. - Conf.)	EM1	0.8	4	28	none	4
RP-Boulder Creek (Falls - 1st Bridge)	BD2	0.8	0	5	index	6
RP-Boulder Creek (1st Bridge - Conf.)	BD1	0.8	0	2	index	1
RP-Lake Creek (Black Lk. - 1st Bridge)	LK2	10.1	0	0	4.4 r/km	44
RP-Lake Creek (1st Bridge – Conf.)	LK1	0.8	0	0	4.4 r/km	4
RP-Andrews Creek (L. And. Cr. – 1st Br.)	AN2	0.3	0	1	4.4 r/km	1
RP-Andrews Creek (1st Bridge - Conf.)	AN1	0.2	0	1	4.4 r/km	1
RP-Twentymile Creek (Falls - FR 5010)	TW2	0.9	0[a]	1[a]	4.4 r/km	4[a]
RP-Twentymile Creek (FR 5010 - Conf.)	TW1	0.1			4.4 r/km	
Chewuch River tributary total		14.8	4	38		65

ns = not surveyed.
[a]Expansions calculated before delineation of two reaches.

Based on biological sampling of the 2006 broodstock, most hatchery-origin steelhead were 2-salt fish (81.6%). The majority of wild steelhead were also 2-salt fish (63.6%), most of which (86.3%) exhibited a 2-year freshwater scale pattern. Using expanded redd counts by tributary and the mean fecundity from Wells Hatchery broodstock (N = 6,264 for hatchery origin fish and N = 6,067 for wild origin fish), an estimated 5,059,260 eggs were deposited in the Methow Basin (Table 14). Egg deposition decreased in all sub-basins compared to 2005 due to lower numbers of redds. Overall mean fecundity of females was slightly higher in 2006 because of the large proportion of 2-salt females, but poor survey conditions in many reaches likely resulted in

underestimates of total redds per sub-basin. Thus, egg deposition within each sub-basin should be considered a minimum value.

Table 14. Estimated 2006 spawning escapement and steelhead egg deposition in Methow Basin.

Sub-basin	Expanded redds	Sub-basin proportion	Estimated egg deposition		
			2004	2005	2006
Upper Methow	171	21.1%	2,230,826	3,756,517	1,068,066
Chewuch	67	8.3%	364,026	336,231	418,482
Twisp	391	48.3%	1,194,752	2,805,792	2,442,186
Lower Methow	181	22.3%	877,396	3,443,472	1,130,526
Methow Basin	810	100.0%	4,667,000	10,342,012	5,059,260

Natural Replacement Rate (NRR) and Stray Rates

Of the 1,334 steelhead trapped and sampled at Wells Dam, 124 were determined to be wild (9.3%). Although some wild fish were released during trapping, scale samples collected during spawning of the broodstock confirmed the age and origin of 88 wild steelhead (12.48% of the wild fish passing Wells Dam; Table 15). The NRR of the steelhead population above Wells Dam was below the value necessary to replace the parent population (i.e., ≥ 1.0) in each of the five brood years examined (Table 16). The NRR values for steelhead above Wells Dam were calculated using run-escapement values from both spawners and recruits. Ideally, these calculations should use the actual number of fish that spawned and only those progeny that survived to spawn or were harvested. Conversely, the HRR greatly exceeded the NRR for all brood years examined.

Table 15. Wild steelhead sampling at Wells Hatchery and expanded age composition by brood year.

Brood year	Wild fish			Expanded return at age				Total
	Total	Sampled	Sample rate	1.1	1.2, 2.1	1.3, 3.1, 2.2	2.3, 3.2	
2006	705	88	0.1248	8	208	433	56	705
2005	773	66	0.0854	12	351	410	0	773
2004	946	115	0.1216	16	732	189	8	946
2003	818	25	0.0306	0	0	720	98	818
2002	843	18	0.0214	47	281	422	94	843
2001	537	26	0.0484	21	413	103	0	537
2000	443	39	0.0880	34	239	148	23	443
1999	215	25	0.1163	9	69	138	0	215

Table 16. Run escapement and NRR of the above Wells Dam steelhead population calculated from broodstock sampling at Wells Hatchery. Escapement values are derived from data from the Fish Passage Center.

Parent brood	Run escapement	Brood at age				Recruits produced	NRR	HRR
		1.1	1.2, 2.1	1.3, 3.1, 2.2	2.3, 3.2			
1996	945	1999	2000	2001	2002	444	0.4699	14.3
1997	4,127	2000	2001	2002	2003	967	0.2343	16.1
1998	4,107	2001	2002	2003	2004	1,030	0.2507	39.0
1999	2,668	2002	2003	2004	2005	236	0.0885	48.0
2000	3,557	2003	2004	2005	2006	1,198	0.3368	6.6

Non-supplemented reference streams for Methow and Okanogan steelhead populations have not been identified. Spatial references are necessary to determine if supplementation has benefited target populations. The lack of spatial reference populations or a suitable alternative has been identified as a data gap.

The ability to detect stray Wells hatchery steelhead in non-target streams is limited. Homing fidelity of juvenile hatchery steelhead released into the Okanogan or Methow Basin is unknown and has been identified as a data gap. Although, elastomer tagged Wells hatchery steelhead have not been recovered during broodstock collection in the Wenatchee River (A. Murdoch, WDFW, personal communication). Determining stray rates of Wells hatchery steelhead requires that an adequate number of juvenile fish must be uniquely marked by release location (i.e., elastomer or PIT tagged).

The number of out-of-basin stray steelhead (e.g., Wenatchee basin fish) upstream of Wells Dam was estimated at 520 fish (2006 brood). The number of stray fish in the 2005 brood spawning escapement above Wells dam was estimated to contain 1,701 stray hatchery fish. Although these fish were assigned a basin for escapement purposes, the ultimate fate or spawning stream of these fish is unknown.

Discussion

Based on sampling at Wells Dam, approximately 7.3% of the steelhead passing the dam in 2005 (2006 brood) were stray fish from the Wenatchee River. Whether or not these stray fish spawned above Wells Dam is unknown. Because few steelhead carcasses are recovered on spawning ground surveys, the extent to which Wells Hatchery steelhead stray within their basin of release is also unknown. Recovery of PIT tags from 2003 and 2004 brood Wells Hatchery steelhead returning in 2005 (N = 2,165) indicates that no straying into the Snake River occurred. For tributaries upstream or downstream of the Snake River without PIT tag detection equipment the stray rate for Wells Hatchery fish is unknown.

Origin composition of escapement above Wells Dam relies on data collected at Wells Dam during hatchery broodstock collection. Because broodstock collection ends approximately five

months before the start of natural spawning, the actual spawning composition may substantially differ from the estimated escapement because of dam fallback, over-winter mortality, and straying. Comparisons of run and spawning escapement estimates are further confounded by the assumptions used in calculating run escapement estimates. Additional research is needed to determine the homing fidelity of Wells hatchery fish to their respective release location and the distribution of wild steelhead to the Methow and Okanogan basins (e.g., PIT tag antenna arrays or radio tags).

Total spawning escapement was likely underestimated due to poor survey conditions, particularly in the Chewuch sub-basin. The estimated spawning escapement derived from redd counts was only 29% of estimated run escapement to the Methow basin. Stream survey crews were only able to survey the Chewuch River index reach three times and found two redds. No other mainstem Chewuch River reaches were surveyed. The number of redds in Chewuch sub-basin tributaries ($N = 65$) suggests that a fair number of fish spawned in the Chewuch sub-basin in 2006. Chewuch River steelhead production will likely be underestimated for a number of years due to prolonged post-fire effects (i.e., increased runoff, sedimentation, turbidity).

Analysis of the run timing of hatchery and wild fish passing Wells Dam suggest wild fish migrate earlier than hatchery fish. Although a more detailed analysis is required to remove any bias due to differences in age. Spawn timing of hatchery and wild fish in the hatchery environment was different and data collected during spawning ground surveys suggests a similar pattern. Spawning distribution of hatchery and wild fish in the natural environment could not be determined because not all hatchery fish were adipose fin-clipped. Until such a time that all hatchery fish are adipose fin-clipped, quantifying differences in spawn timing and distribution will require comprehensive tagging and recovery projects utilizing radio tags or externally visible tags (e.g., spaghetti tags).

Although the NRR was below replacement levels for each of the broods examined, these data were based on estimates of run escapement and may underestimate the true productivity of the populations. In addition, current NRR values are calculated for the composite population. Methods need to be developed to annually estimate the number of hatchery and wild steelhead that migrate (i.e., run escapement) and spawn (spawning escapement) in the Methow and Okanogan rivers.

Given the extreme differences in habitat conditions within the Methow and Okanogan basins, determining the number of wild and hatchery steelhead returning to each population should be of the highest priority. Secondly, an assessment of the relative reproductive success of hatchery and wild steelhead is necessary to determine the fitness of the current population. Without understanding current differences in fitness, any effects of changes in hatchery operations or management (i.e., proportion of hatchery fish on the spawning grounds) may not be detectable. Furthermore, determining the relative reproductive success may also improve our understanding of the carrying capacity of steelhead in the Methow Basin. Lastly, the comparison of life-history traits (spawning timing and distribution) should be conducted concurrently with the study of reproductive success. Differences in reproductive success may simply be explained by differences in spawn timing or location.

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Appendix A1. Upper Methow River sub-basin steelhead redd counts by section and survey year. Section descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006
Upper Methow River						
Ballard CG. - Lost R.	M15	ns	15	27	17	3
Lost R. - Gate Cr.	M14	ns		10	51	0
Gate Cr. - Early Winters Cr.	M13	ns	215[a]	23	60	15
Early Winters Cr. - Mazama Br.	M12	ns		0	43	3
Mazama Br. - Susp. Br.	M11	70	44[a]	12	25	9
Susp. Br. - Weeman Br.	M10	156		8	52	26
Weeman Br. - Along Hwy 20	M9	ns		93	180	30
Along Highway 20 - Wolf Cr.	M8	ns	325[a]	0	9	0
Wolf Cr. - Foghorn Dam	M7	ns		0	9	5
Foghorn Dam - Winthrop Br.	M6	ns		0	34	0
Upper Methow River total		226	599	173	480	91
Lost River						
Sunset Cr. - Eureka Cr.	L3	ns	ns	17	6	ns
Eureka Cr. - Lost River Br.	L2	10	25	11	7	ns
Lost River Br. - Confluence	L1	1	0	3	7	2
Early Winters Creek						
Klipchuck CG. - Early Winters Br.	EW5	ns	ns	0	0	ns
Early Winters Br. - Highway 20 Br.	EW4	ns	ns	0	0	ns
Highway 20 Br. - Diversion Dam	EW3	ns	ns	23	6	ns
Diversion Dam - Hwy 20 Br.	EW2	ns	ns	0	0	3
Hwy 20 Br. - Confluence	EW1	ns	ns	1	0	1
Suspension Creek	SP1	ns	ns	43	37	31
MH Outfall[1]	MH1	15	ns	18	15	14
WNFH Outfall[2]	WN1	171	61	113	83	29
Wolf Creek	W2	ns	ns	29	0	0
Wolf Creek	W1	ns	ns	8	0	0
Little Boulder Creek	LBO1	ns	ns	3	3	0
Goat Creek	GT1	ns	ns	33	4	0
Hancock Creek	HA1	ns	ns	3	0	0
Upper Methow River sub-basin total		423	685	478	648	171

[a] Reaches M12-M14, M10 and M11, and M6-M9 were combined in 2003.
ns = not surveyed.
[1] Methow State Fish Hatchery outfall.
[2] Winthrop National Fish Hatchery outfall.

Appendix A2. Lower Methow River sub-basin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006
Lower Methow River						
Winthrop Br. - MVID Dam	M5	ns	89[a]	14	44	15
MVID - Twisp Confluence	M4	ns		24	50	0
Twisp Confluence - Carlton	M3	ns	69	38	123	44
Carlton - Upper Burma Bridge	M2	ns	99	33	79	28
Upper Burma Bridge - Mouth	M1	ns	58	42	67	10
Lower Methow River total		ns	315	151	363	97
Beaver Creek						
Lester Rd Br. - Balky Hill Rd	BV3	ns	ns	16[b]	2	ns
Balky Hill Rd - Hwy 20	BV2	ns	ns		14	ns
Hwy 20 - confluence	BV1	70	15	21	39	21
Lower Methow River tributaries						
Gold Cr. Upper North Fork	GD-N4	ns	ns	0	22	15
Gold Cr. Upper North Fork	GD-N3	ns	ns	0	3	2
Gold Cr. Upper North Fork	GD-N2	ns	ns	0	16	3
Gold Cr. Lower North Fork	GD-N1	ns	ns	0	15	2
Gold Cr. South Fork	GD-S3	ns	ns	0	30	10
Gold Cr. South Fork	GD-S2	ns	ns	0	8	3
Gold Cr. South Fork	GD-S1	ns	ns	0	4	1
Gold Cr. - Mainstem Index	GD-M2	ns	ns	0	12	2
Gold Cr. - Mainstem Index	GD-M1	ns	2	0	15	3
Foggy Dew Creek	FD1	ns	ns	0	14	10
Black Canyon Creek	BC2	ns	ns	0	7	2
Black Canyon Creek	BC1	ns	ns	0	6	2
Libby Creek	LB4	ns	ns	0	7	2
Libby Creek	LB3	ns	ns	0	8	2
Libby Creek	LB2	ns	ns	0	2	1
Libby Creek	LB1	ns	ns	0	7	3
Lower Methow River sub-basin total		70	332	188	594	181

[a] Sections M5 and M4 were combined in 2003.
[b] Sections BV2 and BV3 were combined in 2004.
ns = not surveyed.

Appendix A3. Twisp River sub-basin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries.

River/section	Code	2001	2002	2003	2004	2005	2006
	Twisp River						
Road End CG. - South Cr. Br.	T10	ns	ns	33	15	9	ns
South Cr. Br. - Poplar Flats CG.	T9	ns	ns	5	9	6	4
Poplar Flats CG. - Mystery Br.	T8	ns	ns	17	2	17	29
Mystery Br. - War Cr. Br.	T7	2	ns	36	88	112	47
War Cr. Br. - Buttermilk Br.	T6	40	ns	91	9	78	70
Buttermilk Br. - Little Br. Cr.	T5	47	156	322[a]	22	87	130
Little Br. Cr. - Twisp Weir	T4	100	194		94	25	34
Twisp Weir - Upper Poorman Br.	T3	48	ns	88	3	32	32
Up. P'man Br. - Low. P'man Br.	T2	46	ns	14	1	29	18
Lower Poorman Br. - Confluence	T1	29	ns	90	0	20	5
Twisp River total		312	350	696	243	415	369
	Twisp River tributaries						
Little Bridge Cr.	LBC3	ns	ns	ns	ns	3	0
Little Bridge Cr.	LBC2	ns	ns	ns	ns	4	1
Little Bridge Cr.	LBC1	ns	ns	ns	11	20	3
MSRF pond outfall[1]	MSRF1	ns	ns	ns	2	11	0
War Creek	WR1	ns	0	0	0	2	0
Eagle Creek	EA1	ns	ns	ns	0	2	3
Buttermilk Creek	BM2	ns	ns	ns	0	13	5
Buttermilk Creek	BM1	ns	4	0	0	13	5
South Creek	SO1	ns	ns	ns	0	1	2
Twisp River sub-basin total		312	354	696	256	484	388

[1] Methow Salmon Recovery Foundation pond outfall.

[a] Sections T4 and T5 were combined in 2003.

ns = not surveyed.

Appendix A4. Chewuch River sub-basin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006
	Chewuch River					
Chewuch Falls - 30 Mi. Br.	C13	ns	ns	0	0	ns
30 Mi. Br. - Road Side Camp	C12	ns	14	3	0	ns
Road Side Camp - Andrews Cr.	C11	ns	3	8	0	ns
Andrews Cr. - Lake Cr.	C10	ns	8	23	0	ns
Lake Cr. - Buck Cr.	C9	ns	9	0	0	ns
Buck Cr. - Camp 4	C8	ns	3	3	0	ns
Camp 4 - Chewuch CG.	C7	ns	6	10	0	ns
Chewuch CG. - Falls Cr. CG.	C6	ns	26	3	0	ns
Falls Cr. CG. - 8 Mile Cr.	C5	ns	44	8	0	ns
8 Mile Cr. - Boulder Cr.	C4	105	134	5	20	2
Boulder Cr. - Chewuch Br.	C3	ns	0	0	0	ns
Chewuch Br. - WDFW Land	C2	ns	35	8	0	ns
WDFW Land - Confluence	C1	ns	3	3	0	ns
Chewuch River total		105	285	74	20	2
	Chewuch River tributaries					
Eightmile Creek	EM1	5	20	4	28	4
Boulder Creek	BD2	ns	0	0	5	6
Boulder Creek	BD1	4	0	0	2	1
Lake Creek	LK2	ns	ns	0	0	44
Lake Creek	LK1	1	1	0	0	4
Andrews Creek	AN2	ns	ns	0	1	1
Andrews Creek	AN1	ns	ns	0	1	1
Twentymile Creek	TW2	ns	ns	0[a]	1[a]	4[a]
Twentymile Creek	TW1	ns	ns			
Chewuch River sub-basin total		115	306	78	58	67

ns = not surveyed.
[a]Expansions calculated before delineation of two reaches.

Chapter 5

2006 Brood Spring Chinook Spawning Ground Surveys conducted in the Methow River Basin

Abstract

The Methow River basin was divided into three geographic sub-basins; Methow River (upstream of Twisp), Chewuch River, and Twisp River with designated index areas in each sub-basin to determine spawn timing, distribution, and abundance. Spawning ground surveys were performed on foot between 31 July and 29 September. We estimated a minimum of 929 Chinook redds were constructed in the Methow River basin in 2006. The Methow River sub-basin, which includes the Lost River, Early Winters Creek, and both hatchery outfalls had the greatest number of redds (N = 569). The Chewuch River (N = 273) had fewer redds than the mainstem Methow River (N = 395), and the fewest redds were located in the Twisp River (N = 87). Peak spawning occurred between 27 August and 8 September in index areas of all three sub-basins.

An estimated 4,365 spring Chinook migrated past Wells Dam in 2006. No estimates of dam fallback, poaching, or pre-spawn mortality were made. Based on male-to-female ratios at Wells Dam (0.88:1.0), an estimated 1,748 fish spawned in the Methow River Basin. After removing fish collected for hatchery broodstock (N = 780), and fish bound for the Okanogan River (N =110), the estimated spawning population represents only 50.3% of the estimated escapement to the Methow River Basin of 3,475 fish.

The estimated overall spawning population in 2006 was composed primarily of hatchery origin Chinook (81.2%). However, differences in the estimated proportion of wild fish were evident among sub-basins with the Twisp and Chewuch Rivers having greater proportions of wild fish (39.4% and 26.3%, respectively) than the Methow River and tributaries (12.0%). Age-4 fish were the majority of local-hatchery Chinook (95.5%) and wild Chinook (68.0%) carcasses recovered in the Methow Basin. The proportion of age-5 fish was much greater for wild Chinook (32.0%) than for hatchery fish (4.5%). The Natural Replacement Rate (NRR) for the most recent brood of spring Chinook with complete recovery data (2000 brood) was highest in the Twisp River sub-basin (1.45 fish per spawning adult). The geometric mean NRR for brood years 1992 to 1999 was less than 1.0 fish per spawning adult in each sub-basin. Of all the coded-wire tagged hatchery fish recovered on spawning grounds in 2006, 30.5% were classified as within-basin strays and 5.4% were stray fish from other basins.

Introduction

Spring Chinook spawning ground surveys were used to evaluate spawn timing, distribution, spawner demographics, and tributary specific spawning escapement within the Methow River Basin. Spring Chinook propagated at Methow Fish Hatchery (MH) are used to supplement natural spawning populations in the Methow, Twisp, and Chewuch river sub-basins. As such, returning hatchery adults should have similar migration timing, spawn timing, and redd distributions to that of naturally produced fish. Most spring Chinook reared at MH were marked

with unique coded-wire tags (CWT) based on their sub-basin of release. In some cases, individual families, progeny from adults with elevated ELISA values, or juveniles released as subyearlings were also marked with unique CWT codes. Recovery of CWT from spawning ground surveys provides the data necessary to estimate hatchery stray rates and spawning ground composition of target streams. Hatchery fish may stray within their basin of release, or to other river basins, and may contribute to the loss of genetic variation within or between populations. In the upper Columbia River Basin, comprehensive spawning ground surveys are conducted for most Chinook stocks.

The implementation of the Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas County PUD (M&E Plan; Wells HCP HC 2005), as proposed by the Supplementation Research Team (SRT 2005) included eight objectives designed to answer issues regarding supplementation programs in the Methow Basin. This chapter addresses elements of the M&E Plan related to spring Chinook spawning ground surveys in 2006, and specifically addresses the following objectives:

Objective 1: Determine if a) supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e., reference stream), and b) changes in the natural replacement rate (NRR) of the supplemented population are similar to that of the non-supplemented population.

- Ho: Δ Total spawners $_{\text{Supplemented population}} > \Delta$ Total spawners $_{\text{Non-supplemented population}}$
- Ho: Δ NOR $_{\text{Supplemented population}} = \Delta$ NOR $_{\text{Non-supplemented population}}$
- Ho: Δ NRR $_{\text{Supplemented population}} = \Delta$ NRR $_{\text{Non-supplemented population}}$

Objective 2: Determine if migration timing, spawn timing, and redd distribution of both natural and hatchery components of the target population are similar.

- Ho: Migration timing$_{\text{Hatchery}}$ = Migration timing$_{\text{Naturally produced}}$
- Ho: Spawn timing$_{\text{Hatchery}}$ = Spawn timing$_{\text{Naturally produced}}$
- Ho: Redd distribution$_{\text{Hatchery}}$ = Redd distribution$_{\text{Naturally produced}}$

Objective 4: Determine if hatchery adult-to-adult survival (i.e., Hatchery Replacement Rate, HRR) is greater than natural adult-to-adult survival (i.e., Natural Replacement Rate, NRR).

- Ho: Sub-basin HRR $\geq$ Sub-basin NRR

Objective 5: Determine if the stray rate of hatchery fish is below acceptable levels to maintain genetic variation.

- Ho: Stray rate $_{\text{Hatchery fish}}$ < 5% total brood return

- Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations

- Ho: Stray rate$_{\text{Hatchery fish}}$ < 10% total within independent populations

Methods

Migration Timing and Run Composition

Adult spring Chinook were randomly sampled every fourth day at Wells Dam to assess migration timing and run composition from 15 May through 10 July 2006. All trapped fish were sampled for length, origin (i.e., CWT, scales), and hatchery marks were recorded. Gender was estimated using secondary sexual characteristics (e.g., snout elongation, body depth). Fish were tagged in the dorsal sinus on the left side of the body with passive integrated transponder (PIT) tags to assess sex ratio and carcass recovery bias of the 2006 brood. Sex, length, and origin of carcasses recovered on the spawning grounds or within hatchery broodstocks was used to determine carcass recovery bias based on fish size (Zhou 2002, Murdoch et al. 2006) and estimate sex ratio of the run.

During Wells trapping operations, fish assumed to have originated from Okanogan Basin hatchery releases (i.e., left-ventral fin clip) were not sampled. During sampling, adipose fin-clipped fish that were exposed to MS-222 (tricaine methane sulfonate) were marked with an anchor tag in the posterior of the dorsal fin to allow exclusion from consumptive fisheries (i.e., tribal or sport summer Chinook). All fish trapped were transported and released above Wells Dam.

A review of videotape records of fish passage at Wells Dam from the spring Chinook passage period was conducted to exclude summer Chinook included in the Wells Dam spring Chinook count. Summer chinook were distinguished from spring Chinook based on body color and lack of secondary sexual characteristics. We reviewed video records between June 23 and July 8 for both east and west ladders and through July 12 for the west ladder. No estimates of pre-spawn mortality, illegal removal (i.e., poaching) or dam fallback were made.

Redd Distribution and Spawn Timing

The Methow River basin was divided into three geographic sub-basins, Methow River (upstream of Twisp), Chewuch River, and Twisp River. Index areas of annual spawning activity were established within each sub-basin based on historic survey information to estimate spawn timing of hatchery and wild fish. Spring Chinook redds were individually flagged with date, redd number, and instream location on each flag. Each location was also recorded with Global Positioning System (GPS) technology for subsequent mapping. All mainstem reaches were surveyed each week during the spawning season (August and September). Although several reaches in the middle and upper Chewuch River were closed during various times throughout the

season due to forest fire danger. Selected smaller tributaries were also surveyed weekly during the spawning season based on historic spring Chinook spawning. Dewatered redds were quantified during surveys in areas where stream flow was completely sub-surface.

Spawner Composition, Demographics, and Egg Deposition

Spawning population characteristics were derived from biological data collected from carcasses recovered during surveys. Location, origin, sex, fork length, post orbital-to-hypural plate (POH) length, egg retention (females), and scale samples were collected from each carcass when applicable. Tissue samples were collected (4 opercle punches) for genetic analyses (Chapter 6). Locations of carcasses were recorded using GPS technology. All carcasses were sampled for coded wire tags (CWT) using hand-held electronic detection wands, and snouts were collected from all fish where the presence of a CWT was indicated. Most fish released from local hatcheries in recent years have been marked with only a CWT, thus requiring the use of electronic detectors. Most other fish hatcheries in the Upper Columbia still use adipose fin-clips and CWTs in varying combinations to designate hatchery origin. Snouts were sent to the WDFW CWT Lab for tag extraction and decoding. Scales were sent to the WDFW Scale Lab for age confirmation. Tails from all sampled carcasses were removed to prevent repeat sampling. Fish age was determined either through CWT decoding or scale analysis. Scale analysis was also used to confirm origin for fish with no mark (i.e., no CWT, intact adipose fin).

Egg retention (%) was determined by the number of eggs present in the body cavities of female carcasses compared to the mean fecundity of broodstock at MH. Eggs were counted from each carcass with an intact abdomen. Greatly decomposed or scavenged carcasses were not examined for egg retention. Female carcasses with intact abdominal cavities, a large number of eggs, and no external signs that spawning had occurred (i.e., eroded caudal fin) were considered to be pre-spawn mortalities. Estimated egg deposition was calculated using mean fecundities from Methow Hatchery broodstock (i.e., MetComp stock for the Methow and Chewuch sub-basins, Twisp stock for the Twisp sub-basin) and adjusting for mean egg retention.

Natural Replacement Rate

Natural Replacement Rate (NRR) for each brood was calculated by adding the number of recruits (r) from successive return years (i) that originated from the same broodyear. The result was divided in the following formula by the number of spawners (S) for that brood year calculated from expanded spawning ground carcass surveys:

$$NRR = r_{i+1} + r_{i+2} + r_{i+3} + \ldots / S$$

Estimated spawning escapement was derived from redd counts and based on fish-per-redd values calculate from Wells Dam counts and adjusted for the proportion of jacks (age-3 fish) in the run (Meekin 1967). Recruits were expanded to account for non-selective fishery harvest and indirect mortality attributed to selective fisheries.

Stray Rates

Hatchery origin composition on spawning grounds was determined by expanding all CWT recoveries by the mark rate for each tag code and the reach-specific sampling rates from

spawning ground surveys. Hatchery fish were assigned to one of four categories depending on release and recovery location (i.e., local, within-basin, out-of-basin, or unknown hatchery). Local fish were all Methow River Basin fish recovered in the stream, or sub-basin from which they were released. Within-basin strays were all Methow River Basin fish recovered in a stream or sub-basin from which they were not released. Out-of-basin strays were all fish recovered that were released outside the Methow River Basin. Unknown hatchery fish were all fish for which release river or hatchery could not be determined (i.e., ad-clip only, no mark).

Statistical Analyses

For all comparisons of hatchery and wild fish, only local hatchery fish were used within specific tributary release locations (i.e., Chewuch River recoveries that were released from the Chewuch River, etc.). Differences in migration timing among age classes of hatchery and wild fish were tested using Kruskal-Wallis Analysis Of Variance (KW ANOVA). Sub-basin redd distribution was tested using the Mann-Whitney U-test (one factor non-parametric test). Female carcass locations (river kilometers, RKM) were used as surrogates for redd distribution because most hatchery fish lack an externally visible mark confounding the ability to determine origin of actively spawning fish. Differences in spawn timing between hatchery and wild females by sub-basin were tested using KW ANOVA. Hatchery Replacement Rate and NRR were tested by origin and sub-basin using Mann-Whitney U-tests. Stray rates were tested using one-sample t-tests.

Objective 1 of the M & E Plan requires the use of spatial reference populations. Reference populations are currently being investigated and once identified, similar data for those populations will be included in future reports.

Results

Migration Timing and Run Composition

The 2006 spring Chinook migration to Wells Dam was monitored between 15 May and 14 July. During this period, the majority of fish migrated between 20 May and 19 June (Figure 1). Differences in migration timing between hatchery and wild age-4 and 5 fish were not significant (KW ANOVA, $P = 0.06$; Figure 2). Age-3 fish were not included in statistical analyses because no wild age-3 fish were encountered during trapping operations at Wells Dam. .

The spring Chinook run above Wells Dam was composed primarily of hatchery fish (90.5%), the majority of which were not adipose fin-clipped (Table 1). Based on spawning ground and broodstock recoveries of PIT-tagged fish, gender determination at Wells Dam was 80.4% accurate for female Chinook and 80.6% accurate for male fish. After correction, the gender ratio of males to females of fish sampled at Wells Dam was 0.88 to 1.0 or a fish-per-redd value of 1.88, assuming females construct a single redd and males spawn with a single female. After removing fish bound for the Okanogan River ($N = 110$) and fish collected for hatchery broodstock ($N = 780$), the estimated run escapement to the Methow River was 3,475 fish.

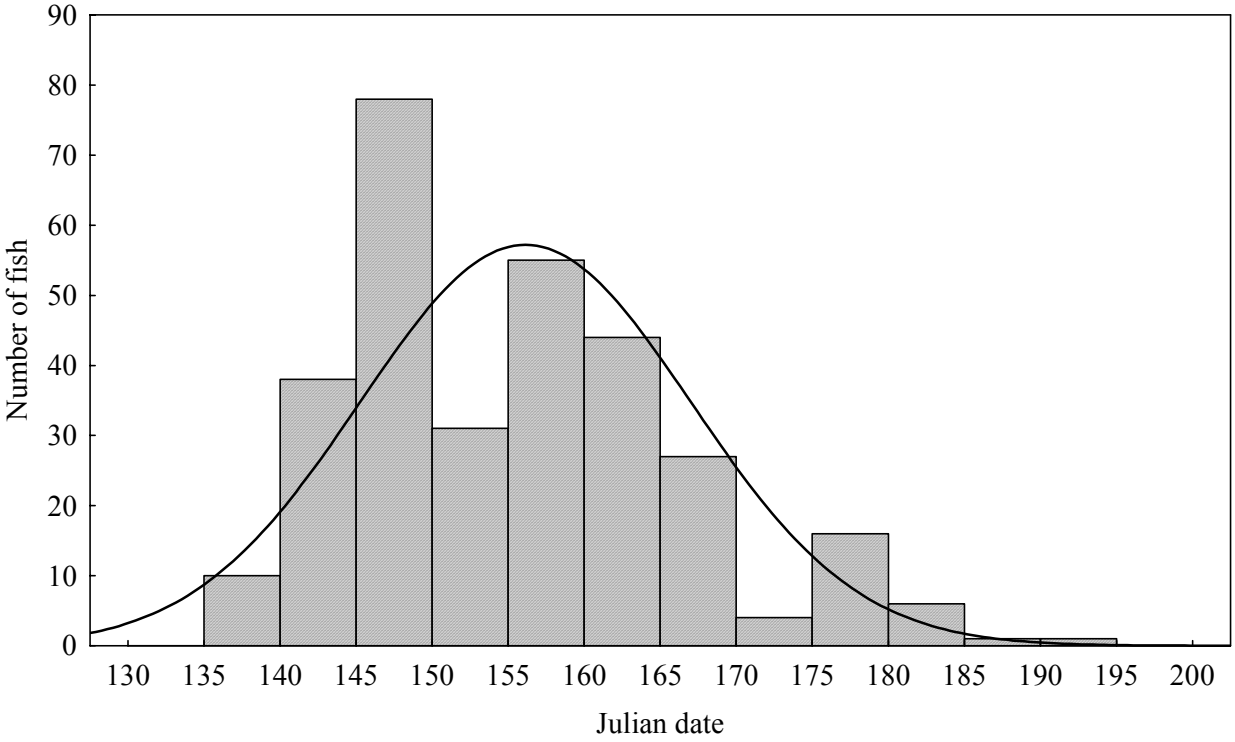

Figure 1. 2006 spring Chinook migration timing to Wells Dam. All fish sampled during trapping operations are included.

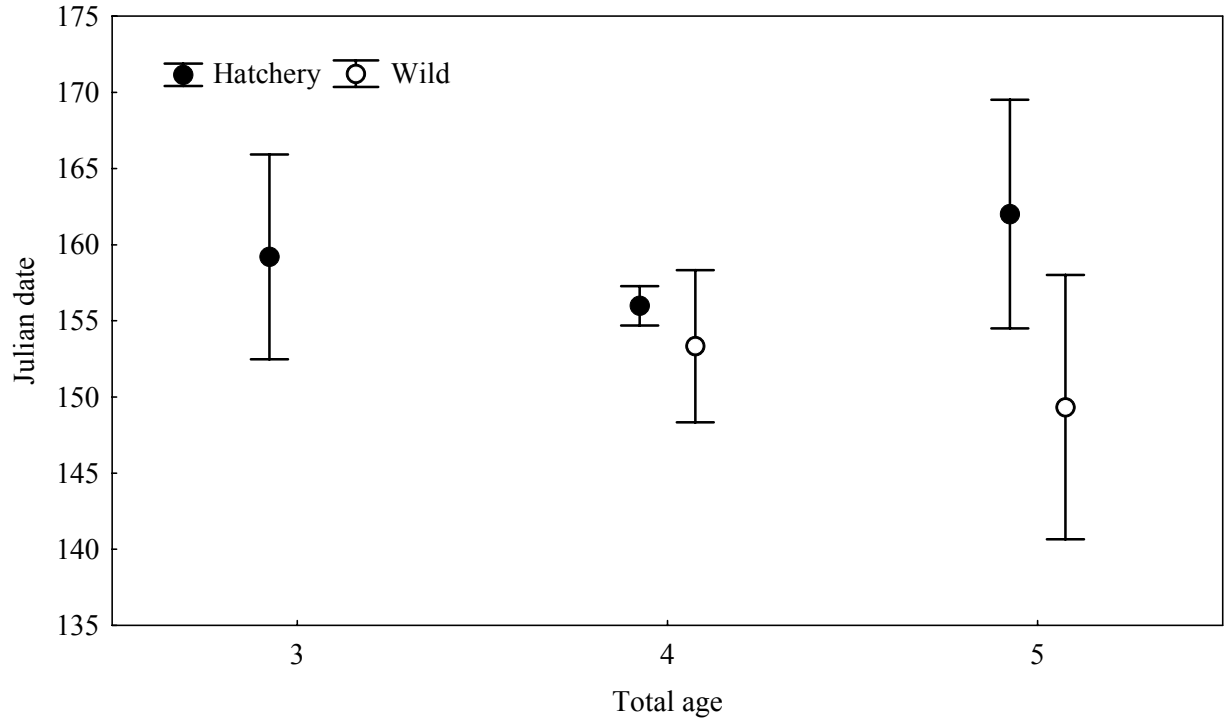

Figure 2. Mean migration timing by Julian date to Wells Dam of 2006 spring Chinook. Error bars represent 95% confidence intervals.

Table 1. The 2006 spring Chinook run composition above Wells Dam based on random trapping every fourth day. Left-ventral-clip only fish are Okanogan River releases. Estimated run above Wells Dam includes fish collected for broodstock (N = 780).

Origin	Mark	Proportion (%)	Estimated run above Wells
Hatchery	Coded-wire tag (CWT-only)	57.3	2,502
	Ad-clip only	18.1	790
	None	8.0	351
	Ad-clip + CWT	4.5	197
	Left-ventral-clip only	2.5	110
Wild	None	6.9	302
Unknown	None	2.6	113
Total		100.0	4,365

Redd Distribution and Spawn Timing

Spawning ground surveys were performed on foot between 31 July and 29 September. The majority (61.2 %) of 2006 Methow Basin spring Chinook redds (N = 569) were found in the Methow River sub-basin (Table 2; Figure 3). The greatest number of redds within the Methow River sub-basin were found in the 9 km downstream of Weeman Bridge (N = 173). A total of 174 redds were found in Methow River tributaries including 96 redds in the Methow (N = 75) and Winthrop (N = 21) Hatchery outfalls (Table 2). The Chewuch River sub-basin had 273 redds (Table 3; Figure 4) and 87 redds were found in the Twisp sub-basin (Table 4; Figure 5). In 2006, wild females spawned on average 22 km and 11 km farther upstream than hatchery females in the Methow and Twisp sub-basins, respectively (Mann-Whitney U-test; $P < 0.01$; Figure 6). There was no difference in redd distribution between wild and hatchery females in the Chewuch sub-basin (Mann-Whitney U-test; $P = 0.24$; Figure 6).

Peak spawning occurred between 27 August and 8 September in index areas of all three sub-basins. Based on the female carcass recovery data, no differences in spawn timing (Julian date) between hatchery and wild fish were detected for any sub-basin (Figure 7; KW ANOVA, P = 0.69).

Table 2. 2006 spring Chinook redd distribution, estimated spawning escapement, and carcass recoveries in the Methow River sub-basin.

Reach	Redds		Estimated spawning escapement	Carcasses				
	Count	Sub-basin proportion (%)		Recoveries			Expanded count	
				H	W	Total	H	W
			Methow River					
M15	6	1.1	11	2	2	4	6	5
M14	17	3.0	32	4	4	8	15	14
M13	5	0.9	9	5	6	12[a]	5	7
M12	20	3.5	38	11	1	12	35	3
M11	24	4.2	45	21	6	27	35	10
M10	36	6.3	68	19	2	21	62	6
M9	173	30.4	325	93	8	105[a]	299	26
M8	9	1.6	17	4	1	5	14	3
M7	59	10.3	111	48	0	48	61	0
M6	46	8.1	86	135	0	136[a]	131	0
M5	0	0.0	0	4	0	5[a]	5	0
Total	395	69.4	742	346	30	383	668	74
			Lost River					
L3	0	0.0	0	0	0	0	0	0
L2	26	4.5	49	1	5	6	8	41
L1	2	0.4	4	0	0	0	1	3
Total	28	4.9	53	1	5	6	9	44
			Early Winters Creek					
EW5	0	0.0	0	0	0	0	0	0
EW4	0	0.0	0	0	0	0	0	0
EW3	9	1.6	17	0	0	0	16	0
EW2	1	0.2	2	2	0	3[a]	3	0
EW1	4	0.7	8	0	1	1	0	8
Total	14	2.5	27	2	1	4	19	8
			Methow River tributaries					
MH1	75	13.2	141	83	1	84	139	2
SP1	36	6.3	68	6	0	6	68	0
WN1	21	3.7	39	8	0	8	39	0
Total	132	23.2	248	97	1	98	246	2
Grand total	569	100.0	1,070	446	37	491[a]	942	128

[a] Includes fish of unknown origin.

Table 3. 2006 spring Chinook redd distribution, estimated spawning escapement, and carcass recoveries in the Chewuch River sub-basin.

Reach	Redds		Estimated spawning escapement	Carcasses				
	Count	Sub-basin proportion (%)		Recoveries			Expanded count	
				H	W	Total	H	W
C12	1	0.4	2	2	0	2	2	0
C11	1	0.4	2	1	0	1	2	0
C10	9	3.3	17	6	3	9	11	5
C9	0	0	0	1	0	1	1	0
C8	10	3.7	19	13	3	16	15	4
C7	32	11.7	60	23	11	34	41	19
C6	54	19.8	102	22	9	31	72	30
C5	22	8.1	41	10	6	16	26	15
C4	63	23.1	118	21	12	33	68	42
C3	5	1.8	9	14	2	17[a]	15	2
C2	51	18.7	96	28	5	35[a]	81	15
C1	25	9.2	47	26	2	28	44	3
Total	273	100.0	513	167	53	223[a]	378	135

[a] Includes fish of unknown origin.

Table 4. 2006 spring Chinook redd distribution, estimated spawning escapement, and carcass recoveries in the Twisp River sub-basin.

Reach	Redds		Estimated spawning escapement	Carcasses				
	Count	Sub-basin proportion (%)		Recoveries			Expanded count	
				H	W	Total	H	W
T10	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0
T8	3	3.4	6	0	1	1	0	6
T7	19	21.8	36	2	6	8	9	27
T6	39	44.8	73	8	5	14[a]	45	28
T5	15	17.2	28	7	1	9[a]	24	4
T4	3	3.4	6	1	0	1	6	0
T3	2	2.3	4	1	0	1	4	0
T2	2	2.3	4	3	0	4[a]	4	0
T1	4	4.6	8	3	0	3	8	0
Total	87	100.0	165	25	13	41[a]	100	65

[a] Includes fish of unknown origin.

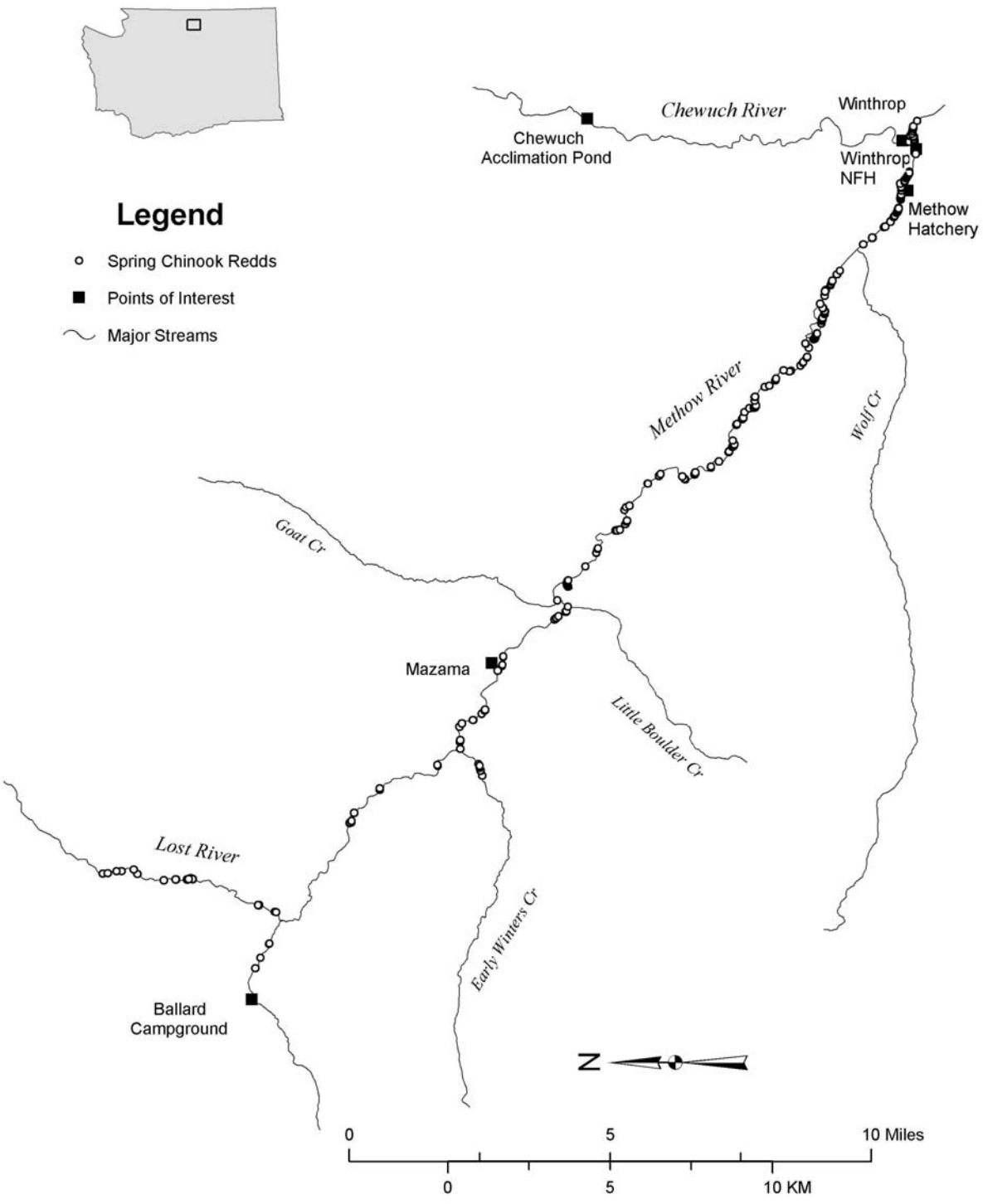

Figure 3. Spatial distribution of spring Chinook redds in the Methow River sub-basin based on GPS waypoints collected during 2006 surveys.

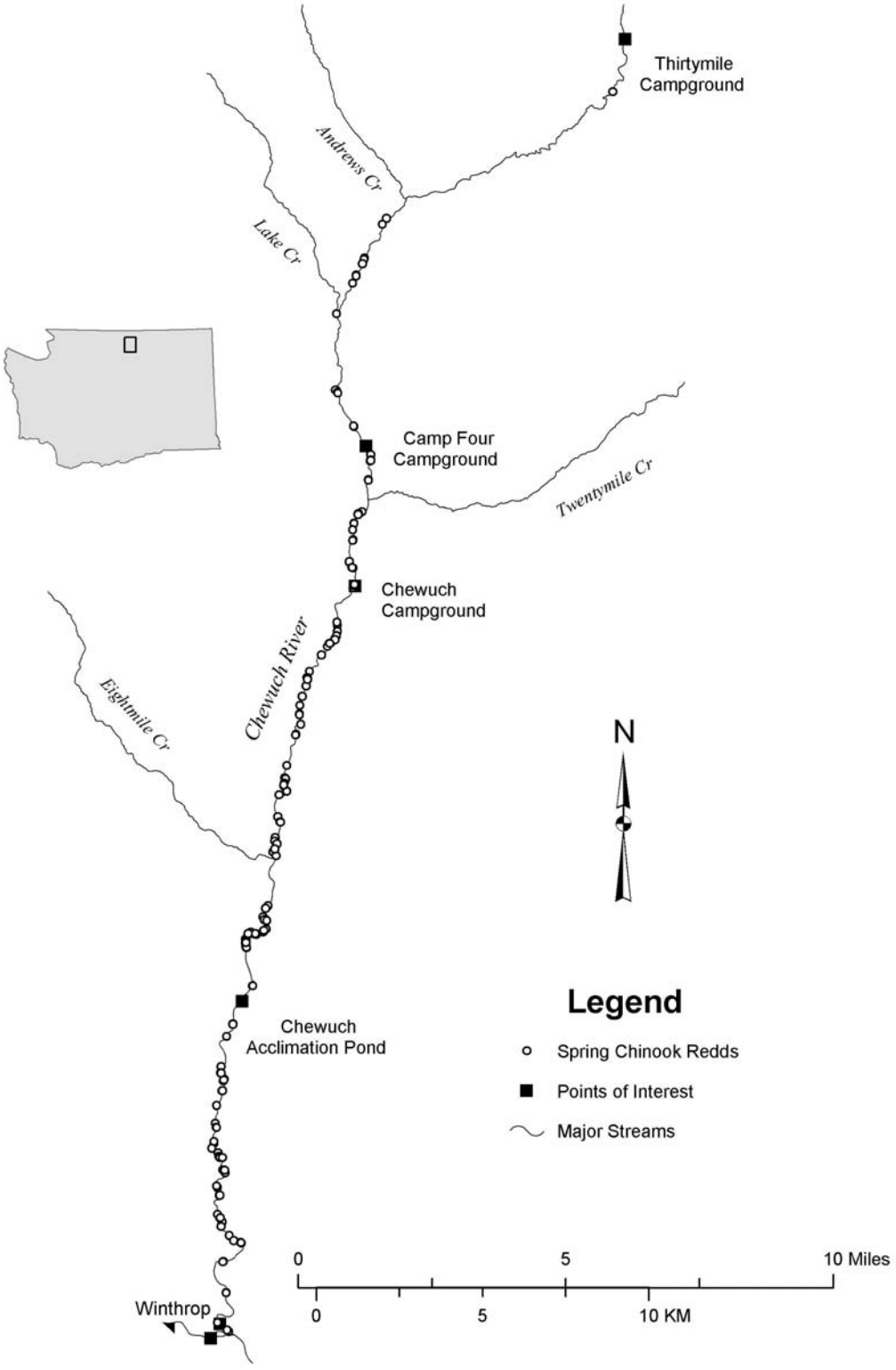

Figure 4. Spatial distribution of spring Chinook redds in the Chewuch River sub-basin based on GPS waypoints collected during 2006 surveys.

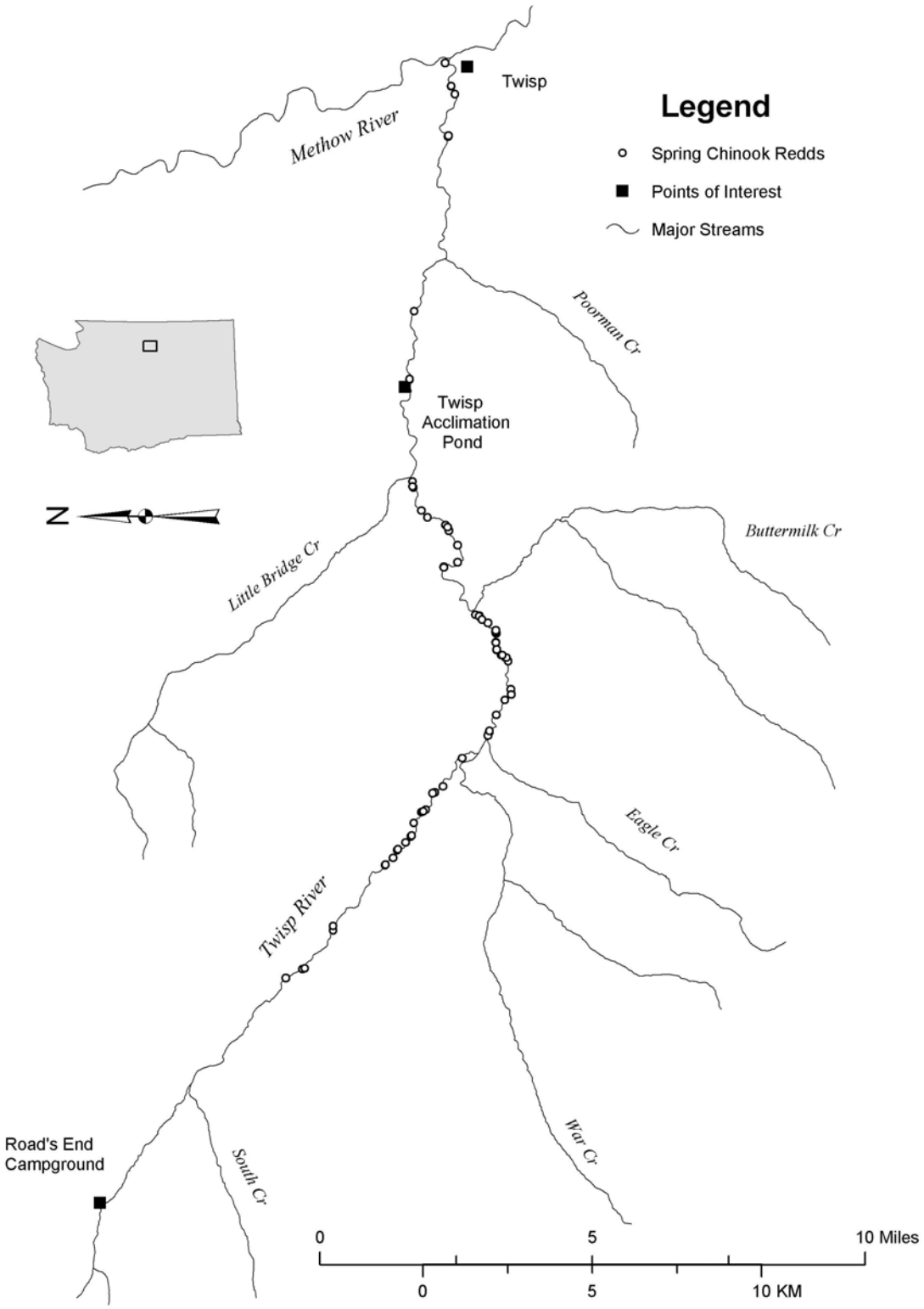

Figure 5. Spatial distribution of spring Chinook redds in the Twisp River sub-basin based on GPS waypoints collected during 2006 surveys.

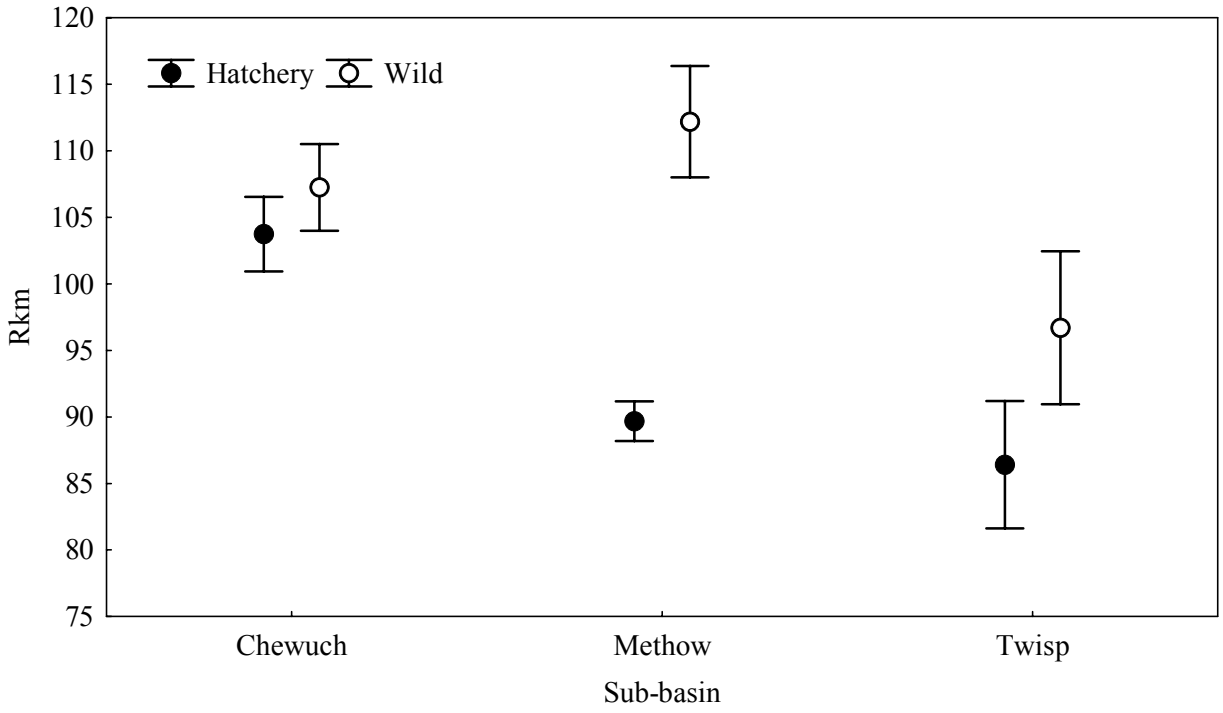

Figure 6. Mean redd distribution (Rkm) of hatchery and wild females in the Methow River Basin in 2006. Error bars represent 95% confidence intervals.

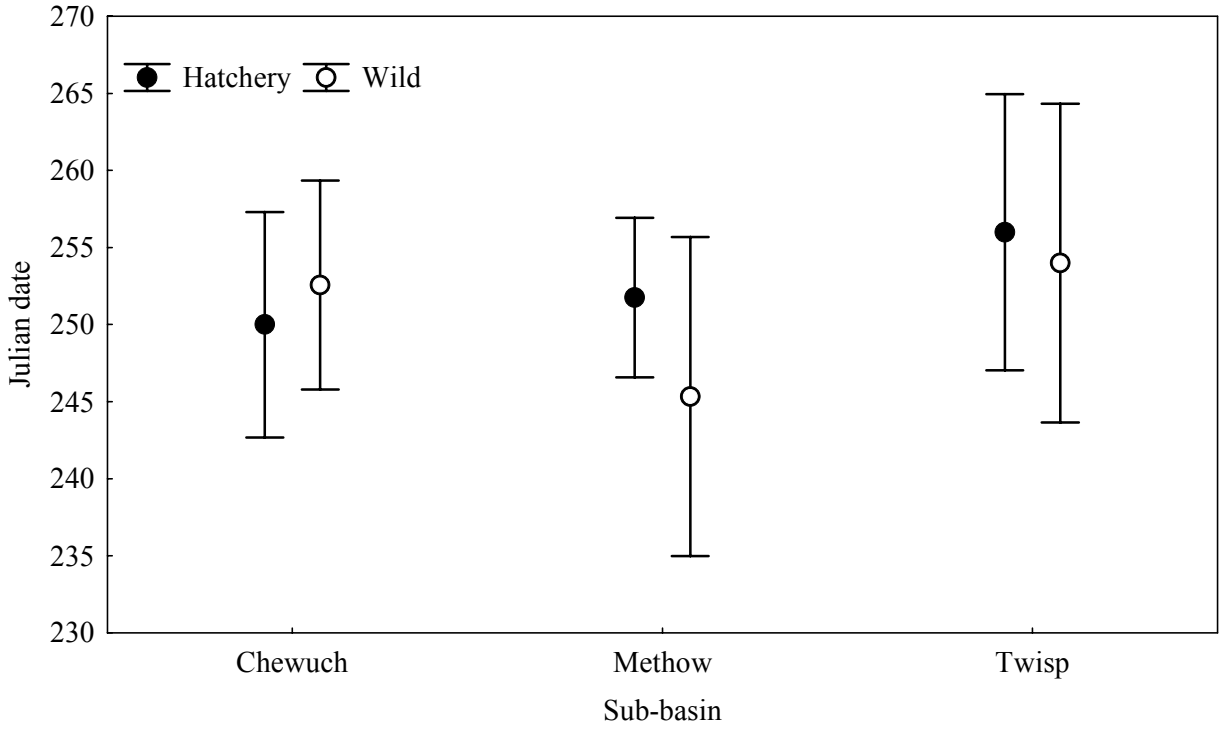

Figure 7. Mean spawn timing (Julian date) of hatchery and wild females in the Methow River Basin in 2006. Error bars represent 95% confidence intervals.

Spawner Composition, Demographics, and Egg Deposition

An estimated 1,748 fish spawned in the Methow River Basin in 2006, of which 1,420 (81.2%) were hatchery origin. The majority of carcasses were recovered in the Methow sub-basin (N = 491; Table 5, Figure 8) followed by the Chewuch sub-basin (N = 223; Table 5, Figure 9) and the Twisp sub-basin (N = 41; Table 5, Figure 10). Wild fish comprised the largest proportion of estimated spawners in the Twisp River sub-basin (39.4%) followed by the Chewuch River sub-basin (26.3%) and Methow River sub-basin (12.0%; Tables 2-4). The estimated spawning escapement does not include hatchery or wild fish collected for broodstock.

Table 5. 2006 spring Chinook carcass recoveries by origin, stock, and recovery sub-basin.

Origin	Stock	Recovery sub-basin		
		Chewuch	Methow	Twisp
Hatchery	MetComp	70	248	1
	Twisp	2	22	16
	Winthrop	11	84	1
	Ad-only	57	22	6
	No mark	16	67	1
	Out-of-basin strays	10	3	0
Wild	Wild	54	37	13
Unknown	Unknown	3	8	3
Total		223	491	41

Of the 755 carcasses recovered, the age, origin, gender, and length was confirmed for 730 (96.7%). Of the confirmed 730 recoveries, 330 target hatchery fish and 103 wild fish comprised the 2006 sample. Modal age of recovered fish was age-4 (N = 385), accounting for 88.9% of confirmed fish (Table 6). Carcass recovery bias was not calculated due to low numbers of age-3 fish tagged at Wells Dam (N = 10). However, 79 fish PIT-tagged at Wells Dam were recovered on spawning grounds representing 27.4% of potential recoveries and as expected, recovery rates were higher for larger fish (Table 7).

A total of 474 females were examined on spawning grounds for egg retention, 381 of which had intact abdominal cavities. Using mean fecundities from Methow Hatchery broodstock (MetComp = 3,619, Twisp = 3,433), and adjusting for mean egg retention, the total estimated egg deposition in the Methow River Basin was 3,304,830 eggs (Table 8). A total of seven redds in the upper Methow River were dewatered. While deposition in the Twisp sub-basin in 2006 fell between that estimated in 2004 and 2005, both the Chewuch and Methow sub-basins exhibited egg deposition much higher than that in recent years (Table 8). Egg deposition in the Methow sub-basin was approximately 100% higher than in 2004 (Humling and Snow 2005) and 2005 (Humling and Snow 2006).

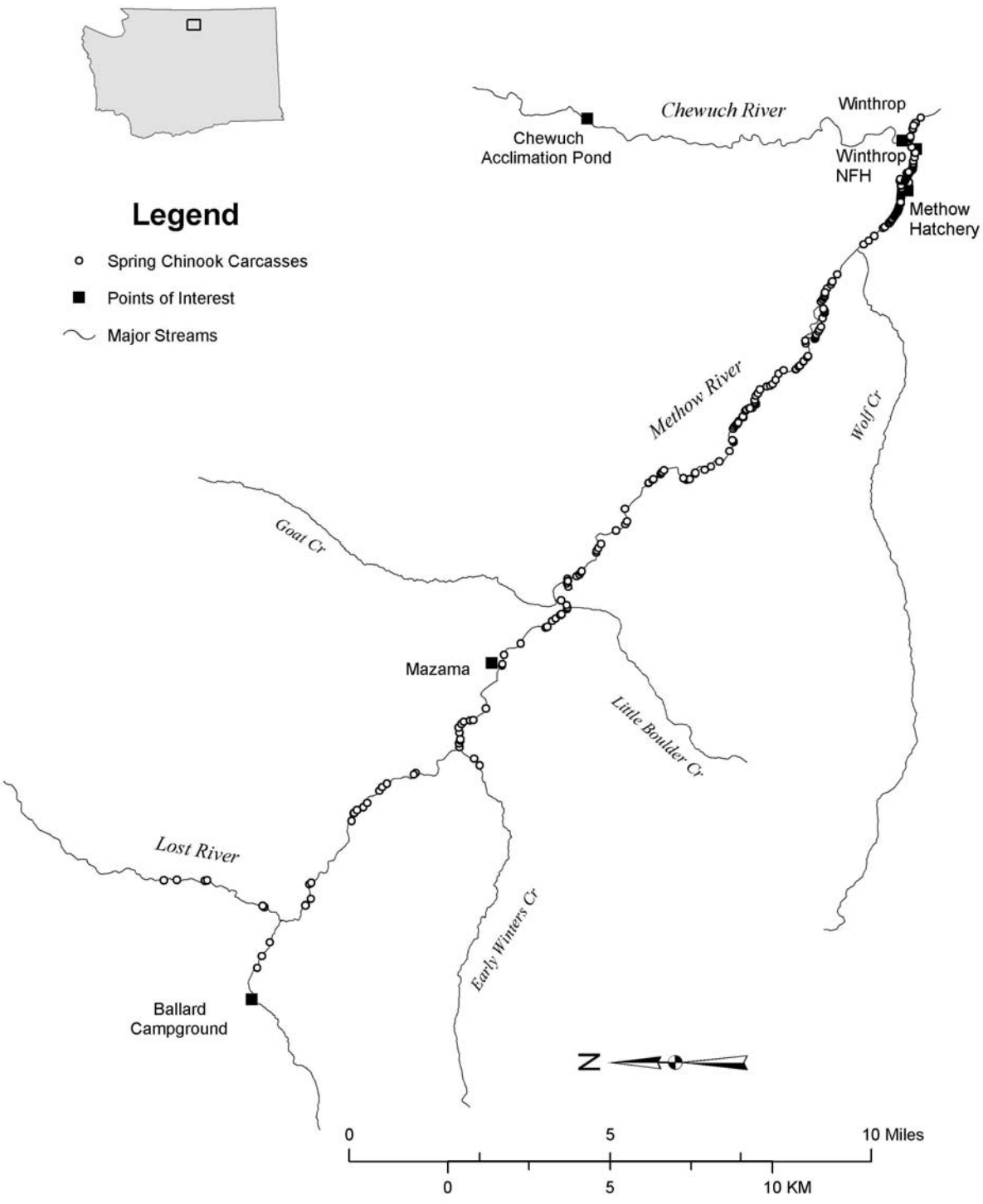

Figure 8. Spatial distribution of spring Chinook carcasses in the Methow River sub-basin based on GPS waypoints collected during 2006 surveys.

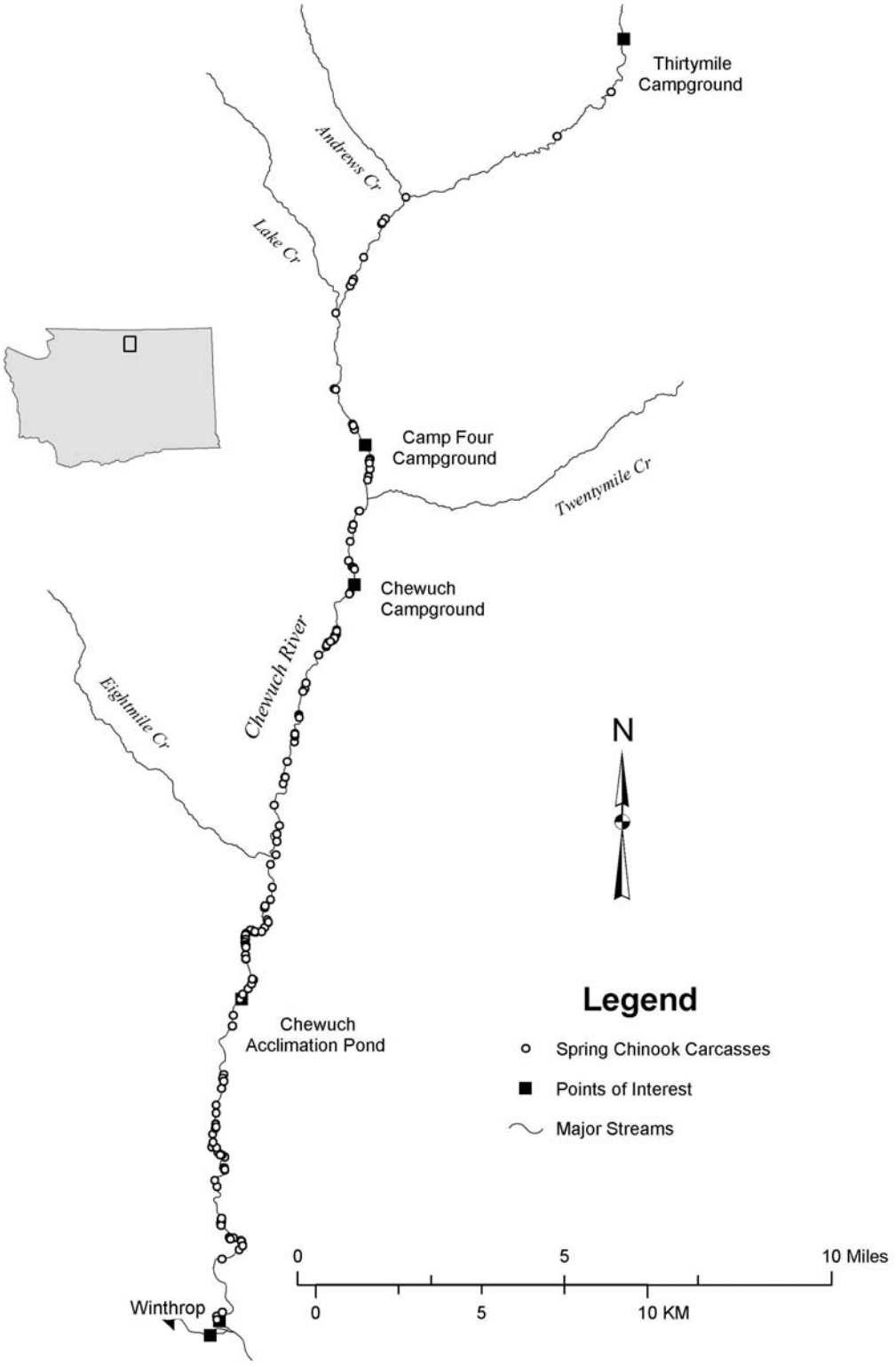

Figure 9. Spatial distribution of spring Chinook carcasses in the Chewuch River sub-basin based on GPS waypoints collected during 2006 surveys.

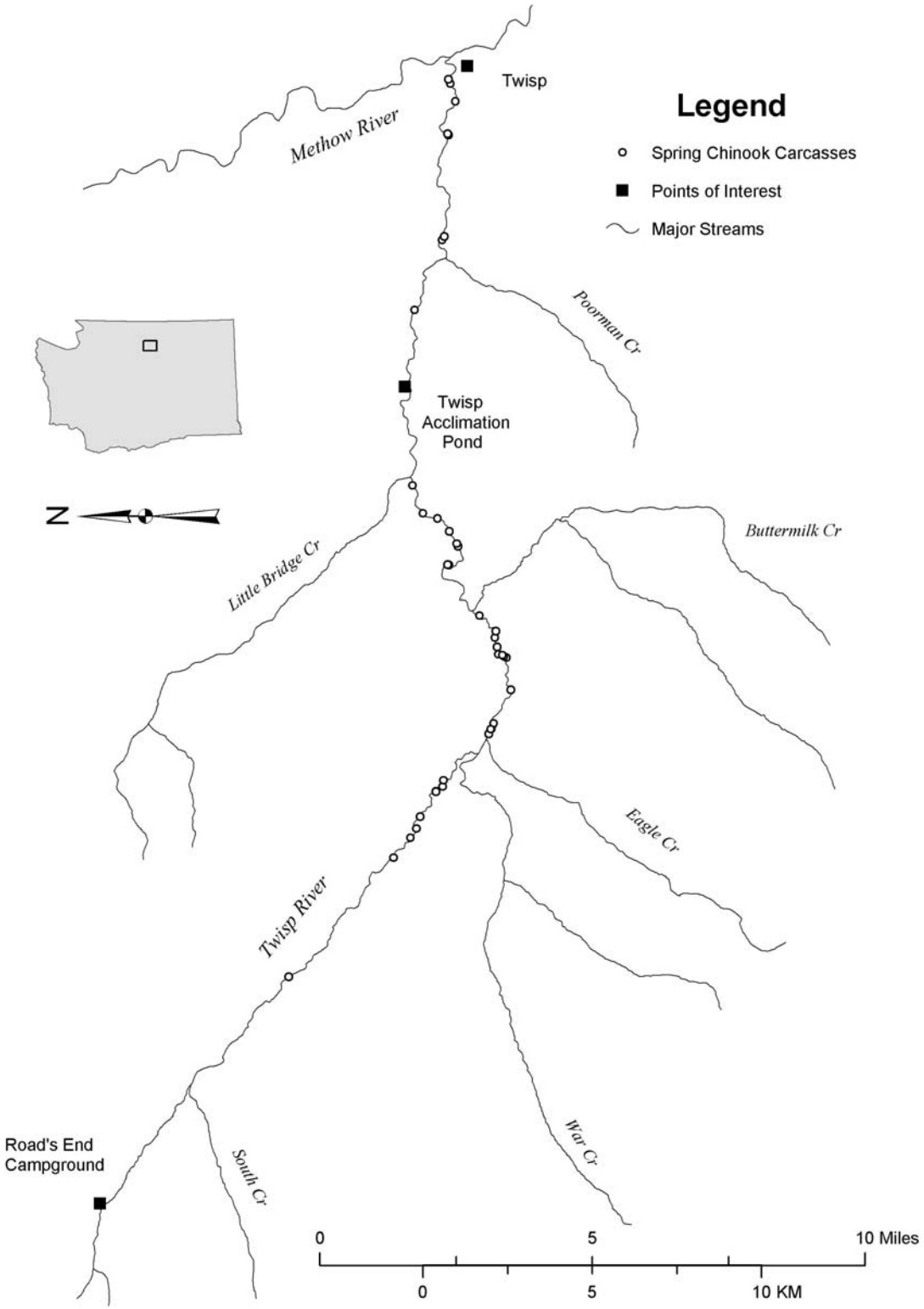

Figure 10. Spatial distribution of spring Chinook carcasses in the Twisp River sub-basin based on GPS waypoints collected during 2006 surveys.

Table 6. Mean fork length (*N*; SD) by age and sex of spring Chinook carcasses recovered during Methow Basin spawning ground surveys in 2006. Only hatchery fish recovered in their release stream are reported within each sub-basin.

Age	Male		Female	
	Hatchery	Wild	Hatchery	Wild
		Chewuch sub-basin		
1.2	58.2 (23; 3.7)	57.4 (16; 7.5)	56.7 (38; 3.4)	57.8 (19; 4.2)
1.3	69.0 (3; 1.0)	70.2 (9; 4.3)	67.2 (6; 3.1)	66.6 (10; 3.3)
		Methow sub-basin		
1.2	59.3 (66; 5.2)	57.8 (14; 5.9)	58.3 (172; 3.9)	57.2 (12; 3.8)
1.3	67.0 (1; 0.0)	71.6 (5; 5.3)	67.0 (5; 6.6)	69.4 (5; 5.8)
		Twisp sub-basin		
1.2	49.0 (2; 2.8)	53.7 (3; 9.1)	56.9 (14; 3.4)	56.3 (6; 5.2)
1.3	- -	71.0 (1; 0.0)	- -	68.3 (3; 1.5)

Table 7. Spawning ground recovery rates of fish PIT-tagged at Wells Dam in 2006. U = unknown age.

Recovery sub-basin	Hatchery				Wild			Total
	1.1	1.2	1.3	U	1.1	1.2	1.3	
Chewuch	0	11	2	0	0	2	3	18
Methow	2	48	1	0	0	4	3	58
Twisp	0	2	0	0	0	1	0	3
Total tagged	10	270	8	19	0	18	6	331
Total collected in broodstock	0	36	0	1	0	0	0	37
Total recovered below Wells	0	6	0	0	0	0	0	6
Potential spawning total	10	228	8	18	0	18	6	288
Total recovered	2	61	3	0	0	7	6	79
Recovery rate (%)	20.0	26.8	37.5	0.0	- -	38.9	100.0	27.4

Table 8. Estimated 2006 spring Chinook egg deposition in the Methow Basin. Mean fecundities are derived from Methow Hatchery broodstock (MetComp or Twisp).

Sub-basin	# of F examined	Mean fecundity	Mean egg retention (%)	Redds	Sub-basin proportion (%)	Estimated egg deposition		
						2004	2005	2006
Chewuch	112	3,619	0.5	273	29.6%	405,921	772,199	983,047
Methow	243			562[a]	61.0%	1,004,782	1,049,362	2,023,709
Twisp	26	3,433	0.2	87	9.4%	509,248	241,132	298,074
Total	381			922[a]	100.0%	1,919,951	2,062,693	3,304,830

[a] Total after removing seven dewatered redds in the upper Methow River.

Natural Replacement Rate

Data from the most recently completed brood year indicates the Twisp River had the highest NNR in the Methow Basin. However, between 1992 and 1999, the Chewuch River on average had the highest NRR (geometric mean = 0.70 fish per spawning adult; Table 9, Appendix A). Historically, NRR of the spring Chinook populations in the Methow River Basin did not meet the value necessary to replace the parent population (i.e., NRR ≥ 1.0; Table 9). Comparisons between NRR and HRR only included brood years in which data for both metrics were available (Appendix A). Reported NRR values for the 1997 brood were considerably greater than other brood years. The influence of the 1997 brood in the analysis was assessed by repeating the statistical comparisons of NRR and HRR data excluding the 1997 brood data.

Significant differences between the NRR and HRR were detected regardless of sub-basin (KW Test, H = 7.07, $P < 0.01$). Mean NRR for all three sub-basins was lower than HRR. When the 1997 brood was excluded from the analysis, results were similar (KW Test, H = 11.73, $P < 0.001$). However, a more detailed analysis by sub-basin concluded that no difference existed between NRR and HRR within any of the sub-basins (Table 10). However, when the 1997 brood was excluded from the analysis, differences were detected in the Methow and Twisp sub-basins (Table 10). Inconsistency in results and the strong influence from the 1997 brood suggest further monitoring is required.

Table 9. Estimated natural spawning escapement and Natural Replacement Rates (NRR) of Methow River Basin spring Chinook populations. Escapement values are derived from annual redd counts expanded by fish-per-redd values. Total expanded adults were adjusted to estimate non-selective fishery harvest and indirect mortality. 1992-1999 NRR values are geometric means.

Parent Brood	Est. spawning escapement	Returns			Total expanded adults	NRR
		1.1	1.2	1.3		
			Chewuch River			
2000	83	21	42	12	76	0.92
1992-1999	102	2	139	17	195	0.70[a]
			Methow River and tributaries			
2000	611	6	180	38	228	0.37
1992-1999	234	3	73	23	114	0.41[a]
			Twisp River			
2000	256	27	254	82	370	1.45
1992-1999	117	3	88	31	147	0.55[a]

[a] Excludes 1996 or 1998 brood years (100% collection at Wells Dam).

Table 10. Mean NRR and HRR values for Methow spring Chinook for brood years 1992 – 2000. P-values are the results of Mann-Whitney U-tests.

Subbasin	Mean (± SD) values for all years			Mean (± SD) values, 1997 excluded		
	NRR	HRR	P-value	NRR	HRR	P-value
Methow	1.26 (1.63)	3.99 (3.22)	>0.05	0.95 (1.62)	3.73 (3.54)	<0.05
Chewuch	2.04 (4.11)	2.69 (2.55)	0.20	0.37 (0.32)	2.10 (2.35)	0.08
Twisp	2.19 (4.33)	1.84 (1.38)	0.15	0.43 (0.57)	1.32 (0.58)	<0.05
Overall	1.83 (3.38)	2.84 (2.52)	<0.01	0.58 (0.97)	2.38 (2.52)	<0.001

Stray Rates by Brood year

Analysis of stray rates by brood year provides an assessment of homing fidelity for each program. Total brood stray rates were analyzed for brood years 1992 to 2000. The mean proportion of Methow spring Chinook straying into non-target locations relative to the total brood return was significantly lower than 5.0% (1.4%, $P = 0.02$; Appendix B). Chewuch spring Chinook stray rates were not significantly lower than 5.0% (22.6%, $P = 0.15$; Appendix B). While the stray rate for Twisp spring Chinook into non-target locations was significantly greater than 5.0% (33.9%, $P = 0.03$; Appendix B).

Stray rates for fish reared at Methow Fish Hatchery were greatly influenced by the number of fish collected as broodstock from hatchery outfalls (i.e., Methow and Winthrop). Removing fish collected from hatchery outfalls did lower the mean (SD) stray rates for the Methow (Mean = 1.2%, SD = 1.9), Chewuch (Mean = 4.2%, SD = 4.7), and Twisp (Mean = 9.8%, SD = 12.9) hatchery programs, but did not influence the result of the statistical tests. Both, the Chewuch and Twisp hatchery programs have stray rates that are not significantly less than 5%.

Stray Rates within the Methow Basin

A total of 468 SPCH CWTs were successively decoded from 2006 spawning ground surveys in the Methow River Basin. These fish were expanded by tag-specific mark rates and reach-specific sample rates to account for 1,063 fish (Table 11, Appendix C). Spawning ground data for years 1996 – 2000 where not included in the analysis of stray rates due to lack of spawners (i.e., 1996 and 1998) or poor CWT samples rates. For run years 2001-2006, Twisp hatchery spring Chinook comprised less than 10% of the estimated spawning escapement in the Methow and Chewuch sub-basins ($P < 0.01$ in both cases; Table 12). While Methow and Chewuch hatchery spring Chinook comprised less than 10% of the estimated spawning escapement in the Twisp sub-basin, respectively ($P < 0.01$; Table 12).

Data for run years 2002 through 2004 in the Chewuch and Methow sub-basins were also omitted from statistical analyses due to the inability of assigning release location (i.e., same CWT code) to a large number of spawning adults from the 1998 and 2000 broods (Table 12). Methow and Chewuch hatchery fish comprised greater than 10% of the estimated spawning population in the Chewuch and Methow sub-basins, respectively ($P = 0.80$, and $P = 0.24$; Table 12). Run-year

data from 2002 in the Twisp sub-basin was omitted due to an extremely low carcass sample rate (2.0%).

The estimated number of out-of-basin strays recovered in the Methow River Basin has increased from 6 to 58 (0.6 to 4.1% of estimated hatchery escapement on spawning grounds) between 2003 and 2006 (Appendices D-G).

Table 11. Expanded CWT recoveries by sub-basin and stray status in the Methow River Basin in 2006. Proportions based on total expanded CWT recoveries.

Sub-basin	% Local	% Within-basin strays	% Out-of-basin strays	Expanded CWT recoveries
Chewuch	60.9	21.1	18.0	239
Methow	62.7	35.4	1.9	759
Twisp	93.3	6.7	0.0	65
Total	64.1	30.5	5.4	1,063

Table 12. Proportion of CWT recoveries comprising estimated spawning escapement from 2001-2006 by sub-basin.

Run year	Estimated spawning escapement			Hatchery stock (% of spawning escapement)				
	Hatchery	Wild	Total	Chewuch	Methow	Twisp	Unknown release[a]	Out-of basin
				Chewuch River				
2001	1681	950	2631	32.6	13.9	0.3	1.8	0.2
2002	578	88	666	2.9	7.4	0.0	73.1	0.0
2003	465	25	490	0.0	5.0	0.0	76.7	0.5
2004	289	46	335	5.4	4.3	0.0	71.8	0.0
2005	285	223	508	41.2	5.2	0.4	4.0	3.9
2006	378	135	513	28.4	8.7	1.2	0.0	8.4
				Methow River				
2001	6596	341	6937	7.5	69.9	0.2	1.6	0.2
2002	1642	87	1729	0.2	31.0	1.0	48.6	0.0
2003	596	8	604	0.0	33.1	3.0	43.5	0.6
2004	623	198	821	4.0	19.6	5.3	37.9	0.0
2005	526	221	747	28.6	28.4	2.6	0.7	1.5
2006	942	128	1070	29.5	62.7	5.9	0.0	1.9
				Twisp River				
2001	292	591	883	1.4	1.4	18.7	0.0	0.0
2002	63	176	239	2.9	18.2	9.0	0.0	0.0
2003	17	26	43	0.0	0.0	34.9	0.0	0.0
2004	98	243	341	0.9	0.8	16.9	0.0	3.1
2005	34	87	121	3.0	0.0	16.9	0.0	0.0
2006	100	65	165	0.0	2.6	36.8	0.0	0.0

[a] Unable to determine release location for 1998 and 2000 MetComps (one tag code used for Methow and Chewuch-released fish both years).

Stray Rates outside the Methow Basin

An estimated total of 27 Methow Hatchery fish have been recovered on spawning grounds outside the Methow River Basin. Furthermore, only eight fish have strayed to other spring Chinook populations (e.g., Entiat River; Table 13). Historically, Methow Hatchery fish straying to the Entiat River have comprised less than 5.0% of the overall estimated spawning escapement (One-sample t-test, $P < 0.01$; Table 13).

Table 13. Methow Hatchery program strays by recovery location.

Run year	Recovery location	CWT	Stock	Expanded count	Estimated escapement	% of population
1997	Entiat River	635551	Methow	1	82	1.22
2000	Entiat River	630130	Methow	1	172	0.58
2001	Entiat River	630613	Methow	1	460	0.22
2002	Entiat River	631024	MetComp	5	250	2.00
2000	Similkameen River	630130	Methow	3	- -	- -
2001	Similkameen River	630614	Chewuch	5	- -	- -
2001	Similkameen River	631024	MetComp	5	- -	- -
2002	Similkameen River	631024	MetComp	5	- -	- -
2003	Similkameen River	631024	MetComp	1	- -	- -

Unknown Hatchery Fish

In 2003, the estimated number of unknown hatchery fish (ad-only and no-mark fish) comprised a substantial proportion of the overall estimated hatchery origin escapement to the Methow River Basin ($N = 170$, 15.8%; Appendix D). In 2004 and 2005, these values were marginally lower ($N_{2004} = 125$, 12.4%; $N_{2005} = 99$, 11.7%; Appendices E, F). However, in 2006, the estimated number of unknown hatchery fish on the Methow River Basin spawning grounds was the highest in recent history ($N = 360$, 25.4%; Appendix G).

Discussion

Estimated spawning escapement in the Methow River Basin represented only 50.3% of the potential run escapement to the Methow River. In 2006, fish-per-redd values were calculated from male-to-female ratios at Wells Dam. This ratio was used to expand the number of redds to overall spawning escapement on the assumption that female Chinook constructed only a single redd and males spawned only with one female. The fish-per-redd value in 2006 (1.88) was much lower than that used in the previous three years (2.20 to 2.86). A similar fish-per-redd value (1.78) and proportion of the run escapement (51.8%) was reported for Wenatchee Basin spring chinook in 2006 (A. Murdoch, WDFW, personal communication). Similar methods were used

for both populations in all cases, except in the Wenatchee Basin almost 100% of the run was trapped and sampled as part of an ongoing study. Estimates of spawning escapement do not account for mortality from fisheries, poaching, predation, dam fallback, or pre-spawn mortality. However, similarities between the two populations suggest these differences are real and fish from both populations experience similar conditions before and after reaching the spawning grounds. Unknown are the specific factors (i.e., lack of habitat, water temperature, poor condition) that contribute to the observed differences in run and spawning escapement.

Wild fish comprised 18.7% of the estimated spawning escapement to the Methow River Basin, but only 6.9% of the estimated run above Wells Dam. Additionally, the estimated number of wild spring Chinook on spawning grounds in the Methow River Basin was 328 compared to an estimated 302 wild fish above Wells Dam. Unless hatchery fish have much higher pre-spawn mortality or susceptibility to predators, the proportion of wild fish that comprised the overall 2006 natural spawning population in the Methow River Basin may be overestimated. Murdoch et al. (2007) did report that hatchery fish suffered lower survival than wild fish in 2006 in the Wenatchee River, but causation was not determined. Though no statistical analyses were performed on carcass recovery bias, age-4 and age-5 wild fish were recovered at a higher rate (54.2%) on the spawning grounds than age-4 and age-5 hatchery fish (27.1%).

Though overall spawn timing (females) was not different between hatchery and wild fish in any of the three tributary index areas, wild fish spawned farther upstream in both the Methow and Twisp sub-basins, but not in the Chewuch. The greatest difference in redd distribution between hatchery and wild fish was found in the Methow River. Methow Hatchery (the site of Methow River acclimation and release) is located near the confluence of the Methow and Chewuch Rivers. Though the location of the Methow acclimation pond may influence redd distribution of hatchery fish, Methow-released fish tend to stray less within the Methow River Basin than Chewuch or Twisp program fish.

In the Methow River Basin, spring Chinook spawn during a relatively narrow timeframe. Only 35 female fish could be used to determine spawn timing differences between hatchery ($N = 22$) and wild ($N = 13$) fish because of the need to use only local-released hatchery fish in statistical analyses (Chewuch released fish recovered in Chewuch River, etc.). The ability to detect differences between groups was further complicated by testing differences between sub-basins. Because of this, sample size may be a limiting factor in any given year. Using multiple years as replicates in subsequent analyses will aid in our ability to detect statistical differences across years.

Within-basin straying of hatchery fish was much higher than the goal set forth in the objectives of the M & E Plan. Methow Hatchery spring Chinook are typically released from one of three locations in the Methow River Basin. The Twisp and Chewuch acclimation ponds are remote locations designed to acclimate these fish on local river water, thus increasing the chance these fish return to their respective release stream. The estimated number of Twisp-released fish that spawned in the Twisp sub-basin ($N = 59$) was nearly equal to the number that spawned in the Methow and Chewuch sub-basins combined ($N = 52$). Conversely, the estimated number of Methow-released fish that spawned in the Methow River ($N = 475$) was an order of magnitude greater than that in the Chewuch and Twisp sub-basins combined ($N = 48$). These data suggest

that acclimation protocols at the Twisp and Chewuch ponds may not be appropriate to meet the current within-basin stray objectives (< 10%). For the broods (2001-2003) that returned to spawn in 2006, Methow program fish were acclimated on local river water on average 53 and 55 days longer than Chewuch and Twisp program fish, respectively. Furthermore, Chewuch and Twisp program fish at Methow Hatchery are typically reared on Methow River surface water prior to transfer (2001 brood = 53 days, 2002 brood = 12-18 days, 2003 brood = 4+ months). Extended rearing on Methow River water may increase the likelihood of Chewuch and Twisp fish straying into non-target spawning locations.

Overall, only 5.5% of the estimated number of hatchery fish spawning in the Methow River Basin strayed from other independent populations. However, these fish comprised 18.4% of the hatchery fish spawning in the Chewuch River Basin. These fish originated from Entiat, Leavenworth, Chiwawa, Dworshak, and Lookingglass hatcheries. A number of fish from these hatcheries were also recovered in the Methow River, but in lower proportions. No out-of basin strays were recovered in the Twisp River in 2006.

Spring Chinook released from Methow Fish Hatchery do not stray to other independent populations in significant rates. However, lack of acclimation has negatively affected homing fidelity within basin. Lack of acclimation of river water may have also contributed to the low smolt to adult survival rates (i.e., smolt quality). Hatchery replacement rates for spring Chinook released from Methow Fish Hatchery have not met expected HRR values (Chapter 1) and in some years are no different than the respective NRR. The HRR must exceed the NRR of the target stock. Studies should be initiated that examine life stage survival rates in order to detect possible limiting factors (e.g., density dependence or reproductive success).

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Appendix A. Natural Replacement Rate (NRR) summary by sub-basin for brood years 1992 through 2000 with corresponding hatchery replacement rates (HRR). NOR = natural origin recruits.

Parent brood	Est. spawning escapement	Return age			Total expanded adults (NOR)	NRR	HRR
		1.1	1.2	1.3			
			Chewuch River				
1992	415	0	29	19	51	0.12	1.57
1993	184	3	40	12	57	0.31	1.13
1994	63	3	9	4	15	0.24	0.17
1995	6	0	16	15	33	5.50	- -
1996	0	0	32	17	50	- -	0.57
1997	125	2	951	61	1,301	10.41	5.63
1998	0	9	27	9	51	- -	- -
1999	21	0	5	0	5	0.24	- -
2000	83	21	42	12	76	0.92	- -
			Methow River				
1992	924	0	63	24	91	0.10	- -
1993	537	6	83	33	126	0.23	1.83
1994	172	0	24	16	40	0.23	0.50
1995	27	1	69	29	104	3.85	8.70
1996	0	1	22	36	61	- -	4.55
1997	143	11	255	41	395	2.76	5.25
1998	0	3	69	3	86	- -	14.38
1999	70	4	2	0	6	0.09	1.45
2000	611	6	180	38	228	0.37	6.19
			Twisp River				
1992	316	0	21	20	46	0.14	1.19
1993	426	2	36	14	54	0.13	0.69
1994	74	1	10	6	18	0.24	1.00
1995	12	0	27	5	34	2.83	- -
1996	0	0	8	86	97	- -	6.17
1997	73	0	519	105	800	10.96	4.44
1998	0	19	72	11	117	- -	1.88
1999	35	0	7	0	7	0.20	1.50
2000	256	27	254	82	370	1.45	2.21

Appendix B. Methow Hatchery CWT recoveries by program and brood year. Stray % is the proportion of total recoveries collected in non-target spawning grounds or at non-target broodstock collection locations. T = target, NT = non-target, W = Wells Dam, Com. = commercial, Sp. = sport, Trbl. = tribal. 1998 and 2000 MetComp broods were not given unique CWT tag codes based on release river.

Brood	Broodstock			Spawning grounds		Ocean fishery			Freshwater fishery			Total	Stray %
	T	NT	W	T	NT	Com.	Sp.	Trbl.	Com.	Sp.	Trbl.		
Chewuch spring Chinook													
1992	0	1	38	0	0	0	0	0	0	0	0	39	2.6
1993	0	19	79	8	3	5	0	0	0	0	1	115	19.1
1994	0	0	3	0	0	0	0	0	0	0	0	3	- -
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	0	15	15	0	4	0	0	0	6	0	1	41	46.3
1997	54	44	14	4	27	2	0	0	24	144	7	320	22.2
Methow spring Chinook													
1992	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1993	43	0	134	6	1	0	0	0	0	4	3	191	0.5
1994	0	0	1	0	0	0	0	0	0	0	0	1	- -
1995	3	0	114	3	0	2	0	0	0	0	0	122	0.0
1996	200	0	58	221	8	0	0	0	2	0	11	500	1.6
1997	422	0	3	16	1	3	0	0	280	209	12	946	0.1
1998	- -	- -	- -	- -	- -	3	0	0	462	428	30	2,301	- -
1999	93	0	- -	35	7	1	0	0	3	6	0	145	4.8
2000	- -	- -	- -	- -	- -	5	0	0	21	6	0	853	- -
Twisp spring Chinook													
1992	0	0	21	0	0	0	0	0	0	0	0	21	- -
1993	0	3	18	1	1	0	0	0	0	4	0	27	14.8
1994	0	0	4	0	0	0	0	0	0	0	0	4	- -
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	4	58	40	151	17	0	0	0	1	0	6	277	27.1
1997	21	6	0	14	0	0	0	0	14	9	1	65	9.2
1998	1	8	- -	0	2	0	0	0	11	0	0	22	44.9
1999	3	25	- -	8	20	1	0	0	4	0	0	61	73.8
2000	22	12	- -	67	40	0	0	0	7	0	0	148	35.1

Appendix C. Expanded coded-wire tag recoveries in 2006 by release site and recovery location.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
Chewuch River	2001	054763	Methow	Within-basin	2
Chewuch River	2001	054953	Methow	Within-basin	2
Chewuch River	2001	631384	Chewuch	Local	18
Chewuch River	2001	631440	Chewuch	Local	2
Chewuch River	2001	631451	Chiwawa	Out-of-basin	1
Chewuch River	2001	631494	Lake Creek	Local	3
Chewuch River	2002	051268	Methow	Within-basin	2
Chewuch River	2002	051269	Methow	Within-basin	2
Chewuch River	2002	051271	Methow	Within-basin	13
Chewuch River	2002	051272	Methow	Within-basin	4
Chewuch River	2002	051493	Icicle Creek	Out-of-basin	5
Chewuch River	2002	054943	Icicle Creek	Out-of-basin	3
Chewuch River	2002	107275	Lochsa	Out-of-basin	3
Chewuch River	2002	612656	Selway	Out-of-basin	3
Chewuch River	2002	631389	Chiwawa	Out-of-basin	3
Chewuch River	2002	631582	Twisp	Within-basin	6
Chewuch River	2002	631891	Methow	Within-basin	16
Chewuch River	2002	631976	Chewuch	Local	122
Chewuch River	2003	051197	Entiat	Out-of-basin	8
Chewuch River	2003	051787	Methow	Within-basin	3
Chewuch River	2003	094037	Lostine	Out-of-basin	3
Chewuch River	2003	107073	Lochsa	Out-of-basin	13
Chewuch River	2003	632272	Chiwawa	Out-of-basin	2
Early Winters Creek	2002	631076	Twisp	Within-basin	7
Early Winters Creek	2002	631891	Methow	Local	6
Lost River	2002	051184	Dworshak NFH	Out-of-basin	8
Methow River	2001	050789	Icicle Creek	Out-of-basin	4
Methow River	2001	054628	Methow	Local	1
Methow River	2001	054633	Methow	Local	3
Methow River	2001	630976	Methow	Local	5
Methow River	2001	631440	Chewuch	Within-basin	3
Methow River	2001	631477	Methow	Local	3
Methow River	2002	051268	Methow	Local	3
Methow River	2002	051269	Methow	Local	37
Methow River	2002	051270	Methow	Local	47
Methow River	2002	051271	Methow	Local	10
Methow River	2002	051272	Methow	Local	14
Methow River	2002	051273	Methow	Local	16
Methow River	2002	054636	Methow	Local	11
Methow River	2002	054917	Methow	Local	9
Methow River	2002	631076	Twisp	Within-basin	8
Methow River	2002	631077	Twisp	Within-basin	5
Methow River	2002	631389	Chiwawa	Out-of-basin	2
Methow River	2002	631524	Wolf Creek	Local	30
Methow River	2002	631582	Twisp	Within-basin	17
Methow River	2002	631694	Twisp	Within-basin	7
Methow River	2002	631891	Methow	Local	138
Methow River	2002	631976	Chewuch	Within-basin	148
Methow River	2003	051266	Methow	Local	4
Methow River	2003	054855	Methow	Local	1
Methow River	2003	632565	Twisp	Within-basin	1
Methow River	2003	632567	Twisp	Within-basin	1

Appendix C, continued.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
MH outfall[1]	2001	631477	Methow	Local	2
MH outfall	2002	051269	Methow	Local	7
MH outfall	2002	051270	Methow	Local	2
MH outfall	2002	051271	Methow	Local	6
MH outfall	2002	051272	Methow	Local	6
MH outfall	2002	051273	Methow	Local	2
MH outfall	2002	054917	Methow	Local	5
MH outfall	2002	631524	Wolf Creek	Local	5
MH outfall	2002	631891	Methow	Local	41
MH outfall	2002	631976	Chewuch	Within-basin	51
Suspension Creek	2002	051268	Methow	Local	11
Suspension Creek	2002	631891	Methow	Local	23
Suspension Creek	2002	631976	Chewuch	Within-basin	11
Twisp River	2002	051270	Methow	Within-basin	1
Twisp River	2002	631076	Twisp	Local	14
Twisp River	2002	631077	Twisp	Local	9
Twisp River	2002	631524	Wolf Creek	Within-basin	3
Twisp River	2002	631582	Twisp	Local	28
Twisp River	2002	631694	Twisp	Local	8
WNFH outfall[2]	2001	054413	Methow	Local	5
WNFH outfall	2002	051269	Methow	Local	11
WNFH outfall	2002	051271	Methow	Local	6
WNFH outfall	2002	054917	Methow	Local	5
WNFH outfall	2002	631976	Chewuch	Within-basin	10

[1]Methow State Fish Hatchery outfall.
[2]Winthrop National Fish Hatchery outfall.

Appendix D. Estimated escapement and straying by section from 2003 Methow River basin spawning ground surveys. The total of local, within-basin (WB) strays, Methow+Chewuch (M+C), and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. M+C are 1998 and 2000 brood fish for which release location cannot be determined. Ad-only or no-mark hatchery fish (U) are the sum total of all fish for which release hatchery could not be identified.

Reach	Redds	Hatchery fish						Wild fish				Estimated
		Local	WB	M+C	OB	U	Total	1.1	1.2	1.3	Total	escapement
M15	0	0	0	0	0	0	0	0	0	0	0	0
M14	4	10	0	0	0	0	9	0	0	0	0	10
M13	0						1	0	0	0	0	0
M12	6	3	0	7	0	3	13	0	1	0	1	14
M11	7	4	1	4	0	8	17	0	0	0	0	17
M10	34	23	0	44	0	14	81	0	0	0	0	81
M9	105	75	5	125	0	45	246	4	0	2	6	252
M8	2						4	1	0	0	1	5
M7	20						48	0	0	0	0	48
M6	19	32	7	53	0	14	46	0	0	0	0	46
M5	5						12	0	0	0	0	12
L2	1	0	0	0	0	2	2	0	0	0	0	2
L1	0	0	0	0	0	0	0	0	0	0	0	0
EW3	3	4	0	4	0	1	7	0	0	0	0	7
EW2	1						2	0	0	0	0	2
EW1	0	0	0	0	0	0	0	0	0	0	0	0
MH1	13	15	0	13	0	3	31	0	0	0	0	31
Susp1	19	16	4	8	0	18	46	0	0	0	0	46
WN1	11	15	0	8	4	0	26	0	0	0	0	26
WLF1	2	3	0	2	0	0	5	0	0	0	0	5
Methow total	252	200	17	268	4	108	596	5	1	2	8	604
C12	0	0	0	0	0	0	0	0	0	0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0	0
C10	0	0	0	0	0	0	0	0	0	0	0	0
C9	2	0	0	0	0	5	5	0	0	0	0	5
C8	14	0	0	34	0	0	34	0	0	0	0	34
C7	25	0	4	45	0	7	56	0	0	4	4	60
C6	16	0	0	31	0	2	33	0	0	6	6	39
C5	18	0	0	38	0	5	43	0	0	0	0	43
C4	49	0	4	90	0	20	114	0	0	4	4	118
C3	3	0	0	5	0	2	7	0	0	0	0	7
C2	51	0	7	92	2	10	111	4	2	5	11	122
C1	26	0	11	43	0	8	62	0	0	0	0	62
Chewuch total	204	0	26	378	2	59	465	4	2	19	25	490
T10	0	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0	0	0	0	0	0
T7	1	0	0	0	0	1	1	0	0	1	1	2
T6	8	6	0	0	0	0	6	0	0	13	13	19
T5	7	9	0	0	0	0	8	4	5	0	9	17
T4	1	0	0	0	0	1	1	2	0	0	2	3
T3	1	0	0	0	0	1	1	0	0	0	0	2
T2	0	0	0	0	0	0	0	0	0	1	1	0
T1	0	0	0	0	0	0	0	0	0	0	0	0
Twisp total	18	15	0	0	0	3	17	6	5	15	26	43
2003 total	474	215	43	646	6	170	1,078	15	8	36	59	1,137

Appendix E. Estimated escapement and straying by section from 2004 Methow River basin spawning ground surveys. The total of local, within-basin (WB) strays, Methow+Chewuch (M+C), and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. M+C are 1998 and 2000 brood fish for which release location cannot be determined. Ad-only or no-mark hatchery fish (U) are the sum total of all fish for which release hatchery could not be identified.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		Local	WB	M+C	OB	U	Total	1.1	1.2	1.3	Total	
M15	0	0	0	0	0	0	0	0	0	0	0	0
M14	9	0	4	16	0	0	19	0	7	0	7	26
M13	14	0	8	33	0	0	40	0	0	0	0	40
M12	9	9	0	14	0	0	22	0	4	0	4	26
M11	10	4	0	13	0	0	16	0	12	0	12	28
M10	51	19	6	49	0	16	90	0	56	0	56	146
M9	104	57	28	83	0	36	204	3	90	0	93	297
M8	3	1	0	6	0	2	9	0	0	0	0	9
M7	16	12	0	24	0	10	46	0	0	0	0	46
M6	17	13	3	20	0	5	41	0	2	0	2	48
M5	0	1	0	1	0	2	4	0	1	0	1	0
L2	10	0	15	15	0	0	29	0	0	0	0	29
L1	5	3	0	3	0	0	6	0	8	0	8	14
EW3	10	0	0	15	0	7	22	0	7	0	7	29
EW2	0	0	0	0	0	0	0	0	0	0	0	0
EW1	0	0	0	0	0	0	0	0	0	0	0	0
MH1	9	7	5	13	0	1	26	0	0	0	0	26
Susp1	12	15	4	8	0	0	26	0	8	0	8	34
WN1	8	20	4	0	0	0	23	0	0	0	0	23
Methow total	287	161	77	313	0	79	623	3	195	0	198	821
C12	0	0	0	0	0	0	0	0	0	0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0	0
C10	0	0	0	0	0	0	0	0	0	0	0	0
C9	0	0	0	0	0	0	0	0	0	0	0	0
C8	10	0	0	23	0	0	22	0	7	0	7	29
C7	2	0	0	3	0	2	5	0	1	0	1	6
C6	19	0	0	39	0	10	49	0	5	0	5	54
C5	27	4	4	55	0	0	61	0	16	0	16	77
C4	20	4	0	44	0	0	46	0	11	0	11	57
C3	0	0	0	0	0	0	0	0	0	0	0	0
C2	29	10	10	55	0	5	80	0	3	0	3	83
C1	10	0	0	21	0	5	26	0	3	0	3	29
Chewuch total	117	18	14	240	0	22	289	0	46	0	46	335

Appendix E, continued.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		Local	WB	M+C	OB	U	Total	1.1	1.2	1.3	Total	
T10	0	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0	0
T8	1	0	0	0	0	0	0	0	2	0	2	2
T7	24	0	0	0	0	0	0	0	59	0	59	59
T6	62	31	0	0	0	15	46	4	102	0	106	152
T5	26	21	6	0	4	1	32	6	26	0	32	64
T4	9	6	0	0	0	5	11	0	11	0	11	22
T3	5	0	0	0	3	0	3	0	9	0	9	12
T2	8	0	0	0	3	0	3	3	14	0	17	20
T1	4	0	0	0	0	3	3	3	4	0	7	10
Twisp total	139	58	6	0	10	24	98	16	227	0	243	341
2004 total	543	237	97	553	10	125	1,010	19	468	0	487	1,497

Appendix F. Estimated escapement and straying by section from 2005 Methow River basin spawning ground surveys. The total of local, within-basin (WB) strays, Methow+Chewuch (M+C), and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. M+C are 1998 and 2000 brood fish for which release location cannot be determined. Ad-only or no-mark hatchery fish (U) are the sum total of all fish for which release hatchery could not be identified.

Reach	Redds	Hatchery fish						Wild fish				Estimated
		Local	WB	M+C	OB	U	Total	1.1	1.2	1.3	Total	escapement
M15	0	0	0	0	0	0	0	0	0	0	0	0
M14	7	0	0	0	0	0	0	0	18	0	18	18
M13	0	0	0	0	0	0	0	0	0	0	0	0
M12	10	0	0	0	0	10	10	0	15	0	15	25
M11	12	0	11	0	0	2	13	0	9	8	17	30
M10	45	22	41	4	0	4	71	0	36	7	43	114
M9	136	119	108	0	5	41	273	0	54	19	73	346
M8	5	0	9	0	0	2	11	0	2	0	2	13
M7	19	21	13	0	5	0	38	0	10	0	10	48
M6	18	17	23	1	2	2	45	0	1	0	1	46
M5	7	4	8	0	0	1	12	0	4	0	4	18
M4	0						1	0	0	1	1	0
L2	12	4	4	0	0	0	8	0	18	4	22	30
L1	1	0	0	0	0	1	1	0	2	0	2	3
EW3	0	0	0	0	0	0	0	0	0	0	0	0
EW2	0	0	0	0	0	0	0	0	0	0	0	0
EW1	2	0	0	0	0	2	2	0	3	0	3	5
MH1	8	8	8	0	0	0	16	0	4	0	4	20
Susp1	7	3	9	0	0	0	12	0	6	0	6	18
WN1	5	13	0	0	0	0	13	0	0	0	0	13
Methow total	294	211	234	5	12	65	526	0	182	39	221	747
C12	3	0	0	0	0	0	0	0	7	0	7	7
C11	1	0	0	0	0	0	0	0	2	0	2	2
C10	7	2	2	0	20	0	11	0	5	0	5	16
C9	0	0	0	0	0	0	0	0	0	0	0	0
C8	5	6	0	0	0	0	4	0	8	0	8	12
C7	16	5	0	2	0	1	8	2	24	4	30	38
C6	33	24	2	2	0	1	29	0	46	2	48	77
C5	32	22	0	2	0	6	30	0	45	0	45	75
C4	44	44	5	7	0	5	61	0	37	5	42	103
C3	10	17	2	0	0	0	19	0	4	0	4	23
C2	55	76	14	6	0	6	102	0	27	0	27	129
C1	11	13	4	1	0	3	21	0	5	0	5	26
Chewuch total	217	209	29	20	20	22	285	2	210	11	223	508
T10	0	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0	0	0	0	0	0
T7	5	0	0	0	0	0	0	0	11	0	11	11
T6	24	4	4	0	0	3	11	0	35	7	42	53
T5	10	2	0	0	0	5	7	0	15	0	15	22
T4	3	3	0	0	0	0	3	0	3	0	3	6
T3	8	2	0	0	0	0	2	0	9	7	16	18
T2	4	9	0	0	0	0	9	0	0	0	0	9
T1	1	0	0	0	0	2	2	0	0	0	0	2
Twisp total	55	20	4	0	0	10	34	0	73	14	87	121
2005 total	566	440	267	25	32	97	845	2	465	64	531	1,376

Appendix G. Estimated escapement and straying by section from 2006 Methow River basin spawning ground surveys. The total of local, within-basin (WB) strays, and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. Ad-only or no-mark hatchery fish (U) are the sum total of all fish for which release hatchery could not be identified.

Reach	Redds	Hatchery fish					Wild fish				Estimated escapement
		Local	WB	OB	U	Total	1.1	1.2	1.3	Total	
M15	6	0	0	0	6	6	0	5	0	5	11
M14	17	2	0	0	13	15	0	11	3	14	32
M13	5	0	2	0	3	5	0	6	1	7	9
M12	20	13	6	0	16	35	0	3	0	3	38
M11	24	9	9	2	15	35	0	8	2	10	45
M10	36	35	13	0	14	62	0	3	3	6	68
M9	173	173	79	4	43	299	0	10	16	26	325
M8	9	3	7	0	4	14	0	3	0	3	17
M7	59	20	24	0	17	61	0	0	0	0	111
M6	46	77	49	0	5	131	0	0	0	0	86
M5	0	0	1	0	4	5	0	0	0	0	0
L2	26	0	0	8	0	8	0	41	0	41	49
L1	2	0	0	0	1	1	0	3	0	3	4
EW3	9	6	7	0	6	16	0	0	0	0	17
EW2	1					3	0	0	0	0	2
EW1	4	0	0	0	0	0	0	8	0	8	8
MH1	75	76	51	0	12	139	0	0	2	2	141
Susp1	36	34	11	0	23	68	0	0	0	0	68
WN1	21	27	10	0	2	39	0	0	0	0	39
Methow total	569	475	269	14	184	942	0	101	27	128	1,070
C12	1	0	0	0	2	2	0	0	0	0	2
C11	1	0	0	0	2	2	0	0	0	0	2
C10	9	9	2	0	1	11	0	5	0	5	17
C9	0					1	0	0	0	0	0
C8	10	5	1	1	8	15	0	3	1	4	19
C7	32	5	0	2	34	41	0	14	5	19	60
C6	54	23	10	16	23	72	0	20	10	30	102
C5	22	10	3	0	13	26	0	10	5	15	41
C4	63	21	11	3	33	68	0	27	15	42	118
C3	5	10	5	0	0	15	0	2	0	2	9
C2	51	36	9	19	17	81	0	3	12	15	96
C1	25	26	9	3	6	44	0	2	1	3	47
Chewuch total	273	145	50	44	139	378	0	86	49	135	513
T10	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0
T8	3	0	0	0	0	0	0	6	0	6	6
T7	19	9	0	0	0	9	0	18	9	27	36
T6	39	21	0	0	24	45	0	17	11	28	73
T5	15	19	3	0	2	24	0	4	0	4	28
T4	3	0	0	0	6	6	0	0	0	0	6
T3	2	4	0	0	0	4	0	0	0	0	4
T2	2	1	1	0	2	4	0	0	0	0	4
T1	4	5	0	0	3	8	0	0	0	0	8
Twisp total	87	59	4	0	37	100	0	45	20	65	165
2006 total	929	679	323	58	360	1,420	0	232	96	328	1,748

Genetic monitoring of Methow Spring Chinook

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Final report, April 13, 2007

Executive summary

Temporal samples from 1992 through 2006 of fish from the Winthrop National Fish Hatchery (WNFH), and hatchery- and natural-origin fish from the Methow, Twisp, and Chewuch rivers were genetically characterized. Twisp hatchery- and natural-origin collections formed a discrete group distinct from a Methow-Chewuch-WNFH group. Methow collections were genetically very similar to the WNFH collections and differentiated from 1992 and 1993 Chewuch collections. The Methow and Chewuch became more similar after implementing the hatchery broodstock developed from a combination of Methow and Chewuch spawners. Collections were examined for signals indicating negative effects from hatchery supplementation, which was started in 1992 and a genetic bottleneck experienced by all fish in 1996-1997. Genetic diversity measures, heterozygosity and allelic richness, and genetic differences between Twisp and other collections were unchanged following hatchery supplementation and the bottleneck. Effective population sizes were difficult to compare pre- and post-supplementation and bottleneck since values differed significantly between 1992 and 1993 collections. If only collections from 2001 and beyond are compared, effective population sizes remained stable in Methow and Chewuch and declined in the Twisp, although supplementation has slowed the decline in Twisp fish. Assignment tests indicated that if natural-origin fish were collected at Wells Dam for broodstocks and assigned with a moderate probability threshold (10 times more likely to have come from one collection as from another), there is low risk of incorrectly identifying a Methow-Chewuch fish as a Twisp fish and even lower risk of incorrectly identifying a Twisp fish as a Methow-Chewuch fish.

Introduction

Supplementation programs were implemented in 1992 on the Twisp, Chewuch, and Methow rivers to mitigate for smolt mortality associated with the operation of Wells Hydroelectric project. Initially these programs used in-river natural broodstock collected from each respective subbasin. Beginning in 2001, an alternative strategy was developed for the Chewuch and Methow rivers, which used a common broodstock developed from the Chewuch and Methow rivers spawning aggregates. This broodstock (Methow

composite, hereafter referred to as Metcomp) employed natural- and hatchery-origin fish collected from both rivers as well as hatchery adults returning to either Methow or Winthrop Hatchery. Progeny of this broodstock have been released annually into both the Chewuch and Methow rivers. In the Twisp River, located roughly 20 miles downstream from the confluence of the Chewuch and Methow rivers, natural- and hatchery-origin fish have also been collected for hatchery broodstock each year, but their progeny have been released back into the Twisp River only.

Hatchery-origin fish were identified on spawning grounds by wanding for coded-wire tags (CWT) and in hatcheries by decoding CWTs. In some fish, especially fish from the earlier collections (e.g., 1992 and 1993), hatchery fish without CWTs were identified by diagnosic scale patterns. Hatchery fish have demonstrated a tendency to stray into rivers upstream of the release locations (A. Murdoch, unpublished data), so some Twisp hatchery-origin fish have strayed into the Chewuch and Methow rivers. But reciprocal straying is rarely detected on the spawning grounds (A. Murdoch, unpublished data). Previous to the Methow Fish Hatchery Program, a federal hatchery program was implemented in the 1940's at the Winthrop National Fish Hatchery (WNFH), located on the Methow River one mile upstream of the confluence of the Chewuch and the Methow rivers. WNFH originally used broodstock derived from out-of-basin fish (Carson stock), but transitioned in 2001 to the Metcomp broodstock. Based upon CWT recoveries, relatively few spring Chinook from WNFH of Carson stock origin have strayed into the Twisp River compared to the Methow or Chewuch rivers (A. Murdoch, unpublished data) and an increasing proportion (range 2.2 – 71.4%) of fish released from WNFH have spawned annually in the Methow and Chewuch rivers (Cooper 2005). Since 2001, WNFH collected only the number of fish required to meet the broodstock goal and all returning hatchery fish in excess of the broodstock goal spawned naturally in either the Methow or Chewuch rivers.

Based on the Douglas County PUD Monitoring and Evaluation Plan (Wells HCP HC, 2005), we developed nine specific genetic-related tasks (Small and Murdoch 2006) to be completed in a multi-year study. However, funding allowed us to complete the study in a

single year, rendering some tasks unnecessary (e.g., task 3 – modeling effects of bottleneck in 1996-97 to assess if bottleneck effects could be distinguished from hatchery impact). Since we have data for samples collected before and after bottlenecks and hatchery impacts, we can estimate these effects from the samples rather than through a model. In the tasks (described in the discussion section below) we outlined the development of genetic profiles of natural-origin collections from the Methow, Chewuch, and Twisp rivers from three time periods: before in-river hatchery supplementation (1992-1993), after the bottleneck and early in the interactions between natural-origin and hatchery-origin fish on spawning grounds (2001), and after several years of interactions between natural-origin and hatchery supplementation fish on spawning grounds (2005-2006). We estimate measures of genetic diversity and compare these among collections from the three time periods to document changes. We also profile changes in genetic variance among collections from different time periods and estimate if temporal differences among collections from the same river are greater than spatial differences among rivers within a single year. We calculate the effective number of spawners (N_e) for each collection and look for changes over time in hatchery- and natural-origin fish and calculate the relationship of N_e to census size. The effective population size is the theoretical number of individuals that would display similar diversity and be subject to similar genetic drift (random changes in allele frequencies). Since reproductive success is unequal among individuals within a population, N_e is usually smaller than the population's census size. In our final task we estimate the probability of correctly assigning naturally produced spring Chinook collected at Wells Dam to the Twisp, Chewuch, or Methow spawning aggregates through assignment tests with collections separated into temporal and spatial collections and grouped into spatial (tributary) collections.

Methods

Sample processing

Scale and tissue samples were processed for 1681 fish from Methow, Chewuch, and Twisp rivers (Figure 1) and the Metcomp hatchery broodstock (Table 1). Fish were genotyped at the 13 standardized Chinook Technical Committee (CTC) or GAPS loci.

We added an additional ten loci to increase the power to distinguish between closely related samples, making a total of 23 loci for a complete genotype (Table 2). Genomic DNA was extracted from tissue and scale samples using silica membrane kits (Macherey-Nagel). Microsatellite alleles at 23 loci were PCR-amplified using fluorescently labeled primers (see Table 2 for detailed PCR information). PCRs were conducted in 96 well plates in 10 µl volumes employing 1 µl template with final concentrations of 1.5 mM $MgCl_2$, 200µM of each dNTP, and 1X Promega PCR buffer. After initial three minute denature at 94°, 40 cycles consisting of 94° for 15 seconds, annealing (temperature in Table 1) for 30 seconds, extension at 72° for 60 seconds were followed by a 10-minute extension at 72°. Microsatellites were detected using an ABI 3730 automated DNA Analyzer, and alleles were sized (to base pairs) and binned using an internal lane size standard (GS500Liz from Applied Biosystems) and GeneMapper software (Applied Biosystems). Scale samples and some tissue samples were degraded and required rerunning to attempt complete genotypes. Since many samples were of poor quality, fish included in the analysis (N = 1576) were genotyped at a minimum of ten total loci (Table 1). There were several hatchery-origin fish in samples from 1992 and 1993 (pre-hatchery supplementation, see Table 1). In the 1993 Methow and Chewuch collections, 62 out of 93 fish and 10 out of 104 fish, respectively, were identified by scale analysis to be of hatchery-origin. To determine the source of these hatchery fish, we analyzed samples as separate groups and dropped hatchery-origin samples under 10 fish from 1992 Chewuch and 1993 Twisp natural-origin collections (Table 1).

Within-population genetic diversity and equilibrium

We used FSTAT 2.9.3 (Goudet 2001) to assess conformation to Hardy-Weinberg equilibrium expectations as expressed by F_{IS} and tested its significance for each locus and over all loci in each collection with 350,000 randomizations. Departures from Hardy-Weinberg equilibrium within a population can result from a variety of causes, including, nonrandom relationship among individuals within the collections resulting from the presence of family groups or inbreeding, or when a collection is composed of two or more populations. Linkage disequilibrium in each locus pair in each collection group was assessed using GENEPOP (Raymond and Rousset 1995) with 5000 burn-ins and

5000 iterations. If a collection has several pairs of linked loci, the collection may contain family groups or be an admixture of more than one population. Other causes of linkage disequilibrium within a population include natural selection, bottlenecks, and genetic drift (Nielsen et al. 1999). We examined collections for family groups by measuring pairwise relatedness among individuals with IDENTIX (Belkhir *et al*. 2002), using Queller and Goodnight's (1989) "Q" value (Q = 0.25 for half-siblings and 0.5 for full-siblings). We also calculated the mean and variance of the Q value for each collection and their significance compared to a null model of no relatedness using 1000 permutations (if samples contain family groups individuals will either be highly related or unrelated such that the variance of relatedness is high). Allelic richness was calculated using a randomization implemented in FSTAT and based upon permutation of 8 diploid individuals, the smallest sample size at a single locus. Allelic richness is a measure of diversity. In general, populations that are isolated and have smaller effective population sizes have fewer alleles. Gene diversity (expected heterozygosity corrected for sample size, Nei 1987) was calculated using FSTAT. Heterozygosity is another diversity measure – isolated populations with small effective population sizes tend towards lower heterozygosity, or the same, rather than two different alleles at each locus. Effective population size was estimated using a linkage disequilibrium method (Waples 2006) and the program LDN_e (Do and Waples unpublished).

Population differentiation

Genetic variance among temporal and spatial collections was estimated by a hierarchical analysis of molecular variance (AMOVA) using ARLEQUIN3.0 (Schneider et al. 2000) with 10,000 permutations. If genetic variance is unequally distributed among collections, there is genetic structure in the data set and we explore this structure for temporal and spatial patterns. We examined the magnitude of genetic differences among temporal and spatial collections in pairwise F_{ST} tests with 10,000 permutations using ARLEQUIN. We conducted explicit tests of differences in genotypic distributions among temporal and spatial collections in pairwise genotypic tests with 200,000 permutations using FSTAT. Statistical significance in all analyses was evaluated using a Bonferroni correction of *p*-values (Rice 1989).

We used GENETIX (Belkhir et al. 2004) to visualize relative similarities among spring Chinook populations based on genotypic data. GENETIX performs a factorial correspondence analysis in which composite factorial axes are generated that describe the most variance in a "cloud" of observations, here a plot of individuals according to their allele types. Individuals are plotted in three dimensions along these axes according to their genotype (Lu et al. 2001). The analysis was conducted "over populations" in which the program condenses the cluster of individuals into a single point representing the mean allele frequencies in the collection (Belkhir et al. 2004). We viewed genetic distance relationships among collections in a dendrogram. We generated allele frequencies for each collection using CONVERT 1.3 (Glaubitz 2004) and calculated pairwise chord distances (Cavalli-Sforza and Edwards, 1967) among collections from allele frequencies using GENDIST in PHYLIP 3.5c (Felsenstein 1993). Chord distances were plotted in a neighbor-joining (NJ) tree using PHYLIP and visualized with TREEVIEW 1.6.6 (Page 2001). To test the repeatability of branching in the NJ tree, the allele frequency file was bootstrapped 1,000 times across loci using SEQBOOT. Tree topologies were created for replicates with NEIGHBOR, and a consensus tree was generated using CONSENSE. Node values from the consensus tree were added to the chord distance tree described above.

We used a third method to view population differences and similarities in a nonmetric multidimensional scaling analysis (MDS) using allele-sharing distance matrices. Pairwise allele-sharing distances are calculated as 1 – (mean over all loci of the sums of the minima of the relative frequencies of each allele common to a pair of populations). To calculate the allele-sharing distances for each pair of populations we used PowerMarker v3.25 (Liu and Muse 2005). Nonmetric multidimensional scaling is a technique designed to construct an n-dimensional "map" of populations, given a set of pairwise distances between populations (Manly 1986). The output from this analysis is a set of coordinates along n-axes, with the coordinates specific to the number of n-dimensions selected. To simplify, we selected a 2-dimensional analysis to represent the relative positions of each population in a typical bivariate plot. The goodness of fit

between the original allele-sharing distances and the pairwise distances between all populations along the n-dimensional plot is measured by a "stress" statistic. Kruskal (in Rohlf 2002) developed a five-tier guide for evaluating stress levels, ranging from a perfect fit (stress=0) to a poor fit (stress=0.40). We conducted the nonmetric multidimensional scaling analysis using the mdscale module in MATLAB R2006b (The Mathworks 2006).

Individual assignment tests

We completed a series of individual assignment tests, using a variety of baseline collections. Fish were assigned to their most likely population of origin based on the partial Bayesian criteria of Rannala and Mountain (1997), using a "jack-knife" procedure, where each individual to be assigned was removed from the baseline prior to the calculation of population likelihoods. We implemented this procedure using a program written by Warheit in MATLAB R2006b (The Mathworks 2006). Two assignment criteria were used, 1) the population with the largest posterior probability for an individual was the "most-likely" population of origin (i.e., all individuals assigned to a collection), and 2) an assignment was considered valid only if the posterior probability was greater than or equal to 0.9. A posterior probability of 0.9 is roughly equivalent to a likelihood ratio of 10, whereby the assigned population is 10 times (or more) likely than the second-most likely population. Please note that while we used temporal collections as populations for each analysis (e.g., 1993 natural-origin fish from Twisp River [93TwispW]), likelihoods for each of these collections were summed based on more inclusive population grouping (e.g., Chewuch, Twisp, Methow) and posterior probabilities were calculated for that grouping or population, rather than individual temporal collections.

Results

Hardy-Weinberg equilibrium

We tested for departures from Hardy-Weinberg equilibrium (HWE) expectations at individual loci and over all loci. There were 125 (out of 506) departures from HWE for excess homozygotes at individual loci before corrections for multiple simultaneous tests

(data not shown), and 20 departures after corrections (corrected alpha = 0.00009). Seven of these departures were at the locus *Omm*-1080. This locus also appeared unstable in genotypes for scale samples since several genotypes in reruns differed from original runs. Therefore, we dropped *Omm*-1080 from all tests and analysis, except for the individual assignments tests and the MDS analysis (see below). There were also 23 departures from HWE for excess heterozygosity, before corrections and 2 departures after corrections. In tests over all loci, 10 collections departed from HWE with excess homozygosity (after corrections) and 2005 Twisp natural departed from HWE with excess heterozygosity (Table 2). Excess homozygosity may indicate inbreeding due to small population size, or the collection may have contained genetically differentiated groups, such as families or spawners from other populations. Excess heterozygosity could indicate that a population recently decreased in size or that some parents were from genetically differentiated groups.

Linkage disequilibrium

Pairwise linkage disequilibrium was moderate to numerous in collections (Table 1). All collections had some linkage disequilibrium before Bonferroni corrections, and after corrections several hatchery-origin collections as well as the 1992 and 2006 Twisp collections had significant (>5%) linkage. The GAPS loci have been screened for evidence of physical linkage (loci on the same chromosome) and the loci to increase discrimination power have not been reported as physically linked to other loci in this study. Significant linkage suggests that some hatchery-origin and Twisp natural-origin collections may contain family groups or be composed of recently merged genetically differentiated groups now interbreeding. Our analysis on the pairwise relatedness of individuals within the population supports the family groups hypothesis (see below).

Family analyses

Since linkage indicated that hatchery collections might contain family groups we examined pairs of hatchery- and natural-origin collections for indications of family groups by measuring pairwise relatedness among individuals within collections using the program IDENTIX (Table 3). The highest percentage of full sibling relationships was

2.6% in 2006 Twisp hatchery collection and the highest percentage of half sibling relationships was 6.8% in 2001 Twisp hatchery collection. We found positive relationships between the percentage of loci in linkage disequilibrium and the percentage of half or full sibling relationships (Figure 2a, b). The 2005 Twisp natural-origin collection was anomalous in that it had high linkage but relatively low sibling relationships (Table 3). The r^2 value for the half-sibling regression line for linkage before Bonferroni corrections changed from 0.0067 to 0.2385 when 2005 Twisp natural-origin values were removed from the regression (plot shown without 2005 Twisp natural-origin) and the regression for linkage after corrections changed from a negative to positive slope with an r^2 value of 0.4671. The 2005 Twisp natural-origin collection also had a significant excess of heterozygotes (Table 1), suggesting that that the high linkage was at least partially the result of mating among genetically differentiated groups in the parental generation. We found significantly high variance ($p < 0.001$) in pairwise relatedness within all hatchery and natural-origin collections and variance was higher in collections with high linkage).

Diversity

Mean heterozygosity and mean allelic richness were the same in Chewuch and Methow natural-origin collections (Table 1, $p = 0.07$ and 0.09 respectively for one-tailed Student's t-tests). Mean heterozygosity and allelic richness were significantly lower in Twisp natural-origin collections than in Chewuch ($p = 0.01$ and 0.00047, respectively for one-tailed Student's t-tests) and Methow natural-origin collections ($p = 0.0046$ and 0.00026, respectively for one-tailed Student's t-tests). There were no significant differences in heterozygosity or allelic richness in collections from before and after the bottleneck ($p > 0.05$ for comparisons of collections within each river using group test in FSTAT).

Effective population size (N_e)

We calculated N_e and its 95% confidence interval (1000 bootstraps) for each temporal collection (Table 1) using a linkage disequilibrium method (Waples 2006) with the lowest frequency allele set at 5% to avoid bias introduced by small samples. N_e values changed dramatically between 1992 and 1993 for Chewuch and Twisp natural-origin

collections (we had no 1992 Methow collection), suggesting differences in survivorship between years (Figure 3). Differences could also be influenced by non-biological phenomena such as sampling error or poor genotyping for scale tissue collected in 1992 (in Chewuch failure rate was 6.6% for scales from 1992 and 1.7% for tissues from 1993, respectively, and in Twisp 10.24% for 1992 and 4.5% for 1993, respectively). If we compare only 1993 collections to later collections, N_e was universally smaller after the 1996-1997 bottleneck (Figure 3). Post-1997, N_e in Chewuch and Methow collections remained stable while N_e in Twisp collections declined.

Since the programs employed a supplementation hatchery protocol, we also calculated N_e for combined hatchery- and natural-origin collections (Table 1) and plot these values for Twisp in Figure 3. With the exception of 2001 Twisp, hatchery supplementation increased N_e in the combined population. In 2001 Twisp, N_e of the hatchery was roughly one-third the N_e of the natural-origin collection and when the hatchery and natural-origin collections were combined, the N_e was lower than the N_e for the natural-origin collection alone. The ratio of N_e to census size was highly variable (Table 1), but we found a positive relationship between census size and N_e (Figure 4).

Analysis of Molecular Variance (AMOVA)

The analysis of molecular variance (AMOVA) indicated little variance among collections (1.11%). There was virtually no temporal variance among collections and modest spatial variance. When averaged over all loci, only 0.005% variance was among temporal collections and 1.18% variance was between Twisp collections and a combination of the Methow, Chewuch and Winthrop hatchery-origin collections. Most of the variance (98.89%) was among individuals within collections.

Pairwise F_{ST} and genotypic differentiation

Pairwise F_{ST} values and genotypic tests indicated that spawning aggregates in the Twisp River (and Twisp hatchery-origin collections) are genetically differentiated from spawning aggregates in the Methow and Chewuch rivers (Table 4). Several genotypic tests differed from F_{ST} tests. Genotypic tests are sensitive to low levels of genetic

structure (Waples and Gaggiotti 2006), but so sensitive that they may yield significant values that are biologically meaningless. Pairwise F_{ST} values inform about the magnitude of differentiation, providing a complement to genotypic tests. Wherever the test results differed, the pairwise F_{ST} value was very low, suggesting that differences at one or two loci led to a significant genotypic test. Temporal comparisons within tributaries (boxed values in Table 4) support low temporal variation found in the AMOVA. The 2001 Chewuch hatchery-origin collection had low but significant variance in comparisons with other Chewuch collections, and 2006 Chewuch natural-origin was slightly more differentiated from other Chewuch collections. The Twisp hatchery-origin collections were mostly differentiated from Twisp natural-origin collections, although closer to Twisp natural-origin collections than to collections from other tributaries. The 2006 Twisp natural-origin collection was the smallest collection in the study (N = 13) and was basically undifferentiated from all other collections. Since the 2005 Twisp natural-origin collection (N = 43) was differentiated from the Methow, Chewuch, and Metcomp collections, 13 fish may have been inadequate to capture the genetic diversity identified in the 2006 Twisp natural-origin collection. We found low differentiation between Methow and Chewuch collections, some of which was not significantly different from zero after corrections. With the exception of 2006 Twisp natural-origin collection, all the Twisp collections were differentiated from the Chewuch and Methow collections. Winthrop hatchery collections were not differentiated from most Methow natural-origin collections, suggesting Winthrop hatchery introgression into the Methow population. We plotted pairwise F_{ST} values versus time between collections and found an increase in differentiation over time within Twisp natural-origin collections and within Twisp hatchery-origin collections (Figure 5). Increased differentiation is likely a signal that genetic drift is increasing as N_e decreases. Differentiation also increased among Chewuch collections, possibly due to drift and introgression from the Methow through the Metcomp hatchery program.

Graphical representation of population differentiation

In the factorial correspondence analysis (FCA) the Twisp collections formed a group on the right side of the first axis with the Twisp hatchery-origin collections (and 2006 Twisp

natural-origin) around the periphery of the cluster of natural-origin collections (Figure 6). The Chewuch and Methow collections plotted on the left side of the first axis with the two groups spread along the second axis. Earlier collections plotted at the far ends of the second axis and later collections plotted near the center of the second axis. The Winthrop hatchery collections and the 1993 Methow natural-origin collection formed a tight cluster with the hatchery fish from the 1993 Chewuch and Methow collections plotting nearby, suggesting that these were Winthrop hatchery fish that had strayed into spawning areas. The genetic distance tree shows essentially the same relationships as the FCA plot (Figure 7). The Twisp hatchery- and natural-origin collections form a cluster with 73% bootstrap support. The earlier Twisp collections form a terminal group with 82% bootstrap support. Except for the 2006 natural-origin collection, the Twisp hatchery-origin collections show longer branch lengths indicating some differentiation of hatchery groups, possibly reflecting variance in family size as suggested by higher percentage of sibling relationships and lower N_e. Earlier (pre-2006) Chewuch collections form a cluster with 78% bootstrap support. Methow and Winthrop (and 1993 Chewuch hatchery-origin) collections form a weakly supported cluster. The Metcomp collection inserts between the Chewuch and Methow/Winthrop clusters.

The FCA and dendrogram had many similarities to the nonmetric multidimensional scaling (MDS) analysis. The stress statistic for the MDS was 0.11, a value Kruskal (in Rohlf 2002) considered to be a good fit between the actual allele-sharing distances and the Euclidean (straight-line) distances in the plot indicating that Figure 8 is a good visual representation of the allele-sharing distance matrix; collections with a high percentage of alleles shared will be closer to each other than collections with a lower percentage of alleles shared.

The natural- and hatchery-origin collections from the Twisp River form a loose cluster distinct from the aggregate formed by the Methow, Chewuch, Winthrop, and Metcomp collections (Figure 8). The hatchery-origin collections from 1993 Chewuch and 2006 Twisp appear as outliers, suggesting that their allele distributions were non-representative or that distances were distorted due to small sample sizes. The median percentage of

alleles shared among the natural-origin Twisp collections is 77%, compared with a median percentage of 68% shared between Twisp natural-origin collections and the aggregate of Chewuch, Methow, Metcomp, and Winthrop collections. The median percentage alleles shared between the Methow and Chewuch collections is 74%, nearly as high as the alleles shared among the Twisp collections.

The two Winthrop Hatchery collections are adjacent in the MDS plot and are within the Methow minimum convex polygon (Figure 8). These two collections share approximately 81% of their alleles. The 1993 hatchery-origin collection from the Methow River shares an average of 80% of its alleles with these two Winthrop Hatchery collections, compared with 77% of its alleles with the 1993 Methow natural-origin collection. Furthermore, this 1993 hatchery-origin collection is adjacent to the Winthrop collections in the MDS plot. This suggests that the fish from 1993 Methow hatchery-origin collection were strays from the Winthrop Hatchery. Although the Winthrop Hatchery collections are within the Methow natural-origin polygon the percentage of alleles shared between these two collections and each of the natural-origin Methow collections remained relatively unchanged at 75-76% from 1993 through 2006.

In summary, there is spatial structure among the populations of fish within the Methow system, and this can seen clearly in both the FCA (Figure 6) and the MDS (Figure 8) plots. There is greater allele sharing among the collections from the Chewuch and Methow Rivers, and the Metcomp and Winthrop Hatcheries, than between any of these collections and the Twisp collections. The Twisp collections form a distinct group; however, the allele sharing among the Twisp collections is variable, and the 2006 natural-origin collection from Twisp River (N=13) appears quite divergent.

Assignment tests

Assigning individuals of unknown origin to populations. Individual assignment tests can be used for at least two purposes. First these tests can be used as a measure of discreteness of a population: individuals are tested for assignment probabilities back to their collection of origin (self-assignment). If individuals assign with high probability to

their collection of origin, this is an indication that there has been little straying into the population over time and the population is genetically discrete. Second, these tests can be used to assign a fish of unknown origin to a specific population based on baseline data from a series of populations. Here, we assume that all individuals from a baseline population (i.e., all individuals collected from a specific locality, such as Twisp River) are native to that population and allele frequencies for the baseline population represent the "true" population. We calculate the probabilities that an individual of unknown origin originated from each of the baseline populations based on the alleles in the individual and allele frequencies in the baseline populations. If the allele frequencies for baseline populations are similar to each other, the assignment probabilities associated with these populations will also be similar, and the individual of unknown origin may be incorrectly assigned to a population from which it did not originate. A baseline-specific error rate for this type of assignment test can be quantified using the jack-knife procedure described in the Methods section, and implemented in Task 9, including the preliminary Task 9 analysis in Small et al. (2007).

We expand the Small et al. (2007) analysis to include collections from all years; however, we are restricting the analysis to natural-origin fish only. Since hatchery-origin fish are uniquely tagged, their origins (Twisp, Metcomp, or Winthrop Hatcheries) are known presumably without error. Therefore, only natural-origin fish require genetic analyses to determine their source populations, and they are from rivers and not hatcheries.

For Task 9, we conducted two different individual assignment tests. First, in self-assignments we included all natural-origin temporal collections in the baseline and conducted a jack-knife analysis of all individuals from each collection to calculate posterior probabilities of assignment for the Methow/Chewuch and Twisp populations (Table 5). For each temporal collection, we summed the number of individuals assigned to either the Methow/Chewuch or Twisp population, and calculated the assignment error rate for each group using two different threshold criteria (Table 5). Second, instead of including all natural-origin collections as a baseline, we removed from the baseline the three 2006 natural-origin collections from the Twisp, Chewuch, and Methow rivers, and

used the remaining collections as the baseline. Instead of a jack-knife analysis, we assigned as unknown fish each of the 2006 natural-origin fish to either the Methow/Chewuch or Twisp populations, and calculated the assignment error rate for collections from each river (Table 6).

For the jack-knife analysis (self-assignment), the error rate for the Twisp and Methow/Chewuch ranged 7.32 - 9.83% and 5.48 - 6.57%, respectively (Table 5). Our use of the stringent 0.90 criterion produced an error rate for the Twisp that was 34% lower than that using the highest posterior probability criterion and 20% lower in the Methow/Chewuch. The 7.32% error rate for the Twisp is over three times greater than the 2.25% error rate calculated by Small et al. (2007), who combined the hatchery- and natural-origin fish from the 2005 and 2006 Methow/Chewuch and Twisp collections. This comparison clearly indicates that assessing assignment errors depends on the baseline used to calculate population allele frequencies.

The error rates associated with assigning collection year 2006 fish to the Twisp River are much larger than those associated with either the jack-knife procedure described above or in Small et al. (2007) (Table 6). However, we note that a total of only five fish were assigned to the Twisp River (posterior probability ≥ 0.90) and the origin for four of these fish was indeed the Twisp River (Table 6). Furthermore, seven of the 13 natural-origin Twisp fish were unassigned and in many regards the 2006 natural-origin Twisp collection was unusual compared with the other Twisp collections (see Figures 6, 7, 8).

Assignment tests for measuring immigration rates. Individual assignment tests can also be used to estimate whether an individual in a population is an immigrant to that population (i.e., the fish originated elsewhere and strayed to the population from which it was captured). Algorithmically, the test is identical to the jack-knife procedure used for assessing error with individual assignment tests described above. However, the results are interpreted differently and are based on a different suite of assumptions. Here, if an individual from a baseline population is assigned to a population other than the population from which it was captured, that individual represents a potential immigrant to

the population, rather than a potential error to the assignment process. As with any individual assignment procedure, if two baseline populations are similar it would be difficult to differentiate between immigration and assignment error; however, to accept that an individual is an immigrant the two baseline populations (i.e., the source and capture populations) should have significantly different allele frequencies, and the posterior probability to the assigned population must meet a stringent criterion.

We used individual assignment tests to quantify the degree of straying among rivers within the Methow system, and to determine if fish from the Winthrop Hatchery occur more readily in the Methow River rather than the Chewuch or Twisp Rivers. Table 7 provides the results from a jack-knife-based individual assignment test for each temporal collection. As discussed above, we use the more stringent criterion when assuming "incorrect" assignments are a product of immigration, rather than assignment error associated with two similar baseline populations. Because these analyses are directly relevant to Task 5, we provide an expanded analysis and discussion on introgression in the Task 5 Discussion section, below.

Discussion

The main objectives for this study were to identify genetic structure among spring Chinook populations in the Methow, Chewuch, and Twisp rivers and to determine if hatchery supplementation was negatively impacting populations. Here we restate the tasks outlined in the study plan and discuss our results in light of these tasks.

Task 1: Develop genetic profiles of spring Chinook salmon populations in the Twisp, Chewuch and Methow rivers from samples gathered in 1992 and 1993 (one to two collection years per stock) using 20-25 loci. This will be our pre-supplementation baseline with which we establish the basin population structure. We will also assess whether effective population sizes (N_e) can be calculated using a linkage disequilibrium method.

Task 2: Develop a genetic profile for the WNFH spring Chinook salmon (Carson stock) from 1992 and compare to the pre-supplementation populations in the Twisp, Chewuch and Methow rivers. This will be our baseline for this hatchery.

Methow spawners contained a substantial proportion of the WNFH genome. This was indicated in the close grouping of the 1993 Methow natural-origin collection with 1992 and 2001 Winthrop hatchery-origin collections (Figure 6, Figure 7, and Figure 8), and non-significant pairwise F_{ST} values and genotypic tests (Table 4). The 1992 and 1993 Chewuch and Twisp collections were significantly differentiated from the Winthrop hatchery-origin collection, the Twisp more so than the Chewuch (Table 4). The average of pairwise F_{ST} values indicated a gradient of Winthrop hatchery influence in natural-origin spawners from the different tributaries: 0.0043 Methow, 0.0010 Chewuch, and 0.0168 Twisp (the higher the value, the greater the genetic difference).

Task 3: Using the pre-supplementation baseline, model the effects of the genetic bottleneck (enhanced genetic drift) experienced by the Methow basin spring Chinook salmon in 1996-1997.

We did not model the effects of genetic drift since this project was accomplished in a single year and we could look directly at post-1997 collections to estimate effects of drift. The bottleneck appeared to have little effect on genetic diversity since heterozygosity and allelic richness were essentially unchanged between earlier and later collections (Table 1). Branch lengths for natural-origin collections were similar in earlier and later collections (Figure 7, except 2006 Twisp), indicating little impact by genetic drift on genetic distances. The 2006 Twisp natural-origin collection had a long branch length and was anomalous in all analyses. Because the collection contained only 13 fish, these results are just as likely to have been sampling error as a signal indicating genetic drift. If 1992 collections are ignored, N_e was significantly lower in all post-1997 collections (Figure 3), compared with the 1993 collections. Compared to 1992 collections, N_e was significantly higher in 2001 Chewuch and Twisp collections. Since the 1992 collections were scales and many had incomplete genotypes (50% missing at least one locus in Chewuch and 63% missing at least one locus in Twisp versus 18% and 35%, respectively, missing at least one locus in 1993 collections), the 1992 collections may not have represented the Chewuch and Twisp populations as well as the 1993 collections. There may also have been sampling error, such as family groups, in 1992 collections that

contributed to low N_e, as suggested by higher linkage in 1992 collections. Alternatively, the 1993 collections may have been anomalous. For instance, in the 1993 Chewuch collection the N_e was 1.2 times the census size (Table 1) and N_e was high in relation to census size in 1993 Methow and 1993 Twisp (N_e is generally between 0.1 and 0.3 times the census size, Bartley et al.1992).

Task 4. Genetically profile the spring Chinook salmon populations from 2001 in the Twisp, Chewuch and Methow rivers after the supplementation program fish have returned and have had a chance to interbreed with the wild fish. Compare these to 1992-93 samples to determine if genetic drift and the bottlenecks caused significant divergence between samples within rivers. Determine whether N_e for individual populations could be calculated using a temporal method.

The decrease in N_e in 2001 collections relative to 1993 collections could indicate that in-river supplementation programs were negatively impacting natural spawner groups. Decreased N_e in natural spawners is one danger from integrated hatchery programs due to unequal representation of hatchery families on the natural spawning grounds (Ryman and Laikre 1991). Sibling relationships were higher in hatchery-origin collections than in natural-origin collections (Table 3) and high variance in Q values supported family groups in hatchery- as well as natural-origin collections. However, we found no significant divergence among natural-origin collections from before and after the bottleneck. We did not calculate N_e using a temporal method since we were interested in changes of point estimates of N_e over time.

Task 5. Compare the 2001 naturally produced spawners with the 1992 WNFH fish to identify possible introgression by Carson stock into wild populations.

As discussed above, the Methow population appears closely related to the Carson stock maintained at the WNFH. The pairwise F_{ST} values between WNFH and the 2001 collection from Chewuch were lower than pairwise values with 2001 Twisp natural spawners (Table 4), suggesting a closer relationship between WNFH and Chewuch fish. We plotted pairwise F_{ST} values versus time of separation between WNFH collections and Chewuch and Twisp hatchery- and natural-origin collections and found a slightly negative slope and much variance in the values (Twisp -0.0005, $r^2 = 0.0501$; Chewuch -

0.0003, $r^2 = 0.1109$). If the 2006 Twisp natural-origin collection was removed, the slope became flat and $r^2 = 0.0096$. Since Methow fish were genetically very similar to the WNFH fish, introgression into Chewuch and Twisp populations could have been mediated by either Methow or WNFH fish.

The assignment tests provide further information regarding possible introgression. The number of natural-origin fish "incorrectly" assigned to the Winthrop Hatchery is variable among temporal collections from the Chewuch, Methow, and Twisp Rivers (Table 7, Figure 9). There were considerably more Methow fish than Chewuch fish "incorrectly" assigned to the Winthrop Hatchery. These mis-assigned fish are not hatchery-origin fish[1] and therefore, they are not strays from the Winthrop Hatchery. However, since these fish have been robustly identified as being from the Winthrop Hatchery (i.e., their posterior probabilities were > 0.90), we interpret these results to indicate that these individuals are very recent descendants from at least one parent that strayed from the Winthrop Hatchery into these tributaries. These results suggest that Winthrop Hatchery introgression was greater into the Methow than the Chewuch River, and that there has been no introgression into the Twisp population (Figure 9). Because the Winthrop Hatchery started producing Metcomp fish in 2001, we will lose our ability to statistically differentiate Winthrop Hatchery introgression from natural production from the Methow and Chewuch rivers.

We also examined the source of the hatchery-origin fish (identified by scale patterns) from the 1993 Twisp, Chewuch, and Methow collections, by assigning these fish to either the 1992 Winthrop Hatchery, or the 1992 and 1993 natural-origin collections (Table 8). Considerably more than 50% of the Methow and Chewuch samples assigned to the Winthrop Hatchery, while only one individual from the Twisp assigned to the Winthrop Hatchery. These Winthrop Hatchery-assigned individuals are strays from the Winthrop Hatchery. Those individuals that were not assigned to the Winthrop Hatchery are either natural-origin fish misidentified as hatchery-origin fish, or are Winthrop Hatchery-origin

[1] These fish possess no CWTs, clipped adapose fins, scale hatchery check marks, or any other explicit mark indicating hatchery origin.

fish with at least one natural-origin parent from one of the respective rivers. If the latter, these fish are also strays from the Winthrop Hatchery.

To estimate straying of natural-origin fish among rivers, we conducted an additional four individual assignment tests each using only the natural-origin collections from a single year. For example, for the first test we included only the 1993 natural-origin collections from the Twisp, Methow, and Chewuch Rivers. In each of these tests, we calculated the proportion of fish in the combined Methow/Chewuch population that assigned to the Twisp River from the same year. Similarly, we also calculated the proportion of fish in the Twisp River that assigned to the combined Methow/Chewuch population from the same year. Because the Methow/Chewuch population is dissimilar to the Twisp population (Figure 8), and because we limited our assignments to individuals with posterior probabilities ≥ 0.90, we identified these "incorrectly" assigned fish as actual strays (Figure 10). This suggested that more Methow/Chewuch fish stray into the Twisp River than do Twisp fish into either the Methow or Chewuch Rivers. Furthermore, except for 2001, when the stray rate into the Twisp was 8%, no less than 18% of the individuals from each Twisp collection were identified as Methow/Chewuch fish. In 2006 Twisp collection, nine of the 11 fish with posterior probabilities ≥ 0.90 assigned to the Methow/Chewuch (Figure 10). The two fish from the 2006 Twisp collection that did not meet the 0.90 threshold were assigned to the Twisp, with posterior probabilities equal to 0.83 and 0.87. If we accept the assignments for these two fish, the 2006 Twisp collection was composed of 69% Methow/Chewuch fish and 31% Twisp fish (Figure 10). The somewhat intermediate position in the FCA of the 2006 Twisp natural-origin collection between the rest of the Twisp collections and the Methow/Chewuch group (Figure 6) also suggests that the 2006 Twisp natural-origin is an admixture. Clearly, if these proportions represent the actual proportions of fish breeding in the Twisp River, the 2006 spring Chinook cohort emerging from the Twisp River will resemble more the Methow/Chewuch population than the Twisp population from previous years.

Task 6: Genetically profile hatchery fish returning to spawning grounds in 2001 to determine if hatchery fish are genetically distinguishable from wild spawners. If hatchery fish are different, and 2001 fish are not significantly different from the

1992-1993 fish (or temporal variance is smaller than spatial variance), we will estimate genetic impacts of hatchery fish on wild fish. Estimate numbers of families represented in hatchery fish to explore Ryman-Laikre effects.

We found significant differentiation between hatchery- and natural-origin collections from the same year and between hatchery-origin fish from different collection years in the Chewuch and Twisp (Table 4). However, temporal variance was much smaller than spatial variance (Figure 6, Figure 7, Figure 8, Table 4) and collections from the same tributary clustered together regardless of origin. Although linkage values (Table 1) and sibling analyses (Table 3) suggested that both sampling groups contained family members, there appeared to be more family structure within hatchery-origin collections than in natural-origin collections (Table 3). In paired t-tests, hatchery-origin collections had significantly more full sibling pairs than natural-origin collections ($p = 0.028$), and although hatchery-origin collections averaged twice as many half-sibling pairs as natural-origin collections, the difference was insignificant ($p = 0.055$). Genetic differences between hatchery- and natural-origin fish could thus be a combination of genetic drift from small N_e in both groups, sampling errors associated with limited numbers in hatchery broodstocks, and differential representation of family groups from hatcheries.

Task 7. Genetically profile naturally produced fish from the Twisp, Chewuch, and Methow from 2005 and compare with baseline and hatchery-origin collections to determine if changes have occurred within and between stocks. If the 2001 samples are different from the earlier samples, we will be unable to distinguish between hatchery and bottleneck effects in the 2005 samples, so differences in this later year would be due to unknown causes. We would just document that they are different.

With the exception of 2006 Chewuch, natural-origin collections from the same tributary were not significantly different from each other in pairwise F_{ST} tests (Table 4) and clustered together in the dendrogram (Figure 7), FCA (Figure 6), and MDS plot (Figure 8). Hatchery-origin collections also clustered near natural-origin collections but Twisp hatchery-origin collections had longer branch lengths (Figure 7) and plotted on the periphery of the natural-origin cluster (Figure 8). Most pairwise tests indicated significant differences between hatchery and natural-origin collections (Table 4).

Further, there is a trend towards increased differentiation between natural-origin collections from the same river over time (Figure 5). These differences between hatchery and natural-origin collections and among natural-origin collections in the same river suggest that genetic drift is impacting gene pools. Genetic drift is the random fluctuation of allele frequencies that occur by chance because individuals have unequal reproductive success, and fluctuations in allele frequencies increase with smaller N_e. Only considering collections from 2001 and beyond, N_e is basically stable in the Methow and Chewuch collections (Figure 3), but N_e is small and decreasing in the Twisp natural and hatchery-origin collections (Figure 3). Comparing the N_e of the integrated hatchery-natural group (TwispComb in Figure 3) to the N_e of the natural-origin spawners, hatchery supplementation has been effective in slowing the decrease in N_e, but N_e is still precipitously low.

Task 8. If N_e can be estimated, determine if changes in spawning population size are correlated with changes in N_e.

N_e is positively correlated with census size (Figure 4), but there is enormous variance in the ratios of N_e to census size (Table 1). In general, a larger census size indicates a larger N_e, but there is so much variance that census size is a poor predictor of N_e. Because of this variance, using census size to approximate N_e would be risky since a large census size could mask a low N_e.

Task 9: If baseline populations are genetically differentiated and remain differentiated in 2005 samples, estimate the probability of correctly assigning naturally produced spring Chinook collected at Wells Dam to the Twisp, Chewuch, or Methow spawning aggregates using a mixed stock fishery simulation and assignment tests.

Using the error rates discussed in the Result section (Tables 5 and 6, and Small et al. (2007)), and an estimate of the percentage of the Twisp and Metcomp hatchery broodstock composed of natural-origin fish (Table 9a), we can calculate the percentage of natural-origin Twisp fish that would be included in the Metcomp broodstock, and the percentage of natural-origin Methow/Chewuch fish that would be included in the Twisp

hatchery broodstock if fish are sorted at Well Dam (Table 9b). We emphasize that these calculations are a function of the following two assumptions:

1. error rates are true errors in that they represent the incorrect identification of a fish being from a population that is not its source; and
2. the percent natural-origin fish being used as hatchery broodstock (pNOR) is as calculated in Table 9a.

We calculated the percentage of the Metcomp hatchery broodstock that would be composed of natural-origin Twisp fish by multiplying an estimate of the Metcomp pNORs (either the median or maximum values from Table 9a) by three sets of Methow/Chewuch error rates: the one in Small et al. (2007), the composite errors from Table 5, and the 2006 collection error rates from Table 6. Likewise, we calculated the percentage of the Twisp hatchery broodstock that would be composed of natural-origin Methow/Chewuch fish with the same procedure using Twisp pNORs and appropriate error rates from the same set of tables. We present these results in Table 9b.

The efficacy of collecting appropriate hatchery broodstock at Wells Dam will depend on the percentage of non-source fish used in the respective hatchery broodstocks. We have calculated a wide range of percentages, each depending on a specific error rate and pNOR. If we consider only the composite error rates and limit the assignment of fish to those with posterior probabilities equal to or greater than 0.90 (see Table 5), maximum percentage of non-source fish would be 5.14% in Twisp and 1.55% in Metcomp (Table 9b). These percentages decrease to 2.82% and 0.05%, respectively, as the pNOR is reduced from the maximum to the median values for Twisp and Metcomp in Table 9a. In other words, since the source of hatchery-origin fish is presumably known without error, if the pNORs are limited to 20% or less[2], given the composite error rates, percentage of non-source fish included in either the Twisp or Metcomp hatchery broodstocks can be limited to no more than 1.5% of the total broodstock. Since we are using the more

[2] We are not necessarily recommending that you reduce the pNORs in the Twisp and Metcomp hatchery programs to 20% or less. There is a tradeoff between lower pNORs and having lower percentage of forced geneflow between the Twisp and Methow/Chewuch populations, and higher pNORs and reducing the likelihood of selecting for the negative effects of domestication within your hatchery programs.

stringent assignment criterion, there will be fish that are not assigned and therefore cannot be used in either hatchery program.

In summary, the ability to sort spring Chinook at Wells Dam, and to use these sorted fish in programs that successfully segregate the Twisp from the Methow/Chewuch broodstock will depend on two factors: assignment error rates and the percentage of natural-origin fish included in the broodstock. If either of these factors increases from some standard level our ability to maintain an independent Twisp stock will be compromised. Establishing a "standard level" would require a mathematical model or simulation that includes as variables assignment error rates and pNORs. For now, assignment errors comparable to those presented in Table 5 and pNORs less than or equal to 20% would result in less than 2% gene flow within both the Twisp and Metcomp programs.

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Figure 1. Map of the Methow region obtained from the following source http://wa.water.usgs.gov/projects/methow/maps.htm. Towns are indicated by a box and a name in bold type.

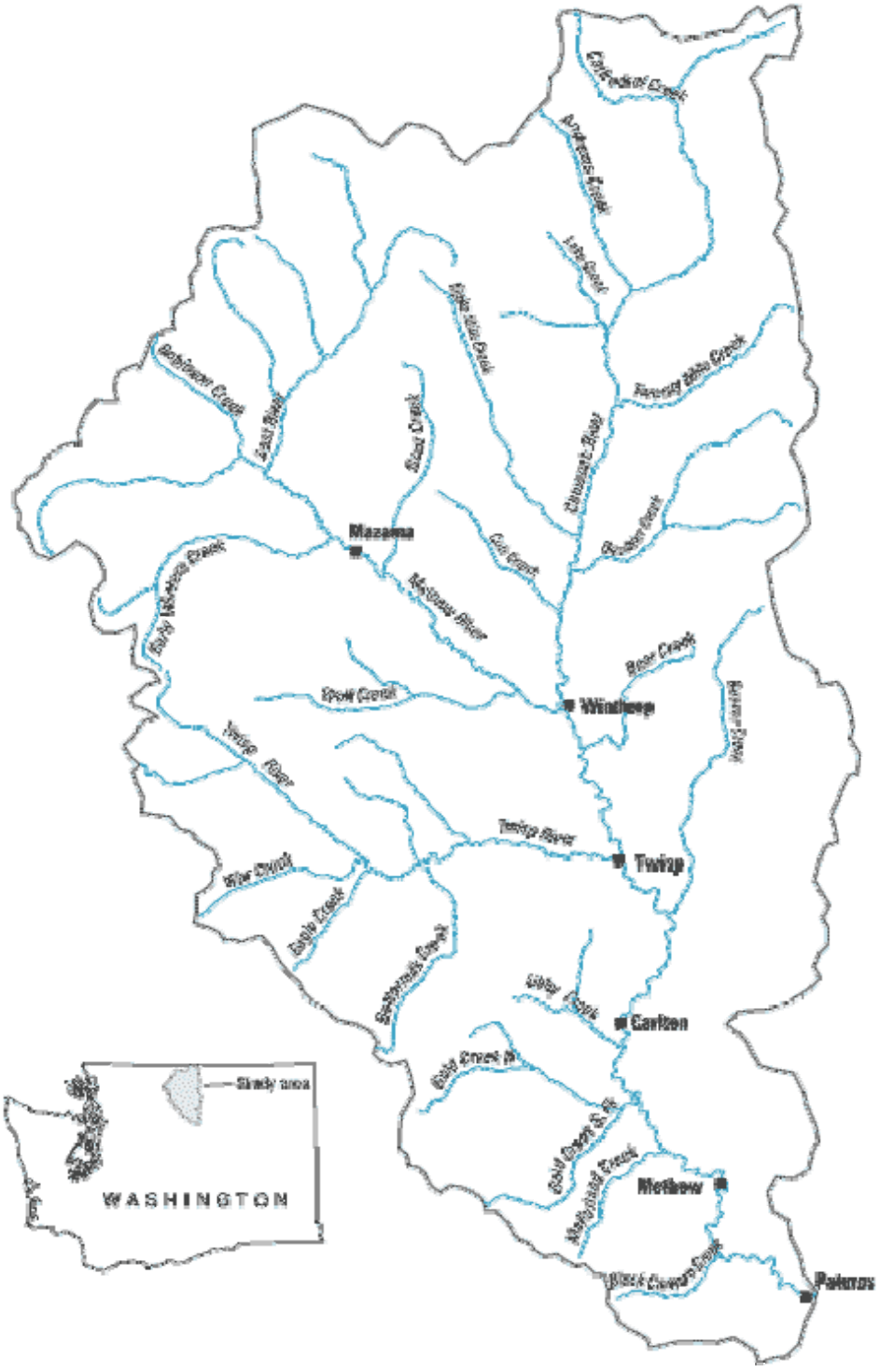
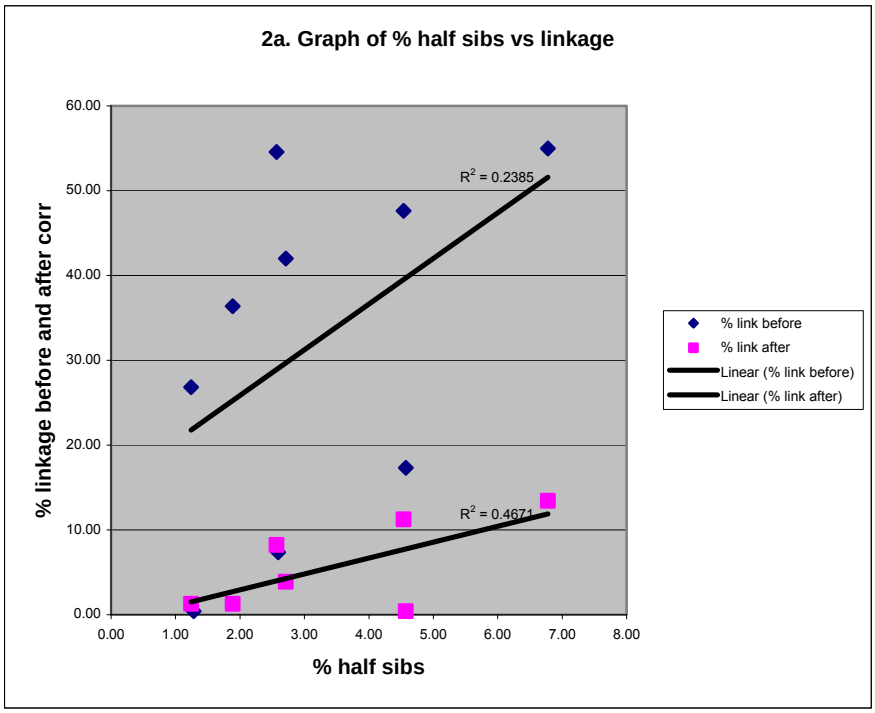


Figure 2a, b. Graph of the percentage of full and half sibling relationships in 2001 – 2006 hatchery- and natural-origin collections versus the percentage of loci in linkage disequilibrium before and after Bonferroni corrections.



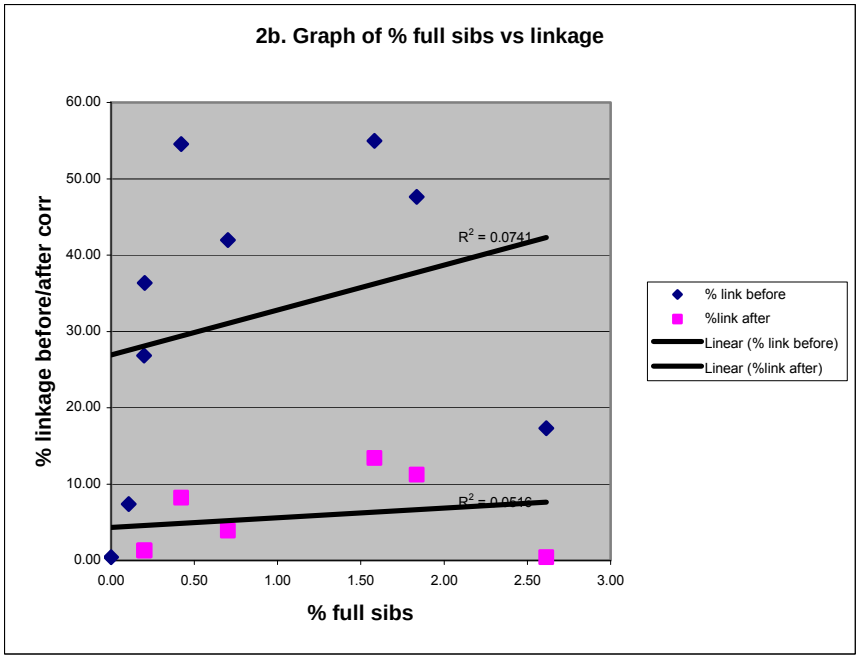


Figure 3. Graph of N_e and 95% confidence interval in temporal collections including natural-origin collections (W) from Methow, Chewuch, Twisp, and hatchery-origin (H) collections from Twisp. N_e for the combined hatchery and natural-origin collections from the Twisp were plotted as "TwispComb".

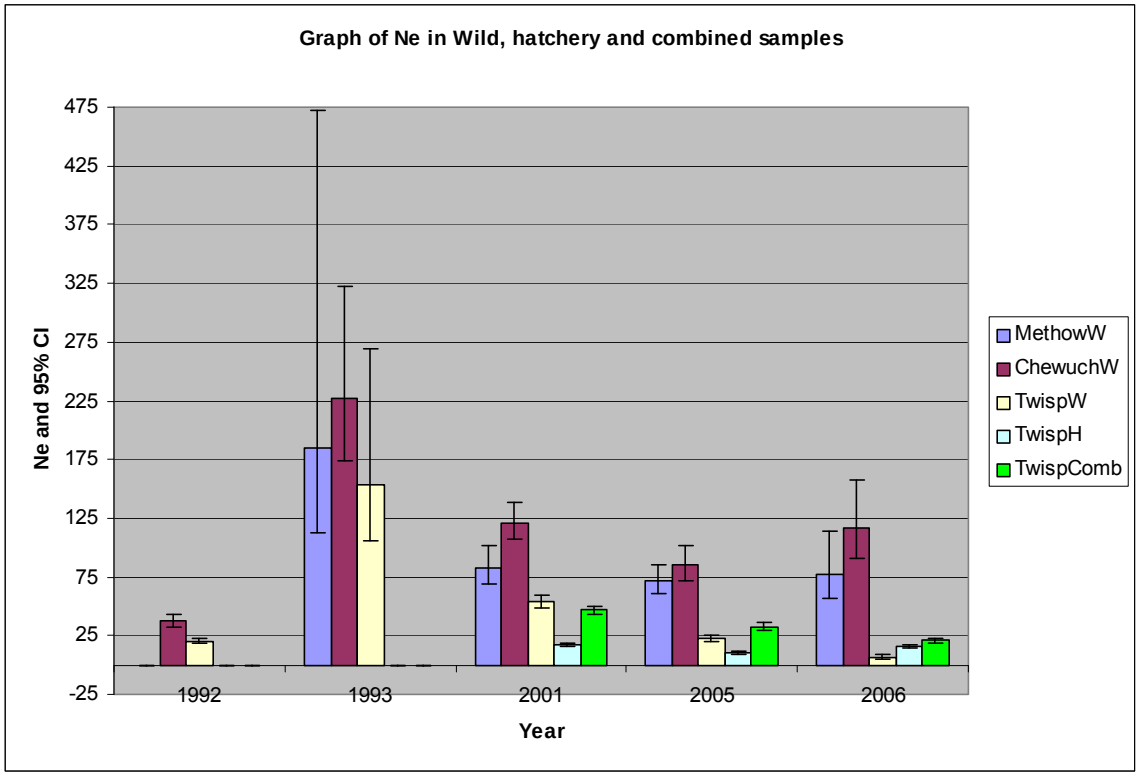


Figure 4. Graph of N_e in hatchery- and natural-origin collections versus census size.

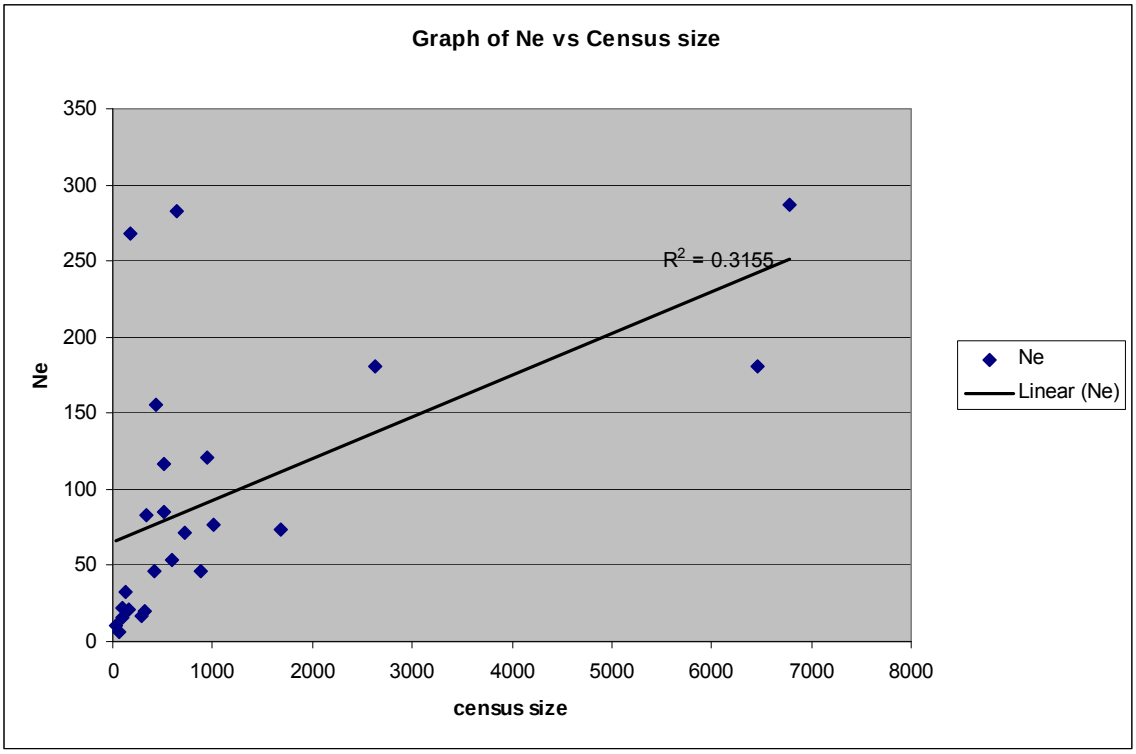


Figure 5. Graph of pairwise F_{ST} values versus time between collections from within the same river (or hatchery). The trendline for linear regressions are plotted for Twisp hatchery, and Twisp natural (wild) collections. The r^2 values for regression lines were 0.9716 for Twisp hatchery, 0.4471 for Twisp natural, 0.1216 for Chewuch natural, and 0.1781 for Methow natural.

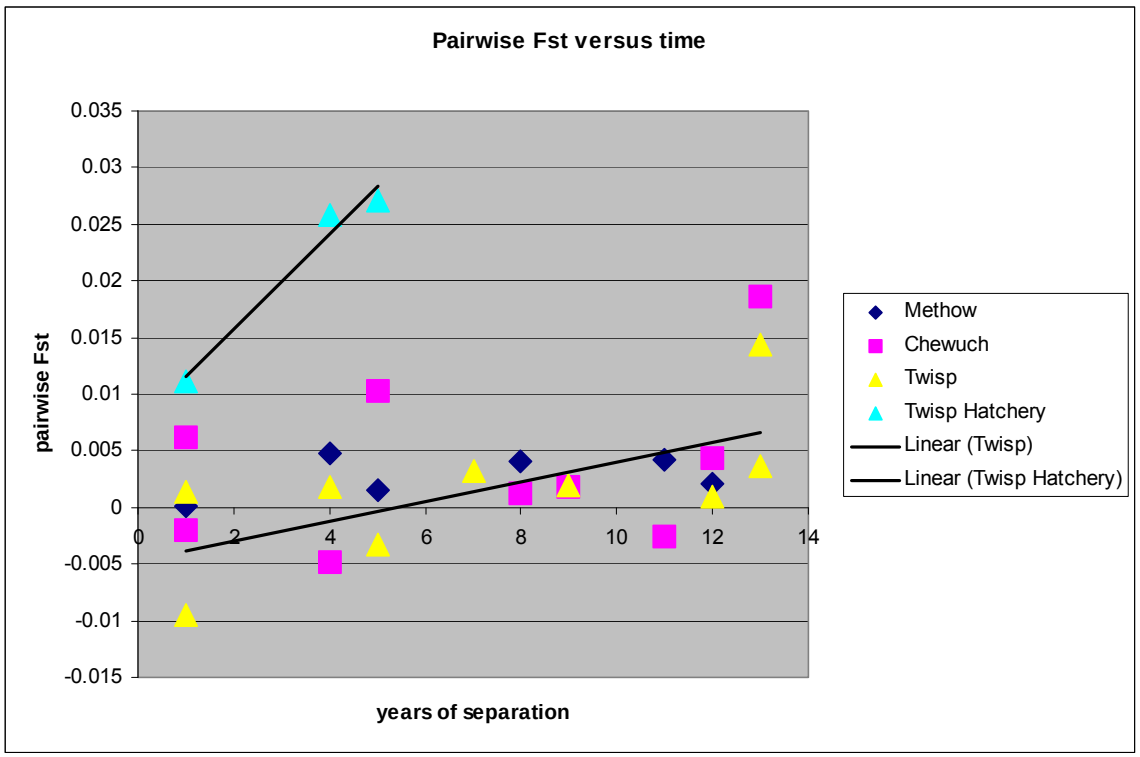


Figure 6. Factorial correspondence analysis plot of hatchery and natural spring Chinook collections from the Methow, Chewuch and Twisp rivers. Hatchery- and natural-origin collections are indicated by "H" and "W", respectively, after the two-digit code for collection year.

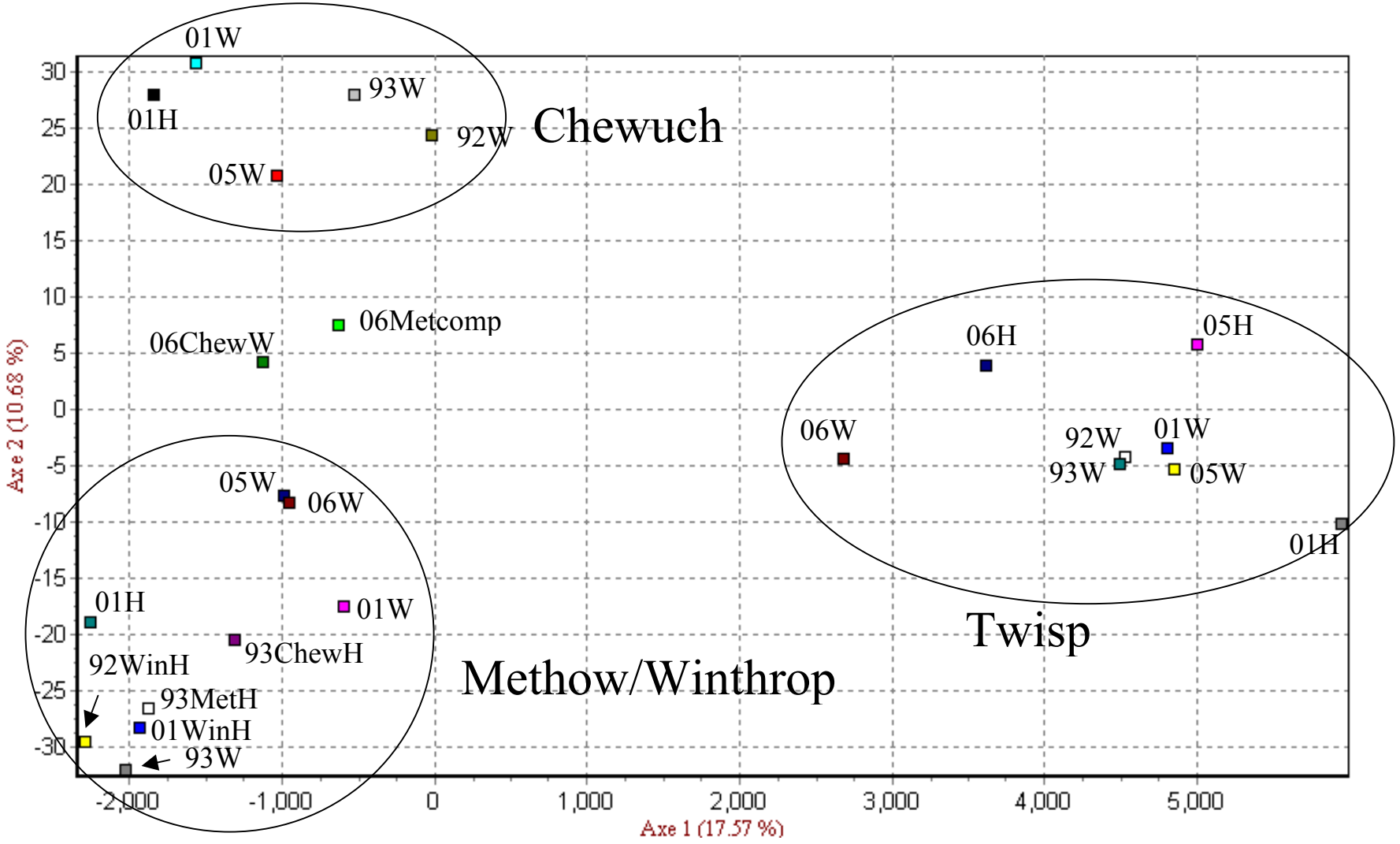


Figure 7. Neighbor-joining tree of Cavalli-Sforza and Edwards chord distances among spring Chinook collections from the Chewuch, Methow and Twisp rivers. Numbers at the nodes are the percentage of trees out of 1,000 trees in which the collections beyond the node grouped together in the consensus tree.

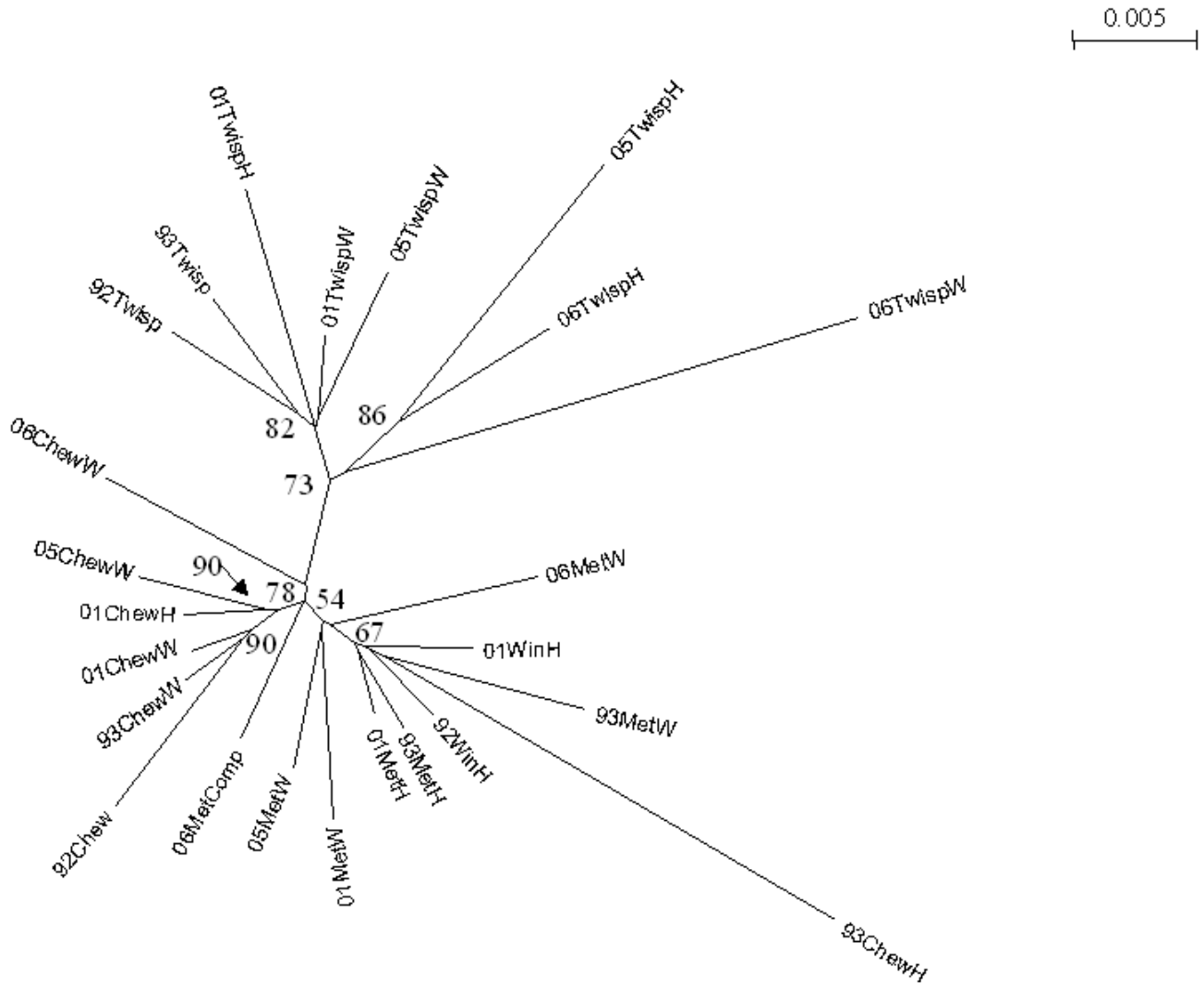


Figure 8. Nonmetric multidimensional scaling plot from an allele-sharing distance matrix calculated using all 24 temporal populations. Polygons enclose the natural-origin collections from the Methow, Chewuch, and Twisp Rivers, respectively (moving left to right). All Twisp, Methow, and Chewuch temporal collections are labeled except 2005 collections (i.e., the unlabeled symbols are from the 2005 collections). The two Winthrop Hatchery collections are from 1992 (below) and 2001 (above), and the Methcomp Hatchery collection is from 2006.

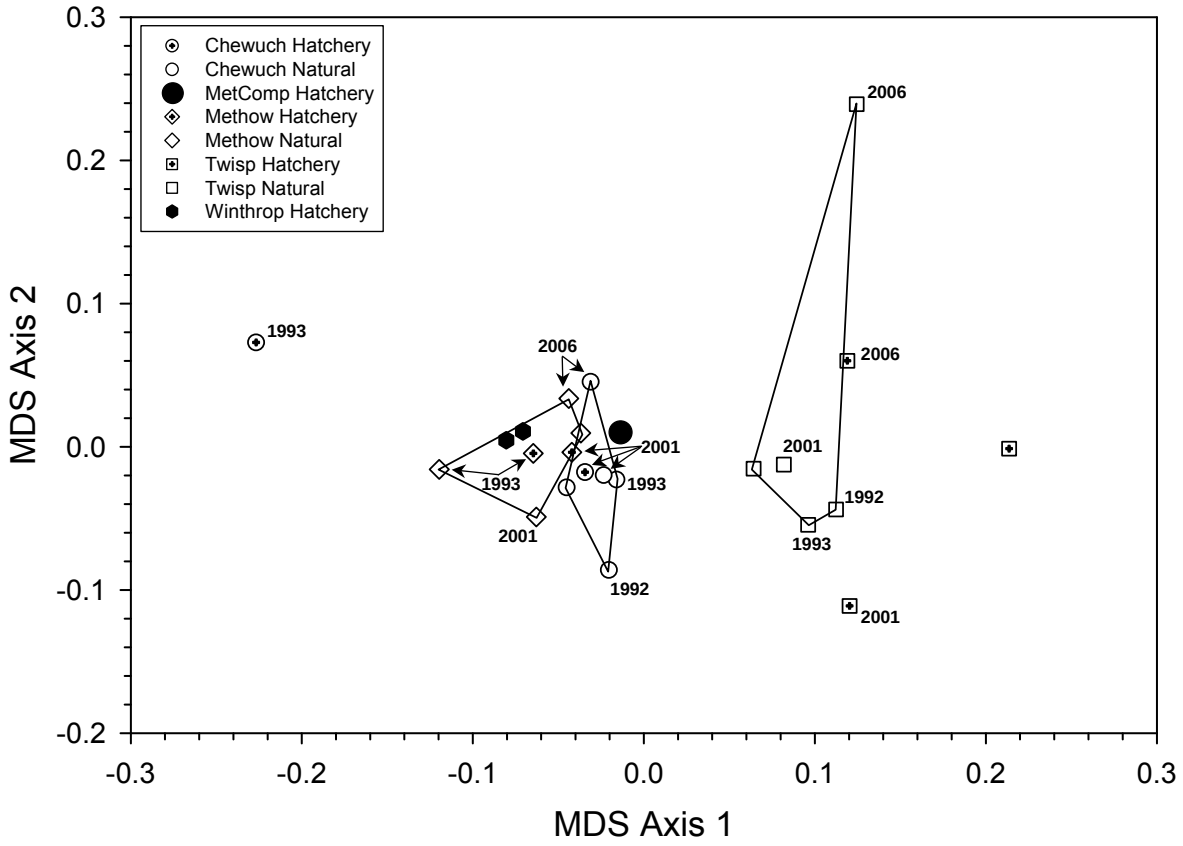


Figure 9. Proportion of natural-origin fish from the Chewuch, Methow, and Twisp rivers that are assigned to the Winthrop Hatchery. These results can be interpreted as the proportion of fish in each river that descended from Winthrop Hatchery strays. Upper and lower plots are based on Highest Posterior Probability and Posterior Probability ≥ 0.90, respectively. Data are from Winthrop columns in Table 8.

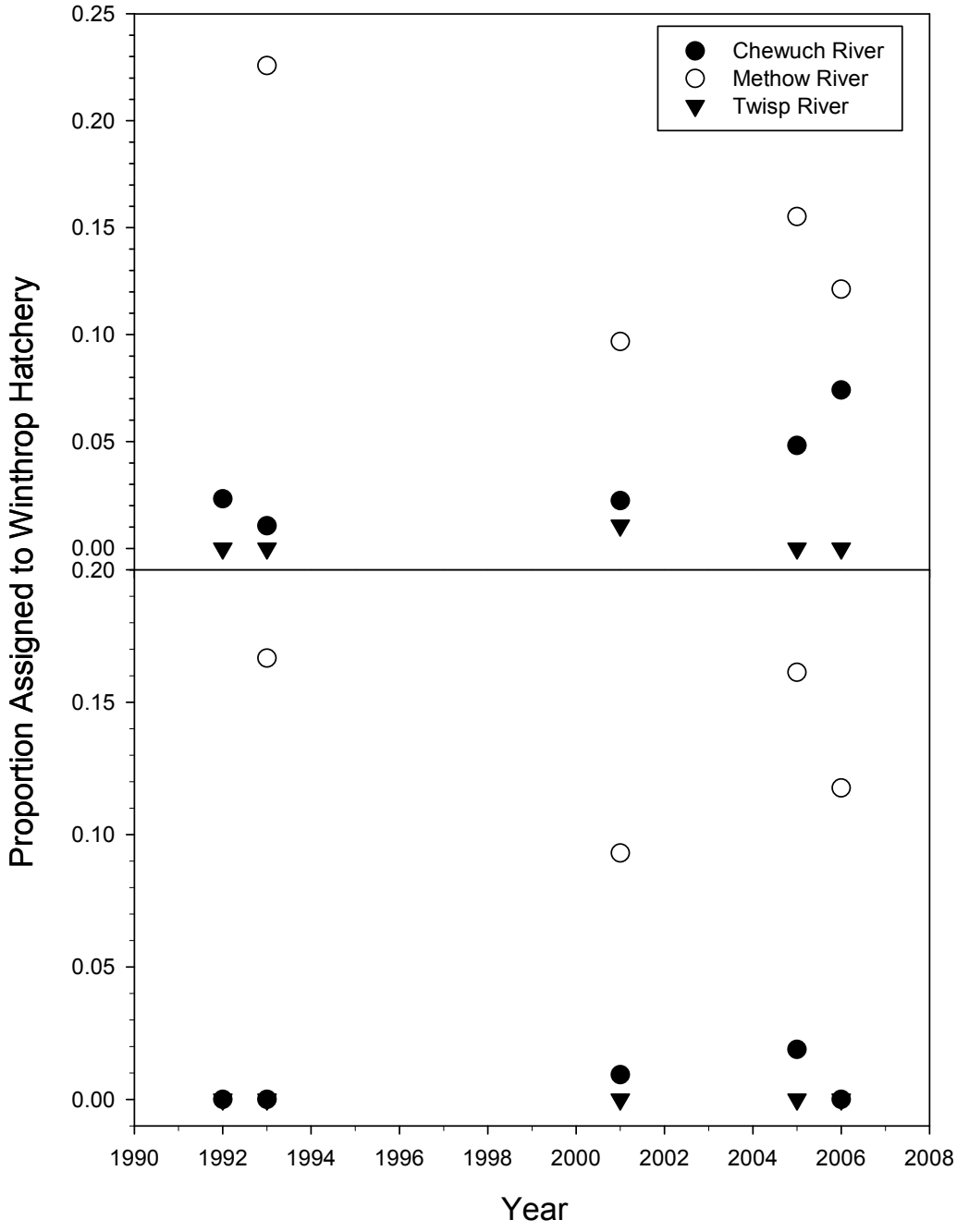


Figure 10. Assignment errors associated with four independent individual assignment tests, one each for the collection years 1993, 2001, 2005, and 2006. These results can be interpreted as the proportion of fish in each river group that are strays from the other river group. For example, in 1993 roughly 28% of the fish captured in the Twisp were assigned to Methow/Chewuch; these fish may represent Chewuch or Methow fish that have strayed into the Twisp River.

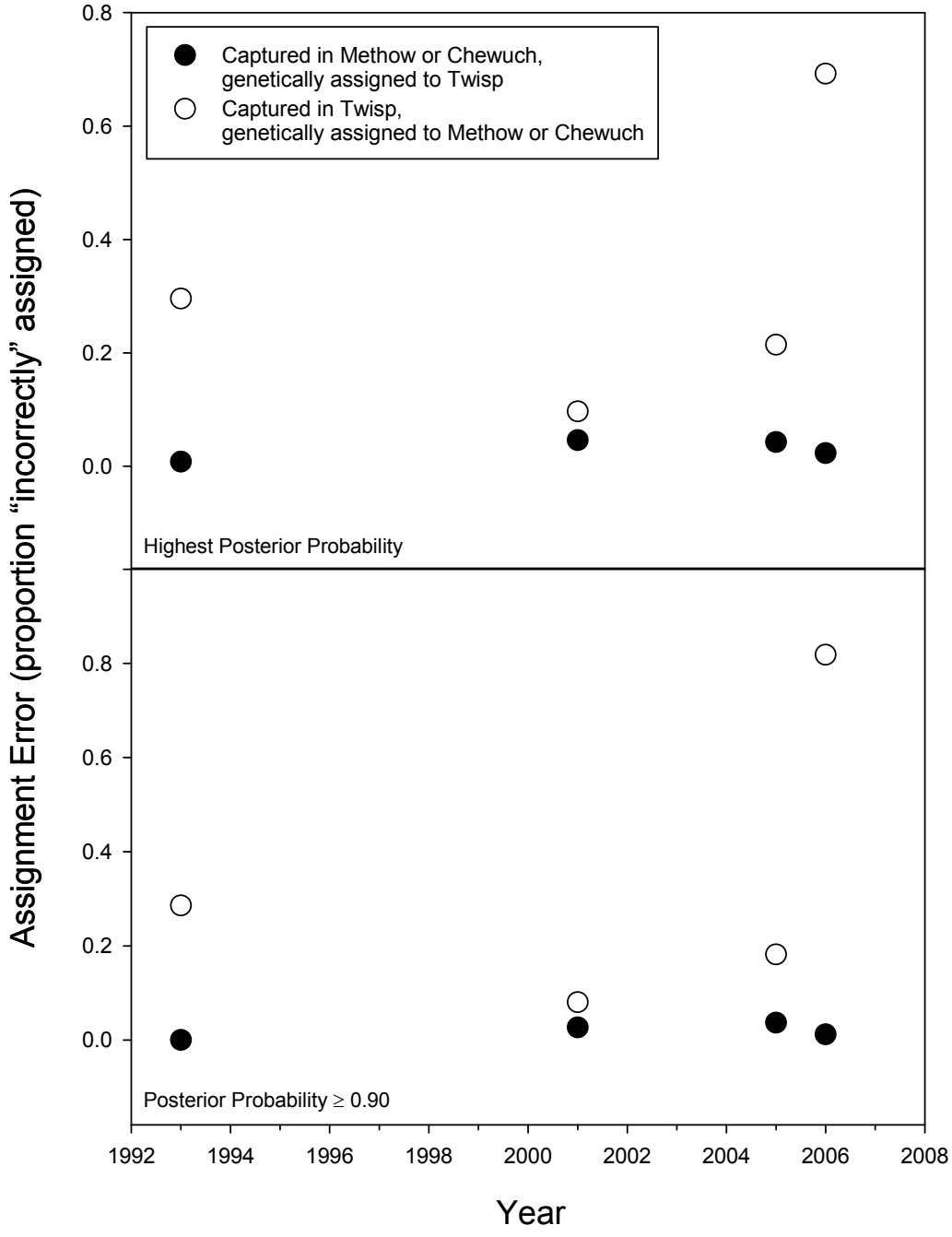


Table 1. Statistics for samples processed and analyzed for the 2007 Methow spring Chinook. The data include the WDFW sample codes ("Code"), the number of samples processed, and the number of samples with genotypic data at ten or more loci (N >= 10), Hardy-Weinberg equilibrium as expressed by F_{IS} (bold values had significant homozygote excess and boxed values had significant heterozygote excess), and their significance (*p*val), the percentage of loci in linkage disequilibrium (% link) before and after Bonferroni corrections. Combined hatchery and natural samples are below individual samples and indicated by the prefix "All". Diversity statistics include expected heterozygosity (H_e, Nei 1987) and allelic richness. Effective population size (N_e) was calculated from linkage disequilibrium, (see Figure 3 for 95% confidence interval). Census size (from Andrew Murdoch, WDFW) and ratio of N_e to census size are in the last two columns.

							% link				95% CI				
Tributary/Hatchery	Code	N	N >= 10	F_{IS}	*p*val	before	after	He	Richness	N_e	low	high	Census	Ne/Cen
92Winthrop Hatchery	92DR	100	100	-0.012	0.9149	10.82	0.43	0.7897	7.51	128	108	156		
01Winthrop Hatchery	01EL	95	93	0.007	0.2221	40.26	5.19	0.7829	7.41	63	57	71		
06MetComp Hatchery	06EP	127	127	-0.005	0.7542	50.65	25.97	0.7704	7.28	43	40	46		
93Methow Natural	93EA	93	31*	0.044	0.0026	3.29		0.7913	7.53	184.2	112.1	472.6	646	0.29
93Methow Hatchery?	93EA		62@	0.025	0.0083	5.634		0.7882	7.65	481.9	264.8	2161		
01Methow Natural	01AAJ	62	62	**0.127**	0.0000	7.36		0.7970	7.86	83	69	102	333	0.25
01Methow Hatchery	01AAK	142	139	**0.021**	0.0015	26.84	1.30	0.7904	7.67	181	155	215	6453	0.03
01AllMet			201	**0.054**	0.0000	31.92	2.82	0.7939	7.79	287	241	350	6786	0.04
05Methow Natural	05HW,05HZ	62	62	**0.062**	0.0000	25.54		0.7867	7.67	72	61	85	714	0.10
06Methow Natural	06DA	33	33	0.020	0.0891	4.76	0.43	0.7735	7.59	77	57	114	1017	0.08
92Chewuch Natural	92DO	47	43*	0.042	0.0019	27.70	0.94	0.7697	7.05	37	32	43.2	415	0.09
93Chewuch Natural	93DZ	104	94*	0.021	0.0109	13.62		0.7643	7.29	227.5	173.5	322.1	184	1.23
01Chewuch Natural	01EL, 01AAN	142	134	**0.039**	0.0000	36.36	1.30	0.7795	7.46	121	107	138	950	0.13
01Chewuch Hatchery	01EL, 01AAO	144	140	**0.089**	0.0000	54.55	8.23	0.7833	7.52	74	67	81	1681	0.04
01AllChew			274	**0.066**	0.0000	67.61	6.57	0.7830	7.57	181	163	202	2630	0.07
05Chewuch Natural	05HY	88	83	**0.059**	0.0000	5.63		0.7928	7.64	85	72	101	508	0.17
06Chewuch Natural	06DC	54	54	**0.052**	0.0000	3.03		0.7707	7.42	116	91	157	513	0.23
92Twisp Natural	92DQ	61	59	-0.004	0.6311	63.38	10.33	0.7686	6.78	20	18	22	316	0.06
93Twisp Natural	93EB	48	44*	0.033	0.0089	2.82		0.7612	6.98	153.4	105.2	269	426	0.36
01Twisp Natural	01EL, 01AAL	95	93	0.017	0.0403	41.99	3.90	0.7530	6.69	53	48	59	591	0.09
01Twisp Hatchery	01EL, 01AAM	61	60	0.037	0.0018	54.98	13.42	0.7515	6.49	17	15	18	292	0.06
01AllTwisp			153	**0.031**	0.0000	72.30	18.31	0.7577	6.79	47	44	50	883	0.05
05Twisp Natural	05HX, 05HZ, 05IA	43	42	-0.061	0.9977	90.48	47.62	0.7576	6.59	23	20	26	90	0.25
05Twisp Hatchery	05HX, 05HZ, 05IA	21	21	0.006	0.3244	17.32	0.43	0.7625	6.78	11	9	12	31	0.34
05AllTwisp			63	-0.009	0.7648	88.26	46.48	0.7652	6.87	33	30	36	121	0.27
06Twisp Natural	06DB	13	13	0.016	0.1278	0.433		0.7561	6.83	7	5	8	65	0.10
06Twisp Hatchery	06DA, 06DB, 06DC, 06EQ	46	46	0.042	0.0721	47.62	11.26	0.7712	6.96	16	15	18	100	0.16
06AllTwisp			59	0.024	0.0243	48.83	11.74	0.7618	6.96	21	19	23	165	0.13

@ These fish were collected as natural-origin spawners in the Methow but scales indicated hatchery origin.
*Fish collected as natural-origin were eliminated from this collection when scale analysis indicated hatchery origin.

Table 2. Information for multiplexes and loci including annealing temperature (°C) primer concentration, number of alleles observed, size range (in basepairs). References for primer sequences are under Citation.

Multiplex	Locus	Anneal temp	conc [uM]	Alleles Observed	Size Range	Citation
			CTC standardized loci			
Ots-M	*Oki100*	50	0.37	24	164-353	Miller, Department of Fish and Oceans, unpublished
	Ots201b		0.35	29	133-342	Banks, Oregon State University, unpublished
	Ots208b		0.2	29	142-378	Grieg et al. 2003
	Ssa408		0.2	20	180-320	Cairney et al. 2000
Ots-N	*Ogo2*	60	0.15	16	200-258	Olsen et al. 1998
	Ssa197[a]		0.25	28	171-318	O'Reilly et al. 1996
Ots-O	*Ogo4*	56	0.18	14	132-170	Olsen et al. 1998
	Ots213		0.18	29	178-378	Grieg et al. 2003
	OtsG474		0.16	8	144-220	Williamson et al. 2002
Ots-R	*Omm1080**	53	0.26	46	162-458	Rexroad et al. 2001
	Ots3M		0.12	10	122-170	Banks et al. 1999
Ots-S	*Ots211*	60	0.2	29	196-337	Grieg et al. 2003
	Ots212		0.3	21	123-263	Grieg et al. 2003
	Ots9		0.1	5	99-115	Banks et al. 1999
			Loci we developed to increase discrimination power			
Ots-T pool	*Ots104*	50	0.07	41	185-325	Nelson and Beacham, 1999
	Ots107	50	0.1	33	187-329	Nelson and Beacham, 1999
	Ots515	50	0.23	13	209-261	Naish and Park, 2002
	One8	58	0.06	17	155-192	Scribner et al. 1998
Ots-U pool	*Ocl1*	53	0.08	9	158-176	Condrey and Bentzen, 1998
	Oke4	53	0.15	8	238-255	Bucholz et al. 1999
	Ots108	53	0.1	48	99- 343	Nelson and Beacham, 1999
Ots-V	*Omm1020*	56	0.08	6	153-167	Rexroad et al. 2002
	Ots100	56	0.2	58	246-422	Nelson and Beacham, 1999

[a] We collect data for this locus, along with Ogo2, in multiplex Ots-N, but Ssa197 is not a CTC-GAPS locus.

* We collected data for *Omm*1080 but excluded the locus from analyses due to instability with scale-origin DNA.

Table 3. Estimated percentage of full (Q > 0.45), and half (0.22 < Q < 0.45) sibling relationships in paired hatchery- and natural-origin collections, total number of pairwise relationships in the collection (total) and the percentage of loci in linkage disequilibrium in each collection before and after Bonferroni corrections. The following abbreviations were employed: Methow = "Met", Chewuch = "Chew", Natural = W and Hatchery = H.

	total	% full	% half	% link	% link after
01MetH	9591	0.20	1.24	26.84	1.30
01MetW	1891	0.11	2.59	7.36	
01ChewH	9730	0.42	2.57	54.55	8.23
01ChewW	8911	0.20	1.89	36.36	1.30
01TwispH	1770	1.58	6.78	54.98	13.42
01TwispW	4278	0.70	2.71	41.99	3.90
05TwispH	153	2.61	4.58	17.32	0.43
05TwispW	861	1.28	0.93	90.48	47.62
06TwispH	1035	1.84	4.54	47.62	11.26
06TwispW	78	0.00	1.28	0.43	

Table 4. Pairwise F_{ST} values (lower matrix) and *p* values for pairwise genotypic tests (upper matrix) for temporal and spatial collections. Values that were significant before Bonferroni corrections are underlined and values that were significant after Bonferroni corrections are in bold type (corrected alpha = 0.05/253 = 0.00019). Abbreviations follow Table 3. Temporal comparisons within tributary are boxed (Metcomp was included with both Methow and Chewuch comparisons).

	92WinH	01WinH	93MetH	93MetW	01MetW	01MetH	05MetW	06MetW	Metcomp	92Chew	93ChewW	01ChewW	01ChewH	05ChewW	06ChewW	92Twisp	93Twisp	01TwispW	01TwispH	05TwispH	05TwispW	06TwispH	06TwispW
92WinH	*	0	0.00021	0.05363	**0**	**0**	**0**	**0.00013**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
01WinH	**0.0034**	*	0.00022	0.00048	**0**	**0**	**0**	0.0003	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
93MetH	0.0034	0.0044	*	0.19253	**0**	0.53881	0.00815	0.02743	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0001**
93MetW	0.0003	0.0052	-0.0004	*	**0.00018**	0.04141	0.00112	0.00065	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
01MetW	0.0036	0.0022	-0.0003	0.0041	*	**0**	0.01093	0.03388	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.0011
01MetH	**0.0036**	**0.0029**	-0.0002	0.0015	0.0002	*	0.00029	0.06308	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.0008
05MetW	**0.0087**	**0.0065**	0.0011	0.0043	0.0048	0.0021	*	0.14475	**0**	**0**	**0**	**0**	**0**	0.00613	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0001**
06MetW	0.0040	0.0046	-0.0012	0.0022	0.0015	0.0004	0.0002	*	**0**	**0.00001**	**0.00002**	**0.00009**	**0.00001**	**0.00002**	**0.00003**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.0031
06Metcomp	**0.0142**	**0.0124**	**0.0109**	**0.0125**	0.0039	**0.0072**	**0.0056**	0.0040	*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.0008
92Chew	**0.0126**	**0.0141**	**0.0099**	**0.0123**	**0.0096**	**0.0107**	**0.0131**	0.0027	**0.0100**	*	0.03835	0.00217	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
93ChewW	**0.0141**	**0.0132**	**0.0104**	**0.0105**	0.0035	**0.0094**	**0.0082**	0.0013	**0.0095**	-0.0021	*	0.03415	**0**	**0.00088**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
01ChewW	**0.0091**	**0.0099**	**0.0062**	**0.0067**	0.0026	**0.0059**	**0.0049**	0.0006	**0.0090**	0.0018	0.0012	*	**0**	**0.00003**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
01ChewH	**0.0098**	**0.0090**	**0.0078**	**0.0104**	0.0043	**0.0064**	**0.0054**	0.0060	**0.0078**	**0.0071**	**0.0049**	**0.0029**	*	0.01551	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0001**
05ChewW	0.0013	0.0024	-0.0026	0.0003	0.0045	-0.0014	-0.0039	0.0046	-0.0010	0.0043	-0.0026	-0.0048	-0.0033	*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0000**
06ChewW	**0.0106**	**0.0126**	**0.0102**	**0.0117**	**0.0174**	**0.0114**	**0.0098**	**0.0103**	**0.0142**	**0.0186**	**0.0129**	**0.0103**	**0.0116**	**0.0061**	*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.0087
92Twisp	**0.0205**	**0.0180**	**0.0118**	**0.0192**	**0.0186**	**0.0156**	**0.0215**	**0.0141**	**0.0160**	**0.0179**	**0.0122**	**0.0142**	**0.0198**	**0.0221**	**0.0279**	*	0.60454	0.00136	**0**	0.00034	0.00969	**0**	0.0476
93Twisp	**0.0256**	**0.0240**	**0.0152**	**0.0215**	**0.0174**	**0.0177**	**0.0211**	**0.0161**	**0.0194**	**0.0187**	**0.0177**	**0.0173**	**0.0195**	**0.0213**	**0.0294**	0.0015	*	0.04706	**0**	**0.00001**	0.00244	**0**	0.0130
01TwispW	**0.0222**	**0.0210**	**0.0162**	**0.0198**	**0.0133**	**0.0152**	**0.0165**	**0.0089**	**0.0172**	**0.0133**	**0.0143**	**0.0159**	**0.0184**	**0.0143**	**0.0262**	0.0019	0.0032	*	**0**	**0**	0.0015	**0**	**0.0001**
01TwispH	**0.0347**	**0.0314**	**0.0239**	**0.0294**	**0.0288**	**0.0252**	**0.0316**	**0.0261**	**0.0300**	**0.0329**	**0.0293**	**0.0263**	**0.0321**	**0.0329**	**0.0388**	**0.0179**	**0.0105**	**0.0139**	*	**0**	**0**	**0**	**0.0001**
05TwispH	**0.0320**	**0.0292**	**0.0251**	**0.0265**	**0.0198**	**0.0240**	**0.0206**	**0.0183**	**0.0245**	**0.0167**	**0.0239**	**0.0224**	**0.0238**	**0.0181**	**0.0317**	0.0066	**0.0140**	0.0127	**0.0258**	*	**0.00013**	0.02645	0.0027
05TwispW	**0.0223**	**0.0191**	**0.0151**	**0.0185**	**0.0125**	**0.0129**	**0.0134**	**0.0147**	**0.0170**	**0.0159**	**0.0166**	**0.0156**	**0.0176**	**0.0129**	**0.0261**	0.0009	0.0036	0.0018	**0.0110**	0.0110	*	**0**	0.0347
06TwispH	**0.0247**	**0.0227**	**0.0194**	**0.0242**	**0.0258**	**0.0200**	**0.0213**	**0.0193**	**0.0221**	**0.0231**	**0.0221**	**0.0209**	**0.0233**	**0.0194**	**0.0185**	**0.0168**	**0.0168**	**0.0177**	**0.0271**	0.0112	**0.0122**	*	0.0154
06TwispW	0.0029	-0.0035	-0.0094	0.0001	0.0164	-0.0054	-0.0066	0.0062	-0.0102	0.0116	-0.0043	-0.0027	0.0009	0.0121	0.0004	0.0144	-0.0007	-0.0033	0.0151	0.0025	-0.0095	-0.0018	*

Table 5. Summary of the jack-knife-based individual assignment tests for each of the natural-origin collections from the Methow, Chewuch, and Twisp rivers. Each temporal collection was used as baseline collections, and individual fish were assigned to either an aggregate Methow/Chewuch or Twisp group using two different criteria, as explained in the Methods Section. All fish are assigned when using the Highest Posterior Probability criterion, but only those fish with a posterior probability greater than or equal to 0.90 were assigned using the more stringent criterion. The table lists numbers of fish from each temporal collection assigned to the respective group. Percent correct refers to the aggregate number of samples correctly assigned from each group. For example, 92.68% of all the fish assigned to Twisp were from one of the Twisp temporal collections (190/205 = 0.9268). Error rate is equal to 1- % correct. Abbreviations follow Table 3.

Year	Population	N	Highest Posterior Probability		Posterior Probability >= 0.90		
			Methow/Chewuch	Twisp	Methow/Chewuch	Twisp	unassigned
1992	ChewW	43	39	4	35	3	5
1993	ChewW	94	92	2	91	0	3
2001	ChewW	134	130	4	125	3	6
2005	ChewW	83	80	3	79	2	2
2006	ChewW	54	52	2	52	1	1
1993	MetW	31	30	1	30	1	0
2001	MetW	62	59	3	55	2	5
2005	MetW	58	55	3	53	2	3
2006	MetW	33	32	1	32	1	0
1992	TwispW	59	8	51	4	46	9
1993	TwispW	44	11	33	10	32	2
2001	TwispW	93	9	84	7	75	11
2005	TwispW	42	7	35	6	31	5
2006	TwispW	13	5	8	5	6	2
	TOTAL	843	609	234	584	205	54
	% Correct		93.43%	90.17%	94.52%	92.68%	
	Error Rate		6.57%	9.83%	5.48%	7.32%	

Table 6. As in Table 5, except that the 2006 temporal collections were removed from the baseline and assigned to either the Methow/Chewuch or Twisp group, based on the new baseline populations. The table lists numbers of fish from each 2006 collection assigned to the respective groups, using the two different assignment criteria.

			Highest Posterior Probability		Posterior Probability ≥ 0.90		
Year	Population	N	Methow/Chewuch	Twisp	Methow/Chewuch	Twisp	unassigned
2006	ChewW	54	53	1	26	1	27
2006	MetW	33	32	1	14	0	14
2006	TwispW	13	8	5	2	4	7
	TOTAL	100	93	7	42	5	47
	% Correct		91.40%	71.43%	95.24%	80.00%	
	Error		8.60%	28.57%	4.76%	20.00%	

Table 7. Summary of the jack-knife-based individual assignment test for each temporal collection from the Methow, Chewuch, and Twisp rivers, the 2006 MetComp hatchery, and the Winthrop Hatchery. Each individual fish was assigned to either Chewuch, Methow, Metcomp, Twisp, or Winthrop hatchery groups using two different criteria, as explained in the Methods Section. The table lists the percentage of fish from each temporal collection assigned to the respective group. These results provide the relative proportion of fish from each of the Chewuch, Methow, Metcomp, Twisp, or Winthrop populations captured within each temporal collection. The percentages from non-source populations can represent the proportion of individuals that have immigrated into that temporal collection. For the results associated with the Posterior Probability ≥ 0.90 criterion, the percentages are based on the total number of assigned individuals.

Year	Population	N	Highest Posterior Probability					Posterior Probability ≥ 0.90					
			Chewuch	Methow	Metcomp	Twisp	Winthrop	Chewuch	Methow	Metcomp	Twisp	Winthrop	unassigned
1992	ChewH	4	0.50	0.25	0.00	0.00	0.25	0.33	0.33	0.00	0.00	0.33	0.25
1993	ChewH	10	0.20	0.30	0.00	0.00	0.50	0.20	0.20	0.00	0.00	0.60	0.50
2001	ChewH	140	0.71	0.18	0.02	0.03	0.06	0.79	0.13	0.02	0.01	0.05	0.27
1992	ChewW	43	0.74	0.14	0.02	0.07	0.02	0.83	0.06	0.03	0.08	0.00	0.16
1993	ChewW	94	0.82	0.13	0.02	0.02	0.01	0.94	0.06	0.00	0.00	0.00	0.23
2001	ChewW	134	0.83	0.09	0.02	0.04	0.02	0.88	0.06	0.03	0.03	0.01	0.20
2005	ChewW	83	0.64	0.24	0.00	0.07	0.05	0.79	0.13	0.00	0.06	0.02	0.36
2006	ChewW	54	0.63	0.22	0.04	0.04	0.07	0.79	0.21	0.00	0.00	0.00	0.46
1993	MetH	62	0.11	0.58	0.02	0.03	0.26	0.00	0.71	0.02	0.05	0.21	0.32
2001	MetH	139	0.14	0.58	0.01	0.02	0.25	0.13	0.60	0.01	0.02	0.25	0.27
1993	MetW	31	0.13	0.61	0.00	0.03	0.23	0.11	0.67	0.00	0.06	0.17	0.42
2001	MetW	62	0.23	0.60	0.03	0.05	0.10	0.14	0.70	0.02	0.05	0.09	0.31
2005	MetW	58	0.31	0.47	0.02	0.05	0.16	0.32	0.45	0.03	0.03	0.16	0.47
2006	MetW	33	0.30	0.48	0.06	0.03	0.12	0.35	0.47	0.06	0.00	0.12	0.48
2006	MetComp	127	0.15	0.09	0.69	0.03	0.04	0.14	0.07	0.73	0.04	0.02	0.28
1993	TwispH	4	0.00	0.25	0.00	0.50	0.25	0.00	0.00	0.00	0.67	0.33	0.25
2001	TwispH	60	0.02	0.07	0.02	0.88	0.02	0.02	0.04	0.02	0.91	0.02	0.07
2005	TwispH	18	0.00	0.06	0.00	0.94	0.00	0.00	0.06	0.00	0.94	0.00	0.00
2006	TwispH	46	0.11	0.02	0.02	0.78	0.07	0.10	0.03	0.03	0.82	0.03	0.15
1992	TwispW	59	0.08	0.05	0.02	0.85	0.00	0.06	0.02	0.00	0.92	0.00	0.14
1993	TwispW	44	0.11	0.16	0.02	0.70	0.00	0.11	0.08	0.03	0.79	0.00	0.14
2001	TwispW	93	0.02	0.05	0.04	0.87	0.01	0.03	0.04	0.01	0.93	0.00	0.14
2005	TwispW	42	0.07	0.07	0.00	0.86	0.00	0.06	0.03	0.00	0.91	0.00	0.17
2006	TwispW	13	0.15	0.15	0.08	0.62	0.00	0.13	0.00	0.00	0.88	0.00	0.38
1992	WinH	100	0.06	0.36	0.00	0.01	0.57	0.04	0.32	0.00	0.00	0.65	0.43
2001	WinH	93	0.08	0.34	0.01	0.00	0.57	0.07	0.33	0.00	0.00	0.61	0.34

Table 8. Proportion of samples from each hatchery collection assigned to the 1992 and 1993 natural-origin collections and the 1992 Winthrop Hatchery collection. All samples are assigned using the Highest Posterior Probability criterion (upper table), while only those individuals satisfying the Posterior Probability ≥ 0.90 criterion are assigned in the lower table.

Hatchery Population	N	Highest Posterior Probability					
		92ChewW	92TwispW	93ChewW	93MetW	93TwispW	92WinH
93ChewH	10	0.00	0.00	0.00	0.20	0.00	0.80
93MetH	62	0.02	0.02	0.11	0.24	0.02	0.60
93TwispH	4	0.00	0.00	0.25	0.25	0.25	0.25

Hatchery Population	N	Posterior Probability ≥ 0.90					
		92ChewW	92TwispW	93ChewW	93MetW	93TwispW	92WinH
93ChewH	7	0.00	0.00	0.00	0.14	0.00	0.86
93MetH	54	0.00	0.00	0.13	0.20	0.02	0.65
93TwispH	3	0.00	0.00	0.00	0.33	0.33	0.33

Table 9a. Composition of the Methow-Chewuch (Metcomp) and Twisp hatchery broodstocks from 2000 through 2006. H = number of hatchery-origin fish; N = number of natural-origin fish contributing to each hatchery broodstock. For both the Twisp and Metcomp programs, the median and maximum percent natural-origin part (pNOR) are highlighted in bold typeface. These pNORs were used to calculate the non-source component of each broodstock, as explain in the text and shown in Table 9b. Data from Kirk Truscott.

Brood Year	Metcomp					Twisp				
	H	%	N	%	Total	H	%	N	%	Total
2000	173	100.0%	0	0.0%	173	63	91.3%	6	8.7%	69
2001	104	71.7%	41	**28.3%**	145	14	29.8%	33	**70.2%**	47
2002	248	100.0%	0	0.0%	248	9	100.0%	0	0.0%	9
2003	93	98.9%	1	1.1%	94	16	61.5%	10	38.5%	26
2004	284	99.6%	1	0.4%	285	23	34.3%	44	65.7%	67
2005	202	99.0%	2	1.0%	204	11	61.1%	7	38.9%	18
2006	315	96.3%	9	2.8%	327	26	100.0%	0	0.0%	26
Mean	202.714	95.1%	7.714	4.8%	210.857	23.143	68.3%	14.286	31.7%	37.429
Median	202.000	99.0%	1.000	**1.0%**	204.000	16.000	61.5%	7.000	**38.5%**	26.000

Table 9b. The percentage of non-source fish contributing to each hatchery program based on specific assignment error rates, and the percent natural-origin fish (pNOR) being used as hatchery broodstock. The pNORs are represented as median and maximum estimates from Table 9a. The percentage of non-source fish contributing to each hatchery program is calculated by multiplying the error assignment rates from Small et al. (2007), Table 5, and Table 6, by the median and maximum pNORs from Table 9a. See text for details.

		Small et al. (2007)		Composite Errors		2006 Errors	
		Median	Max	Median	Max	Median	Max
Highest Posterior Probability	% MetComp Hatchery composed of Natural Origin Twisp	0.10%	2.83%	0.07%	1.86%	0.09%	2.43%
	% Twisp Hatchery composed of Natural Origin Methow & Chewuch	4.53%	8.26%	3.78%	6.90%	11.00%	20.06%
Posterior Probability ≥ 0.90	% MetComp Hatchery composed of Natural Origin Twisp	0.05%	1.29%	0.05%	1.55%	0.05%	1.35%
	% Twisp Hatchery composed of Natural Origin Methow & Chewuch	0.87%	1.58%	2.82%	5.14%	7.70%	14.04%