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

April 10, 2009

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

Subject: **Wells Hydroelectric Project – FERC Project No. 2149**
Annual Report – Anadromous Fish Agreement and Habitat Conservation Plan

Dear Secretary Bose:

Pursuant to Article 59 of the Wells Project License, the Public Utility District No. 1 of Douglas County hereby submits the enclosed annual report of activities related to the Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Project. The enclosed annual report covers activities performed from January 1, 2008 through December 31, 2008.

If you have any questions or require further information, please feel free to contact me at (509) 881-2208 or sbickford@dcpud.org.

Sincerely,

Shane Bickford
Supervisor of Relicensing

Enclosure

Cc: Mr. James Hastreiter, FERC, Portland
Mr. Erich Gaedeke, FERC, Portland
Mr. Jon Miyashiro, FERC, Portland
Wells HCP Coordinating, Hatchery and Tributary Committees

ANNUAL REPORT
CALENDAR YEAR 2008
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

Anchor QEA, LLC
1423 Third Avenue, Suite 300
Seattle, Washington 98101
and
Public Utility District No. 1
of Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

April 2009

ANNUAL REPORT
CALENDAR YEAR 2008
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

Anchor QEA, LLC
1423 Third Avenue, Suite 300
Seattle, Washington 98101
and
Public Utility District No. 1
of Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

April 2009

TABLE OF CONTENTS

1 INTRODUCTION 1

2 PROGRESS TOWARD MEETING NO NET IMPACT 2

2.1 Status of Phase Designations for Current Plan Species 2

2.2 2008 HCP Decisions 3

2.3 Project Operations and Improvements 5

2.3.1 Operations 5

2.3.2 Improvements 6

2.3.3 Assessment of Project Survival 6

2.4 Hatchery Compensation 9

2.4.1 Hatchery Production Summary 9

2.4.2 Hatchery Planning 11

2.4.3 Maintenance and Improvements 14

2.5 Tributary Committees and Plan Species Accounts 15

2.5.1 Regional Coordination 16

2.5.2 Fiscal Management of Plan Species Accounts 17

2.5.3 General Salmon Habitat Program 18

2.5.4 Small Projects Program 20

2.5.5 Tributary Assessment Program 22

3 HCP ADMINISTRATION 23

3.1 Mid-Columbia HCP Forums 23

3.2 HCP Related Reports Published in Calendar Year 2008 23

List of Tables

Table 1 Phase Designations for Wells Dam 3

Table 2 Summary of 2008 Decisions for Wells HCP 4

Table 3 Adult Conversion Rates for All Available Release Groups 7

Table 4 Production Objectives for the Inundation Compensation Program and Releases in 2008 10

Table 5 Production Objectives for the HCP Passage Loss Compensation Program and Releases in 2008 11

Table 6 General Salmon Habitat Program Projects Reviewed by the Tributary Committees in 2008 19
Table 7 Projects Reviewed by the Tributary Committees under the Small Projects Program in 2008 21

List of Appendices

Appendix A Habitat Conservation Plan Coordinating Committees Meeting Minutes and Conference Call Minutes
Appendix B Habitat Conservation Plan Hatchery Committees Meeting Minutes and Conference Call Minutes
Appendix C Habitat Conservation Plan Tributary Committees Meeting Minutes
Appendix D List of Wells HCP Committee Members
Appendix E 2008 Juvenile Bypass Operating Plan
Appendix F Broodstock Collection Protocols
Appendix G Wells Hatchery Compliance Report
Appendix H 2008 Action Plan: Wells HCP
Appendix I Annual Report of Wells Plan Species Account Financial Activity For the Year Ended December 31, 2008
Appendix J Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2007

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 and remain unresolved. The Policy Committees meet as needed to discuss any of these issues and receive updates on the progress of HCP implementation. Appendix D lists members of the Wells HCP Committees. The Coordinating Committee for the Wells HCP oversaw the preparation of this fifth Annual Report for calendar year 2008, which covers the period from January 1 to December 31, 2008. (The first through fourth Annual Reports covered January 1 to December 31, 2004 through 2007.)

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 2008 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. 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 2007, coho salmon were designated as in Phase III (Additional Juvenile Studies). In 2008, land and cash with a total value of $600,000 was transferred to the Yakama Nation pursuant to Douglas PUD's coho mitigation agreement. This completes Douglas PUD's coho mitigation obligation through 2017.

Under Phase III conditions (Standard Achieved), Douglas PUD is required to re-evaluate survival at 10-year intervals. The current Phase Designations of all Plan Species covered by the Wells HCP are shown in Table 1. No changes in Phase Designations occurred in 2008.

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 2008 HCP Decisions

Throughout 2008, 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 2008 Decisions for Wells HCP

Date	Agreement	HCP Committee	Reference
Jan, 16, 2008	Acceptance that the shortfall in 2007 brood spring Chinook production at the Methow Hatchery due to BKD management would be proportionally shared among the obligations of the three PUD's	Hatchery	Appendix B; Jan 16, 2008
Jan 22, 2008	Acceptance of the 2008 Douglas PUD Action Plan	Coordinating	Appendix A; Jan 22, 2008
Feb 26, 2008	Acceptance of the 2008 Juvenile Bypass Operating Plan	Coordinating	Appendix A; Feb 26, 2008
Aug. 20, 2008	Support for Grant PUD's request for access to the Wells Hatchery for 80,000 summer steelhead and the Methow Hatchery for 201,000 spring Chinook	Hatchery	Appendix B: Aug. 20, 2008
Aug 20, 2008	Agreement for additional efforts to obtain and PIT tag more naturally produced spring Chinook parr in the Methow River as part of the M&E activities	Hatchery	Appendix B: Aug 20, 2008
Aug 20, 2008	Approval to collect 29 brood summer Chinook at the Wells Hatchery for 2010 survival study fish	Hatchery	Appendix B: Aug 20, 2008
Sept 17, 2008	Approval to collect 15 additional (44 total) adult summer Chinook at the Wells Hatchery for 2010 survival study fish.	Hatchery	Appendix B: Sept. 17, 20008
Oct. 15, 2008	Approval of 2007 Monitoring and Evaluation Report	Hatchery	Appendix B: Oct 15, 2008
Nov 19, 2008	Approval of the 2009 Monitoring and Evaluation Plan	Hatchery	Appendix B: Nov 19, 2008
March 12, 2008	Approved funding of the Small Project: *Riparian Regeneration and Restoration Initiative* for $15,536	Tributary	Appendix C: March 12, 2008
April 10, 2008	Approved funding of the Small Project: *Fort-Thurlow Pump Project* for $7,000	Tributary	Appendix C: April 10, 2008
June 13, 2008	Approved funding of the *ORRI Effectiveness Monitoring Project* as the first expenditure under the Wells Tributary Assessment Program (Wells HCP Section 7.5)	Tributary	Appendix C: June 13, 2008
June 13, 2008	Approved funding of Small Project: *Goodman Livestock Exclusion Project* for $7,980	Tributary	Appendix C: June 13, 2008
Dec. 19, 2008	Approved funding of General Salmon Habitat Program Projects: *Poorman Creek Barrier Removal*, for $53,748; and *Twisp River Riparian Protection – Pampanin, Neighbor-Vasques, and Speir properties* for $127,642	Tributary	Appendix C: Dec. 19, 2008

2.3 Project Operations and Improvements

This section summarizes project operations toward meeting and maintaining HCP requirements at Wells Dam in 2008. Actions in 2008 were guided by the 2008 Douglas PUD Action Plan, as approved by the Coordinating Committees (Appendix H).

2.3.1 Operations

As in past years, operation of the juvenile bypass system in 2008 was guided by the Bypass Operating Plan (Appendix E) and criteria 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 2008 (Appendix A). In September 2008, Douglas PUD provided a bypass operation summary that documented the initiation and termination dates for the Wells bypass operation. The year 2008 was the fifth year that operation of the bypass system was guided by representatives of the Wells HCP Coordinating Committee.

River flows at Wells Dam during the 2008 juvenile migration of Plan Species (April to August) were at 104 percent of the 20-year average. Operationally, all five bypass bays were available and were utilized as appropriate during the outmigration.

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 discharged a total flow volume of 1.24 million acre feet (MAF), or an average of 9.92 thousand cubic feet per second (kcfs), which was 6.5 percent of total project discharge. During the spring bypass operation, there was forced spill during 469 hours or 31.0 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. The summer bypass operations discharged a total flow volume of 1.65 MAF, or an average of 11.25 kcfs, which was 8.5 percent of the total discharge dedicated to summer bypass. During the summer bypass operating period, there were 425 hours, or 23.9 percent of the season's hours, with forced spill.

2.3.2 Improvements

Maintenance and improvements at Wells Dam in 2008 fell largely into the category of repairs or retrofits. In January, a flow-guidance baffle was installed in the west fishway, identical to the baffle installed in the east fishway and tested in 2007. In February 2008, the Wells Hatchery Surface-water Intake Screen Project was completed to bring the intake into compliance with current screening criteria. In May, the inefficient Passive Integrated Transponder tag (PIT-tag) detector system on the west ladder trap was replaced with an upgraded system in a new location. Construction for a debris boom began in November and the project is expected to be completed by the end of February 2009. Finally, the east fishway was serviced in December and the west fishway will be serviced in February 2009.

2.3.3 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 2008, Douglas PUD continued to successfully implement the juvenile and adult passage plans.

2.3.3.1 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 methods 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 adult survival rates are being achieved. Table 3 details detections at Priest Rapids Dam of known-origin adult steelhead and Chinook salmon that were PIT-tagged, 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. Data for fall Chinook and sockeye are not available. 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 2004-2008	5,356	4,983	93.0%	98.2%
All Releases[3] Spring Chinook 2003-2008	427	396	92.7%	98.1%
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. 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, METHR, TWISPP, TWISPR, BEAV2C, WINT, and METTRP.

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 2008. 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 December 24, 2008.

2.3.3.2 Completed Studies 2008

Douglas PUD documented the removal of 20,414 northern pikeminnow from the Wells Reservoir and tailrace during annual removal efforts occurring from April to July 2008. From 1995 to present, the pikeminnow removal programs sponsored by Douglas PUD have resulted in the removal of approximately 174,000 pikeminnow from the Wells Project. Documentation of northern pikeminnow removal efforts in 2008 will be presented to the Wells Coordinating Committee in early 2009.

2.3.3.3 Planned Studies 2009

As per Section 4.2.5.1 of the Wells HCP, Douglas PUD is scheduled for a 10-year "re-evaluation" survival study to re-assess the survival of yearling spring migrants in 2010. Douglas PUD intends to replicate the studies on yearling spring migrants (Chinook and steelhead) conducted in 1998, 1999, and 2000. In August and September 2008, the Hatchery Committees approved the collection of 44 additional summer/fall Chinook broodstock from the Wells Hatchery program to provide approximately 75,000 smolts for this study. There is no shortfall in Wells summer Chinook broodstock, so this request will not affect the existing program objectives. Yearling summer Chinook from Wells Hatchery were used in the original 1998 study because they are readily available and are not listed under the Endangered Species Act (ESA). Douglas PUD will be discussing a study plan with the Coordinating Committees in spring 2009. Also, as in previous years (see Section 2.4.2.2), Douglas PUD will continue the pikeminnow removal program in 2009.

2.4 Hatchery Compensation

As required by the HCP, Douglas PUD supported hatchery production in 2008 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 2008 (for Chinook, sockeye, and steelhead), and were implemented at program hatcheries (Appendix F); in-season revisions were made as needed in coordination with the Hatchery Committees. Hatchery compensation in 2008 included the release of 804,747 yearling and 402,527 subyearling salmonids from hatcheries associated with the Wells Project (Appendix G). 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.

2.4.1 Hatchery Production Summary

Tables 4 and 5 summarize and compare HCP hatchery production objectives and actual 2008 production levels for both the original inundation compensation program and HCP passage loss compensation program.

2.4.1.1 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 Dam and 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 2008

Inundation Compensation Program	Numeric Target	Poundage Target	Target Weight	Number Released	Fish Per Pound	Pounds Released
Yearling Summer/Fall Chinook (2006 BY)	320,000	32,000	10 fpp	311,880[1]	11.0	28,353
Subyearling Summer/Fall Chinook (2007 BY)	484,000	24,200	20 fpp	402,527[2]	39.0	10,321
Yearling Summer Steelhead (2007 BY)	300,000	50,000	6 fpp	286,540[3]	7.0	40,934

fpp – fish per pound

1 C. Snow May 2008 Memo for the total released.

2 C. Snow June 2008 and July 2008 show an early release on May 13 of 158,044 (52.4 fpp) and a late release on June 16 of 244,483 (33.5 fpp). The poundage obligation was affected by the experimental early release of fish conducted by Washington Department of Fish and Wildlife (WDFW) hatchery evaluation staff. The experimental release was approved by the Hatchery Committees on March 21, 2007.

3 C. Snow (June 2008) shows total release of 440,362 steelhead smolts at 62,904 lbs, which is 95.5 percent of the numerical target for release. The shortage was equally assigned to Wells Inundation (286,540), to NNI (58,322), and to Grant Group 3 steelhead (95,500) under the Grant PUD Sharing Agreement.

(The memos referenced above are available upon request.)

2.4.1.2 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's NNI production levels for unavoidable juvenile losses at the Wells 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 2008

No Net Impact Compensation Program	Numeric Target	Poundage Target	Target Weight	Number Released	Fish Per Pound	Pounds Released
Yearling Summer Steelhead (2007 BY)	48,858	8,143	6 fpp	46,659[1]	7.0	6,666
Yearling Summer/Fall Chinook (2006 BY)	108,570	10,857	10 fpp	113,926[2]	12.1	9,415
Yearling Spring Chinook (2006 BY)	61,071	4,071	15 fpp	45,742[3]	19.4	2,358
Yearling Osoyoos Lake Sockeye[4]	NA	NA	NA	NA	NA	NA

1 C. Snow (June 2008) shows total release of 440,362 steelhead smolts at 62,904 lbs, which is 95.5 percent of the numerical target for release. The shortage was equally assigned to Wells Inundation (286,540), to NNI (58,322), and to Grant Group 3 steelhead (95,500) under the Grant PUD Sharing Agreement.

2 Carlton Pond Summer Chinook released by Chelan PUD for Douglas PUD as part of Douglas-Chelan Hatchery Sharing Agreement. The target release for the pond is 400,000 and the actual release in 2008 was 419,734, or 104.93 percent of the goal. NNI "Number Released" is 104.93 percent of 108,570 fish.

3 There were 411,785 spring Chinook smolts released at an average of 19.4 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 74.9 percent of the numerical target for release for 2008. The shortfall was equally applied to the three programs, giving Wells NNI 45,742 fish, Chelan PUD 215,712 fish, and Grant PUD 150,549 fish in 2008.

4 Okanogan Sockeye obligation for NNI is covered by Douglas PUD funding of the Fish/Water Management Tool (FWMT) program managed through the Okanagan Nation Alliance. The HCP Hatchery and Coordinating committees agreed that the continued implementation of this program will satisfy Douglas PUD's 7 percent hatchery compensation requirement for sockeye, based on a retrospective analysis of 25 years of historic data on sockeye production that estimated an average 55 percent increase in annual sockeye smolt production had flows in the Canadian Okanagan been annually managed with the FWMT.

(The memos referenced above are available upon request.)

2.4.2 Hatchery Planning

2.4.2.1 Monitoring and Evaluation Plan Implementation

In 2005, Douglas PUD and WDFW completed a Monitoring and Evaluation (M&E) Plan for the 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 2008 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 (2009) in November 2008. In September 2008, Douglas PUD finalized an M&E Report documenting M&E activities in 2007, titled *Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2007* (Appendix J). A similar report will be expected in 2009 for 2008 hatchery operations.

2.4.2.2 Hatchery and Genetic Management Plans

In October 2008, the National Marine Fisheries Service (NMFS) requested that the Wells HCP Hatchery Committee prepare updated HGMPs for Methow and Okanogan basin federal and ESA-listed species hatchery programs. NMFS will use the new HGMPs to determine whether the current Biological Opinions and Incidental Take Permits will require amendment or modification, or will require a new consultation. The Wells HCP Hatchery Committee is currently compiling information and preparing a schedule to completing these documents by June 2009.

In preparing the new HGMPs, NMFS requested that the Hatchery Committees consider the recommendations of the Hatchery Scientific Review Group (HSRG). The HSRG conducted a review of the Upper Columbia River hatcheries in spring 2008, and presented preliminary findings to the regional fisheries managers in May 2008. A final set of recommendations is expected in February 2009. Preliminary recommendations include developing localized broodstocks and aggressively limiting the numbers of hatchery origin fish on the spawning grounds. Additional recommendations call for lethal removal of high-ELISA (high bacterial kidney disease [BKD]) spring Chinook from broodstocks when programs are not broodstock-limited.

2.4.2.3 Objective 9 of the Hatchery M&E Plan – BKD

Throughout 2007, the Hatchery Committees engaged in discussions regarding the management of BKD as it pertains to HCP hatchery operations (Objective 9 of the Hatchery

M&E Plan). At the close of 2007, the Hatchery Committees had tasked the Hatchery Evaluation Technical Team (HETT) with developing a detailed study plan to test the effects of BKD antigen levels and rearing density on life cycle survival. In early 2008, the Hatchery Committees considered various study designs and venues for a potential study. In April, WDFW released its 2008 broodstock collection protocols, which indicated that eggs from high BKD females would be culled and monitoring would be conducted in order to better understand the potential effect of culling on the prevalence of BKD in returning adult fish. At that point, the Hatchery Committees anticipated that the proposed culling of these eggs would, at least temporarily, alleviate the capacity constraints associated with the current WDFW BKD rearing strategy, thereby forestalling the urgent need for the BKD study. No further alternatives for a BKD study were proposed, and no timeline was proposed for future discussion of the topic.

2.4.2.4 Objective 10 of the Hatchery M&E Plan - NTTOC

The Hatchery Committees began addressing the interaction of Plan Species with non-target taxa of concern (NTTOC; Objective 10 of the Hatchery M&E Plan) in early 2008. At the close of 2008, the Hatchery Committees agreed to conduct a panel exercise in spring 2009 with a risk-based model that WDFW has previously developed and applied in the Yakima River basin (Ham and Pearsons, 2001, Fisheries 26: 15-23). The Hatchery Committees agreed on the species to be analyzed and containment objective categories for these species, as well as potential panel members for the exercise, as noted in the meeting minutes from November 2008 (Appendix B). The final documentation for this decision will appear in the January 2009 minutes.

2.4.2.5 Steelhead Reproductive Success Study

A steelhead reproductive success study is required by all three of the Mid-Columbia HCPs; the requirement is found in Section 8.5.3 of the Wells HCP. In May 2008, NMFS provided some recommended endpoints for Upper Columbia River Steelhead reproductive success research that can be used to guide the Hatchery Committees' development and review of a study plan. In late 2008, the Hatchery Committees were working to develop and agree upon a study plan that would address these key points, aiming to produce by February 2009 an agreed-to set of objectives and goals for the study.

2.4.2.6 Hatchery Evaluation Technical Team

In 2007, the HETT was tasked with making recommendations to the Hatchery Committees on reference streams (now defined as "control groups") for the Chelan and Douglas PUDs M&E programs. In 2008, the HETT completed the control group analysis for the Chiwawa, Methow, Chewuch, and Twisp Rivers. The HETT considered correlation coefficients for effect sizes, and also productivity and abundance. The next step is for the HETT to provide a list of recommended control groups for steelhead and sockeye. The Hatchery Committees will then consider these recommendations in their selection of control groups for the M&E program.

2.4.3 Maintenance and Improvements

Maintenance activities supporting hatchery production under the Wells HCP in 2008 included several design projects, as well as work at existing facilities.

2.4.3.1 Wells Hatchery Screens

Installation of the new Wells Hatchery surface-water intake screens began in fall 2007 and construction was completed in February 2008.

2.4.3.2 PIT-Tag Detector at Wells Ladder Trap

The PIT-tag detector re-configuration project on the west ladder trap at Wells Dam was completed in May 2008. This re-configuration was necessary because some tagged fish were previously not being detected by the detection array at the trap exit.

2.4.3.3 Twisp Weir Improvements

The Twisp Weir was heavily damaged in 2006 during spring high flows. Repair and improvement construction was completed in time to use the weir for collection of spring Chinook broodstock in 2008.

2.5 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], and most recently updated in March of 2008. The Tributary Committees also developed Policies and Procedures for soliciting, reviewing, and approving project proposals (Anchor 2005); this document was last updated in September of 2007. 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 Committees established two complementary funding programs, the General Salmon Habitat Program and the Small Projects Program.

In 2008, the Committees outlined their vision for monitoring the effectiveness of habitat actions funded through the Plan Species Accounts. Under Section 7.5 of the Anadromous Fish Agreement and Habitat Conservation Plans, each of the three projects (Rock Island, Rocky Reach, and Wells) shall provide up to $200,000 to each of their respective Tributary Assessment Programs, which are separate from the Plan Species Accounts. The Programs will be used to monitor and evaluate the relative performance of tributary enhancement projects approved by the Committees and funded directly by the Plan Species Accounts. Thus, the Programs are intended to make sure that dollars allocated to the Plan Species Accounts are used in an effective and efficient manner. To that end, the Committees established the following draft guidelines for funding effectiveness monitoring projects.

- The Committees intend to focus on the effects of off-channel habitat actions on the rearing and spawning of salmonids.

[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 intend to focus monitoring efforts at the reach or project scale where a signal is more likely to be detected.
- The Committees are interested in measuring changes in fish abundance, distribution, and size, and changes in physical/environmental performance metrics that are linked directly to the habitat action.
- The Committees recommend that changes in response variables be compared to spatial and/or temporal reference or control conditions.
- The Committees are interested in partnering with existing monitoring programs.

Based on these draft guidelines, in April 2008, the Committees solicited effectiveness monitoring proposals from the Yakama Nation and the Okanagan Nation Alliance (see Section 2.6.5).

In October 2008, the Committees conducted a post-implementation project inspection with the Upper Columbia Regional Technical Team (RTT). The Committees visited the Entiat Instream Habitat Improvements project, Entiat River Off-Channel Rearing Habitat project, Alder Creek Culverts, Nason Creek Off-Channel project, Dryden Fish Enhancement Channel Migration Zone project, Lower Wenatchee Complexity Channel Migration Zone sites 12 and 13 projects, Beebe Creek Channel Reconfiguration project, Omak Creek Restoration project, Hancock Springs, and Fulton Dam. The Committees and the RTT jointly compiled their observations and provided those to the sponsors. Those notes are appended to this report in Appendix C.

2.5.1 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 2008.

The Tributary Committees also coordinate with the Upper Columbia Salmon Recovery Board (UCSRB). Coordination is typically between the chairperson of the Tributary Committees and the Executive Director or Associate Director of the UCSRB. In addition, some members of the Committees typically attend the UCSRB meetings 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, and annual funding rounds by these funding entities have been coordinated over the last several years.

2.5.2 Fiscal Management of Plan Species Accounts

The Tributary Committees set up methods for the long-term management of 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, 2008 was $1,500,301.18; interest accrued during 2008 was $43,235.07; funds disbursed for projects in 2008 totaled $426,803.23; disbursements for administrative costs included $3,267.69 to Chelan PUD for administrative support provided to the Wells Plan Species Account, and $2,336.00 to Douglas PUD for account administration during 2008; resulting in an ending balance of $1,111,129.33 on December 31, 2008.

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.

2.5.3 General Salmon Habitat Program

The Tributary Committees established the General Salmon Habitat Program as the principle 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. Because of this trend, 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.

2.5.3.1 2008 General Salmon Habitat Projects

The Tributary Committees announced their 2008 funding cycle in March, with pre-proposal applications due on June 2, 2008 and full proposals due on August 8, 2008. The Tributary Committees received and reviewed 13 pre-proposal applications. The Committees selected eight projects that they believed warranted full proposals, and dismissed four 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 eight full proposals to the General Salmon Habitat Program. Most of these were “cost-shares” with SRFB or other funding entities. By December, one proposal was withdrawn by the project sponsor. Of the remaining seven proposals, the Committees approved funding for five projects. The following table (Table 6)

identifies the projects, sponsors, amounts 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 2008

Project Name	Sponsor	Cost Share	Request from T.C.	Plan Species Account
Lower Icicle Conservation Easement	Chelan-Douglas Land Trust	$1,006,200	$300,000	Not Funded
Twisp River Conservation Acquisition II	Methow Salmon Recovery Foundation	$261,814	$220,000	Rock Island
Poorman Creek Barrier Removal	Methow Salmon Recovery Foundation	$137,831	$53,748	Wells
Twisp River Riparian Protection	Methow Conservancy			
Zinn Property		$244,992	$104,996	Rock Island
Buckley Property		$209,593	$89,825	Rocky Reach
Pampanin Property		$71,071	$48,649	Wells
Neighbor-Vasques Property		$205,000	$55,000	Wells
Speir Property		$55,983	$23,993	Wells
Cashmere Pond Off-Channel Habitat Project	Chelan County Natural Resource Dept	$664,966	$249,110	Rock Island
Middle Stillwater Design Only	Cascadia Conservation District	$64,253	$253,887	Not Funded
Below the Bridge (Keystone Diversion/Moody Canyon)	Cascadia Conservation District	$248,998	$150,000	Rocky Reach

In 2008, the Wells Tributary Committee agreed to fund the following projects:

- Poorman Creek Barrier Removal Project for the amount of $53,748 (with cost share the total cost of the project was $191,579). This project will replace an undersized, perched culvert, which does not meet state or federal fish passage criteria for slope and velocity, with a prefabricated bottomless box culvert. The new culvert will restore access to spawning and rearing habitat for steelhead and rearing habitat for spring Chinook. In addition, the new culvert will improve downstream habitat in Poorman Creek by restoring bedload and wood transport through the culvert. The culvert is located about 0.2 miles upstream from the mouth of Poorman Creek.
- Three of the five conservation easements under the Twisp River Riparian Protection

Project for the amount of $127,642 (with cost share the total cost of the three easements was $459,696). This project will purchase conservation easements on the Pampanin, Neighbor-Vasquez, and Speir properties located along the Twisp River. The easements would prohibit home-building, road-building, industrial or commercial use, timber harvest or vegetation alteration, land surface or watercourse alteration, water pollution or activities that cause pollution, and motorized recreational use. In the absence of easements, these properties would likely be sub-divided and developed in the near future. The conservation of these properties along with the other properties already conserved by the Methow Conservancy and WDFW would protect a total of 5.8 river miles along the lower Twisp River Assessment Unit.

2.5.4 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.

2.5.4.1 2008 Small Projects

In 2008, the Tributary Committees received five requests for funding under the Small Projects Program. Four projects were approved for funding. No funding decision was made on the remaining project, because the Committees requested additional information that has yet to be provided. The following table (Table 7) identifies the projects, sponsors, amounts 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 2008

Project Name	Sponsor	Cost Share	Request from T.C.	Plan Species Account
Riparian Regeneration and Restoration Initiative	Methow Conservancy	$7,200	$15,537	Wells
Entiat PUD Canal Log-Boom Installation	Cascadia Conservation District	$3,500	$7,160	Rocky Reach
Fort-Thurlow Pump Project	Methow Salmon Recovery Foundation	$41,150	$7,000	Wells
Goodman Livestock Exclusion Project	Okanogan Conservation District	$100	$7,980	Wells
Sleepy Hollow Reserve Protection Feasibility Assessment	Chelan County NRD	$5,000	$20,000	No Decision*

*The Committees requested additional information from the sponsor that has yet to be provided.

In 2008, the Wells Tributary Committee agreed to fund the following small projects:

- Riparian Regeneration and Restoration Initiative Project for the amount of $15,537 (with cost share the total cost of the project was $22,737). This project will build re-useable cages that will protect seedlings and saplings of cottonwood, aspen, and willow trees within riparian areas along the Methow and Twisp rivers from wildlife browsing. The cages will allow young trees to grow beyond the damaging effects of herbivores and thereby improve natural regeneration of riparian vegetation in the Methow Valley. Because the cages are durable and reusable, the work can continue indefinitely with minimal need for future funding.
- Fort-Thurlow Pump Project for the amount of $7,000 (with cost share the total cost of the project was $48,150). This project will complete the piping modification on the Fort-Thurlow irrigation system on Beaver Creek. By connecting the second pump to the newly piped system, which was funded by the Salmon Recovery Funding Board, the project will create a completely enclosed and pressurized irrigation system. This will eliminate an existing 0.5-mile bypass reach for operational spill and benefit salmonids by adding 0.5 cfs of flow to Beaver Creek near the point of the diversion.
- Goodman Livestock Exclusion Project for the amount of $7,980 (with cost share the total cost of the project was $8,080). This project will install about 800 feet of riparian

exclusion fencing along Beaver Creek and provide an off-stream water source for livestock. This should protect existing riparian habitat and reduce bank instability and fine sediment recruitment to the channel.

2.5.5 Tributary Assessment Program

In April, the Committees invited the Yakama Nation to submit a proposal to monitor the effectiveness of the Nason Creek Oxbow Project and the Okanagan Nation Alliance to submit a proposal to monitor the Okanagan River Restoration Initiative Project. Only the Okanagan Nation Alliance responded to the request for proposals.

The Wells Tributary Committee agreed to fund three monitoring tasks of the Okanagan River Restoration Initiative: (1) Fish Holding and Rearing for $2,983, (2) Channel Morphometry and Hydraulics for $7,224, and (3) Substrate Composition for $5,596. Douglas PUD provided funding for the approved monitoring tasks through the Wells Tributary Assessment Program, as per Section 7.5 of the Wells HCP, rather than through the Wells Plan Species Account. By May 2009, the Okanagan Nation Alliance will submit a report that summarizes the monitoring results and a budget for the next annual monitoring period.

3 HCP ADMINISTRATION

This chapter lists events of note that occurred in 2008 related to the administration of the HCPs, as well as a list of reports published in 2008 that relate to the HCPs.

3.1 Mid-Columbia HCP Forums

In 2005 and 2006, Mid-Columbia Forums (Forum) were held as a means of communicating and coordinating with the non-signatories and other interested parties on the implementation of the HCPs. Non-signatory parties at the time of the 2006 meeting included the Confederated Tribes of the Umatilla Reservation and American Rivers. As in 2007, these parties were invited by letter in 2008 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 2008, and thus no forum was held in 2008.

3.2 HCP Related Reports Published in Calendar Year 2008

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

- Anchor Environmental. 2008. 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 FERC. April 2008.
- Jerald, T. 2008. 2007 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. December 1, 2008.
- Murdoch, A. and C. Snow. 2008. Implementation of Comprehensive Monitoring and Evaluation of Hatchery Programs Funded by Douglas County PUD. Submitted to Douglas County PUD. October 2008.
- Snow, C., C. Frady, A. Fowler, and A. Murdoch. 2008. Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2007. Prepared for Douglas County Public Utility District and Wells Habitat Conservation Plan Hatchery Committee. Prepared by WDFW. March 2008.
- Public Utility District No. 1 of Douglas County. 2007. Annual Report of Operations,

Fish Facilities: 2007. Wells Hydroelectric Project, FERC No. 2149. April 2008.

- LGL Limited Environmental Research Associates and Public Utility District No. 1 of Douglas County. 2008. Wells Bull Trout Monitoring and Management Plan 2005-2008 Final Report. Wells Hydroelectric Project, FERC No. 2149. December 24, 2008.

APPENDIX A

HABITAT CONSERVATION PLAN COORDINATING COMMITTEES MEETING MINUTES AND CONFERENCE CALL 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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: February 26, 2008

Re: Final Minutes of January 22, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington, on Tuesday, January 22, 2008, from 12:30 pm to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final November 27 and December 11 Meeting Minutes by email to the Committees (Item I).
- Chuck Peven will provide the Committees with background information on run-timing, prevalence of descaling injuries, and diel distributions of juvenile salmonids from data collected at the Rocky Reach Juvenile Fish Bypass System (JFBS; Item III-B).
- Chuck Peven will invite members the Fish Bypass Oversight Team (FBOT) to the next Coordinating Committees meeting to discuss the overall strategy for Rocky Reach sockeye testing (Item III-C).
- The Coordinating Committees will send comments to Chuck Peven as soon as possible regarding the *Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam in 2008* (Item III-C).
- Chuck Peven will email the Chelan PUD 2008 Action Plan to Ali Wick for distribution to the Committees (Item III-F).
- Rick Klinge will update the hatchery release numbers and will send a revised version of the 2008 Bypass Operating Plan Memorandum to Ali Wick for distribution to the Committees (Item IV-A).

- Tom Kahler will send the revised calculations for the adult salmonids dam conversion rates to Ali Wick for inclusion in the HCP Annual Reports (IV-D).
- Ali Wick will compile a list of all reports currently out for review by the Committees as well as dates that comments are due; this list will be regularly updated and will be included along with the list of meeting Action Items that are distributed to Committees members following each monthly meeting (Item V-C).

DECISION SUMMARY

- The Coordinating Committees approved the Statement of Agreement (SOA) and *Study Plan for the Biological Evaluation of the Rocky Reach Fish Bypass System* (Item III-A; Attachment B).
- The Coordinating Committees approved the SOA and *Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10 Percent Spill Operation* (Item III-B; Attachment C).

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe welcomed everyone to the meeting, and the meeting minutes from November 27 and December 11 were approved with revisions. 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 that the Tributary Committees have finalized funding decisions for the 2007 funding cycle. A total of six projects were identified for funding: one from the Rocky Reach Plan Species account, four from the Rock Island account, and one from the Wells account. Of these six, the Wells HCP tributary project (the Okanagan River Restoration Initiative) received the largest funding amount. The Tributary Committees also discussed monitoring objectives relevant to the Tributary Fund projects.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- The Hatchery Committees discussed the Chelan PUD proposal for a partial water reuse study using Wells summer Chinook, and will soon be considering a decision on whether to go forward with the study.
- Chelan PUD is working on design of steelhead acclimation ponds at the Chiwawa facility, and will be providing the feasibility study and preliminary drawings to the Hatchery Committees soon.
- The Hatchery Committees will be providing a letter to the Upper Columbia Salmon Recovery Board to update them on the Hatchery Committees progress on identifying reference streams.
- Trout Unlimited is developing Blackbird Island Pond as a potential acclimation site for a portion of the HCP production of Wenatchee steelhead. Trout Unlimited understands the need to coordinate this activity with the Hatchery Committees, and toward this end Rollie Schmitten and others involved in the project will be attending the next Hatchery Committees meeting to brief the group.
- The Hatchery Committees approved Douglas PUD's 2008 Action Plan.
- Grant PUD has sent its annual request to Douglas PUD for access to the Wells and Methow hatchery facilities to raise Upper Columbia River (UCR) steelhead, and UCR spring-run Chinook salmon.
- For permit compliance, Kirk Truscott at Washington Department of Fish and Wildlife (WDFW) is drafting a Request for Concurrence letter for the Hatchery Committees' draft interim bacterial kidney disease (BKD) management strategy.
- The Douglas PUD Wells Hatchery screen and Twisp weir projects are proceeding well.
- WDFW updated the Hatchery Committees on the first year results of rearing Turtle Rock summer Chinook (Broodyear 2005) in net pens at Chelan Falls.
- The Colville Tribes have made their annual request to WDFW to release 25,000 steelhead smolts in Salmon Creek this spring.
- The Hatchery Committees discussed the inconsistent results of dam counts for coho salmon at several Mid-Columbia dams during the past year (e.g., Rock Island counts of coho were approximately 5000 fish higher than those at Priest Rapids). The Committees discussed that these counts may be caused by fish counters misidentifying coho salmon.
- The Yakama Nation (YN) is currently considering the feasibility of reintroducing sockeye into Lake Cle Elum.

- The YN is discussing a proposal for steelhead kelt reconditioning with the Federal Columbia River Power System (FCRPS) Action Agencies.
- YN staff are further developing the Wenatchee basin steelhead smolt acclimation concept proposal that was presented to the Hatchery Committees at the last Committees meeting. The YN is now identifying and evaluating potential acclimation sites.
- Over the next few months the Hatchery Committees will be developing a plan for addressing Objective 10 of the HCP Monitoring and Evaluation (M&E) Plans; this objective involves defining and evaluating risks of HCP supplementation to Non-Target Taxa of Concern (NTTOC).
- The Hatchery Evaluation Technical Team (HETT) is working on the following:
    - Developing a list of potential facilities where the draft BKD study plan could be implemented
    - Developing a list of potential spring Chinook reference streams/populations for use in M&E evaluations

III Chelan PUD (Chuck Peven)

A. *DECISION ITEM: SOA and Study Plan for the Biological Evaluation of the Rocky Reach Fish Bypass System*

Chuck Peven introduced this topic and the Committees approved the study plan and SOA with minor revisions.

B. *DECISION ITEM: SOA and Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10 Percent Spill Operation*

Chuck Peven introduced this topic and answered several questions by Committees members about the study plan. In response to an inquiry about scale loss, Peven noted that the criterion to determine whether an individual fish is "descaled" (at least 20% loss on one side of a fish) used for the Rocky Reach Bypass was the same as that used at all the smolt monitoring program (run by the FPC) sites . He noted that the percent of fish that are considered descaled, rarely exceeds 2 to 4%, and that at those levels the operators look hard to identify any problems. Another question involved information previously collected on diel distribution, and how that information was used in establishing the sample schedule. In addition to addressing these questions, Peven agreed to provide the Committees with background information on run-timing, prevalence of descaling, and diel distribution of

plan species from previous year's operations at the Rocky Reach JFBS. The Committees approved the study plan and SOA.

C. Study Proposal for Sockeye Salmon Testing at Rocky Reach in 2008

Chuck Peven introduced the *Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam in 2008*. The study focuses on evaluating a dam operation that is designed to maximize the proportion of sockeye that pass the dam via the JFBS, and also maximizes turbine survival by specifying turbine loading of specific units and how all units are run in tandem. Bryan Nordlund asked Peven to confirm that conditions being tested would be implementable in the long run; Peven confirmed that the FBOT is aware of this issue and takes this into consideration when planning studies. Peven also agreed to ask FBOT to summarize past testing at Rocky Reach for the Committees and address questions about future directions. Peven indicated that he would develop a report. The Committees requested that selected FBOT members attend the next Coordinating Committees meeting to review this information and answer questions. The Coordinating Committees will send comments to Chuck Peven as soon as possible regarding the study.

D. Briefing Paper on Path Forward for Subyearling Chinook Phase Designation

Mike Schiewe introduced this topic, recalling that the Coordinating Committees intended to document the process for designating the phase for subyearling Chinook under the HCP. The briefing papers are still under development.

E. NPCC Fish and Wildlife Amendment Process

Chuck Peven updated the group that Chelan and Douglas PUDs were working together to include language in the Northwest Power and Conservation Council (NPCC) Fish and Wildlife Plan to acknowledge the HCPs to a greater degree.

F. Chelan PUD 2008 Action Plan

Chuck Peven provided a handout of the Chelan PUD 2008 Action Plan for discussion at the next meeting. Peven will email this to Ali Wick for distribution to the Committees.

IV Douglas PUD (Rick Klinge and Tom Kahler)

A. 2008 Juvenile Bypass Operating Plan

Rick Klinge provided the Committees with a draft memorandum summarizing the proposed 2008 Juvenile Bypass Operating Plan. This is a draft for discussion and Klinge will update the release numbers and will send a revised version to Ali Wick for distribution to the Committees.

B. 2008 Douglas PUD Action Plan Agreement

Rick Klinge introduced this topic and provided handouts of the previously distributed Douglas PUD 2008 Action Plan, which establishes significant dates for the HCP year. Important actions for this year are the construction and installation of a flow-directing baffle in the west fishway, as well as the placement of a lamprey structure to aid in evaluation. The Coordinating Committees approved the plan; the Hatchery and Tributary Committees have also previously approved elements of the plan that were germane to their responsibilities.

C. Land Use Policy Change

Tom Kahler updated the group that Douglas PUD had recently made a change to their land use policy. The new policy limits dock construction on Douglas PUD-owned land adjacent to the Wells reservoir. This change was made following PUD concerns that the proliferation of residential docks would impact survival of migrating summer and fall Chinook. Section 5 of the Wells HCP requires Douglas PUD, when making land-use decisions, to consider cumulative impacts in order to meet the conservation objectives of the HCP. The new policy went into effect in December 2007 after being approved by the Douglas PUD Board of Commissioners, following two months of deliberations, including substantial public comment. Chuck Peven noted that Chelan PUD is aware of this issue, but is in a different position because Chelan PUD does not own the land adjacent to the reservoir.

D. Adult Conversion Rates on the DART Website

Tom Kahler updated the group that the adult fish count data for Wells Dam that are listed on the Columbia River Data Access in Real Time (DART) website are incomplete. He noted that this fact affects the estimation of adult passage conversion rates included in HCP Annual Reports. Kahler described that there are PIT (Passive Integrated Transponder) tag

detectors on both ladders and ladder traps at Wells Dam. He further noted that although the ladder detectors are highly efficient (circa 100 percent), the west-ladder trapdetectors has recently not been. The west ladder trap PIT tag detector has been reading tags at around 2 percent efficiency, but the fish are manually checked by hatchery staff. It was recently determined that these manually-collected data are not being incorporated into the DART database. Douglas PUD is working with DART to rectify this situation. Tom Kahler will send these revised numbers to Ali Wick for use in the Annual Reports.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

- The Committees agreed with the Douglas PUD 2008 Action Plan.

B. Meeting Schedule

The upcoming meetings are set as follows:

- February 26 in SeaTac, 9:30 am to 4:00 pm
- March 25 in SeaTac
- April 22 in SeaTac

C. Reports out for Review

Ali Wick will compile a list of reports currently out for review as well as dates that comments are due, and will send a list out to the Committees. This item will become a standing item on the Action Item list.

VI List of Attachments

Attachment A – List of Attendees

Attachment B – Statement of Agreement – Approval of the Study Plan for the Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2008.

Attachment C – Statement of Agreement for Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10 Percent Spill Operation

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
Jerry Marco * (by conference call)	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

ATTACHMENT B

STATEMENT OF AGREEMENT – APPROVAL OF THE STUDY PLAN FOR THE BIOLOGICAL EVALUATION OF THE ROCKY REACH JUVENILE FISH BYPASS SYSTEM 2008

FINAL

January 22, 2008

Statement of Agreement – Approval of the Study Plan for the Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2008
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 Rocky Reach Juvenile Fish Bypass System."**

ATTACHMENT C

STATEMENT OF AGREEMENT FOR STUDY PLAN TO ESTIMATE ROCK ISLAND PROJECT SURVIVAL FOR YEARLING CHINOOK, STEELHEAD, AND SOCKEYE DURING A 10 PERCENT 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, Steelhead, and Sockeye during a 10% Spill Operation

January 22, 2008

Statement

The Rock Island HCP Coordinating Committee has reviewed the Chelan County PUD document, "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation,*" and accepts the plan for 2008 testing.

Background

On December 8, 2006, the Committees approved a Statement of Agreement for testing a 10% spill operation (10% SOA) in 2007 at Rock Island Dam to assess yearling Chinook survival. The SOA outlined an agreed to project survival testing plan for 2008 and 2009 (spill level and species studied) based on results of the 2007 test. Given the 2007 project survival results for yearling Chinook (97.25%), the SOA calls for 10% spill operation for 2 additional years study of yearling Chinook and a first year's study of steelhead. In addition, the Committees agreed that that additional testing using paired-release study for sockeye is necessary to accurately evaluate project survival. Therefore, sockeye salmon will also be included in the 2008 project survival testing. For reference, the "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation*") has been attached (Attachment A.1).

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: March 27, 2008

Re: Final Minutes of February 26, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington, on Tuesday, February 26, 2008, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Chuck Peven will report back to the Coordinating Committees with background information on descaling criteria, diel distribution by species, and run timing with regard to operation of the Rocky Reach Juvenile Fish Bypass System (JFBS; January Meeting).
- Keith Truscott will send the final version of the Chelan PUD 2008 Action Plan to Ali Wick for distribution to the Committees (Item I-A).
- Chuck Peven will send the study report from the 1996 balloon tag study of juvenile survival through the turbines at Rocky Reach to Ali Wick for posting on the ftp site, at Carmen Andonaegui's request (Item I-E).
- Carmen Andonaegui will send the tagging protocols for Grant's recent survival studies to Ali Wick for distribution to the Committees (Item I-E).
- Ali Wick will distribute the final January 23 Meeting Minutes by email to the Committees (Item II).
- Rick Klinge will send the final 2008 Douglas PUD Bypass Operating Plan to Ali Wick for distribution to the Committees (Item IV-A).
- Rick Klinge will send a revised draft summary of Plan Species phase designations for the Wells Project HCP to Ali Wick for distribution to the Committees (Item IV-B).

- Rick Klinge will send Ali Wick the link to the Final Environmental Impact Statement (FEIS) for the HCPs and if not posted on the ftp site, Wick will post it there (Item IV-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Chelan PUD

A. Acceptance of Chelan PUD 2008 Action Plan

Keith Truscott introduced the Chelan PUD 2008 Action Plan, which was previously distributed to the Coordinating Committees. The Committees accepted the plan with revisions discussed at the meeting. Keith Truscott will send the final version out to Ali Wick for distribution to the Committees.

B. Pikeminnow Trapping Plan

Keith Truscott introduced this topic that Chelan PUD is proposing again in 2008 to implement the pikeminnow ladder trapping plan similar to 2007, with some modifications. The plan has been sent out to the Coordinating Committees for their review and comment. Chelan PUD is proposing four traps at Rock Island and two at Rocky Reach. Truscott mentioned that Chelan PUD will carefully monitor all incidental catch of non-target species, in particular to document any small salmonids that would be entrained in the traps. He verified that in the past years when using the traps to collect lamprey, a few (<10) small salmonids (~130 millimeters, likely rainbow trout) were trapped as well as one Chinook mini-jack. Truscott said that he would send out periodic trapping updates (weekly at first, and then dependent upon catch) to the Committees during the study. Bryan Nordlund requested that Truscott coordinate with him on the final location of the traps on the ladder weirs at Rock Island Dam.

C. Fishway Maintenance Update

Keith Truscott updated the group that he had received an update from Thad Mosey on recent fishway maintenance work. The attraction water pump at Rocky Reach Dam has been installed and is on schedule for a startup date of March 3. Two attraction water pump

gear boxes at the RI right bank fishway were rehabilitated last year, all three attraction water pumps will be operational by March 1.

D. Phase Designation Summary Paper

Keith Truscott gave background on this topic, which the Coordinating Committees had discussed several meetings back, about the need for preparing documentation for phase designation at HCP projects. He is currently working to prepare such a document for Rocky Reach and Rock Island HCPs and will keep the group updated on this work. Mike Schiewe noted that a document for Wells HCP will be discussed during Douglas PUD's time today.

E. Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam in 2008

Chuck Peven provided an introduction to the Fish Bypass Optimization Team (FBOT) and their efforts to design study operations for Rocky Reach Dam, described in the *Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam in 2008.* Peven noted that the purpose of the document distributed by email last week was to provide a comprehensive summary of past results of Rocky Reach sockeye studies. He then turned his attention to the 2008 study plan, and reviewed the various hypotheses for improving survival that had been considered in developing the proposed operation for 2008. Tracy Steig and Al Giorgi (both FBOT members) then joined the presentation, discussing the results supporting each of the hypotheses evaluated thus far. Looking at all testing conducted since 2003, the FBOT has concluded the following for sockeye passage through Rocky Reach:

- Mortality in the Rocky Reach reservoir is high because of large numbers of exotic predators, with the highest sockeye mortality probably occurring in the upper reaches of the reservoir. Predation is also occurring in the Wells Dam tailrace.
- The project survival estimate for sockeye is biased low due to tagger handling effects, and this will be addressed in 2008 studies.
- Sockeye distribution in the forebay is not significantly affected by spill/no-spill conditions. Spill is generally an inefficient tool for passage.
- It is not clear whether spill (including block loading configurations) alters conditions within the tailrace that increases sockeye mortality. Block loading does affect sockeye survival through the powerhouse.
- Structural devices in the forebay and dam will be tested in the future to attempt to increase Fish Bypass Efficiency (FBE); expansion of the 3-D array in the forebay will

help inform this. Pilot testing for the reef net concept is ongoing this year in the Okanogan River.

- Adding a second entrance to the existing system in the vicinity of powerhouse units 3 and 4 is unlikely to significantly increase FPE.
- The concept of modifying the surface collector has not been tested yet.
- Shutting off Units 1 and 2 does not enhance surface collector sockeye passage. Changes in turbine operations in 2007 increased surface collector passage.
- Simple modeling of the High Flow operating condition shows that higher sockeye passage densities are focused directly toward the surface collector, while the Water View condition shows higher densities along the powerhouse wall.
- Increasing the number of pumps and the amount of flow into the surface collector would likely cause only a small change in the zone of entrainment upstream of the surface collector entrance.
- Collection efficiency is high for fish that move to within 300 feet of the surface collector entrance; and a long-term goal is to get more sockeye into this zone.
- Project survival is ultimately determined by a combination of powerhouse survival and surface collector survival, and the proportion of fish that pass via each of these routes. The FBOT is working to determine what actions can be tested for increasing both powerhouse survivals, as well as increasing sockeye passage efficiency through the surface collector.

At Carmen Andonaegui's request, Chuck Peven will send the study report from the 1996 balloon tag study of juvenile survival through the turbines at Rocky Reach to Ali Wick for posting on the ftp site. Also, Carmen Andonaegui will send the tagging protocols for Grant County PUD's recent survival studies to Ali Wick for distribution to the Coordinating Committees.

For 2008, Chelan PUD is proposing a study operation similar to that of 2007 with no spill, but with modified turbine operations, the addition of an acoustic array in the Rocky Reach forebay, a refined method of estimating juvenile dam passage survival (JDPS), and offsite efforts to investigate structural options to influence fish guidance. All of the Committees members present indicated their acceptance of the proposal, with the exception of Bryan Nordlund who

requested additional time to review the information presented today. The Committees agreed to a conference call on Friday, February 29, at 10:00 am to discuss any further concerns.

II Approval of Meeting Minutes and Agenda (Mike Schiewe)

The January 23 Meeting Minutes were approved with several revisions. Ali Wick will distribute the final meeting minutes by email to the Coordinating Committees.

III Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees are working through several administrative matters associated with previously approved and awarded projects. There has been some discussion about developing a closer interaction between the Tributary Committees and the Bureau of Reclamation's (BOR's) Entiat and Wenatchee Interdisciplinary Teams (IDTs). The Committees decided not to participate directly, but will invite BOR staff periodically to Tributary Committees meetings. The Tributary Committees are continuing to work on a Monitoring and Evaluation (M&E) program for funded projects.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- The Hatchery Committees reviewed and approved the pilot water reuse study plan for 2008. The discussion included settling on a tagging approach appropriate to the study.
- The Hatchery Committees received a presentation from the Icicle Chapter of Trout Unlimited on the group's ongoing efforts to develop Blackbird Island Pond for steelhead acclimation. The group anticipates that the ponds should be available by next year. Discussion is still ongoing regarding managing any residualized fish that may remain in the ponds.
- Chelan PUD will soon be distributing the Chiwawa Steelhead Acclimation Ponds Feasibility Study for Hatchery Committees' review and comment. Permitting for the Chelan Falls and the Chiwawa facilities will likely proceed on similar timelines.
- Washington Department of Fish and Wildlife (WDFW) and the Yakama Nation (YN) are collaborating on a draft white paper describing a Joint Fisheries Parties (JFP)

management plan for spring Chinook production in the Wenatchee basin; a major focus of the plan will be broodstock management.

- The Tumwater Passive Integrated Transponder tag (PIT-tag) coil has now been installed and is either working now or will be shortly.
- Chelan PUD may not be able to operate Tumwater Dam on a year-round basis, and will be working with WDFW on this issue.
- Construction is underway building the cofferdam for the Twisp weir project, and the Wells Hatchery Screen project is now complete.
- Douglas PUD is reconfiguring the PIT-tag detector associated with the west ladder trap; as currently positioned, it is subject to vibration and electromagnetic interference, and near 100 percent detection is anticipated following this upgrade.
- Douglas PUD is considering converting from individual water certificates for each of the wells to one that applies to an entire wellfield at the Wells and Methow hatcheries. Douglas PUD plans to request letters of support from individual Hatchery Committee members to Washington State Department of Ecology (Ecology) to support this conversion.
- National Marine Fisheries Service (NMFS) researchers are requesting permission to sample about 300 yearling and subyearling Chinook smolts from each of the Upper Columbia hatchery programs. The fish will be sacrificed to measure serum factors that can be used to predict precocious maturation of males. The Hatchery Committees provisionally agreed with this study subject to ESA review.
- The YN is working on a proposal for kelt reconditioning; this activity will eventually involve trapping kelts at the PUD dams.
- The YN is planning to request summer Chinook eggs from Wells Hatchery for rearing and release at Prosser Dam in the Yakima basin. The Hatchery Committees agreed that this proposal is acceptable in concept; the Committees anticipated that the Colville Tribes would want to review this proposal from a tribal policy perspective.
- The YN (along with the other Columbia River Treaty Tribes) is considering a 10-year Memorandum of Agreement (MOA) with the Federal Columbia River Power System (FCRPS) Action Agencies (BOR, U.S. Army Corps of Engineers [USACE], and Bonneville Power Administration [BPA]) to fund a wide range of fishery projects and activities.

- WDFW and Chelan PUD are planning to meet to discuss the timeline for continued testing and possible purchase of additional ultrasound units for determining the gender of early returning fish.
- The Hatchery Committees agreed that WDFW can continue net pen rearing of Turtle Rock Summer Chinook in 2008, employing the same protocols and schedule as were used in 2007.
- The Hatchery Committees are discussing locations for a potential bacterial kidney disease (BKD) study (Cle Elum or Methow hatcheries).
- The Hatchery Committees will soon be reviewing WDFW's proposal to conduct trapping-efficiency trials for spring Chinook in the Methow basin.
- The Hatchery Evaluation Technical Team (HETT) is close to completing the work on reference stream (reference populations) analysis for Chiwawa River spring Chinook.
- The Hatchery Committees are considering the best approach to engage the Entiat Watershed Planning Unit regarding reference populations for the M&E program.

IV Douglas PUD (Rick Klinge and Tom Kahler)

A. Acceptance of 2008 Juvenile Bypass Operating Plan

Rick Klinge introduced the 2008 Juvenile Bypass Operating Plan that was distributed to the Coordinating Committees in January. The bypass will begin at 0000 hours on April 12 and run until August 26 at 2400 hours. The Committees concurred with this plan. Klinge will send the final plan to Ali Wick for distribution to the Committees.

B. Summary of Phase Designation

Rick Klinge updated the group that Douglas PUD is working on a summary document that reviews the history of phase-designation decisions for the Wells Project, documents a periodic review of technology and other experimental considerations affecting survival studies for subyearling Chinook and sockeye salmon. Chelan PUD is developing a similar document for the Rock Island and Rocky Reach projects. Coordinating Committees members provided comments on a preliminary draft distributed by Douglas PUD. Rick Klinge will send a revision of the document to Ali Wick for distribution prior to the next meeting. Klinge will also send Wick the link to the FEIS for the HCPs and if not posted on the ftp site, Wick will post it there.

C. Update on Wells Hatchery Water Intake Screen

Tom Kahler updated the group that the Wells Hatchery Water Intake Screen project is complete and operational.

D. Update on Fish Ladder Service

Rick Klinge updated the group that the Wells fish ladder was brought back into service on February 19 after winter maintenance. Service is still needed on the PIT-tag detection system at the west ladder broodstock trap. Douglas PUD will be moving the PIT-tag coil into the ladder sometime this spring, after the parts for the coil arrive. The upper portion of the ladder will be dewatered to install the new coils.

E. JFP Letter of Support on Wellfield Water Certificiates

Rick Klinge introduced this topic that Douglas PUD is considering converting from individual water certificates for each well to one certificate that applies to an entire wellfield at the Methow and Wells hatcheries. Douglas PUD plans to request letters of support from individual Coordinating and Hatchery Committees members to Ecology for this conversion, and will be providing template letters for members to modify and send.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Agreements

The Committees accepted the Chelan PUD 2008 Action Plan with revisions discussed at the meeting.

B. Meeting Schedule

The upcoming meetings are set as follows:

- March 25 from 12:30 pm to 4:30 pm in SeaTac
- April 22 from 9:30 am to 4:30 pm at Wells Dam (location details TBA)
- May 27 in SeaTac (time TBA)

C. Reports Out for Review

Ali Wick reminded the group that the FBOT document *Survival Testing and Fish Bypass Evaluation at Rocky Reach Dam Beginning in 2003* is out for review until April 18. An update on other review documents includes the following:

- *Monitoring and Evaluation of the Chelan County PUD Hatchery Programs* is out for review until May 2.
- Rocky Reach/Rock Island Annual HCP Report documents are also both out for review until March 14.

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.
Al Giorgi	BioAnalysts
Chuck Peven *	Chelan PUD
Keith Truscott *	Chelan PUD
Duncan Hay	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Tracy Steig	HTI
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW

* Denotes Coordinating Committees member or alternate

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Final Memorandum

To: Rocky Reach and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: March 27, 2008

Re: Final Minutes of February 29, 2008 Rocky Reach and Rock Island Coordinating Committees Conference Call

The Rocky Reach and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCP) Coordinating Committees met by conference call on Friday, February 29, 2008 from 10:00 am to 11:00 am to review the *Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam For 2008*. Attendees are listed in Attachment A.

I Welcome (Mike Schiewe)

Mike Schiewe welcomed the group and stated that the purpose of the call was to review the *Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam for 2008,* and work toward approval of this study plan for 2008. At the February 26 Coordinating Committees, all of the members committee that were present (save Bryan Nordlund) had provisionally approved the study plan; Nordlund had requested additional time to consider the proposed study after the presentation from the Chelan PUD Fish Bypass Optimization Team (FBOT) on the previous years investigations.

Bryan Nordlund raised several concerns about the study plan. One was whether the 7.5 percentage point reduction in powerhouse survival under the block loading condition (a 2007 result) could be compensated for by expected improvements in tailrace egress conditions. He suggested that perhaps a computational model could be used more effectively to help sort out anticipated changes in tailrace flows and fish egress conditions associated with different turbine operations. He also emphasized the importance of developing a better understanding of tailrace egress conditions under a variety of flow conditions that would be optimize powerhouse survival and remain sustainable to define long-term operations of the Rocky Reach

powerhouse. In addition, Nordlund and Chuck Peven discussed the various turbine operations that would potentially provide the best turbine survival test conditions. Nordlund expressed reservations that the proposed study operation may not optimize project survival. He noted that although the operation of Turbine Units 1 and 2 at 16 kcfs would probably increase the percent of fish entering the fish bypass system, he was concerned that this benefit will be partially and may be totally offset by higher turbine mortality associated with operating these units at 16 kcfs as compared to, for example 11 or 12 kcfs, as indicated by past direct turbine survival studies and confirmed through last season's test results. Nordlund also indicated that he considers the addition of turbine screens in Units 3 and 4 and addition of a second entrance gate to have high potential for an increment of survival improvement (he had calculated up to a 0.85% survival improvement, if fish that currently pass through Units 3 and 4 were guided into the bypass system by new screens, and this improvement could only increase if a new entrance in this vicinity were successful). Lastly, Nordlund indicated he had several minor comments that he would email to Peven for incorporation into the document. To conclude this discussion, Nordlund noted that he still had concerns with the study as proposed, but did not want to stand in the way of the study going forward. Thus, he chose to abstain from voting.

Bob Rose, who was unable to attend the February 26 Coordinating Committee, after hearing the discussion on this call and talking with other members of the Committee, indicated that he shared many of Nordlund's concerns, but would support the study as proposed by Chelan.

Thus with one abstention, and the remainder of the Coordinating Committees approving the study plan, Chelan PUD will proceed with implementing the study as proposed.

At the close of the call, Mike Schiewe noted that there was a short list of Chelan PUD study reports that have been out for review for several months and about which much discussion has already taken place, but the Committees had yet to formally accept the documents. He wanted to let Coordinating Committees know that in order to keep track of decisions, these documents would be up for approval at the next meeting as a matter of process.

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
Bryan Nordlund *	NMFS
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: April 30, 2008

Re: Final Minutes of March 25, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington, on Tuesday, March 25, 2008, from 12:30 pm to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final February 26 Meeting Minutes and February 29 Conference Call Minutes to the Coordinating Committees (Item I).
- Chelan PUD will provide final reports approved in Statements of Agreement (SOAs) to Ali Wick to distribute to the Coordinating Committees (Item III-A).
- Keith Truscott will review the draft *Summary of Phase Designations of Plan Species under the Rock Island and Rocky Reach Hydroelectric Projects Habitat Conservation Plans* and send to Ali Wick for distribution to the Coordinating Committees (Item III-B).
- Tom Kahler will discuss the Douglas PUD letter regarding sockeye survival investigations with staff, and will likely redraft it in the form of a status white paper (Item IV-A).

DECISION SUMMARY

- The Coordinating Committees approved the following SOAs and associated documents:
    - Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2006 (Attachment B)

- Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2007 (Attachment C)
- Statement of Agreement for Survival of Yearling Chinook Salmon Smolts through the Rock Island Project in 2007; and Comparison of Sockeye Salmon Smolt Survival Estimates through Rock Island using Paired-Release and Single Release Methods (Attachment D)
- Statement of Agreement for Acoustic-Tag Investigations of Sockeye Salmon Smolt Survival and Migration Dynamics at Rocky Reach in 2007 (Attachment E)
- Statement of Agreement for Approval of the 2008 Fish Spill Plan, Rocky Reach and Rock Island Dams (Attachment F)
- Statement of Agreement for Approval of the 2008 Rocky Reach Study Plan (National Marine Fisheries Service [NMFS] abstained from voting on this item as discussed in the February 29 meeting minutes; Attachment G)

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The February 26 Meeting Minutes and February 29 Conference Call Minutes were approved with several revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees were dealing with mostly administrative matters in the last month. The Committees also received two Small Projects Program applications: one from the Methow Conservancy (a riparian restoration initiative) and another from Cascadia Conservation District (a log-boom installation in the Entiat PUD Canal). The Wells Tributary Committee approved funding for the riparian project. For the log boom project, the Committees identified issues that require additional information from the sponsor, and no funding decision has been made at this time.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- Members of the Hatchery Committees drafted a support letter for Douglas PUD to send to Washington State Department of Ecology (Ecology) supporting Douglas PUD consolidating water right certifications for individual wells into a single certification for each wellfield.
- The Twisp Weir construction project is progressing well.
- The Hatchery Committees approved the feasibility report for the rearing ponds at Chiwawa, except Washington Department of Fish and Wildlife (WDFW), which requested some additional time to review the report. The project will now move forward into design.
- The Chelan PUD Annual Monitoring and Evaluation (M&E) Report is now posted to the ftp site and comments are due May 2.
- Chelan PUD and Yakama Nation (YN) have met and agreed to a plan for this year regarding the trap and leaf litter at Dryden; they will be evaluating the leaf litter situation again following this year.
- The Hatchery Scientific Review Group (HSRG) will be in the Upper Columbia in late April. The Hatchery Committees may be reviewing some of the information that the HSRG will be analyzing.
- The Ad Hoc Supplementation Technical Working Group is meeting to evaluate the effectiveness of supplementation programs in the Upper Columbia basin. NMFS and Columbia River Inter-Tribal Fish Commission (CRITFC) are the organizers of this group.
- The Hatchery Committees are looking at various sites for the potential bacterial kidney disease (BKD) study. The Cle Elum Hatchery is a potential option; however, BKD levels may not be high enough there to make the study worthwhile. The Methow Hatchery is another option, but production would have to be reduced substantially in order to accommodate the study there. WDFW will be evaluating potential rearing configurations that would optimize production at the hatchery while allowing a useful study setup.
- The Hatchery Committees now have a draft schedule and proposal for implementing Objective 10 of the M&E Plan and the Hatchery Evaluation Technical Team (HETT) will now proceed with the first steps.

- The YN has initiated discussions with the Okanagan Nation Alliance (ONA) to discuss partnering with ONA on egg take operations for Okanagan sockeye from Shuswap Hatchery in order to re-establish sockeye populations in the Yakima River.
- The YN is doing some background work with Chelan PUD on potential kelt reconditioning at Rocky Reach and Rock Island Dams.
- The YN has requested 250,000 summer Chinook eggs from WDFW with the intention to re-establish fall Chinook in the Yakima River. The Hatchery Committees discussed that this is not likely to impact HCP production or policy.
- WDFW will be conducting some trap-efficiency studies at Lake Wenatchee. These studies include marking sockeye captured at Lake Wenatchee and releasing them at the Monitor trap to look at trap efficiency at Monitor.
- The Hatchery Committees are discussing the steelhead reproductive success endpoints and the potential for a future study.
- WDFW and NMFS will be discussing the disposition of potential residualized steelhead at Blackbird Pond in light of the Endangered Species Act (ESA) permits.
- Non-HCP related NMFS staff have proposed a study on early maturation in mini-jacks that would require lethal sampling for hormone concentrations in blood. The HCP NMFS representative, Kris Petersen, was not in support of this study as it relates to listed fish because of the amount of take.
- The Joint Fisheries Parties (JFP) will be discussing why Chiwawa spring Chinook (a listed stock) are being ad-clipped.
- The HETT is currently working on reference streams for spring Chinook, and will soon begin the analysis for steelhead and sockeye.
- The ONA will attend the July Hatchery Committees meeting to discuss the year's progress on the Skaha sockeye program.
- Mike Schiewe will be meeting with the Upper Columbia Salmon Recovery Board (UCSRB) on April 24 to discuss HCP progress and work.

III Chelan PUD (Keith Truscott)

A. Housekeeping Item: SOAs for Approval

Keith Truscott introduced a number of SOAs that need to be approved for housekeeping purposes. The Coordinating Committees approved these SOAs.

- Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2006 (Attachment B)
- Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2007 (Attachment C)
- Statement of Agreement for Survival of Yearling Chinook Salmon Smolts through the Rock Island Project in 2007; and Comparison of Sockeye Salmon Smolt Survival Estimates through Rock Island using Paired-Release and Single Release Methods (Attachment D)
- Statement of Agreement for Acoustic-Tag Investigations of Sockeye Salmon Smolt Survival and Migration Dynamics at Rocky Reach in 2007 (Attachment E)
- Statement of Agreement for Approval of the 2008 Fish Spill Plan, Rocky Reach and Rock Island Dams (Attachment F)
- Statement of Agreement for Approval of the 2008 Rocky Reach Study Plan (NMFS abstained from voting on this item as discussed in the February 29 meeting minutes; Attachment G)

Chelan PUD will provide final reports approved in these SOAs to Ali Wick to distribute to the Committees.

B. Summary of Phase Designations for Plan Species under the Rocky Reach and Rock Island HCP

Keith Truscott introduced the document titled *Summary of Phase Designations of Plan Species under the Rock Island and Rocky Reach Hydroelectric Projects Habitat Conservation Plans*. This document has been provided to the Coordinating Committees as an informational summary on the phase designations of Plan Species for Rock Island and Rocky Reach HCPs. Truscott asked for comments from the Committees on this document. The Committees discussed several edits, including a statement documenting the most recent date that the technology available to conduct survival studies with subyearling Chinook salmon had been considered. Keith Truscott will send a new draft to Ali Wick for distribution to the Committees.

IV Douglas PUD (Tom Kahler)

A. Douglas PUD Response to Juvenile Sockeye Study

Tom Kahler reported that at the last meeting the Coordinating Committees had requested additional information on any Douglas PUD plans for future testing of juvenile sockeye survival at Wells Dam. Kahler noted that Douglas PUD has discussed the request internally and provided a letter to the Committees with this additional information. Tom Kahler requested feedback on the letter. Bryan Nordlund commented that the letter summarized past work effectively, but should provide more information on possible future actions and a path forward. Nordlund stated that Wells does have excellent dam passage documented, but there is no information on sockeye (or sub-yearling Chinook) survival through the Wells Pool, including the Okanangon Arm. The letter did not clarify how current sockeye tagging technology (such as employed by Grant and Chelan PUD's) is insufficient to complete such a study and this should be discussed by the Wells CC. Nordlund also commented that he had just received the letter this morning and has not reviewed it completely, and may have further comment. Carmen Andonaegui and Jerry Marco agreed that a better understanding of possible future investigations would be helpful. Kahler will discuss this letter internally with Douglas PUD and will likely provide it in the form of a status white paper.

B. Status of PIT-tag Detector Repair

Tom Kahler updated the group that Douglas PUD plans to repair the existing west ladder trap Passive Integrated Transponder tag (PIT-tag) detector, which will require dewatering the top portion of the west fish ladder. This will require a 2-day outage for the fish ladder during construction. Douglas PUD will update the Coordinating Committees when a firm date for the outage has been identified. Bryan Nordlund suggested that pumping around the affected ladder pools may allow this work to continue without completely dewatering the ladder. Tom Kahler said that he would discuss this with Rick Klinge and look into this option.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- April 29 from 10:00 am to 1:00 pm at Wells Dam
- May 27 from 12:30 to 4:30 pm in SeaTac

- June 24 from 12:30 to 4:30 pm in SeaTac

B. Reports Out for Review

Ali Wick reminded the group that the Fish Bypass Optimization Team (FBOT) document titled *Survival Testing and Fish Bypass Evaluation at Rocky Reach Dam Beginning in 2003* is out for review until April 18. In addition, the document titled *Monitoring and Evaluation of the Chelan County PUD Hatchery Programs* is out for review until May 2.

VI List of Attachments

Attachment A – List of Attendees

Attachment B – Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2006

Attachment C – Statement of Agreement for the Biological Evaluation of the Rocky Reach Juvenile Bypass System 2007

Attachment D – Statement of Agreement for Survival of Yearling Chinook Salmon Smolts through the Rock Island Project in 2007; and Comparison of Sockeye Salmon Smolt Survival Estimates through Rock Island using Paired-Release and Single Release Methods

Attachment E – Statement of Agreement for Acoustic-Tag Investigations of Sockeye Salmon Smolt Survival and Migration Dynamics at Rocky Reach in 2007

Attachment F – Statement of Agreement for Approval of the 2008 Fish Spill Plan, Rocky Reach and Rock Island Dams

Attachment G – Statement of Agreement for Approval of the 2008 Rocky Reach Study Plan

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
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

STATEMENT OF AGREEMENT FOR THE BIOLOGICAL EVALUATION OF THE ROCKY REACH JUVENILE BYPASS SYSTEM 2006

Statement of Agreement
Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2006
Rocky Reach HCP Coordinating Committee
March 25, 2008

The Rocky Reach HCP Coordinating Committee has reviewed the 2006 Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System report and agrees with the findings stated in the report and accepts the report as final.

ATTACHMENT C

STATEMENT OF AGREEMENT FOR THE BIOLOGICAL EVALUATION OF THE ROCKY REACH JUVENILE BYPASS SYSTEM 2007

Statement of Agreement
Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System 2007
Rocky Reach HCP Coordinating Committee

March 25, 2008

The Rocky Reach HCP Coordinating Committee has reviewed the 2007 Biological Evaluation of the Rocky Reach Juvenile Fish Bypass System report and agrees with the findings stated in the report and accepts the report as final.

ATTACHMENT D

STATEMENT OF AGREEMENT FOR SURVIVAL OF YEARLING CHINOOK SALMON SMOLTS THROUGH THE ROCK ISLAND PROJECT IN 2007; AND COMPARISON OF SOCKEYE SALMON SMOLT SURVIVAL ESTIMATES THROUGH ROCK ISLAND USING PAIRED-RELEASE AND SINGLE RELEASE METHODS

Rock Island HCP Coordinating Committee
Statement of Agreement
Survival of Yearling Chinook Salmon Smolts through the Rock Island Project in 2007; Comparison of Sockeye Salmon Smolt Survival Estimates through Rock Island using Paired-Release and Single-Release Methods
March 25, 2008

Statement

The Rock Island HCP Coordinating Committee has reviewed the Chelan County PUD reports, ***Survival of Yearling Chinook Salmon Smolts through the Rock Island Project in 2007;*** and ***Comparison of Sockeye Salmon Smolt Survival Estimates through Rock Island using Paired-Release and Single-Release Methods*** and agrees with the findings stated in the reports and accepts the reports as final.

Background

On December 8, 2006, the Committees approved a Statement of Agreement for testing a 10% spill operation (10% SAO) in 2007 at Rock Island Dam to assess yearling Chinook survival. A paired-release study design using acoustic tags was used to estimate project passage survival at Rock Island Dam. In addition, sockeye investigations (using similar acoustic tags) at the upstream Rocky Reach Dam enabled researchers to conduct a single-release analysis of sockeye passage survival at Rock Island Dam.

ATTACHMENT E

STATEMENT OF AGREEMENT FOR ACOUSTIC-TAG INVESTIGATIONS OF SOCKEYE SALMON SMOLT SURVIVAL AND MIGRATION DYNAMICS AT ROCKY REACH IN 2007

March 25, 2008

Rocky Reach HCP Coordinating Committee
Statement of Agreement
Acoustic-Tag Investigations of Sockeye Salmon Smolt Survival and Migration Dynamics at Rocky Reach in 2007

Statement

The Rocky Reach HCP Coordinating Committee has reviewed the Chelan County PUD report, ***Acoustic-Tag Investigations of Sockeye Salmon Smolt Survival and Migration Dynamics at Rocky Reach in 2007*** and agrees with the findings stated in the report and accepts the report as final.

ATTACHMENT F

STATEMENT OF AGREEMENT FOR APPROVAL OF THE 2008 FISH SPILL PLAN, ROCKY REACH AND ROCK ISLAND DAMS

Statement of Agreement – Approval of the 2008 Fish Spill Plan, Rocky Reach and Rock Island Dams
Rocky Reach and Rock Island HCP Coordinating Committees
March 25, 2008

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, **"2008 Fish Spill Plan, Rocky Reach and Rock Island Dams."**

ATTACHMENT G

STATEMENT OF AGREEMENT FOR APPROVAL OF THE 2008 ROCKY REACH STUDY PLAN

March 25, 2008

Statement of Agreement – Approval of the 2008 Rocky Reach Study Plan
Rocky Reach HCP Coordinating Committee

Agreement Statement:
The Rocky Reach HCP Coordinating Committee, with one abstention (see meeting notes from February 29, 2008 Rocky Reach & Rock Island CC conference call) agrees that Chelan PUD should implement the study plan entitled, "***Study Proposal for Sockeye Salmon Testing at Rocky Reach Dam for 2008***".

Study Plan Summary
In 2008, the District will continue monitoring and research activities to improve survival of juvenile sockeye salmon at Rocky Reach Dam. Based on the results from the 2007 study, the District will employ a two-pronged approach to improving survival; improve survival through the powerhouse, and continue to increase passage through the surface collector.

Three primary objectives are identified for the 2008 study:

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

In general, less than 10% of the fish passing the project go through Units 1 and 2, while approximately 30% of the fish pass through Units 3 - 5. It's believed that by running a block of turbines contiguously, it concentrates 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. Therefore, the District will operate units 3 - 5 at an average of 12.5 kcfs; the turbine discharge level which appeared to produce the highest direct survival in the 1996 balloon tag test.
Individual turbines:
Powerhouse block load design:
Units 1-2: average of 16 kcfs
Units 3-5: average of 12.5 kcfs
Units 6-7: average of 14 kcfs
Units 8-11: average of 17 kcfs

Powerhouse sequencing:
The powerhouse will operate with "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

DRAFT

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 the normal operating program "Waterview".

Similar to 2007, the 2008 study will be conducted without spill to avoid confounding the comparison between powerhouse operations in 2007 and the proposed operation in 2008. The operation of the powerhouse through Waterview is the reference condition in both years (without spill).

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

By running Units 1 and 2 at high flow (avg. 16 kcfs), it is believed that more fish will likely be drawn towards and pass through the surface collector. This was demonstrated in 2007 results by a greater percentage of fish passing through the collector during the test condition (39%) compared to the non-test condition (34%)

In addition to evaluating juvenile route-specific survival at Rocky Reach Project, the District has determined that additional behavioral information in the forebay is needed. Prior analyses suggest that fish that migrate closer to the right bank are more prone to enter and pass through the bypass system. However, previous hydrophone arrays upstream of the dam precluded detection in large areas between the Boat Restriction Zone (BRZ) and the acoustic array within the forebay. Therefore, extended acoustic arrays will be deployed in 2008 to monitor fish movement in more of the forebay between the BRZ and historical array.

3. *Establish a more-representative estimate of dam passage survival, as defined in the HCP, using an additional release of fish downstream of the dam.*

Currently, a triple release model is used to estimate dam passage survival, but this method does not include any measure of forebay mortality. The triple release model does not do an adequate job of estimating total dam passage survival because survival estimation begins at the concrete rather than in the forebay.

In 2008, an additional release group downstream of Rocky Reach will be used to estimate dam passage survival using an alternative paired release model. The new additional release of fish will occur at the Hydropark detection location.

The fish that are detected at the Rocky Reach BRZ will be used as a "virtual" release to estimate survival from the Rocky Reach BRZ to Hydropark. Concurrently, a paired release from Rocky Reach tailrace and at Hydropark will be used to estimate survival from the tailrace release to Hydropark. The ratio of those two survival estimates, one

DRAFT

from the “virtual” release, and one from the paired release, will be the estimated dam passage survival.

DRAFT

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Final Memorandum

To: Rocky Reach and Rock Island HCP Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Chuck Peven

Date: April 30, 2008

Re: Final Minutes of April 2, 2008 Rocky Reach and Rock Island Coordinating Committees Conference Call

The Rocky Reach and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCP) Coordinating Committees met by conference call on Wednesday, April 2, 2008 from 10:00 am to 11:00 am to review the repair options for failed hydraulic fittings associated with the Unit 1 and 2 bypass collection screens at Rocky Reach Dam.

I Welcome (Mike Schiewe)

Mike Schiewe welcomed the group and stated that the purpose of the call was to review the repair options for failed hydraulic fittings associated with the Unit 1 and 2 bypass collection screens at Rocky Reach Dam.

II Discussion of Repair Plan for Failed Hydraulic Fittings Associated with Unit 1 and 2 Bypass Collection Screens at Rocky Reach Dam

Keith Truscott updated the group that hydraulic fittings that control water-regulating gates in the intake screen (IS) system had failed at Rocky Reach Dam, and that the Chelan PUD needed to shut down the IS system for repair. Because this was the third hydraulic fitting failure in the last 2 weeks, Chelan PUD wanted to discuss the option of replacing the remaining fittings that were of similar design.

Bryan Nordlund asked about the nature of the fittings that were failing, and whether they were all the same brand and material. Keith Truscott indicated that there was a mix of two different fittings; one was stainless steel and the other mild steel. It appeared that it was the mild steel fittings that were failing.

Keith Truscott described the various options for making these repairs. The first option would include isolating the slide gate from the hydraulic pressure system and positioning it in a moderate or conservative fixed location to account for forebay fluctuation, allowing water to pass through the slide gate and on to the conduit pipe for fish passage. During the fitting repairs, one turbine unit would be in operation and one unit would be off. This is necessary to protect divers working in the open water column of the turbine unit. The benefit of this option would be that fish could still be collected in the IS system because one of the two turbine units would still be working. The second option would be to completely close the IS system down. The benefit of this option would be that it would eliminate any problems created by high forebay elevation. However, during closure, any fish entering the turbine intake would not be bypassed. Truscott said that Chelan PUD currently favors the second option. Under either option, Chelan PUD planned to replace all of the mild steel fittings with stainless steel fittings. He also confirmed that Chelan PUD is working to stabilize the forebay elevations. Chelan PUD believes the work could be completed by next Monday or Tuesday, working on one unit at a time.

The Coordinating Committees members present agreed that the second option would be acceptable as most fish are currently passing the surface collector, and they are in relatively low numbers at this time. Truscott agreed to update the Committees this Friday regarding any issues with the repair. At the end of the call, Truscott also updated the Committees that Chelan PUD was working on the Rock Island bypass system to improve the operation of a flow regulating gate (R11) thereby reducing the possibility of descale or injury of fish.

III 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.
Barry Keesee	Chelan PUD
Steve Hemstrom	Chelan PUD
Thad Mosey	Chelan PUD
Keith Truscott *	Chelan PUD
Bryan Nordlund *	NMFS
Jim Craig	USFWS
Carmen Andonaegui	WDFW

* Denotes Coordinating Committees member

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Tracy Yount

Date: May 27, 2008

Re: Final Minutes of April 29, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at Wells Dam, on Tuesday, April 29, 2008, from 10:30 am to 12:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final March 25 Meeting Minutes and April 2 Conference Call Minutes to the Coordinating Committees (Item I).
- Carmen Andonaegui and Bob Rose will each work with Keith Truscott to clarify language in the Chelan PUD phase designation summary (Item III-B).
- Tom Kahler will provide an email update on progress regarding work on the west ladder Passive Integrated Transponder tag (PIT-tag) detector (Item IV-A).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The March 25 Meeting Minutes and April 2 Conference Call Minutes were approved with several revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees have developed a detailed schedule on funding decisions for 2008. The Wells Committee approved funding for a

Tributary Fund Small Project, the Fort-Thurlow Pump Project. This project provides a fully pressurized water system at an irrigation withdrawal on Beaver Creek, tributary to the Methow, thereby keeping 0.5 cfs in the creek. Several previously funded projects are being monitored by others for biological effects, including the Nason Creek Oxbow project, and the Committees requested proposals from those monitoring entities for consideration by the Committees as part of HCP Tributary Assessment Program.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- Chelan PUD has distributed the Chiwawa Feasibility Report and is working with Washington Department of Fish and Wildlife (WDFW) toward resolution of WDFW comments to the report. Key issues were: 1) water right and steelhead and Chinook rearing; 2) amount of steelhead rearing space; and 3) the mechanism for volitional release from the main ponds.
- Chelan PUD will soon provide preliminary drawings of the Chelan Falls rearing facility.
- Chelan PUD is completing a study on a conceptual model for the Eastbank Aquifer and is drilling wells at the Chelan Falls Hatchery, in order to inform their "bioprogramming" approach for hatchery facility management. The aquifer model is being developed by U.S. Geological Survey (USGS) and will be available in June.
- The Hatchery Scientific Review Group (HSRG) completed their visits in the Mid-Columbia during the week of April 21. The Hatchery Committees provided updated information to the HSRG to inform their review.
- The PIT-tag detection capability is now functioning at Tumwater Dam, and Chelan PUD is coordinating with Integrated Status and Effectiveness Monitoring Project (ISEMP) on this.
- Chelan PUD's sockeye counter efficiency study is now out for review by the Hatchery Committees.
- WDFW is conducting sockeye salmon trap efficiency tests at the Monitor Trap.
- WDFW and U.S. Fish and Wildlife Service (USFWS) have decided to stay with the current marking scheme for Chiwawa Hatchery fish, following some discussion regarding ad-clips of these fish.

- WDFW has released the 2008 broodstock protocols, which, among other issues, addresses culling of eggs of high bacterial kidney disease (BKD) hatchery females at Methow Hatchery. WDFW will still be discussing this internally.
- The Yakama Nation (YN) provided a proposal for use of Entiat Hatchery for steelhead kelt reconditioning.
- WDFW and YN are working on an improved mechanism to better communicate information on the timing of hatchery releases.
- The construction at the Twisp weir is complete.
- The Hatchery Evaluation Technical Team (HETT) has now provided recommendations for Chiwawa spring Chinook control groups (previously called reference streams).
- The HETT has now provided a recommendation for an analysis to inform Objective 10 of the Monitoring and Evaluation (M&E) Program (non-target taxa) to the Hatchery Committees. This recommendation included non-target taxa, containment objectives, and panel members for the analysis.
- National Marine Fisheries Service (NMFS) is working on providing some parameters for the Hatchery Committees to consider in a potential upcoming steelhead reproductive success study.
- The Hatchery Committees members have provided a letter to Washington State Department of Ecology (Ecology) confirming their support of the Blackbird Pond water right application and project.

III Chelan PUD (Tracy Yount and Keith Truscott)

A. Participation in Chicago Climate Exchange

Tracy Yount updated the group that Chelan PUD is now participating in the Chicago Climate Exchange (CCX) and discussed how it relates to this committee. The Exchange is a voluntary organization that is a trading platform for carbon offsets via "carbon financial instruments" (CFIs), the unit of exchange on the CCX. Chelan PUD's role is as an offset provider for other members to purchase CFIs resulting from incremental increases in hydroelectric generation. The PUD intends to reinvest any revenues that come from the market into other carbon-reduction efficiencies. Chelan PUD is the first hydropower producer to join the CCX and has an audit process in place to validate their production. Tracy Yount will provide a link to Ali Wick for the document that discusses Chelan PUD's revenue plan as it relates to the CCX. Tracy Yount noted that his purpose in bringing this to

the committee is to communicate that Chelan PUD is both meeting its environmental obligations via the Endangered Species Act (ESA; through this Committee) and supporting technology to minimize climate impacts through the CCX. Yount clarified that due to the current scale and business sectors of the CCX membership, Chelan PUD expects that operational decisions at the dams will not depend on the CCX or vice versa.

B. Summary of Phase Designations for Plan Species under the Rocky Reach and Rock Island HCPs

Keith Truscott had previously sent out a revised summary of phase designations for plan species at Rocky Reach and Rock Island Dams, incorporating comments from Bryan Nordlund and Carmen Andonaegui. Bryan Nordlund said that Truscott had successfully incorporated his comments. Andonaegui had additional comments: 1) she requested that the document include a discussion of whether subyearling Chinook passing Rocky Reach and Rock Island Dam are expressing reservoir overwintering similar to subyearlings originating in the Snake River subbasin, and 2) she suggested that some references to the body of literature discussing Snake and Columbia River outmigration life histories might be appropriate. She and Truscott will work together to create that language. Bob Rose asked Truscott to include a discussion of how the Coordinating Committees came to the conclusion that subyearlings were not testable. Bob Rose will talk to Steve Parker on this issue and will get back to Truscott so that language can be finalized. Mike Schiewe said that once this document is finalized, the next step for the Committees is to develop a path forward for survival testing at Rocky Reach Dam.

C. 10 Percent Spill Study at Rock Island and Repairs at Rocky Reach

Keith Truscott updated the group that Chelan PUD has now conducted four of the six releases for the 10 percent spill study at Rock Island Dam. The study is going well so far.

At Rocky Reach, repair has been completed on the intake screen project with no further loss of pressure thus far. Chelan PUD is pleased with this outcome. Bryan Nordlund asked whether this fix is permanent. Truscott replied that Chelan PUD is unsure at this time, but will be re-evaluating this in the off-season. Jerry Marco asked whether Chinook numbers had picked up in the last few days. Truscott said that numbers had been increasing in past days.

IV Douglas PUD (Tom Kahler)

A. Timing Notification for work with PIT-Tag Detector on West Ladder Trap

Tom Kahler updated the group that the west ladder will be de-watered on Monday, May 5, for installation of the PIT-tag detector. The collection gallery will remain watered. Douglas PUD anticipates that the west ladder will be re-watered on May 7, but this depends on how the work goes. Tom Kahler will provide an email update on progress of the project.

V HCP Committees Administration (Mike Schiewe)

A. WDFW Representative

Carmen Andonaegui let the Coordinating Committees know that she has accepted a position with Anchor Environmental and today's meeting will be her last with the Coordinating Committees. The Committees are grateful for her work on the Committees over the past several years.

B. Meeting Schedule

The upcoming meetings are set as follows:

- May 27 from 12:30 to 4:30 pm in SeaTac
- June 24 from 12:30 to 4:30 pm in SeaTac
- July 22 from 12:30 to 4:30 pm in SeaTac

C. Reports Out for Review

Ali Wick reminded the group that *Monitoring and Evaluation of the Chelan County PUD Hatchery Programs* is out for review until May 2.

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 * (by conference call)	Chelan PUD
Tracy Yount	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Carmen Andonaegui *	WDFW
Bob Rose * (by conference call)	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Steve Hemstrom

Date: June 24, 2008

Re: Final Minutes of May 27, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington, on Tuesday, May 27, 2008, 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 April 29 Meeting Minutes to the Coordinating Committees (Item I).
- Keith Truscott will finalize the Chelan PUD phase designation summary paper and send to Ali Wick for distribution to the Coordinating Committees (Item IV-A).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The April 29 Meeting Minutes were approved with minor revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees did not meet last month.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- The Hatchery Evaluation Technical Team (HETT) has developed their recommendations for control groups for supplementation as per the Monitoring and Evaluation (M&E) Plan, and the Hatchery Committees are reviewing this information. These groups were the Naches River, Entiat River, Little Wenatchee River, Marsh Creek, and the Secesh River. The HETT will be working toward completing the analyses for the Twisp and Chewuch populations, followed by steelhead and sockeye.
- Douglas PUD is working to consolidate its well certificates into single well-field certificates for the Methow Hatchery and the Wells Hatchery (one for each) with the Washington State Department of Ecology (Ecology).
- The Hatchery Committees are finalizing the Chiwawa Feasibility report and Chelan PUD has applied for the water right with Ecology.
- The U.S. Geological Survey (USGS) Eastbank Aquifer study will be finalized soon, and USGS and Chelan PUD will be hosting an informational meeting on May 28 to discuss results.
- Chelan PUD will soon be meeting with Washington State Department of Transportation (WSDOT) to discuss erosion issues at Highway 2 adjacent to Tumwater Dam. The likely solution will be road engineering to stem the erosion.
- Chelan PUD is reviewing staffing for the 2008 sockeye spawner counter efficiency study.
- The Hatchery Committees supported the Washington Department of Fish and Wildlife (WDFW) proposal to release progeny of high-ELISA Chiwawa spring Chinook as marked subyearlings in Meadow Creek.
- The Yakama Nation and the Bonneville Power Administration (BPA) have signed a Memorandum of Agreement for a variety of new studies; Hatchery Committees' members are reviewing how best to coordinate BPA-funded projects with the HCPs.
- The Colville Tribes are currently developing a budget and proposal for rearing smolts in Bonaparte Ponds this fall.
- The Hatchery Committees discussed experimental strategies for a steelhead reproductive success study, including potential endpoints for the study.
- Hatchery Committees' members are discussing the Non-Target Taxa of Concern (NTTOC) process (Objective 10 of the M&E Plan) with their respective agencies to determine a path forward and a decision at the July meeting.

- Hatchery Committees' members will discuss the preliminary Hatchery Scientific Review Group (HSRG) recommendations within their organizations, and particularly those that may affect HCP programs.

III Douglas PUD (Rick Klinge and Tom Kahler)

A. Status on PIT-Tag Detector on West Ladder Trap

Tom Kahler reported that installation of a new Passive Integrated Transponder tag (PIT-tag) detector on the west ladder trap at Wells Dam had been completed. Douglas PUD is now monitoring the efficacy of the new setup by comparing detections at the ladder trap to those obtained by hand-wanding fish at the hatchery.

B. Debris Boom

Rick Klinge updated the group that Douglas PUD has initiated the bid process for construction of a debris boom at Wells Dam. He will keep the Coordinating Committees updated on the progress of this project.

C. Bypass Operation Update

Rick Klinge updated the group that the bypass has been running since April 12 as per the HCP Operating Plan. He said that once flows exceed 200 thousand cubic feet per second (kcfs), Douglas PUD will evaluate whether the barriers in the flow slots may be limiting the amount of spill at the dam. Klinge confirmed that removing these baffles does not affect passage opportunities and Douglas PUD will continue to monitor the situation during high flows.

IV Chelan PUD (Keith Truscott)

A. Summary of Phase Designations for Rocky Reach and Rock Island Plan Species

Keith Truscott updated the group that he has worked through the comments on the "white paper" summarizing phase designations for Rocky Reach and Rock Island Plan Species with Carmen Andonaegui. The paper was accepted by the Coordinating Committees at the last meeting. He will now finalize the paper and send to Ali Wick for distribution to the Committees. Rick Klinge commented that Douglas PUD would be preparing a paper discussing phase designation as well, for Committees review.

B. Rock Island Spill Update

Keith Truscott updated the group that Chelan PUD is several weeks away from concluding the Rock Island 10 percent spill study. Because of the late migration, Chelan PUD may be slightly short on the numbers for individual releases. Truscott also noted that the PUD was focusing extra attention on the tag-life issues, and that results would be adjusted accordingly. Steve Hemstrom noted that the run-timing program RealTime has predicted that spring Chinook passage is about 70 percent complete at Rock Island; at Rocky Reach, the program is predicting the spring Chinook run is about 50 percent complete.

C. USDA Pikeminnow Fishing Crews

Keith Truscott updated the group that the pikeminnow fishing crews are now working at the Rocky Reach and Rock Island projects and reservoirs.

D. Modernization of Powerhouse 1

Keith Truscott updated the group that Chelan PUD is evaluating the performance of the new turbine unit at Rock Island Dam, and based on that evaluation, they will be deciding whether changes are needed before proceeding with orders for additional replacement turbines.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- June 24 from 9:30 am to 12:00 pm in SeaTac
- July 22 from 9:30 am to 12:00 pm (update: this will be a conference call)
- August 26 from 9:30 am to 12:00 pm 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
Steve Hemstrom	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bob Rose * (by conference call)	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Steve Hemstrom

Date: July 22, 2008

Re: Final Minutes of June 24, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington, on Tuesday, June 24, 2008, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final May 27 Meeting Minutes to the Coordinating Committees (Item I).
- Steve Hemstrom will provide to the Coordinating Committees an electronic version of the pikeminnow trapping handout from today (Item III-A).
- Keith Truscott will send out the final Rocky Reach and Rock Island Plan Species phase designation summary paper soon (Item III-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

Mike Schiewe updated the group that Washington Department of Fish and Wildlife (WDFW) has been working to identify new representatives for the Coordinating Committees and Tributary Committees as soon as possible.

The May 27 Meeting Minutes were approved with minor revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees have been dealing with several administrative issues for funded projects, including modest cost increases and project schedules. Also, the Committees have received 13 pre-proposals for the 2008 round of the General Salmon Habitat Program. One project has subsequently been withdrawn, 4 have been returned to project sponsors as not likely to be funded, and 8 are under consideration for funding. The Committees' tour of projects in scheduled for June 23 to 25.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- The Hatchery Evaluation Technical Team (HETT) is working on compiling and analyzing data on potential control populations for the Twisp, Chewuch, and Methow spring Chinook populations.
- The Colville Tribes are working to develop a groundwater source for Bonaparte Pond that would minimize ice-over and facilitate winter fish rearing.
- The Hatchery Committees are discussing adult trap operations at Wells Dam as a way to minimize passage delay; in the future, WDFW and Douglas PUD staff will be discussing possible structure changes.
- WDFW has prepared a proposal for a steelhead reproductive study for the Hatchery Committees to consider during development of a study plan. This proposal will be discussed at the next meeting.
- WDFW is finalizing broodstock protocols for this year.
- The Joint Fisheries Parties (JFP) is preparing a white paper on Wenatchee Spring Chinook management that will be distributed for public review in July.
- The Hatchery Committees are continuing to consider approaches for conducting a sockeye spawner and counter efficiency study.
- Chelan PUD will be providing some funding to Trout Unlimited for the Blackbird Pond project.
- Okanagan Nation Alliance (ONA) will be presenting information on their Skaha Lake sockeye salmon program at the July 16 Hatchery Committees meeting. The Committees have previously approved Chelan PUD's partial funding of this program as a means for the PUD to meet its mitigation requirement for sockeye through the year 2013.

- Chelan PUD is working with Washington State Department of Transportation (WSDOT) to identify a solution for erosion issues at Highway 2 adjacent to Tumwater Dam.
- Douglas PUD is working to consolidate its well certificates into single well-field certificates for the Methow Hatchery and the Wells Hatchery (one for each) with the Washington State Department of Ecology (Ecology).
- Douglas PUD updated the group that developing a Chewuch trap is still on the radar, but is not a high priority at this time.
- Hatchery Committees' members are discussing the Non-Target Taxa of Concern (NTTOC) process (Objective 10 of the Monitoring and Evaluation [M&E] Plan) with their respective agencies to determine a path forward and a decision at the July meeting.
- Hatchery Committees' members are discussing the preliminary Hatchery Scientific Review Group (HSRG) recommendations within their organizations, and particularly those that may affect HCP programs.

III Chelan PUD (Keith Truscott)

A. Update on Pikeminnow Ladder Trapping

Steve Hemstrom provided a handout describing the pikeminnow trapping locations, with two traps each on an upper and lower weir at Rock Island. Hemstrom will provide additional information at a later time as the trapping progresses. Chelan PUD is working to increase efficiency at these traps. Steve Hemstrom will forward this handout to the group for their information.

B. Summary of Phase Designations for Rocky Reach and Rock Island Plan Species

Keith Truscott updated the group that he has completed the paper summarizing phase designations for Rocky Reach and Rock Island Plan Species. He explained that Phase III (Provisional Review) is the appropriate designation for yearling Chinook because this species has already undergone 2 years of testing (with results ranging from 91 to 93 percent survival), and that the Coordinating Committees have previously agreed to suspend further testing until research identifies operation that will improve sockeye passage survival (and also presumably yearling Chinook survival). The Committees accepted this document as final, and Keith Truscott will distribute this final version to the Committees.

IV Douglas PUD (Rick Klinge)

A. Bypass Operation Update

Rick Klinge updated the group that the Wells Dam bypass has been running since April 12 as per the HCP Operating Plan, and will run until August 26. Spring spill occurred until June 13. Spill has been occurring at approximately 30 percent to date, and the PUD intends to raise pool volume for the 4th of July holiday.

B. Debris Boom

Rick Klinge updated the group that bids have been received for the debris boom project. Douglas PUD will be reviewing the bids and the project will likely be constructed this winter after November 15.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- July 22 from 9:30 am to 12:00 pm by conference call
- August 26 from 9:30 am to 12:00 pm, location TBA
- September 23 from 9:30 am to 12:00 pm 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
Steve Hemstrom	Chelan PUD
Jerry Marco * (by conference call)	Colville Confederated Tribes
Rick Klinge	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bob Rose * (by conference call)	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Steve Hemstrom

Date: August 26, 2008

Re: Final Minutes of July 22, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, July 22, 2008, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final June 24 Meeting Minutes to the Coordinating Committees (Item I).
- Steve Hemstrom will provide the Coordinating Committees with a summary of run-timing and index counts to supplement spring spill information previously sent out to the group. (Item III-A).
- Bryan Nordlund asked to be invited to see the traveling fishway screens at Rock Island when dewatered, and Thad Mosey confirmed that he would do so (Item III-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The June 24 Meeting Minutes were approved with no revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees are reviewing details of projects for 2008 and will be conducting a tour on October 8 and 9 of completed projects previously funded by the SRFB and/or Tributary Committees.

At the last Hatchery Committees meeting, the Hatchery Committees focused on the following items:

- The Hatchery Committees received an update from Howie Wright of the Okanagan Nation Alliance on the Skaha sockeye reintroduction program.
- The Hatchery Committees received an update from Kim Hyatt of Department of Fisheries and Oceans – Canada on the Fish-Water Management Tool.
- The Hatchery Committees are reviewing a Colville Tribes proposal on rearing up to 100,000 summer Chinook at Bonaparte Pond.
- The Hatchery Committees received a report that the Twisp weir is working well and the Methow Hatchery should be able to meet program this year due to efficient broodstock collection.
- Representatives from the PUDs met with National Marine Fisheries Service (NMFS) staff in July to learn how NMFS would be evaluating and potentially implementing Hatchery Scientific Review Group (HSRG) recommendations. Hatchery Committees' members are discussing the preliminary HSRG recommendations within their organizations, and particularly those that may affect HCP programs.
- Chelan PUD is reconsidering the approach to the study design for the sockeye counter efficiency and spawner study. The Hatchery Committees will be reviewing this soon.
- Chelan PUD is reviewing information from the U.S. Geological Survey (USGS) Eastbank Aquifer study.
- Chelan PUD is working with Washington State Department of Transportation (WSDOT) to identify a solution for erosion issues at Highway 2 adjacent to Tumwater Dam.
- Washington Department of Fish and Wildlife (WDFW) may be using Grant PUD's ultrasound unit this year for gender ID of broodstock at Well Hatchery.
- The Hatchery Committees are discussing Passive Integrated Transponder tag (PIT-tag) placement in steelhead and its implications for future studies in the Monitoring and Evaluation (M&E) program.

- Because of broodstock limitations, the Chiwawa spring Chinook program may not meet program objectives this summer. Kirk Truscott will provide information on this soon to the Hatchery Committees.
- Hatchery Committees' members are considering how to proceed with implementing the Non-Target Taxa of Concern (NTTOC) process (Objective 10 of the M&E Plan); Mike Schiewe will be soliciting written recommendations from individual members on what are the priority interactions to focus on, and what should be the proposed risk containment levels.

III Chelan PUD (Keith Truscott)

A. Spring Spill Summary (Steve Hemstrom)

Steve Hemstrom provided an update on spring spill, which began April 17 and ended June 7. He had previously provided a handout by email with details on the spill. Hemstrom reviewed these details and will be sending out a summary of run-timing and index counts to supplement this information.

B. Fishway Maintenance Memorandum (Thad Mosey)

Keith Truscott introduced Thad Mosey to discuss the upcoming fishway maintenance schedule. There are two main items that will be completed this year, including maintenance of the attraction water system pump at Rocky Reach, and overhaul of the traveling fishway screens at the right bank fishway at Rock Island. The attraction water pump maintenance is scheduled to be completed in time to have the fishway operational by March 1, 2009. Dewatering procedures for the Rock Island fishway screen overhaul will begin on approximately December 1, 2008. As in previous years' overhaul work on adult fishways at Rock Island, at least one of the three ladders will remain operational for adult passage. All work will be completed in time for March 1 start-up. In addition, routine maintenance will be performed as described in the memorandum. Bryan Nordlund asked to be invited to see the traveling fishway screens at Rock Island when dewatered, and Thad Mosey confirmed that he would do so.

C. Ladder Trapping of Pikeminnow at Rocky Reach and Rock Island (Steve Hemstrom)

Keith Truscott provided an update on the numbers of fish trapped to date at Rock Island in the pikeminnow ladder traps. The non-target fish that have been captured in the traps include adult sockeye and Chinook salmon mini-jacks.

IV Douglas PUD (Rick Klinge and Tom Kahler)

A. Pikeminnow Removal Effort

Tom Kahler updated the group that the annual pikeminnow removal effort is going well, continuing with an annual target of 20,000 fish. Kahler reported that Douglas PUD anticipates meeting their target again this year.

B. Delayed Fish Counts from Wells Dam

Rick Klinge updated the group on the delay in reporting fish counts at Wells Dam. The "problem" is the result of large numbers of sockeye returning and the fish counters working a double shift to try to keep up. This situation is expected to be short term.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- August 26 from 9:30 am to 12:00 pm by conference call
- September 23 from 9:30 am to 12:00 pm in SeaTac
- October 28 from 9:30 am to 12:00 pm 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
Thad Mosey	Chelan PUD
Steve Hemstrom	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Bill Tweit *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Steve Hemstrom

Date: September 23, 2008

Re: Final Minutes of August 26, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, August 26, 2008, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final July 22 Meeting Minutes to the Coordinating Committees (Item I).
- Steve Hemstrom will send a final spill summary from Rock Island to the Coordinating Committees for their information, and will send one for Rocky Reach as it becomes available (Item III-A).
- Rick Klinge will provide an update on the analyses that Douglas PUD uses to predict that 95 percent of the subyearling migration has passed Wells Dam by August 26 of each year. Klinge also said that he will provide a complete bypass summary at the September meeting (Item IV-A).
- Rick Klinge will check with Douglas PUD engineering staff to evaluate whether sockeye are falling back through the supply channel or trash racks (Item IV-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The July 22 Meeting Minutes were approved with no revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees are reviewing details of potential projects for 2008.

At the last Hatchery Committees meeting, the group focused on the following items:

- The Hatchery Committees agreed to table the Non-target Taxa of Concern (NTTOC) discussion until next meeting so that the full Committees can discuss.
- The Hatchery Committees agreed that Douglas PUD can collect an additional 29 Wells summer Chinook broodstock to rear smolts for a potential dam passage survival study in spring 2010 (approximately 50,000 juveniles).
- As in previous years, the Hatchery Committees approved Grant PUD's request to rear 80,000 summer steelhead at the Wells Hatchery and 201,000 spring Chinook at the Methow Hatchery.
- Wells Hatchery staff have collected additional summer Chinook broodstock on behalf of the Yakama Nation (YN); the eggs from these fish are for possible use in a pilot program to enhance summer/fall Chinook production in the Yakima basin. Washington Department of Fish and Wildlife (WDFW) has provisionally approved the transfer as a one-year pilot program only, and is working with National Oceanic and Atmospheric Administration (NOAA) Fisheries to resolve potential Endangered Species Act (ESA) permit issues.
- Don Larsen and Brian Beckman from National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center attended the Hatchery Committees meeting to review some of their work examining life-history variability in Chinook salmon.
- Lake Wenatchee net pens had an unexpected release due to a tear thought to have been caused by a recreational fishing lure caught in the net. The tear has been repaired.
- Chelan PUD is working with the manager of the PIT-tag Information System (PTAGIS) database to improve access to Passive Integrated Transponder tag (PIT-tag) data from the Peshastin and Entiat PIT-tag arrays.
- Chelan PUD will be drafting a Statement of Agreement (SOA) on bacterial kidney disease (BKD) management for Chiwawa spring Chinook for the Hatchery Committees' consideration that will be consistent with Hatchery Committees'

discussions over the last several years as well as the recent Hatchery Scientific Review Group (HSRG) recommendations.

- The Hatchery Committees reviewed the YN's Memorandum of Agreement (MOA) project list for opportunities for coordination of HCP and MOA activities.
- The Hatchery Committees discussed developing a plan to install PIT-tag arrays to support determining sockeye escapement in the White and Little Wenatchee Rivers.
- The Hatchery Committees discussed the steelhead reproductive success study plan in light of the HSRG recommendations and timing of the study plan. WDFW will be coordinating a Joint Fisheries Parties (JFP) response to issues raised by Chelan PUD.

III Chelan PUD (Steve Hemstrom)

A. Spill Update

Steve Hemstrom provided an update on Rock Island summer spill and the spill studies thus far this year, including information on index counts (as of August 23, the total index count since June 1 is 30,830 Chinook year-0 smolts). Hemstrom will send a final spill summary from Rock Island to the Coordinating Committees for their information, and will send one for Rocky Reach as it becomes available.

Spill is ongoing at Rocky Reach. The index count from May 27 to August 25 was 11,534 smolts. The modeling program RealTime is estimating 95 percent passage at this time. Barring some unanticipated increase in numbers of outmigrants, Hemstrom indicated that Chelan PUD planned to spill through the end of the week at Rocky Reach, and the Committees agreed to an August 31 shutdown date. Hemstrom also noted that Chelan PUD would probably run the bypass an additional week, through the first week of September.

B. Pikeminnow Trapping

Steve Hemstrom updated the group that trapping on the fish ladders is going well, and approximately 4,200 pikeminnow have been trapped in the ladders at Rocky Reach and Rock Island. This is in addition to over 60,000 removed by other methods (e.g., long line fishery).

IV Douglas PUD (Rick Klinge and Tom Kahler)

A. Spill Update

Rick Klinge updated the group that bypass operations have been completed for the year, and that today is the last day of bypass spill. Responding to a question from Jerry Marco, Klinge will provide an update to the Coordinating Committees on the analyses Douglas PUD uses to predict 95 percent passage and spill termination on August 26 of each year. Klinge also said that he will provide a complete bypass summary at the September meeting.

B. East Fish Ladder Sockeye and Attraction Water Grates

Rick Klinge updated the group on the situation that occurred several weeks ago in which sockeye were trapped on the wrong side of the attraction water grates in the collection gallery of the Wells east fishway. The problem initially was thought to be the result of a failure of the attachment points on the water grates; however, this did not prove to be the case. With this possibility ruled out, it was thought that fish were leaping into the collection gallery from the fishway. Accordingly, a net/PVC barrier was added to prevent this for the remainder of this year, and Douglas PUD will check the grates again next winter during service to ensure that the bolts are secure. Responding to a question from Bryan Nordlund, Klinge will check with Douglas PUD engineering staff to assess whether fish could be falling back through the supply channel intake or trash racks.

C. Pikeminnow Summary for 2008

Tom Kahler updated the group that pikeminnow removal is complete for this year, and final counts are forthcoming. Approximately 20,000 pikeminnow have been captured.

D. Planning for Future Project Survival Studies

Rick Klinge updated the group that Douglas PUD is scheduled for a survival study "check-in" for yearling Chinook and steelhead in 2010, and has requested hatchery broodstock to support this study. Planning currently includes discussions of rearing strategies, tag types, and release locations. Douglas PUD will be discussing a study plan next spring with the Coordinating Committees.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- September 23 from 9:30 am to 3:00 pm in SeaTac
- October 28 from 9:30 am to 3:00 pm in SeaTac
- November 18 from 9:30 am to 3:00 pm in SeaTac
- December 16 from 1:00 pm to 4:30 pm (tentatively scheduled for Wenatchee)

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.
Steve Hemstrom *	Chelan PUD
Jerry Marco *	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bill Tweit *	WDFW

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick, Steve Hemstrom

Date: October 21, 2008

Re: Final Minutes of September 23, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington on Tuesday, September 23, 2008, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final August 26 Meeting Minutes to the Coordinating Committees (Item I).
- Ali Wick will re-circulate the previous Statement of Agreement (SOA) approval of the Rock Island 10% spill study as review material to assist with the October meeting discussions addressing Remedial Investigation (RI) 2009 study design (Item IV-B).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The August 26 Meeting Minutes were approved with revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees did not meet in September, but are on track to make funding decisions this fall consistent with the Tributary Fund schedule, which matches the Salmon Recovery Funding Board schedule.

At the last Hatchery Committees meeting, the group focused on the following items:

- The Hatchery Committees addressed the Non-target Taxa of Concern (NTTOC) analysis, primarily discussing the species that would be analyzed.
- Chelan PUD has developed a plan to estimate sockeye observer error and redd residence time, and will be implementing the study in the next year.
- Chelan PUD presented results of the pilot water re-use study, and the Hatchery Committees approved an additional year of study. Density will be increased from 126,000 to 200,000 fish in the re-use ponds next year.
- Chelan PUD is continuing to work with the U.S. Forest Service (USFS) and local landowners regarding the new Chiwawa steelhead rearing ponds.
- Chelan PUD presented an SOA for a bacterial kidney disease (BKD) strategy for the Committees' review. This SOA will soon be up for Committee approval.
- Chelan and Douglas PUD (along with Grant PUD) have sent a joint comment letter to the Hatchery Scientific Review Group (HSRG) regarding their draft recommendations for hatchery reform.
- Chelan PUD is working to get Passive Integrated Transponder tag (PIT-tag) data from Peshastin and Entiat into the PTAGIS database.
- Douglas PUD presented results from bird predation studies of recent years at the Wells Hatchery and other rearing areas.
- Douglas PUD updated the group on some minor maintenance issues at Twisp weir.
- Douglas PUD is requesting additional Wells summer/fall Chinook broodstock to produce smolts for potential survival studies in 2010.
- The Colville Tribes are moving forward on developing a groundwater supply at Bonaparte Pond.
- The Committees are discussing a steelhead reproductive success study, which is currently under review by the Joint Fisheries Parties (JFPs); the JFPs are preparing a response memorandum to concerns raised by Chelan PUD.

- The Yakama Nation (YN) initiated a discussion on balancing brood collection and harvest, and on the use of ultrasound for gender identification of broodstock and its effect on timing of broodstock collection and determining whether there are surplus adults available for distribution to the tribes.
- A summer Chinook management workshop is planned for the spring of 2009.
- The YN updated the group that Columbia River Intertribal Fish Commission (CRITFC) has recently received some funding that the YN would potentially like to use for PIT-tagging of Skaha Lake sockeye.
- The YN is evaluating opportunities for expanded acclimation of spring Chinook and steelhead in the Wenatchee and Methow Basins.
- The YN is working on the proposal for kelt reconditioning and plan to submit it for Independent Scientific Review Panel (ISRP) review.
- The YN is working with National Marine Fisheries Service (NMFS) on Section 10 coverage for the pilot study of summer Chinook reintroduction in the Yakima River.
- A NMFS kickoff meeting will occur October 2, 2008, to discuss the process described in the recent NMFS letter regarding reinitiation of consultation on HCP hatchery programs.

III Douglas PUD (Rick Klinge)

A. Summary of 2008 Bypass Operations

Rick Klinge provided a summary of 2008 bypass operations and a memorandum documenting the actions, which will be forwarded to the Committees.

B. Schedule for Debris Boom Construction

Rick Klinge updated the group that the bid has been awarded for the Wells Dam debris boom construction contract. In-water work is anticipated between November of this year and January of 2009, to be completed in January. In November, the pool will be lowered for approximately 5 days in order to install a concrete pad; Douglas PUD will keep the Committees updated on this work.

IV Chelan PUD (Keith Truscott and Steve Hemstrom)

A. Bypass Spill Update

Keith Truscott and Steve Hemstrom reviewed the spill actions for 2008, including test dates, 95 percent passage dates, and spill percentages. They provided a handout with details for the Committees' information.

Hemstrom provided total fish captures during pikeminnow trapping at Rocky Reach and Rock Island, which included approximately 5,000 pikeminnow, approximately 1,000 sockeye, and 460 mini-jack Chinook. He said that the total pikeminnow counts are 40,000 at Rock Island and about 15,000 at Rocky Reach.

B. Update on Study Results

Keith Truscott provided a handout with some preliminary acoustic tag survival study results for Rocky Reach and Rock Island. This included sockeye studies at Rocky Reach, and sockeye, steelhead, and yearling Chinook at Rock Island. Chelan PUD will be working with their consultants to refine these estimates based on tag life information. The PUD will also be looking carefully for an explanation of the preliminary yearling Chinook results; estimated survival this year was 89.72 percent in contrast to 97.25 percent in 2007. Truscott said that Chelan PUD would likely ask John Skalski and Tracey Steig to attend the November meeting to present and discuss the final results. This will include route-specific passage and survival information. Ali Wick will re-circulate the previous SOA approval of the Rock Island 10% spill study as review material to assist with the October meeting discussions addressing RI 2009 study design.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- October 21 from 9:30 am to 3:00 pm in SeaTac (moved a week earlier of normal schedule to accommodate HCP CC member conflicts)
- November 18 from 9:30 am to 3:00 pm in SeaTac
- December 16 from 1:00 pm to 4:30 pm 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.
Ali Wick	Anchor Environmental, L.L.C.
Steve Hemstrom *	Chelan PUD
Keith Truscott *	Chelan PUD
Jerry Marco * (by conference call)	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bill Tweit *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick

Date: November 18, 2008

Re: Final Minutes of October 21, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington on Tuesday, October 21, 2008, from 9:30 to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final September 23 Meeting Minutes to the Coordinating Committees (Item I).
- Keith Truscott will send out draft reports and Statements of Agreement (SOAs) for the Rock Island 10 percent spill study and the 2009 Rocky Reach sockeye studies (Item IV-A).

DECISION SUMMARY

There were no decision items at this meeting.

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The September 23 Meeting Minutes were approved with revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees received presentations on seven General Salmon Habitat Program projects at the last meeting. There are approximately

nine proposals under consideration, and the Tributary Committees will make final funding decisions in December. For the Small Projects Program, the Tributary Committees are considering the *Sleepy Hollow Reserve Protection Feasibility Assessment* and will make a funding decision after they receive signed landowner agreement forms from the sponsor (Chelan County Natural Resources).

The Tributary Committees had a discussion with the Chelan-Douglas Land Trust, Methow Salmon Recovery Foundation, and the Methow Conservancy regarding the escalating cost of conservation easements. The sponsors assured the Tributary Committees that they are doing everything they can to keep the cost down and that they are seeking multiple sources of funding.

Tributary Committees members attended post-implementation project tours with the Upper Columbia Regional Technical Team (RTT).

At the last Hatchery Committees meeting, the group focused on the following items:

- Rob Jones of National Marine Fisheries Service (NMFS) attended the Hatchery Committees meeting to discuss and answer questions about the hatchery program review and to summarize specific information that will inform the review. The Hatchery Committees discussed sequencing of the reviews, the appropriate permit-holder(s), and the process for completing the Hatchery Genetic Management Plans (HGMPs).
- The Hatchery Evaluation Technical Team (HETT) is continuing to work on identifying control groups (also known as reference populations) and is researching the origin of the 1981 and 1982 spring Chinook spawning data in the Chewuch and Twisp rivers.
- The Hatchery Committees approved the 2007 Douglas PUD Monitoring and Evaluation (M&E) Report and are currently reviewing the 2009 M&E Implementation Work Plan.
- Douglas PUD recently provided $41,000 to the Yakama Nation as the final installment pursuant to Douglas PUD's coho mitigation agreement.
- Douglas PUD is about to begin a turbine rewind project at Wells Dam that will affect access to the east fish ladder (See Item III-D below).

- The Hatchery Committees tentatively agreed on a final list of species to consider in the Non-target Taxa of Concern (NTTOC) expert panel exercise. The Committees agreed to convene the expert panel next spring or early summer.
- Pamela Nelle of the Integrated Status and Effectiveness Monitoring Project (ISEMP) attended the last Hatchery Committees meeting to give an update on incorporating Peshastin and Entiat Passive Integrated Transponder (PIT)-tag data into the PTAGIS database.
- The Hatchery Committees have conditionally approved an SOA regarding an additional year of study for the Chelan PUD Partial Water Re-Use Study.
- The Hatchery Committees will soon be considering the Sockeye Enumeration Study Plan for approval.
- Chelan PUD is at 30 percent design for both the Chelan Falls (conversion of the Turtle Rock summer Chinook program) and the Chiwawa steelhead facilities, and will wait for HGMPs to be completed before moving forward on design.
- The Chelan PUD 2009 M&E Work Plan has been finalized and was approved by conference call on October 1.
- The Committees are continuing to consider options for steelhead reproductive success studies.
- The Committees formally approved the Blackbird Island Pond project.
- The Colville Tribes and the Yakama Nation will soon be discussing the use of Columbia River Intertribal Fish Commission (CRITFC) funds for enhancing sockeye salmon PIT-tagging in the Upper Columbia.
- The Coho Master Plan will be completed soon and available for Hatchery Committees review.

III Douglas PUD (Rick Klinge)

A. Update on Debris Boom Construction

Rick Klinge updated the group that the debris boom project is underway, and the pool will be dropped 8.5 feet at the end of October for approximately 2 weeks in order to pour concrete for the debris ramp. Following this work, the floats will be installed. The project is expected to be completed by the end of January.

B. Update on Lamprey Passage

Rick Klinge said that it appears that lamprey are able to pass through the ladder grates below the fish counting window at Wells Dam and are not being counted at the window. No lamprey have been counted since October 6. Klinge indicated that he could not rule out that this might be a function of temperature as well. Douglas PUD is investigating this and will have an update at the November meeting.

C. Update on Coho Mitigation Requirement

Tom Kahler said that Douglas PUD recently completed its 10-year coho mitigation agreement by transfer of $41,000 to the Yakama Nation.

D. Rewind Project at Wells Dam

Rick Klinge informed the group that Douglas PUD is about to begin a turbine rewind project at Wells Dam. The project will require work space on the deck that could obstruct direct access to the east fish ladder. Klinge assured the group that Douglas PUD is working through this internally and will keep the Hatchery and Coordinating Committees updated on the solutions.

IV Chelan PUD (Keith Truscott)

A. Rock Island 10 Percent Spill Study and Survival Studies Discussion – SOA and Path Forward

Keith Truscott reviewed the preliminary 10 percent spill study results from this year (2008) and summarized Chelan PUD's initial plans for additional studies in 2009. The 2008 survival estimate for yearling Chinook was 89.7 percent, which is lower than the 97.3 percent estimate from 2007, and lower than the 3-year average of 94.3 percent at 20 percent spill. The 2008 steelhead survival estimate was 97.0 percent, which is higher than the 3-year average of 94.1 percent at 20 percent spill; sockeye survival in 2008 was 93.25 percent, which was lower than the 3-year average of 96.6 percent at 20 percent. John Skalski and Tracy Steig will attend the next meeting to go over these data, as well as the results from Rocky Reach sockeye testing. Truscott anticipates that Chelan PUD will have draft reports from both Rocky Reach and Rock Island studies as well as an SOA for Rock Island 2009 studies distributed in advance of the meeting.

B. Implications of a Decreased Bond Market

Keith Truscott updated the group that in light of the current economic climate, Chelan PUD is developing separate budget plans for 2009 for two scenarios: 1) in the case of "business-as-usual" and 2) in the case of a depressed bond market. If the second scenario occurs, funding would be restricted in some fashion, but so far, this situation is for discussion only.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- November 18 from 9:30 am to 3:00 pm in SeaTac
- December 16 from 1:00 to 4:30 pm at Chelan PUD in Wenatchee
- January 27 from 9:30 am to 3:00 pm 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
Jerry Marco * (by conference call)	Colville Confederated Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Bryan Nordlund *	NMFS
Jim Craig *	USFWS
Bill Tweit *	WDFW
Bob Rose *	Yakama Nation

* Denotes Coordinating Committees member or alternate

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick and Steve Hemstrom

Date: December 16, 2008

Re: Final Minutes of November 18, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Radisson Gateway Hotel in SeaTac, Washington on Tuesday, November 18, 2008, 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 October 21 Meeting Minutes to the Coordinating Committees (Item I).
- Keith Truscott will follow up with Bill Tweit to discuss possible causes of the interannual variability between Chinook salmon survival estimates in 2007 and 2008 at Rock Island Dam under 10 percent spill. They will also discuss developing additional language for the Rock Island 10% Statement of Agreement (SOA; Item II-B) addressing unexpected high interannual variability for the current and potential future survival estimates. Chelan PUD will provide a revised draft SOA that reflects the discussions to the Committees by e-mail by December 5 as the means to finalize the Rock Island 2008 10% SOA.
- Mike Schiewe will update the group on the status of Washington State Department of Ecology's (Ecology's) water right discussions about Blackbird Island Pond following tomorrow's Hatchery Committees meeting (Item IV).

DECISION SUMMARY

- There were no decisions made at this month's meeting.

I Approval of Meeting Minutes and Agenda (Ali Wick)

The October 21 Meeting Minutes were approved with minor revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Chelan PUD (Keith Truscott)

A. Survival Study Presentations

John Skalski reviewed the results of the survival studies for 2008. His presentation and the others' presentations from today's meeting were sent out to the Coordinating Committees prior to the meeting. At Rocky Reach Dam, Skalski indicated that the treatment operation did not increase sockeye salmon survival when compared with the "Waterview" or conventional powerhouse operation in 2008. Overall, project passage survival of sockeye in 2008 was 0.9202 and standard error was 0.0212. This compares to historical survival estimates of 0.8351 (0.0213) in 2004, 0.8920 (0.0165) in 2005, 0.9331 (0.0121) in 2006, and 0.8381 (0.0188) in 2007 (standard error in parentheses). At Rock Island Dam in 2008, project survival estimates were 0.8972 (0.0157) for yearling Chinook salmon, 0.9335 (0.0163) for sockeye salmon, and 0.9699 (0.0103) for steelhead. The Chinook salmon estimate of 0.8972 (0.0157) compared with the 0.9725 (0.019) estimate in 2007. Both 2007 and 2008 Rock Island studies were completed under a 10 percent spill.

Tracey Steig summarized results of the 2008 juvenile sockeye salmon acoustic tag studies at Rocky Reach Dam. These studies focused on route-specific passage. The study showed that fewer sockeye went through the surface collector during the treatment operation than during the Waterview operation. Further, more sockeye passed through Units 3 through 11 during the treatment operation than during the Waterview operation; slightly fewer sockeye passed via Units 1 and 2 and the spillway during the treatment versus Waterview operation. Steig indicated that during time periods when fewer sockeye passed via the surface collector, higher numbers of sockeye smolts were approaching the dam from a mid-river trajectory. In contrast, during periods when a higher proportion of sockeye smolts were using the surface collector, more smolts tended to approach the dam along the west bank. Steig said that he was not sure why this would be the case, and Chelan PUD will continue to look at these data to see if there is some condition that could be used that would increase surface collector passage for sockeye.

Next, Steig presented the results of the Chinook salmon acoustic tag studies evaluating route-specific passage at Rock Island Dam. In 2008, more Chinook smolts approached the dam along the east shore than in 2005 and 2007, when a large percentage of Chinook migrated down the west shore. In 2008, 54 percent of Chinook passed via Powerhouse 2, and 37 percent passed via Powerhouse 1. During the period from 2005 to 2008, the proportion of Chinook smolts annually passing via Powerhouse 2 and Spillway 2 declined, while the proportions increased through Spillway 1 and Powerhouse 1. There was not any major week-to-week variability with regard to passage route.

In 2008, most sockeye smolts approaching Rock Island migrated down the west bank (51 percent) and mid-river (38 percent), with a majority passing through Powerhouse 2. For steelhead, passage has decreased via Powerhouse 2 during the period of 2004 through 2008; passage has increased through Powerhouse 1 in latter years, and has increased through Spillways 1 and 2, except in 2008, when it dropped slightly due to different spill conditions. In 2008, most steelhead approached the dam mid-river (50 percent) and along the west bank (32 percent), and most passed through Powerhouse 2. Steig mentioned that the report for all of these data will be coming out soon, and more details will be discussed there.

B. SOA for Rock Island 10 Percent Spill Study

Keith Truscott updated the group that Chelan PUD has distributed a draft SOA for a Rock Island 10 percent spill study for 2009 that was essentially the same as that conducted in 2008—same species, same test protocols. Committees members raised several questions about the differences between Chinook salmon survival estimates in 2007 and 2008, and asked whether there were additional investigations that might be helpful to sort this out. Truscott indicated that Chelan PUD was open to suggestion, but at this time, he felt obtaining a third year's estimate was the appropriate next step. Bob Rose asked about the availability of a hydraulic model for the Rock Island Tailrace. Truscott indicated that hydraulic modeling was being discussed for Rocky Reach, but that one was not currently planned for Rock Island. Rose suggested that such a model might be useful to explain fish behavior in the forebay in different years. The Committees requested that Chelan PUD provide additional detail in the SOA on how 2009 studies might further the understanding of the differences between the 2007 and 2008 survival estimates. Truscott said that Chelan PUD would like the SOA to memorialize the Committees' decision to go forward with the

study as proposed, and that Chelan PUD would be open to continuing discussion on what further information might be developed to resolve the question regarding interannual variability. Steve Hemstrom noted that Chelan PUD tagging technicians had indicated that the 2008 Chinook smolts did not appear to be in as good a condition as in past years. Jim Craig indicated that he could go back and check fish condition from the Methow Hatchery and the Entiat screw traps to see if poor fish condition was observed higher in the watersheds.

Keith Truscott will follow up with Bill Tweit and Bob Rose to discuss possible causes of the interannual variability between Chinook salmon survival estimates in 2007 and 2008 at Rock Island Dam under 10 percent spill. They will also discuss additional language for the Rock Island 10% Statement of Agreement (SOA; Item II-B) addressing unexpected high interannual variability for the current and potential future survival estimates. Chelan PUD will provide a revised draft SOA that reflects the discussions to the Committees by e-mail by December 5 as the means to finalize the Rock Island 2008 10% SOA.

C. Revised Scope of Work for Rocky Reach Fishway Maintenance Schedule

Keith Truscott provided a revised scope and schedule for reconditioning the third attraction water pump at Rocky Reach. Due to some cracks in pump B, a new shaft will be needed and has been ordered. Pump C was also found to have cracks, but there is no replacement shaft at this time. The new shaft for Pump B will arrive in mid-January. Pump C will be operated without overhaul this year, and the replacement shaft for Pump B will be installed during the 2009/2010 overhaul period. The Pump C shaft would then be replaced during the 2010/2011 overhaul period. Additional items to be addressed during this year's outage include the following:

- Automating the upper fishway picket barriers
- Removing the antiquated fish counting platforms and infrastructure
- Changing out the middle spillway entrance gate operators from pneumatic to electric
- Installing the de-watering pump in the spillway entrance pool and cleaning the floor diffusers
- Removing the antiquated stilling wells and replacing them with look-down transducers

D. Annual, 3-year, and 6-year Rocky Reach Surface Collector Underwater Inspection Schedule

Keith Truscott explained that the 6th year is coming up on the preventative maintenance underwater inspection schedule for the Rocky Reach surface collector. He provided a list of inspection items and the frequency. The 6th year's items include all of the items on the annual and 3-year list as well. The total time needed for the maintenance inspection will be 6 weeks.

III Douglas PUD (Rick Klinge)

E. Update on Debris Boom Construction

Rick Klinge reminded the group that the debris boom project required dropping the pool 8.5 feet from November 1 through 13 in order to pour concrete for the debris ramp. This was completed and the pool is back up now. During this period, some coho were found in a dried-out pond behind a 12-inch culvert through a berm along the Columbia River about 3.5 miles downriver from the confluence of the Methow River. Douglas PUD inspected the area and could find nothing that would have attracted the fish to the pond where they were subsequently stranded. Douglas PUD also looked around for others at other known ponds and did not find any Plan Species in these other ponds.

The construction of the debris boom should be completed by the end of February.

F. Winter Ladder Maintenance Schedule

Rick Klinge said that Douglas PUD is preparing for winter maintenance and will be servicing both fish ladders as typical. The west ladder will be serviced in December, and the east ladder will be serviced sometime in January 2009. Klinge reminded Committees members that they were welcome to visit the dam during this period to view the de-watered ladders.

IV Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe said that the Tributary Committees did not meet in November and that the November Hatchery Committees meeting will be occurring tomorrow. Mike Schiewe will update the group on the status of Ecology's water right discussions about Blackbird Island Pond following tomorrow's Hatchery Committees meeting. Schiewe said that the key item that the Hatchery Committees are dealing with is the Hatchery Scientific Review Group updates.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- December 16 from 1:00 to 4:30 pm at Chelan PUD in Wenatchee
- January 27 from 9:30 am to 3:00 pm in SeaTac
- February 24 from 9:30 am to 3:00 pm 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
Steve Hemstrom	Chelan PUD
Lance Keller	Chelan PUD intern
Jerry Marco *	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tracy Steig (morning)	Hydroacoustic Technology, Inc.
Bryan Nordlund * (by conference call – morning only)	NMFS
John Skalski (morning)	University of Washington
Rich Townsend (morning)	University of Washington
Jim Craig *	USFWS
Bill Tweit *	WDFW
Bob Rose * (by conference call)	Yakama Nation

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

ROCK ISLAND HCP COORDINATING COMMITTEE STATEMENT OF AGREEMENT CHELAN COUNTY PUD, 2009 CONTINUED EVALUATION OF ROCK ISLAND PROJECT SURVIVAL FOR YEARLING CHINOOK, STEELHEAD, AND SOCKEYE DURING A 10% SPILL OPERATION

Rock Island HCP Coordinating Committee
Statement of Agreement
Chelan County PUD
2009 Continued Evaluation of Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation

December 16, 2008

Statement
The Rock Island HCP Coordinating Committee has reviewed the draft results of Chelan County PUD's 2008 Rock Island Survival Study with 10% spill operations and has agreed as outlined in the original Statement of Agreement approved on December 8, 2006 that the results warrant continued project survival evaluation of yearling Chinook, steelhead, and sockeye in 2009 under a 10% spill operation. Study protocol and logistics detail will be implemented as outlined in the RI 2008 "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation*". It was noted by the Committee that unexpectedly high variability exists between the 2007 and 2008 estimates of yearling Chinook survival. Continued detailed analysis comparing results of 2007 and 2008 (plant operations, tag/tagger effect, environmental conditions, fish health) is recommended as a means to explain the unusual variability. Should an element or combination of elements arise as likely contributors to the variance then efforts to improve study design and/or protocol to implement corrective action (if possible) will be considered.

If 2009 results continue to contribute to this unexplained extreme variability (unexplained high or low survival estimate) from previous years' study then the Committee will consider discussion regarding the need for additional information, including the option of an additional year of survival study .

Background
On December 8, 2006, the Committees approved a Statement of Agreement for testing a 10% spill operation (10% SOA) in 2007 at Rock Island Dam to assess yearling Chinook survival. The 10% SOA outlined an agreed project survival testing plan for 2007 and 2008 and beyond) based on results of the 2007 and 2008 tests. Although the 2-year average (2007 & 2008) of Project Survival for yearling Chinook is 93.5% and sets in motion as outlined in the 10% SOA a third year of yearling Chinook testing in 2009 at 10% spill operation, the Committee expressed some concern with the high level of variability between 2007 and 2008 results and will pursue additional data analysis in attempts to describe elements contributing to the variance. The first-year steelhead and sockeye results (97% & 93.3%; paired-release model) met the pre-determined survival metrics of the 10% SOA to continue survival testing in 2009. For reference, the December 2006 10% SOA and the "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation*" have been attached (Attachment A.1, 2).

Deleted: SOA 2009 CPUD RI 10% Survival Study V2 12_02_08 bt .doc¶

DRAFT

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 Coordinating Committees

From: Michael Schiewe, Chair, HCP Coordinating Committees

CC: Ali Wick

Date: January 27, 2009

Re: Final Minutes of December 16, 2008 HCP Coordinating Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Chelan PUD Headquarters Building in Wenatchee, Washington on Tuesday, December 16, 2008, from 1:00 pm to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will distribute the final November 18 Meeting Minutes to the Coordinating Committees (Item I).
- Bryan Nordlund will be meeting with Richie Graves at National Marine Fisheries Service (NMFS; Chief of the Federal Columbia River Power System Branch [FCRPS] Branch) to discuss further the appropriate path forward regarding potential modification of non-lethal take of non-listed Plan Species (Item III-B), and Nordlund will update Mike Schiewe on these discussions.

DECISION SUMMARY

- The Committees approved the Statement of Agreement (SOA) for the 2009 Rock Island 10% spill study (Item III-A).

I Approval of Meeting Minutes and Agenda (Mike Schiewe)

The November 18 Meeting Minutes were approved with minor revisions. Ali Wick will distribute the final minutes to the Coordinating Committees.

II Update: Tributary and Hatchery Committees (Mike Schiewe)

Mike Schiewe updated the group that the Tributary Committees have not met since the last Coordinating Committees meeting. The Tributary Committees will be meeting this Friday, December 19 to finalize the list of habitat projects to be funded in 2008.

Schiewe gave an update on the issues under discussion by the Hatchery Committees during the November meeting:

- Chelan PUD has been working toward Committees agreement on a second year of a partial water re-use study with summer/fall Chinook.
- The Committees have agreed to move up to 50,000 steelhead for acclimation at Blackbird Island Pond. The Committees have also agreed to support the water right application to Ecology.
- Since 2005, Chelan PUD has been supporting the Okanagan Nation Alliance's (ONA's) Skaha sockeye program as part of its mitigation obligation. Recently, Chelan PUD has been seeking an extension of this commitment beyond 2013 in order to finance an ONA hatchery facility and increase fry production. The goal of this action is to ultimately increase smolt numbers to meet the Rocky Reach and Rock Island HCP's mitigation obligation.
- Under the 2008 FCRPS Biological Opinion, NMFS is requiring the preparation of new Hatchery Genetic Management Plans (HGMPs) for all federally funded hatcheries in the Columbia River basin. Coincident with this review, NMFS has requested that the Hatchery Committees update HGMPs for the PUD-funded programs that rear Endangered Species Act-listed species. The first programs to be considered will be Wenatchee steelhead and Wenatchee spring Chinook. There are a number of policy issues associated with the management of these populations that are under discussion outside the Hatchery Committees, primarily between Washington Department of Fish and Wildlife (WDFW) and the Yakama Nation as co-managers of these programs. WDFW and Chelan PUD will be involved in the writing of the Wenatchee steelhead HGMP, and WDFW, Chelan PUD, and the Yakama Nation will be involved in the Wenatchee spring Chinook HGMP. The other members of the Hatchery Committees have elected to review the draft HGMPs rather than work directly on drafting the documents. The management discussions between WDFW and Yakama Nation are expected to be complete around the time that the HGMPs are due. Consequently, the

timing and schedule of submitting these HGMPs are still under discussion. The current timing being discussed is April or May for Chinook and March for steelhead.

- The Hatchery Committees are continuing their discussion of steelhead reproductive success studies as required by the HCPs. Chelan PUD is currently considering a study plan/proposal prepared by WDFW.
- Chelan PUD is working out the details of a sockeye enumeration study to collect population-specific information for area-under-the-curve method estimates of spawner abundance.
- The Wells Hatchery Compliance Report is out for review.
- The Wells HC approved the Douglas PUD 2009 Monitoring and Evaluation (M&E) Implementation Plan.
- The Committees discussed the Wells "drawdown" for debris boom installation in November and implications for steelhead and coho migration behavior.
- The Yakama Nation and the Colville Tribes are discussing potentially using Columbia River Intertribal Fish Commission (CRITFC) funding for M&E of production of Upper Columbia sockeye (Osoyoos Lake and Skaha Lake, primarily).
- The Committees are discussing broodstock collection at Wells Dam. The Joint Fisheries Parties are planning to hold a summer Chinook broodstock workshop this spring.
- The Yakama Nation expects to have steelhead kelts on station at the Entiat Hatchery for spawning this spring.
- NMFS has sent a proposal regarding male precocity to the Hatchery Committees for potential funding. The PUDs will be organizing some questions to send back to NMFS.
- The Hatchery Evaluation Technical Team (HETT) is working to identify control groups in the Methow basin. The HETT is also working to assemble Passive Integrated Transponder (PIT)-tag data from the Entiat River and Peshastin Creek.

III Chelan PUD (Keith Truscott)

A. DECISION ITEM: SOA Rock Island 10% Spill Study

Keith Truscott introduced this item, noting that discussions with Bill Tweit and Bob Rose had taken place post-November CC meeting to develop language in the SOA that would offer the Committee guidance should results of future RI 10% survival studies vary significantly beyond what has normally been experienced to date. Chelan PUD has agreed to further analyze these data to identify possible reasons for the differences between years.

The Committees approved the SOA previously sent, dated December 5 (now re-dated, see Attachment B). Bryan Nordlund noted that he was interested in seeing some additional investigation of individual turbine survival at Powerhouse 1 in future years, particularly at the higher end of unit flow range. Truscott said that this would be considered as their planning for out-years progresses.

In response to a question from last meeting regarding whether fish condition may have contributed to a decrease in survival in 2008, Jim Craig said that smolt trap data indicated that condition of smolts downstream of Entiat Hatchery in 2007 was significantly better than in 2008. He is still awaiting information on smolts released from Winthrop Hatchery. Keith Truscott expressed gratitude to Committees members for providing this type of information because it helps Chelan PUD and the Committees better understand these results.

B. Bi-catch during 2008 Pikeminnow Ladder Trapping at Rocky Reach and Rock Island

Keith Truscott summarized information on bi-catch of sockeye observed during ladder trapping of pikeminnow at Rocky Reach and Rock Island. He said that he wanted to bring this up for the Committees' information and to ensure that they were informed of this. There was a record return of sockeye this year. Chelan PUD intends to complete similar trapping in 2009 and wants to make sure there are not any Committees' concerns before moving forward with this.

Bryan Nordlund asked how many adult sockeye were caught in the NPM traps at the dams, and Steve Hemstrom responded that all six traps caught a total of 1,031 sockeye, and all were released with no injuries or mortalities documented. With a combined passage of 355,082 adult sockeye this year (combined Rock Island / Rocky Reach), the 1,031 incidental captures accounted for 0.29% of the run. Nordlund said that he asked this because he noted that he believed that the number exceeds the non-lethal take for non-listed HCP Plan Species under the provision for predator control in the Biological Opinion. He suggested that the Committees might want to formally address this issue. He indicated that he will be meeting with Richie Graves at NMFS (Chief of the FCRPS Branch) to discuss further the appropriate path forward regarding potential modification of limits for non-lethal take of non-listed Plan Species. Following these discussions, Nordlund will update Mike Schiewe with the path forward.

C. Rocky Reach Sockeye Study Planning for 2009

Keith Truscott asked for input from the Committees on sockeye study planning for 2009 at Rocky Reach. He asked Steve Hemstrom to provide an overview of what Chelan PUD is likely to propose for 2009. Hemstrom reviewed the test conditions and results since 2005 and said that the highest proportional use of the juvenile bypass was documented in 2008, and that Chelan PUD would like to maximize its use again in 2009. In continuing this discussion, Hemstrom noted that survival test release timing at Wells has traditionally been around noon on the day of release, and that this likely places the fish at the forebay of Rocky Reach during the daytime the next day when predators tend to be more active. To determine if this affects the results of survival testing, Chelan PUD is planning to compare results from both day/night releases, and potentially refine future sockeye release strategies to reflect natural arrival timing at the dam. The powerhouse would be operated according to the "Waterview" condition with no spill. To support this expanded release strategy, Chelan PUD is currently putting together a schedule for releases and staffing and is also looking into hydroacoustic monitoring of fish behavior at the surface collector entrance.

Steve Hemstrom asked if anyone on the Committees knew what the sockeye passage was like in the 1990s before the ONA program, and he questioned whether Skaha sockeye releases and passage timing might affect the overall timing of juvenile sockeye passage timing at Rocky Reach Dam. Rick Klinge suggested that the early records could be consulted to identify deep echoes (sockeye) and shallow echoes (steelhead) to help understand this. He said that historical behavior timing is likely similar to current timing.

Bryan Nordlund recommended that the study plan also include collection of information on survival through the powerhouse turbine units, especially when unit flow is high. He also suggested that spill, even with potential egress issues in the tailrace could prove to be a better option for increasing overall juvenile survival, as opposed to running turbine units at the higher flow rates. Lastly, he questioned whether the proposed test is addressing operating conditions that would benefit survival for all juvenile fish or whether it is more a test of study methods particular to sockeye. He asked this question as a reminder to the Committee that the final year of testing yearling Chinook survival had been deferred and sockeye survival studies initiated, based on the assumption that passage improvements

would benefit both species. He stated that he could not see how the current study plan could result in any benefit to yearling Chinook passage and survival. Steve Hemstrom replied that Chelan PUD recognizes that it would be testing study methods for sockeye, but that it was critical to ensure that the study fish behaved in the same way as run-of-the-river fish.

IV Douglas PUD (Rick Klinge)

D. Update on Debris Boom Construction

Rick Klinge updated the group that the project is going well and the contractor is ahead of schedule. The anchoring cables are in place. The project should be completed in February, and Klinge invited the Committees to visit and see it once it is complete.

E. Update on East Fish Ladder Annual Maintenance at Wells Dam

Rick Klinge said that Douglas PUD conducted a dewatering of the east ladder earlier in December. Klinge has sent a memorandum to the Committees summarizing the number of fish that were removed from the ladder. Dewatering of the Collection Chamber took approximately 1 week to complete because of a leaking bulkhead that required additional attention. Only one fish mortality occurred (one whitefish). Klinge invited the Committees to tour the ladder while it is out of service.

V HCP Committees Administration (Mike Schiewe)

A. Meeting Schedule

The upcoming meetings are set as follows:

- January 27 from 9:30 am to 3:00 pm in SeaTac
- February 24 from 9:30 am to 3:00 pm in SeaTac
- March 24 from 9:30 am to 3:00 pm in SeaTac

VI List of Attachments

Attachment A – List of Attendees

Attachment B – Rock Island HCP Coordinating Committee Statement of Agreement Chelan County PUD, 2009 Continued Evaluation of Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation

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
Steve Hemstrom	Chelan PUD
Jerry Marco * (by conference call)	Colville Confederated Tribes
Rick Klinge *	Douglas PUD
Tom Kahler *	Douglas PUD
Bryan Nordlund * (by conference call)	NMFS
Jim Craig *	USFWS
Bob Rose * (by conference call)	Yakama Nation

* Denotes Coordinating Committees member or alternate

ATTACHMENT B

ROCK ISLAND HCP COORDINATING COMMITTEE STATEMENT OF AGREEMENT CHELAN COUNTY PUD, 2009 CONTINUED EVALUATION OF ROCK ISLAND PROJECT SURVIVAL FOR YEARLING CHINOOK, STEELHEAD, AND SOCKEYE DURING A 10% SPILL OPERATION

Rock Island HCP Coordinating Committee
Statement of Agreement
Chelan County PUD
2009 Continued Evaluation of Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation

December 16, 2008

Statement
The Rock Island HCP Coordinating Committee has reviewed the draft results of Chelan County PUD's 2008 Rock Island Survival Study with 10% spill operations and has agreed as outlined in the original Statement of Agreement approved on December 8, 2006 that the results warrant continued project survival evaluation of yearling Chinook, steelhead, and sockeye in 2009 under a 10% spill operation. Study protocol and logistics detail will be implemented as outlined in the RI 2008 *"Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation"*. It was noted by the Committee that unexpectedly high variability exists between the 2007 and 2008 estimates of yearling Chinook survival. Continued detailed analysis comparing results of 2007 and 2008 (plant operations, tag/tagger effect, environmental conditions, fish health) is recommended as a means to explain the unusual variability. Should an element or combination of elements arise as likely contributors to the variance then efforts to improve study design and/or protocol to implement corrective action (if possible) will be considered.

If 2009 results continue to contribute to this unexplained extreme variability (unexplained high or low survival estimate) from previous years' study then the Committee will consider discussion regarding the need for additional information, including the option of an additional year of survival study .

Background
On December 8, 2006, the Committees approved a Statement of Agreement for testing a 10% spill operation (10% SOA) in 2007 at Rock Island Dam to assess yearling Chinook survival. The 10% SOA outlined an agreed project survival testing plan for 2007 and 2008 and beyond) based on results of the 2007 and 2008 tests. Although the 2-year average (2007 & 2008) of Project Survival for yearling Chinook is 93.5% and sets in motion as outlined in the 10% SOA a third year of yearling Chinook testing in 2009 at 10% spill operation, the Committee expressed some concern with the high level of variability between 2007 and 2008 results and will pursue additional data analysis in attempts to describe elements contributing to the variance. The first-year steelhead and sockeye results (97% & 93.3%; paired-release model) met the pre-determined survival metrics of the 10% SOA to continue survival testing in 2009. For reference, the December 2006 10% SOA and the "*Study Plan to Estimate Rock Island Project Survival for Yearling Chinook, Steelhead, and Sockeye during a 10% Spill Operation"* have been attached (Attachment A.1, 2).

DRAFT

APPENDIX B

HABITAT CONSERVATION PLAN HATCHERY COMMITTEES MEETING MINUTES AND CONFERENCE CALL 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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

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

Date: February 21, 2008

Re: Final Minutes of January 16, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the SeaTac Radisson, on Wednesday, January 16, 2008, from 9:30 am to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Ali Wick will send out the final December 12, 2007 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Shaun Seaman will provide a revised Statement of Agreement (SOA) and study plan for the partial water re-use study to Ali Wick for distribution to the Committees (Item II-A).
- Julie Pyper will send out the Chiwawa Steelhead Acclimation Ponds Feasibility Report and a draft SOA in the next week or so for Committees' review and discussion (Item II-B).
- Julie Pyper will provide the monthly Chelan PUD engineering report to Ali Wick for distribution to the Committees (Item II-C).
- Chuck Peven and Ali Wick will work together to draft a letter to the Upper Columbia Salmon Recovery Board (UCSRB) summarizing the process and status of reference stream selection; the draft letter will include a list of recipients that will be copied on the letter (Item II-D).
- Shaun Seaman will coordinate with Trout Unlimited to request a presentation at the next Hatchery Committees meeting on plans for Blackbird Pond (Item II-E).
- Kris Petersen will discuss the steelhead reproductive success study internally within National Marine Fisheries Service (NMFS) and will provide a brief topic paper for the next meeting on defining potential reproductive success endpoints (Item III-C).

- Kirk Truscott will develop a draft Request for Concurrence letter for NMFS regarding an interim strategy for bacterial kidney disease (BKD) management at Methow Hatchery for the Committees' review by the next meeting (Item III-D).
- Kirk Truscott will provide a summary of the rearing study for 2005 Broodyear Turtle Rock summer Chinook rearing at Chelan Falls net pens to Ali Wick for distribution to the Committees for their review (Item IV-A).
- Tom Scribner will provide to Ali Wick for distribution a recent Yakama Nation (YN) poster discussing the proposed restoration of sockeye in the Yakima Basin (Item V-B).
- Julie Pyper will meet with Tom Scribner on the status of improvements to address leaf litter that impedes fish ladder use at Dryden (Item V-C).
- Tom Scribner will provide the YN's kelt reconditioning proposal to the Committees for their information and discussion as soon as it is available (Item V-D).
- Tom Scribner will provide the handouts on the YN's smolt acclimation proposal to Ali Wick for distribution to the Committees for discussion and review (Item V-E).
- Kirk Truscott will discuss with the Methow Hatchery manager whether the hatchery is a workable location for the BKD study (Item VI-A).
- Tom Scribner will discuss with the Cle Elum Hatchery manager whether this location is a workable location for the BKD study, and if so, then Mike Schiewe will discuss with Dave Fast (YN) a potential presentation to the YN, WDFW, and U.S. Fish and Wildlife Service (USFWS; Item VI-A).
- The Committees will re-review the Non-Target Taxa of Concern (NTTOC) process and be ready to make a decision on path forward at the next meeting (Item VI-B).

DECISION ITEM SUMMARY

There were no formal decision items approved at this meeting.

I Meeting Minutes Approval

The Committees approved the December 12, 2007 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Chelan PUD

A. Partial Water Re-use Pilot Study

Shaun Seaman distributed a revised study plan and draft SOA for a Partial Water Re-use Pilot Study to rear 100,000 Wells summer Chinook from the PUD's hatchery compensation program on a partial water re-use system. The new study plan reflects an agreement between Chelan PUD and WDFW staff that the initial testing will be conducted at a rearing density of 0.12 pounds per cubic foot-inch (lbs/cf-in); this is the same rearing density that is currently used in traditional raceways for HCP production. Under the proposal, Chelan PUD would implement the study as described in a first year "proof of concept" test, and then would review results with WDFW fish health staff and the Hatchery Committees before a potential second year of study would be proposed. The proposal includes the provision that each additional year would require Committees' approval. Seaman indicated today that he would like to further alter the draft SOA distributed today to add the condition that if a second year is agreed to, the PUD can test a 0.2 density index; he said that this item was inadvertently omitted when he was preparing the draft SOA for today.

Kirk Truscott discussed the various issues that had been discussed with WDFW fish health and Chelan PUD prior to today's meeting, and indicated that these issues had been worked out to the satisfaction of WDFW.

Shaun Seaman indicated that Chelan PUD had recently requested that John Skalski review the statistical power of the proposed study to compare differences in smolt to adult returns (SARs) between the testing groups; the SARs would be estimated based on Passive Integrated Transponder (PIT) tag detections. Kris Petersen mentioned that it would be valuable from a fisheries perspective to compare the return rates of test versus conventionally-reared fish that return to the area of Chelan Falls. (For context, this is based on an assumption that final acclimation for the test and control fish will occcur in the Chelan River).

Russell Langshaw confirmed that Grant PUD intends to provide some funding to this study because of Grant PUD's interest in the partial water re-use technology.

Tom Scribner asked whether Chelan PUD's expectation was that if the partial water re-use system works, then this system would be applied to other stocks, particularly spring Chinook. Shaun Seaman responded that Chelan PUD faces certain challenges, including

water, in all hatchery programs, and the PUD's intention is to have a set of practical tools to use where they make sense in order to meet these challenges. If this system is a tool that makes sense, then the PUD would consider using it with an agreement by the Committees that it meets resource needs. He said that it was not possible to know at this time whether this tool would be considered for spring Chinook in particular.

Shaun Seaman agreed to provide a revised SOA and study plan for Committees' approval before the next meeting.

B. Chiwawa Feasibility Study

Julie Pyper introduced the current status of the Chiwawa feasibility study. Pyper intends to send this and an SOA out in the next week or so for Committees' email discussion. Pyper confirmed that the design will be consistent with the discussions the Committees have had over the last few months. At the last meeting, the PUD had agreed to investigate whether the design would include production level plus 10 percent because the permit allows 110 percent production if needed. Shaun Seaman commented today that the past Committee agreement to raise 450,000 fish was based on a conservative estimate of fish needed in order to meet permit needs. Thus, the design intent is for 450,000 fish. Kris Petersen noted that the 110 percent criteria is part of Grant PUD's obligation and that the different criteria may have led to this initial request by the Hatchery Committees. The Committees agreed that this criteria did not apply to the sizing of the new steelhead ponds.

C. Engineering Report

Julie Pyper and Sam Dilly provided the Engineering Report to the Committees for review. Pyper will provide the engineering report to Ali Wick for distribution to the Committees.

D. Potential Letter to the Entiat Planning Unit on use of the Entiat River as Potential Reference Stream

Chuck Peven indicated that at a recent UCSRB meeting, a group of Entiat Watershed residents expressed an interested in the status of the Entiat River as a reference stream. The Committees agreed that there was a need for communication with these groups and discussed how best to make the connection. The Committees agreed to send a letter to the UCSRB discussing the process for selecting reference streams, data being collected, and the expected schedule, but the

letter will not discuss fisheries implications, which the Committees agree is outside the purview of these Committees. Chuck Peven and Ali Wick will draft a letter for Committees' review. The draft letter will be directed to the UCSRB, but copies will be distributed to several additional interested parties

E. Blackbird Island Pond Improvements for Steelhead Rearing

Shaun Seaman provided an update on recent Chelan PUD discussions with the Trout Unlimited group that is developing Blackbird Island Pond as a potential steelhead acclimation site. Seaman updated the group that Mike Kaputa of Chelan County Natural Resources Department (NRD) has committed to pursue grant funding to partially fund these improvements along with Chelan PUD. Seaman confirmed that because of the timing of proposal development, the pond would likely be ready for first use in 2009 at the earliest. The pond would not be used for overwintering due to winter conditions at the site. Seaman agreed to discuss with Trout Unlimited representatives the need to coordinate their efforts with the Hatchery Committees, as the final authority to move steelhead to this site will require the Committees' approval. Seaman agreed to coordinate with Trout Unlimited to have them provide a presentation about plans for the pond at the next meeting.

III Douglas PUD

A. 2008 Action Plan

Rick Klinge updated the group that the 2008 Action Plan for Douglas PUD had been distributed last meeting. The Committees approved the Plan for 2008.

B. Request by Grant PUD for Access to 2008 Brood Fish

Rick Klinge updated the group that Grant PUD has sent its annual request to Douglas PUD for access to the Wells and Methow hatchery facility to raise Upper Columbia River (UCR) steelhead, UCR spring-run Chinook salmon, survival study fish, and summer Chinook. The Committees were provided this request letter for their information. Douglas PUD intends to approve this request, as they did last year. Klinge said that the reply to Grant PUD will note that the current Grant PUD request does not conflict with the current programs at either facility, but if the programs change, the request will need to be re-evaluated. The Committees acknowledged that the rearing capacity at the Methow Hatchery for spring Chinook depends on the prevalence of BKD in the broodstock, with the capacity being

reduced as the prevalence of BKD increases. This is due to the WDFW policy of rearing progeny of high BKD antigen females at reduced density. The Committees accept that if production falls below the 550,000 smolt level, then the shortfall will be divided proportionately among the three PUDs utilizing this facility for production.

C. Status of a Steelhead Reproductive Success Study

Tom Kahler discussed that studies comparing the natural reproductive success of hatchery reared and wild steelhead are required by all three HCPs. Kahler further stated that based on an earlier request by Douglas PUD staff, WDFW had included with the 2008 Douglas PUD Monitoring and Evaluation (M&E) Implementation Plan, a draft proposal utilizing the Wells Spawning Channel for such a study. Subsequently, Douglas PUD separated the reproductive success proposal from the M&E Implementation Plan to expedite approval of the M&E Plan. Kahler indicated that based on a more careful review of the proposed steelhead study by Douglas staff, they were reluctant to pursue it as proposed because it did not adequately address the objective identified in the HCP.

The discussion of the WDFW proposal to Douglas PUD served to open a broader discussion of how the Committees should proceed to develop and coordinate plans for reproductive success studies required by all three HCPs. Mike Schiewe suggested that perhaps Hatchery Evaluation Technical Team (HETT) could develop a list of reproductive success endpoints that might be considered, and review the various approaches that have been previously used to measure reproductive success in these types of studies. He further suggested that HETT might develop a matrix of the pros and cons for various endpoints and experimental approaches. Chuck Peven suggested that the work being done by the *ad hoc* supplementation workgroup should be included in this review. Kris Petersen requested the opportunity to discuss this subject internally within NMFS and agreed to provide for the next meeting a brief topic paper on defining potential reproductive success endpoints.

D. Interim BKD Management Strategy for Methow Spring Chinook Supplementation Program

Mike Schiewe introduced this topic by reviewing the brief document summarizing a proposed interim management strategy for BKD in the Methow spring Chinook program that he prepared in collaboration with Douglas PUD and WDFW staff. He explained that the strategy was a much abbreviated version of the July 2, 2007 memo summarizing discussion between WDFW and

Douglas PUD staff that was prepared by Kirk Truscott for the Committees. Schiewe noted that the purpose of his summary document was to document Committees' approval of the interim strategy and initiate NMFS permit review as necessary.

Kris Petersen commented that one of NMFS' ongoing concerns is that too few natural origin fish are currently being incorporated in the broodstock than should be for a true supplementation program. Accordingly, she would like to see some evaluation of the potential of culling to exacerbate this concern. Kirk Truscott indicated that the interim strategy does not contemplate the culling of wild fish. Petersen indicated that it was her first impression that the proposed interim strategy would require modification or amendment of permit 1196.

The Committees discussed that the interim BKD program will need to reflect the intention of producing a positive effect on the program. Petersen recommended that one of the permit holders send a "Request for Concurrence" to NMFS describing this proposal (disposition of culled fish; incorporation of natural origin fish into the program) and how the proposal would increase information about BKD and program effects over the long term. The letter would need to describe any new take that would occur in the program relative to what was originally considered in the permit. Tom Scribner stated that being clear and forthright about the proposed culling (e.g., sacrificing versus early release of the progeny of BKD antigen females) should simplify the permit process. Stating that the high BKD antigen progeny would be removed from the program rather than being reared and released early would eliminate the ecological concern associated with the early release practice. Kirk Truscott agreed to draft a Request for Concurrence letter for Committees' review by the next meeting.

E. Update on Construction Projects

a. Twisp Weir

Tom Kahler updated the group that contractor submittals are being reviewed by Douglas PUD for Twisp Weir.

b. Wells Hatchery Water Intake Screen

Tom Kahler updated the group that the contractor has mobilized the construction/ installation barge and deployed the containment boom for installation of the new screen.

IV WDFW

A. Broodyear 2005 Turtle Rock Summer Chinook Rearing at Chelan Falls

Kirk Truscott provided an update on the outcome of rearing broodyear (BY) 2005 summer Chinook at net pens at Chelan Falls versus those reared under standard rearing protocols at Turtle Rock Island. This year, fish were reared at 16 fish per pound, and 99,660 fish were released. In comparing lengths and weights, results show that fish reared in the Chelan Falls net pens were closer to program targets than those reared at Turtle Rock Island. WDFW believes that fishes homing fidelity will improve and updated the Committees that WDFW will likely request a second year of study. Truscott will provide a study summary to Ali Wick for distribution to the Committees for their review. This will be on the agenda for approval at the next meeting; the Committees decided that a formal SOA is not needed for this year because last year's SOA sufficiently captures the detail needed to agree to a second year of study.

B. Colville Tribes Request for Release of Steelhead Smolts into Salmon Creek

Kirk Truscott updated the group that the Colville Tribes have made their annual request to WDFW to release 25,000 steelhead smolts in Salmon Creek this spring. Truscott brings this up today for the Committees' information.

V Yakama Nation

A. Mid-November Ending Dates for Mainstem Dam Counts as Relates to Coho Salmon

Tom Scribner updated the group that mainstem index dam counts for coho salmon at several Mid-Columbia dams are inconsistent (e.g., Rock Island and Priest Rapids). Scribner believes these counts are the result of counter misidentifying the species and wants to discuss with PUDs ways to refine these. For example, this year's coho counts were approximately 5,000 greater at Rock Island than at Priest Rapids. Chuck Peven surmised that it could be that coho are being counted as Chinook jacks at Priest Rapids, as their jack count is typically out of sync with other dams. Russell Langshaw discussed that smaller fish have historically escaped the camera's view at Priest Rapids Dam, and fish size is distorted due to viewing window/camera position. He indicated that Grant PUD will be moving the camera this year in order to capture these fish better on film. Russell suggested that Keely Murdoch talk to Eric Lauver at Priest Rapids Dam to discuss these counts.

In addition, Scribner noted that counts typically extend to mid-November. He would like to request extending the counting season at least for 1 or 2 years in order to potentially capture more of the run. He indicated that at the time counting ended last year, there were still about 10 coho per day passing the dam, according to dam counts. Scribner will be discussing with the PUDs the options to review existing data or extend the counting season.

B. Sockeye Reintroduction into Lake Cle Elum

Tom Scribner introduced this topic by summarizing that sockeye had been extirpated from Lake Cle Elum, and there is currently an interest by the Yakama Nation Council to look into reintroducing sockeye. The YN is investigating possibilities for obtaining about 200 pairs of sockeye from the Okanagan Basin as an opportunity to reintroduce sockeye. At this time, these discussions are mostly at the conceptual level. The YN has contacted Howie Wright of the Okanagan Nation Alliance to discuss this. At the end of February, the YN will be attending the Bilateral Okanagan Basin Technical Working Group (BOBTWG) meeting in order to further discuss opportunities and arrangements. Scribner will provide to Ali Wick for distribution a recent YN poster discussing restoration of sockeye in the Yakima Basin.

C. Dryden Dam Upgrades

Tom Scribner asked Chelan PUD to update the group on recent work at Dryden Dam to address leaf litter that impedes fish ladder use on the right bank. Julie Pyper will get back to Scribner on the status of improvements at Dryden.

D. Kelt Reconditioning

Tom Scribner provided an update on YN discussions with the Action Agencies as part of the Federal Columbia River Power System Biological Opinion (FCRPS BiOp) remand process. He indicated that the YN is developing an implementation proposal for steelhead kelt reconditioning. Scribner will provide this proposal to the Committees for their information and discussion as soon as it is available.

E. Follow-up on Yakama Nation Smolt Acclimation Presentation from December 2007 Meeting

Tom Scribner updated the group that YN staff are further developing the Wenatchee basin steelhead smolt acclimation proposal by identifying and evaluating potential sites. Scribner will provide this information to Ali Wick for distribution to the Committees for discussion and

review. The next step for the YN staff is to develop some conceptual drawings depicting how these sites might be developed.

VI HETT Updates

A. Progress on Draft BKD Study Plan

Mike Schiewe reminded the group that HETT is working on developing a list of potential facilities where the draft BKD study plan could be implemented. Schiewe reported that after some discussion, it was determined that the USFWS is not interested in performing this study at any USFWS hatcheries. Another potential location is the Methow Hatchery, and Kirk Truscott is discussing with the Methow Hatchery manager whether this location is workable with regard to overall production capacity. Truscott will update the group on these discussions at the next meeting.

Tom Scribner commented that he had discussed the potential to conduct the study at Cle Elum Hatchery, and the preliminary response was a qualified 'yes,' depending on study details. Scribner would likely need a technical presentation to help the hatchery managers and the YN understand the study proposal and capacity needs. Scribner will further discuss with the Cle Elum Hatchery manager whether this location is workable, and if so, then Mike Schiewe will discuss a potential presentation with Dave Fast (YN).

B. NTTOC

Mike Schiewe reminded the group that the NTTOC process has been on hold since last summer pending Hatchery Committees' review of the process described by Todd Pearson at the July Committees meeting. The Committees agreed to review the NTTOC material and be ready develop a path forward at the next meeting.

VII HCP Administration

A. Meeting Agreements

The following are informal Committee agreements that were made at the meeting:

- The Committees agreed that the 2008 Douglas PUD Action Plan is satisfactory (Item III-A).

B. Next Meetings

The next scheduled meetings are as follows: February 20, March 19, and April 16, all 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.
Chuck Peven	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper	Chelan PUD
Sam Dilly (morning only)	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
Dave Carie * (by conference call)	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer	WDFW
Tom Scribner *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

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

Date: March 20, 2008

Re: Final Minutes of February 20, 2008 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, February 20, 2008, from 9:30 am to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Julie Pyper will meet with Tom Scribner on the status of improvements to address leaf litter that impedes fish ladder use at Dryden (January Meeting).
- Ali Wick will send out the final January 16, 2008 Meeting Minutes (as revised) to the Hatchery Committees (Item I).
- Lynn Hatcher will ask Kris Petersen to check with National Oceanic and Atmospheric Administration (NOAA) general counsel regarding the legality of a directed take of listed steelhead that residualize and pose a predation risk on other listed species (Item II).
- George Velasquez will send the Chiwawa Concept Plan/Feasibility Study to Ali Wick by February 29 for Hatchery Committees' review and comment submission by March 19 (Item III-C).
- Shaun Seaman will check with Chuck Peven regarding the 2007 Wenatchee spawning ground reports (Item III-D).
- Shaun Seaman will provide the 2008 Rocky Reach and Rock Island Action Plan to Ali Wick for distribution to the Policy Committees (Item III-F).
- Shaun Seaman will send the January Engineering Report to Ali Wick for distribution to the Hatchery Committees (Item III-H).

- Lynn Hatcher will check with Kris Petersen to determine whether taking blood samples from listed spring Chinook populations is covered by the existing Endangered Species Act (ESA) permit (Item IV-C).
- Kirk Truscott will meet with the Wells Hatchery staff to discuss potential space constraints and manpower issues regarding potential summer Chinook egg collection at Wells Hatchery for subsequent transfer to Prosser Dam (Item V-B).
- Jerry Marco will report back to the Hatchery Committees on any policy issues that the Colville Tribes may have with the Yakama Nation's proposed summer Chinook egg take at Wells for transfer to Prosser Dam (Item V-B).
- Douglas PUD will discuss internally the potential need for new holding facilities for the bacterial kidney disease (BKD) study at the Methow Hatchery and will provide an update at the next meeting (Item VI-D).
- Tom Scribner will discuss with Dave Fast and Cle Elum Hatchery staff the facility requirements for a potential BKD rearing density study (Item VI-D).
- Kirk Truscott will forward to Ali Wick Washington Department of Fish and Wildlife's (WDFW's) proposal to conduct trapping efficiency trials for spring Chinook in the Methow basin, for distribution to the Hatchery Committees and for Committees' email concurrence (Item VI-E).
- Mike Schiewe will discuss with Kris Petersen the potential endpoints for a steelhead reproductive success study for each of the various HCPs (Item VII-A).
- Mike Schiewe will discuss with Ali Wick and Keely Murdoch the development of a Hatchery Evaluation Technical Team (HETT) task order and schedule for the Non-Target Taxa of Concern (NTTOC) process (Objective 10 of the Monitoring and Evaluation [M&E] Plan; Item IX-B).

DECISION ITEM SUMMARY

- The Hatchery Committees approved the Pilot Partial Water Reuse Study Statement of Agreement (SOA) and plans for the study for 2008, with the provision that a decision on whether to mark 10,000 or 20,000 fish per group will be based on further review of the impacts of tagging these groups and the likelihood of increasing the detection of a significant difference between treatment and control (Item III-A).

I Meeting Minutes Approval

The Hatchery Committees approved the January 16, 2008 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Presentation: Blackbird Island Pond

Rollie Schmitten of the Icicle Chapter of Trout Unlimited introduced today's presentation, which was an update on the group's ongoing efforts to develop Blackbird Island Ponds for steelhead acclimation. Bob Stroup of Trout Unlimited provided an overview of the work to date. In the late 1990s, a children's fishing pond and back-channel area were created on the Wenatchee River. He then discussed the history of the support group's participating in the current efforts. Bruce Heiner of WDFW described the proposed installation and operation of a pump during the period of mid-February through April to provide adequate water to support the fish and facilitate their exit to the river. His current design idea for the outlet pipe consisted of a vertical half-round culvert with stop logs and screens at the top, connected to a buried ~18-inch pipe out to the river. Dan Davies said that the capacity of the pond was likely to be 35,000 to 50,000 fish, depending on the water right approved. Tom Scribner noted that one of the key issues will be providing an adequate water supply; Heiner verified that the current design will provide enough head to get water to the pond.

Kirk Truscott requested that Trout Unlimited work with WDFW to develop plans for power outages, security and access, and predator control. Schmitten confirmed that he would provide this information to the Committees. Dan Davies pointed out that the demand for children's fishing ponds is very high in the area. Rollie Schmitten and Kirk Truscott discussed that the strategy for post-release management of steelhead that failed to migrate would need to be considered. Keely Murdoch asked about plans for staffing at the ponds, noting that staff presence during pond operation has a big influence on the magnitude of bird and otter predation. Joe Miller indicated that WDFW would look forward to working with Trout Unlimited on this project and how to address residual steelhead and stocking the pond for kids fishing. Lynn Hatcher asked about the predicted frequency of overtopping; Heiner replied that overtopping might typically be a 10-year event. Mike Schiewe confirmed with the Trout Unlimited group that plans for the facility would continue to be vetted and worked on with WDFW; Rollie Schmitten agreed.

Rollie Schmitten said that the earliest this facility would likely be ready for use would be in the spring of 2009. Shaun Seaman agreed to determine the availability of Chelan PUD permitting staff to advise Trout Unlimited on permitting issues. During this discussion, Lynn Hatcher reported that Kris Petersen had indicated that the project would likely be covered under the existing Permit 1395. Following a discussion of how to manage steelhead that fail to leave the pond, Hatcher indicated he would ask Kris Petersen to contact NOAA General Counsel about potential management options that were legal under the ESA.

III Chelan PUD

A. Partial Water Reuse Pilot Study

Shaun Seaman introduced this topic and the supporting documents that had previously been provided to the Committees, including the SOA for the 2008 pilot study. The SOA discusses that this will be a 1-year study based on the criteria set forth in the supporting documents, including the study's rearing criteria and the study's M&E plans. Sam Dilly discussed that Chelan PUD has been investigating the numbers of fish that could be PIT-tagged, and how different numbers would affect the statistical power of the test. Steve Hays indicated that Chelan PUD had contracted with statistician Dr. John Skalski at the University of Washington for these analyses. Hays noted that Skalski's analyses indicated that the low detection rates of juvenile fish at McNary Dam would make it highly unlikely that a small (10 percent) difference in survival between treatment groups ($\alpha = 0.5$, one-tailed) would be statistically significant. However, the analyses did show that there was a relatively high likelihood of detecting a 50 or 100 percent difference in survival as statistically significant. Under all circumstances, it was demonstrated that increasing the numbers of tagged fish from 10,000 to 20,000 per treatment would increase the likelihood of detecting a significant difference. It was acknowledged, however, that tagging twice the number of fish posed logistical problems and could potentially compromise the experiment. This lead to considerable discussion on whether or not the increase in confidence was worth the additional tagging and the related impacts to the fish. Sam Dilly agreed to ask their consultants about the use of a pie-shaped crowder in the circular tanks as a way to separate tagged from untagged fish during the tagging process. There was also a discussion of how long the fish might be off-feed during the tagging process. The Committees agreed that 20,000 fish per treatment would be marked, unless it was determined that this number was logistically not possible or that marking this number would compromise fish health and

thus add another unrelated variable to the study. It was further discussed that these fish might be tagged just prior to acclimation and moved to an alternate vessel after tagging. With these provisions, the Committees approved the SOA and plans for the study for 2008.

B. Chiwawa Water Warming Manifold Operation Memorandum

Shaun Seaman updated the group on the Chiwawa water warming manifold operation; this information had been previously sent to the Hatchery Committees.

C. Chiwawa Concept Plan / Feasibility Study Report

George Velasquez introduced this topic and discussed that he will soon be sending out the updated Chiwawa Steelhead Acclimation Ponds Feasibility Study report for Hatchery Committees' review and comment. Velasquez will send the document to Ali Wick by February 29 for distribution to the Committees. The Committees agreed to provide comments by the date of the next meeting, March 19. If Committees members identify any major design issues in the document while reviewing it, they will notify Velasquez as soon as feasible so that these issues can be resolved.

Velasquez also noted that CH2M Hill is concurrently working on the 30 percent design for the Chelan Falls Rearing Ponds. Permitting for the Chelan Falls and the Chiwawa facilities will likely proceed on similar timelines.

D. 2007 Wenatchee Spawning Ground Reports

Shaun Seaman will check with Chuck Peven regarding this item.

E. WDFW/Yakama Nation Wenatchee Spring Chinook Management White Paper

Kirk Truscott updated the group that WDFW and the Yakama Nation (YN) are collaborating on a draft white paper describing a Joint Fisheries Parties (JFP) management plan for spring Chinook in the Wenatchee basin. Truscott and Bob Pfeifer will keep the Hatchery Committees updated as this document develops.

F. 2008 Rocky Reach and Rock Island HCP Action Plan

Shaun Seaman distributed the 2008 Rocky Reach and Rock Island Action Plan. This plan is provided as an FYI to the Committees. Seaman will provide this document to Ali Wick for distribution to the Policy Committees.

G. Update on Tumwater PIT-tag Coil Installation

Shaun Seaman updated the group that the Tumwater Passive Integrated Transponder tag (PIT-tag) coil has been installed and is either working now or will be shortly.

H. Engineering Report

Shaun Seaman will send the January Engineering Report to Ali Wick for distribution to the Committees.

I. Tumwater Dam

Shaun Seaman updated the group that Chelan PUD may not be able to operate Tumwater Dam on a year-round basis, and will be working with WDFW on this issue.

IV Douglas PUD

A. Update on Construction Projects

a. Twisp Weir

Tom Kahler updated the group that construction is underway in building the cofferdam for the Twisp weir project.

b. Wells Hatchery Water Intake Screen

Tom Kahler updated the group that the Wells Hatchery Screen project is now complete.

c. PIT-Tag Detector Location at West Ladder Trap

Tom Kahler updated the group that Douglas PUD is working with Biomark to upgrade and reconfigure the PIT-tag detector associated the west ladder trap; as it is currently positioned, it is subject to vibration and electromagnetic interference. Douglas PUD anticipates 100 percent detection following this upgrade, and the construction is anticipated to begin in March.

B. Water Rights Certificates

Rick Klinge discussed that Douglas PUD is considering converting from individual water certificates for each well to one certificate that applies to an entire wellfield at the Methow Hatchery. The intent of this action is for Douglas PUD to remain within the gallons per minute (gpm) criteria stipulated in the water right, but eliminate the need to manage each well individually. Douglas PUD may request letters of support from individual Committees members to Washington State Department of Ecology (Ecology) for this conversion.

C. Request by NMFS for Blood Samples for Hatchery Fish

Rick Klinge introduced this topic and Russell Langshaw provided additional information. Based on recent work in the Yakima basin, National Marine Fisheries Service (NMFS) researchers had found that a high percentage of male Chinook salmon were maturing as mini-jacks, and that those fish maturing precociously could be identified prior to release based on hormone concentrations in their blood. The NMFS researchers want to expand their study into other basins in the Upper Columbia River, and are now requesting 300 pre-smolt (yearling or subyearling) Chinook per hatchery program for this study. The researchers have not identified which stock(s) they want to sample, but indicated that they would like to sample in March or April. Langshaw confirmed that the researchers cannot get useful samples from dead fish and want to test as many independent spring Chinook populations as possible. The Committees agreed that, subject to NMFS review, making these fish available for this study would be acceptable, given that these fish are not PIT-tagged individuals. Lynn Hatcher will discuss the ESA issues with Kris Petersen to confirm whether this action is within the existing permit.

V Yakama Nation

A. Kelt Reconditioning

Tom Scribner updated the group that the YN are still working on a proposal for kelt reconditioning; this activity will eventually involve trapping kelts at Chelan and Douglas PUD dams. The YN is not anticipating collections this year, but collections would occur within the April to May timeframe, potentially a year from now.

B. Summer Chinook Egg Request from Wells Hatchery for Feasibility Work in Yakima River

Tom Scribner referenced the previously distributed summary of the YN's proposal requesting summer Chinook eggs from Wells Hatchery for rearing and release at Prosser Dam in the Yakima basin. The purpose of this action is to support the reintroduction of summer Chinook in the Yakima Basin. The YN is currently working on fish health issues with WDFW and U.S. Fish and Wildlife Service (USFWS) associated with this proposal. Scribner indicated that he was discussing this proposal with the Hatchery Committees in order to provide an opportunity for members to express any early concerns. Rick Klinge noted that Wells Hatchery may have some space issues with holding excess adults, and would like the opportunity to review this proposal in further detail. Scribner noted that the facility manager had indicated that space would likely not be an issue, but he will continue to work with the PUD to ensure that this action would not negatively impact the summer Chinook production program broodstock currently held at the Wells Hatchery. Kirk Truscott will meet with the hatchery staff to discuss potential space constraints and manpower issues. Several Committees members indicated the need to further explore some of the ramifications (e.g., hatchery use, policy), but the Committees agreed that this proposal is acceptable in concept. Jerry Marco will report back to the Committees on any policy issues that the Colville Tribes may have with this action.

C. Tribal/Action Agency FCRPS Memorandum of Agreement

Tom Scribner updated the group that a 10-year Memorandum of Agreement (MOA) between the Federal Columbia River Power System (FCRPS) Action Agencies (Bureau of Reclamation [BOR], U.S. Army Corps of Engineers [USACE], and Bonneville Power Administration [BPA]) and the Treaty Tribes was close to being agreed upon. Today, the Yakama Nation Tribal Council is meeting to decide whether they will accept this MOA [In review of these minutes, Tom Scribner later noted that this was incorrect - the council was meeting that day to get an initial briefing on the MOA with a decision to come at a later date].

VI WDFW

A. Update on Ultrasound Machines

Kirk Truscott and Shaun Seaman reported that they would review last year's efficiency of the ultrasound equipment in order to finalize the decision to purchase additional units. Since last year's utilization was late in the season, additional information gained from early use this year will help validate the purchase. They will report back to the Hatchery Committees at the next meeting.

B. Concurrence Letter to NMFS on Interim BKD Management Plan

This item is on hold while the Hatchery Committees moves forward on potential sites for the BKD study.

C. Summary of Broodyear 2005 Turtle Rock Summer Chinook Net Pen Rearing at Chelan Falls

Kirk Truscott informed the Hatchery Committees that WDFW would like to continue net-pen rearing of Turtle Rock Summer Chinook in 2008, employing the same protocols and schedule as was used in 2007. The Committees agreed that continuing this rearing is acceptable for 2008.

D. Update on Potential for BKD Study at HCP Hatcheries

Mike Schiewe updated the group that Kirk Truscott had provided a memorandum regarding the use of the Methow Hatchery for a BKD rearing-density study. Truscott indicated that, after taking into account that two brood years would be on station at the same time, the current study design would require use of all of the existing rearing space at the hatchery. Truscott indicated that one way to move forward would be to consider constructing additional rearing facilities at the hatchery, and that any new rearing capacity (after the test) might be used by Grant PUD to meet their production needs in the future. Douglas PUD agreed to discuss this internally and will provide an update at the next meeting.

Reporting back as requested from the last meeting, Mike Schiewe reported that he had spoken to Trevor Evelyn regarding the role of disease in the upcoming Hatchery Scientific Review Group (HSRG) analysis; Evelyn reported that fish disease would factor into the HSRG analysis, but disease would likely not be a substantial driver in the analysis. The HSRG will primarily be looking at genetic management of brood stock. This means that the HSRG analysis will not be a large impetus for the BKD study, and a study (if conducted) will not likely be an important factor in HSRG conclusions.

Tom Scribner will further discuss with Dave Fast and the Cle Elum Hatchery staff the potential to conduct a BKD rearing-density study at the Cle Elum facility.

E. Proposal for Spring Chinook Methow Trapping Efficiency Trials

Kirk Truscott will forward to Ali Wick WDFW's proposal to conduct trapping efficiency trials for spring Chinook in the Methow basin; Wick will distribute the proposal to the Hatchery Committees for review and email concurrence. These trials would need to begin in early March in order to cover a range of discharge levels.

VII NMFS

A. Steelhead Reproductive Success Endpoints

Lynn Hatcher provided a handout on NMFS suggestions for steelhead studies about hatchery supplementation programs in the upper Columbia River Basin. Mike Schiewe will further discuss with Kris Petersen the necessary first step of determining what would be the most appropriate endpoint(s) for determining reproductive success of hatchery-origin recruits spawning naturally. Seaman asked for clarification regarding the action item from the last meeting on how this list meets the intent of that item. Also, Seaman asked whether this list was consistent with the M&E program.

VIII HETT Updates

A. Update on Reference Streams (a.k.a Reference Populations) for Spring Chinook

Keely Murdoch provided an update on the HETT's work on reference stream (reference populations) analysis for Chiwawa River spring Chinook. The HETT looked at correlation coefficients for effect sizes, and also at productivity and abundance. The results were fairly consistent with one another. Populations that are likely to be recommended include Marsh Creek, Entiat River, Secesh River, and the Little Wenatchee River. The Naches River population has a certain set of early datapoints that may be outliers, and Andrew Murdoch is following up for information on these points. The next step is to run the analyses for fish spawning in the Methow and Chewuch Rivers, and for Nason Creek and the White River to be completed as time allows. Russell Langshaw is completing a physical parameter comparison among these streams that will inform the results once data are collected.

IX HCP Administration

A. Upper Columbia River Salmon Recovery Board (UCSRB) Letter

Mike Schiewe reviewed with the Hatchery Committees that Chuck Peven had suggested at the last meeting that the Hatchery Committees might want to send a letter to the Entiat Watershed Planning Group (EWPG) describing progress in identifying hatchery supplementation reference

streams. The Committees agreed to consider drafting such a letter. However, after discussion today, the Committees felt it would be more useful for selected Committees members to attend the next meeting of the EWPG to provide a verbal update. Further, the Committees agreed that it would be useful for Mike Schiewe to contact Julie Morgan (Executive Director) of the UCSRB to arrange for a briefing on HCP programs and progress over the last several years.

B. NTTOC Path Forward

Mike Schiewe introduced this topic and emphasized the importance of agreeing to a plan for implementing Objective 10 of the M&E Plan, determining the effect(s) of supplementation on NTTOC in HCP streams. This objective is a regional issue, and funding should be discussed at some point. The Committees discussed that the species list and containment levels should be chosen in the Hatchery Committees with HETT input. Mike Schiewe will discuss with Ali Wick and Keely Murdoch the development of a HETT task order and schedule for this activity.

C. Informal Meeting Agreements

The following are informal Committee agreements that were made at the meeting:

- Several Committees members indicated the need to further explore some of the ramifications (e.g., hatchery use, policy) of collecting extra summer Chinook eggs at the Wells Hatchery for transfer to the Yakima basin for rearing and release, but the Committees agreed that this proposal is generally acceptable in concept at this time (Item V-B).
- The Committees agreed to continue Turtle Rock summer Chinook net pen rearing in 2008 at Chelan Falls (Item VI-C).

D. Next Meetings

The next scheduled meetings are as follows: March 19, April 16, and May 21, all at Chelan PUD in Wenatchee.

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.
Steve Hays	Chelan PUD
Shaun Seaman *	Chelan PUD
Sam Dilly (morning only)	Chelan PUD
George Velasquez (afternoon only)	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge*	Douglas PUD
Lynn Hatcher *	NMFS
Rollie Schmitten (morning only)	Trout Unlimited
Bob Stroup (morning only)	Trout Unlimited
Dan Davies (morning only)	Trout Unlimited
Dave Graybill (morning only)	Trout Unlimited
Dave Rayfield (morning only)	Trout Unlimited
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Joe Miller (morning only)	WDFW
Bruce Heiner (morning only)	WDFW
Keely Murdoch *	Yakama Nation
Tom Scribner * (by conference call)	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

ROCKY REACH AND ROCK ISLAND HCP HATCHERY COMMITTEES STATEMENT OF AGREEMENT REGARDING PILOT STUDY FOR PARTIAL WATER REUSE

Rocky Reach and Rock Island HCP Hatchery Committees
Statement of Agreement
Regarding Pilot Study for Partial Water Reuse
February 20, 2008

Statement

The Rocky Reach and Rock Island HCP Hatchery Committees (hereafter "Committees") agree that Chelan County PUD (hereafter "District) can perform a partial water reuse pilot study. Approximately 100,000 Wells Summer Chinook from the District's hatchery compensation program will be reared on partial water reuse water utilizing circular ponds. The Committees agree to allow the District to perform the study as outlined in the attached *Pilot Water Reuse Fish Rearing Criteria* and the *Partial Water Reuse Pilot Study Monitoring and Evaluation*. The study will be for one (1) year and the Committees will decide whether to pursue additional years of study based on the results of the first year of the pilot study.

The study will continue as long as the health of the fish remains comparable to the control group reared under protocols as detailed in the *Hatchery Facility Evaluation Suggested Guidelines for Anadromous Fish Hatchery Programs.* The pilot study will be discontinued if fish health criteria and mortality limits agreed to by the Committees prior to the start of the study are not met or if limits are exceeded.

A subset of the study (those in the circular ponds) and control fish will be PIT tagged to allow for evaluation of the study. All study fish will be differentially marked with coded wire tags. The number of study and control fish to be PIT tagged will be determined by the Committees.

Background

Background

Water and space are major limiting factors in hatchery facilities. The District would like to investigate alternative methods for using water, and potentially space, when revising either existing facilities or constructing new ones. One such method for conserving water during rearing is partial water re-use. Successful application of water re-use technology has been previously demonstrated with Atlantic Chinook using 75 % reuse water. Twenty-five percent of the water is instantaneously added and the 75% reused water is oxygenated and CO2 stripped before reentering the pond. The effluent (at the bottom of the pond) contains practically all of the waste products and unused fish food.

The District proposes to test this configuration at a rearing density (0.12 lbs./cu.ft.-in). Based on case studies from existing applications, this reuse technology may be practical and feasibility for application to Upper Columbia hatchery sites at this density.

Objective

Determine if circular ponds with 75% reuse can be used to rear Chinook from ponding to yearling size at Eastbank, while producing fish with growth, health and vigor desired for the supplementation programs.

ATTACHMENT 1

PILOT STUDY REARING CRITERIA

P I L O T W A T E R R E U S E

F I S H R E A R I N G C R I T E R I A

DATE: February 2, 2009

TO: Hatchery Committee

FROM: Sam Dilly

RE: Pilot Study Rearing Criteria

This draft Pilot Water Reuse Fish Rearing Criteria was developed in collaboration with WDFW staff and Chelan PUD representatives January 23, 2008. WDFW staff reviewed the criteria and provided recommendations that were accepted by the District and are included in the pilot program. These final criteria will be part of the pilot study covered in the Statement of Agreement February 2008.

Pilot study disease and rearing criteria

1. Juvenile summer Chinook disease identification and treatment requires consideration of multiple variables and conditions. The pilot water reuse study will track water quality and study conditions per the attached monitoring and evaluation paper. The Fish Health Monitoring and Evaluation is structured adequately, contains the correct magnitude of testing and observation and will be followed. However, rearing conditions, test duration, and further discussion among WDFW staff and Chris Good, fish veterinarian with Freshwater Institute, may lead to additional testing or other testing to improve the pilot test data. The data will create the basis for disease identification and treatment.

2. Observed fish disease and sickness among pilot study fish will be treated. Upon observation of abnormal fish behavior or physical condition, the Complex Manager, John Penny, will contact Bob Rogers (WDFW Fish Pathologist) and the District. In coordination, Bob Rogers, John Penny, and Chris Good will develop:

a. Possible cause of the fish health condition

b. Recommended changes to pilot conditions

c. Recommended treatments and

d. Record of observations and actions to resolve the conditions

3. An acute fish health event (epizootic) could be defined as 0.08 percent mortality for three consecutive days (0.0008 X 50,000 fish = 40 fish). The District and WDFW recognize waiting to observe continued fish health deterioration to this point is not recommended or practical. Upon observing as few as five daily mortalities, WDFW and the District will begin discussions. Upon documenting sickness, disease, or causative conditions, and group consultation, WDFW will prepare treatment recommendations and may take action. Anticipated actions include:

   a. Changing the reuse water proportion

   b. Changing water quality

   c. Treatment with medications (water treatment or feed)

4. WDFW and the District will inspect pilot study fish, compile data, and create recommendations for final fish rearing and release. At the September 2008 HC meeting there will be a data review and recommendation for final rearing conditions. Location, cohort co-mingling, and possible continued cohort biological analysis will be decided at that time.

5. Fish mortality among pilot study fish will be compared to survival standards per Table 1. Mortality will be compared to cohorts in a standard raceway as well. Wenatchee Summer Chinook have been reared in Eastbank raceways for over 17 years. Historical survival rates will provide a general basis for comparison at the study's end.

6. If mortality exceeds life stage standards the study will be terminated unless extenuating circumstances exist. Standards are contained in Table 1.

Table 1
Pilot Study Survival Standard

Standard	Ponding To 30-days	Ponding To 100-days	Ponding To Release	Transport To Release
Percent Survival	97	93	90	95

Temporary equipment failures, acute treatable fish illness, and unforeseen conditions that affect fish will not give cause to stop the study. Conditions that can not be changed or remedied will give cause to stop the study. Chronic illness, with mortality (approaching survival standards), and poor performance compared to cohorts in raceways will give cause to stop the study. If necessary either a flow through system in the circular ponds or transfer to annex raceways will occur.

ATTACHMENT 2

PARTIAL WATER REUSE PILOT STUDY MONITORING AND EVALUATION

Partial Water Reuse Pilot Study
Monitoring and Evaluation

The District will investigate a partial reuse aquaculture system incorporating circular culture tanks with dual drains. Such technologies have been successfully applied elsewhere to improve rearing volume use, reduce site footprint, improve control over culture conditions, and reduce water consumption and energy costs.

The pilot project at the Eastbank Hatchery will use Chelan River (A.K.A. TRI Yearling) Summer Chinook. The following piloting parameters have been defined but may be subject to change:

Table 1:
Pilot Project Parameters[1]

Parameter	Criteria
Per tank volume	3884.6 ft3
Total tank volume	7769.2 ft3
Density index	0.125 lb/cf-in
Max rearing density	9.2 kg/m3 (1.24 lb/gal)
Minimum Flow Index	0.75 lb/gpm-in
Tank exchange rate	calculated
Condition factor	0.0121 g/cm3
Release length	4.6 in (11.7 cm)
Release weight	23.5 fish/lb (19.4 g)
Total number of fish	104,500
Total fish biomass	4,467 lb (9848.7 kg)
Maximum temperature	59 °F (15 °C)
Reuse rate	75%
Total flow rate (2 tanks, flow index based)[2]	1295 gpm (4902 lpm)
Influent flow rate (2 tanks)	323 gpm (1222 lpm)

1 Based upon moving fish in November to acclimation facility
2 Single pass water use provisions will be provided

To facilitate an effective piloting process, the District will use a hatchery consultant to design an aquaculture systems, supply and support equipment, perform training, and assist with data analysis during the pilot.

Design Concept

Based on design parameters, the estimated equipment requirements are:

1. **30 ft Diameter Circular Culture Tank System (Qty = 2)**
    a. 30 ft diameter x 6 ft wall height circular culture tank, FRP walls and floor, sectional
    b. Bottom drain sump and screen
    c. Side drain (Cornell style) and screen
    d. Bottom drain standpipe
    e. Spraybar assembly
2. **Partial Reuse Aquaculture System**
    a. Drum filter (Qty = 1)
    b. 89 micron screens

    c. Pump sump (Qty = 1)
    d. Reuse pumps (Qty = 2 or 3)
    e. Oxytower Gas Transfer System (Qty = 2)
        i. CO2 stripper and Low Head Oxygenator (LHO)
        ii. Gas transfer media
3. **Motor Control Panel (Qty = 1)**
    a. Alarm relays
4. **Water Quality Monitoring System**
    a. Analyzers (4-DO, 1-Temperature, 1-pH)
    b. Flow meter (1 for influent 1 for reuse)
    c. Multi-channel transmitter unit with local display and alarm relays
    d. Data logging capabilities
    e. Software package for PC
5. **Effluent Treatment**
    a. Radial Flow Settlers (Qty = 2)
6. **Ancillary Equipment**
7. **Culture tank jump screens or covers**
8. **Feeding systems will be manual (to make a consistent comparison)**
9. **Spare parts and materials as needed or related tools.**

<u>Scope of Work</u>

The pilot study work is organized into the following tasks:

1. **Scoping and concept design**
    a. Site review and layout analysis.
    b. Identify design constraints and preferences.
    c. Production parameters.
    d. Rearing parameters.
    e. Water quality parameters.
    f. Calculate mass balance and verify flow and treatment requirements.
    g. Develop process and layout drawings.
    h. Check equipment list and performance criteria.
    i. Calculate influent and effluent water quality.
    j. Prepare water quality report template.
2. **Detailed system design and design coordination**
    a. Aquaculture system process design.
    b. Layout of aquaculture systems.
    c. Detailed design analysis and design calculations
    d. Prepare detailed list of electrical loads, mechanical loads, and other service requirements.
    e. Integrate aquaculture system to site.
    f. Develop construction drawing
3. **Equipment supply**
4. **Construction**
5. **Commissioning**
6. **Training**
    a. Prepare and provide Operation and Maintenance Manual for System and for Components.
    b. Prepare training program for O&M personnel.
    c. Coordinate and conduct O&M personnel training.

7. **Operational support**
    a. Provide qualified personnel for operational advice and water quality troubleshooting.
8. **Monitoring Parameters**
    a. The following parameters will be monitored continuously with analyzers and meters:
        i. Dissolved Oxygen (DO) in each of the tank side drains (2 places).
        ii. Dissolved Oxygen (DO) in the header tank.
        iii. Dissolved Oxygen (DO) in the pump sump.
        iv. Water temperature in the header tank.
        v. Water pH in the header tank.
        vi. Water flow rate on influent water supply (make-up water).
        vii. Water flow rate on the reuse flow directly downstream of the pumps.
    b. The following parameters are to be monitored using a colorimetric test kit or laboratory methods (frequency to be determined):
        i. Dissolved carbon dioxide at the pump sump and the header tank.
        ii. Dissolved total ammonia nitrogen (TAN) at the pump sump.
        iii. Alkalinity (as calcium carbonate) at the pump sump.
        iv. Biological Oxygen Demand (BOD) in the culture tanks and in the effluent.
        v. Total Suspended Solids (TSS) in the culture tanks and in the effluent.
    c. The following additional parameters are examples of additional parameters that will be read and/or recorded manually (frequency to be determined):
        i. Pressure as measured with gauges upstream and downstream of pumps.
        ii. Flow split between bottom and side drain of tank (using portable flow meter)
        iii. Rotational period at perimeter of the culture tanks (using a float)
        iv. Oxygen use rate (at oxygen flow meter on LHO inlet)
        v. Daily feed usage and feeding time of day
9. **Data analysis and reporting**
    a. Provide analysis and trend development for water quality data. Track dissolved oxygen, dissolved CO_2, ph, temperature, Total Ammonia Nitrogen, BOD, and TSS. Analysis will be performed monthly but may be more frequent if so required for troubleshooting purposes.
    b. Prepare a monthly summary report of system performance and water quality.

The following schedule of milestones is estimated:

Table 2:
Pilot Project Parameters

Milestone	Estimated Completion Date
Scoping and concept design	2008-01-31
Detailed design documents	2008-02-29
Equipment delivery	2008-03-31
Pilot equipment installation	2008-04-30
Commissioning	2008-05-15
O&M training	2008-05-30
Piloting period	2008-06-01 (start) to 2009-05-31 (end)
Decommissioning or contract renewal	2009-06-01

Note: All dates assume initiation of contract by December 20, 2007.

Partial Water Reuse Fish Health Monitoring and Evaluation

Background

Modern partial reuse aquaculture systems have the capacity to reuse up to 85% while maintaining water quality parameters (e.g. DO, CO_2, ammonia) within safe limits. The capacity to reuse water makes the technology applicable to those who are investigating methods to reduce source water usage. One of the most important concerns for using any different technology is how fish health might be affected.

The pilot study purpose is to investigate and document fish health differences among fish raised in traditional raceways compared to fish raised in a partial reuse system.

A partial water reuse system will be constructed at the Eastbank Hatchery to rear approximately 100,000 Summer Chinook salmon for a 5-month period (June 2008–November 2008) while the remainder of this population will be raised for the same period at Eastbank Hatchery in traditional flow-through raceway units. Both groups will be differentially marked and transferred to the acclimation pond prior to release. In addition, 10,000 fish of the test and the same number of control fish will be PIT tagged for evaluation of survival and travel time comparison to McNary dam (see attached correspondence). Fish health and welfare will be evaluated according to the below plan.

Proposed Study Details

Start date: June, 2008
End date: November, 2008

(For a complete time-line of the proposed study, see Appendix A)

Hypothesis – Fish growth and $\text{health}_{\text{partial reuse}} \geq \text{Fish growth and health}_{\text{traditional raceway}}$

Study design – This study follows a prospective cohort epidemiological design, and will assess specific health and welfare indicators between two cohorts of fish of the same background (genetic strain, early rearing environment, etc.) exposed to two different rearing systems, with other exposures (water source, management, feeding rates, etc.) being equal.

Methodology

1. **Performance** – Fish will be sampled from both cohorts at regular monthly intervals for length and weight, from which growth curves and (with feeding data) feed conversion ratios will be generated. These data will be analyzed for statistically significant differences over time between the two cohorts.

2. **Fish Health** – There will be multiple assessments:
    a. Mortality data will be collected throughout the study period, and a proportional hazards survival analysis will be carried out at the end of the study to determine differences in overall survival between the two cohorts.
    b. Samples of 60 fish from each cohort (120 fish total per sampling event) will be collected at the start, middle, and end of the rearing period. These fish will be euthanized, packed in ice and shipped overnight to an accredited fish disease

diagnostic laboratory for screening of listed viral, bacterial, and parasitic pathogens, following Blue Book protocols (see Appendix B). This testing will reveal the presence or absence of subclinical infections, and will be used to assess changes in subclinical infection over time between the two cohorts.

c. In the event of clinical disease outbreaks during the study period, WDFW fish pathologist will diagnose and treat the study populations with support from a fish pathologist. Diagnostic and treatment records for each cohort will be summarized at the end of the study, and compared statistically.
d. At the end of the study, 50 fish from each cohort will be euthanized, and samples of multiple tissues (gill, heart, liver, spleen, pyloric cecae, intestine, swim bladder, anterior and posterior kidney, skin, and fillet) will be sent to a fish pathologist for histopathological assessment to determine the extent of organ pathology within each cohort.
e. At the end of the study, 50 fish from each cohort will be bled, and frozen plasma samples will be sent to a diagnostic laboratory for biochemistry profiles as agreed upon with WDFW for further comparison of pathological processes, as well as indictors of long-term stress (see Appendix C).
f.

3. **Fish Welfare –** At the end of the study, 50 fish from each cohort will have their fin condition assessed. This will be carried out for all rayed fins, with measurements by digital calipers to calculate the overall fin indices (i.e. length of longest ray of each fin standardized to fork length) for each fish. Differences in fin indices between the two cohorts will be assessed statistically. This work will be coordinated with WDFW to insure proper techniques and methods are used.

Table 1:
Estimated Effort and Time

Task	Effort
Field Work	
Site Visits and Field Work (Principal Investigator)	15 days
Site Visits and Field Work (Technician)	5 days
Field Work TOTAL	**20 days**
Laboratory Analyses – Allowances	
Pathogen Screening: 6 samples	
Diagnostic pathology (blood chemistry)	
Sample Shipment, Field Work Equipment, etc.	
Laboratory Analyses TOTAL	
Data Analysis and Report Preparation	
Monthly Data Collection and Study Coordination	5 days
Analysis and Report Writing	15 days
Data Analysis TOTAL	**20 days**
PROJECT TOTAL[1]	**40 Days**

[1] Diagnostic veterinary services to address clinical disease are not included in this estimate. These services are assumed to be part of the normal hatchery program.

Appendix A:
Detailed Project Time-Line

Date	Activity

June 2008	• Chris Good to travel to Eastbank Hatchery
	• First sampling of 60 fish per system for **pathogen screening** (see Appendix B) as cohorts begin early rearing at Eastbank
	Details:
	  • Sampling for pathogen screening requires MS-222 for euthanasia, and hard-sided coolers packed with ice for shipment
	  • Purposive sampling is employed (as opposed to random sampling), in that smaller, unthrifty fish or those exhibiting clinical signs will be targeted

August 2008	• Chris Good to travel to Eastbank Hatchery • Second sampling of 60 fish per system for **pathogen screening**

November 2008	• Chris Good plus technician final visit to Eastbank Hatchery
	• Final sampling of 60 fish per system for **pathogen screening**
	• Blood sample collection from 50 fish per system for **biochemistry profile analysis**
	Details:
	  • Blood collection will require 3ml syringes with 22-guage needles, blood collection tubes and freezer space to freeze samples prior to shipment (hard-sided cooler plus ice).
	• **Tissue collection** from 50 fish per system for histological assessment
	Details:
	  • Tissue collection requires dissection kits, histological grade formalin, and plastic jars for specimen fixation
	  • Once fixation is complete (48 hours), tissues are removed, placed in Whirlpak bags with small amounts of formalin, and shipped to the pathologist in a hard-sided cooler
	• **Fin data collection** for 50 fish per system for fin health assessment, and this requires use of a digital microcaliper

Throughout study period	• Routine mortality data collection following established facility protocols • Routine feeding data collection • Routine performance (length, weight, etc.) data collection • As needed veterinary sampling and diagnoses for clinical disease conditions as they arise

Appendix B Listed Pathogen Screening

The following fish pathogens will be screened in samples of 60 fish from each system according to Blue Book guidelines. The sample size of 60 fish in populations greater than 100,000 provides a 95% confidence of pathogen detection when pathogen apparent prevalence is at least 5%.

Pathogen	**Disease**	**Detection Method**
Bacteria		
Aeromonas salmonicida	Furunculosis	Culture
Yersinia ruckeri	Enteric redmouth disease	Culture
Renibacterium salmoninarum	Bacterial kidney disease	ELISA
Viruses		
IHNV	Infectious hematopoietic necrosis	Cell culture on CHSE, EPC
IPNV	Infectious pancreatic necrosis	Same
VHSV	Viral hemorrhagic septicemia	Same
Parasites		
Myxobolus cerebralis	Whirling disease	Tissue digestion / light microscopy
Additional Screening		**As determined by WDFW**

Appendix C Plasma Chemistry Analysis

The following plasma chemistry parameters are typical of a small animal panel as performed by a veterinary diagnostic laboratory. Specific parameters, such as the electrolytes, glucose, and liver enzymes, provide useful data for interpreting fish stress and underlying pathological processes.

Sodium	Albumin	Cholesterol
Potassium	Globulin	Creatine kinase
Chloride	Glucose	Iron
Bicarbonate	ALT	Total iron binding capacity
Anion gap	AST	Saturation
Urea nitrogen	Alkaline Phosphatase	Lipemia
Creatinine	GGT	Hemolysis
Calcium	Total bilirubin	Icterus
Phosphate	Direct bilirubin	Plasma Protien
Magnesium	Indirect bilirubin	hematocrits
Total protein	Amylase	Blood Osmolatity
Cortisol	Lactate	

REPRINTED E-MAIL FROM STEVE HAYS

OK - here we have it for adults.

These statistical powers are based on PIT tag recoveries at Columbia River fishways, assuming about a 0.5% SAR for Turtle Rock adults escaping ocean harvest and making it to Bonneville Dam, and using all PIT recoveries (3, 4, 5, and 6 year old returns).

With PIT tag releases of 10,000 fish each for reuse and control, a 2x1 survival difference beween control and test fish has a high power of being detected, a 1.5x1 survival difference has a power of .70 (not bad) if you are willing to use a .10 alpha level of significance, and only a 1-in-5 chance of detecting a 10% (1.08x1) SAR reduction from reuse rearing conditions with a .10 alpha level

To put this into perspective, if your PIT tag returns actually do equal 0.00499 for the controls, then the table below gives an idea of how many fewer fish could return from the reuse group before you would fail to reject the null hypothesis when, in fact, there was a difference in SAR. So, from a conservative viewpoint of do no harm and we detected 50 PIT tagged controls, then if we detected fewer than 33 adults we could conclude that the SAR was reduced because of rearing on reuse water (with a 1 in 10 chance of having convicted an innocent rearing technology). With control returns greater than 50, the likelihood of rejecting the null hypothesis (no difference in SAR) gets progressively closer to the Test .91 column.

Control	Test .91	Test .67	Test .50
100	91	67	50
90	82	60	45
80	73	53	40
70	64	47	35
60	55	40	30
50	45	33	25
40	36	27	20
30	27	20	15
20	18	13	10
10	9	7	5

Steven Hays
Fish and Wildlife Senior Advisor
Chelan County Public Utility District
PO Box 1231
Wenatchee, Washington 98807
(509) 661-4181

-----Original Message-----
From: John Skalski [mailto:skalski@u.washington.edu]
Sent: Monday, February 04, 2008 10:52 AM
To: Hays, Steve
Subject: Re: Statistical power

Steve,
Here is the updated table with the SAR values you suggested.

Power calculations for estimates of SAR_C = 0.00499, tested against SAR_T = 0.00454 and 0.00333, and 0.00250.

Release Size		% S_C greater than	α-level	Power
R_C	R_T	S_T	1-tailed	(1-β)
10,000	10,000	10%	0.05	0.1184
10,000	10,000	50%	0.05	0.5710
10,000	10,000	100%	0.05	0.8922
10,000	10,000	10%	0.10	0.2063
10,000	10,000	50%	0.10	0.7062
10,000	10,000	100%	0.10	0.9454
20,000	20,000	10%	0.05	0.1607
20,000	20,000	50%	0.05	0.8250
20,000	20,000	100%	0.05	0.9925
20,000	20,000	10%	0.10	0.2650
20,000	20,000	50%	0.10	0.9028
20,000	20,000	100%	0.10	0.9974

John

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

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

Date: April 17, 2008

Re: Final Minutes of March 19, 2008 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, March 19, 2008, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Rick Klinge will send the Hatchery Committees' revised well field letter to Mike Schiewe for submittal to Ecology (Item II-A).
- Tom Kahler will email photos, and possibly video, of the Twisp Weir construction project to Ali Wick for distribution to the Hatchery Committees (Item II-B).
- Kirk Truscott will provide comments to the Chiwawa Feasibility Report to George Velasquez by March 28 (Item III-A).
- Ali Wick will email the Hatchery Committees with Washington Department of Fish and Wildlife's (WDFW's) comments on the Chiwawa Feasibility Report, and schedule a conference call if necessary to resolve any issues (Item III-A).
- Julie Pyper will send the Engineering Report to Ali Wick for distribution to the Hatchery Committees when it is ready (Item III-D).
- Chuck Peven will check with Derek Van Marter of the Upper Columbia Salmon Recovery Board (UCSRB) regarding progress on obtaining hatchery data that the Hatchery Scientific Review Group (HSRG) is compiling, and will send an email to the Hatchery Committees updating them on this (Item III-E).
- Kirk Truscott will re-evaluate future Methow Hatchery spring Chinook salmon production capacity for the period spanning a potential bacterial kidney disease (BKD)

study, assuming that the BKD study fish would be held in the same raceways as production fish; Truscott will brief the Hatchery Committees in the next few weeks (Item IV-A).

- Kirk Truscott will ask Andrew Murdoch to provide additional information for the proposed sockeye trap efficiency tests for distribution to the Hatchery Committees for discussion (Item VI-B).
- The Hatchery Committees will provide comments on the sockeye trap efficiency test protocols to Kirk Truscott by April 1 for consideration (Item VI-B).
- Kris Petersen and Kirk Truscott will talk with their respective staff to determine when the National Marine Fisheries Service's (NMFS') potential steelhead reproductive success study plan may be available for Hatchery Committees review (Item VII-A).
- Mike Schiewe will draft a request from the Hatchery Committees to the Hatchery Evaluation Technical Team (HETT) to develop a study plan for assessing steelhead reproductive success (Item VII-A).
- Kirk Truscott and Kris Petersen will discuss Endangered Species Act (ESA) permit concerns regarding potential steelhead residualization at Blackbird Island Pond (Item VII-B).
- Bob Pfeifer and Kirk Truscott will coordinate a Joint Fisheries Parties (JFP) discussion regarding marking of Chiwawa Hatchery fish (Item VIII).

DECISION ITEM SUMMARY

- The Hatchery Committees provisionally approved the Chiwawa Feasibility Report contingent on WDFW's review of the document; if WDFW has significant unresolved issues with the report or preliminary design, the Committees will convene by conference call for additional discussion (Item III-A). [Update on April 30, 2008: SOA is still in progress for this item].

I Meeting Minutes Approval

The Hatchery Committees approved the February 27, 2008 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Douglas PUD

A. Letter of Support for Douglas PUD Request to Convert Individual Hatchery Well Water Certificates to Well Field Certificates at the Methow and Well hatcheries

Rick Klinge briefed the Hatchery Committees that Douglas PUD had requested that Mike Schiewe send a letter to Washington State Department of Ecology (Ecology) on behalf of the Committees regarding switching from individual groundwater certificates to a single certificate for each hatchery's well field. Klinge provided a draft of this letter for Committees review. The Committees reviewed the letter and, after minor changes, agreed that Klinge should send the draft to Schiewe to transmit to Ecology. [Rick Klinge will coordinate with Ecology to provide additional information on the implications of changing from individual hatchery well water certificates to well field certificates at the Methow and Wells Hatcheries (this comment added during meeting minutes finalization)].

B. Update on Twisp Weir Construction Project

Tom Kahler updated the group that the picket panels and hydraulic system at the left bank were being installed and tested at Twisp Weir this week. Douglas PUD is anticipating that the project will be completed in the next few weeks. Tom Kahler will email some photos and possibly some video of the construction to Ali Wick to send to the Hatchery Committees.

III Chelan PUD

A. DECISION ITEM: Chiwawa Feasibility Report

Julie Pyper briefed the Hatchery Committees that she had received no comments on the draft Chiwawa Feasibility report. George Velasquez joined the meeting in order to address questions about the project engineering. Tom Scribner posed a question regarding the proximity of the water intake location relative to the water discharge because of a concern that there could be co-mingling of the two. Velasquez acknowledged the issue and agreed to work with the engineers to make sure that this would not be a significant issue. Velasquez also verified that he would confirm with Chelan PUD staff that they had a complete list of permits needed and that those have been accounted for in the current schedule. Kirk Truscott informed the group that he needed some additional time to review this report. Notwithstanding the need for additional time, Truscott raised a question regarding whether Chelan PUD had a permit for sufficient volume and flow of Wenatchee River water in the event that Chiwawa spring Chinook would need to be switched over to

an alternate water supply. Truscott also indicated he wanted to review the smolt trap diagrams in greater detail. Truscott agreed to provide comments by March 28.

Jerry Marco, Dave Carie, and Kris Petersen had no comments or issues concerning the feasibility report. The Committees provisionally approved the report and preliminary design contingent on WDFW's approval. If WDFW raises any significant issues with the report or preliminary design, it will come back to the Committees for reconsideration. Ali Wick will email the Hatchery Committees with Washington Department of Fish and Wildlife's (WDFW's) comments on the Chiwawa Feasibility Report, and schedule a conference call if necessary to resolve any issues. [Update on April 30, 2008: SOA is still in progress for this item].

B. Update on 2007 Annual M&E Report Schedule

Julie Pyper updated the group that the 2007 Annual Monitoring and Evaluation (M&E) Report was posted to the ftp site on March 1 and that comments are due to Tracy Hillman by the end of day on Friday, May 2. Chelan PUD anticipates that any changes will be made by the end of May, and the document will be up for approval at the June Hatchery Committees meeting.

C. Update on Discussion with Yakama Nation regarding Dryden Operation

Julie Pyper updated the group that Chelan PUD and Yakama Nation (YN) have agreed on a plan for this year regarding the management of leaf litter at the Dryden Fish Trap. Chelan PUD and the YN will be re-evaluating this year's approach at the end of the trapping season and will make modifications as necessary.

D. Engineering Report

Julie Pyper updated the group that the Engineering Report will be forthcoming. She will send it to Ali Wick for distribution to the Hatchery Committees.

E. Hatchery Scientific Review Group Review

Chuck Peven updated the group that the Upper Columbia Implementation Team (a technical working group of the UCSRB) met last week and discussed the upcoming visit of the HSRG to review Upper Columbia hatchery programs. Peven noted that the UCSRB was

hopeful that the Hatchery Committees members would verify that the HSRG has the correct information for the Upper Columbia. Peven indicated that he would check with Derek Van Marter of the UCSRB regarding progress on obtaining the HSRG data set on Upper Columbia hatcheries, and then forward the response to Committees members. It was agreed that reviewing these data was not strictly an HCP Hatchery Committees responsibility, but that it would be in the best interest of individual members to validate the accuracy of the information on their programs.

F. Ad Hoc Technical Working Group

Chuck Peven reported that an ad hoc Technical Working Group (TWG) had been convened to consider the effectiveness of supplementation in the Upper Columbia. The TWG was preparing a draft study plan to make this assessment; the plan will likely be released in June 2008.

IV Committee Business

A. Update on Potential BKD Rearing Density Study

Tom Scribner updated the group that he has discussed the potential to conduct the BKD Rearing Density Study at Cle Elum Hatchery with hatchery managers. He noted that one way to pursue this would be for the Hatchery Committees to send a study proposal to the Yakima Basin Technical Work Group under the Yakama/Klickitat Fisheries Project (YKFP). However, his understanding after talking to the fish health staff and hatchery managers at Cle Elum was that their ELISA values have been decreasing in recent years. Thus, they were concerned that the returning spring Chinook at the hatchery would not have high enough antigen levels to conduct the study in a manner that effectively answers the research questions. Rick Klinge also updated the Hatchery Committees that Douglas PUD has met internally regarding the potential scenario for the study at Methow Hatchery in terms of juvenile early rearing space. Douglas and Grant PUDs are now discussing these issues together. They have not talked with WDFW yet regarding the types of vessels that might be needed for the study. Rick Klinge cautioned that there was concern on the part of Douglas PUD management that any expansion at the Methow Hatchery would be a concern to landowners in the vicinity of the hatchery.

Tom Scribner brought up the issue of how the hatchery would handle the number of fish produced under the potential study and how many of these fish would go toward HCP

mitigation. Kirk Truscott verified that the HCP amount would be approximately 211,000 fish, with 120,000 of these fish used for the study. Scribner asked what the roadblocks would be to hypothetically raising a larger number of fish there (up to 550,000 fish total). Rick Klinge responded that more water would be needed and an additional water right would need to be procured. One additional complicating factor noted by Kirk Truscott was that if broodstock were reduced in order to raise only 211,000 fish, then sufficiently high ELISA levels may not even be present in the collected broodstock. The Hatchery Committees then proceeded to discuss alternative study designs in which fish could be reared using existing hatchery infrastructures, as well as scenarios that would require additional raceways and acclimation ponds. The conclusion of this discussion was that the study would potentially not be feasible without new infrastructures specific to the study fish group. In agreement with this, Tom Scribner noted that he did not believe that the YN would agree to even a temporary production of 211,000; he indicated that the YN goal was to maintain production at the agreed-to level of 550,000 smolts.

The Hatchery Committees discussed what other ideas might work for the study. Tom Kahler suggested considering a design in which study fish were reared in the same raceways with production fish (at the appropriate densities and BKD condition), thus embedding the test within the production environment. The Committees noted that this might be a workable solution. Mike Schiewe suggested that Truscott re-evaluate hatchery production capacity under this alternative and brief the Committees on his evaluation in the next few weeks.

B. Objective 10: Non-Target Taxa of Concern

Mike Schiewe briefed the group that he had worked with Keely Murdoch and Ali Wick to draft a proposal and schedule for implementing Objective 10 of the M&E Plan. The implementation would begin with HETT reviewing a list of potential non-target taxa of concern (NTTOC), suggesting biologically-appropriate containment objectives for each NTTOC, and assembling a list of potential local experts to complete the analysis. The Hatchery Committees would then review these recommendations, and if approved, the HETT would oversee the analysis process. The Committees' review would occur at the May Hatchery Committees meeting. The Committees agreed that the HETT should proceed with the proposed actions.

V Yakama Nation

A. YN / ONA Discussions Regarding Egg Take of Okanagan sockeye

Tom Scribner updated the group that the Yakama Nation fisheries staff has initiated discussions with the Okanagan Nation Alliance (ONA) to partner with ONA on egg take operations for Okanagan sockeye at Shuswap Hatchery. Eggs from the Okanagan sockeye broodstock would be used in a YN program to re-establish sockeye in the Yakima River Basin. Preliminary discussions with the YN and ONA surfaced concerns that transporting eggs across the U.S./Canada border could be a problem. The YN is developing a proposal for a potential process by which this operation, as well as egg incubation, could occur in Canada. The YN selected this stock because they believe that the Okanagan stock has a better chance of surviving the warmer water in the Yakima River than the Lake Wenatchee stock, which had been used in a previous Yakima Basin study.

B. Update on Kelt Reconditioning

Tom Scribner updated the group that he is continuing to work with Chelan PUD on the potential collection of kelt at Rocky Reach and Rock Island Dams. Scribner said that discussions with Douglas PUD indicated that fish could not be captured at Wells Dam. Ideally, collection would occur in April and May of 2009, with holding and reconditioning at the Entiat Hatchery. Scribner indicated that his understanding of the study plan was that it specified long- and short-term reconditioning.

VI WDFW

A. Update on Yakama Nation Request for Summer Chinook Eggs

Kirk Truscott reminded the Hatchery Committees that the YN has requested 250,000 summer Chinook eggs from Wells Hatchery, and updated the group that this request has been worked out by both agencies. Jerry Marco commented that his action item from the last Hatchery Committees meeting was to check that the Colville policy staff was in agreement with this proposal. Marco updated the group that the next step is for Joe Peone (Colvilles) to meet with Steve Parker (YN) to discuss any policy issues.

B. Lake Wenatchee Sockeye Production Estimates and Smolt Trap Efficiency Trials

Kirk Truscott indicated that WDFW plans to trap sockeye smolts in Lake Wenatchee and release them at the Monitor trap in order to estimate trap efficiency. The trap efficiency estimates would be used in estimating the numbers of outmigrants passing the trap. Additionally, the Hatchery Committees discussed that WDFW might want to consider continuing trapping at the lake in

order to compare the two trap efficiencies. Truscott will ask Andrew Murdoch to provide additional information on the proposed tests for distribution to the Committees for discussion. The Committees will provide any comments to the tests to Truscott by April 1 for incorporation into the trials.

VII NMFS

A. Steelhead Reproductive Success Endpoints

Kris Petersen updated the group that she has been discussing with the Northwest Fisheries Science Center (NWFSC) a steelhead reproductive success study that Science Center staff are working on with WDFW. Petersen noted that the study was not being designed for the Hatchery Committees *per se*, but that the Committees might want to consider the design as appropriate to meeting the requirement for such a study under the HCPs. Petersen is hoping to have the Hatchery Committees review this study so that the Hatchery Committees could use the NMFS input on endpoints to inform the HCP study. Kris Petersen and Kirk Truscott will talk with their respective staff to find out when the study plan may be available. Mike Schiewe will begin developing a request for the HETT to eventually use in crafting a study plan for steelhead reproductive success.

B. Management of Blackbird Island Pond Steelhead that Residualize

An action item for Kris Petersen from the last meeting was to explore internally within NMFS whether there would be a legal constraint on how to manage ESA listed steelhead acclimated at Blackbird Island pond that failed to migrate. She indicated that, in general, NMFS had no formal legal or biological opinion on how to manage residualized listed species, and that a proposed management plan would be evaluated on a case-by-case basis. She also noted that NMFS would likely want the Hatchery Committees to investigate the reasons that fish residualized in the first place. The next step is for WDFW to discuss internally what type of management scenario they might propose, and to discuss this with NMFS. Kirk Truscott and Kris Petersen will discuss Endangered Species Act (ESA) permit concerns regarding potential steelhead residualization at Blackbird Island Pond.

C. Request by NMFS for Blood Samples for Hatchery Fish

Kris Petersen provided an update to the last meeting's discussion about a proposed NMFS study on early maturation that would require lethal sampling for hormone concentrations in blood.

Petersen updated the group that after some internal discussion, she has identified that this "take" of ESA-listed fish would not be covered under the existing ESA permit and that this sampling should not be occurring on ESA-listed fish. The Hatchery Committees discussed that if the Committees agreed in the future that this study were a part of the 2009 M&E Implementation Plan, then the activity might be covered under the existing Section 10 permit for the Hatchery M&E program.

VIII USFWS

Dave Carie asked for clarification of why Chiwawa spring Chinook (a listed stock) were being marked with an ad-clip, as this external mark is typically used to identify hatchery fish that are available for harvest. The USFWS views the use of this mark as a potential limit on harvest potential for spring Chinook from the Leavenworth Hatchery. Carie asked whether there might be another external mark for Chiwawa fish that could be used for this same purpose. Kirk Truscott stated that one reason for the ad-clip is that it is used to distinguish Chiwawa hatchery from wild fish for the reproductive success study. The JFP members agreed to further discuss this issue. Bob Pfeifer and Truscott will coordinate this discussion.

IX HETT Updates

Ali Wick updated the group that the HETT is currently working on reference streams for spring Chinook, and will soon begin the analysis for steelhead and sockeye.

X HCP Administration

A. ONA Program Review

Mike Schiewe will check with the ONA regarding a presentation at a future meeting (June or July) to discuss the year's progress on the Skaha sockeye program. [This was subsequently scheduled for July.]

B. Updates to UCSRB

At the request of the HCP Policy members and based on discussions with the Coordinating Committees, Mike Schiewe will be meeting with the UCSRB next month on April 24 to discuss HCP progress.

C. Informal Meeting Agreements

The following agreements were reached at this meeting:

- The Committees agreed that the HETT could proceed with the proposed actions for NTTOC.

D. Next Meetings

The next scheduled meetings are as follows: April 16 in SeaTac (location TBA); May 21 and June 18 at Chelan PUD in Wenatchee.

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.
Julie Pyper *	Chelan PUD
Chuck Peven	Chelan PUD
George Velasquez (morning only)	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge*	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Keely Murdoch *	Yakama Nation
Tom Scribner *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, and Tom Kahler

Date: May 22, 2008

Re: Final Minutes of April 16, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Radisson Hotel at SeaTac on Wednesday, April 16, 2008, from 9:30 am to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Rick Klinge will coordinate with Washington State Department of Ecology (Ecology) to provide additional information on the implications of changing from individual hatchery well water certificates to well field certificates at the Methow and Wells Hatcheries (Item I).
- Following resolution of the Washington Department of Fish and Wildlife (WDFW) comments on the Chiwawa Steelhead Ponds Feasibility Study, Kirk Truscott will provide an email documenting concurrence with the study document and Statement of Agreement (SOA) that were provisionally approved at the last (March 2008) Hatchery Committees meeting (Item II-A).
- Julie Pyper will provide Chelan PUD's response to WDFW comments on the Chiwawa Feasibility Report to Ali Wick for distribution to the Hatchery Committees (Item II-A).
- Julie Pyper will provide preliminary design drawings of the Chelan Falls rearing facility to the Hatchery Committees (Item II-B).
- Shaun Seaman will provide the Hatchery Committees with an update on installation of the Integrated Status and Effectiveness Monitoring Project (ISEMP) Passive Integrated Transponder tag (PIT-tag) detection arrays (Item II-D).

- The Hatchery Committees will provide comments to Kirk Truscott on WDFW's broodstock collection protocols by Thursday, April 24; Ali Wick will distribute copies of all comments to Committees members (Item III-C).
- Tom Scribner will send Kirk Truscott a template that identifies the information on smolt releases that Scribner requested be made available in advance of the releases; Truscott will review the list and work with the Hatchery Committees in developing a response (Item IV-A).
- Tom Scribner will send out the proposal for kelt reconditioning at the Entiat Hatchery for Hatchery Committees' comment. The Committees will provide comments by the next meeting. (Item IV-B).
- Ali Wick will coordinate with Tracy Hillman to invite him to attend the next Hatchery Committees meeting to discuss the Hatchery Monitoring and Evaluation (M&E) Plan control group recommendations and the technical basis behind them (Item VI-A).
- Kris Petersen will provide a document on steelhead reproductive success study endpoints to the Hatchery Committees by Friday, April 25 (Item VII-A).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the March 19, 2008 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees. Kirk Truscott asked to add an additional action item for Rick Klinge from the last meeting that was overlooked in the meeting minutes. The action item is for Klinge to coordinate with Ecology to provide additional information on the implications of changing from individual hatchery well water certificates to well field certificates at the Methow and Wells Hatcheries.

II Chelan PUD

A. Update on Chiwawa Feasibility Report

Julie Pyper discussed that Chelan PUD has been working toward resolving and responding to WDFW comments on the Chiwawa Feasibility Report. Pyper indicated that one of the issues remained unresolved: whether the proposed water right was adequate to serve capacity and flow density at the hatchery under all possible circumstances. Shaun Seaman

said that this issue is still being worked out with Chelan PUD's consulting engineers. Pending resolution of the water right comment, Kirk Truscott will provide an email that he concurs with the SOA provisionally approved at the last (March 2008) Hatchery Committees meeting. Julie Pyper also noted that Chelan PUD is committed to ensuring that the volitional release infrastructure functions properly, and will be working with the engineers during design to make this release strategy possible. Pyper will provide Chelan PUD's response to WDFW comments to Ali Wick for distribution to the Committees.

B. Engineering Report

Julie Pyper provided an overview of the Engineering Report for March, and addressed several Hatchery Committees questions on this report. The Committees requested that Pyper provide preliminary design drawings for the Chelan Falls rearing facility for Committees' review. The Committees also had several questions about the purpose of the Eastbank Aquifer conceptual model that was developed under contract by the U.S. Geological Survey (USGS). Pyper confirmed that the purpose of the model is to better understand the relationship between water use at the Eastbank Hatchery and the aquifer water temperature. Pyper explained that the purpose of aquifer modeling and the ongoing evaluation of test wells at the Chelan Falls Hatchery is to develop data for use in planning for future operations at the Chelan Falls and Eastbank Hatcheries. She further explained that Chelan PUD was using a "bioprogramming" approach to plan the implementation of Alternative 3 of the Hatchery Facilities Evaluation completed in 2005.

Pyper also provided an update on the water reuse pilot study, which is on schedule. Chelan PUD is in the construction phase, and the ponds and water treatment towers are now installed. The next steps are to evaluate the function of the facility with no fish present and then to begin testing with fish in June.

C. Hatchery Scientific Review Group

Julie Pyper reminded the group that the Hatchery Scientific Review Group (HSRG) will be conducting visits to the Mid-Columbia next week. On May 12 through 15, the HSRG will be convening a summary meeting to review recommendations for the entire Columbia River basin; the meeting location is uncertain at this time, but it will likely be held either in the Tri-Cities or in

Wenatchee. Douglas PUD, Chelan PUD, and WDFW all confirmed that they had provided comment and updates to the HSRG's data.

D. PIT-Tag Detection at Tumwater Dam

Shaun Seaman updated the group that the Tumwater Dam PIT-tag detector is up and running and is sending data to the PTAGIS database. In the course of discussing PIT-tag detection at Tumwater Dam, a question was asked about the status of the ISEMP PIT-tag detection arrays. Seaman agreed to provide the Hatchery Committees with an update on implementation and operation of the ISEMP PIT-tag detection arrays at the next Hatchery Committees meeting.

E. Sockeye Spawning Counter Efficiency Study

Shaun Seaman reminded the group that a new draft of this document has just been sent out for review, and that this will be a discussion item at the next meeting.

III WDFW

A. Sockeye Trap Efficiency Tests

Kirk Truscott reviewed WDFW's plans to use sockeye trapped in Lake Wenatchee to test trap efficiency for this species at the Monitor Trap.

B. Ad-Clipping of Chiwawa Fish

Kirk Truscott reviewed recent discussions with U.S. Fish and Wildlife Service (USFWS) staff regarding the purpose of ad-clipping Chiwawa hatchery fish. The purpose is to distinguish hatchery fish from wild fish on the spawning grounds through visual observations for use in the Wenatchee spring Chinook reproductive success study. The discussion resulted in agreement between the USFWS and WDFW that if the USFWS were to need an alternative mark for the Leavenworth hatchery fish in the future, that the USFWS would develop and implement this additional mark. Tom Scribner noted that he would like the Hatchery Committees to be involved in any marking decisions that affect HCP species, and the Committees agreed that this is a good practice to continue.

C. Broodstock Collection Protocols

Kirk Truscott reminded the group that broodstock collection protocols had been sent out. So far, WDFW has received comments from Douglas PUD and Yakama Nation (YN). Julie Pyper

confirmed that Chelan PUD has comments as well. Truscott noted that the most important issues from his perspective are the Methow rearing capacity and production estimates, and associated with that, the culling of eggs of females with high bacterial kidney disease (BKD) antigen levels as described in the document. Following review of the protocols with the Hatchery Committees, Truscott will discuss these protocols with WDFW policy-level staff before forwarding them to National Marine Fisheries Service (NMFS). The Committees discussed that one important element is that monitoring will be conducted to better understand the potential effect of culling eggs from high BKD females on the prevalence of BKD in returning adult fish.

Tom Kahler asked questions regarding the nature and scope of the proposed culling and monitoring and the implications of those proposed actions on the planned BKD study. The details of the monitoring are under development and would not be included in the broodstock collection protocols, but would include, at a minimum, differential CWT marking of progeny of high-ELISA wild fish, and a comparison of SARs from the marked groups. The Committees briefly discussed the possible inclusion of PIT tagging some fraction of the comparison groups to provide more immediate performance data. The initial implication of the culling and monitoring on the BKD study is that no study would be conducted on the 2008 brood.

On the general topic of broodstock collection, Tom Scribner noted that he would like to have more input into in-season adjustments to the protocols to ensure that the Committees have the best opportunity to meet program goals at the hatcheries. Truscott would like any comments by end of day on Thursday, April 24. Ali Wick will distribute copies of all comments to Committees members.

IV Yakama Nation

A. Release Information as It Affects Trapping

Tom Scribner indicated that YN biologists continue to have problems managing work load and sampling efforts at riverine traps because they do not receive up-to-date hatchery release information (tags, release date, release location, etc.) from hatchery operators prior to release. Kirk Truscott agreed to develop a protocol for smolt release coordination, including asking the hatchery operators to provide information within a week of release. Tom Scribner will send Truscott a template of information that he suggested would meet YN needs; Truscott will review this template and provide a recommendation to the Hatchery Committees for consideration.

B. Kelt Reconditioning Paper

Tom Scribner updated the group that the YN has been in communication with USFWS regarding potential kelt reconditioning, and current thinking is for this activity to occur at the Entiat Hatchery. Scribner will send out an update soon with the proposed implementation plan for Hatchery Committees' comment. The Committees will provide comments by the next meeting.

V Douglas PUD

A. Update on Twisp Weir Construction Project

Tom Kahler updated the group that the Twisp Weir construction project has been completed. One item of note is that the existing trap box was installed unmodified, so when the trap is removed in August, it will be modified at that time. The foundation for the new trap will be also modified in August, as there are currently small gaps between the trap and a pair of aluminum rests on the trap foundation. . These gaps were to be closed with aluminum shims during project implementation, but the contractor failed to install the shims. In the meantime, some wood shims have been installed in the gaps until the work can take place. Finally, triangular plates will be installed to keep fish from jumping through a gap between the picket panels and the aluminum structure that guides fish into the trap. The dimensions of the gap vary according to the angle of the picket panels and the amount of flow through the gaps varies with discharge. Fish response will be monitored by WDFW personnel to inform the design of the triangular plates. The hope is that fish will not be attracted to the gaps under typical operating configurations.

VI HETT Updates

A. Reference Streams (Control Groups) Recommendation for Chiwawa Spring Chinook

Tom Kahler introduced this topic and the one-page summary that was sent out to the Hatchery Committees to document the Hatchery Evaluation Technical Team's (HETT's) recent work to identify control groups for the M&E program. These recommendations were based on analyses using primarily adult data. The Hatchery Committees will discuss what might be done using juvenile data. Ali Wick will coordinate with Tracy Hillman to invite him to attend the next meeting to discuss the recommendations and the technical basis supporting them. Agreeing to control groups for Chiwawa spring Chinook will be up for decision at the next meeting.

B. NTTOC Recommendation

Tom Kahler introduced the HETT's recommendations for non-target taxa of concern (NTTOC; relative to target species), containment objectives for those NTTOC, and a panel of experts to assess program impacts to NTTOC. This is the HETT's biological recommendation, from which the Hatchery Committees will prepare their recommendation that includes policy considerations. This item will be up for decision at the next meeting.

VII NMFS

A. Steelhead Reproductive Success Study Endpoints

Kris Petersen updated the group that she is working on a document summarizing experimental strategies for reproductive success studies, including potential endpoints. She will have this to the Hatchery Committees by Friday, April 25.

VIII Committee Business

A. Update on Task List for HETT for Steelhead Reproductive Success Study Plan

This item is on hold while Kris Petersen prepares documentation for the next meeting (See Item VII-A).

B. Update on BKD Rearing Density Study Siting

This topic was covered under the discussion on the broodstock collection protocols (III C, above). As an action item from the Hatchery Committees meeting on 19 March 2008, Kirk Truscott was to re-evaluate the production capacity for spring Chinook at the Methow Hatchery under the scenario of a BKD study where instead of limiting each raceway to 10,000 study fish, the study fish would be a sub-sample of the production fish held in each raceway at the prescribed study densities. The study design would include the rearing of progeny of high-ELISA parents at normal 0.12 rearing densities; previous experience by WDFW has indicated that rearing high-ELISA fish at that density results in heavy fish losses from BKD. Because WDFW was unwilling to jeopardize additional production fish beyond those necessary for the study, such a study design is not workable. Additionally, Tom Scribner reiterated that the YN would not be satisfied with the 211,000-fish production capacity estimated for the Methow Hatchery under the original study proposal of 10,000-fish study groups, and other parties agreed. The Committees anticipate that the proposed culling of eggs of hatchery origin high-ELISA parents would, at least temporarily, alleviate the capacity constraints associated with the current WDFW BKD rearing

strategy, thereby forestalling the urgent need for the BKD study. No further alternatives for a BKD study were proposed, and no timeline was proposed for future discussion on the topic.

C. Update on Blackbird Island Pond Letter and Potential Steelhead Residualization

Mike Schiewe updated the group that the letter from the Hatchery Committees members had been sent to Ecology asking that the water right request be expedited. Rollie Schmitten from Trout Unlimited is currently working with Ecology on this issue.

Kris Petersen and Kirk Truscott have met to discuss management of the steelhead acclimation at the Blackbird Island Pond, including how best to minimize the proportion of fish that residualize and how to manage those that do residualize.

IX HCP Administration

A. Next Meetings

The next scheduled meetings are as follows: May 21, June 18, and July 16, all at Chelan PUD in Wenatchee.

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
Julie Pyper *	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Russell Langshaw	Grant PUD
Curt Dodson	Grant PUD
Kris Petersen * (afternoon)	NMFS
Dave Carie * (by conference call: morning)	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Tom Scribner *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, and Tom Kahler

Date: June 19, 2008

Re: Final Minutes of May 21, 2008 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, May 21, 2008, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Julie Pyper will send the final design criteria for Chiwawa to Ali Wick for attachment to the previously provided Statement of Agreement (SOA), for the Hatchery Committees' agreement by email. (Item IV-A).
- Julie Pyper will provide Chelan PUD responses to Washington Department of Fish and Wildlife's (WDFW's) comments on the Chiwawa Feasibility Study for the Hatchery Committees' information (Item IV-A).
- Julie Pyper will send the link to the U.S. Geological Survey (USGS) Eastbank Aquifer report on May 27 for the Hatchery Committees' information, if available (Item IV-B).
- Julie Pyper will forward the Chelan PUD Engineering Report when it is available (Item IV-D).
- Shaun Seaman will give an update at the next meeting on the sockeye counter efficiency study plan (Item IV-F).
- Kirk Truscott has received comments on this year's broodstock collection protocols from the Yakama Nation (YN) and from Douglas PUD. He will revise and send out the finalized protocols (Item V-B).

- Shaun Seaman will work with Keely Murdoch to review the list of Bonneville Power Administration (BPA)/YN Memorandum of Agreement (MOA) projects to identify those that may have a nexus with the Hatchery Committees (VI-A).
- The Hatchery Committees will submit any additional comments to the YN on the kelt reconditioning proposal by May 30 (Item VI-B).
- Jerry Marco will send out a proposal on the use of Bonaparte Ponds for rearing Chinook for Hatchery Committees' review before the next meeting (Item VII-A).
- Hatchery Committees' members will discuss how to proceed with implementing Monitoring and Evaluation (M&E) Objective 10 (NTTOC) with their respective agencies with the goal of making a decision at the July meeting (Item IX-A).
- Dave Carie will identify additional experts within the U.S. Fish and Wildlife Service (USFWS) that can address bull trout in the non-target taxa of concern (NTTOC) process (Item IX-A).
- Hatchery Committees' members will discuss the preliminary Hatchery Scientific Review Group (HSRG) recommendations within their agencies in anticipation of future discussion among Committees members when the recommendations are finalized in December (Item IX-B).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the April 16, 2008 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II HETT Presentation on Control Groups

Tracy Hillman provided a presentation on the Hatchery Evaluation Technical Team's (HETT's) work on selecting control groups for use in the monitoring and evaluation of HCP hatchery programs. He began by discussing the difference between reference and control groups and the fact that the HETT is evaluating control groups, not reference groups. He then described the various methods for comparing pre- and post-treatment values and the HETT's rationale for using one method over the other. He described the meaning of the various trend patterns that may occur in treatment effects and that the Hatchery Committees likely will want to use several

of the comparisons to give a more complete picture of the treatment effects. He also noted it was important to retain several control groups in order to increase certainty in inferences made.

Hillman reviewed results of comparisons of natural log-normalized spawner abundance and productivity of control groups for Chiwawa spring Chinook. Productivity was analyzed using recruits per spawner. He confirmed that next steps in the process of identifying control groups would be to focus on those useful for comparisons with the spring Chinook populations in the Twisp, Methow, and Chewuch Rivers, with White River and Nason Creek to follow (the latter under contract from Grant PUD and not affiliated with the HCPs). After spring Chinook, steelhead will be analyzed, followed by sockeye. The Hatchery Committees agreed with this priority going forward and accepted the recommendations from the HETT provided today, which included the use of multiple analyses and statistics to test for the effect of the supplementation programs (Attachment B).

III Douglas PUD

A. Status on Wells Dam PIT-tag Detector

Tom Kahler updated the group that the Passive Integrated Transponder tag (PIT-tag) detector project on the west ladder trap at Wells Dam was completed on May 12 and the system is now functional. BioMark is now remotely monitoring the detections, and WDFW personnel are also hand-wanding captured fish providing opportunity to ground-truth the efficiency of the detection array.

B. Status of Hatchery Well-field Certificates for Wells and Methow Hatcheries

Rick Klinge updated the group that it was his understanding that, based on discussions with the Washington State Department of Ecology (Ecology), combining the water-right certificates for the Wells Hatchery and for the Methow Hatchery well-fields would not jeopardize the existing well water rights or options for the future. Klinge agreed to update the Hatchery Committees as he obtained new information. In order to facilitate the process, Ecology has recommended that the Chelan County Water Conservancy Board be contracted to review the application as Ecology's workload is too high to complete it. Douglas PUD is currently contemplating this arrangement and will be making a decision on this soon, as the PUD's General Manager needs to approve the process.

IV Chelan PUD

A. Finalization of Chiwawa Feasibility Study

Julie Pyper updated the group that Chelan PUD had calculated that a new water right of 21.4 cubic feet per second (cfs) would be applied for by the District for the new steelhead ponds. Such right would be from the Wenatchee River and separate from the existing spring Chinook water right from the Wenatchee River. This would be consistent with the proposed production level of 450,000 steelhead smolts at 6 fish per pound. Chelan PUD will be meeting soon with WDFW to discuss the operations relevant to design for this pond. Pyper will send the final design criteria to Ali Wick for attachment to the previously provided SOA, for the Hatchery Committees' agreement by email. She will also provide Chelan PUD responses to WDFW's previous comments for the Committees information.

B. USGS Report on Eastbank Aquifer Expected out May 27

Julie Pyper updated the group that the report on Eastbank Aquifer Model from USGS is expected on May 27. On May 28, from 8:30 am to 12:00 pm, Chelan PUD is hosting a meeting to debrief about the report, held at Chelan PUD. Julie Pyper will send the link to the document on May 27 for the Hatchery Committees' information, as this is the earliest date that the information will be released.

C. Meeting with Washington State Department of Transportation regarding Tumwater Dam

Shaun Seaman updated the group that Chelan PUD will be meeting with Washington State Department of Transportation (WSDOT) about future road and bank stabilization work adjacent to Tumwater Dam. Tumwater Dam is currently used for broodstock collection and other fish collection and monitoring activities. Currently, WSDOT would like to make some adjustments to the base of the dam, but questions remain regarding fish passage, and so this meeting is being held to try to work out some of these issues. The Hatchery Committees indicated that they would be willing to write a letter in support of maintaining the dam for fish monitoring activities, if necessary.

D. Engineering Report

Julie Pyper will forward the engineering report when it is available.

E. 2007 Monitoring and Evaluation Annual Report

Julie Pyper updated the group that the comment period for the 2007 M&E Annual Report has ended, and that Chelan PUD had received comments only from WDFW; the final report will be out on June 2.

F. Committees' Review of Sockeye Spawner Counter Efficiency Study

Shaun Seaman indicated he would like to table discussion of the sockeye counter efficiency study plan until June while Chelan PUD reviews staffing for implementing this study; Seaman will give an update at the next meeting.

V WDFW

A. Disposition of High ELISA Broodyear 2007 Spring Chinook at Eastbank Annex

Kirk Truscott reported that there were a small number of high-ELISA Chiwawa spring Chinook females incorporated in the 2007 broodstock, which have produced a relatively small group of juveniles (about 800). Truscott indicated that these fish have been adipose-clipped, and that WDFW intends to release them as subyearlings at the confluence of the Chiwawa River at Meadow Creek. The Hatchery Committees indicated that they did not object to this proposal and WDFW will proceed with this action.

B. Broodstock Collection Protocols

Kirk Truscott has received written comments on this year's broodstock collection protocols from the YN and from Douglas PUD and verbal comments from Chelan PUD. He will revise and send out the finalized protocols shortly.

VI Yakama Nation

A. Memorandum of Agreement with Bonneville Power Administration

Keely Murdoch discussed the MOA that has recently been signed by BPA and the YN. Murdoch indicated that she was raising this subject and the YN was open to input from the Hatchery Committees on how best to implement the actions identified in the MOA. Shaun Seaman agreed to work with Murdoch to review the list of projects to identify those that may have a nexus with the Hatchery Committees. This will then be shared with the Hatchery Committees to begin coordination on this work.

B. Kelt Reconditioning Proposal

Keely Murdoch updated the group that the YN had previously distributed a draft proposal to the Hatchery Committees describing a YN approach for kelt reconditioning in the Yakima Basin. The YN would like to develop the plan further, and she stated that, if there are additional comments expected, she would appreciate having those by May 30. Comments have been received thus far from Chelan PUD (Chuck Peven) and from USFWS (Ray Brunson).

VII Colville Tribes

A. Update on Bonaparte Ponds

Jerry Marco updated the group that the Colville Tribes are developing a proposal to rear Chinook smolts in Bonaparte Ponds this fall, and are currently developing a budget for this activity. He will be sending out a proposal before the next meeting for Hatchery Committees' review.

VIII USFWS

C. Two-Year Steelhead Rearing Program

Dave Carie briefly updated the group that the USFWS has begun a 2-year hatchery rearing program for steelhead at Winthrop Hatchery (different from the typical 1-year rearing program). Fourteen females were spawned and the USFWS has observed 98 percent eye-up of these progeny.

IX Committee Business

A. Committees Agreement on HETT Recommendations for Non-Target Taxa of Concern, Containment Objectives, and Panel of Experts

Mike Schiewe introduced this topic, reminding the group that HETT had previously provided recommendations for NTTOC, the NTTOC containment objectives, and a panel of experts to participate in a potential analysis. The Hatchery Committees had an extended discussion on the implications of having containment objectives of 0-percent allowable impact for listed species. Also, Shaun Seaman suggested that the spirit of Objective 10 of the M&E Plan on NTTOC was to analyze risk of impact to non-listed species that are not currently addressed in the HCP (e.g., species such as leopard dace and lamprey). Kirk Truscott brought up the point that it would be infeasible and potentially unacceptable to WDFW to support a 0-percent containment objective. Kris Petersen agreed with this comment.

Mike Schiewe reminded the group that today's discussion is about a modeling exercise that would help the Hatchery Committees evaluate where new data are needed, and not about an automatic decision to begin new field programs.

Keely Murdoch commented that the YN suggests reducing the containment objective percentage for Wenatchee and Okanogan sockeye to less than or equal to 5 percent, due to the importance of sockeye to the tribe, as well as the reduced size of sockeye populations in the Mid-Columbia system relative to pre-development conditions.

Several of the Hatchery Committees' members requested more time to evaluate this recommendation and the Committees will continue discussion of this item in July. Committees' members will discuss how to proceed with implementing M&E Objective 10 with their respective agencies with the goal of making a decision at the July meeting. Mike Schiewe summarized that the issues that need to be resolved include: 1) whether the analysis would include species already being monitored under the HCP; 2) whether a 0-percent containment is realistic and acceptable for any of the species; and 3) who will facilitate the NTTOC process. Also, Dave Carie agreed to discuss internally whether the USFWS would identify a list of experts that can address bull trout as a potential NTTOC.

B. Summary of Hatchery Scientific Review Group Preliminary Recommendations

Mike Schiewe briefed the group on the recent meeting that was held to discuss the HSRG's preliminary recommendations. Several of the metrics discussed included proportion of natural influence (PNI), proportion of natural origin in the broodstock (pNOB), and proportion of hatchery-origin spawners (pHOS). Schiewe noted that several of the recommendations called for aggressively limiting the numbers of hatchery origin fish on the spawning grounds, and the development of localized broodstocks. He also noted that the recommendations included the idea of culling high-ELISA fish when programs are not broodstock-limited. The HSRG intends to finalize these recommendations by December.

Schiewe said that it would be important for the Hatchery Committees to discuss these and any potential implications for the HCPs. The Committees agreed that the path forward would be for individual Committees members to work these recommendations through their respective

organizations, and be prepared to discuss those that may affect the HCP process. No timeline was set for further discussions, other than it was noted the HSRG recommendations will not be finalized until December 2008.

C. Reproductive Success Study Endpoints

Kris Petersen recently sent out a document summarizing experimental strategies for reproductive success studies, including potential endpoints for these studies. The Hatchery Committees discussed how the National Marine Fisheries Service (NMFS)/Columbia River Intertibal Fish Commission (CRITFC) hatchery supplementation workshop scheduled for June 3 and 4, 2008, in Seattle would be useful in the development of these studies. Kirk Truscott noted that WDFW will use Petersen's document as well as information from the upcoming workshop to formulate a study plan that the Committees could use as a starting point to develop a study plan; the Committees agreed with this approach.

X HCP Administration

A. Next Meetings

The next scheduled meetings are as follows: June 18, July 16, and August 20, all at Chelan PUD in Wenatchee.

B. Meeting Agreements

The following informal agreements were made at today's meeting:

- The Hatchery Committees agreed with the HETT's proposed Wenatchee spring Chinook control groups and accepted the recommendations from the HETT to use multiple analyses and statistics to test the effects of the supplementation programs on unsupplemented populations (Item II).
- The Hatchery Committees agreed with WDFW's planned early release of adipose-clipped progeny of 2007 high-ELISA broodstock spring Chinook at the confluence of the Chiwawa River at Meadow Creek (Item V-A).
- The Hatchery Committees agreed that WDFW, using Kris Petersen's recent guidance document on steelhead reproductive success studies, as well as information from the upcoming workshop, would formulate a steelhead reproductive success study plan that the Committees could use as a starting

point for planning a Wenatchee steelhead reproductive success study (Item IX-C).

List of Attachments

Attachment A – List of Attendees

Attachment B – Chiwawa Spring Chinook Control Groups Handout

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Tracy Hillman	BioAnalysts, Inc.
Shaun Seaman *	Chelan PUD
Julie Pyper *	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
George Thompson	Grant PUD
Curt Dotson	Grant PUD
Kris Petersen * (by conference call)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

CHIWAWA SPRING CHINOOK CONTROL GROUPS HANDOUT

Chiwawa Spring Chinook Control Groups

Initial Candidate Groups:

(1) Naches
(2) Entiat
(3) Lemhi
(4) Marsh
(5) Sesech
(6) Little Wenatchee

Final Groups for Spawner Abundance:

Comparison of LN spawner abundance of control groups with Chiwawa spring Chinook before the Chiwawa group was supplemented (1981-1991). The correlation coefficient reflects the relationship between the control groups and the Chiwawa group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the Chiwawa group; and the effect size represents the minimum detectable difference between the Chiwawa group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.22	P = 0.06	1.36
Entiat	0.58	P = 0.21	1.82
Lemhi	-0.03	P = 0.52	1.45
Marsh	0.28	P = 0.17	1.88
Sesech	0.37	P = 0.33	0.97
Little Wenatchee	0.70	P = 0.25	0.97
Mean (N, E, M, S, LW)	***0.58***	***P = 0.28***	***1.12***
Mean (E, M, S, LW)	***0.73***	***P = 0.97***	***1.03***
Mean (E, S, LW)	***0.70***	***P = 0.56***	***0.99***

Final Groups for Productivity (Returns/Spawner):

Comparison of LN productivity (R/S) of control groups with Chiwawa spring Chinook before the Chiwawa group was supplemented (1981-1991). The correlation coefficient reflects the relationship between the control groups and the Chiwawa group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the Chiwawa group; and the effect size represents the minimum detectable difference between the Chiwawa group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.63	P = 0.71	1.79
Entiat	0.64	P = 0.03	1.50
Lemhi	0.43	P = 0.99	2.11
Marsh	0.79	P = 0.30	1.30
Sesech	0.84	P = 0.11	1.31
Little Wenatchee	0.85	P = 0.21	1.33
Median (N,E,M,S,LW)	***0.91***	***P = 0.09***	***1.32***
Median (E,M,S,LW)	***0.90***	***P = 0.17***	***1.18***
Median (M,S,LW)	***0.86***	***P = 0.47***	***1.04***

MetChew Spring Chinook Control Groups

Initial Candidate Groups:

(1) Naches
(2) Entiat
(3) Lemhi
(4) Marsh
(5) Sesech
(6) Little Wenatchee

Final Groups for Spawner Abundance:

Comparison of LN spawner abundance of control groups with MetChew spring Chinook before the MetChew group was supplemented (1981-1994). The correlation coefficient reflects the relationship between the control groups and the MetChew group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the MetChew group; and the effect size represents the minimum detectable difference between the MetChew group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.51	P = 0.79	3.12
Entiat	0.22	P = 0.00	3.80
Lemhi	0.36	P = 0.03	3.21
Marsh	0.83	P = 0.57	4.48
Sesech	0.66	P = 0.43	3.26
Little Wenatchee	0.55	P = 0.00	3.48
Mean			
Mean			
Mean			

Final Groups for Productivity (Returns/Spawner):

Comparison of LN productivity (R/S) of control groups with MetChew spring Chinook before the MetChew group was supplemented (1981-1994). The correlation coefficient reflects the relationship between the control groups and the MetChew group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the MetChew group; and the effect size represents the minimum detectable difference between the MetChew group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.32	P = 0.09	1.76
Entiat	0.66	P = 0.01	1.89
Lemhi	0.13	P = 0.03	1.30
Marsh	0.70	P = 0.47	1.41
Sesech	0.68	P = 0.01	0.70
Little Wenatchee	0.80	P = 0.06	1.10
Median			
Median			
Median			

Twisp Spring Chinook Control Groups

Initial Candidate Groups:

(1) Naches
(2) Entiat
(3) Lemhi
(4) Marsh
(5) Sesech
(6) Little Wenatchee

Final Groups for Spawner Abundance:

Comparison of LN spawner abundance of control groups with Twisp spring Chinook before the Twisp group was supplemented (1981-1994). The correlation coefficient reflects the relationship between the control groups and the Twisp group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the Twisp group; and the effect size represents the minimum detectable difference between the Twisp group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.26	P = 0.83	2.44
Entiat	-0.09	P = 0.00	2.41
Lemhi	0.01	P = 0.01	2.55
Marsh	0.65	P = 0.21	4.05
Sesech	0.48	P = 0.09	2.43
Little Wenatchee	0.16	P = 0.00	2.79
Mean			
Mean			
Mean			

Final Groups for Productivity (Returns/Spawner):

Comparison of LN productivity (R/S) of control groups with Twisp spring Chinook before the Twisp group was supplemented (1981-1994). The correlation coefficient reflects the relationship between the control groups and the Twisp group before supplementation; differences in trends determines if the change in the time series of control groups differed significantly from the Twisp group; and the effect size represents the minimum detectable difference between the Twisp group (T) and the control groups (C) in five-years post-supplementation.

Control Group	Correlation Coefficient	Differences in trends	Effect size (T-C) in 5 years
Naches	0.37	P = 0.05	1.92
Entiat	0.61	P = 0.00	1.53
Lemhi	0.11	P = 0.01	1.86
Marsh	0.62	P = 0.22	1.68
Sesech	0.62	P = 0.00	0.79
Little Wenatchee	0.79	P = 0.01	0.97
Median			
Median			
Median			

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Tom Kahler, Keely Murdoch, and Bob Pfeifer

Date: July 22, 2008

Re: Final Minutes of June 18, 2008 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, June 18, 2008, from 9:30 am to 1:30 pm. Following the meeting, the Committees proceeded on a site visit of the water reuse pilot study at Eastbank Hatchery. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Kirk Truscott and Jerry Marco will meet with Eastbank Hatchery staff to discuss whether 50,000, instead of 100,000 of the 576,000 summer Chinook programmed for rearing and release in the Similkameen River could be reared and released from Bonaparte Ponds. This would be conditioned on resolving the water quality and icing problems previously encountered at Bonaparte Ponds (Item III).
- Kirk Truscott will update the Hatchery Committees this week about whether Washington Department of Fish and Wildlife (WDFW) can implement additional consecutive trapping days at Wells Dam to minimize adult passage delays at the trapping weirs (Item IV-A).
- WDFW and Douglas PUD will meet to discuss potential structural and operational ways of minimizing adult fish delay at the Wells Dam ladders during trapping (Item IV-A).
- Kirk Truscott will be distributing the revised broodstock protocols soon (Item V-B).
- Shaun Seaman will check on the availability of motion-sensing radio tags for use in the sockeye salmon spawning studies this year, and will also ask Chelan PUD staff to estimate the number of tags that would be needed, both practically and statistically (Item VI-A).

- Joe Miller will work with John Skalski and Tracy Hillman on a statistical power analysis to determine the numbers of radio tags that would be necessary to estimate sockeye salmon spawning ground residency time and observation error—both are parameters needed for area-under-the-curve estimates of spawner abundance (Item VI-A).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the May 21, 2008 Meeting Minutes pending revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II HETT Update

The Hatchery Evaluation Technical Team (HETT) is currently compiling data and conducting analyses to determine the suitability of potential control groups to be used in the Hatchery Monitoring and Evaluation (M&E) of Methow Basin spring Chinook. Tracy Hillman is separating and analyzing Methow and Chewuch populations independently for these analyses. Following these analyses, the HETT will consider control groups for steelhead and sockeye. The Hatchery Committees requested a matrix showing the control groups and populations for each of the objectives, to be prepared at the conclusion of the work.

III Colville Tribes

Jerry Marco updated the group that he had sent a proposal out for discussion regarding reinitiating use of Bonaparte Ponds to rear up to 100,000 summer Chinook smolts from the Similkameen program. The proposal outlines the problems with the current system and discusses how modified operations would address these issues. The Colville Tribes have secured funding and plan to drill a well to develop a groundwater source for the ponds that would be isolated from the Okanogan River. Marco noted that the Colville Tribes would not go forward with the proposed rearing in Bonaparte Pond if a groundwater source is not found. The Hatchery Committees will review the proposal this month and will decide on it at the next meeting. Kirk Truscott and Jerry Marco will meet with Eastbank Hatchery staff to discuss whether 50,000, instead of 100,000 of the 576,000 summer Chinook programmed for rearing and

release in the Similkameen River could instead be reared and released from Bonaparte Ponds. This would be conditioned on resolving the water quality and icing problems previously encountered at Bonaparte Ponds.

IV Yakama Nation

A. Wells Dam Trapping of Methow Spring Chinook Broodstock

Tom Scribner expressed concern that adult spring Chinook migration was being delayed at Wells Dam because fish were not immediately passing the trapping weir when the diversion screens were in the water. He asked if WDFW was considering the potential negative impact that this delay might be having on spawning fish. Kirk Truscott acknowledged this delay, and indicated that WDFW would like to analyze the existing facility to evaluate trapping configuration to minimize fish delay. Currently, Truscott believes that the issue may be that the attraction flow to the trapping weir occurs at a right angle to the flow exiting the fish ladder; a remedy to this might include installing a diagonal picket weir or some other flow modification. Scribner suggested that some modification in trapping schedule might also, at least in the short term, minimize fish delay. Truscott said that he will discuss with his trapping staff the possibility that increasing the period the screens are in the water might reduce the delay. The specific request was to increase to two consecutive 24-hour days of trapping on the west ladder and 16-hour days (dawn to dusk) of trapping on the east ladder. Truscott will update the Hatchery Committees this week as to whether this might be a workable solution. WDFW and Douglas PUD agreed to meet to discuss what changes might be possible in the future to remedy this situation.

V WDFW

A. Reproductive Success Proposal

Kirk Truscott reminded the Hatchery Committees that WDFW and National Marine Fisheries Service (NMFS) have provided a proposal for a potential reproductive success study to the Committees to use in the development of a Committees-approved study plan. Committees' comments are requested by the end of July to Andrew Murdoch. The development of a study plan will be discussed in August.

B. Broodstock Protocols

Kirk Truscott has received comments from the Yakama Nation, Douglas PUD, and Chelan PUD on the broodstock protocols. Kirk Truscott will work with Tom Scribner on these and said that he will be sending out the final protocols soon.

C. Wenatchee Spring Chinook Management Plan White Paper

Bob Pfeifer updated the Committees that WDFW has been preparing a white paper for Wenatchee Spring Chinook Management. This paper will discuss such topics as escapement goals and managing hatchery-wild proportions on spawning grounds. One outstanding issue that WDFW is still working on is the capability of using genetic stock identification in broodstock collections. The next JFP meeting will be on July 22, and the draft paper will be sent out for Committees review following a full JFP review.

VI Chelan PUD

A. Sockeye Spawner and Counter Efficiency Study Update

Steve Hays said that after reviewing the sockeye spawner and counter efficiency study plan again, he is concerned the seining approach that was proposed might be too stressful or otherwise damaging to fish nearing their spawning time. He suggested the possibility of using Passive Integrated Transponder tags (PIT-tags) for this work to track spawner escapement. Keely Murdoch commented that early on in the study development in the HETT, external tags plus radio tags with motion sensors were discussed but dismissed due to cost. Tom Scribner noted that the HETT had taken considerable time to refine this study plan, and was concerned about the timing of Hays input. The Hatchery Committees discussed the merits of going forward with a study that might damage spawners versus delaying and going with a plan that might provide higher quality data. In order to more fully consider the possible use of radio tags, Shaun Seaman will check on the availability of motion-sensing radio tags for study this year, and also committed Chelan PUD (Joe Miller) to work with John Skalski and Tracy Hillman on a statistical power analysis to determine sample sizes. Seaman also indicated that Chelan PUD would further explore the potential to use PIT-tags, and a 2008 study plan would follow. Kirk Truscott suggested that even if radio tags were not available, it might be possible to use Peterson tags to estimate counter efficiency for this year.

B. Blackbird Pond

Shaun Seaman updated the group that Chelan PUD will be supporting the Blackbird Pond project with Trout Unlimited. The project is progressing forward to have fish in the pond next year.

C. Okanagan Nation Alliance Sockeye Program

Shaun Seaman reviewed with the Hatchery Committees that the Statement of Agreement (SOA) on Skaha sockeye from 2005 confirms that Chelan PUD fulfills its mitigation obligation for Okanogan River sockeye by funding the Okanagan Nation Alliance's (ONA) Skaha sockeye program through 2013. Seaman reaffirmed with the Committees that, according to this agreement, after 4 years (2009 data), Chelan PUD will conduct a check-in on the program. He wanted to confirm this again with the Committees because next month's Hatchery Committees meeting will include an update from the ONA on survival for the third year (2008 data) and previous years. This program is funded jointly with Grant PUD.

D. Tumwater Dam

Shaun Seaman updated the group that Washington State Department of Transportation (WSDOT) and Chelan PUD had met to discuss bank stabilization at Tumwater Dam. At that meeting, the U.S. Fish and Wildlife Service (USFWS) raised the question about potential removal of the dam. Seaman said that Chelan PUD believes that the facility has a value toward recovery, and asked whether the Hatchery Committees would want to send a letter that confirms this. The Committees discussed that they would like to think about this further. Chelan PUD will consider this issue and will come back at a later date to discuss.

E. Engineering Report

Chelan PUD intends to prepare a status report for the July meeting. Julie Pyper commented that there are no "red flags" to date on any of the ongoing projects.

VII Douglas PUD

A. Status of Hatchery Well-field Certificates for Wells and Methow Hatcheries

Rick Klinge updated the group that Douglas PUD has been in touch with the Chelan Water Conservancy Board regarding these certificates and the PUD has been working to understand the cost involved. The Hatchery Committees have previously recommended that any change in these certificates should not affect the water right. Klinge will update the group on any new movement on this item.

B. Chewuch Trap

Tom Scribner asked for an update on this item. Rick Klinge said that Douglas PUD has not discussed this recently due to other workload issues; the most recent discussions several years ago were that Chewuch Dam was likely the most workable location.

VIII HCP Administration

A. Reminders

Ali Wick reminded the group that the Hatchery Committees agreed at the last meeting that they would discuss within their agencies the Non-target Taxa of Concern (NTTOC) process and the Hatchery Scientific Review Group (HSRG) recommendations, for discussion at the July meeting. Further discussions regarding HSRG recommendations indicated that there were different opinions as to how the HSRG recommendations would be addressed. Kirk Truscott and Tom Scribner stated that the HSRG recommendations were simply that and it would be up to the Hatchery Committees to decide how to apply the recommendations. Seaman asked that the Hatchery Committees members be ready to discuss how their respective agencies plan on addressing the recommendations. For the HSRG discussions, this includes bringing to the meeting an understanding of the policy-level approach and responses to the HSRG recommendations.

B. Next Meetings

The next scheduled meetings are as follows: July 16 in SeaTac at Grant PUD's offices; and August 20 and September 17 at Chelan PUD in Wenatchee.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Ali Wick	Anchor Environmental, L.L.C.
Shaun Seaman *	Chelan PUD
Julie Pyper *	Chelan PUD
Steve Hays (morning only)	Chelan PUD
Jerry Marco * (by conference call)	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Kris Petersen * (by conference call)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Bob Pfeifer, and Tom Kahler

Date: August 20, 2008

Re: Final Minutes of July 16, 2008 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 Wednesday, July 16, 2008, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Chelan PUD will provide a schedule for developing a proposal using Passive Integrated Transponder tags (PIT-tags) to estimate observer error and redd residence time for use in Area-Under-the-Curve (AUC) estimates of spawner counts for Lake Wenatchee sockeye (Item VI-A).
- Tom Scribner and Russell Langshaw will look into a temporary loan of Grant PUD's ultrasound equipment to Washington Department of Fish and Wildlife (WDFW) for use in the Wells Hatchery summer Chinook program; Kirk Truscott will verify that the current fish holding arrangement at Wells Hatchery will allow the use of this equipment (Item VII-A).
- Kirk Truscott will distribute a brief summary on broodstock collection for the Hatchery Committees' information (Item VII-C).
- Mike Schiewe will be requesting that Hatchery Committees members document their recommendations for (a) species of concern, (b) risk containment levels, and (c) panel members, as a way to move forward on implementing Objective 10 of the Hatchery Monitoring and Evaluation (M&E) Program (Non-target Taxa of Concern [NTTOC] analysis; Item VIII-A).

- Mike Schiewe will call Michael Newsom regarding Bureau of Reclamation's (BOR's) plans for reproductive success studies (Item VII-D).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the June 18, 2008 Meeting Minutes subject to revisions from Douglas PUD; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Colville Tribes

Jerry Marco informed the group that the Colville Tribes have a proposal out for review and discussion regarding the use of Bonaparte Ponds to rear up to 100,000 summer Chinook smolts from the Similkameen program. The Hatchery Committees discussed the proposal and concluded that it would likely be approved when a source of warmer water was available to prevent icing over of the pond during the winter. Eastbank Hatchery staff will be uniquely marking these fish in anticipation of this program going forward this year. Marco will prepare a Statement of Agreement (SOA) for the Committees' consideration after the water supply issue has been resolved.

III Yakama Nation

A. Surplus Summer Chinook Eggs from Wells Hatchery

Tom Scribner discussed with the group that the Yakama Nation request for summer Chinook eggs from "excess" broodstock at Wells Hatchery had not yet been resolved with the Colville Tribes; he noted that this issue was separate from, but tied to, the allocation of "excess" broodstock that had in past years been distributed to the tribes. Mike Schiewe reminded the Hatchery Committees that under the HCP the responsibility of the Committees was to determine whether a surplus existed, but that any issue related to allocation or use (for any purpose) was a fishery co-manager issue. Kris Petersen also noted that any proposed transfer of eggs or live fish to the Yakima River would be subject to Endangered Species Act (ESA) consultation. Steve Parker joined the meeting by phone and,

after being briefed on the discussion, agreed to look into the ESA issue and work with WDFW on the allocation and use issue. Chelan PUD requested to have it reflected in the meeting minutes that it is abstaining from this discussion.

IV Okanogan Nation Alliance and Fish-Water Management Tool Presentation

A. Skaha Sockeye Program

Howie Wright of the Okanagan Nation Alliance (ONA) presented an overview of the Skaha Lake sockeye program, including information from the 2007 egg take and releases. The ONA has documented that adult sockeye from earlier releases are returning to the Okanagan and have been observed on the spawning grounds. Based on 2007 returns, Skaha smolt-to-adult return rates (SARs) are lower than Osoyoos SARs, but within the range of SARs in other British Columbia sockeye populations. Wright also noted that there is no evidence that kokanee survival and growth have been affected by the presence of sockeye in the system. The ONA has recently participated in a 4-year review of the program with the Canadian Okanagan Basin Technical Working Group (COBTWG) to confirm that the ONA is meeting the requirements of the program. For the 2008 broodyear, the ONA expects to easily meet their broodstock goal.

B. Okanagan Fish-Water Management Tool

Kim Hyatt introduced the Okanagan Fish-Water Management Tool (FWMT) and presented a summary for 2007–2008. The Tool is a simulation model and rule set that informs how water is managed in the Okanagan River Basin in British Columbia. The model takes into account event timing and natural variations to maximize fish survival as it relates to water availability. Sockeye fry emergence is verified with direct field observation to confirm that the FWMT is managing actual conditions. The tool was used successfully this season and the development team recently received an award for its work.

V Douglas PUD

A. Update on Operation of Twisp Weir

Rick Klinge updated the group that the Twisp weir has been operating smoothly and successfully this summer, even under fairly high flows. Kirk Truscott noted that WDFW is retaining one out of every three fish collected, and so far, there are approximately 40 adults on station. Truscott indicated that this number is higher than last year, and this should

translate to the full program of 550,000 spring Chinook smolts at the Methow Hatchery. Klinge also noted that spring Chinook jacks and bull trout have been observed at the weir.

B. HSRG Draft Recommendations

Mike Schiewe updated the group that he had attended a meeting with NMFS and PUD representatives to gain insight into how NMFS plans to deal with the Hatchery Scientific Review Group (HSRG) recommendations. NMFS expressed that any possible changes to any of the HCP hatchery programs would have to meet these two ESA criteria: changes would have to be 1) based on the best available science, and 2) reasonably certain to occur. NMFS will also consider trust responsibilities with regard to treaty rights. Kris Petersen noted that she has been tasked with evaluating which programs might warrant re-initiation of consultation as a result of the HSRG recommendations. She will provide additional information as it evolves. The PUDs emphasized to NMFS staff that early notification of any proposed changes would be critically important from a facilities perspective.

VI Chelan PUD

A. Sockeye AUC Study Update

Joe Miller introduced this subject and summarized the discussions on the sockeye spawner efficiency study (also known as the AUC study) to date. At the last meeting, Chelan PUD agreed to check on the cost of radio tags and the required number of fish that would need to be tagged. Miller reported that the tags cost approximately $212 each, and that an optimal sample size would be approximately 5-10% percent of the run. This estimate would translate to a cost of anywhere from $150,000 to $600,000 for tags alone. This estimate would translate to a cost of anywhere from $150,000 to $600,000 for tags alone, depending on percentage of fish tagged and the run size (which could exceed 30k in 2008). He also checked on the availability of antennae and signal decoders to detect radio tags and indicated that Chelan does not have any of this equipment available for this year. The PUD's entire inventory is deployed and committed through 2009 for ongoing studies. To purchase new units, the cost per decoder is $9-12,000 and likely several would be needed to cover the White and Little Wenatchee Rivers. Given that (1) a radio-tag study would be extremely expensive and difficult to implement in 2008 because of the short-time frame, (2) the expectations of a very large run , and (3) the need to develop a long-term solution to measuring escapement , Chelan PUD would like to move ahead with a proposal to install

PIT-tag arrays on the White River and Little Wenatchee Rivers to enumerate Wenatchee sockeye escapement in the future. The Hatchery Committees took advantage of attendance of the ONA and Department of Fisheries and Oceans – Canada (DFO) staff at the meeting, and asked for their input on the best methods for defining AUC parameters. Kim Hyatt noted that for the most part DFO had relied on mark-recapture studies. Julie Pyper indicated that, in August, Chelan PUD would provide a schedule for developing a proposal for using PIT-tags and in-stream detection arrays to estimate redd residency times and observer error. The Committees agreed with this path forward.

B. USGS Report Follow-Up

Julie Pyper updated the group that the U.S. Geological Survey (USGS) report on the Eastbank Aquifer has been finalized and is available to the general public. In response to the report, Chelan PUD intends to increase monitoring of the aquifer, and begin developing an aquifer management plan.

C. MOA with Bonneville

This discussion was deferred to the next meeting, when Shaun Seaman and Keely Murdoch will be present, as they were reviewing the Memorandum of Agreement (MOA) project list for opportunities for coordination of HCP and MOA activities.

D. Tumwater Dam meeting with WSDOT

Julie Pyper said that there is no activity on this item, but as this process unfolds, the Hatchery Committees will be kept informed.

E. CRITFC Sampling at Tumwater

Julie Pyper updated the group that the Columbia River Intertribal Fish Commission (CRITFC) had requested permission for access to Tumwater Dam to continue their annual sockeye salmon sampling. It was noted that this will require anesthetizing fish with MS-222. Kirk Truscott indicated that he was interested in learning more details about this sampling, so that WDFW can evaluate what, if any, measures need to be taken to prevent anglers from consuming fish that had been exposed to MS-222 within 21 days of capture. Because this is not an HCP issue, the fisheries co-managers will discuss this offline.

F. Engineering Report

Julie Pyper provided and discussed key points in the Engineering Report for July. Regarding the Chiwawa acclimation ponds, Pyper noted that Chelan PUD is currently working on the water right permit, and will be evaluating what components of the facility could be constructed in 2009, before the water rights are finalized.

VII WDFW

A. Broodstock Gender ID

The Hatchery Committees discussed the status of WDFW's evaluation of ultrasound as a way to determine fish gender at an early stage of maturation. Tom Scribner asked whether ultrasound was being used for summer Chinook at Wells Hatchery. Kirk Truscott said it was not currently being tested there, and that the only equipment was Chelan PUD's and was being used elsewhere. Scribner noted that the use of ultrasound at Wells Hatchery could help make sure adequate broodstock were available to meet program objectives, and could also help determine if there were fish in excess of broodstock needs at a time when the fish are in better shape and might be available for harvest. Scribner indicated that he would like to see additional units purchased. Julie Pyper communicated that the District had funding to purchase additional units in 2008 if use during the current year brood stock collection proved that the units were useful and warranted. Truscott reminded the group that WDFW was still evaluating the technology and planned to continue the evaluation this year before committing to further purchases. He indicated that if another unit was available he could look into whether WDFW could also test the technology at Wells Hatchery. Tom Scribner and Russell Langshaw will look into borrowing Grant PUD's ultrasound unit for use by WDFW; Truscott will verify whether the holding pond at Wells Hatchery is set up in such a way that it is possible to use it for the summer Chinook program (Item VI-F).

B. Proposal to PIT-Tag Steelhead

Kirk Truscott updated the group that he is seeking the Hatchery Committees' concurrence on a WDFW proposal to body-tag female steelhead at Tumwater Dam. The purpose of the pilot study would be to evaluate whether the shedding of PIT-tags as steelhead spawn can be used to identify spawning location and relate the location to individual females. Joe Miller said that without a study design and plan, that there are too many unknowns to evaluate the proposal. He indicated that Chelan PUD would need a study plan before

approving any study. Joe Miller indicated that examining tag retention in the hatchery environment would be a beneficial step in determining the efficacy of the body cavity approach. Chelan PUD would support the examination of PIT-tag retention in brood stock, but would not support the use of the protocol in the field until it is vetted. Mike Schiewe noted that such a study might be appropriate as part of the 2009 M&E Implementation Plan. Julie Pyper confirmed that this plan is slated for Committees review in the next few weeks. The Committees agreed that, as a first step, WDFW could begin evaluating PIT-tag shedding by double-tagging steelhead broodstock at Eastbank Hatchery. Truscott agreed with this approach and will work with hatchery staff to develop a brief study protocol.

C. Broodstock Collection Update

Kirk Truscott updated the group that WDFW has counted about 3,900 spring Chinook at Tumwater, of which approximately 500 are wild. The proportion of wild fish is lower than pre-season predictions. At Chiwawa, WDFW has halted collection of hatchery origin fish until more wild fish are collected. The goal under the permit for both programs is 33 percent wild fish in the brood. Truscott will soon send out a brief summary on these numbers for the Hatchery Committees.

D. Steelhead Reproductive Success Study Plan

The Hatchery Committees discussed the path forward for developing the steelhead reproductive success studies that are described in the three HCPs. WDFW had previously distributed a study proposal for the Wenatchee that might serve as either a starting point for planning or as a possible study that could be implemented if funded. Joe Miller indicated that Chelan PUD was anticipating this discussion at the August meeting but had strong reservations about moving forward with the study given the HSRG recommendations that appear to have already decided the fate of hatchery steelhead on the Wenatchee. There would be some question about the relevance of the study if all the hatchery fish were removed. Chelan PUD anticipates conducting a reproductive success study in accordance with the HCPs, but will continue to question how a study proposal can be evaluated before the Committees have (1) determined the goal and objectives of the study itself, or (2) decided how the study results would influence on-the-ground program changes. At this point, the WDFW, Yakama Nation, National Marine Fisheries Service (NMFS), and the Colville Tribes indicated that they are in agreement in principle with the WDFW study

proposal. Julie Pyper reminded the Committees that comments on the WDFW study proposal were due to Andrew Murdoch by the end of July, and that consideration of the proposal would be more appropriate after any comments were addressed. Mike Schiewe indicated that he wanted the Committees to be prepared to discuss the proposal and agree on a path forward in August. Mike Schiewe will call Michael Newsom regarding Bureau of Reclamation's (BOR's) plans for reproductive success studies.

VIII HETT

A. NTTOC Discussion

Mike Schiewe introduced this topic by summarizing that the Hatchery Evaluation Technical Team (HETT) had previously provided its recommendations for species of concern, risk containment criteria, and area biologists who were knowledgeable of these species and might be asked to serve in the study group. Joe Miller indicated that Chelan PUD had refocused on the language in the HCPs, M&E plan and other documents to prioritize the consideration of NTTOC species. The result of this effort was a much smaller list of species that reflected high risk and priority interactions. These included the four high risk interactions with NTT Chinook in Table 3 of the M&E plan. Chelan felt that this "refocusing" effort was important because the HCP was designed to address Plan Species - as opposed to all species present, and that many of the interactions were addressed by other regulatory efforts or as the result of the current M&E plan. Chelan also indicated that objective 10 (NTTOC) in the M&E plan explicitly states that monitoring all species is impractical, prioritization must be focused on the species of highest risk, and "Investigating these effects will rely primarily on efforts outlined in objectives 1-8". Miller also noted that Chelan PUD believes that most of the NTTOC interactions involving the HCP species are (1) already considered in the incidental take permits and associated Biological Opinions that cover Chelan PUD's hatchery programs or will be in the context of future consultations, and (2) other resident species and those species not included in the HCPs and Biological Opinions should be addressed in Relicensing Settlement Agreements where plans (e.g., resident species, bull trout, pikeminnow) have been established and approved by many of the same parties as are present on the Hatchery Committees. Kris Petersen noted that not all species interactions are considered under the ESA consultations. Miller also stated that the listed containment objectives of "zero," for some interactions among Plan Species, did

not comport with existing incidental take permits that authorize take and presumably would exceed the zero containment level. Miller also stated that Chelan PUD was concerned that the entire NTTOC objective was originally a regional objective with expected contributions by other parties but was now apparently the sole responsibility of the Chelan PUD. In conclusion, Chelan PUD indicated a desire to consider the NTTOC interactions in the context of the existing M&E objectives 1-8, focusing on the four high priority Chinook species, as opposed to convening the panel of regional experts to consider the broader range of interactions. The Hatchery Committees then engaged in an extended discussion on whether and how the NTTOC process should be implemented. To move the discussion forward, Mike Schiewe will be sending an email to each of the Committees members asking for them to document their recommendations for which species to focus on, what the appropriate risk containment levels are, and any changes to the list of biologists who might participate in the study group. He reiterated that the NTTOC objective is part of the approved Hatchery M&E Program and will need to be either addressed or modified.

IX HCP Administration

A. Meeting Agreements

The following informal agreements were made at the meeting:

- The Hatchery Committees agreed that the path forward for the AUC study is that in August, Chelan PUD will provide a schedule for developing a proposal for using PIT-tags as the evaluation tool for calculating AUC (Item VI-A).
- The Hatchery Committees agreed that Kirk Truscott can instruct his staff to double-tag the steelhead broodstock in the hatchery to determine tag shedding rates; the use of these data will be described further in the study plan (Item VII-B).

B. Next Meetings

The next scheduled meetings are as follows: August 20, September 17, and October 15, all at Chelan PUD in Wenatchee.

List of Attachments

Attachment A – List of Attendees

Attachment B – Okanagan Nation Alliance Presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Julie Pyper *	Chelan PUD
Joe Miller	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Barry Rosenberger (ONA presentation and AUC discussion)	DFO-Canada
Kim Hyatt (ONA presentation and AUC discussion)	DFO-Canada
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Todd Pearsons	Grant PUD
David Duvall (ONA presentation and AUC discussion)	Grant PUD
Debbie Williams (ONA presentation and AUC discussion)	Grant PUD
Chris Carlson (ONA presentation and AUC discussion)	Grant PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Howie Wright (ONA presentation and AUC discussion)	ONA
Denny Rohr (ONA presentation and AUC discussion)	Rohr and Associates
Dave Carie * (by conference call)	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Bob Rose	Yakama Nation
Tom Scribner *	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

OKANAGAN NATION ALLIANCE PRESENTATION

Reintroduction of Sockeye Salmon into Skaha Lake

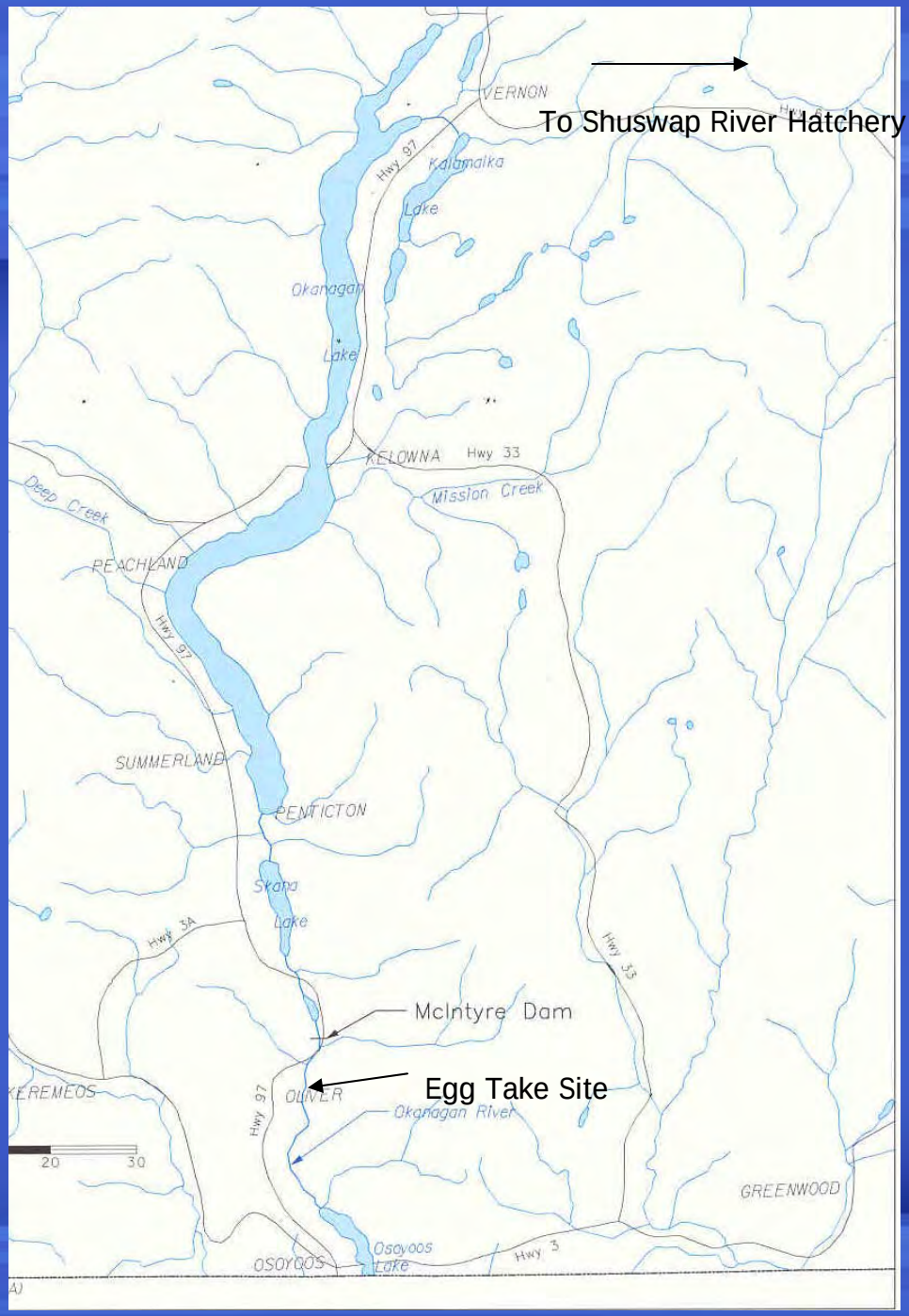
Okanagan Nation Alliance
3255 C Shannon Lake Road
Westbank, BC V4T 1V4
250.707.0095

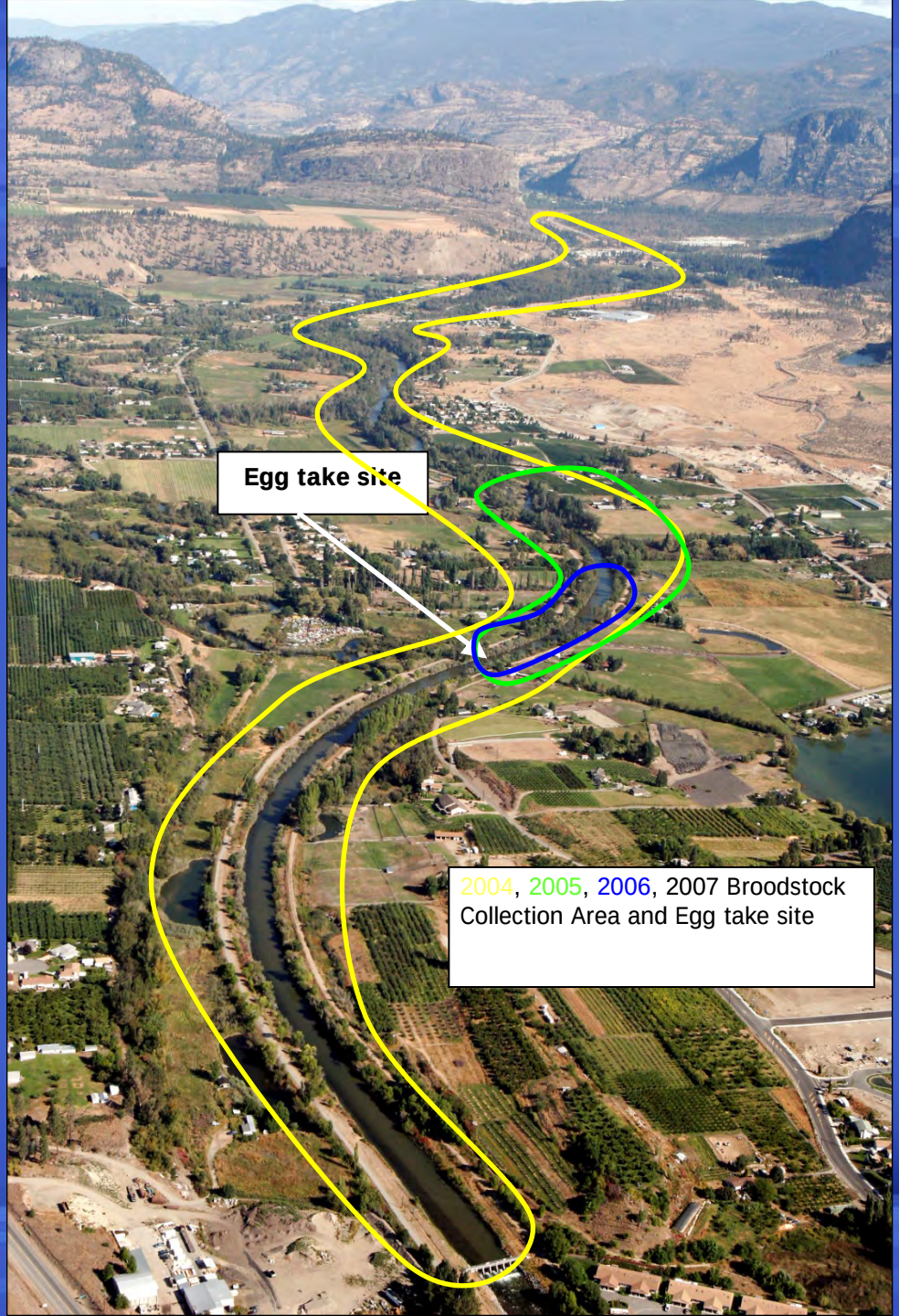
Background

- **Initiated by the Okanagan Nation in 1997**
- **Multi-agency workshop**
- **Proposed Reintroduction into Okanagan L. - Skaha Lake selected as the experimental control**
- ***"Evaluation of an Experimental Reintroduction into Skaha Lake"* funded by BPA (2000-2003)**
- **Pilot Reintroduction in 2003**
- **12-year Sockeye Reintroduction Program implemented in 2004**

Summary of Broodstock Collections and Fry Releases

Brood years 2004 - 2007


To Shuswap River Hatchery
VERNON
Hwy 97
Kalamalka
Lake
Okanagan
Lake
KELOWNA
Hwy 33
Mission Creek
Deep Creek
PEACHLAND
Hwy 97
SUMMERLAND
PENTICTON
Skaha
Lake
Hwy 3A
Hwy 33
McIntyre Dam
Egg Take Site
KEREMEOS
OLIVER
Hwy 97
Okanagan River
20
30
GREENWOOD
Osoyoos
Lake
OSOYOOS
Hwy 3


Egg take site
2004, 2005, 2006, 2007 Broodstock Collection Area and Egg take site

Collection, Transportation and Holding

Egg Take

Evening Release

Ceremonial Release

Summary of Broodyears 2004-2007

	2004	2005	2006	2007
Spawning escapement est.	21,423	24,279	18,686	13,504
No. females / males retained	642 / 700	680 / 720	656 / 690	395/450
Final inventory of green eggs	1,574,600	1,702,400	1,742,800	1,053,800
Number of fry ponded	1,372,400	1,462,800	1,504,700	926,680
Number of fry externally marked	363,300	150,000	--	-
Number marked released	349,000	134,300	--	-
Total number released (fry/ha)	1,205,500 (603)	1,384,000 (692)	1,479,000 (740)	885,500 (443)
% survival (green eggs to fry)	76.5 %	81.3 %	85.5 %	84.03%
Average weight at release	1.16 g	1.01 g	1.24 g	1.27 g

All fry receive thermal otolith marking. Mortalities associates with calcein application deemed too high to continue with external marking in 2005 - 2007.

- In-Lake Monitoring
- Smolt migration monitoring
- Adults returning (habitat/migration studies)

1. Kokanee variables
2. Sockeye variables
3. Four year review (2004-2007)
4. 2008 BY
5. Hatchery Update

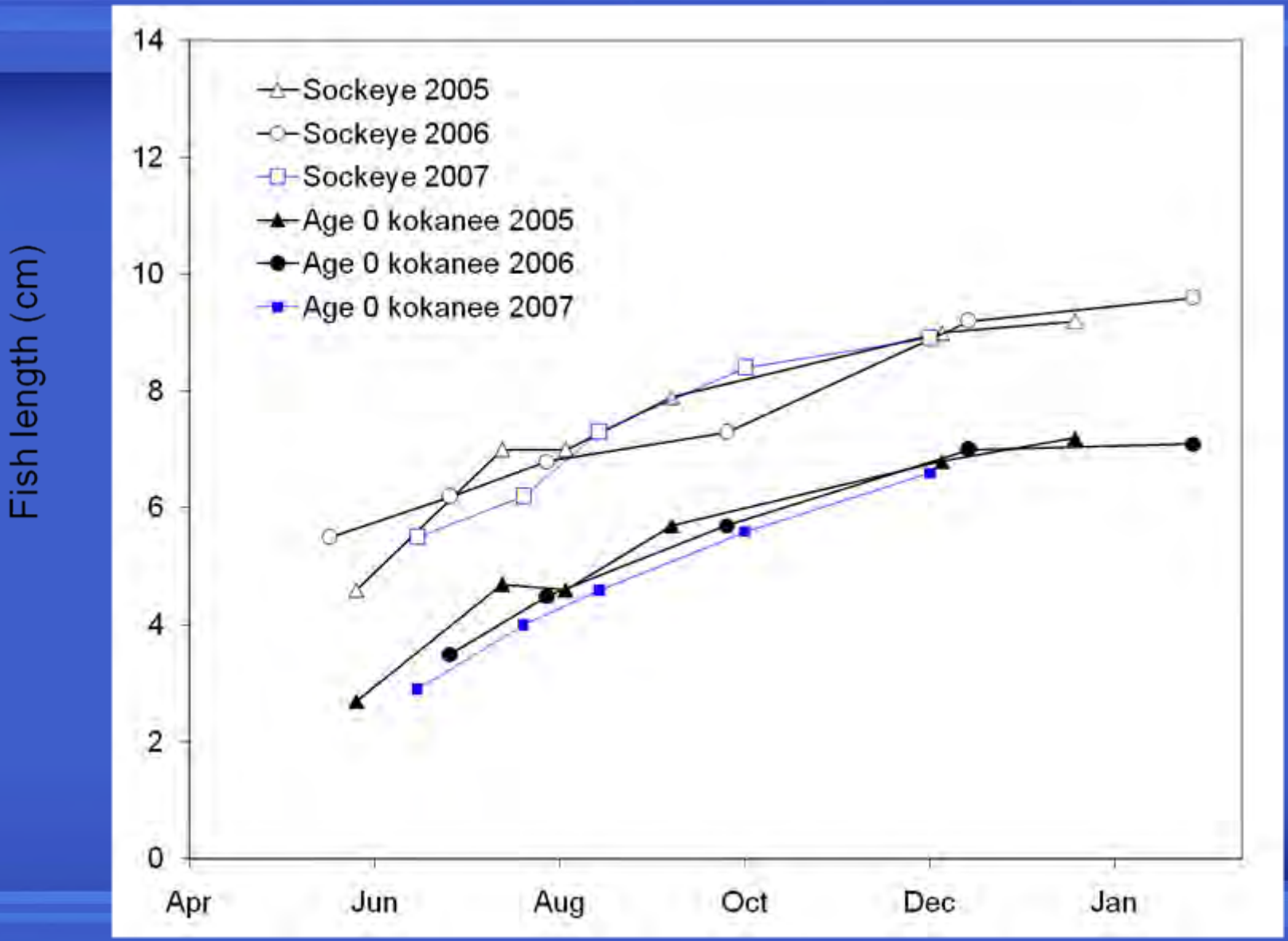
Kokanee Variables

Are kokanee numbers declining in presence of sockeye?

Age 0 kokanee survival not changing

	2005	Stocked 26 May	Sampled 13 Jul 2005	Sampled 18 Jan 2006
Age 0 sockeye	Density per ha	602	241	72
			% surviving since July	**30**
Age 0 kokanee	Density per ha		241	186
			% surviving since July	**77**
	2006	Stocked 19 May	Sampled 29 Jul 2006	Sampled 27 Feb 2007
Age 0 sockeye	Density per ha	692	194	66
			% surviving since July	**34**
Age 0 kokanee	Density per ha		210	109
			% surviving since July	**52**
	2007	Stocked 17 May	Sampled 17 Jul 2007	Sampled 18 Mar 2008
Age 0 sockeye	Density per ha	735	223	99
			% surviving since July	**44**
Age 0 kokanee	Density per ha		145	116
			% surviving since July	**80**

Age 0 kokanee growth not changing



Are Skaha sockeye being produced in sufficient numbers?

Objective: no more than 10% of Spawners

Effects on Osoyoos Lake sockeye?

Year	AUCriver	Number spawners taken	Percent spawners taken
2003	18,896	458	2
2004	40,908	1400	3
2005	31,536	1464	5
2006	20,819	1421	7
2007	13,504	955	7

Skaha egg-to-winter fry survival is higher

	egg number	Late summer fry number	% egg to late summer fry survival		Pre-Smolt numbers	% egg to winter fry (Pre-smolt) survival
Osoyoos Lake						
2005	70,901,746	4,000,000	**6**		1,800,000	**3**
2006	44,064,433	2,500,000	**6**		1,600,000	**4**
2007	33,439,894	2,500,000	**7**		2,202,930	**7**
Skaha Lake						
2005	1,574,600	400,000	**25**		144,000	**10**
2006	1,702,400	300,000	**18**		132,000	**9**
2007	1,742,800	220,000	**13**		198,000	**11**
2008	1,053,800	440,000	42			

sockeye smolts produced in Skaha Lake

2005	Stocked 26 May		13-Jul-05	3-Aug-05	7-Sep-05	25 Nov - 13 Dec.		18-Jan-06	Juvenile sockeye production
Density per ha	602		241	198	301	85		72	144,000

2006	Stocked 16-19 May	26-Jun-06	24 July - 03 Aug.		20-27 Sept 06	23-Nov-06		26-27 Feb 07	
Density per ha	692	103	194		100	117		66	132,000

2007	Stocked 16-17 May	11-Jun-07	17-Jul-07	14-Aug-08	2-Oct-07	13-20 Nov 07	20-Dec-07	18-Mar-08	
Density per ha	735	nd	223	110	154	78	56	99	198,000

Skaha production remains at about 10% of Osoyoos production

Production per Lake

Osoyoos		Skaha	
18-Jan-06	1,812,890	18-Jan-06	144,000
14-Mar-07	1,480,560	26-27 Feb 07	132,000
15-Jan-08	2,202,930	18-Mar-08	198,000

Are Sockeye Adults Returning? 2007 Spawners (2003 pilot year)

BY	SEX	THERMAL MARKS	NO THERMAL MARKS	Total fish	% of hatchery fish
2003 OR OLDER	Male	4	89	93	4
	Female	17	175	192	9
2004	Male	10	52	62	16
	Female	17	36	53	32
				400	

Adults are returning

Age Structure/Proportion of Skaha Sockeye

	Brood Year			
	2003		2004	
AUC (River)	%	number	%	number
13,504	71	9,622	29	2,766

		Skaha Adults		Osoyoos Adult	
BY	AUC River	%	number	%	number
2003	9,622	7	709	93	8,913
2004	2,766	23	649	77	2,117

Smolt/Adult Ratio

	Smolts	Adults	Ratio
Skaha	176,500	709	0.40
Osoyoos	850,000	8,913	1.05

SK survival compared to other watersheds

- Comparison to sk hatchery supplementation in other watersheds
- Taltahn
- Tatsenmine

Four year review – COBTWG Skaha Sub-Committee

- ONA mtg requirements of program
- Continue with same monitoring program and fry supplementation
- Want to push limits of Skaha Lake (require hatchery)
- May have to evaluate potential ‘hatchery effect” which would involve releasing into Osoyoos Lake (2010 or 2011)
- Conduct spawning habitat assessments (spawn habitat most likely limiting)
- Provide long term program on trap and transport of adults
- Learning for Okanagan Lake

2008 Broodyear Plans

Workplan for ESSA Technologies for support in:

1. Data management
2. Evaluation/Synthesis
3. Model options

2008 Broodyear

- 2008 **estimates** for Sockeye returns
  - July 9, 2008 about 80,000 at Wells Dam
  - Therefore maximize collection of females for broodstock to hatchery capacity

Shuswap River Hatchery

- Priority on Adams Lake (Fraser) sockeye egg take
- Maximum capacity is 1.7-million eggs (due to biomass / water flow constraints of rearing ponds)
- Will investigate varying release strategy similar to 2007 BY

Hatchery Study Design

Penticton Indian Band Lands

2007 Objectives

- Identify aquifer depth, thickness and extent at the selected site
- Determine well and aquifer hydraulic properties
- Develop an initial conceptual hydrogeologic model
- Evaluate potential for development of a 2,000 gpm well field
- Characterize groundwater physical and chemical properties and assess the suitability of the resource for use as the hatchery water supply

Deliverables

- Completed groundwater test wells
- Aquifer and water quality data
- Draft and Final Hydrogeologic Report

Update/next steps

- a suitable aquifer exists near the proposed hatchery site,
- characterize the aquifer properties and water quality to develop conceptual design of a hatchery wellfield,
- Identified additional groundwater-related studies needed to develop final design

Next Steps

- Develop to 75% final design to confirm programming, and provide supporting technical information, project definition and construction costs in more detail
- Refine capital and operational cost budgets
- Work with PUDs since plans for ONA owned/leased to sockeye program
- First Egg Take October 2010

Any Questions????

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Draft Memorandum

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

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Jeff Korth, Bob Pfeifer, Steve Hays, Joe Miller

Date: September 18, 2008

Re: Draft Minutes of August 20, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD offices in Wenatchee, Washington, on Wednesday, August 20, 2008, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Rick Klinge will send an email to the Hatchery Committees describing planned water releases from Okanagan Lake that are intended to minimize the temperature-oxygen squeeze in Osoyoos Lake (Item II-C).
- Tom Kahler will provide a field study plan for Passive Integrated Transponder tagging (PIT-tagging) additional spring Chinook parr in the Methow sub-basin (Item II-D).
- Hatchery Committees members will be prepared to discuss the path forward for Monitoring and Evaluation (M&E) Plan Objective 10 (Non-target Taxa of Concern [NTTOC]) at the next meeting (Item IV-A).
- Chelan PUD will present a draft bacterial kidney disease (BKD) management plan for discussion at the next meeting, with the goal of having a Hatchery Committees decision in October (Item IV-F).
- Joe Miller will send a preliminary proposal to install PIT-tag arrays and implement the sockeye enumeration study to Ali Wick for distribution to the Hatchery Committees (Item IV-H).
- Tom Kahler will provide for the Hatchery Committees' information the Scope of Work describing the Bureau of Reclamation's (BOR's) monitoring of habitat improvements in the Methow sub-basin (Item IV-I).

- Mike Schiewe will talk again with Michael Newsom (BOR) regarding the October 10, 2008, meeting to discuss BOR's habitat improvement program in the Methow Basin, and their proposed steelhead reproductive success study; Schiewe will forward this information to the Hatchery Committees (Item IV-I).
- Kirk Truscott will coordinate a Joint Fisheries Parties (JFP) response to Chelan PUD's memorandum discussing Washington Department of Fish and Wildlife's (WDFW's) steelhead reproductive success study plan (Item IV-I).
- Kirk Truscott will provide dated broodstock collection updates (Item VII-A).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the July 16, 2008 Meeting Minutes subject to revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Douglas PUD

A. Response to HETT NTTOC Recommendations

Rick Klinge requested more time for Douglas PUD to consider the Hatchery Evaluation Technical Team (HETT) recommendations and formulate a Douglas PUD response.

B. Request for Additional Wells Summer Chinook Brood for Study Fish

Rick Klinge informed the Hatchery Committees that Douglas PUD is requesting that an additional 29 adult Wells summer Chinook be collected for broodstock so that approximately 50,000 smolts would be available for dam passage survival studies in the spring of 2010. Klinge said that by early winter of this year, Douglas PUD will have a preliminary study design available for review by the Coordinating Committees. In the event that the juveniles were not needed for a study, they would be released as part of the current program. Tom Kahler pointed out that these fish would need to be held separate from the regular production once they are marked. Mike Schiewe clarified that the role of the Hatchery Committees is to decide whether these fish are available, and the role of the Coordinating Committees will be to agree to a survival study design. Kirk Truscott stated that there is no shortfall in Wells summer Chinook broodstock, so this request will not affect

the existing program. The Hatchery Committees agreed to the collection of these additional fish.

C. Update on FWMT Action to Prevent Osoyoos Lake Oxygen-Temperature Squeeze

Rick Klinge updated the group that the Fish-Water-Management Tool (FWMT) team has reported that the oxygen levels in Osoyoos Lake are dropping to levels that could affect the survival of juvenile sockeye currently residing in the lake. As a result, the FWMT team recommended a water flush (approximately 1,000 cubic feet per second [cfs]) from Okanagan Lake in late August and early September, with the goal of increasing oxygen levels in Osoyoos Lake. Jerry Marco asked whether anyone knew the location of fish holding in the lake; Klinge verified that there have not been any recent studies to evaluate this. Klinge also said that this information represents another benefit of this tool, as this was an unanticipated use of the FWMT. Typically, the information from the FWMT is used to reduce scour and dewatering in spawning areas. Klinge will send an email verifying the dates and specifics of this action.

D. Proposed Parr Tagging in the Methow Sub-basin

Tom Kahler introduced this topic stating that Douglas PUD is proposing to increase efforts to PIT-tag spring Chinook parr in the Methow Basin. Additional numbers of PIT-tagged parr are needed to enhance the collection of M&E information on juvenile fish production. Currently, WDFW M&E crews are having trouble meeting sample sizes as described in the Douglas PUD M&E Plan. Douglas PUD intends to work with WDFW crews to collect and tag as many as 10,000 fish per year, with beach seining the preferred collected method. In response to a question from Keely Murdoch, Tom Kahler clarified that protocols for collecting genetic material would follow the methods that are currently being used when fish are being PIT-tagged at the screw traps, as described in the Douglas PUD M&E Implementation Plan. Kris Petersen commented that Douglas PUD should continue to meet conditions of the permit, and Kahler verified that this would be the case. The Hatchery Committees concurred that this tagging can proceed this year, with re-evaluation next year, provisioned on Douglas PUD providing a copy of a field study plan to the Committees for their reference. Tom Kahler will provide this document.

E. Hatchery Space

Rick Klinge updated the group that Grant PUD submitted to Douglas PUD a request to rear 80,000 summer steelhead at the Wells Hatchery and 201,000 spring Chinook at the Methow Hatchery. The Hatchery Committees concurred with this request, as in past years. This action is consistent with previous years' requests and continues the Committees' support of Chelan and Douglas' NNI obligation under their respective HCPs for the Methow system.

F. Disposition of Wells Summer Chinook Juveniles

Rick Klinge asked about the status of summer Chinook broodstock being held at Wells Hatchery that are provisionally earmarked for use by the Yakama Nation (YN) for green eggs that would be used in a pilot summer Chinook program in the Yakima sub-basin. Kirk Truscott verified that eggs from these fish will leave the hatchery as green eggs; however, he was uncertain if any decision had been made by WDFW Olympia staff regarding their intended use. Keely Murdoch reported that Tom Scribner indicated that Heather Bartlett would be sending a letter to Joe Peone stating that WDFW approved the use, even though the Colville Tribes objected. Kris Petersen indicated that she was unsure if the transfer was covered by any existing Endangered Species Act (ESA) permit, and that this needed to be resolved before any transfer occurred.

III Presentation: Hatchery Induced Life-history Variability in Chinook Salmon

Drs. Don Larsen and Brian Beckman from National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center presented a summary of their research on precocity in Chinook salmon. Don Larsen gave the first half of the presentation, which included a summary of data showing that in some years up to 50 percent of the male spring Chinook from a given brood year return as precociously mature mini-jacks. Larsen noted that NMFS uses a biochemical marker to screen hatchery populations prior to release to estimate the proportion of fish that are likely to mature precociously. This work has been conducted on populations at other area hatcheries, with recent percentages ranging from approximately 10 to 50 percent, and generally trending upward. Recently, this work was extended to Chinook at Carlton, Dryden, and Similkameen Ponds, and mini-jack percentages were 37 percent, 17 percent, and 10 percent, respectively. Larsen's conclusions were that mini-jacks are ubiquitous; mini-jack percentages are variable from population to population and from year to year; supplementation programs with local

broodstock may have a higher proportion of mini-jacks; and a high proportion of mini-jacks obviously affects production

Brian Beckman's half of the presentation focused on the effect of emergence timing on life-history decisions. Beckman noted that in brood years with a relatively low proportion of precocious parr, there appears to be a relationship to the timing of ponding the juveniles and the release size. In years in which juveniles are ponded during a compressed period in late spring, the fish are subsequently released at a smaller size, and they tend to exhibit lower proportions of mini-jacks. Conversely, early emerging fish that are released at a large size have a high propensity for early male maturation. These results suggest that the Cle Elum Hatchery strategy of late release contributes to a low rate of age-1 precocious parr. Beckman speculated that this schedule perhaps best mimics conditions found in headwater streams and is favorable for yearling releases.

IV Chelan PUD

A. NTTOC Discussion

Shaun Seaman agreed to support Douglas PUD's request to defer this discussion until next meeting so that the full Hatchery Committees can discuss. The Committees agreed to be prepared to discuss NTTOC at the next meeting.

B. Chelan PUD Engineering Report

Julie Pyper said that the Engineering Report will be discussed next meeting.

C. Lake Wenatchee Net Pens

Julie Pyper updated the Hatchery Committees that the Lake Wenatchee net pens had been damaged, probably by a recreational fishing lure caught in the net, and that an unknown number of juvenile sockeye had escaped and a large number of pikeminnow had entered the net pen. The net has been repaired, and the pikeminnow have been removed. Information has already been forwarded to Tracy Hillman (BioAnalysts, Inc.) for inclusion in the annual M&E report.

D. Chelan PUD M&E Work Plan Comments

The Hatchery Committees agreed to submit comments on the Chelan PUD M&E Work Plan by next meeting (September 17). This schedule will allow the PUD to move forward with contracting in a timely manner.

E. PIT-tag Array at Peshastin and Entiat

Shaun Seaman updated the group that Chelan PUD is working with ISEMP|WDFW and the PIT-tag Information System (PTAGIS) database manager to obtain PIT-tag detection data from the Peshastin Creek and Entiat River PIT-tag arrays in order to evaluate steelhead spawning ground composition. Joe Miller outlined that indications are that initial problems with database format and accessibility will be resolved by the end of the summer and data will be available for use.

F. BKD Strategy Draft SOA

Shaun Seaman indicated that Chelan PUD will be drafting a Statement of Agreement (SOA) on BKD management for HCP Plan Species based on recent discussions in the Hatchery Committees and the Hatchery Scientific Review Group (HSRG) recommendations. Chelan PUD will work with WDFW in the preparation of the draft SOA and will present a draft at the next meeting, with a goal of having a Committees decision in October.

G. Tribal MOA with Bonneville

Shaun Seaman and Keely Murdoch have been reviewing the 2008 Columbia Basin Fish Accords Memorandum of Agreement (MOA) project list for opportunities for coordination of HCP and MOA activities. Seaman provided a summary table with a list of hatchery projects for Upper Columbia Spring Chinook and steelhead ESUs, organized by river basin. Jerry Marco commented that the Colville Tribes do not have a similar table prepared at this time, but as the Chief Joseph Hatchery program develops, he will initiate a discussion like this in the Hatchery Committees.

H. Sockeye Enumeration Study Update

At the last meeting, the Hatchery Committees discussed developing a plan to install PIT-tag arrays to support determining sockeye escapement in the White and Little Wenatchee Rivers. Joe Miller provided a handout today with a preliminary proposal to install these

arrays and implement this study. He will send it to Ali Wick for distribution to the Committees. Chelan PUD would like comments by the next meeting and will have an SOA prepared for decision on the proposed study approach at that meeting.

I. Steelhead Reproductive Success Study Proposal

Regarding the WDFW study plan for steelhead reproductive success studies in the Wenatchee sub-basin, the Committees engaged in a lengthy discussion about the obligation to implement a steelhead reproductive success study and the timing of such a study. The Committees discussed the fact that the HCP does describe the need for a reproductive success study but does not prescribe a study date or timeline. The Committees discussed that the draft HSRG recommendations included proposed changes that would affect the nature of the steelhead hatchery program in the Wenatchee, and also the likelihood that these recommendations would be adopted. After some discussion about this and the WDFW study plan that was provided last month, NMFS, WDFW, YN, and the Colville Tribes indicated that they supported the WDFW study plan; Marco indicated the Colville Tribes would approve deferring a start until after the HSRG recommendations were finalized and considered. Chelan PUD stated that it did not support going forward with the study plan at this time, indicating that the HSRG recommendations may influence the need for and design of a study plan once the recommendations were finalized and considered by the Committees. Specifically, Chelan PUD noted that the HSRG has recommended substantive changes including the removal of at least 80 percent of hatchery origin spawners. This recommendation for the Wenatchee and the HSRG's recommendation for all steelhead programs that "outplanting of hatchery steelhead be discontinued (or at least minimized) wherever facilities are not available to recapture returning adults that escape harvest," strongly suggests that enough evidence exists to conclude that hatchery fish are deleterious on the spawning grounds. If the Committees implement a study now, and then change the management of steelhead to reflect the HSRG's recommendations, any results would be confounded by a significant reduction or the absence of hatchery steelhead.

Moreover, if Chelan PUD opted to maintain the integrity of the study, Chelan PUD would have to maintain a significant number of hatchery origin spawners on the spawning grounds (e.g., not implement the HSRG recommendations). Either way, Chelan PUD is concerned that proceeding with a study, before the final recommendations are available

would be premature. In addition, the PUD is concerned about starting the study when over-winter acclimation at the new Chiwawa Acclimation Facility will likely occur during the study. This too would greatly influence the relative abundance of hatchery fish on the spawning grounds and potentially affect the reproductive success of hatchery fish, which may be spatially segregated and subject to the density dependent efforts. This operational change is going to occur and, like implementation of the HSRG recommendations, would confound the study results. Kirk Truscott agreed to coordinate a JFP response to Chelan PUD's concerns as expressed in their recent memorandum to the Committees, including questions about the timing of the study, consistency with the language in the HCP, and how to make management decisions with the study results.

In addition, and not related to Chelan PUD's work per se, Mike Schiewe reported that he contacted Michael Newsom of the BOR about BOR plans for steelhead reproductive success studies in the Methow Basin. Newsom indicated that Bonneville Power Administration (BPA) will be funding the study, and that it is required by the Federal Columbia River Power System (FCRPS) Biological Opinion. Newsom indicated that a meeting was being planned for October 10, 2008, in Twisp to review the study design and discuss logistical issues; BOR's habitat monitoring will also be discussed. Tom Kahler indicated that he had only limited information on the BOR's steelhead relative reproductive success study, but would provide to the Hatchery Committees a Scope of Work describing BOR's monitoring of their habitat improvement program in the Methow sub-basin. Schiewe will talk again with Newsom regarding an agenda for the October 10 meeting, and will forward this information to the Committees.

V NMFS

A. NMFS Letters on Upper Columbia River FCRPS Consultation

Mike Schiewe brought up the topic that NMFS had recently sent out a draft letter discussing their plan for reviewing federally funded hatcheries in the Columbia River basin as required under the 2008 FCRPS Biological Opinion. The letter indicated that NMFS would be taking this opportunity to review HCP-funded hatchery programs as well. The letter also indicated that NMFS would be holding a meeting in September to discuss the schedule for this review, and that they would be requesting revised Hatchery Genetic Management Plans (HGMPs) for all the programs by November 1, 2008. Kris Petersen commented that NMFS

recognizes that new consultations may not be necessary for every program, and there must be clear rationale for any new consultations. Shaun Seaman commented that Chelan PUD will be sending a response letter to NMFS on this topic; Douglas PUD will also provide comments on the draft letter. NMFS has requested that comments be submitted by COB on August 22.

VI WDFW

A. Wenatchee Spring Chinook White Paper

The Hatchery Committees requested an update on the Wenatchee spring Chinook white paper. Kirk Truscott updated the group that the white paper is still in progress and it will be provided to the Committees when it is available. The outstanding issues still being discussed by the co-managers are related to broodstock abundance versus diversity in the sub-basin and how they support recovery. Julie Pyper requested that as soon as any sections of the white paper were available for distribution, Chelan PUD would appreciate receiving a copy; she noted that Grant PUD requested the same at the previous day's PRCC HSC meeting.

VII Yakama Nation

A. Questions on Status of Summer Chinook Broodstock Collection

Keely Murdoch asked Kirk Truscott about the status of summer Chinook broodstock collection at Wells Dam. One of the questions related to whether the changes in collection protocol implemented to make up the shortfall in broodstock were for the Methow/Okanogan and Wenatchee programs. Truscott indicated that the actions currently being taken are intended to make up the shortfall for the Methow/Okanogan program, but there is no shortfall for the Wells program. Murdoch commented that if shortfalls in the Methow/Okanogan program continue, the YN would recommend suspending the summer Chinook fishery that targets fish above Priest Rapids. Kirk Truscott will be providing another broodstock collection update soon.

VIII HETT Update

Tom Kahler updated the group that the HETT has been reviewing information on potential reference populations for the Methow, Chewuch, and Twisp populations. The HETT has identified a problem with the Chewuch numbers in some years, and will be further looking into

the issue. Early indications are that there are only two reference streams that may serve as reference populations.

IX HCP Administration

A. Meeting Agreements

The following informal agreements were made at the meeting:

- The Hatchery Committees agreed that Douglas PUD can authorize collection of an additional 29 adult summer Chinook to produce up to 50,000 smolts for use in dam passage survival studies in spring 2010 (Item II-B).
- The Hatchery Committees concurred that Douglas PUD could PIT-tag up to 10,000 spring Chinook parr in the Methow for use in their M&E Program, with re-evaluation next year, provisioned on Douglas PUD providing a copy of the field study plan to the Committees for their reference (Item II-D).
- The Hatchery Committees concurred with the Grant PUD request of Douglas PUD to rear 80,000 summer steelhead and 201,000 spring Chinook at Wells and Methow Hatcheries, respectively (Item II-E).

B. Next Meetings

The next scheduled meetings are as follows: September 17, October 15, and November 19, all at the Chelan PUD offices in Wenatchee.

List of Attachments

Attachment A – List of Attendees

Attachment B – Hatchery Induced Life-history Variability in Chinook Salmon (presentation handout)

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Julie Pyper *	Chelan PUD
Joe Miller	Chelan PUD
Shaun Seaman *	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Todd Pearsons	Grant PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Brian Beckman (presentation only)	NMFS
Don Larsen (presentation only)	NMFS
Dave Carie * (by conference call)	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Jeff Korth	WDFW
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

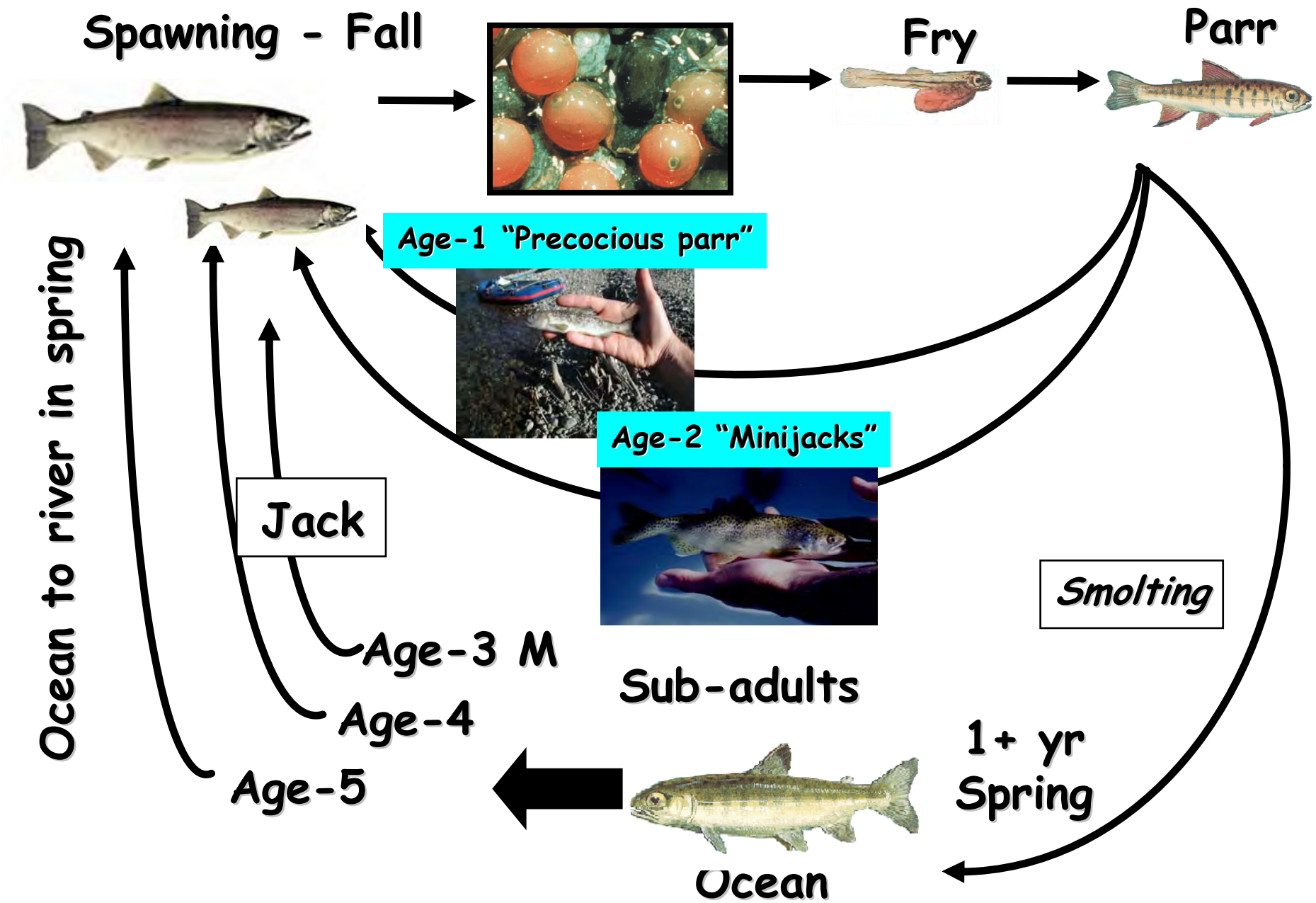
HATCHERY INDUCED LIFE-HISTORY VARIABILITY IN CHINOOK SALMON (PRESENTATION HANDOUT)

Hatchery induced life-history variability in Chinook Salmon

Don Larsen - part1
Brian Beckman - part 2

NOAA Fisheries, Northwest Fisheries Science Center
Seattle, Washington

Chinook Salmon



Variation in Age of Male Maturity

Mature male salmon

Factors Affecting Age of Maturation

- ✓ Genetics
- ✓ Environment
  - temperature
  - food availability
  - food quality

} Growth & Body energy stores

The Hatchery environment can significantly influence age of maturation

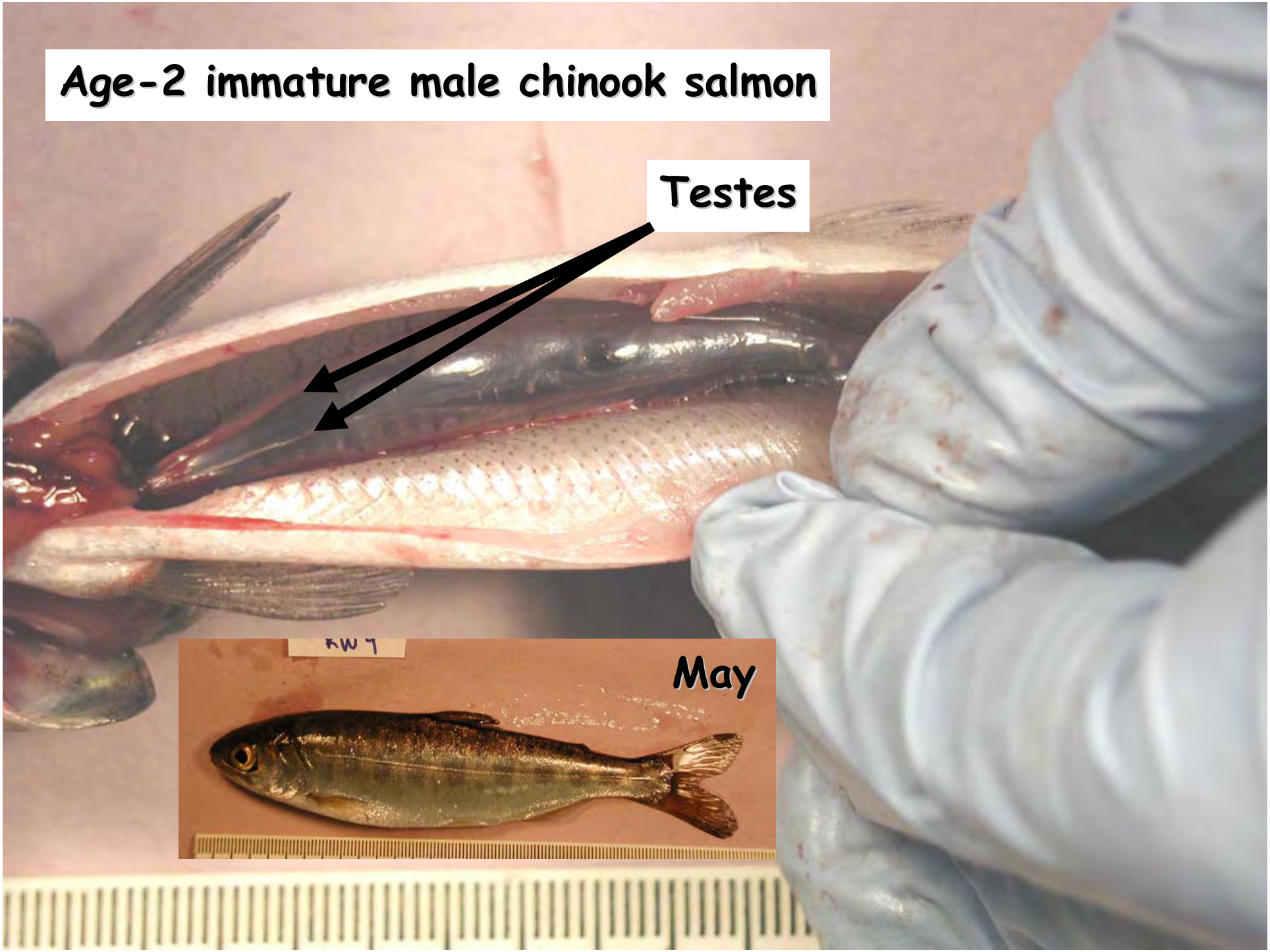
We've been monitoring the physiology of Cle Elum Supplementation Hatchery Spring Chinook since implementation in 1997

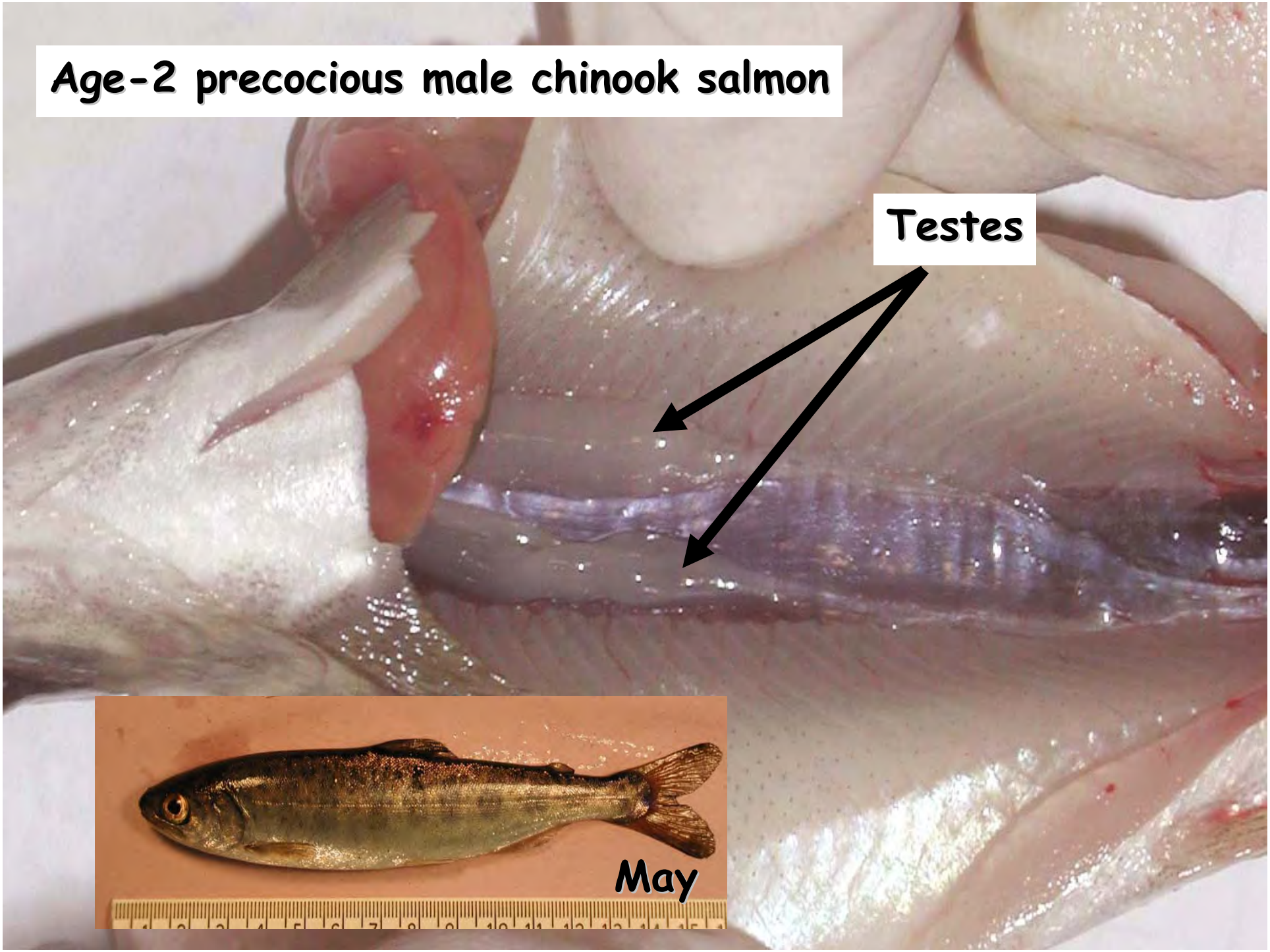
On average 50% of male Cle Elum hatchery spring Chinook precociously matured at age-2

BY	Release #	% of males	# Minijacks
1997	386,048	44%	84,931
1998	589,683	72%	211,107
1999	758,789	50%	189,697
2000	834,285	37%	153,508
2001	370,236	52%	95,520
		Avg. 50%	

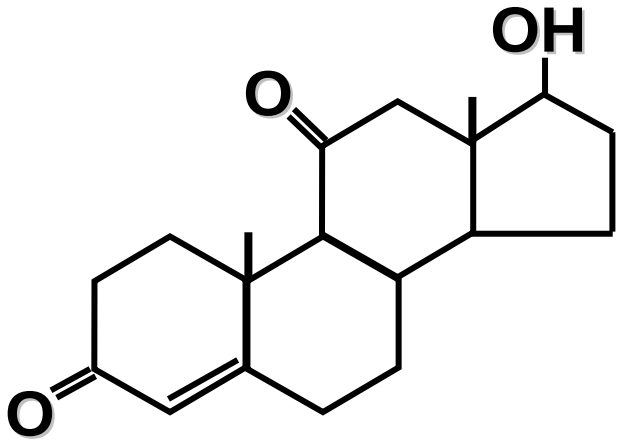
Larsen, D.A., Beckman, B.R., Cooper, K.A., Barrett, D., Johnston, M., Swanson, P., and Dickhoff, W.W. (2004). Assessment of high rates of precocious male maturation in a spring Chinook salmon supplementation hatchery program. Transactions of the American Fisheries Society. 133, 98-120.

How do we assess precocious male maturation?


Age-2 immature male chinook salmon
Testes
May

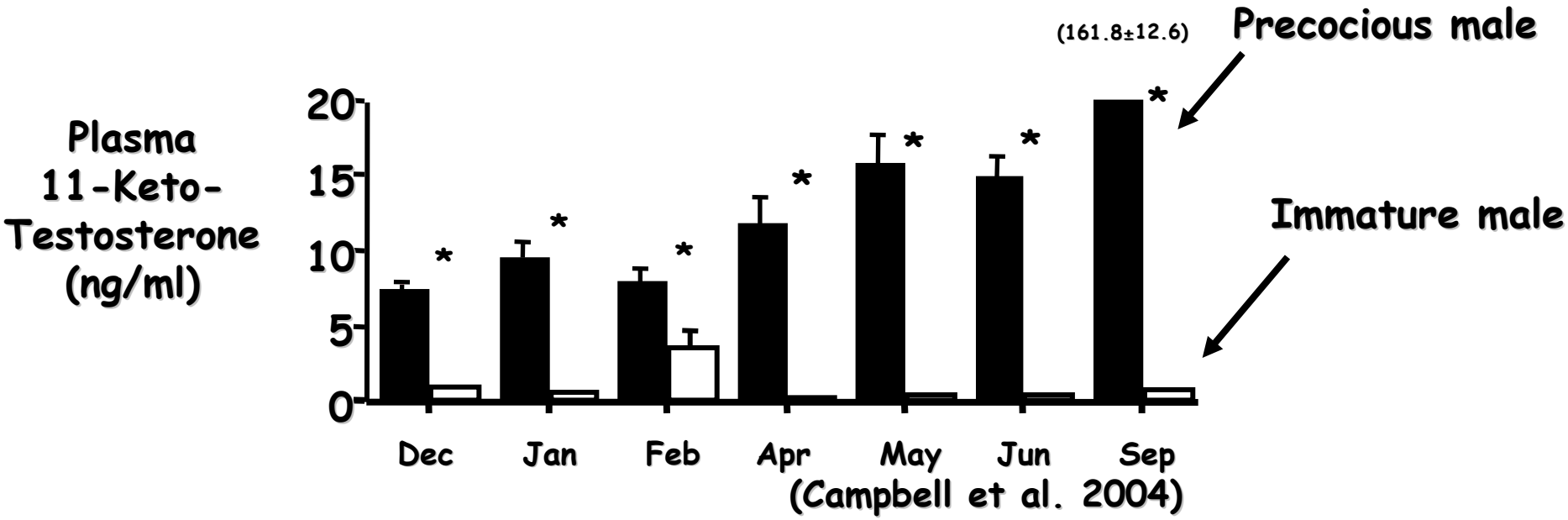

Age-2 precocious male chinook salmon
Testes
May

Plasma 11-ketotestosterone (11-KT)



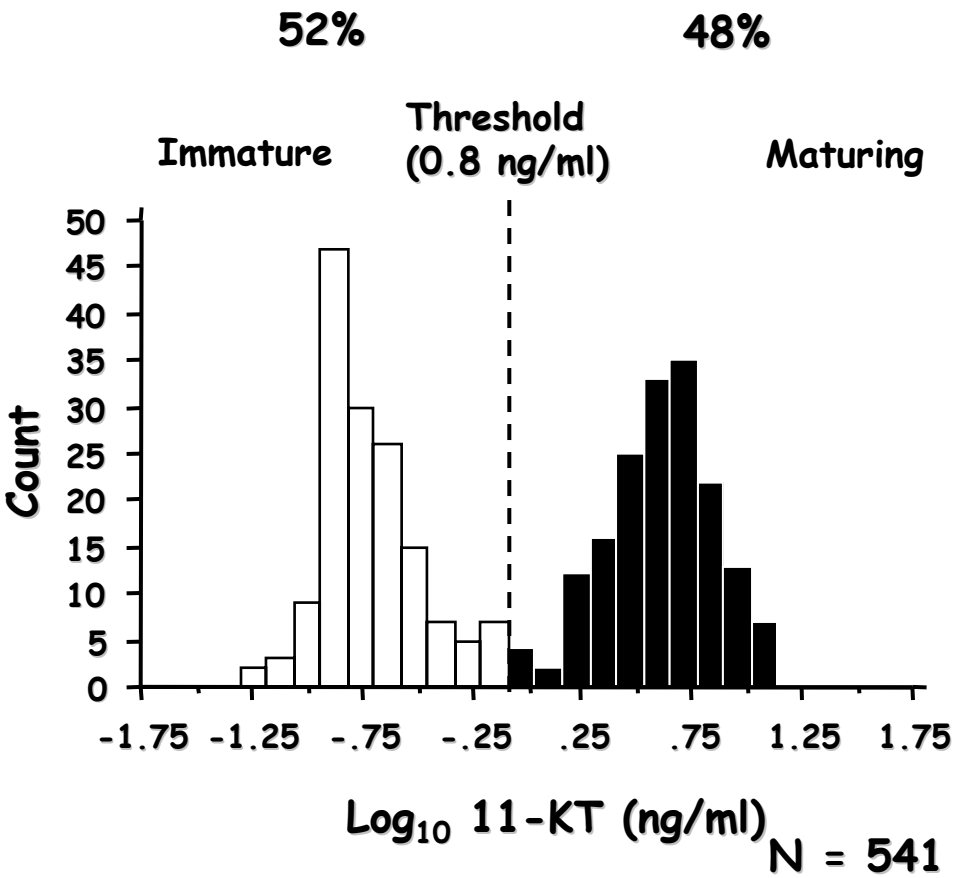
- Major androgen in teleost fish
- Instrumental in the regulation of spermatogenesis

Laboratory based studies have clearly established that 11-ketotestosterone (11-KT) is significantly elevated in precocious males as much as a year prior to mating



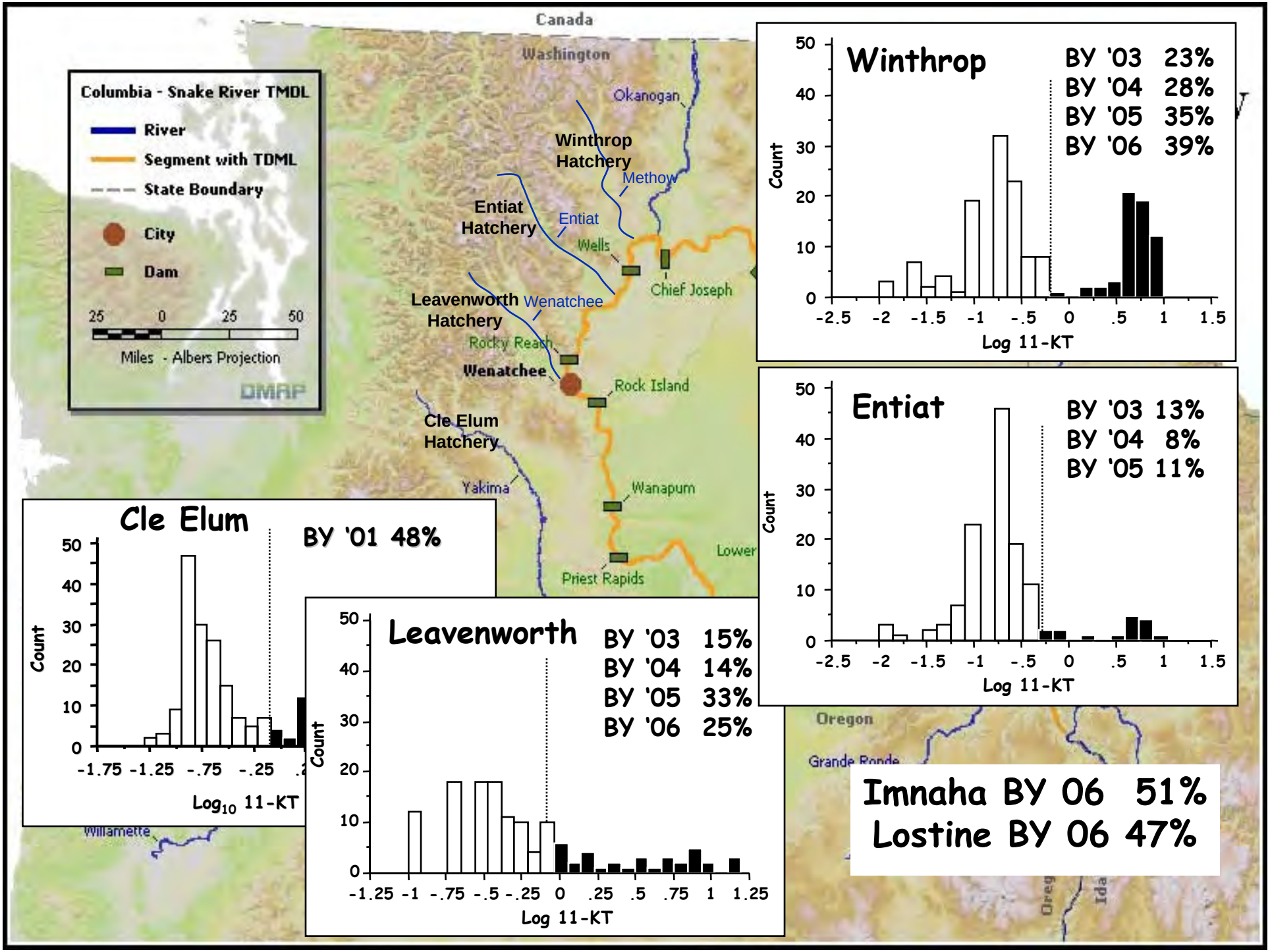
(Campbell et al. 2004)

Every March the Cle Elum Chinook are screened for pathology just prior to volitional release



Consequences of high levels of precocious maturation

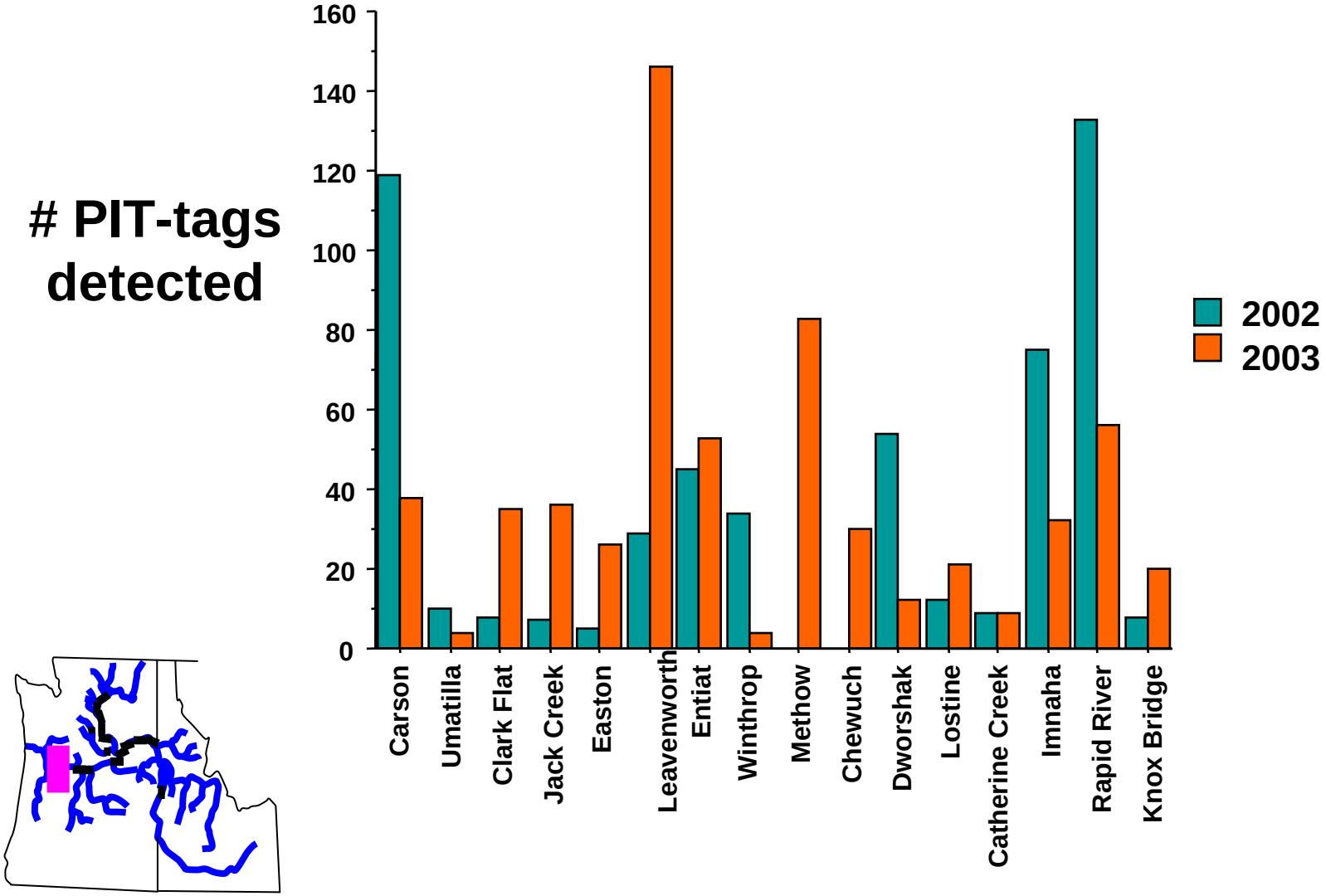
- Ecological impacts
- Genetic impacts
- Increased straying
- Skewed gender ratio
- Loss of adult production
- Alter accuracy of SAR's


Columbia - Snake River TMDL
River
Segment with TDML
State Boundary
City
Dam
25 0 25 50
Miles - Albers Projection
DMAP
Canada
Washington
Okanogan
Winthrop Hatchery
Methow
Entiat Hatchery
Entiat
Wells
Chief Joseph
Leavenworth Hatchery
Wenatchee
Rocky Reach
Wenatchee
Rock Island
Cle Elum Hatchery
Yakima
Wanapum
Priest Rapids
Lower
Oregon
Grande Ronde
Willamette
Winthrop
BY '03 23%
BY '04 28%
BY '05 35%
BY '06 39%
Count
Log 11-KT
Entiat
BY '03 13%
BY '04 8%
BY '05 11%
Count
Log 11-KT
Cle Elum
BY '01 48%
Count
Log10 11-KT
Leavenworth
BY '03 15%
BY '04 14%
BY '05 33%
BY '06 25%
Count
Log 11-KT
Imnaha BY 06 51%
Lostine BY 06 47%

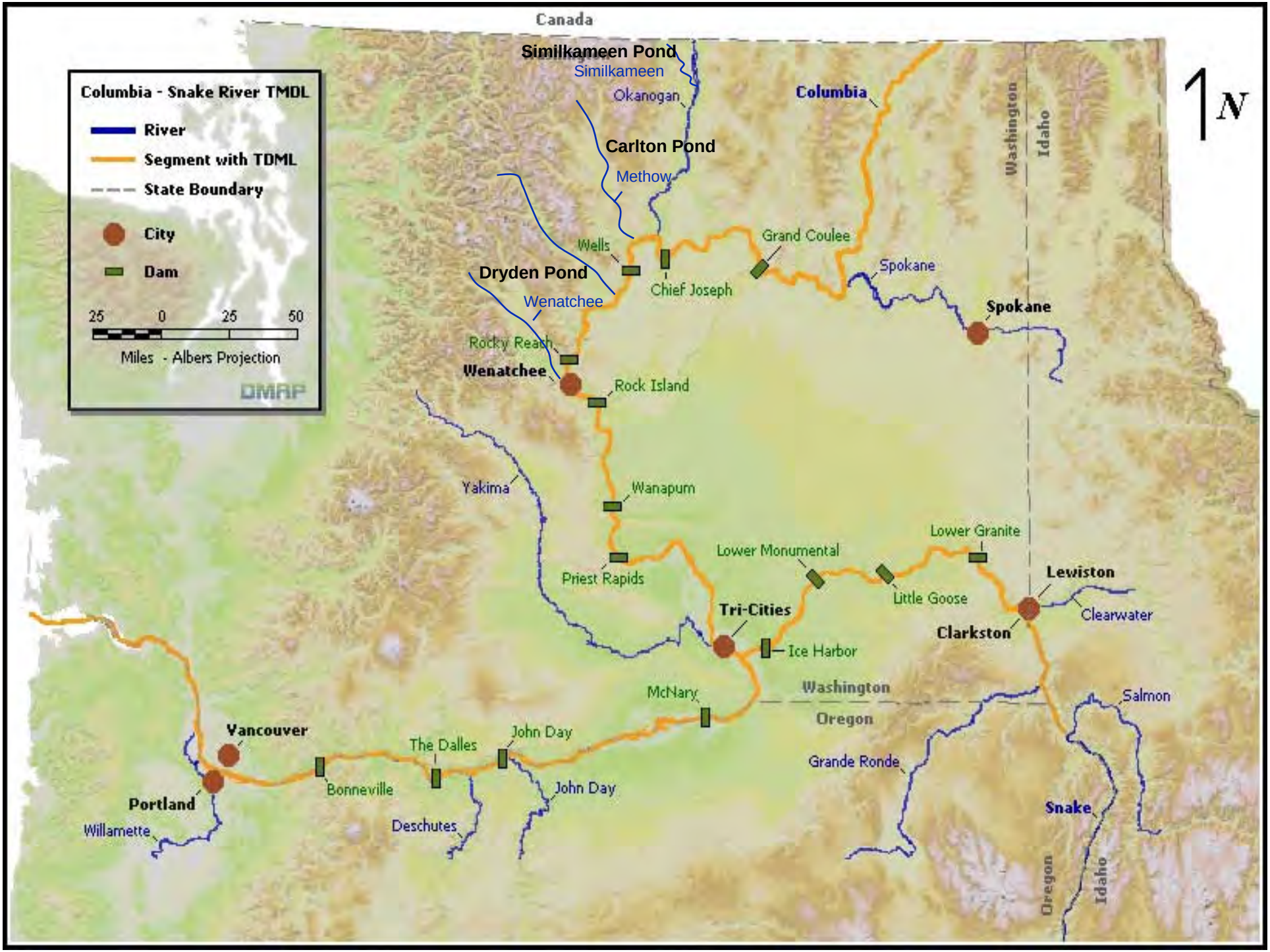
Minijacks are ubiquitous throughout the Columbia Basin

Beckman, B.R. and Larsen D.A. (2005). Up-stream migration of PIT-tagged Age 2 (minijack) Chinook salmon in the Columbia River: behavior, abundance, distribution, and origin. Transactions of the American Fisheries Society. 134, 1520 -1541.

Minijacks were detected at Bonneville Dam from all releases



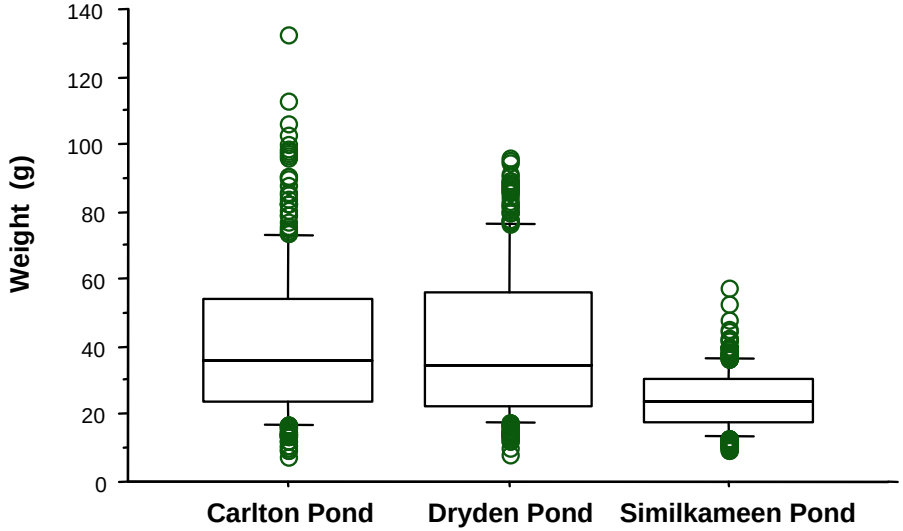
Mid/Upper Columbia Summer Chinook Salmon

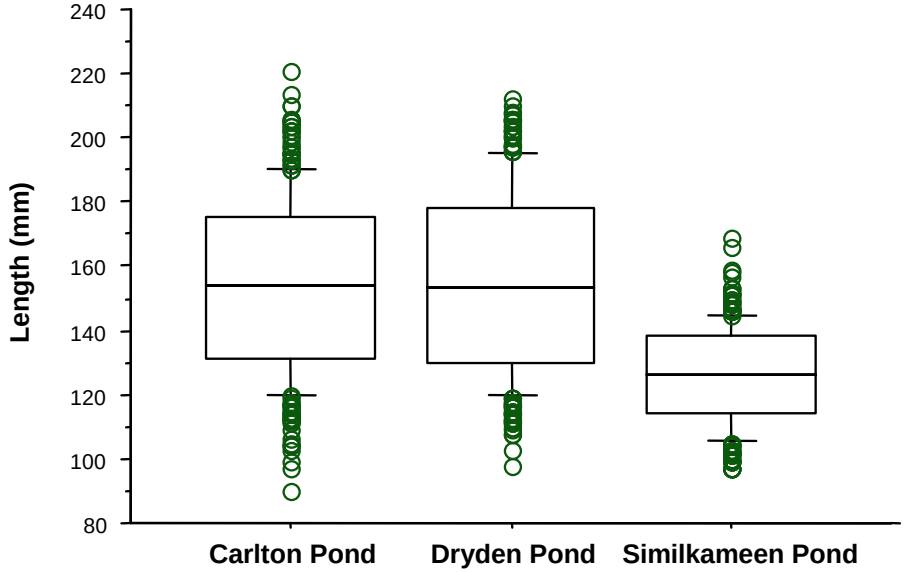

Columbia - Snake River TMDL
River
Segment with TDML
State Boundary
City
Dam
25 0 25 50
Miles - Albers Projection
DMAP
N
Canada
Similkameen Pond
Similkameen
Okanogan
Columbia
Washington
Idaho
Carlton Pond
Methow
Wells
Grand Coulee
Spokane
Dryden Pond
Chief Joseph
Wenatchee
Spokane
Rocky Reach
Wenatchee
Rock Island
Yakima
Wanapum
Lower Granite
Lower Monumental
Priest Rapids
Lewiston
Little Goose
Tri-Cities
Clearwater
Clarkston
Ice Harbor
Washington
McNary
Salmon
Oregon
Vancouver
The Dalles
John Day
Grande Ronde
Bonneville
John Day
Portland
Snake
Deschutes
Willamette
Oregon
Idaho

Methods

- April, 2008 collect random net grab samples of 300 fish from Carlton (Methow), Dryden (Wenatchee), and Similkameen Ponds prior to release.
- Measure fork length and weight, visually determined gender
- Collect blood and determine plasma 11-KT levels in all males via ELISA at NW Fish. Sci. Ctr., Seattle.
- Age-2 minijacks determined by 11-KT levels in excess of 1.5 ng/ml.

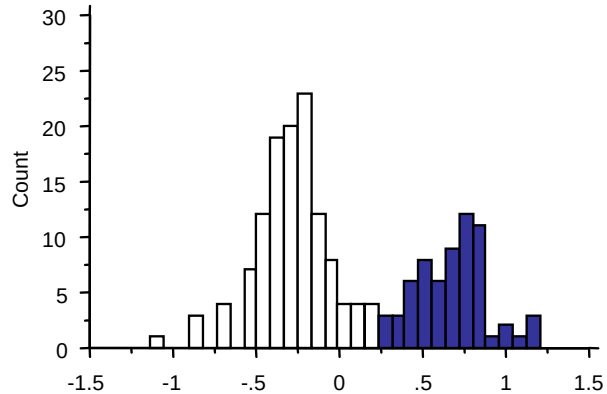
Mid-Columbia Summer Chinook - size comparison





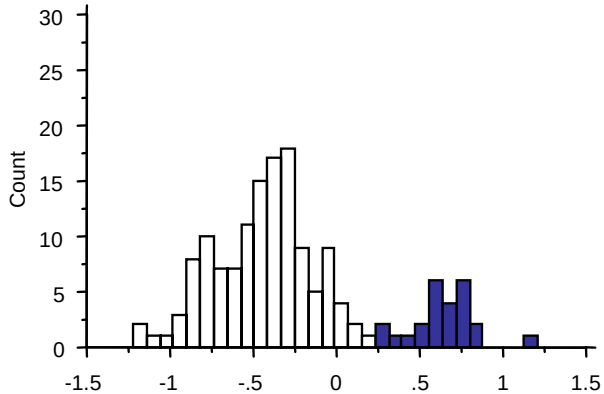
11-KT frequency distribution between stocks

Carlton Pond



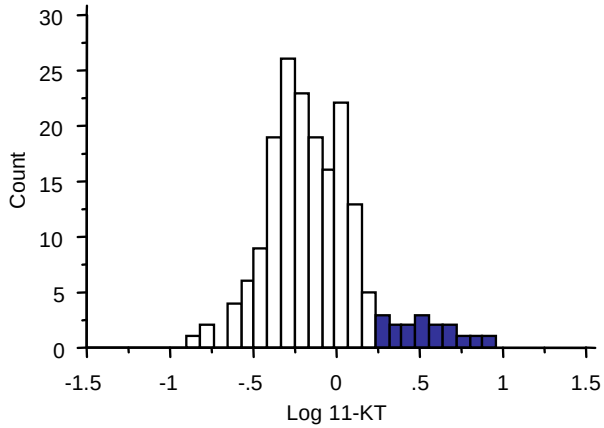
37% of males Minijacks
74, 000 fish
(400,000 released)

Dryden Pond



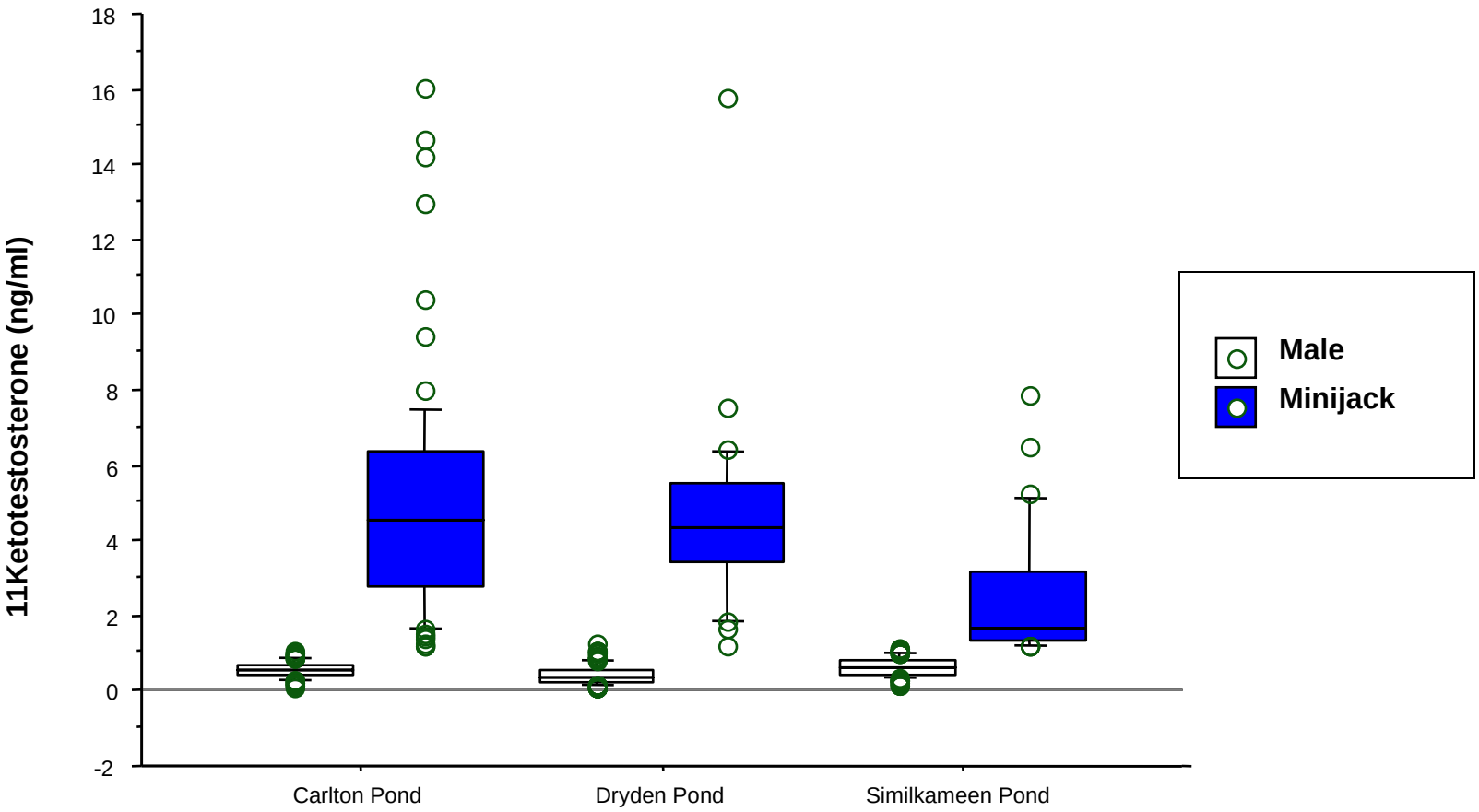
17% of males Minijacks
73,440 fish
(864,000 released)

Similkameen Pond

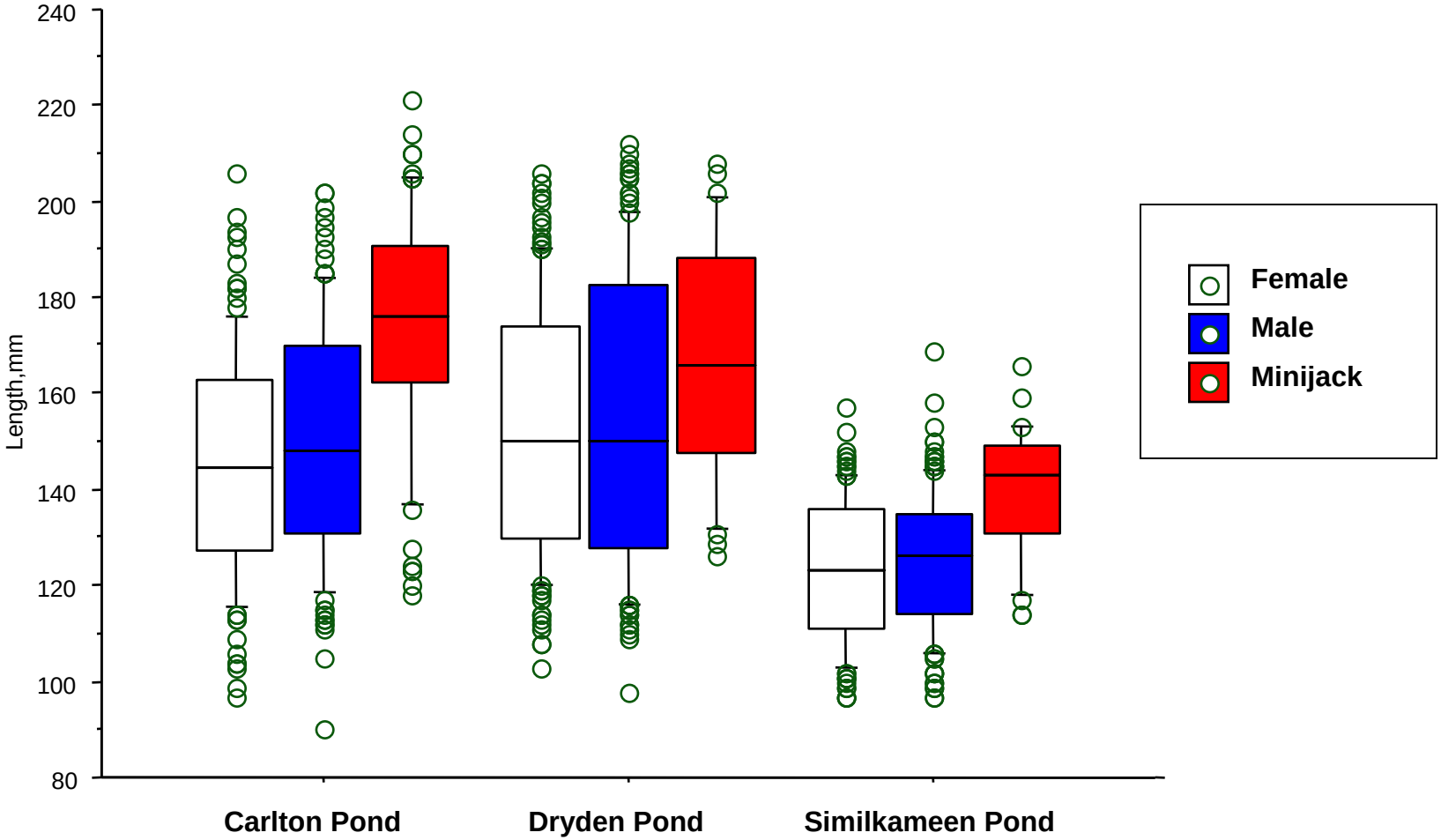


10% of males Minijacks
28, 800 fish
(576,000 released)

11-KT levels in males and minijacks

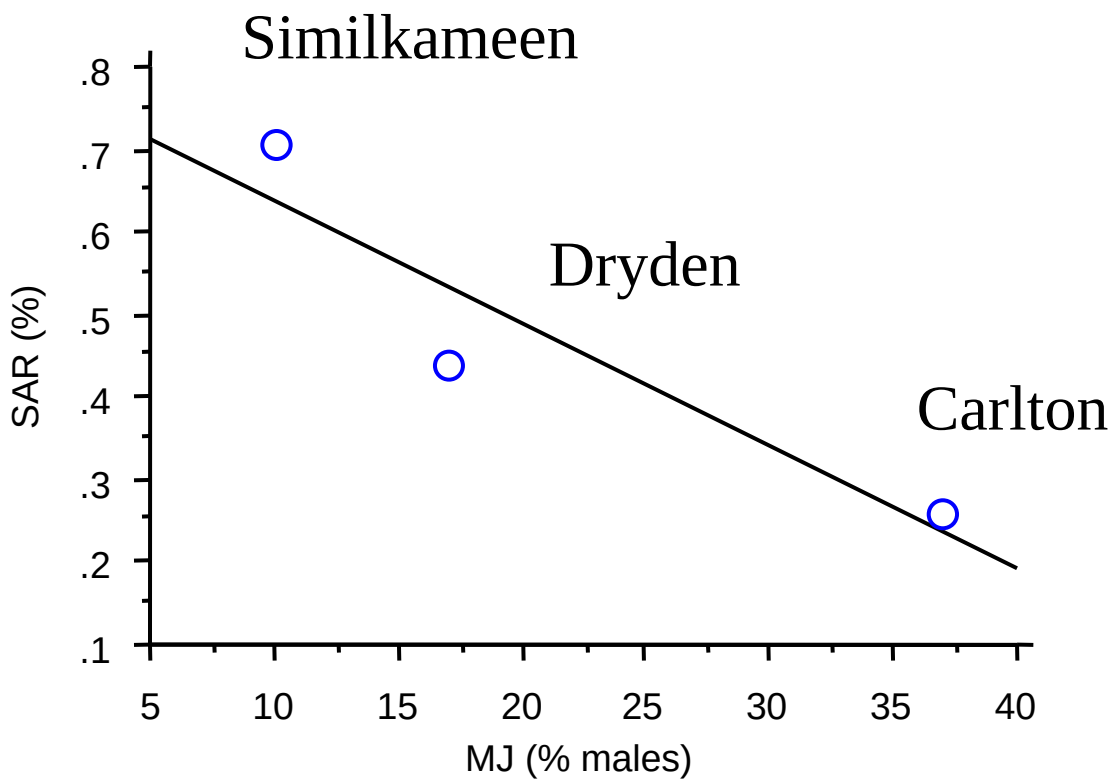


Size by phenotype



Regression relation between % Minijacks and SAR (avg. % over 11-13 years)

$R^2 = 0.86$

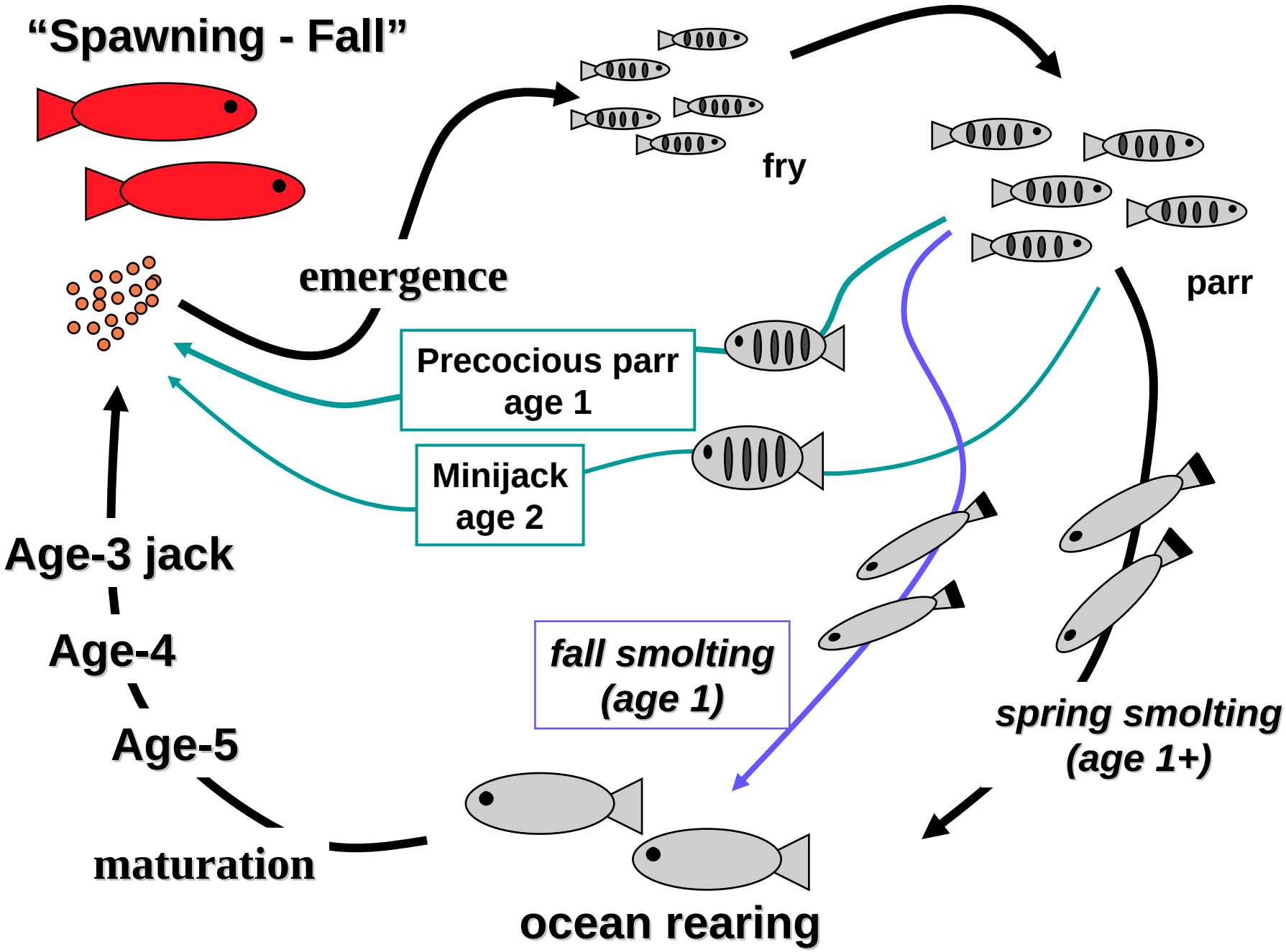


Columbia Basin Research
School of Aquatic and Fishery Science
University of Washington
Web@cbr.washington.edu
http://www.cbr.washington.edu/trends/index.php

Conclusions - part 1

- Minijacks are ubiquitous among all spring Chinook populations we've surveyed.
- Minijack rates among hatchery Summer Chinook populations are relatively variable (high and low).
- Supplementation programs using localized broodstocks may have increased susceptible to this life-history.
- The economic, ecological, and genetic impacts of this phenomenon may be significant
- Smolt quality monitoring is a useful tool for helping make informed decisions about hatchery uses and practices.

Brian -part 2


"Spawning - Fall"
emergence
fry
parr
Precocious parr
age 1
Minijack
age 2
Age-3 jack
Age-4
Age-5
fall smolting
(age 1)
spring smolting
(age 1+)
maturation
ocean rearing

10 years of sampling, >12,000 fish = 2 precocious parr (<0.02%)

1). this appears to be quite low

data from other hatchery and wild populations

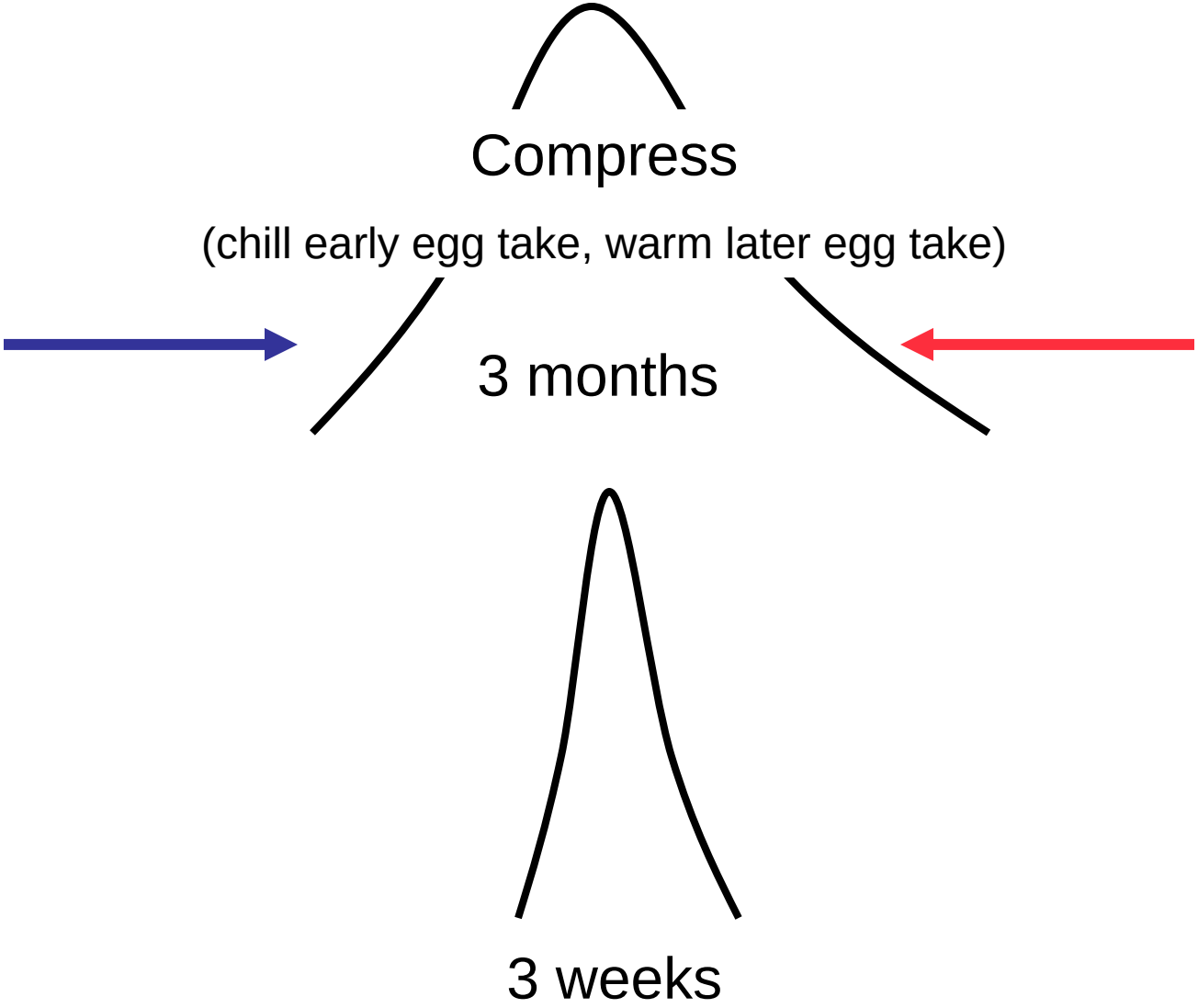
Why so few precocious parr?

One of the reasons CESRF is special: (there are many)

Seasonal timing for ponding fry

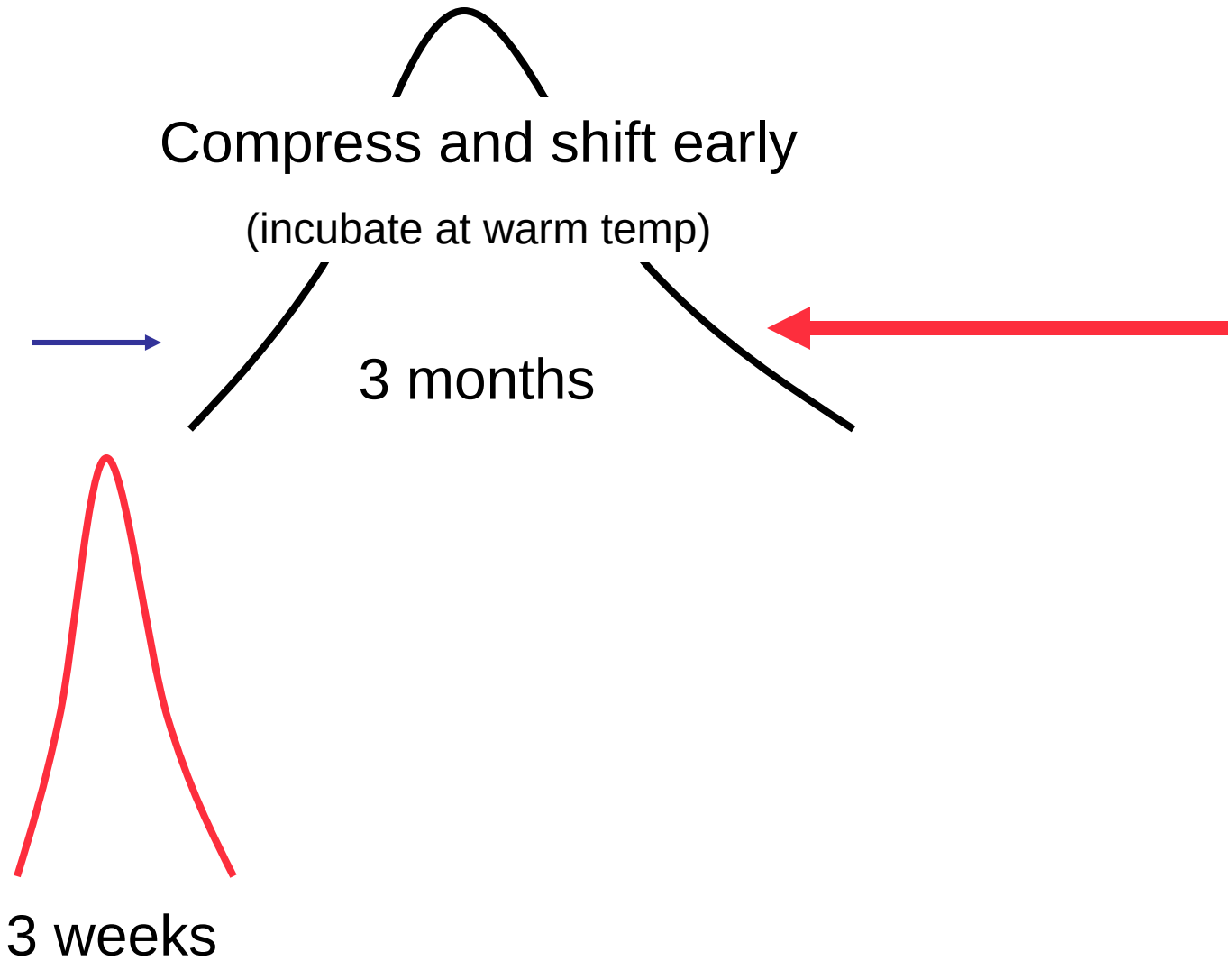
Many hatcheries alter emergence (ponding)

I). synchronize ponding



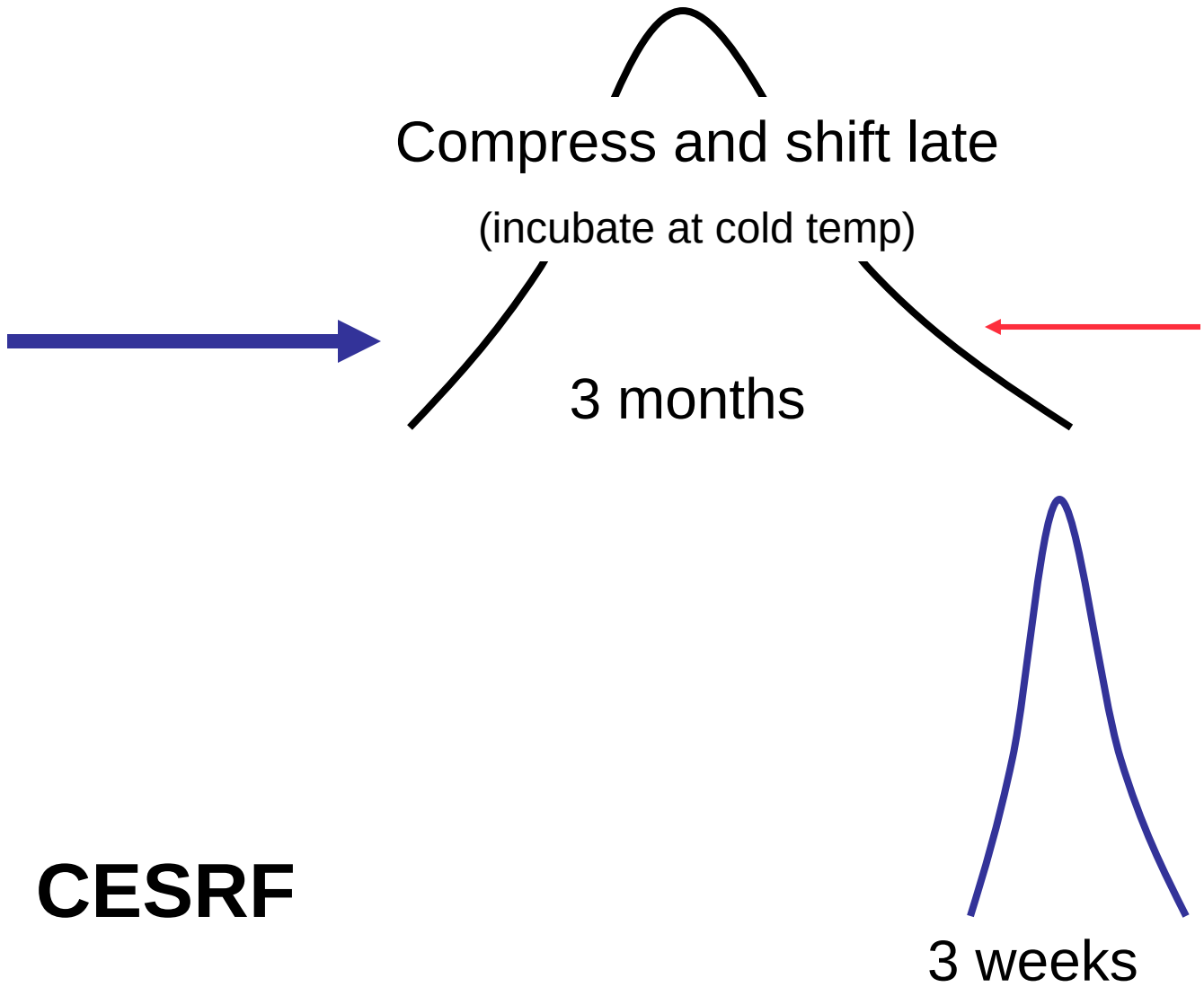
Many hatcheries alter emergence (ponding)

II). Pond “early” - longer growth period, clear egg stacks



Many hatcheries alter emergence (ponding)

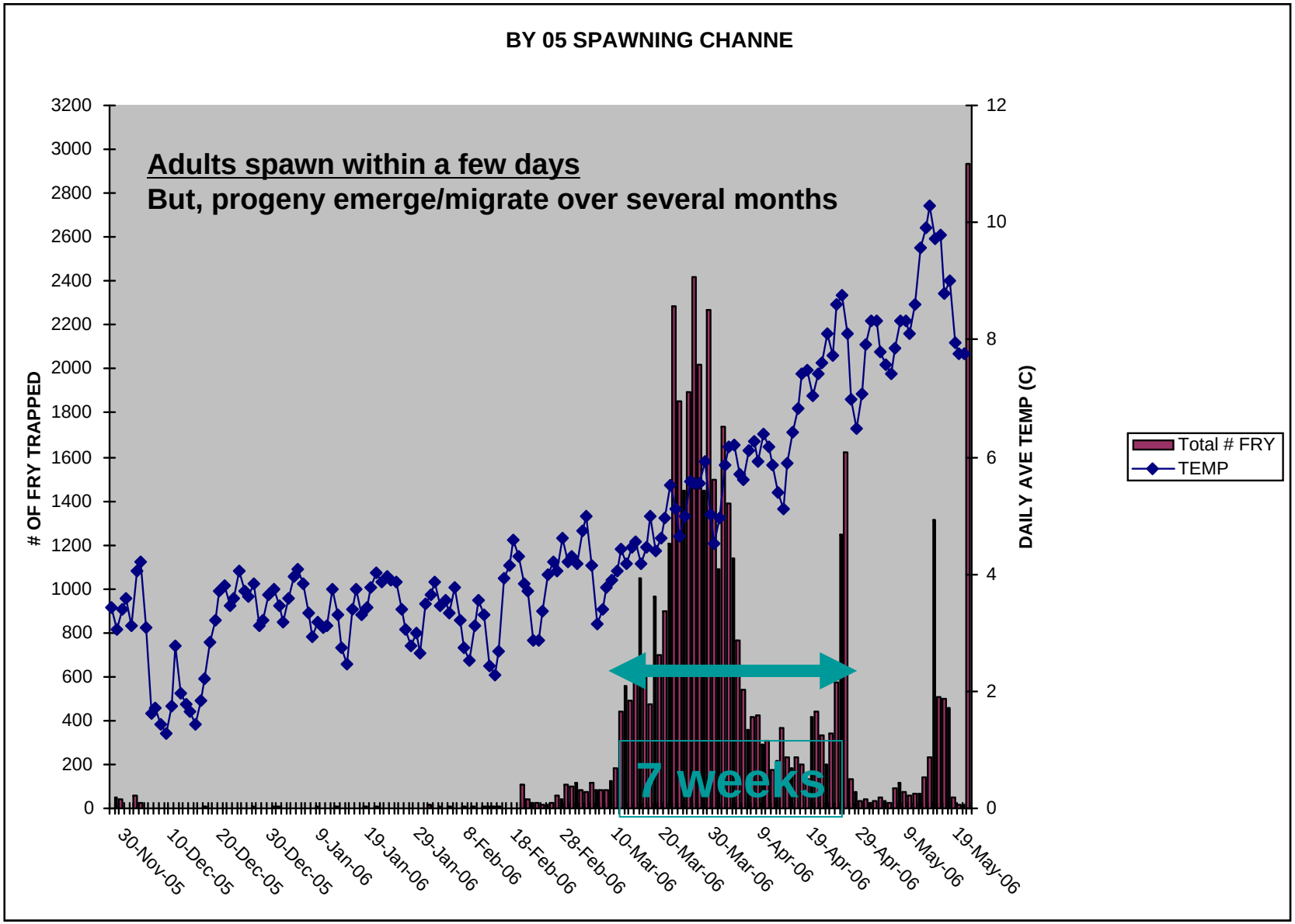
III). Pond “late” - avoid silting of ponds, smaller size



CESRF

What is “Natural Emergence Timing”?

QuickTime™ and a
decompressor
are needed to see this picture.



Data kindly provided by Steve Schroder,Todd Pearsons, Anthony Fritts, Jen Scott, Jordan Vandal, Gene Sanborn (WDFW) and Curt Knudsen (Oncorh Consulting).

Experimental Question:

What is the effect of emergence timing on life-history decisions?

Experimental approach:

Pond fry at 3 different photoperiods

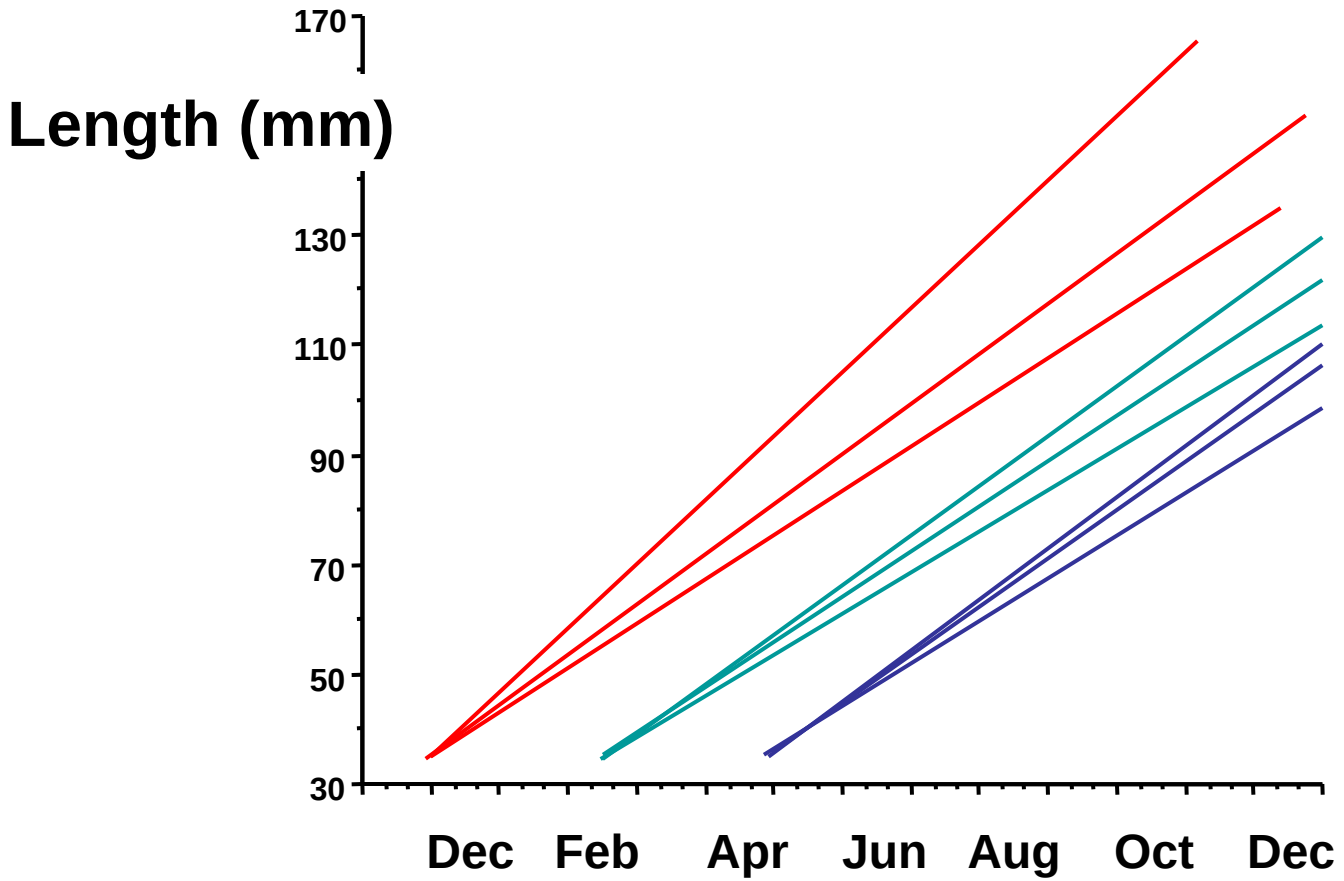
1 December (early)
15 February (middle)
1 May (late)

Experimental approach II:

feed fry at 3 different rates

Low
High
Satiation

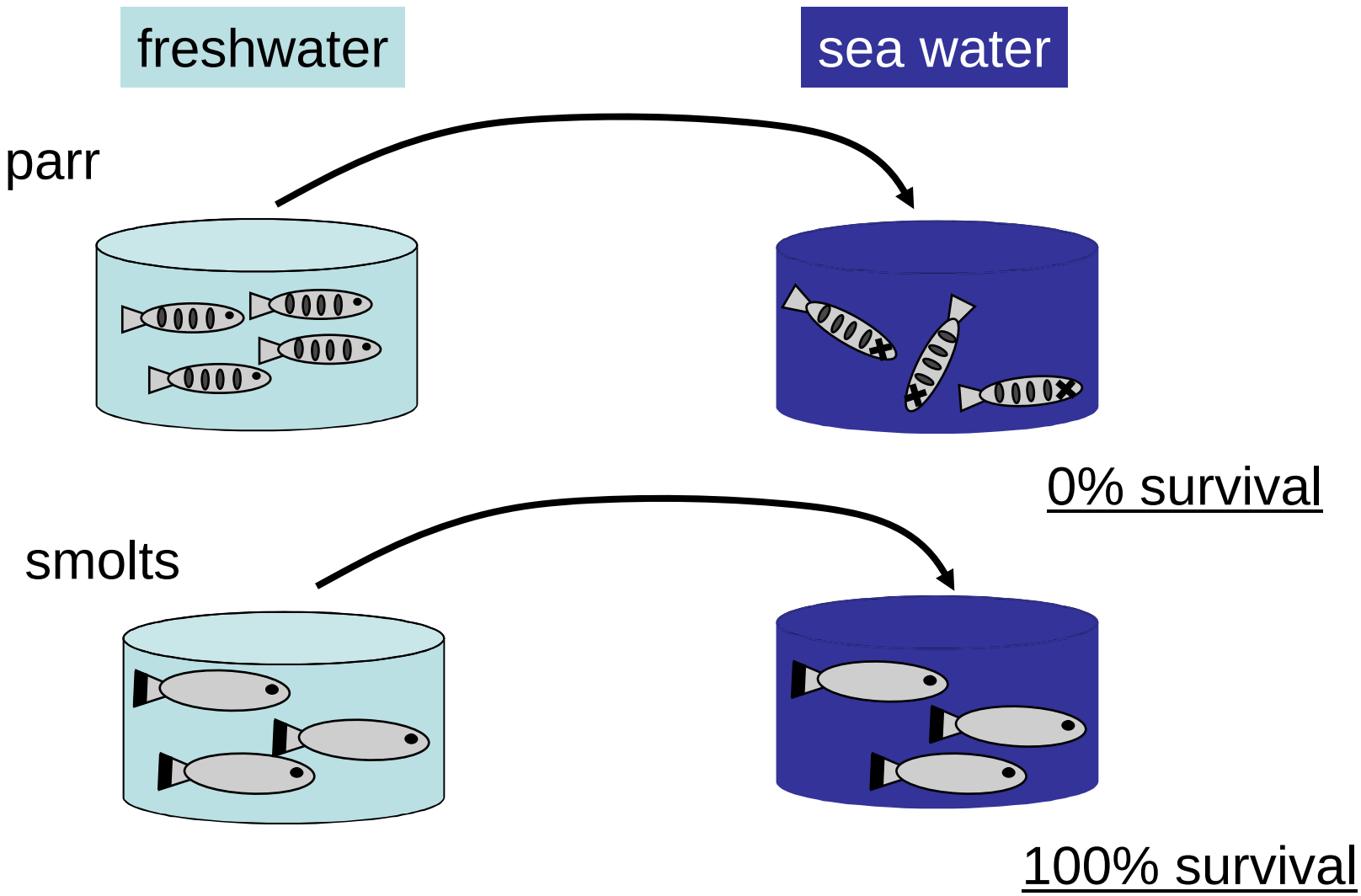
Emergence time, growth and size were varied experimentally



Fish grown in experimental tanks NOAA Montlake

Monitor Autumnal Smolting:

24 hour seawater challenge

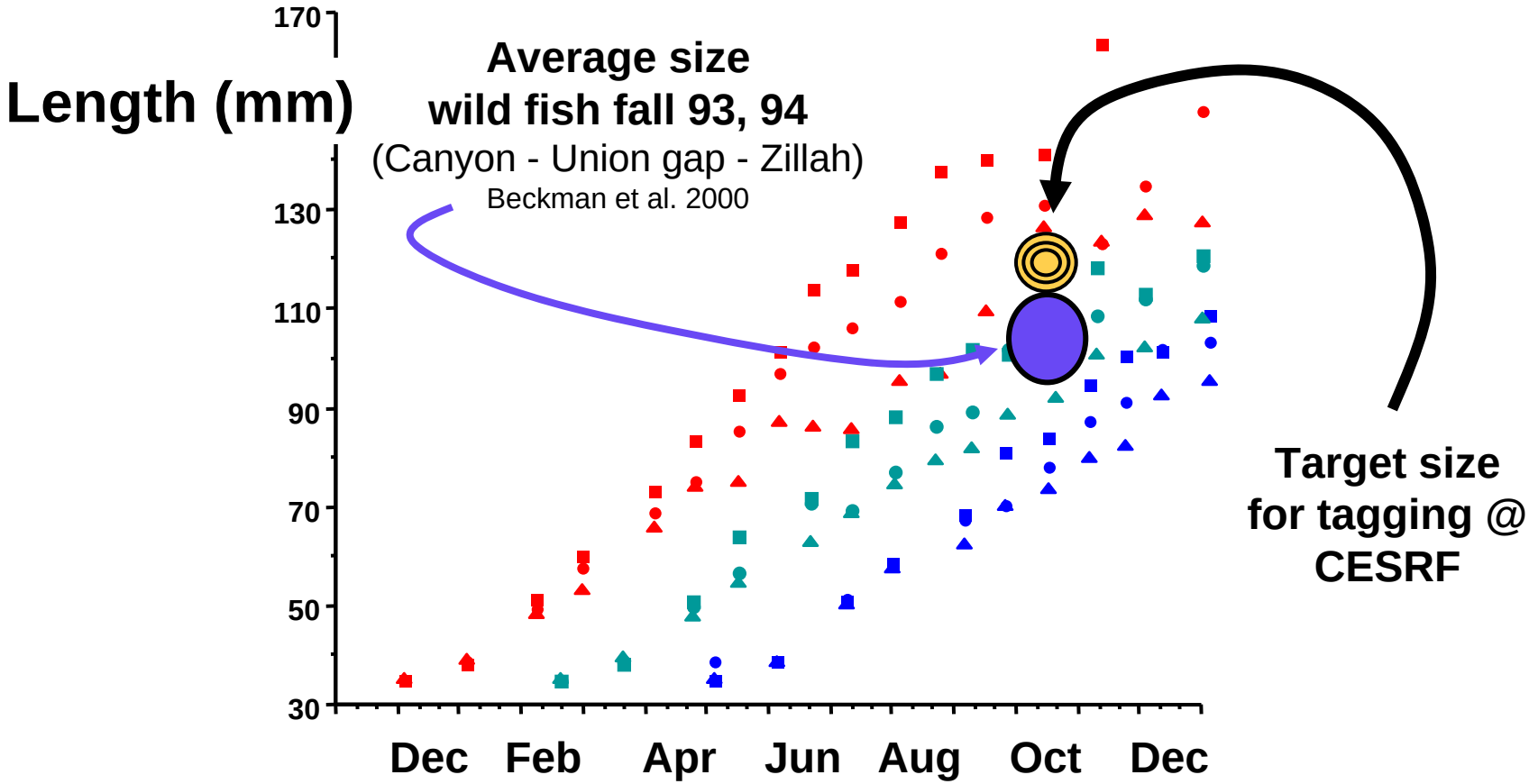


Monitor Age-1 (precocious parr) Maturation:

milt expression or simple dissection

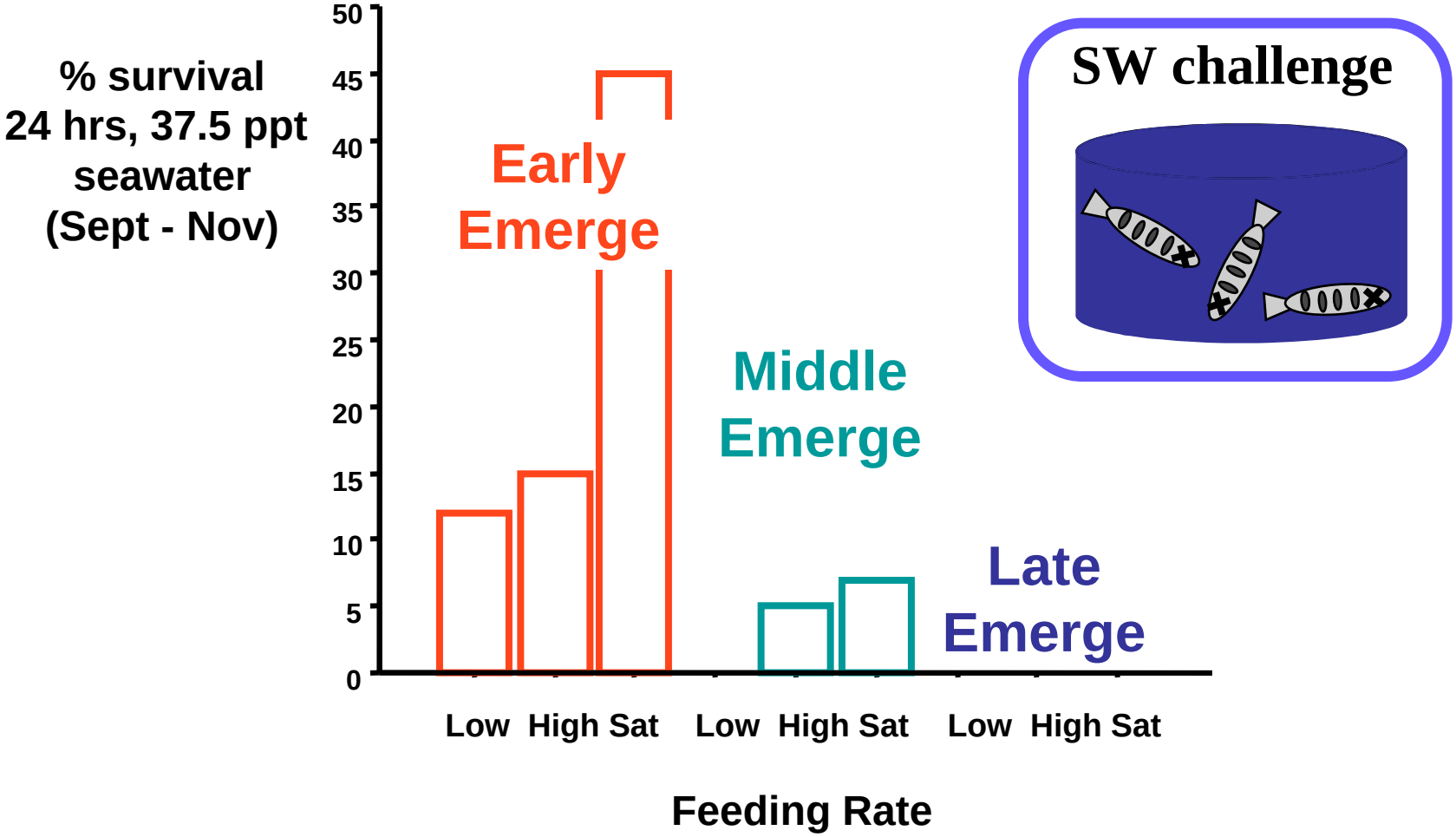
QuickTime™ and a
decompressor
are needed to see this picture.

Emergence and growth of fish did vary



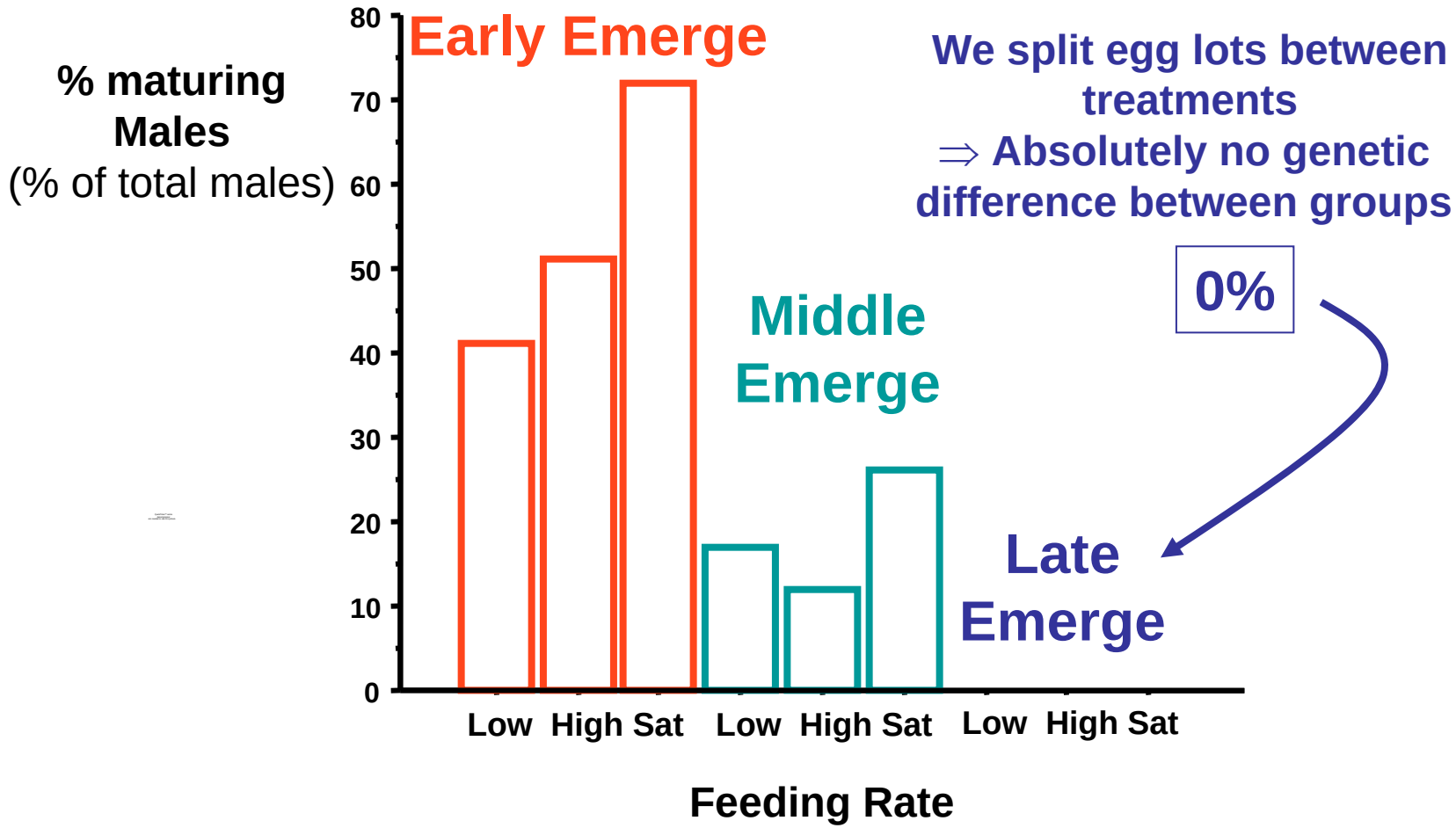
Thanks to Charlie Strom and CESRF staff for eggs

Early emerging fish smolt in the autumn
Later emerging fish do not

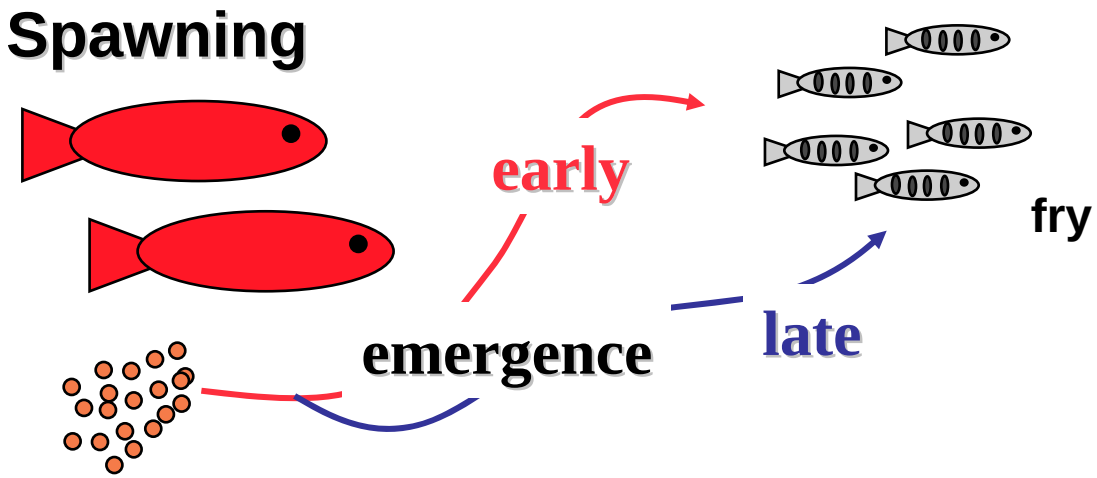


Early emerging fish have a high propensity for early male maturation (age 1)

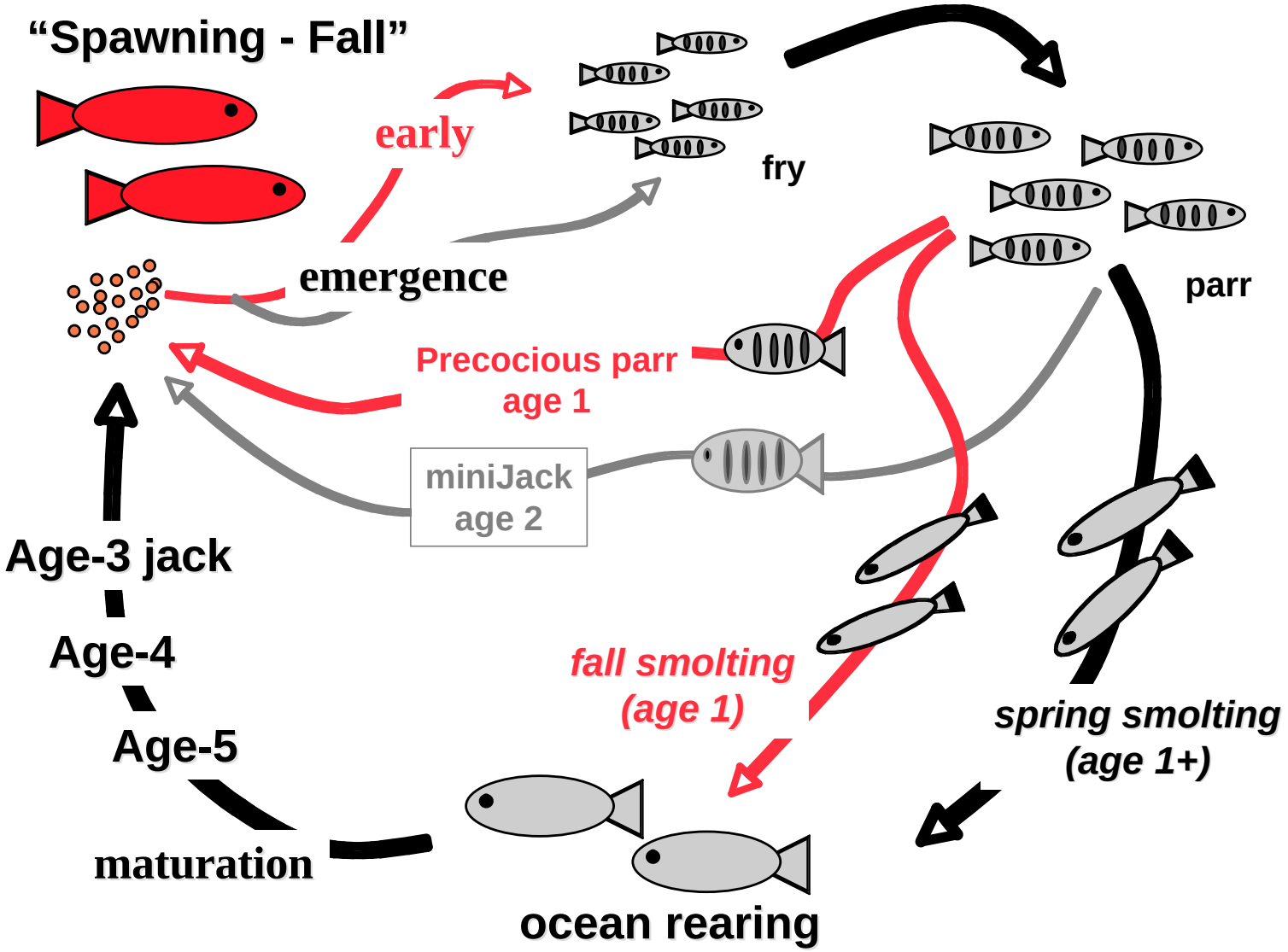
(precocious parr)



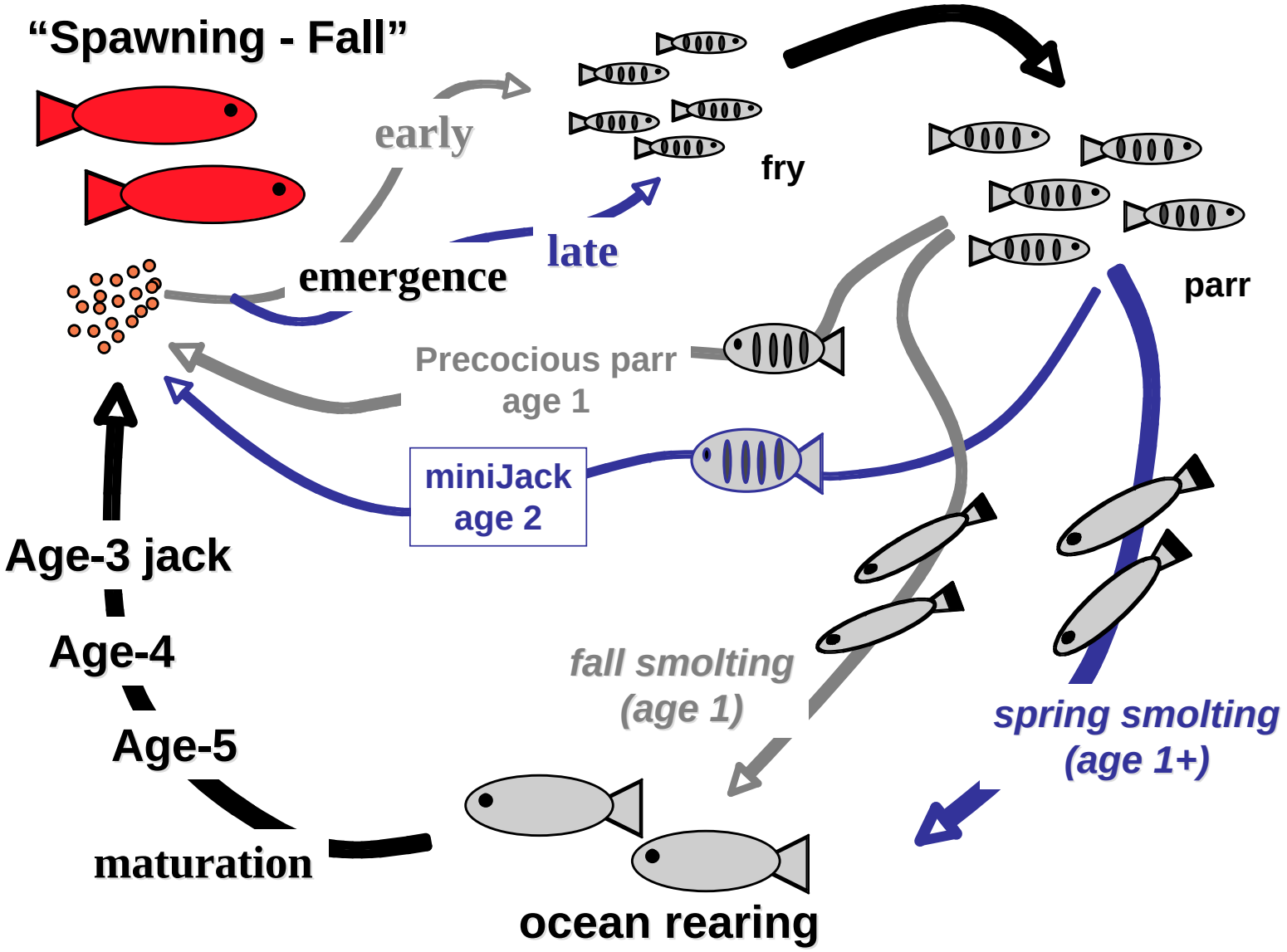
Conclusion -part 2: Emergence timing may provide another axis for life history variability



Early emergence accelerates life history

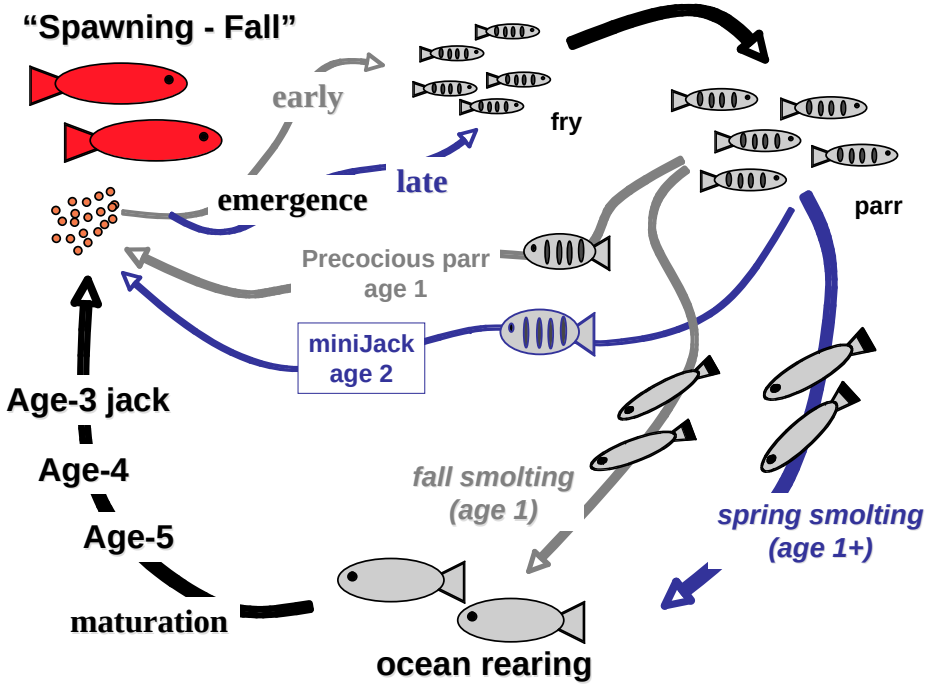


Late emergence delays life history



10 years of sampling, >12,000 fish = 2 precocious parr (<0.02%)

Late emergence delays life history



Implications

What happens in the hatchery <u>does not</u> stay in the hatchery, long-term life history implications for altering emergence (ponding) time exist.

No easy answers for “best” rearing program - a series of trade-offs between male maturation, size (tagging targets), smolting and SAR.

Current rearing program ((Yakima) late ponding) mimics conditions found in head water streams (high elevation, cold - late emergence) and is favorable for yearling releases.

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 Hatchery Committees

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Bob Pfeifer, Steve Hays, Joe Miller

Date: October 16, 2008

Re: Final Minutes of September 17, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD offices in Wenatchee, Washington, on Wednesday, September 17, 2008, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Mike Schiewe will summarize Committees member's preferences regarding a path forward for Non-target Taxa of Concern (NTTOC) in a table and will send it out for Hatchery Committees review (Item II-A).
- Each Committees member will provide to Mike Schiewe a list of recommended species to be analyzed in the initial NTTOC modeling exercise by September 24 (Item II-A).
- The Committees members will provide comments to Joe Miller on the sockeye enumeration study by October 1 (Item II-B).
- Chelan PUD will prepare a Statement of Agreement (SOA) for the Water Re-Use Study for the next meeting for continuing the study in 2009 (Item II-C).
- The Committees members will provide comments on the 2009 Chelan PUD Monitoring and Evaluation (M&E) Work Plan to Joe Miller by September 24 (Item II-F).
- Joe Miller will send the PUD's joint Hatchery Scientific Review Group (HSRG) comment letter and table to Ali Wick for distribution to the Committees (Item II-G).
- Shaun Seaman will ask for a memorandum from Pamela Nelle on the status of data archiving and will share this with the Committees (Item II-H).
- Jerry Marco will provide information from the Bonaparte Pond well water test as soon as it is available (Item IV-A).

- Kirk Truscott will finalize the Joint Fisheries Parties' (JFP's) response to Chelan PUD's concerns on Washington Department of Fish and Wildlife's (WDFW's) draft steelhead reproductive success study plan/proposal by the next meeting (Item V-A).
- Mike Schiewe will forward WDFW's Passive Integrated Transponder tagging (PIT-tagging) retention study protocol to Ali Wick for distribution to the Committees (Item V-B).
- Truscott and Shaun Seaman agreed to discuss options to protect the Lake Wenatchee net pens in the future from the net-snagging that caused the sockeye release last month (Item V-C).
- Scribner and Shaun Seaman will discuss cost sharing for PIT-tagging of Okanogan sockeye to clarify goals and potential objectives of having PIT-tag data (Item VI-B).
- Scribner and Kirk Truscott will discuss a date by which Section 10 coverage needs to be obtained in order to spawn the source fish for the Yakama Nation's (YN's) summer/fall Chinook reintroduction pilot study in the Yakima River (Item VI-E).

DECISION ITEM SUMMARY

There were no decision items at this meeting.

I Meeting Minutes Approval

The Hatchery Committees approved the August 20, 2008 Meeting Minutes subject to revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II Chelan PUD

A. NTTOC Discussion

Joe Miller opened this discussion by explaining that Chelan PUD recommends a focus on high-risk Plan Species as per the HCPs and Objective 10 in the M&E plan. Miller read excerpts form the HCPs and Objective 10 supporting the Chelan position. For the argument that HCPs explicitly do not address non-plan species, Miller read section 9.10 of the HCPs: "Non-Plan Species are not addressed in this agreement." For the argument that the M&E plan explicitly states that monitoring will be focused on high risk species, Miller read from page 37 of Objective 10 of the Plan: "Prioritization for monitoring will be given to those NTT, which are believed to be at the highest risk." Tom Scribner and Keely Murdoch disagreed, saying that the YN would like to 1) retain a broader range of species in the

analysis, 2) include sockeye, and 3) support completing the analysis sooner rather than deferring until some future date. Kirk Truscott indicated that WDFW would support limiting the analyses to a specific list of Plan Species and other species but would recommend deferring the start of this effort until some future date. Truscott further noted that risk containment levels should be based on categories such as high, medium, and low, and not on precise (and uncertain) percentages. Jerry Marco commented that the Colville Tribes would be supportive of broader analyses that are not limited to Plan Species and would be supportive of completing the analysis now rather than waiting for regional action. Tom Kahler said that Douglas PUD would support analyzing a full range of Plan Species and was undecided as to whether the modeling exercise should be a current priority. Dave Carie noted that the U.S. Fish and Wildlife Service (USFWS) would support evaluating species other than Plan Species, but felt that he would need to consult further with his agency leadership before endorsing this as an agency priority. Kris Petersen stated that National Marine Fisheries Service (NMFS) would support a focus on a broad range of species, as well as involving other regional entities that should weigh in on completing this objective. She also said that NMFS would support going ahead now with the analysis. Mike Schiewe agreed to summarize these opinions in a table, and requested that each HCP entity provide a list of species to be analyzed in the NTTOC modeling exercise to him by September 24.

B. Comments on Sockeye Enumeration Study

Joe Miller opened this topic and asked whether there were any more comments on the sockeye enumeration study. Keely Murdoch asked for more time to review the study. The Committees agreed that Chelan PUD could move forward with planning, and that Committees members will provide any last comments to Joe Miller no later than October 1.

C. Water Re-Use Pilot Study Update

Sam Dilly reviewed the information in the recently distributed memorandum on the water re-use pilot study. He clarified an error in the memorandum: there were approximately 126,000 Turtle Rock summer Chinook in the circular re-use ponds and approximately 55,000 fish in the raceway. Further, he indicated that this year's results indicate that re-use pond fish are slightly longer and more narrow-bodied than the raceway fish. Dissolved oxygen levels have been high and carbon dioxide and ammonia have been low. Disease has not been a problem. Based on

these results, Chelan PUD proposed an additional year of study with approximately 60 percent more fish in the re-use ponds to evaluate a higher rearing density. Kirk Truscott noted that two important points with this proposal are 1) that taking more fish into the re-use pond study would have the effect of reducing the subyearling program and 2) brings up the question of whether Endangered Species Act (ESA) permit coverage would still be adequate. Kris Petersen clarified that switching these subyearlings to yearlings would not be a permit issue. Taking this into account, Truscott said that the proposed action would be consistent with the goals of the study and program. The Committees said that they were comfortable with the study as stated, and Chelan PUD will prepare an SOA for the Water Re-Use Study for the next meeting for continuing the study in 2009. Chelan and NMFS will need to exchange letters relative to this issue to clarify any permit issues.

D. Chelan PUD Engineering Report

Mike Schiewe opened the floor for questions on the Chelan PUD Engineering Report. Tom Scribner asked for an update on the implementation of Chelan PUD's 5-year Capital Improvement Plan; Shaun Seaman verified that the Committees will have the opportunity to review this plan before implementation. Seaman also noted that, on the Chiwawa pond project, Chelan PUD has met with the U.S. Forest Service (USFS), and the USFS has been supportive of the Chiwawa project. In addition, Chelan PUD has had positive interactions with the nearby homeowners.

E. BKD Strategy Draft SOA

Shaun Seaman discussed the draft SOA for managing bacterial kidney disease (BKD) in Chelan PUD hatchery programs, which had been previously sent out to the Committees for review. Seaman indicated that the management strategy will be further developed (e.g., adding suggested management thresholds for prevalence of BKD in broodstock that would trigger culling of progeny), and that Chelan PUD would like this to be on the agenda for approval next month. Kirk Truscott provided some comments on the SOA, mentioning that WDFW will soon be developing a statewide policy on culling. He indicated that he did not know whether the upcoming WDFW policy would be consistent with this SOA, but Truscott did note that it was unlikely that WDFW would favor culling of natural-origin listed fish. Tom Scribner asked about some of the information currently missing from the SOA (noted as TBD), and Seaman confirmed that Chelan PUD would be working with Truscott on these

items. Given the lack of numerical thresholds in the current SOA, Scribner and Kris Petersen indicated that they will likely want to have additional discussions within their agencies before approval.

F. Comments on M&E Work Plan

Joe Miller indicated that Kirk Truscott had provided comments on the 2009 Chelan PUD M&E Work Plan, and Miller would incorporate those. Shaun Seaman will send out Truscott's comments for the Committees information. The Committees will provide any outstanding comments by September 24, to Joe Miller for discussion and approval on a conference call at 9 am on Wednesday, October 1, if necessary.

G. Mid-Columbia PUD HSRG Comments

Joe Miller reported that Chelan PUD collaborated with Douglas and Grant PUDs to produce a joint comment letter and table outlining their collective concerns regarding the HSRG's draft recommendations for changes in HCP hatchery programs. Miller will send these to Ali Wick for distribution to the Committees.

H. PIT-Tag Data from Peshastin and Entiat

Shaun Seaman said that Chelan PUD is currently working with ISEMP on ways to compile and format PIT-tag data from the Peshastin and Entiat in-river detection sites, and that he hopes it will soon be available. Seaman said that Chelan PUD is working with ISEMP to see if information could be incorporated into PTAGIS. He will contact Pamela Nelle (Terraqua) regarding the status of Chelan PUD's efforts to have the ISEMP data available on PTAGIS.

III Douglas PUD

A. Presentation: USDA Report of Piscivorous Birds at the Wells Hatchery

Rick Klinge introduced Jim McGee of Douglas PUD, who provided a presentation on their evaluation of the effects of and alternatives to the existing bird and mammal control programs being used at Wells Hatchery (Attachment B). The study included identifying current and historic animals feeding on fish at the project hatcheries, looking at impacts of these animals, measures being used to control predation, and potential alternatives to these measures. The study also looked at the Methow Hatchery and the Chewuch and Twisp

Acclimation Ponds, although these were not the primary focus of the study. Approximately 2,200 bird occurrences were counted at the Wells Hatchery during the day, increasing to approximately 6,800 occurrences at night (an occurrence could represent the same bird multiple times). Frequently observed species included heron, merganser, and several duck species. During non-hazing periods, birds observed as most successful at capturing fish included cormorants and ospreys. Worst-case estimates of fish consumed in ponds included approximately 22,000 fish captured by herons, and approximately 5,000 fish captured by mergansers. Mammals observed at the hatchery included one family of raccoons and one otter.

Study results for the Wells Hatchery indicated that hazing is effective in altering the pattern of bird predation, but does not change the amount of predation. Also, the amount of fish lost in Pond 3 could not be attributed to bird predation only, while loss estimates in Pond 4 are likely all attributable to birds. Recommendations include modifying the hazing schedule to include evening/night times, fence and gull wire improvements, and improving fish enumeration throughout the rearing cycle. Results at Methow Hatchery showed that birds are only getting to the acclimation pond through open doors on covers. Mink were observed outside the hatchery but not inside it.

B. Douglas PUD 2009 M&E Implementation Work Plan

Rick Klinge updated the group that by the end of this week, Douglas PUD will be sending out its 2009 Implementation Work Plan, which will be out for a 30-day review.

C. Twisp Weir Update

Tom Kahler updated the group that a hydraulic hose on the Twisp Weir that had become disconnected near the end of the trapping season, had been reconnected in August, but incorrectly routed. Douglas PUD is uncertain how the quick-disconnect fitting became disconnected during trapping, but suspects that perhaps some debris could have jarred loose the collar on the female end of the fitting. Before the next Hatchery Committee meeting, Douglas PUD will be rerouting the hose and installing some devices on the quick-release collars so that they cannot accidentally come off again.

D. Summer Chinook Study Fish

Rick Klinge said that Douglas PUD is requesting Committees' approval for the collection of additional summer/fall Chinook broodstock from the Wells Hatchery program for potential use in 2010 survival studies. The new total is 44 study fish, up from 26 that had been previously approved. After some discussion as to whether this would be enough fish to meet HCP program needs, this study, and the YN request for green eggs for its Yakima River reintroduction pilot study, the Committees agreed to the increase in broodstock collection requested by Douglas PUD.

IV Colville Tribes

A. Groundwater Development at Bonaparte Pond

Jerry Marco updated the group that the Colville Tribes will soon have a test well drilled at the Bonaparte Pond site to determine the adequacy of groundwater as a potential source of water to prevent winter icing of the pond. This is a slight delay from the original schedule, as the Colville Tribes had hoped to have this completed by now. As such, Marco will forward information from this test as soon as it is available, and, if shown to be adequate, he will be looking for Committees concurrence as soon as possible following the test.

V WDFW

A. Steelhead Reproductive Success Response Memorandum

Kirk Truscott updated the group that he has sent a draft response memorandum on the steelhead reproductive success study plan out to the JFP for review. He will be finalizing this memorandum following the comment period, prior to the next meeting.

B. PIT-Tag Retention Study Protocols

Kirk Truscott said that all the fish in the PIT-tag retention study have now been tagged in the pelvic girdle. The study is intended to ultimately provide an indicator of PIT-tag shed rates. Mike Schiewe will forward the PIT-tag retention study protocol to Ali Wick for distribution to the Committees.

C. Results of Sockeye Fishery in Lake Wenatchee

In response to a question by Tom Scribner, Kirk Truscott reported that approximately 27,000 sockeye have been counted at Tumwater Dam, and that he would have information on harvest

available shortly. Truscott and Shaun Seaman agreed to discuss options to protect the Lake Wenatchee net pens in the future from the net-snagging that caused the sockeye release last month.

D. Program Broodstock Collection

In response to a question by Tom Scribner, Kirk Truscott updated the group that the Methow spring Chinook broodstock collection should be adequate to meet the program's needs. David Carie said that whether there will be spring Chinook available above program needs at Winthrop Hatchery will depend on the BKD results for this brood. Truscott also reported that spring Chinook collection for the Chiwawa was approximately 80 percent of the program's needs.

VI Yakama Nation

A. Balancing Broodstock Collection and Harvest

Tom Scribner invited WDFW to initiate discussions about managing broodstock collections at Wells Dam and the associated hatchery programs. In particular, he indicated that the YN was interested in the use of ultrasound at the volunteer traps in order to finer tune broodstock sex ratios during brood collection. He also suggested that a more efficient collection of broodstock had the potential to allow the co-managers to make more timely decisions regarding the disposition of surplus fish. The Committees discussed that there will soon be an upper Columbia summer Chinook management workshop, which will be a good venue to discuss broodstock collection and these other issues.

B. Cost Sharing for PIT-Tagging of Okanogan Sockeye

Tom Scribner updated the group that Columbia River Intertribal Fish Commission (CRITFC) has recently received some funding that the YN would potentially like to use for PIT-tag arrays in the Skaha system. The YN's goal would be to use PIT-tag information to calculate a more precise assessment of smolt-to-adult survival in the Skaha system. Scribner and Shaun Seaman will discuss cost sharing for PIT-tagging of Okanogan sockeye to clarify goals and potential objectives of having PIT-tag data.

C. Expanded Acclimation in Wenatchee and Methow Basins

Tom Scribner said that the YN is evaluating expanded acclimation in the Wenatchee and Methow Basins and has hired Anchor Environmental, L.L.C., to help develop these ideas. Scribner verified that these acclimation sites would re-distribute existing production.

D. Update on Kelt Reconditioning

Tom Scribner said that the YN has received comments on their kelt reconditioning proposal, and he is working on submitting the proposal for Independent Scientific Review Panel (ISRP) review at this time. The YN is anticipating that reconditioning would begin May 2009 at the Entiat Hatchery. Seaman reminded Scribner on the limitations on using the Rocky Reach juvenile bypass system to collect kelts due to permit limitations and that fact that modifications to the system would be needed. Modifications have a long lead-time due to engineering and scheduling requirements.

E. Update on Section 10 for Summer Chinook Reintroduction

Tom Scribner is working with NMFS on Section 10 coverage for the YN's summer/fall Chinook reintroduction pilot study in the Yakima River. Scribner and Kirk Truscott will discuss a date by which Section 10 coverage needs to be obtained in order to spawn the source fish.

VII NMFS

A. NMFS Letter Regarding Hatchery Program

Kris Petersen confirmed that a kickoff meeting will occur October 2 to discuss the process described in the recent NMFS letter regarding a potential reinitiating of consultation on HCP hatchery programs. An agenda and other materials will be sent out this Friday, September 26, or next Monday, September 29. The tentative time and location are 10 am to 4:00 pm or 4:30 pm at the Ratepayer room at Bonneville Power Administration; RSVPs to Petersen are appreciated.

VIII HCP Administration

B. Next Meetings

The next scheduled meetings are as follows: October 15, November 19, and December 17, all at the Chelan PUD offices in Wenatchee.

List of Attachments

Attachment A – List of Attendees

Attachment B – An Evaluation of the Effects of and Alternatives to the Existing Bird and Mammal Control Program

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Joe Miller	Chelan PUD
Shaun Seaman *	Chelan PUD
Steve Hays (after 11 am)	Chelan PUD
Jerry Marco *	Colville Tribes
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Todd Pearsons	Grant PUD
Russell Langshaw	Grant PUD
Kris Petersen * (by conference call)	NMFS
Dave Carie *	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

ATTACHMENT B

AN EVALUATION OF THE EFFECTS OF AND ALTERNATIVES TO THE EXISTING BIRD AND MAMMAL CONTROL PROGRAM

AN EVALUATION OF THE EFFECTS OF AND ALTERNATIVES TO THE EXISTING BIRD AND MAMMAL CONTROL PROGRAMS

Study goal

- The goals of this study were to evaluate existing practices and alternatives, and inform future management decisions related to future piscivorous wildlife control measures at the Wells Project and associated hatchery rearing facilities.

Objectives

- Identify and count the current and historic numbers and species of birds and mammals feeding on fish at the Project hatcheries and in the Wells tailrace;
- Assess the potential impacts of mortality caused by piscivorous birds and mammals to ESA listed, sensitive and recreationally important species;
- Describe each of the existing piscivorous wildlife control measures, including species targeted, reasons for control, frequency of control and effectiveness of the control method;
- Evaluate alternatives, including the costs and benefits of each measure recommended. The study will provide alternative methods of preventing predation of fish at the Wells Project and in hatchery rearing ponds.

Wells Hatchery

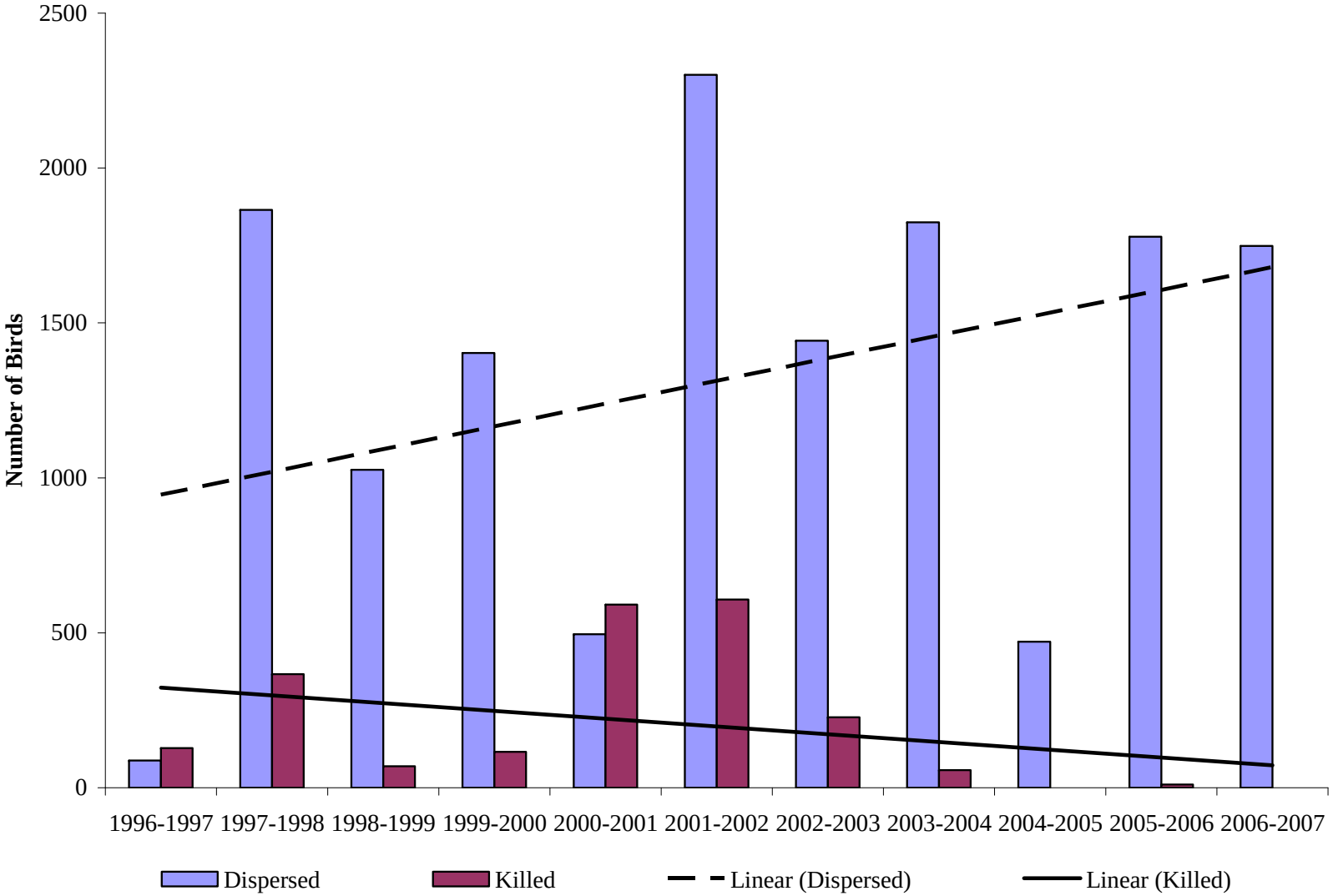
Methow Hatchery
Chewuch Acclimation Pond
Twisp Acclimation Pond

Observations

- Daytime Hazing
- Observed 2,288 birds attempting to use the Wells Hatchery.
- Dispersed 2,274 birds in 810 hazing events (324 vehicle and 486 pyrotechnics).

- Nighttime – no hazing
- Observed 6,839 birds using the Wells hatchery without hazing.

Numbers of birds dispersed and killed during management activities at Wells Hatchery October-May, 1996-2007.

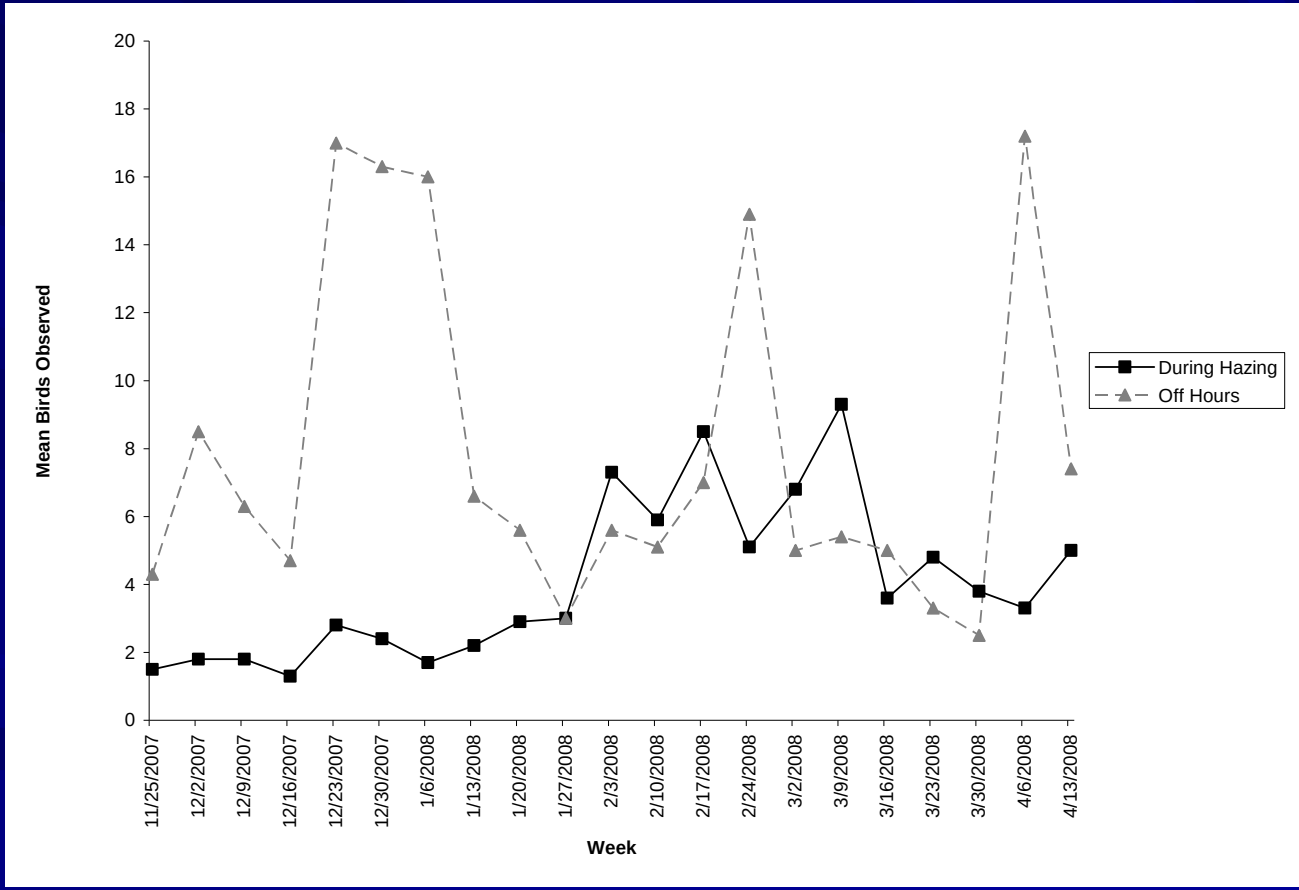


Three Most Frequently Observed Species

- <u>Nighttime</u>
- Great Blue Heron
- Mallard
- Common Goldeneye
- 23 species observed

- <u>Daytime</u>
- Common Merganser
- Bufflehead
- Great Blue Heron
- 15 species observed

Mean numbers of birds observed weekly at all Wells Hatchery locations during hazing and non-hazing periods, November 2007-April 2008



Observations of bird foraging behavior recorded during non-hazing periods at Wells Hatchery, Chelan County, Washington, November 2007-May 2008.

Species	Foraging attempts	Fish caught	Unknown caught
Great Blue Heron	522	16	329
Common Merganser	87	0	51
Hooded Merganser	53	0	27
Double-crested Cormorant	34	23	8
Osprey	27	26	0
Belted Kingfisher	26	1	14
Bufflehead	10	0	0
Pied-billed Grebe	9	0	2
Mallard	6	1	0
Common Loon	6	0	3
Common Goldeneye	2	0	2
Total	782	67	436

Worst case estimate of fish consumed in pond 1-4 during non-hazing periods at Wells Hatchery

Species	Pond 1	Pond 2	Pond 3	Pond 4	Total
Great Blue Heron	10,929	2,704	5,555	2,791	21,979
Double-crested Cormorant*	0	98	98	11	207
Belted Kingfisher	178	16	435	341	970
Common Merganser*	0	0	2,648	223	2,871
Hooded Merganser*	153	0	1,587	0	1,740
Total	11,260	2,818	10,323	3,366	27,767

* Estimated consumed 3 fish per hour

WDFW estimates of fish loss from Ponds 3 and 4 at Wells Hatchery, Chelan County, Washington, November 2007-May 2008.

Pond	Fish in	Fish out	Fish missing	Loss rate
Pond 3	333,908	294,908	39,000	11.7%
Pond 4	148,525	145,525	3,000	2.0%

Furbearer Observations

- 1 to 4 Raccoon observed 15 times
- 1 otter observed 4 times – caught 2 fish

What do we know?

- Local populations of birds altered their daily use of hatchery ponds to avoid hazing.
- The amount of loss in Pond 3 can not be attributed only to bird predation.
- Loss estimate in Pond 4 could be counting error.
- Otter predation was negligible.

Recommendations

- Modify the hazing schedule to also cover evening and nighttime hours.
- Replace the electric fence around ponds with woven fencing.
- Replace gull wires on ponds with 1 - 2 foot wire spacing.
- Improve the enumeration of fish through out the rearing cycle.

Methow Hatchery

- Only birds observes foraging in raceways entered through open doors on covers.
- Mink tracks were observed outside of the fence although not documented in ponds or raceways.

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Revised Final Memorandum

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

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Bob Pfeifer, Steve Hays, Joe Miller

Date: November 25, 2008

Re: Revised Final Minutes of October 15, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD auditorium in Wenatchee, Washington, on Wednesday, October 15, 2008, from 9:30 am to 4:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Shaun Seaman will email the Hatchery Committees the Chelan PUD response letter to National Marine Fisheries Service (NMFS) on the hatchery review process (Item IV).
- Rob Jones will finalize the draft NMFS handout on "Consultations for Upper Columbia River Hatchery Programs" and send it to Ali Wick for distribution to the Committees (Item IV).
- Mike Schiewe will contact the Colville Tribes regarding including westslope cutthroat, mountain whitefish, and resident rainbow trout in the Non-target Taxa of Concern (NTTOC) expert panel exercise (Item V-E).
- Pamela Nelle will send information on the November 13 Integrated Status and Effectiveness Monitoring Program (ISEMP) meeting to Ali Wick for distribution to the Hatchery Committees (Item VI-A).
- Julie Pyper will make edits to the Chelan PUD Statement of Agreement (SOA) for the Partial Water Re-use Study based on discussions with Washington Department of Fish and Wildlife (WDFW) on rearing issues. She will also check with John Skalski on Passive Integrated Transponder (PIT) tag sample sizes that are needed to calculate adult return rate, and will send out another SOA for consideration by October 31 (Item VI-B).

- Joe Miller will send the Final 2009 Chelan PUD Monitoring and Evaluation (M&E) Work Plan file to Ali Wick for distribution to the Committees; several Committees members had problems opening the previous version (Item VI-E).
- Kirk Truscott agreed to confirm whether WDFW would be collecting steelhead tissue samples at Tumwater Dam this year similar to last year (Item VI-H).
- Shaun Seaman will summarize Chelan PUD's procedural and technical concerns with the steelhead reproductive success study plan distributed by WDFW, and he will lead a discussion on this at the next meeting (Item VI-I).
- Shaun Seaman will provide for Committees approval an SOA for the Blackbird Island Pond project (Item VI-J).
- Tom Scribner will post the Yakama Nation's (YN's) coho Master Plan on an ftp site for Committees' review (Item VII-B).

DECISION SUMMARY

- The Committees approved the Blackbird Island Pond project and will document the decision with an SOA by email (Item VI-J).

I Meeting Minutes Approval

The Hatchery Committees approved the September 17, 2008 Meeting Minutes subject to revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees.

II HETT Update

Tom Kahler updated the group that Hatchery Evaluation Technical Team (HETT) is continuing to work on control groups (also known as reference populations) and is researching the origin of the 1981 and 1982 spring Chinook spawning data in the Chewuch River; these 2 years have exceptionally low spawner abundances and high recruits/spawner values compared to subsequent years.

III Recent Methow Basin Monitoring Meeting

Mike Schiewe noted that there was a meeting last week in Twisp convened by the U.S. Bureau of Reclamation (BOR) to review and coordinate habitat monitoring and evaluation in the Methow basin. Tom Kahler attended the meeting and indicated that most of the discussion was

about current monitoring activities, but that the group also talked about a steelhead reproductive success study required by the Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp). Kahler indicated that BOR was waiting to see what the HCP entities were going to do to meet their steelhead reproductive success study requirement, and that BOR was looking to coordinate with them. Also discussed was the coordination between WDFW and U.S. Geological Survey M&E activities, including PIT-tagging juveniles and placement of PIT-tag detection arrays. Kahler noted that the BOR/USGS group was using the PTAGIS database to archive and retrieve their data.

IV NMFS Follow-up on Process for Hatchery Review

Mike Schiewe noted that NMFS convened a meeting in Portland on October 2 to formally kick off their comprehensive review of hatchery programs in the Upper Columbia. To follow up on several questions raised at that meeting, Rob Jones of NMFS had agreed to attend today's meeting to address questions about the review and to begin the discussion of the new information that NMFS considered important as to how hatchery programs might change in the Upper Columbia.

Jones began by noting that the time is ripe for considering the role of hatcheries in rebuilding Columbia River salmon populations. Several new documents are out regarding effects of hatcheries in light of recent recovery documents. These include the FCRPS BiOp's reasonable and prudent measures (RPAs), the Hatchery Scientific Review Group's (HSRG's) recommendations, the Interior Columbia Technical Recovery Team's (ICTRT) work, and several recently published scientific papers. The FCRPS BiOp lays out a schedule for reviewing hatchery programs in the Upper Columbia and requires the preparation of new Hatchery and Genetic Management Plans (HGMPs) for hatcheries in 2009. At the Portland meeting, NMFS described their expectation that these reviews would be completed within the current Mid-Columbia process, reviewed with the existing regulatory processes, and a new schedule would be set for the actions. Jones clarified that there could be four types of permit actions considered: 1) keeping the existing permit, 2) amending the existing permit 3)modifying the existing permit,, or 4) creating a new permit (given here in order of increasing change). Jones stated that it would not be until hatchery reviews were complete and new HGMPs were developed that NMFS would know which permit action would be required. He also said that NMFS is

committed to the HCP process and will rely on the HCP Committees to develop the new HGMPs and work to achieve consensus among HCP signatories.

Jones provided a handout titled "Consultations for Upper Columbia River Hatchery Programs" that he would send to Ali Wick (Attachment B). The handout included a table that listed hatchery programs that are intended to supplement natural populations and hence may require reevaluation under the Endangered Species Act.

Jones said that it is NMFS' expectation that permit holders would take the lead on preparing the new HGMPs. Kris Petersen said that would help to focus the permits and set them up for future modifications if needed. She said that, typically, hatchery operators are the permit holders and that there can be multiple permit holders but that NOAA would leave this decision to the members of the Hatchery Committees. Cherise Oram said that her understanding was that the regulations contemplate that a permit holder is a single entity, that the entity is the party with the obligation to operate the hatchery program, and that the regulations specifically anticipate that agents are covered without being named in the permits. She said that this would suggest to her that Chelan and Douglas PUDs would be the permit holders. Tom Scribner indicated that the YN would like to be on the permits. Jones said that NMFS was flexible to discuss the specifics of how this would be set up. Kris Petersen reminded the group that how things had been done in the past was that there were multiple permit holders.

The Committees discussed concerns that the schedule for preparing new HGMPs may not be realistic. However, the Committees understood that if hatchery reviews were not complete by the deadlines, NMFS would not meet its deadline articulated in the FCRPS BiOp. Shaun Seaman expressed concern that Chelan PUD still may not have enough information to prepare the HGMPs. Jones confirmed that NMFS would not be dictating specific values such as percent natural influence (PNI), but NMFS would work iteratively with the PUDs to prepare acceptable HGMPs bases on available information. Oram asked Jones to clarify whether existing BiOps are still valid until the hatchery review is complete, and Jones confirmed this is the case.

Seaman indicated that Chelan PUD had sent a letter to NMFS expressing their concerns about the hatchery review process laid out at the October 2 meeting; he indicated that he would distribute the letter to the Committees. Oram summarized the Chelan PUD letter, which

includes a recommendation to complete the comprehensive review at the ESU level, not at an individual basin level. Chelan PUD also recommended that individual BiOps and Individual Take Statements (ITS) be issued for individual programs. Petersen responded that the analyses would be done at the basin level and rolled up to the ESU level. Tom Scribner pointed out that the schedule is based on a basin level analysis, so this may have to be taken into account for future deadlines.

Petersen said that NMFS would further discuss internally the issue of sequencing the reviews. Oram suggested that if they are conducted sequentially, then the first programs to be consulted on would seem to limit the options for later programs. Jones agreed to modify today's handout to address some of these concerns and send it to Ali Wick for distribution to the Committees. Seaman indicated that Chelan PUD had additional questions that it would like NMFS to address and would follow up after today's meetings.

V Douglas PUD

A. Douglas PUD 2007 M&E Report

Tom Kahler updated the group that Douglas PUD received no comments on the Draft 2007 Douglas PUD M&E Report. The Hatchery Committees approved this report.

B. Douglas PUD 2009 M&E Implementation Plan

Tom Kahler reminded the group that the Douglas PUD Draft 2009 M&E Implementation Plan was sent out to the Committees for review and comments are due November 11.

C. Coho Obligation

Tom Kahler said that a final payment of $41,000 was transferred to the YN pursuant to Douglas PUD's coho mitigation agreement. This completes Douglas PUD's coho mitigation obligation through 2017.

D. Access to East Embankment and Trapping Facilities during Rewind Process at Wells Dam

Rick Klinge updated the group that Douglas PUD will be rewinding the turbine rotors at Wells Dam over the next 9 years. This work requires a flat surface near the turbines. Because of the configuration of Wells Dam, rewind will need to take place on the deck of the dam and there will be times when access to the east fish ladder will be restricted. Klinge is working with project engineers to resolve potential ladder access issues, and he will keep

the Committees apprised of progress. Schiewe recommended that the affected parties (e.g., WDFW, YN) convene an onsite meeting with Douglas personnel to evaluate the potential for disruption of access to the east fishway and to discuss measures to minimize or avoid disruptions. Douglas will work with the affected parties to coordinate an onsite meeting.

E. NTTOC Discussion

The Committees reviewed the various HCP parties' positions listed on the recently compiled NTTOC table, and the group agreed on a final list of species to consider in the expert panel exercise. Because the Colville Tribes representative was unable to participate in today's meeting, Mike Schiewe will follow up with the Colville Tribes regarding their interest in including westslope cutthroat, mountain whitefish, and resident rainbow trout in the NTTOC review. The Committees agreed to convene the expert panel next spring or early summer.

VI Chelan PUD

A. ISEMP PIT-Tag Arrays

Pamela Nelle of ISEMP attended today's meeting to discuss incorporating Peshastin Creek and Entiat River PIT-tag data into the PTAGIS database. Because these arrays (as well as most ISEMP arrays) are not considered permanent detection locations, they are not currently archived in PTAGIS. Nelle indicated that ISEMP is setting up an ACCESS database to archive these data until an arrangement can be worked out with PSMFC, the organization that hosts the PTAGIS data system. The ACCESS database will be set up to allow HCP members to query these data. Nelle also mentioned that there will be an ISEMP coordination meeting on November 13, and that she would send Ali Wick information on the meeting for distribution to Committees members. The plan is to eventually get the data into PTAGIS.

B. Water Re-use Study Update

As discussed at the September Hatchery Committees meeting, Julie Pyper presented a draft SOA for consideration of a second year of study of water re-use for rearing summer Chinook. The Committees discussed several edits that Chelan PUD agreed to make. Chelan PUD indicated that it wanted to be very clear that if these pilot studies continued to show high survival, that eventually they would want to convert part of their mitigation fish to

circular production. Committees members acknowledged this, but were equally clear that they had not expressly agreed to consider that path forward yet. Pyper worked through comments from the YN and WDFW regarding the SOA, and Chelan PUD and WDFW agreed to work out any outstanding issues before finalizing the SOA. Chelan PUD agreed to maximize the number of tags such that information on adult returns would be available in the future. Pyper will have these edits made and will send out another SOA for consideration by October 31.

C. Comments on Sockeye Enumeration Study

Joe Miller indicated that he had made edits to the study plan based on Committees comments. The Committees reviewed these edits. One issue that will still need additional work was how to evaluate the sampling efficiency of the instream PIT-tag detectors. Miller agreed to continue working on options for addressing this issue.

D. Revised HGMPs – Chelan Falls and Chiwawa

Julie Pyper updated the group that Chelan PUD is at 30 percent design for both the Chelan Falls (Turtle Rock conversion) and Chiwawa steelhead rearing facilities, but Chelan PUD does not have Section 10 permits for either of these programs/facilities. Chelan PUD wanted to make the Committees aware that it does not intend to move beyond the 30 percent design until Section 10 coverage is in place. Chelan PUD is committed to working with NMFS and the Committees to complete an HGMP and obtain the necessary permits.

E. Final 2009 Chelan PUD M&E Work Plan

Joe Miller indicated that all comments on the 2009 Chelan PUD M&E Work Plan have been addressed, and the version that the Committees conditionally approved by conference call on October 1 is now final. Joe Miller will send the file to Ali Wick for distribution to the Committees.

F. Chelan PUD Engineering Report

Julie Pyper said that the CPUD Engineering Report was distributed by email last week; there was no additional discussion on the report.

G. HSRG Coordination

Shaun Seaman indicated that Chelan PUD would be submitting additional comments to the HSRG during the formal comment period. Committee members indicated that as their individual agency comments were completed that they would share them with the other Committees members.

H. 2008/2009 NOAA/WDFW Steelhead Study

Julie Pyper asked WDFW whether they indicated to continue to collect steelhead tissue samples at Tumwater Dam this year. Kirk Truscott said that he thought that was the case, but he agreed to check with research staff to confirm.

I. Steelhead Reproductive Success Study

Mike Schiewe asked Committee members if there had been any progress toward resolving concerns raised by Chelan PUD on the draft steelhead reproductive success study plan circulated by WDFW. Tom Scribner asked if Chelan PUD was committed to doing a steelhead reproductive success study. Shaun Seaman confirmed this. Schiewe reminded the group that HCP explicitly required the Committees to plan a steelhead reproductive success study and Chelan PUD to implement the study. Schiewe also stated that he did not believe the Committees had vetted the technical issues of the study to all members' satisfaction. Seaman said that Chelan PUD wanted to consider further the policy and technical aspects of the study and will lead a discussion on this at the next meeting.

J. Blackbird Island Pond

Shaun Seaman indicated that although all the permits, agreements, and water rights applications were progressing through the approval process for the Blackbird Island Pond project, and the Committees had verbally agreed to this project, there had not been a formal SOA approved by the Committee. Today, the Committees stated their official agreement for the use of Blackbird Pond for acclimating up to 50,000 juvenile steelhead annually from 2009 to 2013. Seaman will provide a follow-up SOA for email approval.

VII Yakama Nation

A. Cost Sharing for PIT-Tagging of Okanogan Sockeye

Tom Scribner updated the Committees that any use of Columbia River Intertribal Fish Commission funds to enhance monitoring and evaluation of upper Columbia sockeye would require further coordination between the YN and the Colville Tribes.

B. Coho Master Plan

Tom Scribner updated the group that the YN has almost finished the final draft of the Coho Master Plan and would submit it to the Technical Working Group (TWG) soon. This submittal is part of the Northwest Power Planning and Conservation Council's (NPPCC) three-step process. Scribner will place the document on the ftp site for Committees' access and review. Comments will be due within 30 days from the date of Committee access.

VIII HCP Administration

A. Meeting Agreements

The Committees made the following agreements at this meeting that did not require a formal SOA:

- The Committees accepted the 2007 Douglas PUD M&E Report as final (Item V-A).
- The Committees agreed to proceed with the NTTOC expert panel exercise next spring or early summer (Item V-E).

B. Next Meetings

The next scheduled meetings are as follows: November 19, December 17, and January 21—all at the Chelan PUD offices in Wenatchee.

List of Attachments

Attachment A – List of Attendees

Attachment B – Consultations for Upper Columbia River Hatchery Programs (Draft NMFS handout) – TO BE REVISED

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor Environmental, L.L.C.
Ali Wick	Anchor Environmental, L.L.C.
Jeff Gislason (by conference call)	Bonneville Power Administration
Ron Eggers (by conference call)	Bureau of Reclamation
Joe Miller	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper *	Chelan PUD
Cherise Oram	Stoel Rives
Tom Kahler *	Douglas PUD
Rick Klinge *	Douglas PUD
Todd Pearsons	Grant PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Rob Jones	NMFS
Bob Turner	NMFS
Dave Carie *	USFWS
Julie Collins	USFWS
Bill Gale	USFWS
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Tom Scribner *	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B
Consultations for Upper Columbia River Hatchery Programs (NMFS handout)
TO BE REVISED

CONSULTATIONS FOR UPPER COLUMBIA RIVER HATCHERY PROGRAMS

NOAA's National Marine Fisheries Service (NMFS) has announced a comprehensive review of hatchery programs starting in the Upper Columbia River Basin (UCR) (see the September 12, 2008 letter from Rob Walton). Federal programs and several Public Utility District funded programs in the UCR will be initiating consultations under the Federal Endangered Species Act (ESA) with NMFS and are working on new Hatchery and Genetic Management Plans (HGMPs). Hatchery programs funded by Chelan and Douglas PUDs were issued permits in 2003 and 2004 pursuant to section 10 of the ESA (permits 1196, 1395, and 1347). Issuance of these permits was based on NMFS Biological Opinions (BiOps) that considered public comments on hatchery operations as described in the permit applications submitted five and six years ago and on best available science at that time. Under the present circumstances, permit holders have been advised that reinitiation of consultation under the ESA is adviseable and to submit new HGMPs to NMFS for review.

As provided in 50 CFR §402.16 of the ESA, reinitiation of formal consultation is required if: (1) the amount or extent of annual take, either intentional take or incidental take, is exceeded or is expected to be exceeded; (2) new information reveals effects of the agency action that may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect to listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. Nine PUD funded hatchery programs fall into the first or second category; two funded by Grant PUD, five funded by Douglas PUD, and two funded by Chelan PUD (Table 1).

Hatchery actions may affect listed species in a way not previously considered based on substantial new information and analysis available since the issuance of permits 1196, 1395, and 1347. Technical analysis and options for operating hatchery programs consistent with ESA recovery objectives have been provided by the Interior Columbia Technical Recovery Team (ICTRT) and a recovery plan for UCR spring Chinook salmon and steelhead was adopted by NMFS in 2007. In May 2008, NMFS completed its analysis of the Federal Columbia River Power System (FCRPS) and issued a supplemental comprehensive analysis (SCA) with the BiOp on the FCRPS proposed action. The FCRPS BiOp and SCA considered new information in the form of scientific research published in both peer reviewed and technical report forms along with new life history models. Furthermore, the Federal Hatchery Review Team (HRT) and the Hatchery Scientific Review Group (HSRG) have conducted reviews of UCR hatchery programs in recent months. All of these sources of information and review have occurred since ESA permits 1196, 1395, and 1347 were issued.

Recent research on the fitness of hatchery-origin fish when they spawn in the natural environment comingled with natural-origin fish suggest that natural populations are susceptible to fitness loss in the hatchery most probably due to domestication selection. That is, salmon are inadvertently selected and thus adapt to the hatchery environment in either captive reared, traditional or supplementation hatcheries as contrasted with the natural environment (Araki et al. 2008; Naish et al. 2008; Ford 2002). In other words, the natural

gene flow and adaption processes are interrupted and may adversely affect the natural-population. One of the major insights from past studies on documenting poorer relative fitness from hatchery origin fish compared to natural origin fish on the spawning grounds is the point that in most cases, the more generations that hatchery fish have been in culture the greater the fitness loss (Araki et al. 2008; Naish et al. 2008; Ford 2004).

The previous analysis and permit 1395 recognized that non-migratory hatchery-origin (residual) steelhead could pose a risk to natural-origin juvenile steelhead in the Wenatchee and other rivers in the UCR basin. The primary mechanism to address this risk was a term and condition in permit 1395 that states *"Measures shall be applied to ensure that artificially propagated UCR steelhead juveniles released will be ready to actively migrate to the ocean. To meet this condition, fish must be released at a uniform size and state of smoltification that ensures that the fish will migrate seaward without delay after release."* The target size and coefficient of variation (CV) for the Wenatchee steelhead program is a fork length of 198 mm and a CV of 9.0 as established by the hatchery committee that oversees this program. The size variance target has been met for only two out of 27 release groups since 1999. This information in combination with observations and sampling of non-migratory steelhead in the UCR suggests that the risk posed to ESA-listed natural-origin fish by residualized steelhead in the form of competition and predation is greater than previously thought and that the amount or extent of annual take, either intentional take or incidental take, is exceeded or is expected to be exceeded.

New information reveals effects of the hatchery programs that may affect listed species in a way not previously considered. For example, sliding scale strategy for broodstock collection and sliding scale for the management of adult returns for specific programs was not considered in any of the previous BiOps. This shortcoming of permit 1196 was identified as far back as 2005 when the Washington Department of Fish and Wildlife (WDFW) with the Yakama Nation began work on a modification proposal for the Chiwawa Spring Chinook Salmon Program. Those agencies were concerned with broodstock collection constraints in permit 1196. Chelan PUD, as a co-permit holder with WDFW (and Douglas PUD), provided comments on the draft modification request in March of 2005 including providing additional text to support the request for permit modification *"this proposal is necessary because of various changes in anticipated adult returns from hatchery fish and potential changes in hatchery production levels."* Since that time progress on a permit modification has been slow, but the need for the modification persists.

Programs that supplement natural spawning to reduce short-term extinction risk and accelerate recovery should include actions to reduce the dependence on the hatchery program as the status of the target population improves. Specific to the UCR Spring Chinook Salmon Programs (Permit 1196), the Biological Opinion on the issuance of permit 1196 (consultation 1999/00836) in addition to the aforementioned language quoting 50 CRF §402.16 of the ESA, states that "*the recent increased run sizes of hatchery origin UCR spring Chinook salmon might lead NMFS to reassess the potential adverse impacts on the natural spring Chinook populations, such as those of swamping and genetic introgression. Prior to the 2001 return year, the UCR spring Chinook returns were very low, since 2001 the adult returns have rebounded, primarily attributable to improved ocean conditions. If high returns continue, it is important to identify potential alternative uses for artificial propagated adult spring Chinook in order to promote the recovery of natural*

selection and protect natural origin spawners from being inundated by hatchery origin fish. Potential management actions include; the removal of excess artificially propagated spring Chinook salmon adults at traps and ladders in the Columbia River or at tributary locations; opening fish hatchery facility ladders for artificially propagated fish to enter voluntarily; allowing selective harvest using dip nets or traditional gear by tribes that historically fished in the UCR Basin; allowing selective harvest of artificially propagated salmon by recreational anglers. If new management actions are required, the potential impacts will need to be further evaluated under the ESA in a separate consultation process."

The need to develop strategies to manage hatchery adults on the spawning grounds has also been a draft recommendation of the HSRG. The parties to the Chelan PUD Habitat Conservation Plans (HCPs) were aware of this need as indicated by the text in the draft permit modification already mentioned. Adult management strategies were included in permit 1395 for UCR steelhead, but not in permit 1196 for UCR spring Chinook salmon. Since there was no analysis conducted on the effects on the listed species from adult management activities, a new consultation is necessary.

Table 1. Hatchery programs that warrant consultation under the Federal Endangered Species Act . The programs in this table engage in the direct "take" of salmon or steelhead listed as Endangered.

Program	Funding	Basin	Justification for Consultation
White River Spring Chinook	Grant PUD	Wenatchee	• Permit expires May 2010
Chewuch spring Chinook	Douglas PUD	Methow	• Adult hatchery fish management strategies not addressed in previous consultation • New information regarding fitness loss in natural population not addressed in previous consultation • "The ICTRT characterizes the diversity risk to all UCR spring Chinook populations as "high". The high risk is a result of reduced genetic diversity from homogenization of populations…In recent years, straying hatchery fish, compositing fish for broodstock, low proportion of natural-origin fish in some broodstocks and a high proportion of hatchery fish on the spawning grounds have contributed to high genetic diversity risk"0+ (SCA 8.6-6). • The Chiwawa program does not manage the HOF fraction of natural spawners and this poses a risk to population productivity (SCA Appendix D). • The Methow Chinook program composites Methow and Chewuch fish which breaks down genetic differentiation and "poses a risk to the fitness of the natural population" (SCA, 8.6-9). "Additional reforms would reduce threats to genetic diversity within the Methow population and to fitness reductions when a high proportion of the natural spawners are of hatchery –origin" (SCA 8.6-30).
Chiwawa spring Chinook	Chelan PUD	Wenatchee	
Methow Composite spring Chinook	Douglas PUD	Methow	
Twisp spring Chinook	Douglas PUD	Methow	

			• Broodstock practices reduce population diversity (few NOF are incorporated into the hatchery broodstock and the program composites Methow and Chewuch fish). Failure to manage the HOF fraction of natural spawners poses a risk to population productivity (SCA Appendix D).
Okanogan steelhead	Grant PUD	Okanogan	• Permit expires Oct 2008
Wells steelhead Methow	Douglas PUD	Methow	• The Wells Methow and Okanogan programs have been identified in the FCRPS as a top 5 limiting factor (SCA Appendix C). Pose risks to population diversity and productivity because of the broodstock program and because HOF >90% of all natural spawners (SCA Appendix D). • Non-migratory juveniles increase risk to naturally produced fish • New information regarding fitness loss in natural population not addressed in previous consultation • "The ICTRT has characterized the diversity risk to al UCR steelhead populations as "high". The Methow and Okanogan populations have particularly hig proportions of hatchery-origin spawners and recent monitoring data suggests that hatchery fish may be straying into non-target areas, likely contributing to the continued homogenization of the populations" (SCA 8.7-7). "The PUD funded program continues to be a composite of the Methow and Okanogan populations (not an optimum practice for a hatchery program intended to promote genetic diversity and improve natural survival" (SCA 8.7-11). • "In this analysis for the Wenatchee, Methow and Okanogan basins, assumptions in the CA that supplementation will be significantly reduced from recent averages and that the proportion of natural spawners composed of HOF will decline dramatically, depend on the increased abundance of natural-origin spawners in each basin and on future HGMPs that reduce the proportion of natural spawners composed of HOF as the abundance of NOF increases" (SCA 8.7-12). • "NOAA Fisheries expects that hatchery reform measures will include a plan for reducing the dependence on hatchery fish to spawn naturally as the abundance of NOF increases" (SCA 8.7-28). • "If the percentage of NOF on the spawning grounds increases, then it is likely that further increases in productivity, as reflected in the R/S estimates, would occur" (SCA 8.7-37). • The CA "demonstrated that if hatchery fractions were to be reduced sufficiently in the future, R/S estimates could be greater than 1.0 for three of the four populations. NOAA Fisheries acknowledges the potential that R/S could be greater than 1.0 for these populations when the natural-origin abundance increases and dependence on hatcheries can be reduced".(SCA 8.7-38). • "Additional reforms to increase the percentage of NOF on the spawning grounds and improved hatchery broodstock practices, are likely to reduce these residual effects and increase productivity" (SCA 8.7-38).
Wells steelhead Okanogan	Douglas PUD	Okanogan	

			• "Prospective actions to develop a local broodstock for the Methow and Okanogan are expected to improve the situation for the Wenatchee, Enitat, Methow and Okanogan populations. Substantial reduction in the homogenization of the Methow population will require reforms at Winthrop NFH and in the Wells Hatchery program (a hatchery program not funded by the Action Agencies)". (SCA 8.7-40). • "Hatchery programs in the Methow and Okanogan do not currently follow optimum broodstock practices for improving diversity for the Methow and Okanogan populations" (SCA 8.7.41).
Wenatchee steelhead	Chelan PUD	Wenatchee	• High adult stray rate to areas outside the Wenatchee basin (SCA Appendix D). • Non-migratory juveniles increase risk to naturally produced fish • New information regarding fitness loss in natural population not addressed in previous consultation

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Final Memorandum

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

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Bob Pfeifer, Steve Hays, and Joe Miller

Date: December 17, 2008

Re: Final Minutes of November 19, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD offices in Wenatchee, Washington, on Wednesday, November 19, 2008, from 9:30 am to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Shaun Seaman will add appendices to the Water Re-use Statement of Agreement (SOA) as attachments and will send the final SOA and attachments to Ali Wick for distribution to the Committees (Item II-A).
- Ali Wick will send out the final Blackbird Island Pond SOA (Item II-B).
- Keely Murdoch will work with Tom Scribner to develop additional text for the Okanogan Nation Alliance (ONA) SOA and will provide this to the Committees the first week of December (Item II-C).
- Mike Schiewe will develop a schedule of meetings and discussions for coming months that will be necessary to complete the revised/new Hatchery Genetic Management Plans (HGMPs; Item II-D).
- Joe Miller will work with Grant and Douglas PUDs to put together some key questions about the *Hatchery-Induced Life History Variability in Chinook Salmon* study (V-A).
- Kirk Truscott will work with Andrew Murdoch to develop a summary of steelhead Passive Integrated Transponder (PIT)-tag data for fish into the Entiat River and Peshastin Creek (Item VI).

DECISION SUMMARY

- There were no decisions made at this meeting.

I Welcome

The Hatchery Committees approved the October 15, 2008 Meeting Minutes subject to revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees. During the action item review, referring to an Action Item from last month, Kirk Truscott reported that Washington Department of Fish and Wildlife (WDFW) is collecting steelhead tissue samples at Tumwater Dam again this year.

II Chelan PUD

A. Water Re-use SOA

The Committees considered a revised SOA for a continuation of the Pilot Water Re-use Study. The SOA will be amended to include a statement clarifying that implementation is subject to National Marine Fisheries Service (NMFS) concurrence that the impacts to Endangered Species Act (ESA) species remain within those that were contemplated in the existing ESA authorizations. Kirk Truscott said that there would be substantive differences between 2008 and 2009 release dates. Keely Murdoch reminded the Committees that the Yakama Nation (YN) would be recommending that a high proportion of the fish are tagged in order to quantify adult returns. Shaun Seaman said that Chelan PUD agreed with PIT tagging and clarified that the full Committees have not yet agreed upon the method by which to quantify adult return rates. Seaman will add several appendices that are needed to the SOA as attachments and will send the final SOA to Ali Wick for distribution to the Committees.

B. Blackbird Island Pond SOA Edits

The Committees agreed to edits to the previously agreed to SOA for Blackbird Island Pond. Ali Wick will send out the final SOA as edited today.

C. Okanogan Nation Alliance SOA

Julie Pyper introduced a draft SOA that would commit Chelan PUD to funding the ONA Skaha Lake Sockeye Program through the broodyear starting in 2017, and concomitantly extend the Committee's agreement that this funding meets the Chelan PUD HCP obligation

for sockeye mitigation through 2018. Pyper indicated that Chelan PUD would like a Committees' decision on this SOA prior to the next meeting.

Keely Murdoch noted that the YN would like the SOA to include a requirement that adult returns will be used in the monitoring and evaluation of program progress. Murdoch will discuss some suggested text for the SOA with Tom Scribner and will provide this to the Committees the first week of December. Additional Committee discussions focused on the extension of the deadline to reevaluation of program progress; some members of the Committees indicated that they would prefer that the 2013 check-in date that was written into the original 2005 SOA should be retained. Several Joint Fisheries Parties (JFPs) members said that they would work collaboratively to draft some edits that address this timeline and will discuss these edits on a conference call set for 9:00 am on Thursday, December 4.

D. Preparation of HGMPs

Mike Schiewe introduced this topic. He noted that NMFS had requested that the Committees complete new HGMPs for Wenatchee spring Chinook and Wenatchee steelhead by February for 2009. Schiewe also noted that WDFW and YN staff have been working over the past several months to develop a joint management plan for Wenatchee spring Chinook. Steve Parker was attending today's meeting to brief the Committees on the status of their discussions and a recent agreement between WDFW and YN on management principles.

Steve Parker distributed to the Committees a document jointly prepared by WDFW and YN that articulated the co-managers' primary goals of ensuring that mitigation benefits are realized and that the programs do not impede recovery. The document included jointly agreed to principles and priorities, underlying assumptions, and next steps for the program. One of those priorities is to use proportion natural influence (PNI) thresholds in broodstock management to reduce risk of domestication in the Chiwawa River and Nason Creek populations. Parker noted that this may involve collection of broodstock at Tumwater Dam and assignment to a population (i.e., White River, Nason Creek, or Chiwawa River) based on results of genotyping of fish previously collected and tagged at Priest Rapids Dam. In response to a question from Shaun Seaman on whether weirs were then necessary upstream,

Parker said that the intent of the co-managers' planning is that the need for weirs on the Chiwawa River and Nason Creek would for this purpose ultimately be eliminated.

Russell Langshaw had several questions. He asked what a suggested re-evaluation of population substructure would involve, and Parker replied that this had not been worked out yet. Langshaw also asked about the priority of genetic diversity over PNI as it applies to the White River. Parker said that the co-managers' goal is to keep the White River populations isolated from the lower basin populations in order to maintain its uniqueness within the Wenatchee basin. Langshaw also asked whether this approach would be applied for the Methow and Twisp populations. Parker replied that the approach could be used to consider management options not currently available, but that the co-managers have not discussed that yet.

Mike Schiewe asked Steve Parker whether there was any timeline for the YN and WDFW to complete their management plan. Parker said that the co-manager group will be meeting again on December 1, and he anticipates a decision and a product for external review within at least a month of the new year.

Mike Schiewe suggested that it would be important for the Committees to establish a schedule for developing the new HGMPs, and the members generally agreed, acknowledging that the Wenatchee spring Chinook management plan was due February 2009. Schiewe then posed several questions to the Committees:

1. Are there new or previously not identified data that the Committees should be considering in developing the HGMPs?
2. For each of the programs are there major policy or technical issues that need to be resolved before completing an HGMP (e.g., Tribal/WDFW agreement in Wenatchee spring Chinook HGMP)?
3. Who should or wants to be directly involved in crafting the HGMPs (as opposed to approving them once drafted)?

Schiewe said that once these issues were sorted out, a realistic schedule could be developed.

The Committees discussed in some detail what some of the bigger policy and technical issues are for revisions of the HGMPs:

- The time period or duration of the HGMPs (i.e., 10 years?)
- How to incorporate new information on reproductive success of hatchery versus wild fish
- Regarding adults
  - Balancing minimum escapement levels versus a liberal harvest policy
  - Incorporating a consideration of carrying capacity
- Regarding juveniles
  - Residualization of hatchery fish (particularly steelhead smolts)
  - Incorporating a consideration of carrying capacity

Regarding who should be involved in the writing the HGMP for the Chiwawa River spring Chinook program, Shaun Seaman said that he had been in contact with Jeff Korth of WDFW and that they had tentatively agreed that WDFW and Chelan PUD would jointly take leadership in drafting the HGMP, with Chelan PUD facilitating the process. He indicated that they would welcome the direct involvement of any other member of the Hatchery Committees as well. Kirk Truscott and Keely Murdoch (WDFW and YN, respectively) would definitely be involved in the writing. Jerry Marco, Bill Gale, and Dave Carie said that their agencies would not be directly involved in the writing but would appreciate some periodic check-ins as the documents are being prepared. Kris Petersen said that NMFS would like to be involved in the initial meetings and have the opportunity to review the draft documents as they come together.

Mike Schiewe asked about schedule; the Committees agreed that they could produce a final Wenatchee steelhead HGMP that could be reviewed by NMFS by the end of March. For Wenatchee spring Chinook, Steve Parker said that his expectation was that co-manager input would be available to craft a new HGMP by the end of January. Based on this timeline, the Committees agreed on a schedule for a final Chiwawa River HGMP by the end of May. Schiewe said that he would vet this schedule with Rob Jones (NMFS) and if acceptable, he would lay out a schedule of HGMP meetings and discussions for the coming months.

Kris Petersen asked Rick Klinge whether Douglas PUD wanted to be in on the Wenatchee discussions to prepare for developing a plan for drafting new HGMPs for the Methow Basin. He said that Douglas PUD would be ready to discuss their preferred approach at the December meeting.

E. Steelhead Reproductive Success Study Update

Shaun Seaman reported that he and Joe Miller had met with Andrew Murdoch (WDFW) and Mike Ford (NMFS) to review the technical aspects of the study. Miller said that the key topics discussed were 1) the statistical power of the study, 2) the importance of developing a draft decision structure for data interpretation and management strategies, and 3) development of a study budget. In December, Chelan PUD will invite Murdoch and Ford to come and share the discussions with the Committees.

F. Approval of Water Re-Use Rearing Criteria

Shaun Seaman reminded the Committees that at the beginning of the 2008 Pilot Water Re-use Study, Chelan PUD had agreed to review the rearing criteria with the Committees before proposing additional testing. Seaman noted that this information had been sent out to the Committees by email in order to close this loop.

G. Sockeye Enumeration Study – PIT-Tag arrays for Sockeye

Joe Miller said that Chelan PUD is making good progress on getting this study ready to implement. Chelan PUD has received a quantitative analysis of sample size from John Skalski. He also said that Chelan PUD has applied for a Hydraulic Project Approval (HPA) for the PIT-tag arrays. Miller said that Chelan PUD is on track to have this study ready for the 2009 sockeye spawning period.

H. Chelan PUD Engineering Report

Julie Pyper said that the Chelan PUD Engineering Report was distributed by email last week; there was no additional discussion on the report at this meeting, but members are encouraged to call her if any questions arise.

III Douglas PUD

A. Wells Hatchery Compliance Report

Rick Klinge said that this document is out for review and will be up for approval at the December meeting.

B. Douglas PUD 2009 M&E Implementation Plan

Rick Klinge said that there were no comments to the Douglas PUD Draft 2009 Monitoring and Evaluation (M&E) Implementation Plan; comments were due November 11. The Committees approved this plan.

IV Yakama Nation

A. Impacts to Coho Adults from Recent Wells "Drawdown"

Keely Murdoch reported that the YN was concerned that the recent Wells Project "drawdown" may have affected coho ability to migrate into and up the Methow River because only a few fish entered the Winthrop Hatchery during and immediately following the "drawdown." She requested that any future "drawdown" operations be scheduled to occur later in the year following the coho spawning migration. Rick Klinge agreed that doing the work in December would have reduced the potential for stranding coho. He said that the "drawdown" had been approved by the Wells Coordinating Committee. In the future, he would recommend to the PUD that a "drawdown" like this one would occur later in the coho migration period.

B. Sockeye Cost-Sharing in Okanogan Basin

Keely Murdoch updated the group that Jeff Fryer (Columbia River Intertribal Fish Commission) is continuing to discuss enhanced sockeye salmon monitoring and evaluating activities with the Colville Tribes and the Okanogan Nation Alliance.

C. Path Forward for Coordinating Protocols for Summer Brood Collection at Wells Dam

Keely Murdoch said that the YN was interested in better planning for managing broodstock collection of summer Chinook at Wells Dam. Jerry Marco said that the Colville Tribes will be holding a workshop this spring to discuss this.

D. Upper Columbia Kelt Re-Conditioning Program Funded under Yakama Nation MOA

Keely Murdoch said that the YN is hoping to have a test group this spring to begin testing kelt re-conditioning. Bill Gale noted that the U.S. Fish and Wildlife Service would like to be kept in the loop on this because of the proposed involvement of the Entiat Hatchery. Murdoch confirmed that the YN is coordinating with the staff at Entiat Hatchery.

V NMFS

A. Draft Proposal: "Hatchery-Induced Life History Variability in Chinook Salmon"

Kris Petersen said that she distributed this paper to the Committees on behalf of Don Larsen and Brian Beckman. She indicated that she was passing this on as an FYI. She said that the Hatchery Committees might think about whether the Committees would want to pursue something like this. Bill Gale wanted more information about how the authors would propose to link their findings about precocity and smolt-to-adult return rates (SARs) to rearing conditions. Shaun Seaman asked whether this study could fit within the existing M&E program. Joe Miller will work with Grant and Douglas PUDs to put together some additional questions about the study. If the Committees have additional comments, Petersen agreed to pass those on to the authors.

VI HETT Update

Keely Murdoch updated the group that Hatchery Evaluation Technical Team (HETT) is looking at ways to deal with density dependence when screening control groups. The HETT is also reviewing the recent ad hoc supplementation report to look for additional steelhead control groups since steelhead data are sparse. In addition, the HETT is investigating high adult productivity values for some early year data on Methow spring Chinook.

Shaun Seaman asked whether someone was going to analyze the steelhead PIT-tag data from the Entiat and Peshastin PIT-tag arrays from this year. Keely Murdoch responded that at the last ISEMP meeting, it was communicated to Chris Jordan that these data needed to be input into the PIT-tag Information System (PTAGIS) database. Kris Petersen asked WDFW to provide a summary of steelhead going into the Entiat River and Peshastin Creek. Kirk Truscott said that he would ask Andrew Murdoch about providing a summary of steelhead PIT-tag data for fish into the Entiat River and Peshastin Creek.

VII HCP Administration

A. Meeting Agreements

The Committees made the following agreements at this meeting that did not require a formal SOA:

- The Committees approved the Douglas PUD Draft 2009 M&E Implementation Plan.

B. Next Meetings

The next scheduled meetings are as follows: December 17, January 21, and February 18—all will be located at the Chelan PUD offices in Wenatchee.

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.
Joe Miller	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper *	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco *	Colville Tribes
Rick Klinge *	Douglas PUD
Todd Pearsons	Grant PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Dave Carie *	USFWS
Bill Gale	USFWS
Pat Phillips	WDFW
Kirk Truscott *	WDFW
Bob Pfeifer *	WDFW
Steve Parker	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Final Memorandum

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

From: Michael Schiewe, Chair, HCP Hatchery Committees

CC: Ali Wick, Julie Pyper, Bob Pfeifer, Steve Hays, and Joe Miller

Date: January 22, 2009

Re: Final Minutes of December 17, 2008 HCP Hatchery Committees Meeting

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD offices in Wenatchee, Washington, on Wednesday, December 17, 2008, from 9:30 am to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Kirk Truscott will coordinate with Shaun Seaman to make sure that all tables were included in the Partial Water Re-Use Statement of Agreement (SOA) as necessary (Item I).
- Ali Wick will finalize and send out the final Okanogan Nation Alliance (ONA) SOA (Item II-A).
- Mike Schiewe will update the handout memorializing the Non-target Taxa of Concern (NTTOC) decision with today's discussion and will send it out prior to the January meeting (Item II-B).
- Ali Wick will send each of the HCP Committees' responses on Blackbird Island Pond to Shaun Seaman so that he can follow-up with Taylor Horne of Washington State Department of Ecology (Ecology; Item II-E).
- Joe Miller will email his comment letter on the life history variability study to the Committees to use as a starting point for their edits or additional questions (Item II-F).
- The Committees will provide additional comments by Friday, January 2 to Joe Miller regarding the comment letter for the life history variability study. Miller will transmit the comments to Kris Petersen, who will work with Don Larsen and Brian Beckman of

the National Marine Fisheries Service (NMFS) Science Center to address the questions (Item II-F).

- Ali Wick will recirculate the document prepared by Kris Petersen that summarized potential endpoints for the steelhead reproductive success study for Committees discussion in January (Item II-H).
- The Committees will produce by February an agreed-to set of objectives and goals for the steelhead reproductive success study (Item II-H).
- Shaun Seaman will compile and provide information to the Committees from the last 2 years' water use for the Chiwawa water warming operation (Item II-I).
- Rick Klinge will edit the Wells Hatchery Compliance Report and will forward the final document to Ali Wick for distribution (Item III-A).
- Kris Petersen will follow-up with Chris Jordan regarding integration of the Entiat River and Peshastin Passive Integrated Transponder tagging (PIT-tag) array data into the PIT-tag Information System (PTAGIS) database (Item IV-A).
- Mike Schiewe will send a letter to Rob Walton saying that the Committees can meet the dates of March 31 for steelhead and May 31 for Wenatchee spring Chinook (Item V-A).

DECISION SUMMARY

- The Committees approved the SOA extending Chelan PUD's funding of the ONA sockeye salmon re-introduction study that meets Chelan PUD's sockeye mitigation until 2017 (Item II-A).
- The Committees approved the Wells Hatchery Compliance Report with today's edits (Item III-A).
- The Committees concurred that Washington Department of Fish and Wildlife (WDFW) can cull the eggs of the very high enzyme-linked immunosorbent assay (ELISA) females from the 2008 Chiwawa spring Chinook brood (Item IV-B).

I Welcome

The Hatchery Committees approved the November 19, 2008 Meeting Minutes subject to revisions; Ali Wick will distribute the final Meeting Minutes to the Hatchery Committees. During the Action Item review, in response to a question about the last meeting, Kirk Truscott said that he would coordinate with Shaun Seaman to make sure that all relevant tables were included in the Partial Water Re-Use SOA.

II Chelan PUD

A. ONA SOA

The Committees discussed some edits to clarify a few last issues in the SOA documenting the agreement that Chelan PUD would contribute to funding an ONA sockeye salmon hatchery and would be a component of Chelan PUD's sockeye mitigation requirement until 2017. The Committees approved the SOA as edited. Ali Wick will finalize and send out the final SOA.

B. NTTOC: Memorializing October Decision in Minutes

The Committees agreed that the handout sent previously to the Committees characterizes the NTTOC decision made at the October meeting, with several edits, including removing bull trout and replacing it with westslope cutthroat, which was the species agreed on at the meeting. Mike Schiewe clarified that the potential list of panel members was preliminary, and a final list will be determined prior to convening the expert panel.

Kirk Truscott noted the need for consistency between future Section 7 consultations of the Hatchery Genetic Management Plan (HGMP) process and the expert panel analysis of impacts on listed NTTOC species. Kris Petersen agreed and was anticipating that these documents would be completed at about the same time. Mike Schiewe agreed that the timelines should match up such that the NTTOC expert panel exercise will occur prior to the completion of any future Biological Opinion(s) (BiOps).

Bill Gale brought up the point that bull trout have not been included in the NTTOC process, and he thought that perhaps the expert panel should review the bull trout consultation sections of the BiOp and comment or concur with it as it applies to NTTOC. Shaun Seaman said that the reason the Committees excluded bull trout was that the Biological Opinion process had already contemplated effects on bull trout. Mike Schiewe pointed out that the Committees had previously agreed not to include bull trout at the October meeting based on input from the U.S. Fish and Wildlife Service (USFWS), and he said that the draft handout will be updated to reflect this agreement. Bill Gale said that it seemed that if bull trout are covered under the BiOp, then the listed Plan Species should also be covered under the BiOps that may come from the HGMP process, and thus Plan Species should be excluded

from the NTTOC process. Kris Petersen replied that she was not certain that the future BiOps would assess risk in the same way that the NTTOC expert panel discussion would and thus including Plan Species would be helpful. The Committees then discussed the usefulness of including bull trout and whether this decision should be re-opened. After some discussion, the various Committees members agreed that the BiOp provides the needed coverage and decided not to include bull trout in the expert panel exercise. Mike Schiewe will update the handout to reflect this and send it to the Committees prior to the January meeting.

C. Hatchery Program Summary (Engineering Report)

Julie Pyper handed out the Hatchery Program Summary (previously known as the Engineering Report) for November through December 2008. This was also sent out by email this morning.

D. PIT-Tag Array for the Sockeye Enumeration Study

Joe Miller updated the group that the Joint Aquatic Resources Permit Application (JARPA) for installing PIT-tag arrays has already been sent out and a contract would be submitted to WDFW. Miller said that Chelan PUD would be evaluating detection efficiency of this array in the coming year. He said that Chelan PUD would ultimately like to have two multiplexers, but the mechanisms cannot be placed closer than 1,000 feet because interference occurs. Chelan PUD's current plan is to install the first array with the current technology and to use the new multiplexing transcievers (MUX) in the future once technology is improved.

E. Blackbird Pond Ecology Responses

Shaun Seaman requested that Ali Wick send him each of the HCP Committees' responses so that he could follow-up with Taylor Horne of Ecology. Mike Schiewe confirmed that each of the HCP members had responded to Horne.

F. Follow-Up on Hatchery-Induced Life History Variability for Yearling Chinook Study

Joe Miller distributed a handout that outlines the joint PUD (Douglas, Chelan, and Grant PUDs) questions on the study proposal for hatchery-induced life history variability in Chinook salmon. The Committees gave Joe Miller some suggestions during today's

meeting. The Committees will provide additional comments by Friday, January 2 to Joe Miller. He will email his comment letter on the life history variability study to the Committees to use as a starting point for their edits and additional questions. Miller will transmit the final summary to Kris Petersen, who will work with Don Larsen and Brian Beckman of the NMFS Science Center to address the questions.

G. Rocky Reach Bull Trout BiOp

Steve Hays informed the Committees that a BiOp has been released for impacts of the new Rocky Reach FERC License on bull trout. He reviewed several of the important points of the document. He said that he may be contacting WDFW and Yakama Nation soon because Federal Energy Regulatory Commission may require documentation of current measures that are being taken to minimize impacts to bull trout at Rocky Reach and several trapping locations associated with the project. Hays said that he does not anticipate any changes to current practices, but he will confirm this with the Committees when the license is provided.

H. Steelhead Reproductive Success Study

Shaun Seaman updated the Committees that he has received a draft study budget for the steelhead reproductive success study from WDFW, which was $2 million over 10 years. Seaman said that Chelan PUD is committed to a reproductive success study, but that the PUD needs more time to evaluate whether the current study design is the only approach. He also said that Chelan PUD is committed to continuing to collect tissue samples in 2009, similar to 2008, in order to have these samples for future use. Mike Schiewe suggested that the Committees might want to consider convening a small group that would review the technical aspects of the study plan, and include in this small group geneticists as well as persons who could help translate the science of the study results to potential management action(s). Several Committees members expressed frustration that implementing a study appears to be stalling. Shaun Seaman reiterated that Chelan PUD is committed to the study. The Committees discussed what might be done with regard to how to move the study process forward. Mike Schiewe said that it would help if the Committees members could formally agree to a set of objectives and goals for the study. To support this, Ali Wick will re-circulate the summary of potential and recommended endpoints for a reproductive success study that Kris Petersen had prepared and previously distributed. The Committees' agreed to use this as a starting point for an in-depth discussion in January. The Committees

committed to producing by February an agreed-to set of objectives and goals for the study. This step will occur prior to convening of the small group noted earlier that would perform a technical review of a study plan.

I. Chiwawa Water Warming

Shaun Seaman updated the group that, at this time, the hatchery is running on one Wenatchee River pump (at a variable flow level, depending on what is required) and one Chiwawa pump. With the cold weather, the Wenatchee river temperature is continuing to drop, so more Wenatchee water may be required as the winter progresses. To help understand what water usage has been over the last several years of water warming at Chiwawa Hatchery, Shaun Seaman said that he would compile and provide information on Chiwawa Hatchery water use from the Chiwawa and Wenatchee Rivers over the past 2 years, and distribute to the Committees.

III Douglas PUD

A. Approval of the Wells Hatchery Compliance Report

Rick Klinge updated the group that Douglas PUD has sent out the Wells Hatchery Compliance Report for review and is looking for approval of this document at this time. The Committees approved this document with minor revisions, including adding a footnote regarding summer Chinook at Carlton Pond. Klinge will forward the final document to Ali Wick for distribution.

IV WDFW

A. Summary of PIT-Tag Array Data for Peshastin Creek and Entiat River Arrays

Kirk Truscott updated the group that he is working on a summary of PIT-tag data for the Peshastin Creek and Entiat River arrays. He is currently assigning origins to the PIT-tag hits from the arrays. He said that he would have this information soon.

This discussion prompted a question of whether there has been progress on adding these data into PTAGIS. Kris Petersen said that she had sent an email to Chris Jordan several weeks ago asking about this and said that she would follow-up with him.

B. ELISA Levels for 2008 Broodyear Spring Chinook Returning to Chiwawa River

Kirk Truscott reported to the group that the ELISA results are now available from broodyear 2008 Chiwawa spring Chinook. He distributed a memorandum that described that five of the wild females had extremely high optical densities (ODs) (average 1.6). Truscott requested Committees' concurrence for WDFW to cull the eggs of these females from the brood because of this highly elevated result, stating that WDFW is typically reticent to cull listed fish eggs. The Committees concurred that WDFW can cull these eggs.

V NMFS

A. HGMP Development Schedule and Plan

Mike Schiewe introduced this topic and said that he had talked to Rob Walton about the HGMP schedule that the Hatchery Committees had agreed to at the November Hatchery Committees meeting. Keely Murdoch updated the group that the YN and WDFW have been meeting weekly since the last Hatchery Committees meeting to develop a co-manager proposal for a joint management plan for Wenatchee spring Chinook. When finished, the intent is for this proposal to be evaluated by NMFS for ESA consistency. Murdoch said that she expects that the plan will be ready for review by the end of January, but additional writing may still be required. The Committees discussed dates that could be met for submitting draft HGMPs to NMFS, and agreed that Mike Schiewe will send a letter to Rob Walton saying that the Committees can meet the dates of March 31 for steelhead and May 31 for Wenatchee spring Chinook. To begin this process, Mike Schiewe scheduled a meeting for Wenatchee steelhead and Chiwawa spring Chinook HGMPs on Wednesday, January 7 in Wenatchee. Attendees will include Kris Petersen, Kirk Truscott, Bob Pfeifer, and several Chelan PUD representatives.

VI USFWS

A. Candidate Notice of Review

Bill Gale updated folks that the USFWS has just released a Candidate Notice of Review summarizing the status of removing or adding candidate species. He said that he did not see any species up for review in this region and invited Committees members to send any questions to him if necessary.

VII HCP Administration

A. Next Meetings

The next scheduled meetings are as follows: January 21, February 18, and March 18; all meetings will be held at the Chelan PUD offices in Wenatchee.

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.
Joe Miller	Chelan PUD
Shaun Seaman *	Chelan PUD
Julie Pyper *	Chelan PUD
Steve Hays	Chelan PUD
Jerry Marco * (by conference call)	Colville Tribes
Rick Klinge *	Douglas PUD
Tom Kahler	Douglas PUD
Russell Langshaw	Grant PUD
Kris Petersen *	NMFS
Bill Gale	USFWS
Kirk Truscott *	WDFW
Tom Scribner * (by conference call)	Yakama Nation
Keely Murdoch *	Yakama Nation

* Denotes Hatchery Committees member or alternate

APPENDIX C

HABITAT CONSERVATION PLAN TRIBUTARY COMMITTEES MEETING MINUTES

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 10 January 2008

Members Present: Dale Bambrick (NOAA-Fisheries)[1], 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 Second-Floor Conference Room in Wenatchee, Washington, on Thursday, 10 January 2008 from 9:00 to 11:30 am.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following changes:

- Added update on Annual Reports.
- Included a discussion on the outcome of the Project Cost Workshop hosted by the Chelan County Lead Entity.
- Dropped the Chelan PUD 2008 Action Plans review.
- Added a Policy Update from Douglas PUD.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 December 2007 meeting notes with revisions suggested by Tom Kahler and Chuck Peven.

III. Update on Annual Reports

Tracy Hillman reported that he and Becky Gallaher were preparing the Tributary Committees Annual Reports for the Plan Species Accounts. Tracy noted that the report for the Wells Account was complete and that the other reports would be completed after receiving financial information from the bank. Tracy asked the Committees if they wanted to review the Tributary sections before seeing the entire draft annual report. The Committees elected not to review the Tributary section before receiving the entire draft report.

[1] Dale joined the meeting via conference call.

IV. Review of Project Cost Workshop

During the afternoon on 13 December 2007, some of the Tributary Committees members attended a Project Cost Workshop hosted by the Chelan County Lead Entity. The intent of the workshop was to provide funding entities with a better understanding of project costs and to identify potential cost-saving actions for habitat projects. The following thoughts were shared by members that attended the workshop.

- Although the workshop was initially proposed as being interactive (i.e., allow open dialog among groups), members felt like some of the presenters lectured rather than allowed for open dialog.
- Members were disappointed that Mike Kaputa, who initiated the workshop, was unable to participate in the workshop.
- Members indicated that some of the information presented during the workshop mischaracterized or misrepresented experiences and requirements. For example, some presenters lacked understanding of permitting and misrepresented the time needed for permitting. Members recommended that the sponsors engage with the permitting agencies well before the permit applications and project applications are submitted.
- Members noted that there was a lack of coordination and communication between Chelan County NRD, Cascadia Conservation District, and the Bureau of Reclamation.
- It was apparent from the presentation that the observed excessive costs of projects from the Lead Entity were the product of: (1) designs that were developed without the input of permitting agencies resulting in last-minute design changes in response to permit conditions, (2) rushing projects in an attempt to prematurely fit them into a funding round, (3) requesting bids on projects for which permits have not been issued, and (4) rushing projects to implementation so that requests for bids occurred too late in the year to obtain the most competitive bidding.
- The presentation revealed a lack of understanding by the Lead Entity of the sequencing and coordination with permitting agencies that would be necessary to align project development with funding-round cycles. Cost savings realized by such alignment would come from the elimination of the problems identified in the above bullet point.

Overall, members found the information presented at the workshop to be of limited use and that the County needs to improve project scheduling and implementation. Members of the Tributary Committees, having experience in stream restoration, project development, and contract management, believe that the County can and should provide more cost-effective estimates in their proposals. All “hidden costs” need to be fully disclosed in the proposed budgets.

Chris Parsons reported that the Salmon Recovery Funding Board will host a meeting on permitting on Tuesday, 22 January from 10:00 am to 2:00 pm. Chris will provide additional information to members as soon as it is available. This meeting should provide information that will help sponsors better understand the permitting process and timelines. Chris will update the Committees in February on the outcome of this meeting.

V. Payment Authorizations

The Wells Tributary Committee authorized the following payments:

- $18,180.71 to the Methow Salmon Recovery Foundation for the Heath Floodplain Restoration project (first payment request).

- $17,450.36 to the Methow Salmon Recovery Foundation for the Heath Floodplain Restoration project (second payment request).
- $559.11 to Chelan County PUD for fourth-quarter administrative work.

The Rock Island Tributary Committee authorized the following payments:

- $733.67 to Chelan County PUD for fourth-quarter administrative work.
- $30.00 to LeMaster and Daniels for Rock Island Administration.

The Rocky Reach Tributary Committee authorized the following payments:

- $12,341.75 to Okanogan Conservation District for the Clees Well and Pump project.[2]
- $838.53 to Chelan County PUD for fourth-quarter administrative work.
- $30.00 to LeMaster and Daniels for Rocky Reach Administration.

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.

- Final reports have been submitted on the Clees Well and Pump, Alder Creek Culvert Replacement, and Nason Creek Off-Channel projects. These reports can be viewed at http://www.midcolumbiahcp.org/Tributary/GSF%20Projects.htm.
- Removal of the lower culvert and construction of the new bridge is complete on the Heath Floodplain Restoration project. Construction of the new fish passage channel is also complete. Bid proposals for the upper portion of the project exceeded the budget and therefore the sponsor will rebid the project in spring.

VII. 2008 Action Plan for the Wells HCP

Tom Kahler described the development of the 2008 Action Plan for the HCP Committees. The Plan outlined the timeline for both the Annual Report on the Plan Species Account Status and the 2008 Funding-Round Review and Funding Decisions. The Wells Tributary Committee accepted the 2008 Action Plan. Chuck Peven reported that he will present the 2008 Action Plans for the Rocky Reach and Rock Island HCPs to the Committees in February.

VIII. Douglas PUD Policy Update

Tom Kahler reported that Douglas County PUD updated their land-use policy regarding docks and piers along Wells Reservoir. Tom noted that development around the reservoir has increased exponentially over the last few years and this has resulted in increased dock development. The PUD hired Don Chapman to conduct an independent review on the effects of docks on Plan Species within the reservoir. The review indicated that docks can have a negative effect on the survival of Plan Species (especially juvenile summer Chinook). Therefore, the updated policy

[2] In December, the Rocky Reach Tributary Committee authorized the payment of $12,341.75 to Kooy's Irrigation for the Clees Well and Pump project. However, Kooy's Irrigation received payment for this amount from Okanogan Conservation District and therefore returned the check from the Rocky Reach Account. Okanogan Conservation District then submitted an invoice to cover the payment they made to Kooy's Irrigation.

will restrict further dock and pier development to areas only within the city limits of Brewster, Bridgeport, and Pateros. Tom stated that the PUD solicited public input and held two public meetings.

IX. Effectiveness Monitoring

Tracy Hillman provided the Committees with a document that briefly described different approaches to effectiveness monitoring. Tracy reviewed the document with the Committees and explained differences among the three primary approaches to effectiveness monitoring (Design-Based, Levels-of-Evidence, and Modeling approaches). Tracy also described the current status/trend and effectiveness monitoring programs within the Upper Columbia (i.e., the Integrated Status and Effectiveness Monitoring Program, the Okanogan Basin Monitoring and Evaluation Program, the Washington Salmon Recovery Funding Board Monitoring Program, and the PUD-funded monitoring programs). Although the Committees made no final decisions on effectiveness monitoring, they discussed the following:

- The recovery plan and other conservation documents identify restoration and enhancement actions within the channel migration zone (e.g., reconnect side channels and off-channel ponds) as important actions to restore native fish species. The Committees, therefore, expect to see more proposals that deal with off-channel restoration and enhancement actions. However, little is known about the effects of these actions on salmonid spawning and rearing. Therefore, the Committees would like to better understand the effects of these off-channel actions on the rearing and spawning of salmonids.
- The Committees expect to see a larger signal-to-noise ratio if monitoring of off-channel habitat actions occurs at the project or reach scale, not the watershed or population scale. Monitoring at a smaller scale is also less expensive than monitoring at the watershed or population scale.
- Because of the cost and effort needed to assess survival and productivity, the Committees are considering monitoring fish abundance, distribution, and size as the primary biological performance metrics. Surrogate metrics such as number and distribution of redds may also be included in the monitoring program.
- The Committees are also considering the measurement of physical/environmental performance metric such as presence of connectivity between mainstem and floodplain, stream flows, thalweg profile, length of side channels or floodplain channels, size of off-channel pond, number of pools, residual pool depth, residual pond depth, number of pieces of large woody debris per 100 m, bank stability, and riparian diversity and shading.
- An appropriate design for testing the effects of off-channel habitat actions would be a before-after (BA) or paired before-after, control-impact (BACI(P)) design at the reach or project scale. This would provide a higher level of certainty of inference than a levels-of-evidence or correlative approach.
- Treatment effects could range from off-channel habitat actions that are connected to the mainstem only during high flow to off-channel actions that are connected to the mainstem at all flows. This would allow the Committees to assess a gradient of treatment effects.
- It is unlikely that treatments can be assigned to streams randomly; therefore, the Committees would select which ones will be monitored from the suite of treatments that

will be implemented throughout the Upper Columbia region, including Canada. Potential bias can be reduced by randomly selecting which treatments will be monitored for effectiveness.

- The Committees are interested in "partnering" with existing programs, such as ISEMP or the Okanagan Nation Alliance program in Canada. The Committees asked Tracy to discuss this opportunity with the ISEMP planners. The Committees also asked Chris Fisher to talk with the Okanagan Nation Alliance about opportunities to support the monitoring component of the Okanagan River Restoration Initiative.
- Because monitoring data collected with funds from the Tributary Committees will likely be curated and managed by the Upper Columbia Data Steward, Chuck Peven suggested that the Committees partially fund the data steward position, which currently has funding for only one-two years. The Committees agreed not to provide funds for this position at this time. In addition, the Committees would need to ensure that funding the Data Steward position is consistent with the language in the HCPs.

The Committees will continue to think about effectiveness monitoring opportunities in the Upper Columbia and will discuss next steps during the February meeting.

X. Next Steps

If necessary, the Tributary Committees will meet on 14 February to conduct regular business and continue their discussion on effectiveness monitoring.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 14 February 2008

Members Present: Dale Bambrick (NOAA-Fisheries), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Chuck Peven (Chelan PUD), Bob Rose (Yakama Nation) [1], and Tracy Hillman (Committee Chair).

Members Absent: David Morgan (USFWS) and Chris Parsons (WDFW)[2]

Others Present: Becky Gallaher (HCP Project Coordinator) and Ben Lenz (Grant PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 14 February 2008 from 9:30 to 11:00 am.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following changes:

- Added brief updates from Dale Bambrick.
- Added a discussion on the Entiat and Wenatchee Interdisciplinary Teams.
- Dropped the Chelan PUD 2008 Action Plans review.
- Dropped the Permit Streamlining Workshop update.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 January 2008 meeting notes with revisions suggested by Dale Bambrick, Tom Kahler, David Morgan, Chris Parsons, and Chuck Peven.

III. Payment Authorizations

The Rocky Reach Tributary Committee authorized the following payment:

- $4,590.76 to Chelan County Natural Resource Department for the Entiat Instream Habitat Improvements Project.

[1] Bob joined the meeting via conference call.
[2] David and Chris provided their votes on decision items before or shortly after the meeting.

IV. 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 is currently preparing HCP Tributary Committee/Sponsor agreements with the Okanagan River Restoration Initiative, Roaring Creek Flow Enhancement and Barrier Removal Project, Entiat PUD Canal System Conversion Project, Wildhorse Spring Creek Project, Keystone Canyon Habitat Restoration Project, and Harrison Side Channel Project.
- The purchase and sale agreements for the Quintana-Leon and Tiegel properties are moving forward and should be completed by March 2008. The sponsor reported that the sale price for the Quintana-Leon property is above fair market value by 3% ($10,000 over the appraised fair market value of $290,000).
- The Entiat Habitat Improvements Project funded by the Rocky Reach Account is complete.
- Because of the need to secure additional funding, the Methow Conservancy was unable to complete the Methow Riparian Protection Phase III: MacDonald Property Project by 31 January 2008. Therefore, the Conservancy requested that the deadline be extended to 30 September 2008. **The Wells Committee approved the extension.**
- The Canadian Okanagan Basin TWG requested that the Tributary Committee/Sponsor Agreement for the Okanagan River Restoration Initiative—Construction (Phase IV) Project be changed to allow internal budget shifts for amounts up to $25,000, rather than the stated amount of $3,000. Under the proposed change, the sponsor would need to request a written budget amendment from the Wells Committee after the $25,000 threshold is met. The sponsor believes this will be a more practical limit for such a large project. **The Wells Committee approved the change**.
- The contract with LeMaster and Daniels for managing the Rock Island and Rocky Reach accounts expired on 31 December 2007. **The Rock Island and Rocky Reach Committees approved a <u>three-year</u> contract with LeMaster and Daniels**.

V. Dale Bambrick Updates

Dale Bambrick provided the Committees with two information updates:

- Dale reported that he, David Morgan, and Ben Lenz visited the proposed Wenatchee River Side Channel Extension Project (aka CMZ Site 2) on the Goodfellow and Chotzen properties (located at RM 1.4 on the north side of the river). The purpose of the proposed project is to increase the length of an existing side channel and create a series of off-channel ponds and backwater areas (primarily for birds). Large wood would be placed and anchored at the head and mouth of the proposed channel. Dale reported that the project as proposed would have limited benefit to salmonids and the potential risks could outweigh the possible benefits, which is consistent with the conclusion reached by the RTT. Some of the risks discussed included fish stranding, possible negative effects on the existing side channel, creation of heat sinks in the ponds (depends on interaction of surface water with groundwater), and potential failure of habitat-diversity structures. The recommendation by Dale and the RTT is to not use a “heavy-handed” approach, but rather allow the river and side channel to function through natural processes. Smaller-scale treatments, such as removal of the dike or berm may be appropriate.

- Dale also reported that Mike Kaputa (Chelan County NRD) called him and they had a candid discussion about the Project Cost Workshop held in December. Dale indicated that he shared with Mike the concerns that the Committees voiced in January (see January meeting notes).

VI. Entiat and Wenatchee Interdisciplinary Teams (IDTs)

Tracy Hillman reported that Steve Kolk (Bureau of Reclamation) is offering the Tributary Committees (one member as a representative) an invitation to participate on the Entiat and Wenatchee Interdisciplinary Teams (IDTs). The purpose of the IDTs is to "brainstorm project purpose, extent, and features." This work would occur in the spring or early summer about two years before construction and would involve one or more field meetings.

After discussion, the Committees decided that they would not send a representative to participate on the IDTs. However, the Committees will invite Reclamation to Tributary Committees meetings every 4 to 6 months to update the Committees on development of preferred alternatives. [*Note: after the meeting, Tracy shared the decision of the Committees with Steve Kolk, who indicated that he and Jennifer Molesworth would be available to meet with the Committees to provide updates on the development of alternatives.*]

VII. Effectiveness Monitoring

Tracy Hillman reported that he contacted Pamela Nelle and discussed the prospects of the Tributary Committees partnering with the Integrated Status and Effectiveness Monitoring Program (ISEMP) to assess the effectiveness of off-channel habitat restoration/alteration projects in the Upper Columbia. Pamela indicated that the ISEMP Program would be open to partnering with the Committees; however, the Committees would need to contract directly with the entities collecting habitat and fish data. Contracts would likely be with the Forest Service, Fish and Wildlife Service, Washington Department of Ecology, and Terraqua. The Committees would need to:

- Identify which treatment and control sites would be monitored.
- Determine the frequency of sampling.
- Specify deliverables (e.g., data, reports, etc.).
- Contact the entities that would be doing the monitoring to determine amount of effort and cost to do the work.

The advantage of partnering with ISEMP is that the Committees would be able to answer most of their questions regarding the effectiveness of different treatment levels of off-channel restoration projects. In addition, the same protocols and survey crews would be used at all restoration sites. The disadvantage would be developing contracts with several different entities.

Chris Fisher reported that he contacted the Okanagan Nation Alliance (ONA) about opportunities to support or supplement the monitoring component of the Okanagan River Restoration Initiative (ORRI). Chris provided the Committees with a table identifying the parameters measured, monitoring methods, duration of the study, expected outcomes, and current funding for monitoring the ORRI project. After reviewing the table, the Committees were satisfied that ONA was proposing to measure parameters that are of interest to the Committees (e.g., numbers and distribution of redds, egg-incubation success, holding and rearing habitat, floodplain re-vegetation, channel morphology and hydraulics, substrate composition, and channel/floodplain

interactions). The Committees were not interested in the measurement of water quality in oxbows. The ONA currently has funding for the redd surveys and is seeking funding from various entities for five of the other surveys. These funds have not been secured. The channel/floodplain interactions and water quality studies have no funding. The Committees asked Chris to find out the status of potential funding for the studies not currently funded, save the water quality studies.

The Committees also discussed a "wait-and-see" approach. That is, with the current level of monitoring of off-channel restoration projects by ISEMP (in the Entiat), ONA (in Canada), and SRFB (in the Wenatchee), many of the questions regarding the effectiveness of off-channel restoration projects may be addressed under these monitoring programs. The disadvantage of this approach is that the various programs may not address all questions of interest to the Committees.

Dale Bambrick asked about the current level of effort used to monitor the effectiveness of the Nason Creek Off-Channel Project. The Yakama Nation (YN) is currently monitoring the project, but no one at the meeting was certain of the intensity or duration of the study. The Committees directed Tracy to contact Keely Murdoch with the YN and find out the extent of their monitoring efforts.

The Committees will continue to compile information on effectiveness monitoring opportunities in the Upper Columbia and will discuss next steps during the March meeting.

VIII. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 13 March. Tentative agenda items include:

- Status of projects.
- Review of Small Projects Proposals.
- Funding strategy for 2008.
- Effectiveness monitoring discussion.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 12 March 2008

Members Present: 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).

Members Absent: Dale Bambrick (NOAA-Fisheries)[1]

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 Fish and Wildlife Conference Room in Wenatchee, Washington, on Wednesday, 12 March 2008 from 1:00 to 3:00 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 14 February 2008 meeting notes.

III. Payment Authorizations

The Rock Island Tributary Committee authorized the following payment:

- $125.00 to LeMaster and Daniels for Rock Island administration for the period January and February.

The Rocky Reach Tributary Committee authorized the following payment:

- $125.00 to LeMaster and Daniels for Rocky Reach administration for the period January and February.

IV. 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 the target completion date for the Quintana Leon and Tiegel properties is 1 April 2008.

[1] Dale provided his votes on decision items before the meeting.

- Becky reported that the sponsor for the Okanagan River Restoration Initiative (Canadian Okanagan Basin TWG) asked the Wells Committee to amend Section 17 of the HCP TC/Sponsor Agreement, which currently requires the sponsor to contact the Committee to review the scopes of work for any work to be performed by the sponsor's contractors that equals or exceeds $5,000. The sponsor asked the Committee to change the limit from $5,000 to $15,000. Rather than amend the limit identified in this agreement, the Committee chose to delete Section 17 (Committee Review of Contractor Scope(s) or Work) from this particular agreement.

V. Recusal Language in the Tributary Committees Operating Procedures

Tracy Hillman reported that "Recusal Language" accepted by the Committees in March 2006 was not in the recent draft of the Tributary Committees Operating Procedures. The accepted recusal language identified in the March 2006 notes stated:

> *Committee members should recuse themselves from voting on a particular project if they represent an entity that may benefit from that project.*

This current version of the Operating Procedures states:

> *VII. FULL DISCLOSURE*
>
> *After full written disclosure of any potential conflict of interest, which shall appear in the minutes of the Committees and prior to project approval, the Committees may approve a project that may benefit a person or entity related to a specific committee member, or an entity which appointed the committee member.*

The Committees agreed that the language accepted in March 2006 should be added to the end of Section VII in the Operating Procedures. The Committees directed Tracy to make the changes and send the revised draft to members of the Committees.

VI. 2008 SRFB/Tributary Fund Timeline

Tracy Hillman and Becky Gallaher discussed the final schedule for the 2008 SRFB/Tributary Fund process (the entire schedule is attached at the end of the notes). The following dates are of interest to the Tributary Committees:

- 30 April: SRFB/Tributary Committees Fund kickoff meeting for the region.
- 2 June: Pre-proposals due to Tributary Committees.
- 10-11 June: Pre-proposal presentation workshop.
- 12 June: Tributary Committees internal review of pre-proposals.
- 23-27 June: Project tours.
- 10 July: Tributary Committees final review of pre-proposals.
- 8 August: Final proposals due to Tributary Committees.
- 28 August: RTT ratings delivered to Tributary Committees.
- 11 Sept: Project presentation to Tributary Committees (if needed).
- 12 Sept: Supplemental tours for Tributary Committees.

- 8 Nov: Tributary Committees make initial internal decisions.
- 11-12 Dec: SRFB makes formal decisions.
- Dec: Tributary Committees make supplemental decisions.

The Committees indicated that they had no issues or apparent conflicts with the schedule.

Tracy reported that the SRFB allocated 10.85% of the total funding to the Upper Columbia. This equates to just over $2,000,000, which is less than the $2,750,000 that was available in 2007.

VII. Effectiveness Monitoring

Nason Creek Off-Channel Project

Tracy Hillman reported that he contacted Keely Murdoch (Yakama Nation) and discussed the extent of their effectiveness monitoring efforts associated with the Nason Creek Off-Channel Project. Tracy shared the following information with the Committees:

- The Yakama Nation has funding for one year of effectiveness monitoring. Funding is currently from Chelan County.
- The monitoring design is a Before-After, Control-Impact design with one sample collected before construction and seasonal sampling occurring post-construction. Prior to construction, sampling occurred in the off-channel site (treatment site), in a control site (Nason Creek site near the treatment site), and in a reference site (off-channel site on the Chiwawa River). During the post-construction period, samples will be collected three times during each season (spring, summer, and fall) in the treatment, control, and reference sites.
- Performance indicators include fish densities (numbers/m^2 by species and life stage), readings from staff gauges, and numbers of cuttings/plantings that are alive. There is no funding for measuring habitat conditions along cross sections.
- Measurement methods include snorkel surveys.

According to Keely, as reported by Tracy, the study would benefit from additional years of sampling and the addition of PIT tag detectors. Currently, the side channel is wide and shallow, which provides limited habitat for juvenile salmonids, especially during winter. As a result, few fish are currently using the off-channel habitat. A spring, high-flow event is needed to scour a channel through the buildup of organic sediments within the off-channel site. Keely believes that the off-channel site will not reach a dynamic equilibrium for a few years. Consequently, fish responses to the site will likely change over time. Therefore, she believes additional years of monitoring are needed to evaluate the effects of the treatment.

The addition of PIT tag detectors within both culverts would allow the assessment of fish movement, residence time, and survival within the off-channel site. Tom Kahler and Chuck Peven reported that detectors could be set up to evaluate directional movement of fish and that the cost to do so would be about $5,000-10,000/site, depending on set up. Fish within Nason Creek are already being PIT tagged under the ISEMP program. PUD crews are collecting fish within Nason Creek for tagging and the Yakama Nation is PIT tagging fish collected at the smolt trap near the mouth of Nason Creek. Approximately 2,500 fish (mix of juvenile Chinook and steelhead) are tagged annually in Nason Creek under ISEMP.

The Committees asked Tracy to invite Keely to the April meeting to give a presentation on their program to monitor the effectiveness of the off-channel project on Nason Creek, to share preliminary results, and to identify ways to improve the study.

Okanagan River Restoration Initiative Project

Chris Fisher indicated that he will contact the Okanagan Nation Alliance about opportunities to support or supplement the monitoring component of the Okanagan River Restoration Initiative. Chris will find out the status of potential funding for the studies not currently funded (see February notes for details) and will report his findings to the Committees in April.

VIII. Update on Permit Streamlining Workshop

Chris Parsons provided an update on the Permit Streamlining Workshop held on 22 January and the Implementation Team Meeting held on 11 March. Chris indicated that the meetings were an overall success and that sponsors should have left the meetings with a better understanding of the permitting process. The meetings resulted in the following recommendations:

- Offer a permitting workshop before June for project sponsors needing to prepare permits. A "how-to" packet (including examples) would be provided to the sponsors to help them through the permitting process.
- Continue a forum for collaboration among all permitting agencies and project sponsors.
- Identify inconsistencies and redundancies in permitting agency requirements and goals.
- Shift state streamlining process from Olympia to the region.
- Offer certification classes for contractors and designers of fish projects in the Upper Columbia. Classes would likely be in February and November.
- Mediate the large woody debris (LWD) issue with WDNR land leases. WDFW requires sponsors to fully mitigate a project. This mitigation usually involves placement of LWD to achieve no net impact. However, on WDNR lands, WDNR charges the applicant for placement of LWD on their lands. The intent is to eliminate the charge.

Chris noted that the goal is to streamline the permitting process. This means that project sponsors need to involve permitting agencies early in the process. In addition, the sponsors need to have the agencies visit the project site before the contractors leave the site.

Chuck Peven noted that additional "thinking-out-of-the-box" ideas were discussed during the Implementation Team Meeting. He stated that one such idea was to have state and federal permitting agencies collaborate and identify where they had similar permit requirements and to explore whether this could lead to a streamlined process that covers both state and federal requirements. Another idea was to have the permitting agencies meet with project sponsors on a weekly basis.

IX. Small Projects Proposals

The Committees received two Small Projects Program applications; one from the Methow Conservancy (*Riparian Regeneration and Restoration Initiative*) and another from Cascadia Conservation District (*Entiat PUD Canal Log-Boom Installation*).

Riparian Regeneration and Restoration Initiative

The Methow Conservancy is the sponsor of the Riparian Regeneration and Restoration Initiative project. The intent of the project is to build re-useable cages that will protect seedlings and saplings of cottonwood, aspen, and willow trees within riparian areas along the Methow and Twisp rivers from wildlife browsing. The cages will allow young trees to grow beyond the damaging effects of herbivores and thereby improve natural regeneration of riparian vegetation in the Methow Valley. Because the cages are durable and reusable, the work can continue indefinitely with minimal need for future funding. The total cost of the project is $22,736.96. The sponsor requested $15,536.96 from HCP Tributary Funds. ***The Wells Tributary Committee approved funding for this project.***

Entiat PUD Canal Log-Boom Installation

Cascadia Conservation District is the sponsor of the Entiat PUD Canal Log-Boom Installation project. The purpose of the project is to allow continuous flow into the restored side channel by installing a log-boom that will reduce or eliminate large woody debris from clogging the entrance to the channel. The total cost of the project is $10,660.40. The sponsor requested $7,160.40 from HCP Tributary Funds.

The Committees identified the following issues that require the attention of the sponsor:

- Is wood currently recruited to the Entiat River in sufficient quantities to create a potential problem at the mouth of the side channel?
- Is there a history of wood collecting at the mouth of the side channel?
- If wood has collected at the mouth of the channel in the past, did it reduce or eliminate flows into the channel?
- Is there any information that indicates that the boom will actually divert wood, and not capture and collect wood?

In an effort to effect a funding decision quickly, the Committees directed Tracy to send an email to the sponsor requesting responses to these questions.

[*After receiving responses to the four questions from the sponsor and discussing the merits of the project in emails, on 25 March the Rocky Reach Tributary Committee approved funding for the Entiat PUD Canal Log-Boom Installation Project.*]

X. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 10 April. Tentative agenda items include:

- Status of projects.
- Presentation by the Yakama Nation on monitoring the Nason Creek Off-Channel project.
- Effectiveness monitoring discussion.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

2008 UPPER COLUMBIA PROCESS SCHEDULE

Tributary Fund and SRFB

Project Proposal Development, Submission, and Review

DATE	ACTIVITY/MILESTONE (MEETING/DEADLINE)
MARCH	
March	SRFB/Tributary Fund cycles announced; SRFB Policy Manual available
APRIL	
30 April	**SRFB/Tributary Fund Kickoff Meeting for the Region; RTT Technical criteria presentation; Citizens' Committee criteria presentation**
MAY	
May	**Project Sponsors develop projects and pre-proposal materials (available from Tributary Committee)**
JUNE	
2 June	**Pre-proposals due to Tributary Committees and to Lead Entities**
4 June	**Pre-proposals delivered to RTT members and Tributary Committee; and SRFB Panel Members (via PRISM)**
10 June (afternoon)	***If necessary*, Pre-proposal Presentation Workshop: review pre-proposal with RTT and Citizens' Committee**
11 June (all day)	**Pre-proposal Presentation Workshop: review pre-proposals with RTT and Citizens' Committee**
12 June	Tributary Committees' internal review of pre-proposals
17 June	Conference Call to discuss project tour logistics (RTT, LEs, Trib and UCSRB)
20 June	**Pre-proposal Presentation Workshop meeting summary distributed**
23-27 June	***SRFB/Trib Fund/RTT project tours*** • **23rd – Okanogan** • **24th – Methow** • **25th – Entiat** • **26th – Wenatchee** • **27th – Contingency for spillover**
JULY	
10 July	Tributary Committees' final review of pre-proposals
17 July	Final comments from Tributary Committee due to project sponsors
AUGUST	
1 August	**Draft project review forms due from State Technical Review Panel to LEs and project sponsors**
8 August	**Final project proposals due to Tributary Committees and Lead Entities**
11 August	**Project proposals delivered to RTT and Citizens Committees**
19 August	***If needed*, RTT Meeting: formal project reviews and technical ranking**
20 August (all day)	**RTT Meeting: formal project reviews and technical ranking**

28 August	**RTT ratings delivered to Lead Entities and Tributary Committees**
SEPTEMBER	
4 September	**Individual Citizen's Committee project ranking**
8 September	**Lead Entity project applications due to SRFB and on to PRISM**
11 September	***If needed*, project presentations to Tributary Committees**
11 September	**Joint Citizen's Committee identifies combined ranked list**
12 September	Tributary Committees' supplemental tours of selected projects (project sponsors will be notified in advance of visit)
15 September	**Final ranked list with regional funding recommendations due to SRFB; information submission questionnaire**
OCTOBER	
6 October	**Second Draft project review forms due from State Technical Review Panel to LEs and project sponsors**
13-17 October	SRFB Review Panel project review
29 October	Draft report by Review Panel to SRFB
NOVEMBER	
8 November	Tributary Committees make initial internal decisions
19 November	Final report by Review Panel to SRFB
DECEMBER	
11-12 December	**SRFB makes formal decisions**
December	Tributary Committees make supplemental decisions

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 10 April 2008

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), Ben Lenz (Grant PUD), Keith Truscott (Chelan PUD; for agenda items 6 and 7), Keely Murdoch (Yakama Nation; for agenda item 6 only), Alan Schmidt (Chelan County NRD; for agenda item 6 only), Lee Duncan (Chelan County NRD; for agenda item 6 only), and Bob Bugert (Chelan-Douglas Land Trust; for agenda item 7 only).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 10 April 2008 from 9:30 to 11:00 am.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions:

- Information updates from Tracy Hillman, Chuck Peven, David Morgan, and Bob Rose.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 12 March 2008 meeting notes with revisions suggested by Chuck Peven and Tracy Hillman.

III. Payment Authorizations

The Rock Island Tributary Committee authorized the following payments:

- $105.00 to LeMaster and Daniels for Rock Island administration in March.
- $1,268.87 to Chelan PUD for project coordination during the first quarter of 2008.

The Rocky Reach Tributary Committee authorized the following payments:

- $105.00 to LeMaster and Daniels for Rocky Reach administration in March.
- $603.04 to Chelan PUD for project coordination during the first quarter of 2008.

The Wells Tributary Committee authorized the following payment:

- $389.51 to Chelan PUD for project coordination during the first quarter of 2008.

IV. 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 the Entiat log-boom will be installed on 15 April 2008.
- Becky reported that the sponsor for the Heath Floodplain Restoration Project has asked contractors to resubmit their bids for the restoration work. Bids are due by the end of April.
- Becky indicated that the sponsor for the Lower Beaver Creek Livestock Exclusion Project has asked for bids for the off-stream stock water system. In addition, the pump for the conveyance system has been ordered. The landowner has started fencing the south end of the stream.

V. Information Updates

Tracy Hillman provided the following announcements:

- Mike Schiewe will be giving a presentation to the Upper Columbia Salmon Recovery Board on 24 April. He will provide them with a general overview of the HCPs and answer questions. He will also provide the Board with a list of projects that the Tributary Committees have funded (Tracy and Becky are compiling information for Mike).
- Mike Schiewe sent letters to American Rivers and the Confederated Tribes of the Umatilla Indian Reservation inviting them to attend a meeting of the HCP Coordinating, Hatchery, and Tributary Committees. The intent is to provide them with a progress report on implementation and allow them to ask questions of Committee members. The meeting would likely be a half-day session. The date for the meeting has not been determined.

Chuck Peven announced that he will end his employment with Chelan PUD at the end of April and will begin a new career as an independent consultant in fisheries science (Peven Consulting, Inc.). Chuck indicated that Keith Truscott will return as the interim Chelan PUD representative on the Rocky Reach and Rock Island Tributary Committees (to which Dale Bambrick led a joyful cheer).

David Morgan reported that John Sunderland contacted him about the possibility of the Tributary Committees attending a rafting trip on the Methow River in May or early June. The trip is being organized for multiple salmon recovery entities. David indicated that John would contact Tracy and provide the Committees with more details about the trip.

Bob Rose announced that the Yakama Nation signed a Memorandum of Agreement (MOA) with the Federal Columbia River Power System Action Agencies that would provide $60 million ($6 million per year for 10 years) for salmon and steelhead recovery in the Upper Columbia. Among other things, the money will be used to protect, restore, and enhance habitat, improve the status of Pacific lamprey, and some will be used for monitoring (effectiveness and status/trend monitoring). Bob indicated that the Yakama Nation will be coordinating these activities with the Co-managers, Upper Columbia Salmon Recovery Board, Regional Technical Team, Tributary Committees, Bureau of Reclamation, and others. Bob noted that additional information on the MOA can be found at: http://www.salmonrecovery.gov/ and http://www.critfc.org/

VI. Nason Creek Oxbow Monitoring (Yakama Nation)

Keely Murdoch with the Yakama Nation provided the Committees with an overview of the work they are doing to monitor the effectiveness of the Nason Creek Oxbow Project. Keely also provided the Committees with three handouts: (1) quarterly report for the period September-December 2007, (2) quarterly report for the period January-March 2008, and (3) the original proposal for monitoring the Nason Creek Oxbow Reconnection Project. What follows are the highlights from her presentation.

- The Yakama Nation has funding for one year from Chelan County NRD.
- Their work currently measures changes in the status of riparian plantings and fish densities (fish/m^2). They are also monitoring water temperatures and flows in the oxbow.
- Fish densities by species are estimated on three different occasions (subsamples) within each season in the oxbow (treatment site), Nason Creek (control site), and an oxbow in the Chiwawa Basin (reference site). Inclement weather and high flows may preclude the collection of all three subsamples during winter and spring.

Keely recommended the following improvements to the monitoring program:

- Install PIT-tag detectors within both culverts to estimate survival, residence times, and life-history characteristics of fish in the oxbow. Under ISEMP, fish are already PIT tagged in Nason Creek and there is a PIT-tag array at the mouth of Nason Creek for detecting fish movement. According to Keely, there may be an opportunity to compare survival of fish in Nason Creek with those that use the Oxbow. This will depend on the number of fish tagged in Nason Creek and the number of tagged fish that use the oxbow. Another feature of adding PIT-tag detectors is that it will allow continuous monitoring of fish into and out of the oxbow. Snorkel surveys only provide a discrete snapshot of fish in the oxbow.
- Increase the sampling duration from one year to at least five years. According to Keely, the oxbow is wide and shallow, and has large amounts of fines (mostly organics). Additional years of high flows may be required to scour a deeper and narrower channel within the oxbow. Sampling for only one year may miss the changes in channel features, habitat conditions, and responses of fish to those changes. Alan Schmidt and Lee Duncan noted that they are already seeing scouring in some locations in the oxbow.
- Because of the dynamic conditions within the oxbow, it would be beneficial to measure physical habitat conditions along systematically placed transects within the oxbow. This would allow one to document responses of fish (i.e., densities) to changes in habitat conditions over time.

Chris Parsons asked about the possibility of dredging the fine materials from the oxbow to expose more coarse substrate. Keely and Alan indicated that they would rather wait and see if spring high flows remove the fines before they consider dredging.

When asked about the buildup of organic sediments and the potential for oxygen sags in the oxbow, Keely indicated that they currently do not monitor oxygen levels. Lee Duncan indicated that measuring oxygen levels could be included with temperature monitoring.

Chris Parsons asked about the possibility that the darkness within the culverts would attract predators, which could prey upon juvenile salmon and steelhead as they passed through the culverts. Keely and others indicated that the culverts were large enough to allow sufficient light into the culverts.

Chris Fisher asked if the low numbers of fish observed in the oxbow during winter was related to the lower water temperatures in the oxbow than in the main channel. Keely indicated that the lower temperatures may be the reason for the lower numbers, but also noted that additional thermographs are needed to more accurately estimate water temperatures throughout the oxbow. The low readings may be an artifact of the location of the existing thermograph.

Dale Bambrick commented that it is probably more important at this time to monitor fish use of the oxbow rather than attempt to implement more sophisticated monitoring methods for estimating survival estimates. Other members agreed and suggested that sampling within the Chiwawa reference site may not be appropriate at this time. However, a reference condition from the literature would be useful.

Lastly, the Committees asked Keely when she needed resolution on funding for the additional monitoring efforts. She indicated that they would need to have additional funds secured by summer 2008.

The Committees asked Tracy to offer Keely an invitation to submit a proposal that describes in detail the approach and cost for each task. Bob Rose indicated that he would work with Keely in developing a proposal that addressed the Committees interests and concerns.

VII. White River Land Exchange (Chelan-Douglas Land Trust)

Bob Bugert with the Chelan-Douglas Land Trust described the efforts of the Land Trust and the Trust for Public Lands in developing a large-scale land exchange program. The purpose of the program is to exchange private lands of high conservation value with public lands of lower conservation value. This would place lands with high conservation value into public ownership. Currently, the Land Trust is focused on 60-65 parcels of public lands of low conservation value (mostly riparian and shrub steppe) in the Entiat and Wenatchee districts. As part of this process, the Land Trust is looking for five types of support:

1. Technical and financial assistance to develop the decision-support modeling efforts.
2. Financial support for facilitation of a stakeholder process.
3. Financial support for the “due diligence” of conducting the real-estate transactions.
4. Assistance in securing support from both the legislative and executive branches of the federal government.
5. Assistance in securing support from non-governmental organizations.

Bob indicated that the Land Trust may seek financial support from the Tributary Committees to help facilitate the process of identifying areas of high conservation value (i.e., areas important for sensitive species). Bob also indicated that a consulting group known as Clearwater Environmental will help with the land exchanges. According to Bob, this group has extensive experience in negotiating land exchanges.

Bob noted that land exchanges are quite controversial, because exchanges may result in a net loss of public ownership. Bob indicated that their efforts are supported at the local level. The legal challenge will likely be at the national level.

Bob then provided an example of an exchange they are brokering in the White River basin. A private landowner (Schmitten) currently owns about 138 acres of valley-bottom land in the White River basin. The landowner is not interested in selling the property. Instead, the landowner would like to trade the 138 acres for 230 acres of Forest Service land on Nason Creek (near Coles Corner). The Forest Service land on Nason Creek has low conservation value but high

commercial value. Because the Forest Service can only trade "value" for "value," it may be necessary to place a conservation easement on portions of the 230 acres to reduce its values and thereby provide an equitable exchange.

Bob indicated that there are other parcels in the White River basin and the Icicle that would be packaged as a bundle. Bob indicated that it is easier to broker exchanges of bundled parcels than single parcels.

The Committees asked if the Forest Service currently has parcels that are available for trade. Bob stated that they have 60 parcels with no to low conservation value that can be freed-up for development. Bob noted that most of these parcels are in shrub steppe habitat.

VIII. ORRI Effectiveness Monitoring

Chris Fisher provided the Committees with an updated table of effectiveness monitoring actions prepared by Chris Bull for the Okanagan River Restoration Initiative (ORRI). Of the eight parameters identified in the table, the Committees identified three that most interested them: (1) fish holding and rearing habitat, (2) channel morphometry and hydraulics, and (3) substrate composition. Based on the information in the table, there is currently no secured funding for these three parameters.

The Committees directed Tracy to send a letter to Chris Bull inviting the Okanagan Nation Alliance (or the Canadian Okanagan Basin Technical Working Group) to submit a proposal to the Tributary Committees for funding the monitoring of these three parameters. The proposal is to include a detailed description of the monitoring objectives, experimental design (e.g., before-after, control-impact design), sampling design for each parameter (including sampling duration and frequency, sampling areas, methods, etc.), measuring instruments, and analytical procedures for assessing treatment effects. The proposal is to include a detailed budget for each parameter. This is important because the Committees noted that the cost per year for some parameters (e.g., redd counts) seemed quite high.

IX. Small Projects Proposal

The Committees reviewed a Small Projects Program application from the Methow Salmon Recovery Foundation titled *Fort-Thurlow Pump Project.*

Fort-Thurlow Pump Project

The purpose of this project is to complete the piping modification on the Fort-Thurlow irrigation system on Beaver Creek. By connecting the second pump to the newly piped system, which was funded by the Salmon Recovery Funding Board, the project will create a completely enclosed and pressurized irrigation system. This will eliminate an existing 0.5-mile bypass reach for operational spill and benefit salmonids by adding 0.5 cfs of flow to Beaver Creek near the point of the diversion. The total cost of the project is $48,150. The sponsor requested $7,000 from HCP Tributary Funds. ***The Wells Tributary Committee approved funding for this project.***

X. Next Steps

The next meeting of the Tributary Committees will be on Friday, 13 June. There will be no meeting in May. Tentative agenda items include:

- Status report on funded projects.
- Review pre-proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 13 June 2008

Members Present: Dale Bambrick (NOAA-Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Keith Truscott (Chelan PUD), and Tracy Hillman (Committee Chair).

Others Present: Becky Gallaher (HCP Project Coordinator) and Joe Miller (Chelan PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Friday, 13 June 2008 from 9:00 am to 12:40 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions:

- Information updates from Keith Truscott, Becky Gallaher, Dale Bambrick, and Tracy Hillman.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 April 2008 meeting notes with revisions suggested by Tom Kahler and Tracy Hillman.

III. Payment Authorizations

The following are payments that the Committees authorized in May.

The Rock Island Tributary Committee authorized the following payments:

- $316,617.15 to Chelan-Douglas Land Trust for the White River Floodplain Project (purchase of the Quintana-Leon property).
- $200,539.18 to Chelan-Douglas Land Trust for the White River Floodplain Project (purchase of the Tiegel property).

The Rocky Reach Tributary Committee authorized the following payments:

- $5,677.34 to Cascadia Conservation District for the Entiat Instream Structure Engineering and Permitting Project (riparian planting pre-work and design and administration costs).
- $12,933.55 to Cascadia Conservation District for the LWD/Rootwad Acquisition and Transport Project (purchase of logs and administration costs).

- $2,989.75 to Cascadia Conservation District for the Entiat PUD Canal Log-Boom Installation Project (purchase of materials and rental of equipment).

The Wells Tributary Committee authorized the following payment:

- $8,456.17 to Stokes and Stokes (submitted by Okanogan Conservation District) for the Lower Beaver Creek Livestock Exclusion Project (purchase of materials and excavation costs).

The following are payments that the Committees authorized during the June meeting.

The Wells Tributary Committee authorized the following payment:

- $1,239.07 to the Methow Conservancy for the Riparian Regeneration and Restoration Initiative (purchase materials and cover mileage costs).

IV. 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.

- Pipe has been installed for the off-stream stock-water system for the Lower Beaver Creek Livestock Exclusion Project.
- The conservation easement for the Wildhorse Spring Creek Conservation Easement Project has been drafted and is in the review process.
- Landowner outreach and landowner agreement development continues on the Entiat PUD Canal System Conversion Project.
- Cultural consultation is complete for three of the five properties under the Riparian Regeneration and Restoration Initiative Project. Materials have been purchased for the Fine-Morrison property.

V. Information Updates

Keith Truscott reported that Chelan PUD recently hired Joe Miller and that Joe will be attending Tributary Committees meetings with Keith. It is likely that Joe will replace Keith as the Chelan PUD representative on the Rocky Reach and Rock Island Tributary Committees sometime in the near future.

Becky Gallaher provided a brief report on the partial failure of the Entiat Canal Log Boom Installation Project. The log boom has not been completely successful in diverting debris away from the canal intake. Debris collecting on the boom created a significant reduction in stream flow into the canal. The sponsor is currently trying to fix the problem.

Dale Bambrick reported that NOAA Fisheries has contracted with Chuck Peven to help write the biological assessment and programmatic biological opinion that will cover habitat actions implemented under the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan. Dale also noted that Kate Terrell with the U.S. Fish and Wildlife Service is aware of this work.

Tracy Hillman reported that Mike Kaputa, Chelan County Natural Resource Department, contacted him with a request to meet with the Committees in July to discuss apparent conflicts between the Committees and the County and to identify solutions to improve relationships between the parties. After considerable discussion, the Committees directed Tracy to send a letter to Mike indicating that the Committees evaluate all CCNRD proposals objectively based on their

technical merit and consistency with the objectives of the Tributary Committees. Tracy will draft a letter and send it to the members of the Committees for review.

VI. Time Extension Request

The Rocky Reach Tributary Committee received a request from Cascadia Conservation District to extend the agreement period for the Entiat Instream Structure Engineering and Permitting Project from 30 June 2008 to 30 June 2009. The extension will allow the District to continue their work and use the existing funds. ***The Rocky Reach Tributary Committee approved the time extension request.*** All other conditions of the agreement remain unchanged.

VII. Budget Amendment Request

The Wells Tributary Committee received a budget amendment request from the Methow Salmon Recovery Foundation asking for an additional $10,000 to complete the Heath Project. The request for an additional $10,000 increases the total award to $58,695, which exceeds the maximum contract allowed under the Small Projects Program as described in Section 3.6 of The Tributary Fund Policies and Procedures for Funding Projects, September 2007. However, given the circumstances associated with this project (early and persistent snow and cold weather conditions that increased costs for site clearing and snow management, and change orders to satisfy WDFW recommendations), ***the Wells Tributary Committee approved the budget amendment request.*** However, the Committee directed Tracy to make it clear in the letter to the Conservancy that this is a one-time budget amendment and the Committee will not view favorably such requests in the future.

VIII. Small Projects Proposal

The Committees reviewed a Small Projects Program application from the Okanogan Conservation District titled *Goodman Livestock Exclusion Project*.

Goodman Livestock Exclusion Project

The purpose of this project is to install about 800 feet of riparian exclusion fencing along Beaver Creek and provide an off-stream water source for livestock. This should protect existing riparian habitat and reduce bank instability and fine sediment recruitment to the channel. The total cost of the project is $8,080. The sponsor requested $7,980 from HCP Tributary Funds. The Wells Tributary Committee agreed to fund this project **if** the fence line just past the proposed solar trough and pipeline (as shown on the Goodman Proposed Project Map) angles to the left and runs parallel to Beaver Creek (not toward the stream as it is currently shown). This would place the connection of the proposed fence near the middle of the existing fence line, not at the end of the existing fence. The Committee believes that this change in the proposed fence line will better protect the existing riparian vegetation and stream channel.

IX. Monitoring Proposal

The Committees reviewed a Monitoring Proposal submitted by Mr. Chris Bull, the Okanagan River Restoration Initiative Project Coordinator, titled *ORRI Effectiveness Monitoring Project*.

ORRI Effectiveness Monitoring Project

The purpose of this project is to monitor the effectiveness of the Okanagan River Restoration Initiative Project. The proposal included four monitoring tasks: (1) Fish Holding and Rearing for $2,983, (2) Channel Morphometry and Hydraulics for $7,224, (3) Substrate Composition for $5,596, and (4) Sockeye Spawning/Incubation Success for $13,772. ***The Wells Tributary Committee approved funding for the first three tasks.***[1] The Committee elected not to fund the sockeye spawning and incubation success work at this time. At the end of the annual monitoring period, the sponsor will submit a report that summarizes the monitoring results and a budget for the next annual monitoring period.

X. General Salmon Habitat Program Pre-Proposals

The Committees received 13 pre-proposals submitted under the General Salmon Habitat Program. Cascadia Conservation District removed one of their proposed projects. Therefore, the Committees reviewed 12 pre-proposals.

Prior to review, Becky gave an update on the amount of funds available from each plan species account for the 2008 funding cycle:

- Rock Island Plan Species Account has about $1,478,265
- Rocky Reach Plan Species Account has about $1,097,188
- Wells Plan Species Account has about $894,224

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 Tracy to notify sponsors with appropriate projects to submit a full proposal, with a discussion of the questions/comments identified for each pre-proposal listed below.

Conservation Opportunities on Icicle Creek Project

The Committees recommend that the sponsor (Chelan-Douglas Land Trust) consider the following comments/suggestions as they develop the full proposal:

- Because conservation of this portion of lower Icicle Creek is not a priority of the Tributary Committees, the sponsor must demonstrate that this particular area is at high risk of development and has high biological benefit to Plan species.
- The Committees would like to see information on the location of the 100-year floodplain and the likelihood of land uses within and outside the 100-year floodplain.
- The Committees recommend that the sponsor seek the majority of funds from entities other than the Tributary Committees.

Twisp River Riparian Protection Project

The Committees recommend that the sponsor (Methow Conservancy) consider the following comments/suggestions as they develop the full proposal:

[1] Douglas PUD will provide funding for the approved monitoring tasks through the Wells Tributary Assessment Program, as per Section 7.5 of the Wells HCP, rather than through the Wells Plan Species Account.

- The Committees would like to see more information on the seven factors that were used to prioritize properties for conservation.
- The Committees have no interest in funding a conservation easement on the Coon property.
- The Committees recommend that the sponsor show a cost share for each property.
- The sponsor needs to explain or justify the $10,000-$13,000 appraisal and review fee for each property.
- The sponsor needs to explain or justify the $2,500-$3,000 easement-drafting fee for each property.

Twisp River Conservation Acquisition II Project

The Committees recommend that the sponsor (Methow Salmon Recovery Foundation) consider the following comments/suggestions as they develop the full proposal:

- The sponsor needs to describe what is meant by a "revocable trust" (e.g., Doran Family Revocable Trust).
- The sponsor should explain why a conservation easement for this project is less appropriate than an acquisition.
- The full proposal should identify the sponsor's future plans for each parcel.
- If the sponsor intends to sell some of the land, what will the sponsor do with the money? Will the Tributary Committees have any input on how those funds will be used?
- The sponsor needs to identify in the full proposal the cost of the house.

Poorman Creek Barrier Removal Project

The Committees recommend that the sponsor (Methow Salmon Recovery Foundation) consider the following comments/suggestions as they develop the full proposal:

- If available, the sponsor should provide information on seasonal stream flows in Poorman Creek.
- The sponsor should include a costs/benefits analysis for a steel bridge versus a steel arch pipe.

Goodfellow/Chotzen Floodplain Reconnection Project

The Committees recommend that this project, sponsored by Chelan County Natural Resource Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- The Committees believe that this site should be protected from land-use activities and allowed to experience natural events and processes that will shape the side channel and off-channel habitat.
- It was not clear why an excavated backchannel was necessary and what benefit to Plan species it would provide.

- The Committees were concerned that the connection with the floodplain during high flows may strand fish during low flow periods.

Nason Creek Kahler Complexity Project

The Committees recommend that this project, sponsored by Chelan County Natural Resource Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- This project is inconsistent with the intent of the Tributary Funds.
- The project is out of sequence with the reach-level strategy plan process.
- The project addresses a symptom rather than the processes that caused the problem.

Nason Creek Ray Rock Springs Complexity Project

The Committees recommend that this project, sponsored by Chelan County Natural Resource Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- This project is inconsistent with the intent of the Tributary Funds.
- The project is out of sequence with the reach-level strategy plan process.
- The project addresses a symptom rather than the processes that caused the problem.

Cashmere Pond Off-Channel Habitat Project

The Committees recommend that the sponsor (Chelan County Natural Resource Department) consider the following comments/suggestions as they develop the full proposal:

- The sponsor needs to describe why the proposed approach is better than simply removing the berm and allowing the river to rework naturally the side channel and pond.
- The Committees believe that if the project goes through as planned, there may be increased public use of the site. If this is true, what will the sponsor do to reduce the impacts of increased public use?
- The construction of an island may increase opportunities for bird predation. The sponsor needs to describe how this potential source of mortality will be minimized.
- The sponsor should describe the costs/benefits of using the dredge materials to create an island versus transporting the materials off site.
- The sponsor needs to explain or justify the $33,340 sum for salaries and benefits.

Middle Stillwater Design Only Project

The Committees recommend that the sponsor (Cascadia Conservation District) consider the following comments/suggestions as they develop the full proposal:

- Because the Committees typically do not fund assessments unless the proposed assessments lead directly and clearly to identification, location, and design of habitat protection or restoration projects, the sponsor must demonstrate how this assessment will

lead to specific habitat actions at specific locations. To be consistent with the intent of the Tributary Funds, the resulting actions must address processes, not symptoms.

- The sponsor needs to make it clear how this project relates to the BOR and Entiat River Reach assessments.
- The sponsor needs to provide more detail in the budget. The budget should identify specific items/tasks and their associated costs.
- The sponsor needs to describe or justify the $33,000 estimate for Permits. It is not clear what permits are needed to conduct the assessment.

Entiat River Reach Assessments Project

The Committees recommend that this project, sponsored by Cascadia Conservation District, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- This project is inconsistent with the intent of the Tributary Funds.
- It is not clear how this project relates to the BOR and Middle Stillwater Design Only assessments.

Keystone Diversion Project

The Committees recommend that the sponsor (Cascadia Conservation District) consider the following comments/suggestions as they develop the full proposal:

- The Committees recommend that the full proposal focus on the rock-wing dam (which will replace the existing push-up dam) and riparian restoration. At this time, the Committees are not interested in funding more boulder clusters and woody debris structures in this reach until monitoring has assessed the effectiveness of structures already implemented in this reach.
- The sponsor needs to provide more detail in the budget. The budget should identify specific items/tasks and their associated costs.

Moody Canyon Engineered Log Jam (ELJ) Project

The Committees recommend that the sponsor (Cascadia Conservation District) consider the following comments/suggestions as they develop the full proposal:

- Although the Committees are disinclined to fund more instream-structure projects, the Committees would like more information and background on the costs/benefits of Engineered Log Jams (ELJs). The sponsor should provide more information on why this restoration technique is more appropriate at this site than other techniques. The proposal should include information on durability of ELJs, resistance to high flow events (say, 100-year events), and the expected life of ELJs.
- The Committees recommend that the full proposal focus only on the ELJ. At this time, the Committees are not interested in funding more boulder clusters and woody debris structures in this reach until monitoring has assessed the effectiveness of structures already implemented in this reach.

- The sponsor needs to provide more detail in the budget. The budget should identify specific items/tasks and their associated costs.

XI. Next Steps

Project tours will be Monday through Wednesday, 23-25 June. The next meeting of the Tributary Committees will be on Thursday, 10 July. Tentative agenda items include:

- Status report on funded projects.
- Time Extension Request.
- Review of Small Projects Application.
- Further discussions on pre-proposals following field visits.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 10 July 2008

Members Present: Dale Bambrick (NOAA-Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Keith Truscott (Chelan PUD), and Tracy Hillman (Committee Chair).

Others Present: Becky Gallaher (HCP Project Coordinator) and Joe Miller (Chelan PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Fish and Wildlife Conference Room in Wenatchee, Washington, on Thursday, 10 July 2008 from 9:30 am to 11:15 am.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions:

- Information updates from Becky Gallaher and Tracy Hillman.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 June 2008 meeting notes with revisions suggested by Tom Kahler and Tracy Hillman.

III. Payment Authorizations

The following payment request was authorized by the Wells Committee at the end of June.

- $345,400.00 to Transnation Escrow for the MacDonald Property Conservation Easement (Methow Riparian Protection-MacDonald Property Project).

The following are payments that the Committees authorized during the July meeting.

The Rock Island Tributary Committee authorized the following payments:

- $1,258.16 to Chelan County PUD for second-quarter administration and coordination work.
- $90.00 to LeMaster and Daniels for second-quarter administration.

The Rocky Reach Tributary Committee authorized the following payments:

- $1,114.53 to Chelan County PUD for second-quarter administration and coordination work.
- $90.00 to LeMaster and Daniels for second-quarter administration.

The Wells Tributary Committee authorized the following payments:

- $575.12 to Chelan County PUD for second-quarter administration and coordination work.
- $100.69 to the Methow Salmon Recovery Foundation for project administration on the Fort Thurlow Pump Project.
- $6,908.31 to the Omak Machine Shop for the purchase of the pump and other materials for the Fort Thurlow Pump Project.
- $215.07 to the Methow Conservancy for travel time and purchase of tree cages for the Riparian Regeneration and Restoration Initiative Project.
- $168.28 to the Okanogan Conservation District for salaries, benefits, and expenses on the Lower Beaver Creek Livestock Exclusion Project.

IV. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects.

- The Methow Riparian Protection-MacDonald Property Project is complete. The project closed on 7 July.
- Fencing is complete and pipe has been installed for the off-stream stock-water system for the Lower Beaver Creek Livestock Exclusion Project.
- Under the LWD/Rootwad Acquisition and Transport Project, a total of 63 logs have been acquired and will be used for the Keystone, Knapp-Wham, and Blackbird Island projects. The cost per log was $350-400.
- The conservation easement for the Wildhorse Spring Creek Conservation Easement Project has been drafted and is in review.
- Landowner outreach and landowner agreement development continues on the Entiat PUD Canal System Conversion Project. It is expected that landowner agreements will be signed by the end of July.
- Cascadia Conservation District and the landowner are currently locating a site for the well for the Roaring Creek Flow Enhancement and Barrier Removal Project.
- All permitting and landowner agreements are complete for the Keystone Canyon Habitat Restoration Project. However, Marc Duboiski and Michelle Kremer with the SRFB want to remove the rock barbs and only use wood. Dale Bambrick will contact SRFB to find out why the SRFB wants to remove the rock barbs and only use wood.
- Solid Rock Contractors was selected to implement the Harrison Side Channel Project. A pre-construction conference is scheduled for 10 July. Trees with attached rootwads have been delivered to the site and rock will be delivered on 14 July.
- The sponsor of the Okanagan River Restoration Initiative would like to move forward on effectiveness monitoring. However, without a contract with Douglas PUD, the sponsor (Okanagan Nation Alliance) cannot begin monitoring work. Tom Kahler will do what he can to expedite a contract between Douglas PUD and the sponsor.
- A total of 60 trees have been caged on the Morrison property under the Riparian Restoration and Regeneration Initiative Project. Additional trees will be caged on the Gilbertsen property in August.

- The pump has been purchased for the Fort-Thurlow Pump Project. The pump should be installed and the project completed by 18 July.

V. Information Updates

Becky Gallaher reported that the SRFB changed the application form for restoration and acquisition projects. Becky will send an electronic version of the revised form to Committees members. The Committees will review the form and determine if it includes all the information required in the General Salmon Habitat Program application. By Friday, 18 July, the Committees will let Tracy and Becky know if the SRFB application form can also be used for General Salmon Habitat Program projects.

Tracy Hillman provided the following updates:

- Tracy reported that Okanogan Conservation District was able to modify the location of the livestock exclusion fence on Beaver Creek (Goodman Livestock Exclusion Project). Rather than angle the fence toward Beaver Creek, the revised fence line will run parallel with Beaver Creek. This satisfies the concern the Wells Committee identified in their letter to the sponsor.
- Tracy reported that he sent a letter to Mike Kaputa indicating the Committees desire to ease any concerns over the objectivity of their funding decisions and thereby obviating a proposed meeting in July. Tracy noted that he had not yet heard from Mike.
- Tracy reported that the Upper Columbia Region Technical Team (RTT) is planning a post-implementation project tour on 8-9 October. The purpose of the tour is to visit projects that were funded by the SRFB and/or Tributary Committees. The Committees indicated that they would participate in these tours and noted that site inspections are consistent with Section 6.4 in the Tributary Fund Policies and Procedures for Funding Projects (September 2007). The Committees identified the following projects that they would like to visit:
    - Entiat Instream Structure Engineering Project
    - Entiat Instream Habitat Improvements Project
    - Nason Creek Off-Channel Habitat Restoration Project
    - Alder Creek Culvert Replacement Project
    - Heath Floodplain Restoration Project

  The Committees asked Tracy to report this information to Derek Van Marter and the RTT.

VI. Time Extension Request

The Rocky Reach Tributary Committee received a request from Cascadia Conservation District to extend the agreement period for the Entiat PUD Canal Log-Boom Project from 26 June 2008 to 30 June 2009. The extension will allow the District to continue work on the log boom. ***The Rocky Reach Tributary Committee approved the time extension request.*** All other conditions of the agreement remain unchanged.

VII. Small Projects Proposal

The Committees reviewed a Small Projects Program application from the Chelan County Natural Resource Department titled *Sleepy Hollow Reserve Protection Feasibility Assessment*.

Sleepy Hollow Reserve Protection Feasibility Assessment

The purpose of this project is to evaluate about 240 acres of land on the north side of the lower Wenatchee River, downstream from the Sleepy Hollow Bridge, for various protection opportunities, including fee-simple acquisition, conservation easements, conservation buyers, landowner agreements, and regulatory measures. The County, in partnership with the Chelan-Douglas Land Trust and the Trust for Public Land, will hire a consultant to develop the work products. The total cost of the project is $25,000. The sponsor requested $20,000 from HCP Tributary Funds. The Committees reviewed the proposal and identified several issues that they would like the sponsor to address before the Committees make a funding decision.

- It appears the intent of the project is to develop a Conservation Plan for the Sleepy Hollow area. The Committees need more information on what will be included in the Plan. For example, what is the purpose of the Plan and will it include different protection and restoration scenarios?
- If a Conservation Plan will be prepared, will it include scenarios for protecting uplands and riparian areas, or only riparian areas?
- The Committees would like to see a delineation of the proposed conservation area that identifies uplands and areas already protected under County Ordinances.
- Finally, the Committees would like to know how the County Ordinances will be included in the Conservation Plan.

The Committees directed Tracy to send a letter to both Mike Kaputa (Chelan County NRD) and Bob Bugert (Chelan-Douglas Land Trust) requesting the additional information.

VIII. General Salmon Habitat Program Site Visits

Some Committees members attended the site visits on 23-25 June. The following points were shared with the Committees by those who attended the site visits.

Conservation Opportunities on Icicle Creek Project

It was recommended that the proposal provide specificity on the size and location of the parcels that will be protected. In addition, the proposal needs to describe clearly the biological benefits of lower Icicle Creek, linkages to restoration opportunities, and what level of protection will be provided beyond current regulatory mechanisms.

Twisp River Riparian Protection Project

It was recommended that the proposal separate the information on the different easements, including costs. Reviewers will need to evaluate each property separately. The proposal should include more information on the methods used to prioritize parcels. It was also recommended that additional efforts should be made to minimize the upland areas in the easements.

Twisp River Conservation Acquisition II Project

The proposal should include before and after pictures of the existing Methow Salmon Recovery Foundation property to demonstrate the potential benefits of the proposed acquisition.

Poorman Creek Barrier Removal Project

The proposal should compare the cost/benefits of a steel bridge with the proposed culvert.

Cashmere Pond Off-Channel Habitat Project

It was suggested that the project may be just as effective if the upstream berm was removed and the downstream outlet modified to prevent fish stranding in the pond. In addition, there was concern about excavating a 1,600-foot side channel. Many questioned the benefits of creating an island. A simpler, less engineered approach may be more reasonable.

Middle Stillwater Design Only Project

This project may be out of sequence if the results of the USFWS assessment (Watershed Assessment of River Stability and Sediment Supply) are not completed.

Keystone Diversion Project

It was recommended that this project be combined with the Moody Canyon Engineered Log Jam Project. The Keystone diversion should include an assessment of the screening and return flow structures. There were concerns about the effects of ice and ice dams on these structures and how ice dams could affect the road. The proposal should include the exact locations and configurations of the instream structures and it should clearly state the objectives for the structures.

Moody Canyon Engineered Log Jam (ELJ) Project

See notes above on the Keystone Diversion Project.

IX. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 14 August. Tentative agenda items include:

- Status report on funded projects.
- Review of Salmon Habitat Proposals (members will receive proposals on 11 August).

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 14 August 2008

Members Present: Dennis Beich (WDFW), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Keith Truscott (Chelan PUD), and Tracy Hillman (Committee Chair).

Members Absent: Dale Bambrick (NOAA-Fisheries)[1] and Bob Rose (Yakama Nation)[2].

Others Present: Becky Gallaher (HCP Project Coordinator) and Joe Miller (Chelan PUD).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Thursday, 14 August 2008 from 9:30 am to 1:00 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions:

- Additional information updates from Tracy Hillman and Becky Gallaher.
- Review of proposed Sleepy Hollow Reserve Protection Feasibility Assessment Project.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 July 2008 meeting notes.

III. Payment Authorizations

The Rock Island Tributary Committee authorized the following payment:

- $578.24 to Chelan County PUD for copying and mailing proposals.

The Rocky Reach Tributary Committee authorized the following payments:

- $578.24 to Chelan County PUD for copying and mailing proposals.
- $2,017.78 to Cascadia Conservation District for salaries and benefits on the Entiat Instream Structure Engineering Project.

[1] Dale notified the chair in advance of his inability to attend, and provided his input on decision items before the meeting.
[2] Bob joined the meeting via conference call.

- $2,961.24 to Cascadia Conservation District for excavation and salaries on the LWD/Rootwad Acquisition and Transport Project (this is the final payment on this project).
- $1,459.62 to Cascadia Conservation District for materials and salaries on the Entiat PUD Canal Log Boom Project.

The Wells Tributary Committee authorized the following payments:

- $1,002.91 to Chelan County PUD for copying and mailing proposals.
- $18,283.15 to the Methow Salmon Recovery Foundation for materials for the Heath Floodplain Restoration Project.
- $141.55 to the Okanogan Conservation District for salaries and benefits on the Lower Beaver Creek Livestock Exclusion Project.
- $6,472.65 to Michael Parks for project materials and labor on the Goodman Livestock Exclusion Project.

IV. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects.

- The Methow Riparian Protection is complete. Final reports were received on the MacDonald and Prentice properties.
- One well site has been identified and landowner forms are in place for the Roaring Creek Flow Enhancement and Barrier Removal Project. The sponsor is working with the USFWS to get approval for placing a second well on the Entiat Hatchery property.
- All permitting and landowner agreements are complete for the Keystone Canyon Habitat Restoration Project. However, the SRFB halted the project because they want to remove the rock barbs and only use wood. During the July meeting, Dale Bambrick volunteered to contact SRFB to find out why they want to remove the rock barbs and only use wood. Dale will report his findings to the Committees when he returns.
- Under the Riparian Restoration and Regeneration Initiative Project, the sponsor will install about 60 cages on 21 August to protect trees on the Gilbertsen property.
- Chris Fisher asked about the status of the Clees Well and Pump Project. Becky reported that the project is complete and the final report can be found at http://www.midcolumbiahcp.org/Tributary/GSF%20Projects.htm.

V. Information Updates

The following information updates were provided during the meeting.

1. Tom Kahler reported that he had a discussion with Chris Johnson (Methow Salmon Recovery Foundation) about how to protect quality habitat under the high cost of conservation easements. Currently, the cost of conservation easements is based on appraisals. Given the high costs of conservation easements, only a limited number of easements can be purchased. In addition, because of the high value of conservation easements based on appraisals, there is a sense that landowners may seek to be paid for conservation easements even though they do not intend to develop their lands. Therefore, the Committees are interested in talking with sponsors about the possibility of sponsors

negotiating costs of easements with the landowners. The Committees would like to speak with the Methow Salmon Recovery Foundation, Methow Conservancy, and Chelan/Douglas Land Trust about the possibility of negotiating prices for easements. The Committees directed Tracy and Becky to organize a discussion with these sponsors following the presentations during the September meeting.

2. Tom Kahler reported that Douglas PUD has completed a contract with the Okanagan Nation Alliance (ONA) to partially fund effectiveness monitoring work on the Okanagan River Restoration Initiative (ORRI), as approved at the June 2008 meeting. As noted in Section 7.5 in the Wells HCP, funds for effectiveness monitoring come from a separate account (not the Plan Species Account). Thus, Douglas PUD had to initiate a "regular" contract with ONA. Tom reported that the contract included a couple of changes to the May 2008 budget: (1) an adjusted price for mileage, and (2) two additional days for report writing.

3. Becky Gallaher reported that she and Keith Truscott recently visited the following projects: Lower Beaver Creek Livestock Exclusion Project, Goodman Livestock Exclusion Project, Heath Floodplain Restoration Project, Thurlow Pump Project, and Clees Well and Pump Project. Pictures from the site visits can be viewed on the ftp site: ftp://ftp.chelanpud.org/tributary. Keith recommended that the Committees visit the Goodman Livestock Exclusion and Heath Floodplain Restoration projects during the October field tours.

4. Tracy Hillman reported that he received an email from Mike Kaputa (Chelan County NRD) responding to the letter the Committees sent to Mike in July about the Committees desire to ease any concerns over the objectivity of their funding decisions. Mike identified three issues that he would like input from the Committees.

    - ***Project Development—Who pays for the capacity to develop high-quality projects?*** Although the Committees understand the cost of developing high-quality projects, funds from the Plan Species Accounts are not used to support the capacity to develop projects.

    - ***Sensitive Projects—It is not clear how to approach the Committees regarding the development of large-scale and sensitive projects.*** The Committees discussed the possibility of providing technical advice to sponsors under certain circumstances, but did not come to agreement on how this would be accomplished or if the Committees should even provide such a service to sponsors. The Committees decided to revisit this issue during the September or October meeting.

    - ***Funding Rationale—Sponsors would appreciate receiving a rationale for funding or not funding a project.*** Although the Committees are not directed under their Policies and Procedures to provide a rationale for funding or not funding a project, most members agreed that a rationale should be provided to project sponsors. Feedback from the Committees provides sponsors with information that should help the sponsors develop better projects and proposals. The Committees decided to revisit this issue during the September or October meeting.

5. Finally, Tracy Hillman, after one year of service with the Committees, asked the members for feedback on how he could better serve the Committees as their Chairperson. Members requested that Tracy: (1) provide more information on funding available from other entities (e.g., Salmon Recovery Funding Board, Action Agencies, etc.) and (2)

provide occasional briefings on what other Committees are doing in the Upper Columbia. In an effort to keep the Committees more informed on the happenings of other Committees, Tracy indicated that he would work more closely with Derek Van Marter (Upper Columbia Salmon Recovery Board) and Casey Baldwin (Upper Columbia Regional Technical Team Chair).

VI. Small Projects Proposal

In July the Committees reviewed a Small Projects Program application from the Chelan County Natural Resource Department titled *Sleepy Hollow Reserve Protection Feasibility Assessment*. The purpose of the project is to evaluate about 240 acres of land on the north side of the lower Wenatchee River, downstream from the Sleepy Hollow Bridge, for various protection opportunities, including fee-simple acquisition, conservation easements, conservation buyers, landowner agreements, and regulatory measures. The County, in partnership with the Chelan-Douglas Land Trust and the Trust for Public Land, will hire a consultant to develop the work products. The total cost of the project is $25,000. The sponsor requested $20,000 from HCP Tributary Funds.

The Committees reviewed the proposal in July and identified the following issues that they asked the sponsor to address before the Committees could make a funding decision.

- The Committees requested more information on what will be included in the Plan. For example, what is the purpose of the Plan and will it include different protection and restoration scenarios?
- If a Conservation Plan will be prepared, would it include scenarios for protecting uplands and riparian areas, or only riparian areas?
- The Committees asked for a delineation of the proposed conservation area that identifies uplands and areas already protected under County Ordinances.
- Finally, the Committees wanted to know how the County Ordinances will be included in the Conservation Plan.

In an email, Mike Kaputa (Chelan County NRD) responded to the Committees request for additional information. After further consideration and discussion, the Committees were unable to reach a funding decision without further clarification. The Committees directed Tracy to send an email to Mike requesting additional information on the following items.

- Given that residential development must be located 200 feet from the ordinary high water mark of the river and side channel and that a variance from this standard is unlikely, what additional benefit will the proposed conservation plan provide that isn't already covered under existing County ordinances?

- The Committees need a more detailed budget showing exactly how the County proposes to use the funds and how the County intends to identify and evaluate alternatives.

VII. Review of General Salmon Habitat Program Proposals

The Committees reviewed eight proposals 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—fundable, Tier 2—fundable 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. The following table summarizes the preliminary rankings of the proposals (these ratings may change after further discussion).

Proposed Project	Preliminary Rankings		
	Tier 1 (Fundable)	Tier 2 (Fundable with questions)	Tier 3 (Do not fund)
Lower Icicle Conservation Easement		X	
Twisp River Conservation Acquisition II		X	
Poorman Creek Barrier Removal		X	
Twisp River Riparian Protection		X	
Cashmere Pond Off-Channel Habitat Project		X	
Middle Stillwater Design Only		X	
Entiat River Reach Assessments (ERRAs)			X
Below the Bridge		X	

Because of the limited time (one day) the members had to review the proposals before the meeting, Committees members will review the proposals in more detail during the next two weeks and submit their questions on the proposals to Tracy and Becky by Friday, 29 August. Tracy and Becky will then compile the questions and send them to the project sponsors. The sponsors will use these questions to prepare their presentations for the Committees on Tuesday, 30 September.

VIII. Next Steps

The Tributary Committees will meet on Tuesday, 30 September for project presentations. The Committees would like to hear from sponsors of the following projects:

- Cashmere Pond Off-Channel Habitat Project (Chelan County Natural Resources Department)
- Middle Stillwater Design Only (Cascadia Conservation District)
- Below the Bridge (Cascadia Conservation District)
- Poorman Creek Barrier Removal (Methow Salmon Recovery Foundation)
- Twisp River Conservation Acquisition II (Methow Salmon Recovery Foundation)
- Twisp River Riparian Protection (Methow Conservancy)
- Lower Icicle Conservation Easement (Chelan/Douglas Land Trust)

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 30 September 2008

Members Present: Dale Bambrick (NOAA-Fisheries), Dennis Beich (WDFW), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Bob Rose (Yakama Nation), Keith Truscott (Chelan PUD), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (HCP Project Coordinator), and Lee Carlson and Brandon Rogers (Yakama Nation). Those present for presentations included Bob Bugert (Chelan-Douglas Land Trust); Greg Knott and Chris Johnson (Methow Salmon Recovery Foundation); Julie Grialou, John Sunderland, and Jason Paulsen (Methow Conservancy); Tom Gibbons, Rich Malinowski, and Mike Rickel (Cascadia Conservation District); Phil Archibald and Rick Woodsmith (U.S. Forest Service); Steve Kolk (Bureau of Reclamation); Joy Juelson and Michael Kane (Chelan County Natural Resource Department); and Bruce Heiner (Washington Department of Fish and Wildlife).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Douglas PUD Auditorium in East Wenatchee, Washington, on Tuesday, 30 September 2008 from 8:30 am to 2:30 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions:

- Additional information updates from Tracy Hillman.
- Minor reorganization of agenda to accommodate project sponsors.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 14 August meeting notes with revisions suggested by Tom Kahler and Tracy Hillman.

III. Payment Authorizations

The Rock Island Tributary Committee authorized the following payment:

- $33.97 to Chelan County PUD for administration and postage costs.

The Rocky Reach Tributary Committee authorized the following payment:

- $33.97 to Chelan County PUD for administration and postage costs.

The Wells Tributary Committee authorized the following payments:

- $2,566.16 to the Methow Conservancy for materials and staff time on the Riparian Regeneration and Restoration Project.
- $355.60 to the Okanogan Conservation District for staff time on the Goodman Livestock Exclusion Project.
- $33.97 to Chelan County PUD for administration and postage costs.

The Committees decided that from this point forward there is no need to vote on each payment request. The Committees will rely on the Coordinator and Chair to provide the Committees with updates on payment requests. The Coordinator, Chair, and the representative from the Yakama Nation will make sure that payment requests are within budget and do not include costs for items that were not included in the contract.

IV. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects.

- The Conservation Easement and the Purchase and Sale Agreement for the Wildhorse Spring Creek Conservation Easement has been drafted. We are waiting for notice of closing date and payment request from the project sponsor.
- The Okanagan River Restoration Initiative Project is progressing well. The sponsor is moving forward with the final engineering, outreach, pre-treatment monitoring and construction planning. A contractor was selected for removing the dyke, which is scheduled to occur in mid-October.
- The Goodman Livestock Exclusion Project is complete and the final report can be found at: http://www.midcolumbiahcp.org/Tributary/Small%20Projects.htm.

V. Information Updates

The following information updates were provided during the meeting.

1. Tracy Hillman reported that instead of a regular meeting in October, the Committees will meet with the Regional Technical Team (RTT) to conduct post-implementation project tours. On Wednesday, 8 October, the Committees and the RTT will visit the Entiat Instream Habitat Improvements project, Entiat River Off-Channel Rearing Habitat project, Alder Creek Culverts, Nason Creek Off-Channel project, Dryden Fish Enhancement CMZ project, and the Lower Wenatchee Complexity CMZ site 13 project. On Thursday, 9 October, they will visit the Beebe Creek Channel Reconfiguration project, Omak Creek Restoration project, Hancock Springs, and Fulton Dam.
2. Because some members will be unavailable in November, the Committees decided that they will not meet in November. The next regular meeting of the Committees will be on Friday, 19 December. At that time, they will make final funding decisions on General Salmon Habitat Fund proposals. The meeting will follow the release of the formal decisions by the Salmon Recovery Funding Board (SRFB). The SRFB will release their final decisions on 11-12 December.

3. Tracy reported that the Integrated Status and Effectiveness Monitoring Program (ISEMP) will hold a workshop on Thursday, 13 November in Wenatchee (time and place to be determined). The purpose of the workshop is to discuss data, hypotheses, and analyses. Members of the Committees are encouraged to attend.
4. Tracy reported that the Upper Columbia will present recommended projects to the State Review Panel on Thursday, 16 October. The Joint Citizen Advisory Committee will recommend the following projects to the SRFB for funding:
    - Twisp River Riparian Protection II—Zinn (includes a T.C. cost share)
    - North Road Culvert
    - Twisp River Conservation Acquisition II (includes a T.C. cost share)
    - Cashmere Pond (includes a T.C. cost share)
    - Twisp River Riparian Protection II—Spier (includes a T.C. cost share)
    - Below the Bridge (includes a T.C. cost share)
    - Twisp River Riparian Protection II—Buckley (includes a T.C. cost share)
    - Lower Icicle Conservation Easement (includes a T.C. cost share)
    - Poorman Creek Barrier Removal (includes a T.C. cost share)
    - Twisp River Riparian Protection II—Coon
5. Tracy reported that he contacted Julie Morgan, executive director of the Upper Columbia Salmon Recovery Board (UCSRB), about meeting with the Tributary Committees to provide updates on happenings within the Board. Julie indicated that she and Derek Van Marter would be willing to provide presentations to the Committees two-three times per year. In addition, at the request of the Committees, Derek and James White would be available to attend Committees meetings to answer any questions that members may have. The Committees agreed to have the UCSRB attend meetings at least twice per year. This will allow the Committees to coordinate better with the UCSRB.
6. Finally, Tracy reported that the UCSRB and WDFW met with the Washington Department of Transportation (WDOT) to discuss opportunities to improve coordination. As reported by Dennis Beich, WDOT is willing to include recovery efforts in the Upper Columbia, but in order to do so, conservation efforts must be identified and coordinated with WDOT before they develop their paving schedule. Tracy reported that WDOT will be sending their proposed future projects to Derek Van Marter so that the UCSRB can coordinate with the agency on recovery efforts.

VI. Small Projects Proposal

In July the Committees reviewed a Small Projects Program application from the Chelan County Natural Resource Department titled *Sleepy Hollow Reserve Protection Feasibility Assessment*. The purpose of the project is to evaluate about 240 acres of land on the north side of the lower Wenatchee River, downstream from the Sleepy Hollow Bridge, for various protection opportunities, including fee-simple acquisition, conservation easements, conservation buyers, landowner agreements, and regulatory measures. The County, in partnership with the Chelan-Douglas Land Trust and the Trust for Public Land, will hire a consultant to develop the work products. The total cost of the project is $25,000. The sponsor requested $20,000 from HCP Tributary Funds.

The Committees reviewed the proposal in July and identified the following issues that they asked the sponsor to address before the Committees could make a funding decision.

- The Committees requested more information on what will be included in the Plan. For example, what is the purpose of the Plan and will it include different protection and restoration scenarios?
- If a Conservation Plan will be prepared, would it include scenarios for protecting uplands and riparian areas, or only riparian areas?
- The Committees asked for a delineation of the proposed conservation area that identifies uplands and areas already protected under County Ordinances.
- Finally, the Committees wanted to know how the County Ordinances will be included in the Conservation Plan.

In an email, Mike Kaputa (Chelan County NRD) responded to the Committees request for additional information. After further consideration and discussion, the Committees were unable to reach a funding decision without further clarification. The Committees directed Tracy to send an email to Mike requesting additional information on the following items.

- Given that residential development must be located 200 feet from the ordinary high water mark of the river and side channel and that a variance from this standard is unlikely, what additional benefit will the proposed conservation plan provide that isn't already covered under existing County ordinances?

- The Committees need a more detailed budget showing exactly how the County proposes to use the funds and how the County intends to identify and evaluate alternatives.

In an email, Mike provided the additional information requested by the Committees. After reviewing all the available information, the Committees noted that this was an appropriate task for the County and that it could serve as a pilot project; however, it was not clear if the landowners potentially affected by the proposed plan agree to the conservation plan concept. Therefore, the Committees directed Tracy to send a letter to the County requesting that they provide signed landowner agreement forms from affected landowners in the proposed project area. This will provide the Committees with some certainty that the landowners are at least open to the idea of a conservation plan.

VII. Conservation Easement Cost Discussion

The Committees had a discussion with the Chelan-Douglas Land Trust, Methow Salmon Recovery Foundation, and the Methow Conservancy on the high cost of conservation easements. The Committees noted that based on the proposals they have received this year, costs of easements have ranged from about $4,000-$20,000 per acre or about $64-$281 per lineal feet of streambank. The Committees explored with the sponsors the option of negotiating prices rather than using appraisals in valuing easements. In short, the sponsors indicated that they have limited ability to negotiate the price of easements. Organizations that pursue conservation easements (e.g., Methow Conservancy) have to follow standards and practices, which are based on appraisals. According to the sponsors, landowners are unlikely to negotiate prices that are based on something other than appraisals. The sponsors assured the Committees that they are doing everything they can to keep the cost down and that they are seeking multiple sources of funding. In some cases, landowners are donating their lands to conservation efforts.

The sponsors also noted that they are engaged in County processes to effect changes in zoning restrictions and ordinances. If regulations are revised and enforced, there should be less need for conservation easements and the "new" regulations should affect appraisals. When asked about the

"Buffer Program," the sponsors indicated that landowners would probably not accept it. The sponsors stressed the point that finding willing landowners is not easy and requires a long process of establishing relationships and trust with the landowners. There is currently little trust between landowners and agencies.

VIII. General Salmon Habitat Program Project Presentations

The Committees listened to presentations on the following projects.

Lower Icicle Conservation Easement

Bob Bugert with the Chelan-Douglas Land Trust gave a presentation on the Lower Icicle Conservation Easement. The purpose of this project is to acquire a conservation easement on 65 acres of floodplain on Lower Icicle Creek. The easement would protect land on the Fromm property that is 80% within the 100-year floodplain and would address the following protection elements: extinguishment of all development rights, prohibition of paved roads, clearing and grading, wetland filling or draining, and mineral extraction. The easement would protect about 5,900 feet of streambank along Icicle Creek. The total estimated cost of the project is $1,306,200. The sponsor is requesting $300,000 from HCP Tributary Funds. A more precise cost estimate will be forthcoming.

Bob noted that this was the first of a three-phased approach. The first phase is to protect the 65-acre pasture, the second is to protect river-bottom lands on the opposite side of the creek, and the third is to protect the uplands. Bob stated that the Fromm's intend to run a small herd of cattle on the property, which, according to Bob, will demonstrate how grazing can be compatible with conservation objectives. A farm plan will be included as part of the conservation easement. Bob indicated that the Fromm's have agreed to the terms of the easement, but have requested some conditions that remain unresolved. The Fromm's would like to continue to use part of the pasture as a helipad for Forest Service fire crews. In addition, the Fromm's would like to make the pasture available for weddings. This may include the addition of a gravel road.

Bob noted that the reach-scale assessment prepared by the Bureau of Reclamation will be used to design restoration work intended to protect the streambanks along the pasture. Restoration work will likely include engineered log jams (ELJs). Finally, Bob noted that at this time the Fromm's do not intend to allow public access.

Poorman Creek Barrier Removal Project

Greg Knott with the Methow Salmon Recovery Foundation gave a presentation on the Poorman Creek Barrier Removal Project. The purpose of this project is to replace an undersized, perched culvert, which does not meet state or federal fish passage criteria for slope and velocity, with a prefabricated bottomless box culvert. The new culvert will restore access to spawning and rearing habitat for steelhead and rearing habitat for spring Chinook. In addition, the new culvert will improve downstream habitat in Poorman Creek by restoring bedload and wood transport through the culvert. The culvert is located about 0.2 miles upstream from the mouth of Poorman Creek. The total cost of the project is $191,579. The sponsor is requesting $53,748 from HCP Tributary Funds.

According to Greg, the replacement of the culvert will provide about 5 miles of spawning and rearing habitat for steelhead in Poorman Creek. There is another culvert about 1-mile upstream from the mouth of the creek that will be replaced by the Forest Service. Greg reported that steelhead do occur downstream from the proposed culvert-replacement site. Greg also noted that the replacement of the culvert will complete barrier-removal projects in the Twisp River basin. When questioned about the large size of substrate placed inside the culvert possibly affecting

transport of woody debris, Greg noted that the drawings of boulders relative to the size of the culvert was misleading in the diagrams. The boulders placed inside the culvert will be small enough to allow passage of debris at all flows.

Twisp River Conservation Acquisition II Project

Chris Johnson with the Methow Salmon Recovery Foundation gave a presentation on the Twisp River Conservation Acquisition Project. The purpose of this project is to purchase and protect about 13.3 acres of land along the lower Twisp River (0.9-1.0 miles upstream from the mouth). The property is across the river from the properties acquired by the MSRF between 2003 and 2006. The MSRF intends to protect and restore the property by purchasing and retiring the development rights that conflict with riparian and floodplain functions. Once acquisition and protection easements have been completed, the home site, septic system, riprap, etc. will be removed. The property will be managed for a mix of uses supporting salmon recovery, passive public recreation, and environmental education. The project will protect more than 1,000 lineal feet of waterfront along the lower Twisp River. The total cost of the project is $481,814. The sponsor is requesting $220,000 from HCP Tributary Funds.

Chris noted that the MSRF will sell about 2 acres of uplands. Money from the sale will be used to restore habitat conditions (e.g., planting native vegetation, reconnecting the river and floodplain, etc.) on the property. Chris stated that the developed parcel will have a conservation easement that is compatible with the conservation objectives of the MSRF.

Twisp River Riparian Protection Project

Julie Grialou with the Methow Conservancy gave a presentation on the Twisp River Riparian Protection Project. The intent of this project is to purchase conservation easements on six properties (Zinn, Buckley, Pampanin, Kominak, Neighbor-Vasquez, and Speir) located along the Twisp River. In sum, the easements would protect about 174 acres, which includes 2.5 miles of riverfront and 99 acres of wetlands. The easements would prohibit home-building, road-building, industrial or commercial use, timber harvest or vegetation alteration, land surface or watercourse alteration, water pollution or activities that cause pollution, and motorized recreational use. In the absence of easements, these properties would likely be sub-divided and developed in the near future. The conservation of these properties along with the other properties already conserved by the Methow Conservancy and WDFW would protect a total of 5.8 river miles along the lower Twisp River Assessment Unit. The total cost of the project is $1,509,101. The sponsor is requesting $472,463 from HCP Tributary Funds.

Julie reported that all easements will exist in perpetuity. When questioned if the landowners are interested in selling their lands, Julie indicated that there is a very high probability of development on these lands and that there is intense pressure in the Methow valley for riverfront properties. For each property, she showed the number of home sites that could be permitted with and without an easement (from Table 2 in the proposal). Julie also noted that the county does not enforce current regulations in the Methow valley and she showed examples of where landowners had cleared riparian vegetation and built homes next to the river.

Below the Bridge Project

Tom Gibbons with the Cascadia Conservation District gave a presentation on the Below the Bridge Project. The intent of this project is to upgrade the existing Keystone Diversion and improve habitat diversity in the lower Entiat River by adding large woody debris (LWD) and boulder clusters. The existing push-up dam will be replaced with a rock-wing dam that will direct water into a sluiceway. Habitat diversity will be increased by placing in the river two LWD structures made up of five logs each and one engineered log jam consisting of 30 logs. The project also will place five boulder clusters in the river. In addition, native trees and shrubs will

be planted in the riparian area. The project is located on both sides of the river between river miles 1.0 and 1.5. The total cost of the project is $398,998. The sponsor is requesting $150,000 from HCP Tributary Funds.

Tom provided the Committees with a handout that addressed the Committees' initial questions. The handout also explained the plan for planting native riparian vegetation. There was an error in the calculation of riparian area in the final proposal. The total area for planting consists of 5.63 acres, not 2.5 acres as identified in the proposal.

Middle Stillwater Design Only Project

Tom Gibbons with the Cascadia Conservation District gave a presentation on the Middle Stillwater Design Only Project. The intent of this project is to use existing information (assessments, technical analyses, studies, literature, reports, etc.) to create two, final engineering designs for multiple, complex wood structures (e.g., ELJs) for the Entiat River between river miles 21 and 23. A design team will follow the Conceptual Design Evaluation Process to determine the type and placement of restoration actions that will restore instream habitat diversity and natural rates of lateral channel migration. The sponsor anticipates using the final designs to apply for and secure grant funds to build the restoration actions. The total cost of the project is $318,140. The sponsor is requesting $253,887 from HCP Tributary Funds.

Tom provided the Committees with three handouts: one provided answers to the Committees' initial questions; the second provided miscellaneous information including Appendix D from the SRFB Manual, project objectives, statement of work for the Preston Reach Assessment, and background information on fluvial processes; and the third was a printout of the PowerPoint presentation. Tom indicated that there are ten landowners in the project area that are on board with the project. When asked about the loss of human life (e.g., a person swimming or rafting that is swept into one of the structures and killed), Tom wasn't sure but thought that the design engineer would be liable.

Cashmere Pond Off-Channel Habitat Protection Project

Bruce Heiner with the Washington Department of Fish and Wildlife gave a presentation on the Cashmere Pond Off-Channel Habitat Protection Project. The objective of this project is to connect the Cashmere pond to the Wenatchee River. This will prevent fish stranding in the pond and increase off-channel habitat in the lower Wenatchee River. The 1.8-acre pond is located at river mile 10.5 and is a relic of past gravel mining for the construction of Highway 2. The pond has no existing outlet channel during low flows and therefore traps fish during high flow. The intent of the project is to excavate from 2 to 10 feet below the existing pond bottom to provide deep-water habitat and excavate a new 1,600 lineal foot outlet channel. The existing 200-foot inlet channel will be stabilized. The outlet channel will initiate flows from the pond and be accessible to salmonids year-round. Woody debris will be added to the pond and outlet channel to provide habitat complexity and fish cover. The project should provide seasonal rearing habitat for Chinook salmon, coho salmon, and steelhead. The total cost of the project is $914,076. The sponsor is requesting $249,110 from HCP Tributary Funds.

Bruce indicated that the Bureau of Reclamation will assist with pump testing to determine groundwater flow and temperatures. He also noted that the inlet channel will be armored and will only provide flow to the pond during high flow conditions. By dropping the elevation of the pond, groundwater will flow from the pond into the excavated outlet channel. The outlet channel will be excavated below the surface of the water table. This should provide flow throughout the year in the outlet channel. Bruce also noted that because the outlet channel will be deepened (below the surface of the water table), irrigation will be needed to water vegetation along the banks of the

channel. Once the vegetation becomes established (i.e., adequate root depth), irrigation should no longer be necessary.

IX. Next Steps

The Tributary Committees will meet with the Regional Technical Team (RTT) on 8 and 9 October to conduct post-implementation project inspections. No regular meetings are planned for October or November. The next regular meeting will be on Friday, 19 December. At that time, the Committees will make final funding decisions on General Salmon Habitat Fund proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Meeting Notes 19 December 2008

Members Present: Dale Bambrick[1] (NOAA-Fisheries), Dennis Beich[1] (WDFW), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), David Morgan (USFWS), Bob Rose[1] (Yakama Nation), Keith Truscott (Chelan PUD), and Tracy Hillman[1] (Committees Chair).

Others Present: Becky Gallaher (HCP Project Coordinator), Lee Carlson[1] (Yakama Nation), Joe Miller (Chelan PUD), and Ben Lenz (Grant PUD). Denny Rohr (PRCC Habitat Subcommittee facilitator) joined the last hour of the meeting.

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Fish and Wildlife Conference Room in Wenatchee, Washington, on Friday, 19 December 2008 from 10:00 am to 12:15 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting, and the Committees adopted the proposed agenda with the following additions/changes:

- Time Extension Request from Cascadia Conservation District.
- Minor reorganization of agenda to accommodate an update on the ORRI project.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 30 September meeting notes with a revision suggested by Tracy Hillman.

The Committees agreed that the meeting minutes and the Regional Technical Team/Tributary Committees notes on the post-implementation project inspections will be posted to the website in January 2009.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. They are progressing well—or had no salient activity in the past month.

[1] Dale, Dennis, Bob, Lee, and Tracy joined the meeting via conference call.

IV. Time Extension Request

The Rock Island Tributary Committee received a request from Cascadia Conservation District to extend the agreement period for the WRIA's 45/46 Riparian Restoration Project from 31 January 2009 to 30 June 2010. The extension would allow the District to move forward with development and coordination of riparian restoration projects and public outreach and education in WRIAs 45 and 46. The Committee discussed the request and concluded that a time extension would be appropriate, but not to 30 June 2010. The Committee agreed to extend the agreement period to 31 August 2009. If the District needs additional time, then they will need to submit another request to the Committee that clearly describes why additional time is needed to complete the project.

The following time extensions were approved by the Rock Island Committee in October (this was not discussed during the meeting but is provided here for the record):

- The Committee approved a time extension on the Roaring Creek Flow Enhancement Project. The deadline was extended from 31 October 2008 to 31 December 2010.
- The Committee approved a time extension on the Wildhorse Spring Creek Conservation Easement. The deadline was extended from 31 October 2008 to 31 January 2009.

V. Review of 2008 General Salmon Habitat Program Proposals

The Committees reviewed seven General Salmon Habitat Program applications. One application, *Entiat River Reach Assessments (ERRAs)*, was withdrawn by the project sponsor.

Before reviewing the proposals, Becky Gallaher reported that currently there is about $2.4 million in the Rock Island Plan Species Account (~$623,000 will be added in January), $1.3 million in the Rocky Reach Plan Species Account (~$295,000 will be added in January), and about $664,000 in the Wells Plan Species Account (additional funds will be added to this account in January 2010).

Lower Icicle Conservation Easement

The Chelan-Douglas Land Trust is the sponsor of the Lower Icicle Conservation Easement. The purpose of this project is to acquire a conservation easement on 65 acres of floodplain on Lower Icicle Creek. The easement would protect land on the Fromm property that is 80% within the 100-year floodplain and would address the following protection elements: extinguishment of all development rights, prohibition of paved roads, clearing and grading, wetland filling or draining, and mineral extraction. The easement would protect about 5,900 feet of streambank along Icicle Creek. The total estimated cost of the project is $1,306,200. The sponsor is requesting $300,000 from HCP Tributary Funds.

The Committees acknowledged the importance of protecting riparian and off-channel habitat; however, they struggled with the cost of this easement. They also had concerns about a lack of public access, the narrow width of the riparian zone to be maintained, and the fact that the landowner will continue grazing the site, albeit at a very low intensity. The Committees would rather use limited resources to protect higher priority areas. Based on these concerns, ***the Tributary Committees elected not to fund this project***.

Twisp River Conservation Acquisition II Project

The Methow Salmon Recovery Foundation is the sponsor of the Twisp River Conservation Acquisition Project. The purpose of this project is to purchase and protect about 13.3 acres of land along the lower Twisp River (0.9-1.0 miles upstream from the mouth). The property is across the river from the properties acquired by the MSRF between 2003 and 2006. The MSRF

intends to protect and restore the property by purchasing and retiring the development rights that conflict with riparian and floodplain functions. Once acquisition and protection easements have been completed, the home site, septic system, riprap, etc. will be removed. The property will be managed for a mix of uses supporting salmon recovery, passive public recreation, and environmental education. The project will protect more than 1,000 lineal feet of waterfront along the lower Twisp River. The total cost of the project is $481,814. The sponsor is requesting $220,000 from HCP Tributary Funds. ***The Rock Island Committee approved funding for this project.***

Poorman Creek Barrier Removal Project

The Methow Salmon Recovery Foundation is the sponsor of the Poorman Creek Barrier Removal Project. The purpose of this project is to replace an undersized, perched culvert, which does not meet state or federal fish passage criteria for slope and velocity, with a prefabricated bottomless box culvert. The new culvert will restore access to spawning and rearing habitat for steelhead and rearing habitat for spring Chinook. In addition, the new culvert will improve downstream habitat in Poorman Creek by restoring bedload and wood transport through the culvert. The culvert is located about 0.2 miles upstream from the mouth of Poorman Creek. The total cost of the project is $191,579. The sponsor is requesting $53,748 from HCP Tributary Funds. ***The Wells Committee approved funding for this project.***

Twisp River Riparian Protection Project

The Methow Conservancy is the sponsor of the Twisp River Riparian Protection Project. The intent of this project is to purchase conservation easements on five properties (Zinn, Buckley, Pampanin, Neighbor-Vasquez, and Speir)[2] located along the Twisp River. In sum, the easements would protect about 174 acres, which includes 2.5 miles of riverfront and 99 acres of wetlands. The easements would prohibit home-building, road-building, industrial or commercial use, timber harvest or vegetation alteration, land surface or watercourse alteration, water pollution or activities that cause pollution, and motorized recreational use. In the absence of easements, these properties would likely be sub-divided and developed in the near future. The conservation of these properties along with the other properties already conserved by the Methow Conservancy and WDFW would protect a total of 5.8 river miles along the lower Twisp River Assessment Unit. The total cost of the project is $1,109,102. The sponsor is requesting $322,463 from HCP Tributary Funds. The Tributary Committees approved funding for these properties as follows:

- ***The Rock Island Committee approved funding for the Zinn Property ($104,996)***
- ***The Rocky Reach Committee approved funding for the Buckley Property ($89,825)***
- ***The Wells Committee approved funding for the Pampanin Property ($48,649)***
- ***The Wells Committee approved funding for the Neighbor-Vasques Property ($55,000)***[3]
- ***The Wells Committee approved funding for the Speir Property ($23,993)***

Cashmere Pond Off-Channel Habitat Protection Project

Chelan County Natural Resource Department is the sponsor of the Cashmere Pond Off-Channel Habitat Protection Project. The objective of this project is to connect the Cashmere pond to the Wenatchee River. This will prevent fish stranding in the pond and increase off-channel habitat in

[2] The Methow Conservancy dropped the Kominak Property because WDFW is pursuing an easement on the property.
[3] The Methow Conservancy revised the estimate on 24 November based on a recently completed appraisal. The estimate was reduced from $75,000 to $55,000.

the lower Wenatchee River. The 1.8-acre pond is located at river mile 10.5 and is a relic of past gravel mining for the construction of Highway 2. The pond has no existing outlet channel during low flows and therefore traps fish during high flow. The intent of the project is to excavate from 2 to 10 feet below the existing pond bottom to provide deep-water habitat and excavate a new 1,600 lineal foot outlet channel. The existing 200-foot inlet channel will be stabilized. The outlet channel will initiate flows from the pond and be accessible to salmonids year-round. Woody debris will be added to the pond and outlet channel to provide habitat complexity and fish cover. The project should provide seasonal rearing habitat for Chinook salmon, coho salmon, and steelhead. The total cost of the project is $914,076. The sponsor is requesting $249,110 from HCP Tributary Funds. ***The Rock Island Committee approved funding for this project***.

The Committee elected to fund this project because they see value in restoring connectivity between the river and its floodplain. However, the Committee identified several issues that concerned them about this project. First, the Committee believes the project is over-priced. In the future, rather than relying solely on consultants, the Committee recommends that sponsors use the expertise of the Habitat Engineer that will soon be hired by WDFW. This should greatly reduce engineering-design costs and other overhead costs associated with project implementation oversight. Second, the Committee believes the project is over-engineered. As they noted in their earlier comments to the sponsor, the Committee believes that a less heavy-handed approach would be effective and much less expensive. Finally, the Committee would like to see a maintenance plan and efforts to monitor the occurrence of fish stranding.

Middle Stillwater Design Only Project

The Cascadia Conservation District is the sponsor of the Middle Stillwater Design Only Project. The intent of this project is to use existing information (assessments, technical analyses, studies, literature, reports, etc.) to create two, final engineering designs for multiple, complex wood structures (e.g., ELJs) for the Entiat River between river miles 21 and 23. A design team will follow the Conceptual Design Evaluation Process to determine the type and placement of restoration actions that will restore instream habitat diversity and natural rates of lateral channel migration. The sponsor anticipates using the final designs to apply for and secure grant funds to build the restoration actions. The total cost of the project is $318,140. The sponsor is requesting $253,887 from HCP Tributary Funds. ***The Tributary Committees elected not to fund this project.***

The Committees believe that this project should not move forward until all the assessments have been completed and all the information from those assessments (including LIDAR) have been incorporated into an agreed upon restoration strategy. The Committees may entertain a design-only project after they see the results of the assessments and how the information is used to identify restoration strategies that restore channel form and function.

Below the Bridge Project

The Cascadia Conservation District is the sponsor of the Below the Bridge Project. The intent of this project is to upgrade the existing Keystone Diversion and improve habitat diversity in the lower Entiat River by adding large woody debris (LWD) and boulder clusters. The existing push-up dam will be replaced with a rock-wing dam that will direct water into a sluiceway. Habitat diversity will be increased by placing in the river two LWD structures made up of five logs each and one engineered log jam consisting of 30 logs. The project also will place five boulder clusters in the river. In addition, native trees and shrubs will be planted in the riparian area. The project is located on both sides of the river between river miles 1.0 and 1.5. The total cost of the project is $398,998. The sponsor is requesting $150,000 from HCP Tributary Funds. ***The Rocky Reach Committee approved funding for this project***.

The Committee asked Tracy to reiterate to the sponsor that Plan Species Account funds should only be used to aid in the construction of the rock-wing dam (which will replace the existing push-up dam), the construction of the engineered log jam, and the restoration of the riparian community. The Committee does not want their funds used to construct more boulder clusters or small woody debris structures.

Summary of review of 2008 General Salmon Habitat Program Projects.

Project Name	Sponsor	Total Cost	Request from T.C.	Plan Species Account
Lower Icicle Conservation Easement	Chelan-Douglas Land Trust	1,306,200	300,000	None
Twisp River Conservation Acquisition II	Methow Salmon Recovery Foundation	481,814	220,000	Rock Island
Poorman Creek Barrier Removal	Methow Salmon Recovery Foundation	191,579	53,748	Wells
Twisp River Riparian Protection	Methow Conservancy			
Zinn Property		349,988	104,996	Rock Island
Buckley Property		299,418	89,825	Rocky Reach
Pampanin Property		119,720	48,649	Wells
Neighbor-Vasques Property		260,000	55,000*	Wells
Speir Property		79,976	23,993	Wells
Cashmere Pond Off-Channel Habitat Project	Chelan County Natural Resource Dept	914,076	249,110	Rock Island
Middle Stillwater Design Only	Cascadia Conservation District	318,140	253,887	None
Below the Bridge (Keystone Diversion/Moody Canyon)	Cascadia Conservation District	398,998	150,000	Rocky Reach

***** The Methow Conservancy revised the estimate on 11/24 based on a recently completed appraisal. The estimate was reduced from $75,000 to $55,000. The sponsor also dropped the Kominak Property because WDFW is pursuing an easement on the property.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in October (this was not discussed during the meeting but is provided here for the record):

   Rock Island Plan Species Account:

   - $995.51 to Chelan County PUD for third quarter administration.
   - $205.00 to LeMaster and Daniels for third quarter financial management.

   Rocky Reach Plan Species Account:

   - $995.51 to Chelan County PUD for third quarter administration.
   - $205.00 to LeMaster and Daniels for third quarter financial management.
   - $56,590.29 to Chelan County Treasurer for time and materials on the Harrison Side Channel Project.

Wells Plan Species Account:

- $1,131.71to the Chelan County PUD for third quarter administration.

2. Approved Payment Requests in November (this was not discussed during the meeting but is provided here for the record):

   Rock Island Plan Species Account:

   - $405.25 to the Colville Confederated Tribes for salaries and benefits on the Wildhorse Spring Creek Conservation Easement.

   Wells Plan Species Account:

   - $2,336.00 to Douglas County PUD for administration for fiscal year ending 31 August 2008.
   - $865.46 to the Methow Conservancy for monitoring and installation of tree cages on three properties for the Riparian Regeneration and Restoration Initiative Project.

3. Approved Payment Requests in December:

   Rock Island Plan Species Account:

   - $9,625.85 to Cascadia Conservation District for development and distribution of outreach materials and ongoing project coordination on the WRIA 45/46 Riparian Restoration Project.

   Rocky Reach Plan Species Account:

   - $35.45 to Cascadia Conservation District for development of permits and responses to agencies on the Entiat Instream Structure Engineering and Permitting Project.

   Wells Plan Species Account:

   - $115,872.41 to the Okanagan Nation Alliance for construction on the Okanagan River Restoration Initiative.
   - $3,190.17 to Stokes and Stokes for connecting the pump to the pipeline on the Lower Beaver Creek Livestock Exclusion Project.
   - $127.61 to the Okanogan Conservation District for salaries and project coordination on the Lower Beaver Creek Livestock Exclusion Project.

4. Tracy Hillman reported that the HCP Policy Committees meeting that was scheduled for January 2009 has been postponed. No new date has been set. Tracy will provide the Tributary Committees with an update as soon as information is available.

5. Tracy Hillman reported that the Tributary Committees have not received any additional information from Chelan County Natural Resource Department on the *Sleepy Hollow Reserve Protection Feasibility Assessment Project.* Recall that in September the Committees requested that the County provide signed landowner agreement forms from affected landowners in the proposed project area.

6. Tom Kahler reported that Shayla Lawrence of the Okanagan Nation Alliance contacted him and was wondering by what date the Committees wanted to review the 2009 work plan for the ORRI monitoring project. The Committees agreed that they would need to receive the 2009 work plan by 1 May 2009. This will give the Committees time to review

the work plan and provide feedback to the sponsor by the end of May. Tracy or Becky will relay this information to Shayla.

7. Chris Fisher reported that he and Ben Lenz toured the Okanagan River Restoration Initiative (ORRI) Project on Thursday, 11 December. As a bit of background, the ORRI project proposed the reconnection of two historic channel meanders (Phase I) and the creation of two channel meanders (Phase II). Chris reported that during implementation, a dyke that channelized the Okanogan River was moved away from the channel to substantially increase floodplain area. The relocation of the dyke was completed in November 2008. Test pits were then dug within the area proposed for creation of two meanders. The test pits revealed that under an organic layer there was partially saturated, unconsolidated, coarse sand, which would likely not maintain lateral and vertical channel stability. This concerned the project manager, on-site engineer, and scientific advisor. A meeting in early January has been scheduled with project proponents and regulatory agencies to discuss modifications to the original plan.

   The proposed alternative to be discussed at the meeting is to omit the creation of the upper-most meanders and to investigate the reconnection of a relic side channel immediately upstream and on the east side of the channelized reach. Early assessments indicate that the dyke would need to be breached in two places (inlet and outlet) to accommodate the relic channel. Bottomless arch culverts or bridges would be used to maintain connectivity of the relic channel. In addition, the planners are considering maintaining the original channelized reach, but designing the channelized reach to be active only during high flow conditions. Recall that the reconnection of the two lower-most meanders initially included a single channel and disconnecting the channelized reach. Chris reported that the final design for Phase I is expected in March 2009. Phase II preliminary design should be completed in late 2009.

   As a final note, Chris reported that the Watershed Management of the Ministry required that the bike/hiker path (the Kettle Valley Railroad grade) be widened from 4.5 m to 8 m so that the Ministry could drive a vehicle on the path to conduct routine maintenance without disrupting recreational users. This requirement roughly costs an additional $272,000, which was absorbed in the 20% contingency.

8. Tracy Hillman reported that Ali Wick would like to have a rough schedule of Tributary Committees meetings in 2009. Tracy proposed that the Committees continue to meet the day after the Regional Technical Team meeting, which usually falls on the second Wednesday of each month. Therefore, the Tributary Committees would meet on the following dates:

Jan 14	Jul 9
Feb 12	Aug 13
Mar 12	Sep 10
Apr 9	Oct 15
May 14	Nov 5
Jun 11	Dec 10

   The Committees will review and discuss these dates during the January meeting.

VII. Next Steps

The Tributary Committees will meet on Wednesday, 14 January at Chelan PUD in Wenatchee. Tentative agenda items include:

- Presentation from Julie Morgan and Derek Van Marter (UCSRB) on activities planned by the Board in 2009.
- Review of SRFB/GSHP application forms.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

APPENDIX D

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	USFWS
Bill Tweit	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 (Bill Gale as of 12/17/08)	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 E

2008 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

1161 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: February 26, 2008

SUBJECT: 2008 Juvenile Bypass Operating Plan

The 2008 spring outmigration at Wells Dam will consist of naturally produced stream-type fish spawned during brood years 2006 and 2007. Counts at Wells Dam included 4,376 adult and jack spring Chinook, 22,075 adult sockeye and 7,203 adult steelhead in 2005 and 6,674 adult steelhead in 2006.

Scheduled hatchery releases, above Wells Dam, include yearling spring Chinook from the Chewuch (190,000), Twisp (49,000) and Methow Acclimation Ponds (210,000) and the Winthrop National Fish Hatchery (515,000). Also the Colville Tribes in cooperation with the Entiat Hatchery will release spring Chinook from St Mary's Pond on Omak Creek (40,000 adipose + CWT) and from Tonasket Pond on the Okanogan River (210,000 adipose clip only). Coho will be released from the Winthrop National Fish Hatchery (350,000). Summer Chinook yearlings will be released from the Carlton (415,000) and Similkameen (594,000). Hatchery summer steelhead will be released throughout the Methow and Okanogan rivers. Hatchery steelhead released above Wells Dam are from Wells Hatchery (480,000) and Winthrop NFH (118,000). 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 2007. Natural escapement of summer / fall Chinook in 2007 was 19,487 counted at Wells Dam.

Operation of the bypass system throughout the 2008 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.

Bypass operations are 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 2008 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 F

BROODSTOCK COLLECTION PROTOCOLS

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

February 27, 2009

To: Mid-Columbia HCP Hatchery Committee

From: Kirk Truscott

Subject: **DRAFT 2009 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 2008 Biological Opinion 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 (YN) Coho Reintroduction Program broodstock collection protocol, when provided by the YN, will be included in this protocol because of the overlap in trapping dates and locations.

This protocol is intended to be a guide for 2009 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 (HCPs, Priest Rapids Dam 2008 Biological Opinion and to comply with ESA permit provisions.

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 to reduce the number of Leavenworth NFH strays into 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 natural origin spring Chinook at Wells Dam and at the Twisp River weir; (4) utilization of genetic sampling/assessment to differentiate Twisp River and non Twisp River natural origin adults collected at Wells Dam and CWT interrogation during spawning of hatchery spring Chinook collected at the Twisp Weir, Methow FH and Winthrop NFH to differentiate Twisp and Methow Composite hatchery fish for discrete management of Twisp and Methow Composite production components; (5) the collection of hatchery origin spring Chinook for the Methow River Basin program in excess of production requirements for BKD management, (6) the use of ultra-sound technology to determine sex of Wenatchee summer Chinook during collection to aid in achieving the appropriate female equivalents for programmed production, and (7) the potential collection of Wells summer Chinook

to support the Yakama Nation (YN). These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and other sampling locations.

Comment [RK1]: An agreement between Art Viola (WDFW) and the District was reached that these brood would not be collected and held at the Wells Hatchery in 2009.

Deleted: and the Washington Department of Fish and Wildlife (WDFW) Lake Chelan triploid program (requires agreement of the HCP Hatchery Committee)

Deleted: .

Above Wells Dam

Spring Chinook

Natural origin fish inclusion into the broodstock will be a priority, with natural origin fish specifically being targeted. Natural origin fish collections will not exceed 33 percent of the MetComp and Twisp natural origin run escapement at Wells Dam.

To facilitate BKD management, to comply with ESA Section 10 permit take provisions and to meet programmed production, hatchery origin spring Chinook will be collected in numbers excess to program production requirements. Based on historical Methow FH spring Chinook ELISA levels above 0.12, the hatchery origin spring Chinook broodstock collection will include hatchery origin spring Chinook in excess to broodstock requirements by approximately 18 percent. The parties to the HCP have acknowledged that targeting broodstock collection objectives at levels that provide for culling of eggs from higher ELISA level hatchery origin females and prioritizing natural origin fish for rearing to yearling smolt stage is a viable approach to balance the promotion of fish health while limiting indirect reductions in genetic diversity and reduced program production, particularly for ESA listed supplementation programs. For purposes of BKD management and to comply with maximum production levels and other take provisions specified in ESA Section 10 permit 1196, culling will include the destruction of eggs from hatchery origin females with ELISA levels greater than 0.12 and or that number of hatchery origin eggs required to maintain production at 550,000 yearling smolts. Culling of eggs from natural origin females will not occur, unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program. Juveniles from natural origin females with ELISA levels greater than 0.12 will be differentially tagged for evaluation purposes. To monitor the efficacy of culling in reducing the prevalence of BKD in Methow Basin spring Chinook, annual monitoring and evaluation of the prevalence and level of BKD in returning hatchery and natural origin spring Chinook will continue and will be reported in the annual monitoring and evaluation report for this program.

Comment [RK2]: This is good as last year this percentage was 26%.

The 2009 Methow spring Chinook broodstock collection will occur at Wells Dam, Twisp River Weir, Methow FH and Winthrop NFH. Limited on-station release of smolts from the Methow FH, absence of a trapping facility on the Chewuch River and poor trapping success at Foghorn Dam on the mainstem Methow River preclude reasonable certainty of meeting adult collection requirements via tributary and Methow FH outfall collections. The aforementioned limitations are the principle reasons for the inclusion of broodstock collection at Wells Dam and Winthrop NFH during 2009.

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 projected Proportion Natural Origin (pNOB) broodstock composition for Twisp and Methow Composite programs (31% and 30%, respectively) and composite brood year assignment errors for wild Twisp and MetComp spring Chinook provided in Snow et al. (2007), the projected non-source fish

contributions to the Twisp and MetComp hatchery programs for 2009 are 1.6% and 1.5%, respectively. 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 2009. Although gene flow between the two hatchery production components is likely, it is expected to be relatively low in 2009 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 Snow et al. (2007).

Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural origin spring Chinook) collected at Wells Dam for origin analysis. Natural origin fish retained for broodstock will be tagged with a PIT tag (dorsal sinus) 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 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 adults returning and the collection objective limiting extraction to no greater than 33% of the natural origin spring Chinook return past Wells Dam. Based on the broodstock collection schedule (3-day/week, 16 hours/day), natural origin spring Chinook extraction is expected to be approximately 33% or less.

Weekly estimates of natural-origin spring Chinook passage past Wells Dam will be provided through stock assessment and broodstock collection activities and will provide the opportunity to adjust, in-season, the extraction of natural origin spring Chinook to maintain no greater that 33% extraction of Twisp and Methow Composite natural origin components while maximizing the opportunity for the inclusion of natural origin spring Chinook in the broodstock. Additionally, in-season estimates of Twisp and Methow Composite natural origin escapement past Wells Dam provides the opportunity to utilize both Wells Dam and the Twisp Weir as natural origin collection sites for the Twisp production component, thereby providing additional flexibility to account for differences between projected and actual returns of Twisp and Methow Composite natural origin fish. Twisp and Methow Composite hatchery origin spring Chinook will be captured at the Twisp Weir, Methow FH outfall. Trapping at the Winthrop NFH will be included if needed to address broodstock shortfalls.

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).

Pre-season run-escapement of Methow origin spring Chinook past Wells Dam during 2009 are estimated at 2,237 spring Chinook, including 1,943 hatchery and 294 natural origin Chinook (Table 1 and Table 2). In-season estimates of natural origin spring Chinook will be adjusted proportional to the estimated returns to Wells Dam at weekly intervals and may result in adjustments to the broodstock collection targets presented in this document.

Based on current juvenile rearing capacity at Methow FH, programmed production levels (550,000 smolts), BKD management strategies, projected return for BY 2009 Methow Basin spring Chinook at Wells Dam (Table 1 and Table 2), and assumptions listed in Table 3, the following broodstock collection protocol was developed.

The 2009 Methow spring Chinook broodstock collection will target 359 adult spring Chinook. Based on the pre-season run forecast, Twisp fish are expected to represent 3% of the adipose present, CWT tagged hatchery adults and 12% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution, and a collection objective to limit extraction to no greater than 33%, the 2009 Twisp origin broodstock collection will be predominantly hatchery origin and total 33 fish (11 wild and 22 Hatchery), representing 30% of the broodstock necessary to meet Twisp program production of 183,000 smolts. Methow Composite fish are expected to represent 97% of the adipose present CWT tagged hatchery adults and 88% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33%, the 2009 Methow Composite (combined Methow and Chewuch river spawning aggregates) broodstock collection will be predominantly hatchery origin and total 326 spring Chinook (86 wild and 240 Hatchery). The broodstock collected for the Methow Composite production represents 100% of the broodstock necessary to meet Methow Composite program production of 367,000 smolts (combined Methow and Chewuch production), and sufficient to backfill the expected shortfall of 129,000 Twisp River spring Chinook. The Twisp River releases will be limited to releasing progeny of broodstock identified as wild Twisp and or known Twisp hatchery origin fish, per ESA Permit 1196. 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. Brood Year 2004-2006 age-class return projection for wild spring Chinook Dam above Wells during 2009.

	Smolt Estimate		Age-at-Return								
	[1/] Twisp	[2/] Methow Basin	Twisp				Methow Basin				[3/]
BY			**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**SAR**
2004	5,873	22,941	2	21	**10**	33	6	83	**38**	128	0.005581
2005	5,372	55,381	1	**19**	9	30	15	**201**	93	309	0.005581
2006	18,580	198,400	**5**	67	31	104	**55**	720	332	1107	0.005581
2009 Return Year			**5**	**19**	**10**	**34**	**55**	**201**	**38**	**294**	

[1/]- Smolt estimate based on sub-yearling and yearling emigration (Snow et al. 2008)

[2/]- Estimated Methow Basin smolt emigration, based on Twisp Basin smolt emigration, proportional redd deposition in the Twisp River and Twisp Basin smolt production estimate.

[3/]- Mean 1998-2003 Chiwawa River wild SAR as a surrogate wild SAR for Methow spring Chinook

BY 2004-2006 age-class and origin run-escapement projection for UCR spring Chinook at Wells Dam, 2009

	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	164	947	42	1,153	50	182	28	260	214	1,129	70	1,413
% Total				59%				88%				63%
Twisp	14	47	6	67	5	19	10	34	19	66	16	101
% Total				3%				12%				5%
Winthrop (MetComp)				723								723
				37%								
Total				1,943	55	201	38	294				2,237
				87%				13%				100%

Table 3. Assumptions and calculations to determine number of broodstock needed for BY 2009 production of 550,00 smolts

Smolt release		**550,000**	**Smolts**
Fertilization-to-release survival	90%		
Egg-take (Production)		611,000	Eggs
18% cull allowance [2/]		73,000	
Total Egg Take		**684,000**	**Eggs**
Fecundity	4,000 [1/]	171	Females spawned
Female to male ratio	1 to 1	341	Total spawned
Pre-spawn survival	**95%**	**359**	**Broodstock collection target**

[1/]- Based on historical program age-4 fecundities and expected 2009 return age structure (Table 1).

[2/]- Hatchery origin MetComp. component only, and is based on projected natural origin collection and assumption that all Twisp (hatchery and wild) and wild MetComp. will be retained for production.

Deleted: ¶
¶
¶
¶
¶

Trapping at Wells Dam will occur at the East and West ladder traps beginning on 04 May and continue through 24 June 2009. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Trapping schedule will consists of 3-day/week (Monday-Wednesday), up to 16-hours/day. Two of the three trapping days will be concurrent with the stock assessment sampling activities authorized through the 2009 Douglas PUD Hatchery M&E Implementation Plan. Natural origin spring Chinook will be retained from the run, consistent with spring Chinook run timing at Wells Dam (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. All natural origin spring Chinook collected at Wells Dam for broodstock will be held at the Methow FH.

To meet Methow FH broodstock collection for hatchery origin Methow Composite and Twisp River stocks, adipose-present coded-wire tagged hatchery fish will be collected at Methow FH, Winthrop NFH and the Twisp Weir beginning 01May and continuing through 21 August 2009. Natural origin spring Chinook will be retained at the Twisp weir as necessary to bolster the Twisp program production so long as the aggregate collection at Wells Dam and Twisp River weir does not exceed 33% of the estimated Twisp River natural origin return past Wells Dam. All hatchery and natural origin fish collected at Methow FH, Twisp Weir and Winthrop NFH for broodstock will be held at the Methow FH.

Steelhead

Steelhead mitigation programs above Wells Dam utilize adult broodstock collections at Wells Dam and incubation/rearing at Wells Fish Hatchery (FH). The Wells Steelhead Program also provides eggs for UCR steelhead reared at Ringold FH, not as a mitigation requirement, but rather an opportunity to reduce the prevalence of early spawn hatchery steelhead in the mitigation component above Wells Dam. Typically, Wells hatchery origin steelhead held at Wells FH spawn earlier than natural origin steelhead. Early maturation of hatchery fish in the hatchery may indicate a propensity for these fish to spawn early in the natural environment as well and may have a negative effect on hatchery spawner success. In efforts to minimize impacts from early maturation, the Wells Hatchery program has transferred eggs from the earliest spawn hatchery steelhead to Ringold FH. Preliminary evaluations indicate that the mean spawn timing of HxH steelhead at Wells FH has been delayed and may be a function of these actions (Figure 1). Based on these preliminary evaluations, WDFW proposes to continue the transfer eggs from early spawn hatchery origin steelhead to Ringold FH.

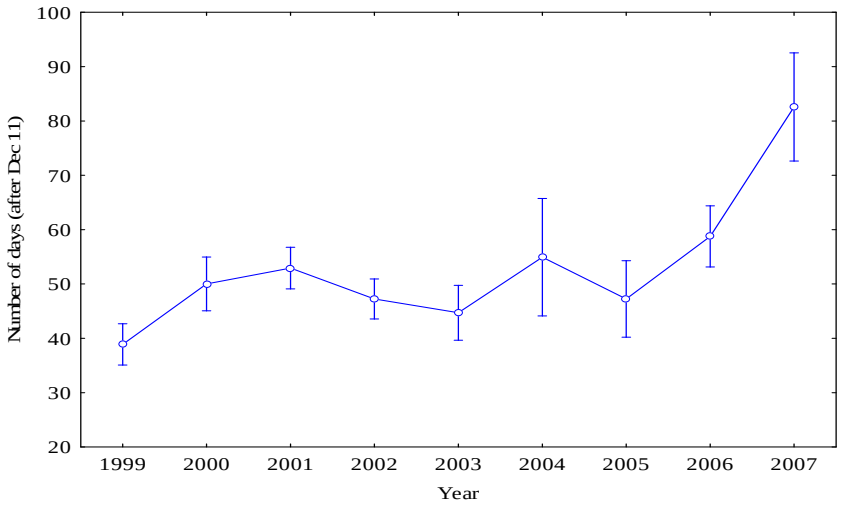


Figure 1. Mean spawn timing of HxH steelhead at Wells FH, BY 1999-2007 (WDFW unpublished Data).

Based on mitigation program production objectives (Table 4) and program assumptions (Table 5), the following broodstock collection protocol was developed.

Trapping at Wells Dam will selectively retain 366 steelhead (east and west ladder collection). Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Hatchery and natural origin collections will be consistent with run-timing of hatchery and natural origin steelhead at Wells Dam. 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 4. 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	401,149	33%	59	119	178	
GCPUD [1/]	80,000	91,954	33%	14	27	41	
USFWS [1/]	80,000	91,954	33%	14	27	41	[3/]
Sub-Total	**509,000**	**585,057**	**33%**	**87**	**174**	**260**	
Ringold	180,000	240,000	0%	0	106	106	[3/]
Sub-Total	**180,000**	**240,000**	**0%**	**0**	**106**	**106**	
Grand Total [2/]	**689,000**	**825,057**	**24%**	**87**	**289**	**366**	

[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 5. 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 2009 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2005, 2006 and 2007 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 6); the following broodstock collection protocol was developed.

WDFW will retain 556 natural-origin summer/fall Chinook at Wells Dam east and west ladder, including 278 females. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. 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 6. 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. Upon agreement in the HCP, the 2009, summer Chinook broodstock collections at Wells FH may also include 250,000 green eggs to support the Yakama Nation (YN) reintroduction of summer Chinook to the Yakima River Basin. If approved by the HCP the YN eggs will be the last eggs taken and will be the responsibility of staff associated with the YN.

Deleted: and 100,000 green eggs for the WDFW Lake Chelan Triploid program.

Deleted: and Lake Chelan program

Deleted: s

Deleted: and Lake Chelan programs.

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 7), the following broodstock collection protocol was developed.

WDFW will collect 1,525 run-at-large summer Chinook including 1,373 hatchery fish from the volunteer ladder trap at Wells Fish Hatchery outfall and 152 natural-origin fish from the Wells Hatchery outfall, and/or Wells Dam east and west ladders. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. 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 (warming Columbia River water during late August), the volunteer collection will begin 10 July and terminate by 31 August. The 3-year old component will be limited to 10 percent of the broodstock collection.

Table 7. 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		[2/] YN	
Program Assumption	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**green-egg**	**Total**
Smolt release			484,000	320,000	1,078,000	200,000	250,000	NA
Fertilization-to-release survival	73% [3/]	78%					NA	NA
Eggtake Target			663,014	410,256	1,476,712	256,410	250,000	3,156,393
Fecundity	4,600	4,600						
Female target			144	89	321	56	54	686
Female to male ratio	1 to 1	1 to 1						
Broodstock target			288	178	642	111	109	1,372
Pre-spawn survival	90%	90%						
Total collection target			**320**	**198**	**713**	**124**	**121**	**1,525**

[2/] - Green eggs for YN reintroduction program in the Yakima River Basin.
[3/] - Based on increased monitoring of the green egg-to-marking loss for BY 07 and 08 that indicates a un-fertilized- to- marking loss of 27%.

Deleted: Lake [1/]
Deleted: Chelan
Deleted: eye-egg
Deleted: NA
Deleted: NA
Deleted: 100,000
Deleted: 22
Deleted: 43
Deleted: 48
Deleted: [1/]- Lake Chelan eggs will be incorporated into the last egg take and incubated at Wells Hatchery until eyed stage and then
Deleted: 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. Access to the east ladder trap will be coordinating with staff at Wells Dam due to the rotor rewind project.

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 spring Chinook (Table 8).

Table 8. 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%	
Total broodstock collection		**379**

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 2009 broodstock collection, will again, as in 2008, target hatchery origin Chiwawa spring Chinook at Tumwater Dam. Also in 2009, an interim measure will include extraction of adipose clipped non-coded wire tag adult spring Chinook, as a strategy to reduce straying of Leavenworth NFH spring Chinook to the upper Basin habitat.

Pre-season estimates project 5,114 spring Chinook destine for the Chiwawa River, of which 703 (13.7%) and 4,411 fish (86.3%) are expected to be natural and hatchery origin spring Chinook,

respectively (Table 9 and 10). Based on the projected 2009 Chiwawa River run-size and origin composition, and provisions in ESA Section 10 Permit 1196, WDFW will retain 379 spring Chinook for broodstock purposes, representing 100% of the program broodstock objective. Two hundred and thirty-two (232) natural origin spring Chinook will be retained at the Chiwawa Weir and 147 adipose-clipped, CWT hatchery origin spring Chinook will be collected at Tumwater Dam. 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 broodstock collection, consistent ESA Section 10 Permit 1196.

Table 9. BY 2004-2006 age-class return projection for wild spring Chinook above Tumwater Dam during 2009

	Smolt Estimate		Chiwawa				Wen. Basin above Tumwater Dam				
Brood Year	**1/ Chiwawa**	**2/ Wen. Basin**	**3/ Age-3**	**3/ Age-4**	**3/ Age-5**	**Total**	**3/ Age-3**	**3/ Age-4**	**3/ Age-5**	**Total**	**4/ SAR**
2004	101,172	197,944	28	367	**169**	565	55	718	**331**	1,105	0.005581
2005	140,737	338,079	39	**510**	236	785	94	**1,226**	566	1,887	0.005581
2006	86,579	153,918	**24**	314	145	483	**43**	558	258	859	0.005581
Total 2008 Return			**24**	**510**	**169**	**703**	**43**	**1,226**	**331**	**1,600**	

1/- Smolt production estimate.

2/- smolt production estimate based on proportional redd disposition in the Wenatchee Basin above Tumwater Dam and Chiwawa smolt production estimate.

3/- Based on average age-at-return for natural-origin spring Chinook above Tumwater Dam (WDFW unpublished data).

4/- Mean Chiwawa spring Chinook SAR to the Wenatchee Basin (BY 1998-2003)(WDFW unpublished data).

Table 10. BY 2004-2006 age-class return projection for Chiwawa Hatchery spring Chinook above Tumwater Dam during 2009

	Smolt Estimate	Adult Return				
Brood Year	**1/ Chiwawa**	**2/ Age-3**	**2/ Age-4**	**2/ Age-5**	**Total**	**3/ SAR**
2004	494,517	883	2,564	**757**	4,203	0.0085
2005	494,012	882	**2,561**	756	4,199	0.0085
2006	612,482	**1,093**	3,176	937	5,206	0.0085
Total 2008 Return		**1,093**	**2,561**	**757**	**4,411**	

1/- Chiwawa smolt release (Hillman et al. 2007)

2/- Based on average age-at-return for natural-origin spring Chinook above Tumwater Dam (Hilllman et al. 2007) . and total estimated BY return.

3/- Mean Chiwawa hatchery spring Chinook SAR to the Wenatchee Basin (BY 1996-2001)

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 be 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. 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 in 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.

Throughout broodstock collection at Tumwater Dam, adipose absent, non-CWT spring Chinook will be extracted and provided to USFWS as a measure to reduce the prevalence of non-endemic spring Chinook above Tumwater Dam. All adults that are found at Tumwater Dam with a missing adipose fin and lacking a coded wire tag will be putatively classified as LNFH strays. However, it is likely that some proportion of the adipose clipped non-CWT fish are ESA-listed hatchery adults that have shed their tags. Based on the BY 2004, 2005, and 2006 tag rate for Chiwawa spring Chinook and the projected 2009 Chiwawa hatchery return to Tumwater Dam, the extraction of adipose clipped non-CWT spring Chinook may include 61 Chiwawa spring Chinook, representing just 1.4% of the projected 4,411 returning Chiwawa hatchery origin spring Chinook. Based on the USFWS estimates of projected LNFH strays arriving at Tumwater Dam in 2009 (USFWS 2009), the extraction action is expected to remove an estimated 89 LNFH stays, representing 54% of the total stray estimate. Logistics for extraction will be coordinated between USFWS, WDFW and CPUD.

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

The steelhead mitigation program in the Wenatchee Basin use broodstock collections at Dryden and Tumwater dams located on the Wenatchee River. Per ESA section 10 Permit 1395 provisions, 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 11), the following broodstock collection protocol was developed.

WDFW will retain 208 mixed origin steelhead at Dryden and Tumwater dams, including 104 natural origin and 104 hatchery origin steelhead. 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. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and

at Dryden Dam. Broodstock collection adjustments may be made based on these in-season monitoring and evaluation.

In the event that steelhead collections fall substantially behind schedule, WDFW may initiate/coordinated adult steelhead collection in 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 11. 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 2009 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2005, 2006 and 2007 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 12), 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 14 September and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam may begin 15 July and terminate no later than 14 September and operate 3-days/week, 8-hours/day.

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 summer Chinook..

Table 9. 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 2009 BY is 200,000 pre-smolts. 1/

The TAC 2009 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 13), 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.

1/- Chelan HCP Hatchery Committee has agreed to future production level of 280,000 fish, pending appropriate infrastructure improvements.

Table 13. 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 will be consistent with provisions of ESA Permit 1592.

Broodstock collection efforts for brood year 2009 will be addressed in a document separate from this 2009 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 14.

Agreements are in place and/or being negotiated that would allow Priest Rapids to take up to 3.7M eyed eggs for the Ringold Springs Rearing Facility. Us V Oregon parties recently agreed that the brood stock used for the program at Ringold should be Priest Rapids stock. This was also a key recommendation by HSRG. This program is partial mitigation for the John Day Dam and will be funded by the ACOE if implemented. Upon negotiated agreement among the effected parties for the additional egg collection for Ringold Springs Rearing Facility, the broodstock collection total will be adjusted accordingly.

Table 14. 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		**3,888**

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Fishing & Shellfishing

2009 Forecasts: Spring Chinook, Summer Chinook and Sockeye

2009 Forecasts For Columbia River Spring Chinook, Summer Chinook, Sockeye and Steelhead			
	2008 Forecast	**2008 Return**	**2009 Forecast**
Total Spring Chinook	**326,300**	**223,330**	**353,700**
Lower River Stocks	**57,000**	**44,730**	**54,800**
Willamette River [1/]	34,100	27,000	37,600
Cowlitz River [2/]	5,200	2,700	4,100
Kalama River [2/]	3,700	1,600	900
Lewis River [2/]	3,500	2,400	2,200
Sandy River [2/]	6,800	6800	5,200
Select Areas			
Youngs Bay	2,000	3,200	2,850
Tongue Point	1,400	1,000	1,450
Blind Slough	270	2,60	470
Deep River	30	30	30
Upriver [3/]	**269,300**	**178,600**	**298,900**
Snake River [4/]	145,400	99,200	
Snake River Wild [5/]	21,100	23,600	
Upper Columbia [4/]	23,300	19,800	
Upper Columbia Wild [6/]	2,900	2,000	
Wind River [2/ 4/]	10,000		
Little White Salmon [2/ 4/]	36,800		
Klickitat River [2/ 4/]	1,100	1,000	2,000
Yakima River [2/ 4/]	10,100	6,600	15,900

Upper Columbia Summer Chinook	**52,000**	**55,500**	**70,700**
Sockeye	75,600	214,500	183,800
Wenatchee Stock	13,700	26,300	18,300
Okanogan Stock	61,200	187,200	164,900
Snake River Sockeye	700	1,000	600
Steelhead			
Wild Winter Steelhead	15,300		
Summer Steelhead [7/]	**326,400**	**355,100**	
Skamania Hatchery	*8,200*	*11,300*	
Skamania Wild	*2,200*	*4,500*	
Group A-Index Hatchery	*196,900*	*164,200*	
Group A-Index Wild	*69,400*	*81,600*	
Group B-Index Hatchery	*41,200*	*74,900*	
Group B Index Wild	*8,500*	*18,500*	

[1/] Includes age-3 jacks.
[2/] To mouth of tributary.
[3/] Includes Snake Summer Chinook.
[4/] Included in Upriver Spring Chinook number.
[5/] Included in Snake River Spring Chinook number.
[6/] Included in Upper Columbia Spring Chinook number.
[7/] To Bonneville Dam.

Prepared by *U.S. v Oregon* Technical Advisor Committee
January 28, 2009

Find a bug or error in the system? Let us know about it!
© 1997- 2009 Washington Department of Fish and Wildlife
E-mail: webmaster@dfw.wa.gov
WHAT'S NEW | EMPLOYMENT | PRIVACY STATEMENT | MAILING LISTS | CONTACT
RSS

APPENDIX G

WELLS HATCHERY COMPLIANCE REPORT

Wells HCP Hatchery Production Compliance Report
2008 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 (2006 BY)	320,000	32,000	10 fpp	311,880[1]	11.0	28,353
Subyearling Summer/Fall Chinook (2007 BY)	484,000	24,200	20 fpp	402,527[2]	39.0	10,321
Yearling Summer Steelhead (2007 BY)	300,000	50,000	6 fpp	286,540[3]	7.0	40,934

[1] C. Snow, May, 2008 Memo for the total released.

[2] C. Snow June 2008 and July 2008 show an early release on May 13 of 158,044 (52.4 fpp) and a late release on June 16 of 244,483 (33.5 fpp). 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 2008) show total release of 440,362 steelhead smolts at 62,904 lbs, which is 95.5 % of the numerical target for release. The shortage was equally assigned to Wells Inundation, 286,540; to NNI 58,322 and to Grant Group 3 steelhead, 95,500 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 (2007 BY)	48,858	8,143	6 fpp	46,659[4]	7.0	6,666
Yearling Summer/Fall Chinook (2006 BY)	108,570	10,857	10 fpp	113,926[5]	12.1	9,415
Yearling Spring Chinook (2006 BY)	61,071	4,071	15 fpp	45,742[6]	19.4	2,358
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. The target release for the pond is 400,000 and the actual release in 2008 was 419,734, or 104.93% of the goal. NNI "Number Released" is 104.93% of the Douglas target of 108,570 fish.

[6] There were 411,785 spring Chinook smolts released at an average of 19.4 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 74.9% of the numerical target for release for 2008. The shortfall was equally applied to the three programs giving Wells NNI 45,742; Chelan PUD 215,712 and Grant PUD 150,549 fish in 2008.

[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 H

2008 ACTION PLAN: WELLS HCP

2008 ACTION PLAN
WELLS HCP

HCP COORDINATING COMMITTEE

1. BYPASS OPERATING PLAN
    a. Draft to Committee: January 2008.
    b. Approval Deadline: March 2008.
    c. Period Covered: April to August 2008.
    d. Report Deadline: October 2008.

2. BULL TROUT MONITORING AND MANAGEMENT PLAN
    a. Period Covered: March 2005 to July 2008.
    b. Report Deadline: March 2008 and December 2008

3. PREDATOR CONTROL PROGRAMS
    a. Northern Pikeminnow removal program in Wells reservoir (March – July 2008)
    b. Avian Predator Hazing at Wells Dam (April – May 2008)

4. ADULT PASSAGE IMPROVEMENTS
    a. Construction and Installation of a flow-directing baffle in the west fishway (February 2008)
    b. Placement of lamprey structure to aide in evaluation (Jan – Feb 2008)

HCP HATCHERY COMMITTEE

1. 5-YEAR HATCHERY MONITORING AND EVALUATION PLAN
    a. Implementation: 2006 to 2010.
    b. Draft Annual Report for 2007: March 2008
    c. Final Annual Report April 2008

2. HCP ANNUAL HATCHERY PRODUCTION COMPLIANCE REPORT
    a. Period Covered: January 2008 to December 2008.
    b. Draft to Committee: November 2008.
    c. Approval Deadline: December 2008.
    d. Submission Deadline: December 2008.

3. 2008 BROOD STOCK PROTOCOL
    a. Draft to Committee: February 2008.
    b. Approval Deadline: April 2008.
    c. Implementation: May 2008 to October 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. Construction activities (November 2007 – March 2008)
    b. Twisp Broodstock Collection Weir
        1. Begin construction (December 2007)
        2. Completion (April 1, 2008)

HCP TRIBUTARY COMMITTEE

1. ANNUAL REPORT - PLAN SPECIES ACCOUNT STATUS
    a. Draft to Committee: February 2008.
    b. Approval Deadline: March 2008.
    c. Period Covered: January to December 2008

2. 2008 FUNDING-ROUND REVIEW AND FUNDING DECISIONS
    a. RFP: *To be determined* (typically in March)
    b. Approval Deadline: *To be determined* (typically in December)

APPENDIX I

ANNUAL REPORT OF WELLS PLAN SPECIES ACCOUNT FINANCIAL ACTIVITY FOR THE YEAR ENDED DECEMBER 31, 2008

Annual Report of Wells Plan Species Account Financial Activity
For the Year Ended December 31, 2008
As required by Section 7.3.7.2 of the Wells Hydroelectric Project HCP

Beginning Balance 01/01/2008			$ 1,500,301.18
Sources:			
Interest earnings			43,235.07
Uses:			
Project #	Description		
0605	Methow Riparian Protection Phase III	$ 345,400.00	
0701	Lower Beaver Creek Livestock Exclusion	8,766.00	
0702	Heath Floodplain Restoration	53,914.22	
0802	Riparian Regeneration and Restoration	4,885.76	
0803	Fort Thurlow Pump Project	7,009.00	
0804	Goodman Livestock Exclusion	6,828.25	
	Total for Projects	426,803.23	
0699	Paid to Chelan PUD	3,267.69	
0699	Paid to Douglas PUD	2,336.00	
	Total for Administration	5,603.69	
	Total Uses		432,406.92
Ending Balance 12/31/2008			$ 1,111,129.33

Wyatt W. Scheibner, Treasurer
PUD No. 1 of Douglas County

APPENDIX J

MONITORING AND EVALUATION OF WELLS AND METHOW HATCHERY PROGRAMS IN 2007

(Appendix J 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 2007

Prepared 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

March 2008

Executive Summary

Chapter 1: 2005 brood spring and summer Chinook salmon and 2006 brood summer steelhead reared at Methow and Wells hatchery facilities

The Public Utility District No. 1 of Douglas County funds hatchery programs intended to supplement natural populations of spring Chinook salmon 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 2005 brood summer Chinook salmon and 2006 brood steelhead, adult collections approximated the total number and genetic origin of fish required for each program. Spawning of adult fish produced enough progeny for juvenile releases to achieve 100% and 95% of program goals for steelhead and summer Chinook salmon, respectively. For 2005 brood spring Chinook salmon, broodstock collection was below target levels, and too few wild fish were collected to achieve program goals. Pre-spawn survival of adult fish was above the set standards for each program, but only the Twisp spring Chinook salmon exceeded all juvenile survival standards during hatchery rearing. Spring Chinook salmon smolt releases were 76% of the specified release goal primarily due to inadequate broodstock collection from tributary locations. Recent brood years of salmon and steelhead exhibited hatchery replacement rates great enough to replace parent broods (i.e., > 1) with the exception of the Wells subyearling summer Chinook salmon.

Chapter 2: Harvest and exploitation of naturally produced and hatchery origin fish released from Wells Complex hatchery facilities

All stocks of salmon and steelhead covered in this report were subject to commercial, sport, or tribal fisheries in ocean and/or freshwater environments. Based on analysis of coded-wire tag data, most Wells summer Chinook salmon adults were recovered in fisheries, while most Methow spring Chinook salmon stocks were recovered in hatchery broodstocks or on spawning grounds. Unlike earlier hatchery releases, recent releases of Methow spring Chinook salmon have not been adipose fin-clipped, which may result in a decrease in harvest rates and an increase in recoveries of coded-wire tagged fish on the spawning grounds. Harvest of adult hatchery steelhead in the upper Columbia River ESU was monitored through local creel census. An estimated 1,612 hatchery and 17 wild steelhead were removed from the 2006 brood of returning adults through sport fisheries. Overall, Wells Complex hatchery fish provided commercial, recreational, and limited tribal harvest, while meeting broodstock and spawning ground requirements.

Chapter 3: Methow River basin spring Chinook salmon and steelhead smolt monitoring in 2007

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 salmon and summer steelhead smolts emigrating from the Twisp and Methow River basins. We captured 390 wild spring Chinook salmon smolts at the Methow

River trap and 283 smolts at the Twisp River trap. A total of 180 and 333 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 33,710 wild spring Chinook salmon smolts emigrated from the Methow River, including 3,329 smolts emigrating from the Twisp River. An estimated 15,003 wild steelhead emigrated from the Methow River, including 3,312 fish from the Twisp River. Utilizing data gathered during spring Chinook salmon spawning ground surveys in 2005, we estimated that the number of emigrants produced from each 2005 brood spring Chinook salmon redd in the Twisp River (121) was 39.1% greater than the number of emigrants produced in the remainder of the Methow River basin (87). Steelhead in the Methow Basin and in the Twisp River produced an estimated four and five emigrants from 2003 brood redds, respectively, although no estimate of age-1 emigration could be calculated for the Twisp River. Excluding Twisp River production, Methow Basin steelhead produced an estimated 4.1 emigrants per 2003 brood steelhead redd. While survival rates of spring Chinook salmon for each trapping location was similar, we were unable to assess the influence of naturally spawning hatchery fish on smolt production because comparisons with reference populations (i.e., not supplemented) are not possible at this time.

Chapter 4: Summer steelhead spawning ground surveys conducted in the Methow River basin in 2007

The Methow River basin was divided into four distinct subbasins, and index areas of steelhead spawning activity were developed within each subbasin. Weekly spawning ground surveys were performed by walking or rafting the index areas between 12 March and 19 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 subbasin was estimated by expanding tributary index areas as with mainstem areas, or by randomly choosing one tributary to serve as an index of redd density (redds/km) for other similar tributaries within each subbasin. We estimated a minimum of 740 steelhead redds were constructed in the Methow River basin in 2007. 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 upper Methow River subbasin ($N = 343$). The lower Methow River subbasin ($N = 177$) and Chewuch River ($N = 138$) had similar numbers of redds. Surveys in the Twisp River subbasin (82 redds counted) were affected by rapid and sustained increases in stream flow during peak spawning, and several reaches in the Chewuch and Twisp subbasins were not surveyed due to high flow and turbidity. Redd abundance in the lower Methow River mainstem was low in 2007 ($N = 7$). Peak spawning was observed the week of 22 April in the lower Methow River and Twisp subbasins, but a week earlier (15 April) in the Chewuch River subbasin. Peak spawning in the upper Methow River subbasin was observed between 15 April and the end of the month. The spawning population in 2007 was composed primarily of hatchery origin steelhead (92.0%). No significant difference was detected in mean passage date to Wells Dam based on salt age or origin. In the hatchery environment, there were no significant differences based on origin in spawn timing of adult (female) steelhead. Distribution and timing of redds by origin cannot be evaluated in the natural environment due to the inability to differentiate hatchery and wild fish on spawning grounds. Based on biological sampling during broodstock collection at Wells Hatchery, 7.6% of the hatchery origin escapement was composed of out-of-basin stray hatchery

fish, primarily from the Wenatchee River. Stray rates of steelhead released in the Methow basin cannot currently be estimated. Wild fish comprised 8.0% of the escapement and were primarily from the 2002 and 2003 broods. Based on run escapement estimates, the mean natural replacement rate for the six most recent broods of steelhead spawning above Wells Dam (1996-2001) was 0.30 recruits per adult. For all brood years examined (1996 to 2001), the hatchery replacement rate was significantly greater than natural replacement rate.

Chapter 5: Spring Chinook salmon spawning ground surveys conducted in the Methow River basin in 2007

The Methow River basin was divided into three subbasins (i.e., Methow River upstream of the Twisp River, Chewuch River, and Twisp River) to determine spring Chinook salmon spawning distribution and abundance. Index areas in each subbasin were used to compare the spawn timing of hatchery and wild spring Chinook salmon. Spawning ground surveys were performed on foot between 1 August and 27 September. We estimated a total of 307 redds were constructed in the Methow River basin in 2007. The Methow River subbasin, which includes the Lost River, Early Winters Creek, the mainstem Methow River upstream of the town of Twisp and both hatchery outfalls had the greatest number of redds (N = 198). The Twisp River (N = 30) had the lowest redd count compared to the Chewuch River (N = 79) and mainstem Methow River (N = 174). Peak spawning occurred between 27 August and 8 September in the index area of all three subbasins. An estimated 2,131 adult spring Chinook salmon migrated past Wells Dam in 2007 (not accounting for dam fallback, poaching, or pre-spawn mortality). Based on male-to-female ratios at Wells Dam (2.5:1), an estimated 1,075 fish spawned in the Methow River basin. After removing fish collected for hatchery broodstock (N = 626), and fish bound for the Okanogan River (N =178), the estimated spawning population represents only 81.0% of the estimated run escapement. The estimated overall spawning population in 2007 was composed primarily of hatchery origin fish (75.3%). However, differences in the estimated proportion of wild fish were evident among subbasins with the Twisp and Chewuch Rivers having greater proportions of wild fish (38.1% and 26.7%, respectively) than the Methow River and tributaries (21.9%). There were no significant differences in spawn timing between hatchery and wild fish (females) within or among subbasins. No significant differences were detected in the distribution of hatchery and wild carcasses (females) within each subbasin. For the most recent brood year with complete recovery data (i.e., 2001 brood), the natural replacement rate (NRR) was highest in the Twisp River subbasin (0.15 recruits per spawner). The geometric mean NRR for brood years 1992 to 2000 was less than 1.0 in each subbasin. No significant differences were detected between the NRR and HRR within any subbasin. However, when evaluating MetComp or Methow basin HRR values with corresponding NRR values, the HRR was greater than NRR. Of the expanded coded wire tagged hatchery fish recovered on Methow Basin spawning grounds in 2007 (N = 639), 21.9% were classified as strays from Methow Hatchery and 18.3% were stray fish from other basins. Of the 2001 brood spring Chinook released in the Twisp and Chewuch rivers, greater than 5% of the adult returns strayed to non-target spawning areas. While less than 5% of the 2001 brood Methow River spring Chinook strayed into non-target spawning areas. Methow Hatchery stocks comprised significantly less than 10% of the estimated spawning escapement into non-target subbasins, with the exception of Chewuch-release fish straying into the Methow subbasin. Methow Hatchery stocks have comprised less than 5% of the estimated spawning escapement in the Entiat River between run years 1997 to 2006.

Table of Contents

Page

Executive Summary i

General Introduction 1

Chapter 1: 2005 brood spring and summer Chinook salmon and 2006 brood summer steelhead reared at Methow and Wells hatchery facilities. 4

Chapter 2: Harvest and exploitation of naturally produced and hatchery origin fish released from Wells Complex hatchery facilities. 44

Chapter 3: Methow River basin spring Chinook salmon and steelhead smolt monitoring in 2007. 67

Chapter 4: Summer steelhead spawning ground surveys conducted in the Methow River basin in 2007. 162

Chapter 5: Spring Chinook salmon spawning ground surveys conducted in the Methow River basin in 2007. 192

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 (Methow spring Chinook salmon, Methow summer steelhead, Okanogan summer steelhead).

2. Increase the abundance of the natural adult population of unlisted plan (i.e., HCP) 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 (Methow summer/fall Chinook salmon, Okanogan sockeye).

3. Provide salmon for harvest and increase harvest opportunities, while segregating returning adults from natural spawning populations (Wells summer/fall Chinook salmon).

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 from fish ladders at Wells Dam adjacent to the hatchery, spawned, and reared as part of what the JFP has considered 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 salmon are 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 salmon supplementation facility. Broodstock are collected from the Methow and Twisp rivers, or in some years from the Chewuch River, and/or the fish ladders at Wells Dam. Juvenile spring Chinook salmon 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 (M&E Plan) for the hatchery programs that consists of 10 objectives (Wells HCP HC 2005). This report summarizes activities and presents data collected during 2007 required to address the program-specific objectives of the M&E Plan 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 2006). 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 M&E 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 the 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 (BAMP 1998).

Objective 5: Determine if the stray rate of hatchery fish is below 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 (e.g., Wells Chinook salmon).

Regional Objectives

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.

Objective 10: Determine if the release of hatchery fish impact non-target taxa of concern (NTTOC) within acceptable limits.

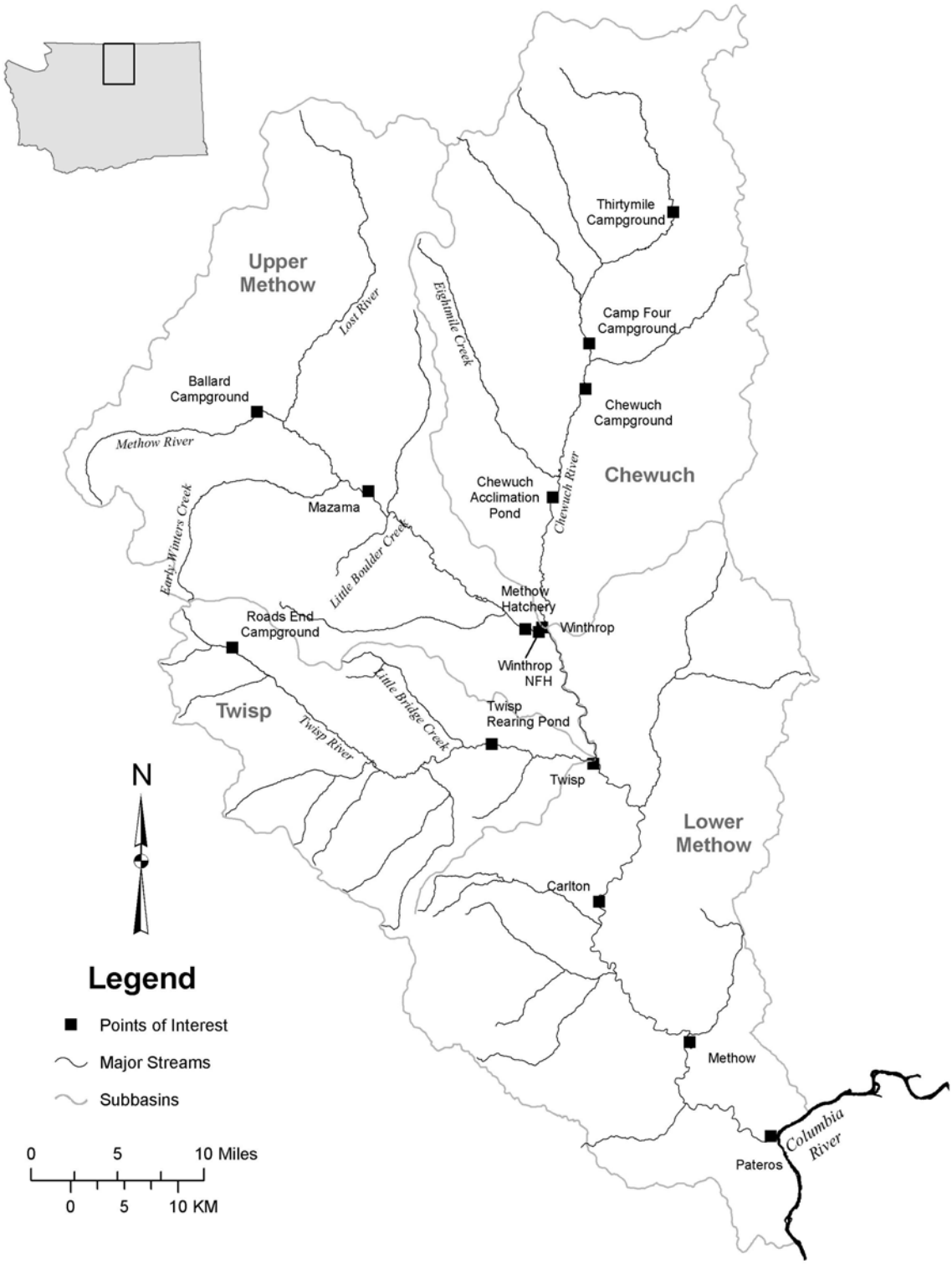


Figure 1. Map of Methow River Basin hatchery facilities and rearing ponds.

Chapter 1

2005 Brood Spring and Summer Chinook salmon and 2006 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 Joint Fishery Parties (JFP) to supplement natural populations of spring Chinook salmon 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 2005 brood summer Chinook salmon and 2006 brood steelhead, adult collections approximated the total number and genetic origin of fish required for each program. Spawning of adult fish produced enough progeny for juvenile releases to achieve 100% and 95% of program goals for steelhead and summer Chinook salmon, respectively. For 2005 brood spring Chinook salmon, broodstock collection was below target levels, and too few wild fish were collected to achieve program goals. Pre-spawn survival of adult fish was above the set standards for each program, but only the Twisp spring Chinook salmon exceeded all juvenile survival standards during hatchery rearing. Spring Chinook salmon smolt releases were 76% of the specified release goal primarily due to inadequate broodstock collection from tributary locations. Recent brood years of salmon and steelhead exhibited hatchery replacement rates (HRRs) great enough to replace parent broods (i.e., > 1) with the exception of the Wells subyearling summer Chinook salmon. Additionally, all programs exceeded the expected HRR values defined in the M&E Plan except for the Twisp River spring Chinook and Wells subyearling summer Chinook programs.

Introduction

Successful 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 Douglas County Public Utility District (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) on anadromous fish populations from the Wells Hydroelectric Project. 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 the HRR ratio and reported in the M&E Plan developed specifically for these programs (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 natural 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 to determine causation 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 salmon 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. However, if strays from harvest-augmentation programs do spawn naturally in significant numbers, it would be important to assess their impacts on natural production.

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 the 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 2005 brood Wells summer Chinook salmon, 2005 brood Methow spring Chinook salmon, and the 2006 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 (length) at Maturity $_{\text{Hatchery Age X and Gender Y}}$ = Size (length) at Maturity $_{\text{Naturally produced Age X and Gender Y}}$

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: $HRR_{Year\ X} \geq NRR_{Year\ X}$
- Ho: HRR ≥ BAMP value (preferred)

Objective 6. Determine if hatchery fish were released at the programmed size and number.

- Ho: Hatchery fish $_{Size\ at\ release}$ = Programmed $_{Size\ at\ release}$
- Ho: Hatchery fish $_{Number\ released}$ = Programmed $_{Number\ released}$

Methods

Broodstock Collection and Spawning

Salmon and steelhead broodstock were collected in accordance with protocols designed to ensure enough fish of the desired genetic composition (i.e., hatchery and wild) were collected to satisfy specific program-release goals (Appendix A). Although broodstock were collected for Wells HCP hatchery programs and other unrelated programs (i.e., Turtle Rock Summer Chinook salmon 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 (Truscott 2005). Hatchery summer Chinook salmon were collected as volunteers to Wells Hatchery. Wild summer Chinook salmon were collected from the west ladder at Wells Dam, or as volunteers to Wells Hatchery. Summer steelhead were collected from the east and west ladders of Wells Dam. Tributary collection of spring Chinook salmon 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 broodstock protocol also designated a maximum extraction rate for most hatchery broodstocks. Extraction rates are expressed as a proportion of the run escapement that may be retained for hatchery broodstocks.

Run-escapement estimates for Wells Hatchery summer Chinook salmon were calculated as the difference between the number of summer Chinook salmon 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 salmon in these tributaries is limited (Hamstreet 2006, 2007; Miller 2006), and natural production in the mainstem has been document but not quantified. The run escapement for Methow spring Chinook salmon at Wells Dam was estimated by subtracting summer Chinook salmon passing Wells Dam during the defined migration period for spring Chinook salmon (Humling and Snow 2006). Spawning escapement estimates for spring Chinook salmon in individual tributaries were calculated from a total census of redds multiplied by the number of fish per redd (i.e., sex ratio).

Broodstock were scanned for marks or tags during trapping to assess the number of hatchery and naturally produced fish collected. Spring Chinook salmon 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 salmon, steelhead, and summer Chinook salmon utilized for yearling programs were assigned a unique number at spawning to allow tracking of biological samples (e.g., age, fecundity, ELISA) and to facilitate the implementation of proper mating protocols. Spawning occurred weekly until the broodstock were exhausted or egg collection goals had been satisfied. Spring Chinook salmon adults and gametes were transferred between Methow Hatchery (MH) and Winthrop National Fish Hatchery (WNFH) as necessary to meet program or rearing requirements.

Biological sampling of broodstock occurred after the gametes were collected. Personnel collected length, sex, mark, scale, and origin data in addition to recovering coded wire tags (CWT). Tissue samples were also collected from both spring Chinook salmon and steelhead broodstock. The unique sample number assigned to each fish at spawning also allowed for the correlation of health sample (i.e., ELISA), fecundity, and egg mortality data provided by hatchery or WDFW fish health personnel. Differences in size by age class of hatchery and wild fish were tested with the non-parametric Kruskal-Wallis analysis of variance (KW ANOVA) test because assumptions of normality could not be met with transformed data.

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 CWT and/or an external mark (adipose fin-clip or elastomer tag). Spring Chinook salmon 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 salmon and steelhead released from Wells Hatchery were reared on Columbia River water prior to release. Wells subyearling summer Chinook salmon were the only anadromous fish reared entirely on well water prior to release.

Juvenile Hatchery Survival

The survival of juveniles in the hatchery is not a primary indicator in the M&E Plan, but may help explain why program release goals (i.e., number of fish released) 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

Because all juvenile fish receive either an internal and/or external tag or mark during rearing, a 100% inventory of fish on station is possible during marking. The number of juvenile fish released was calculated based on the number of fish tagged or marked minus 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 sampled immediately prior to release. Fork length is measured to the nearest millimeter and weight is measured to the nearest 0.1 gram. Juvenile length and weight at release was compared to target release length and weight using one-sample t-tests.

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 (spring and summer Chinook salmon) or run escapement estimates at Wells Dam (steelhead) by the number of broodstock (including prespawn mortality). The HRR of each stock was tested against target HRR rates using a one-sample t-test. For stocks where the HRR data did not meet assumptions of normality, HRR and target values were square root transformed prior to analysis.

Results

Adult Collection and Spawning

Broodstock collection is dependent on the run size and migration timing of the target stock. Pre-season estimates of upper Columbia River salmon runs were calculated to assist managers in determining trapping location and duration, and in developing weekly quotas to extract broodstock in proportion to the run-at-large. Pre-season run estimates for spring Chinook salmon were large enough to recommend tributary collection, instead of mainstem Columbia River trapping at Wells Dam (Truscott 2005). While in-season and final run estimates were sufficient to provide the required number of broodstock, poor trap efficiency in the tributaries and lower-than-expected abundance of wild fish resulted in too few fish retained for broodstock. Collection of summer Chinook salmon at the Wells volunteer trap targets a greater proportion of the broodstock in the first few weeks of trapping to account for the late start date compared to the run timing. Collection quotas for summer steelhead were increased on 20 September to provide fish for survival studies on the mainstem Columbia River, but final adult collection did not meet the revised goal (Table 1).

Low efficiency of tributary traps precluded using stock-specific run timing to guide collection of spring Chinook salmon and 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 salmon broodstock was of hatchery origin (Table 2). The number of broodstock spawned for each program is listed in Appendix B.

Table 1. Cumulative trapping of selected upper Columbia salmon and steelhead runs at Wells Dam. Wells summer Chinook salmon trapping reflects collection of hatchery fish from the volunteer channel (MEOK = Methow and Okanogan rivers).

Stock (brood) / trapping dates	Cumulative passage date during trapping period and broodstock retained (%)			
	25%	50%	75%	100%
Wells summer Chinook salmon (2005)	26 Jul	6 Aug	17 Aug	27 Aug
16 Jul – 27 Aug	39.5	75.6	88.3	96.7
MEOK summer steelhead (2006)	23 Aug	15 Sep	8 Oct	31-Oct
1 Aug – 31 Oct	19.2	51.7	85.4	89.2

Table 2. Broodstock collection results from Wells Complex hatcheries for steelhead (2006 brood) and Chinook salmon (2005 brood). Estimated escapement and required extraction rates for Wells summer Chinook salmon are based on the difference in Chinook salmon counts between Rocky Reach and Wells Dams, and combine hatchery (H) and wild (W) fish.

	Wells summer Chinook salmon		Wells steelhead		Spring Chinook salmon					
					Methow		Chewuch		Twisp	
	H	W	H	W	H	W	H	W	H	W
Broodstock goal	1,146	128	373	94	0	120	0	120	0	120
Est. run escapement	12,874		6,463	663	486	185	285	223	34	87
Extraction rate required	0.098		0.058	0.142	0.00	0.65	0.00	0.54	0.00	1.38
Actual extraction rate	0.092		0.048	0.137	0.40	0.11	0.04	0.01	0.21	0.08
Broodstock collected	1,057	122	310	91	194	20	10	2	7	7

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 calculate replacement rates for hatchery and wild stocks. Broodstock were intended to serve as a representative sample of the spawning population from which comparisons could be made of demographic and phenotypic traits by origin. Because of the low number of wild fish within the spring and summer Chinook salmon broodstocks, it was also necessary to include carcasses recovered on the spawning grounds in the analysis.

Mean fork lengths for 2005 broodstock of Chinook salmon are shown in Table 3 and Appendix C. Sample sizes were small or zero for some ages and origins, affecting our ability to make meaningful comparisons between lengths of hatchery and wild fish for most ages of each stock.

For age-5 summer Chinook, wild fish appear to have fork lengths greater than those of hatchery origin fish, but no comparisons between hatchery and wild fish of the same sex, origin, and juvenile migration age were significant (KW ANOVA: $P > 0.05$) . No significant difference in fork length between wild and hatchery steelhead was detected between fish of the same gender and salt-age (KW ANOVA: $P > 0.05$; Table 4).

Table 3. Mean fork length (cm; *N*; SD) by age, sex, and origin of 2005 Chinook salmon broodstocks sampled at Wells Hatchery Complex facilities (MC = Methow Composite; Wells – 0 = subyearling life history; Wells – 1 = yearling life history).

Stock	Sex	Age-3		Age-4		Age-5		Age-6	Age-7
		H	W	H	W	H	W	H	H
				Spring Chinook salmon					
MC	M	52 (28; 4)	- -	72 (74; 7)	- -	- -	- -	- -	- -
MC	F	- -	- -	74 (98; 4)	71 (2; 3)	81 (1; -)	- -	- -	- -
Twisp	M	50 (10; 2)	- -	- -	82 (1; -)	- -	- -	- -	- -
Twisp	F	- -	- -	- -	81 (4; 8)	- -	89 (2; 4)	- -	- -
				Summer Chinook salmon					
Wells – 0	M	78 (1; -)	72 (6; 7)	84 (38; 6)	83 (23; 6)	91 (4; 8)	99 (5; 4)	102 (2; 5)	- -
Wells – 0	F	- -	74 (1; -)	84 (58; 4)	84 (29; 5)	89 (14; 6)	92 (5; 2)	92 (2; 7)	100 (1; -)
Wells – 1	M	61 (4; 2)	- -	79 (176; 6)	81 (7; 4)	88 (328; 7)	97 (3; 7)	91 (7; 8)	97 (1; -)
Wells – 1	F	- -	- -	80 (70; 5)	88 (1; -)	90 (434; 5)	95 (6; 3)	95 (24; 5)	- -

Table 4. Mean fork length (cm; *N*; SD) by saltwater age, sex, and origin of 2006 steelhead broodstock sampled at Wells Hatchery Complex facilities.

Sex	1-salt		2-salt	
	Hatchery	Wild	Hatchery	Wild
M	60 (97; 3.3)	65 (21; 4.5)	76 (58; 4)	77 (16; 3.5)
F	60 (22; 4.3)	61 (8; 4.9)	71 (123; 4.2)	73 (42; 3.3)

Fecundity of salmon and steelhead is directly related to fish size (Quinn et al. 2004; Campbell et al. 2006). Most summer Chinook salmon were age-5 hatchery fish and had a mean fecundity of 4,264. While a majority of the spring Chinook salmon were age-4 hatchery fish and had a mean fecundity of 3,510 (Table 5). The 2006 brood steelhead comprised primarily 2-salt hatchery fish with a mean fecundity of 6,858 (Table 6). Comparisons with wild fish were not conducted due to small sample sizes. Mean fecundity values for previous broods of Chinook salmon and steelhead are reported in Appendix D.

Results from ELISA sampling of kidney and spleen tissue collected from female spring and summer Chinook salmon at spawning indicated that the prevalence of the antigen for BKD was generally low for the 2005 brood (Table 7). For 2005 brood spring Chinook salmon, ELISA results were lower by category than most recent broods (Appendix E).

Table 5. Mean fecundity (*N*; SD) by total age and origin of 2005 brood Chinook salmon sampled at Wells Complex hatchery facilities (MC = Methow composite).

Stock	Origin	Age-4	Age-5	Age-6
Wells summer Chinook salmon	H	3,728 (14; 677)	4,264 (63; 693)	5,459 (3; 1,028)
Wells summer Chinook salmon	W	3,591 (4; 756)	4,506 (2; 49)	- -
MC spring Chinook salmon	H	3,475 (98; 809)	3,261 (1; - -)	- -
MC spring Chinook salmon	W	3,823 (2; 482)	- -	- -
Twisp spring Chinook salmon	H	- -	- -	- -
Twisp spring Chinook salmon	W	4,216 (4; 641)	4,745 (2; 123)	- -

Table 6. Mean fecundity (*N*; SD) by salt-age and origin of 2006 brood summer steelhead sampled at Wells Complex hatchery facilities.

Origin	1-salt	2-salt
Hatchery	4,652 (13; 814)	6,858 (80; 1,538)
Wild	4,203 (7; 188)	6,397 (35; 1,205)

Table 7. Results (%) of ELISA sampling of 2005 brood female Chinook salmon by category and value.

Program	Below-low	Low	Med	High	*N*
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	
Wells summer Chinook salmon	90.0	0.5	0.0	0.5	190
Methow spring Chinook salmon	87.1	7.9	0.0	5.0	101
Twisp spring Chinook salmon	83.3	16.7	0.0	0.0	6

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 most juvenile rearing stages. The unfertilized-egg-to-release survival for Wells summer Chinook salmon was greater than the five-year average, but fell short of the standard by 0.5%. While the survival rates for the Methow spring Chinook salmon exceeded standards for most stages, only the Twisp spring Chinook salmon program exceeded all survival standards prior to release. Historically, these Chinook salmon programs have usually exceeded survival standards in most categories, while the Wells

steelhead program typically has not (Appendix F). Lower-than-expected fertilization rates and survival during rearing (e.g., assumed avian predation from dirt ponds) were the primary causes that lead to lower survival rates of steelhead at Wells FH.

Table 8. Life-stage survival rate standards for Wells and Methow hatcheries, the 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 salmon		Methow spring Chinook salmon		Twisp spring Chinook salmon	
		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 female*	98.0 (1.0)	95.2	96.9 (1.7)	96.8	95.7 (2.3)	99.0	98.3 (2.5)	100.0
Collection-to-spawning	*85 male*	99.1 (0.5)	93.3	96.5 (1.9)	98.9	96.1 (2.4)	99.1	89.8 (8.3)	100.0
Unfertilized egg-to-eyed	92	84.6 (2.1)	86.6	92.3 (3.5)	100.0	94.1 (2.6)	96.9	94.5 (3.4)	95.7
Eyed egg-to-ponding	98	96.9 (2.3)	99.5	99.7 (0.5)	99.2	99.2 (1.7)	96.9	99.5 (1.0)	98.2
30 d after ponding	97	97.2 (2.3)	92.7	99.3 (0.2)	99.2	99.1 (0.4)	99.6	99.2 (0.3)	99.6
100 d after ponding	93	92.2 (8.4)	89.8	99.3 (0.3)	99.0	98.9 (0.5)	99.5	98.2 (1.7)	99.5
Ponding-to-release	*90*	89.2 (9.8)	80.4	84.3 (27.1)	92.0	96.4 (2.2)	90.4	82.2 (20.6)	99.2
Transport-to-release	95	- -	- -	- -	- -	99.6 (0.6)[a]	99.6	84.7 (34.0)	99.9
Unfertilized egg-to-release	*81*	73.0 (7.0)	69.3	77.4 (24.5)	80.5	87.7 (6.4)	87.7	76.8 (18.8)	93.2

[a] All data from Chewuch acclimation pond releases.

Number of Juvenile Fish Released

The overall numbers of steelhead and summer Chinook salmon released from Wells Hatchery were within 10% of target release goals, although variation in the release targets for specific locations (Twisp and Methow rivers steelhead) and programs (subyearling summer Chinook) exceeded 10% of the target (Table 9). Spring Chinook salmon releases from Methow Hatchery were 76% of the target goal and also had large variation in the number of fish released in specific tributaries. Releases of the 2005 brood spring Chinook salmon from Methow Hatchery were below target goals primarily because too few broodstock were collected from the Twisp River due to low escapement of both hatchery and wild fish. Annual release numbers for each program are listed in Appendix G.

Table 9. Target and release numbers for anadromous fish releases from Wells Complex hatchery facilities in 2007.

Stock/program	Target	Number released (% of target)	14-year (1994 – 2007)[a]		
			Min.	Max.	Mean
Wells summer Chinook	804,000	763,790 (95)	561,227	923,790	755,145
Yearling	320,000	333,587 (104)	185,200	457,770	334,182
Subyearling	484,000	430,203 (89)	187,382	541,923	419,015
Methow spring Chinook	550,000	417,102 (76)	28,878	611,763	335,605
Methow River	183,334	156,633 (85)	4,477	332,484	140,623
Chewuch River	183,333	232,811 (127)	11,854	284,165	171,608
Twisp River	183,333	27,658 (15)	15,470	136,998	62,391
Wells summer steelhead	450,000	451,081 (100)	328,100	775,272	470,223
Methow River	120,000	96,219 (80)	80,580	359,170	178,096
Chewuch River	120,000	107,545 (90)	78,205	138,300	107,013
Twisp River	80,000	111,770 (140)	84,475	136,680	110,898
Okanogan River	130,000	135,547 (104)	67,500	228,770	121,300

[a] Excludes years of no release: 1995 brood Twisp and 1995 and 1999 broods Chewuch spring Chinook salmon; 1993 – 1996 brood steelhead releases in the Twisp and Chewuch rivers; 1992 brood subyearling summer Chinook salmon.

All juvenile anadromous salmonids released from Wells Complex hatchery facilities were marked prior to release, except some fry releases from Methow Hatchery. Marks include elastomer (Wells steelhead), adipose fin-clips (summer Chinook salmon), CWT (spring and summer Chinook salmon), 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 salmon 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 were derived from size-at-release goals outlined in the Wells HCP. These goals are based on the mean weight of fish at release. However, the length-at-release targets were derived from standardized length/weight relationship tables (Piper et al. 1992). We tested mean length and weight at release for all stocks against the M&E Plan target values. The mean weight-at-release was significantly lower than target weights for all stocks except Twisp spring Chinook salmon, which was significantly greater than the target (one-sample t-tests: $P < 0.05$). The mean fork length prior to release was also smaller than the

specified target for all anadromous populations released in 2007 (one-sample t-test: $P < 0.05$; Table 10). Size-at-release values 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), mean weight (g), and fish per pound (FPP) for anadromous fish released from Wells and Methow hatcheries in 2007 (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 (2005)						
Yearling	176 (9.0)	45.4	10	155 (8.6)	42.1	10.7
Early subyearling	140 (9.0)	22.7	20	95 (7.2)	10.6	42.7
Normal subyearling	140 (9.0)	22.7	20	109 (6.8)	14.3	31.7
Methow spring Chinook (2005)						
Methow River	154 (9.0)	30.2	15	131 (10.6)	27.4	16.6
Chewuch River	154 (9.0)	30.2	15	126 (12.2)	24.7	18.4
Twisp River	154 (9.0)	30.2	15	139 (7.2)	33.9	13.4
Wells summer steelhead (2006)						
Methow River	198 (9.0)	75.6	6	182 (11.2)	68.8	6.5
Chewuch River	198 (9.0)	75.6	6	182 (11.2)	68.8	6.5
Twisp River	198 (9.0)	75.6	6	182 (11.2)	68.8	6.5
Okanogan River	198 (9.0)	75.6	6	181 (12.1)	65.7	6.9

Hatchery Replacement Rate

All Wells FH Complex programs returned enough adults to replace the parent brood (i.e., HRR >1), with the exception of Wells subyearling summer Chinook salmon (Table 11). Subyearling Chinook salmon from the 2000 brood experienced poor migration conditions in the Columbia River during 2001, which negatively affected survival. The HRR of the most recent complete brood year (2000) exceeded expected HRR goals as does the mean HRR of historic adult returns for the yearling program of Wells summer Chinook salmon (Table 11; Appendix B). The mean HRRs for Twisp spring Chinook salmon and Wells subyearling summer Chinook salmon were significantly less than their target values ($P < 0.05$). The mean HRR for Chewuch spring Chinook salmon was not significantly different from the target value ($P > 0.05$). Although the mean HRRs for the Methow spring Chinook salmon, Wells yearling summer Chinook salmon, and Wells summer steelhead programs exceeded target values, the differences between the mean and target values were not significant ($P > 0.05$). For the Wells summer Chinook salmon and steelhead, mean HRR values were not significantly different from target values due to the high variability among years tested.

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	182	320,000	0.30	960	333	5.3
Actual	2000	166	343,423	2.20	7,547	46	45.5
Mean	1992-1999	190	360,380	0.9	3,602	491	18.5
Median	1992-1999	191	360,854	0.47	1,598	209	8.6
Subyearling program	Expected	266	484,000	0.12	581	833	2.2
Actual	2000	258	498,500	0.04	183	2,724	0.7
Mean	1993-1999	236	399,351	0.07	289	6,078	1.2
Median	1993-1999	221	408,000	0.04	240	2,258	0.9
Twisp spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2001	30	57,471	0.07	43	1,337	1.4
Mean[a]	1992-2000	28	54,303	0.14	79	1,620	2.5
Median[a]	1992-2000	25	51,631	0.12	44	889	2.1
MetComp spring Chinook	Expected	242	366,048	0.30	1,098	333	4.5
Mean	1998, 2000	154	351,031	0.42	1,577	258	10.1
Median	1998, 2000	- -	- -	- -	- -	- -	- -
Methow spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2001	69	130,787	0.39	508	257	7.4
Mean[b]	1993-1999	81	160,068	0.19	318	1,303	4.1
Median[b]	1993-1999	90	191,861	0.17	169	752	3.5
Chewuch spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2001	85	261,284	0.27	711	367	8.4
Mean[a]	1992-1997	53	112,266	0.09	111	2,454	1.9
Median[a]	1992-1997	64	91,672	0.04	39	250	1.1
Wells steelhead	Expected	285	550,000	1.00	5,500	100	19.3
Actual	2003	260	469,538	1.31	6,129	77	23.6
Mean	1996-2002	293	635,950	1.16	7,685	138	25.1
Median	1996-2002	288	580,498	0.87	4,702	1153	15.9

[a] Does not include 1995 brood.
[b] Does not include 1998 brood (mixed with Chewuch release fish as MetComps).

The HRRs have been influenced by inadequate data such as low sample rates on the spawning grounds or missing data and reflect all sources of mortality during juvenile out-migration, ocean rearing, and adult return migration including harvest, predation, disease, and dam passage.

Additional analysis and research will be required to identify the life stage(s) during which excessive mortality occurs, contributing to the low adult return rates. Such analysis is not the focus of this report.

Discussion

Most releases of current broods covered in this Chapter were close to their program production goals. The Wells steelhead and summer Chinook salmon were within 5% of their release goals, but the total release of spring Chinook salmon from Methow Hatchery was only 76% of the specified goal of 550,000 smolts. Hatchery spring Chinook salmon were below production goals due to low escapement and inadequate broodstock collection from tributary locations as a result of poor tributary trap efficiency (e.g., Twisp River).

Target release sizes specified in the M&E Plan were derived from size-at-release goals outlined in the Wells HCP. Those goals are based on the mean weight of fish at release (FPP), and corresponding length-at-release targets were derived using length/weight relationship tables for Chinook (Piper et al. 1992). Those tables are based on a condition factor of 0.83, while spring and summer Chinook released from Wells Hatchery Complex facilities typically have a condition factor of about 1.1. Mean fork length is a better tool than weight for evaluating growth and release size because it is not biased by recent feeding levels or sampling error as a result of additional water weight. Thus, we recommend that current length-at-release target values be reevaluated to develop release-length goals based on a condition factor appropriate for upper Columbia Chinook stocks.

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 salmon), disproportionate levels of effort to recover CWTs would bias HRR values. A detailed review of data from historical spawning-ground surveys (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.

References

BAMP. 1998. Mid-Columbia River hatchery program, biological assessment and management plan.

Bjornn, T. C., and R. R. Ringe. 1984. Evaluation of conditioning steelhead trout in cold water after rearing at 15 C. Idaho Cooperative Fishery Research Unit. University of Idaho, Moscow.

Campbell, B., B. R. Beckman, W. T. Fairgrieve, J. T. Dickey, and P. Swanson. 2006. Reproductive investment and growth history in female coho salmon. Transactions of the American Fisheries Society 135:164-173.

Hamstreet, C.O. 2006. Spring and summer Chinook salmon spawning ground surveys on the Entiat River, 2005. U. S. Fish and Wildlife Service, Leavenworth, Washington.

Hamstreet, C.O. 2007. Spring and summer Chinook salmon spawning ground surveys on the Entiat River, 2006. U. S. Fish and Wildlife Service, Leavenworth, Washington.

Humling, M. 2005. Methow Hatchery 2002 brood spring Chinook salmon production. Memorandum dated 4 February 2005 to Rick Klinge, Douglas County PUD.

Humling, M., and C. Snow. 2006. Spring Chinook salmon spawning ground surveys in the Methow River basin in 2005. Washington Department of Fish and Wildlife, Olympia, Washington.

IHOT. 1995. Operation plan for annual fish production facilities in the Columbia River basin. Washington Department of Fish and Wildlife, Olympia, Washington.

Jateff, R. 2001. Summary report for the 1998 brood year Methow Basin spring Chinook salmon hatchery program. Washington Department of Fish and Wildlife, Olympia, Washington.

Miller, T. 2006. 2005 Upper Columbia River summer Chinook salmon spawning ground surveys. Memorandum dated 19 January 2006 to HCP Hatchery Committee Members.

Piper, R. G., I. B. McElwain, L. E. Orme, J. P. McCraren, L. G. Fowler, and J. R. Leonard. 1992. Fish hatchery management. U. S. Fish and Wildlife Service. Washington, D.C.

Poe, T. P., H. C. Hansel, S. Vigg, D. E. Palmer, and L. A. Prendergast. 1991. Feeding of predaceous fishes on out-migrating juvenile salmonids in John Day reservoir, Columbia River. Transactions of the American Fisheries Society 120:405-420.

Quinn, T. P., L. A. Vøllestad, J. Peterson, and V. Gallucci. 2004. Influences of freshwater and marine growth on the egg size-egg number tradeoff in coho and Chinook salmon. Transactions of the American Fisheries Society 133:55-65.

Snow, C., H. Bartlett, and S. Hale. 2003. Wells Hatchery summer Chinook salmon production, summary report for brood years 1994-1996. Washington Department of Fish and Wildlife, Olympia, Washington.

Snow, C. 2004. Annual progress report for Wells Hatchery summer steelhead, 2002 brood year. Washington Department of Fish and Wildlife, Olympia, Washington.

Snow, C. 2005. Wells Hatchery 2002 brood summer Chinook salmon production. Memorandum dated 4 February to Rick Klinge, Douglas County Public Utility District.

Supplementation Research Team (SRT). 2006. Proposal for the implementation of the Douglas County PUD Hatchery Monitoring and Evaluation Plan. Submitted to Rick Klinge, Douglas County Public Utility District.

Truscott, K. 2005. Final 2005 Upper Columbia River salmon and steelhead broodstock objectives and site-based broodstock collection protocols. Memo to Mid-Columbia HCP Hatchery Committee.

Wells HCP. 2002. Anadromous fish agreement and habitat conservation plan, the Wells Hydroelectric Project, FERC License No. 2149.

Wells HCP Hatchery Committee (HC). 2005. Conceptual approach to monitoring and evaluation for hatchery programs funded by Douglas County Public Utility District. Douglas PUD Habitat Conservation Plan Hatchery Committee, East Wenatchee, WA.

Appendix A

Upper Columbia River salmon and steelhead broodstock collection protocols for hatchery programs funded by Douglas County PUD.

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

July 5, 2005

To: Mid-Columbia HCP Hatchery Committee

From: Kirk Truscott

Subject: **FINAL 2005 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) and 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). 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 2005 collection of salmon and steelhead broodstocks in the Methow, Wenatchee, and Columbia River basins and was developed using run estimates calculated by WDFW. It is consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation), production level targets, and to comply with ESA permits. This protocol may be adjusted in-season based on actual run monitoring at mainstem dams and other sampling locations.

Above Wells Dam

Spring Chinook salmon

Pre-season estimates have 4,573 spring Chinook salmon destine above Wells Dam, 33% or 1,528 are expected to be natural origin. In-season estimates of natural origin spring Chinook salmon to individual tributaries will be adjusted proportional to the estimated returns detailed in Table 2 of the 2005 upper Columbia River Salmon and Steelhead Escapement and Broodstock Forecast and

the total spring Chinook salmon passage at Wells Dam at the 50% and 75% passage dates. 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% of the in-season estimated return to any tributary spawning population. All hatchery origin fish retained for broodstock will be adipose present coded-wire tagged

The Methow Fish Hatchery (FH) rears spring Chinook salmon salmon for three acclimation/release sites on three tributaries of the Methow River; Twisp, Chewuch and Methow Ponds. The total production level target is 550,000 smolts divided equally among the three release sites (183,000 smolts per site.)

Broodstock will be collected at the Methow FH outfall and at tributary traps on the Methow, Chewuch, and Twisp rivers. The Twisp Pond release group is limited to releasing progeny of broodstock collected from the Twisp River. The Chewuch Pond prioritizes progeny of Chewuch River collected broodstock, but may include progeny of broodstock collected from the Methow River. Based on these limitations and the assumptions listed below (Table 1), the following broodstock collection protocol was developed.

For the Twisp Pond program, up to 120 spring Chinook salmon may be collected at the Twisp River weir. Trapping will begin on 01 May and is expected to be completed by 06 August. Salmon will be retained across the run, proportionally consistent with estimated run timing. No more than 33 of the natural origin run will be retained for broodstock. The trap schedule will include a 4-days up and 3- days down sequence. Once the weekly retention target is reached, trapping 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. The weir will be manned 24-hours/day during trapping days to facilitate operation to minimize impact to steelhead kelts and spring Chinook salmon fallback. If the new weir design and operation cannot adequately address kelt migration or spring Chinook salmon fallback, trapping will cease and the weir removed.

For the Chewuch Pond program, a total of 120 spring Chinook salmon are needed for broodstock. Collection activities will begin 01 May and are expected to be complete by 06 August. Up to 120 spring Chinook salmon may be collected from the Chewuch River at Fulton Dam. The dam does not block migrating fish and the trap is anticipated to have a low capture rate. 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 FH. Angling will be used as a last resort if all other methods do not provide adequate broodstock. No more than 33 percent of the natural origin return will be retained for broodstock. In the event that sufficient broodstock for the Chewuch Program cannot be attained from the Chewuch River, salmon will be collected from the Methow River as described below.

The Methow Pond program requires 120 broodstock. These will be collected at the Foghorn Dam on the Methow River in combination with the Methow FH outfall to meet the broodstock target. Trapping will begin on 01 May and is expected to be completed by 06 August. Weekly collection targets will be followed to collect from throughout the run. Once the weekly retention target is reached, all salmon will be released until the beginning of the next week. If the

Chewuch Pond program is short on broodstock, then the weekly collection target may be adjusted to fill both the Methow and Chewuch broodstock targets.

Table 1. Assumptions and calculations to determine number of broodstock needed for each tributary release of 183,000 smolts.

Smolt release		**183,000**	**Smolt release goal**
Fertilization-to-release survival	90%	203,333	
ELISA adjustment	15%	35,882	Eggs
Eggtake Target		**239,215**	**Eggs**
Fecundity	4,200	57	Females
Female to male ratio	1 to 1	114	
Pre-spawn survival	**95%**	**120**	**Broodstock collection target**

Steelhead

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 2) and program assumptions (Table 3), the following broodstock collection protocol was developed.

Trapping at Wells Dam will selectively retain 396 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 salmon 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 2. Production objectives for programs supported through adult steelhead broodstock collections at Wells Dam.

Program	# Smolts	# eyed eggs	% Wild	# Wild	# Hatchery	Total adults
DCPUD [1/]	349,000	401,149	33%	59	119	178
GCPUD [1/]	100,000	114,943	33%	17	34	51
USFWS [1/]	100,000	125,000	33%	18	37	55[3/]
GCPUD Survival Studies	10,000	11,494	0%	0	6	6
Sub-Total	**559,000**	**641,092**	**32%**	**94**	**196**	**290**
Ringold	180,000	240,000	0%	0	106	106[3/]
Sub-Total	**180,000**	**240,000**	**0%**	**0**	**106**	**106**
Grand Total [2/]	**739,000**	**881,092**	**24%**	**94**	**301**	**396**

[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 3. Program assumptions used to determine adult collection required to meet steelhead production objectives 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

Columbia River Mainstem below Wells Dam

Summer/fall Chinook salmon

Summer/fall Chinook salmon 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 salmon.

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% natural origin fish into the broodstock to reduce the potential genetic risk to the naturalized summer/fall Chinook salmon stocks in the upper Columbia River region. Based on mitigation objectives and program assumptions (Table 4), the following broodstock collection protocol was developed.

WDFW will collect 1,274 run-at-large summer Chinook salmon 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 Wells Dam east and west ladder. 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 salmon broodstock collection objective is met, which ever is earliest. The 3-year old component will be limited to 10% of the broodstock collection to minimize the retention of surplus males.

Table 4. Assumptions and calculations to determine number of broodstock needed for summer/fall Chinook salmon production at Wells and Turtle Rock Island hatcheries.

Program Assumption	**Standard**		**Wells FH**		**Turtle Rock FH**		**Lake Chelan** [1/]	**Total**		**Grand total**
	Sub-yearling	**Yearling**	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**eye-egg**	**Sub-yearling**	**Yearling**	
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.

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 salmon						
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	0.394	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	50.9
1999	176	312,098	1,544	0.495	202	8.8
2000	166	343,423	7,547	2.20	46	45.5
Wells subyearling summer Chinook salmon						
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	0.101	986	2.1
1999	212	363,600	524	0.144	694	2.5
2000	258	498,500	183	0.037	2,724	0.7
Twisp spring Chinook salmon						
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	43	76,687	278	0.363	276	6.5
1997	15	26,714	67	0.251	399	4.5
1998	10	15,470	23	0.149	673	2.3
1999	32	67,408	61	0.090	1,105	1.9
2000	64	75,704	148	0.195	512	2.3
2001	30	57,471	43	0.075	1,337	1.4
Methow spring Chinook salmon[a]						
1992	0	0	0	-	-	-
1993	89	210,849	192	0.091	1,098	2.2
1994	2	4,477	1	0.022	4,477	0.5
1995	12	28,878	122	0.422	237	10.2
1996	103	202,947	500	0.246	406	4.9
1997	187	332,484	945	0.284	352	5.1
1999	90	180,775	145	0.080	1,247	1.6
2001	69	130,787	508	0.388	257	7.4
Methow Composite spring Chinook salmon						
1998	160	435,670	2,300	0.528	189	14.4
2000	147	266,392	853	0.320	312	5.8

Appendix B, continued.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
			Chewuch spring Chinook salmon[a]			
1992	22	40,881	39	0.095	1,048	1.8
1993	89	284,165	116	0.041	2,450	1.3
1994	12	11,854	2	0.017	5,927	0.2
1995	0	0	0	-	-	-
1996	64	91,672	37	0.040	2,478	0.6
1997	64	132,759	360	0.271	369	5.6
2001	85	261,284	711	0.272	367	8.36
			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	1.59	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	4,577	0.77	127	15.9
2003	260	469,538	6,129	1.31	77	23.6

[a] Methow Composite spring Chinook salmon after 1997.

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 salmon-yearling migrants						
2005	M	- -	- -	80.5	80.5	88.9	96.7	91.6	- -	97.0
				(137; 5.9)	(7; 4.2)	(295; 6.7)	(3; 7.1)	(5; 4.9)		(1; - -)
2005	F	- -	- -	81.1	88.0	89.8	95.2	95.5	- -	- -
				(55; 4.5)	(1; - -)	(385; 4.9)	(6; 2.8)	(23; 5.0)		
2004	M	55.0	- -	79.3	77.2	88.1	94.8	100.0	- -	- -
		(1; - -)		(247; 5.0)	(5; 5.8)	(104; 7.1)	(6; 8.7)	(36; 10.0)		
2004	F	- -	- -	79.7	85.7	89.0	91.9	97.1	- -	76.0
				(90; 4.8)	(3; 2.1)	(124; 4.6)	(14; 3.9)	(101; 5.5)		(1; - -)
2003	M	59.1	- -	76.6	74.5	92.4	94	97.7	- -	- -
		(9; 5.7)		(32; 5.8)	(2; 16.3)	(343; 7.8)	(2; 24.0)	(6; 14.7)		
2003	F	- -	- -	80.2	- -	92.4	- -	97.4	- -	- -
				(18; 4.3)		(488; 4.7)		(23; 4.2)		
2002	M	51.5	- -	80.1	- -	95.4	- -	99.5	- -	- -
		(6; 3.3)		(266; 6.1)		(278; 7.2)		(6; 5.9)		
2002	F	- -	- -	84.3	- -	94.3	- -	100	- -	- -
				(66; 4.5)		(519; 4.8)		3 (10; 2.8)		
2001	M	54.9	- -	81	84	94.6	97.7	99.5	- -	- -
		(12; 3.8)		(437; 6.4)	(1; - -)	(84; 8.0)	(16; 8.3)	(2; 7.8)		
2001	F	- -	- -	82.7	- -	93.9	98.7	98.5	92	- -
				(302; 4.6)		(179; 5.3)	(3; 1.5)	(12; 6.1)	(1; - -)	
2000	M	53.2	68	75.9	81.9	91.6	97.8	109	- -	- -
		(63; 5.1)	(1; - -)	(303; 6.6)	(13; 8.7)	(130; 8.0)	(12; 6.4)	0 (1; - -)		
2000	F	- -	- -	81.7	85.5	92.1	95.1	98.1	- -	- -
				(68; 5.3)	(4; 4.2)	(208; 5.0)	(30; 4.5)	(8; 11.5)		
1999	M	51.8	- -	76.8	81.6	93.8	99.6	99.1	- -	- -
		(42; 6.9)		(172; 7.9)	(26; 8.7)	(80; 8.5)	(8; 6.9)	(16; 8.7)		
1999	F	- -	- -	81.5	84	91.4	94.5	98	- -	89.5
				(79; 6.1)	(12; 4.6)	(169; 5.5)	(29; 4.6)	(58; 6.4)		(2; 2.1)
1998	M	55.7	61	74.7	83	94.9	100	101	- -	- -
		(30; 5.9)	(2; 2.8)	(125; 8.9)	(19; 6.2)	(213; 10.1)	5 (2; 2.1)	2 (19; 9.9)		
1998	F	- -	- -	79.4	86	95.2	97.6	97.9	- -	101.0
				(30; 5.2)	(5; 4.2)	(418; 5.4)	(8; 5)	(32; 8.7)		(1; - -)
1997	M	47	68	78.7	79.5	91.3	98	108	109	- -
		(2; 0.0)	(1; - -)	(46; 6.4)	(2; 4.9)	(43; 9.6)	(18; 5.6)	3 (3; 6.8)	(1; - -)	
1997	F	- -	- -	81.2	87.5	92.1	96.2	98	- -	- -
				(26; 5.5)	(4; 3.7)	(96; 4.9)	(9; 5.7)	(10; 8.5)		
1996	M	49.3	57.3	76.4	81	90.4	94.9	98.4	102.3	- -
		(9; 5.4)	(4; 6.6)	(87; 7.0)	(19; 7.5)	(49; 7.5)	(24; 6.6)	(10; 8.1)	(3; 11.6)	
1996	F	- -	- -	80.6	86.9	89.4	94.7	96.3	- -	92.7
				(40; 4.0)	(10; 3.2)	(68; 4.5)	(26; 3.6)	(39; 7.4)		(3; 5.9)

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5		Age-6	
		H	W	H	W	H	W	H	W
				Wells summer Chinook salmon-yearling migrants (continued)					
1995	M	53.4	62	73.1	84.4	90.2	107	98.3	96
		(19; 4.4)	(3; 5.6)	(71; 8.2)	(12; 7.3)	(115; 7.7)	0 (1; - -)	(130; 8.2)	(1; - -)
1995	F	71	- -	81.9	84.5	90.7	94.7	96.6	- -
		(1; - -)		(22; 6.4)	(2; 7.8)	(126; 5.2)	(65; 4.4)	(333; 5.8)	
1994	M	- -	- -	77.1	- -	89.6	- -	- -	- -
				(16; 7.9)		(104; 6.6)			
1994	F	- -	- -	71.3	- -	89.7	91.3	- -	- -
				(3; 2.3)		(137; 5.3)	(4; 10.2)		
				Wells summer Chinook salmon-subyearling migrants					
2005	M	78.0	71.8	85.1	82.6	94.0	98.6	105.0	
		(1; - -)	(6; 7.2)	(32; 6.0)	(23; 6.0)	(3; 6.9)	(5; 4.0)	(1; - -)	
2005	F	- -	74.0	84.2	84.4	88.8	91.8	92.0	100.0
			(1; - -)	(55; 4.1)	(26; 4.4)	(13; 5.6)	(4; 2.1)	(2; 7.1)	(1; - -)
2004	M	73.4	72.3	84.5	84.0	92.2	98.7	- -	- -
		(9; 4.5)	(3; 9.9)	(12; 4.5)	(11; 1.9)	(18; 7.0)	(24; 7.4)		
2004	F	68.0	65.0	84.0	84.2	90.7	93.9	- -	- -
		(1; - -)	(1; - -)	(11; 6.4)	(5; 1.1)	(67; 4.0)	(61; 5.1)		
2003	M	63.0	65.0	83.0	83.6	- -	98.7	- -	- -
		(5; 4.7)	(1; - -)	(29; 6.5)	(18; 4.2)		(3; 11.0)		
2003	F	- -	- -	84.7	86.4	90.0	95.0	- -	- -
				(53; 4.7)	(11; 4.2)	(6; 5.5)	(2; 7.1)		
2002	M	67.6	70.5	86.3	73.0	- -	- -	- -	119.0
		(7; 5.9)	(2; 4.9)	(15; 9.3)	(2; 19.8)				(1; - -)
2002	F	78.0	- -	88.3	81.0	90.8	- -	- -	- -
		(2; 7.1)		(15; 3.5)	(1; - -)	(5; 5.2)			
2001	M	74.1	- -	85.4	91.7	99.0	99.6	- -	- -
		(8; 6.3)		(19; 7.8)	(10; 8.8)	(1; - -)	(10; 8.7)		
2001	F	- -	- -	87.6	88.0	97.7	98.0	- -	- -
				(14; 5.1)	(6; 6.5)	(19; 4.4)	(1; - -)		
2000	M	65.5	72.4	82.8	86.1	109.0	101.0	- -	- -
		(4; 9.6)	(14; 3.5)	(60; 6.8)	(27; 5.9)	5 (2; 2.1)	0 (11; 8.5)		
2000	F	72.0	- -	87.5	87.8	92.1	94.3	- -	- -
		(1; - -)		(146; 4.7)	(32; 5.9)	(19; 6.1)	(29; 4.4)		
1999	M	68.0	69.6	81.6	85.2	102.0	97.7	84.0	- -
		(73; 7.0)	(18; 6.3)	(30; 9.6)	(37; 5.9)	0 (6; 5.1)	(3; 2.1)	(1; - -)	
1999	F	74.1	66.5	85.5	84.7	89.3	96.0	- -	- -
		(20; 6.1)	(2; 0.7)	(41; 4.7)	(52; 5.8)	(3; 9.5)	(13; 4.0)		
1998	M	67.3	66.1	81.4	89.3	96.0	102.0	- -	- -
		(9; 4.5)	(9; 3.9)	(5; 11.9)	(10; 6.2)	(3; 7.5)	5 (4; 6.0)		
1998	F	- -	- -	83.3	85.2	93.8	98.0	- -	- -
				(4; 5.6)	(13; 7.4)	(6; 5.8)	(1; - -)		

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5		Age-6	
		H	W	H	W	H	W	H	W
				Wells summer Chinook salmon-subyearling migrants (continued)					
1997	M	- -	- -	90.0	96.8	- -	101.0	- -	- -
				(1; - -)	(4; 8.4)		5 (2; 3.5)		
1997	F	- -	- -	85.0	87.7	- -	100.0	- -	- -
				(1; - -)	(6; 6.0)		4 (5; 4.7)		
1996	M	59.0	68.3	80.0	82.8	- -	103.0	- -	- -
		(1; - -)	(6; 2.7)	(1; - -)	(12; 8.5)		4 (46; 5.9)		
1996	F	- -	- -	- -	87.3	92.0	94.5	- -	- -
					(16; 5.2)	(1; - -)	(6; 4.7)		
1995	M		69.5	- -	90.1	104.0	99.7	- -	101.5
			(11; 5.8)		(8; 8.0)	5 (2; 2.1)	(12; 7.8)		(2; 2.1)
1995	F	72.0	63.0	- -	92.9	97.8	96.2	- -	99.0
		(1; - -)	(1; - -)		(8; 6.3)	(4; 4.1)	(102; 4.6)		(1; - -)
1994	M	- -	- -	75.0	87.3	89.5	- -	- -	- -
				(2; 8.5)	(7; 8.4)	(4; 11.3)			
1994	F	- -	- -	78.0	86.0	92.0	95.4	- -	- -
				(1; - -)	(6; 5.7)	(1; - -)	(27; 4.8)		

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5	
		H	W	H	W	H	W
				Methow Composite spring Chinook salmon			
2005	M	52.1 (28; 3.9)	- -	72.3 (74; 7.0)	- -	- -	- -
2005	F	- -	- -	74.3 (98; 4.4)	71.0 (2; 2.8)	81.0 (1; - -)	- -
2004	M	48.3 (85; 3.3)	- -	72.0 (52; 6.9)	- -	- -	- -
2004	F	- -	- -	73.4 (144; 3.6)	75.0 (1; - -)	76.0 (1; - -)	- -
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	52.1 (26; 4.1)	- -	73.3 (39; 5.9)	- -	- -	- -
2000	F	- -	- -	74.5 (74; 3.4)	- -	- -	- -
1999	M	52.0 (12; 4.8)	- -	74.6 (14; 3.4)	76.4 (14; 4.8)	- -	100.0 (2; 9.9)
1999	F	- -	- -	78.0 (27; 3.1)	77.6 (13; 5.1)	- -	86.5 (4; 6.6)
1998	M	54.0 (8; 3.4)	52.0 (2; 7.1)	79.0 (1; - -)	74.9 (12; 5.5)	94.0 (20; 4.5)	92.7 (11; 8.8)
1998	F	- -	- -	76.3 (8; 3.7)	76.1 (27; 3.5)	87.2 (22; 4.1)	89.0 (41; 6.2)
				Twisp spring Chinook salmon			
2005	M	49.6 (10; 1.8)	- -	- -	82.0 (1; - -)	- -	- -
2005	F	- -	- -	- -	81.0 (4; 8.0)	- -	88.5 (2; 3.5)
2004	M	49.0 (1; - -)	45.7 (3; 2.3)	72.2 (6; 9.0)	71.6 (21; 7.0)	- -	- -
2004	F	- -	- -	73.0 (16; 3.5)	75.8 (20; 5.6)	- -	- -
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	52.0 (1; - -)	45.0 (1; - -)	71.0 (22; 11.2)	- -	- -	98.0 (2; 1.4)
2000	F	- -	- -	75.1 (38; 3.6)	- -	- -	91.0 (3; 1)
1999	M	50.8 (22; 3.4)	- -	- -	- -	- -	- -
1999	F	- -	- -	- -	78.5 (13; 3.1)	- -	89.3 (3; 2.1)
1998	M	- -	- -	79.5 (2; 0.7)	- -	87.0 (1; - -)	- -
1998	F	- -	- -	77.0 (2; 1.4)	- -	90.5 (2; 2.1)	- -
				Chewuch spring Chinook salmon[a]			
1997	M	- -	- -	76.5 (21; 5.7)	- -	- -	- -
1997	F	- -	- -	76.6 (28; 2.8)	- -	- -	- -
1996	M	54.0 (1; - -)	- -	88.0 (1; - -)	- -	- -	- -
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				
2006	60.3	65.2	75.6	77.4	59.7	61.4	70.9	72.7
	(98; 3.3)	(21; 4.5)	(58; 4)	(16; 3.5)	(22; 4.3)	(8; 4.9)	(123; 4.2)	(42; 3.3)
2005	60.4	62.1	74.0	75.6	59.4	62.5	71.8	73.4
	(93; 3.2)	(15; 3.2)	(53; 3.2)	(9; 2.5)	(31; 2.4)	(15; 2.5)	(138; 3.5)	(27; 4.1)
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)

[a] Methow Composite spring Chinook salmon after 1997.

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 salmon				
2005	- -	3,729 (14; 677)	3,592 (4; 756)	4,264 (63; 694)	4,502 (2; 49)	5,459 (3; 1,029)	4,193 (86; 763)
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 salmon				
2005	- -	- -	4,216 (4; 641)	- -	4,745 (2; 123)	- -	4,393 (6; 569)
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)	4,720 (7; 558)	4,941 (1; - -)	4,469 (1; - -)	- -	4,369 (16; 657)
2000	- -	3,820 (38; 698)	- -	- -	5,292 (3; 997)	- -	3,927 (41; 807)
			Methow Composite spring Chinook salmon				
2005	- -	3,475 (98; 809)	3,823 (2; 482)	3,261 (1; - -)	- -	- -	3,480 (101; 800)
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)	- -	- -	3,884 (130; 679)
2001	- -	3,949 (89; 762)	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			
2006	- -	4,652 (13; 815)	4,203 (7; 189)	6,858 (80; 1,538)	6,397 (35; 1,205)	- -	6,387 (135; 1,580)
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 salmon broodstocks by category. The value listed within each category is the percent of the total number of female Chinook salmon sampled within each brood, excluding captive brood and non-viable females.

Brood	Below-low	Low	Med	High	Total
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	number
		Wells summer Chinook salmon			
2005	98.9	0.5	0.0	0.5	190
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 Composite spring Chinook salmon			
2005	87.1	7.9	0.0	4.9	101
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	74.3	7.9	2.0	15.8	101
		Methow spring Chinook salmon			
1997	25.5	59.1	15.4	0.0	110
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 salmon			
2005	83.3	16.6	0.0	0.0	6
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	75.0	25.0	0.0	0.0	4
1997	33.3	50.0	16.7	0.0	6
1996	68.2	18.2	4.5	9.1	22

Appendix E, continued.

Brood	Below-low <0.099	Low 0.099 - 0.199	Med 0.20 - 0.449	High > 0.450	Total number
		Twisp spring Chinook salmon			
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
		Chewuch spring Chinook salmon			
1997	29.6	33.3	33.3	3.7	27
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 salmon 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 salmon yearling					
2005	96.8	98.9	87.5	100.0	99.2	99.0	92.0	- -	80.5
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 salmon subyearling					
2005	- -	- -	87.1	100.0	82.7	82.4	82.2	- -	71.6
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					
2006	95.2	93.3	86.6	99.5	92.7	89.8	80.4	- -	69.3
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 Composite spring Chinook salmon					
2005	99.0	99.1	96.9	96.9	99.6	99.5	90.4	99.6	87.7
2004	98.1	99.3	94.8	96.2	99.2	99.2	96.6	99.8	84.6
2003	94.1	95.6	90.0	100.0	98.8	98.3	93.0	99.8	77.9
2002	97.7	95.7	96.0	100.0	98.6	98.6	96.5	98.5	92.7
2001	98.1	95.8	93.2	100.0	99.3	99.1	97.0	99.8	90.8
2000	96.1	97.2	96.5	100.0	99.6	99.4	99.0	99.9	92.7
1999	96.0	96.3	95.4	100.0	99.5	99.5	99.2	- -	94.6
				Twisp spring Chinook salmon					
2005	100.0	100.0	95.7	98.2	99.6	99.5	99.2	99.9	93.2
2004	97.3	87.9	95.4	97.8	99.1	98.8	78.7	99.5	73.3
2003	100.0	88.9	91.8	99.8	99.2	98.6	95.9	100.0	86.4
2002	100.0	77.8	97.9	100.0	99.3	99.1	98.5	99.9	96.4
2001	94.4	94.3	90.1	100.0	98.8	95.2	90.1	100.0	81.2
2000	96.9	93.8	97.1	100.0	99.6	99.5	48.0	23.9	46.6
1999	100.0	95.7	94.2	100.0	99.5	99.5	98.0	99.7	92.3

Appendix G. Annual releases by program from Wells Complex Hatchery facilities. All Wells summer Chinook salmon were released into the Columbia River directly adjacent to Wells Hatchery.

Brood	Wells Hatchery steelhead						Wells summer Chinook salmon		
	Methow	Twisp	Chewuch	Okanogan	Columbia R.	Total	Subyearling	Yearling	Total
			Wells Hatchery steelhead						
2006	96,219	111,770	107,545	135,547	- -	451,081	396,538	- -	396,538
2005	99,820	107,245	119,500	146,826	- -	473,391	430,203	333,587	763,790
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 salmon						
2005	156,633	27,658	232,811	- -	- -	417,102			
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 salmon releases include high ELISA (HE) progeny. Mixed releases were those where a single tag code 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 salmon						
2005	Subyearling	12-May-06	0	Ad-clip	633298	200,461	4,509	0.978	204,970
2005	Subyearling	14-Jun-06	0	Ad-clip	633299	223,048	2,185	0.9903	225,233
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	0.992	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	0	1	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	04-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	0.978	237,446
1996	Subyearling	18-Jun-97	0	Ad-clip	636323	230,381	5,173	0.978	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
2005	Yearling	23-Apr-07	137	Ad-clip	633596	322,445	11,142	0.9666	333,587
2004	Yearling	21-Apr-06	137	Ad-clip	632799	147,802	8,288	0.9469	156,090
2004	Yearling	22-Apr-06	137	Ad-clip	632864	148,559	8,331	0.9468	156,890
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	0.978	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	01-Apr-97	166	Ad-clip	634129	187,847	3,153	0.9835	191,000
1995	Yearling	01-Apr-97	166	Ad-clip	634130	96,720	2,280	0.977	99,000
1994	Yearling	01-Apr-96	166	Ad-clip	635324	109,034	7,966	0.9319	117,000
1994	Yearling	01-Apr-96	166	Ad-clip	635838	242,786	5,214	0.979	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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
				Chewuch River spring Chinook salmon					
2005	MC Chewuch	16-Apr-07	27	None	633294	230,716	2,095	0.991	232,811
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
2001	MC Chewuch	21-Apr-03	26	None	631440	94,977	1,329	0.986	96,306
2000	MC Mixed	16-Apr-02	18	None	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	0.99	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	0.99	2,536
1992	Chewuch	18-Apr-94	3	Ad-clip	634848	4,148	- -	1	4,148
1992	Chewuch	18-Apr-94	3	Ad-clip	634850	4,432	43	0.99	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	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	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 salmon					
2005	MC Methow	16-Apr-07	153	None	633395	143,571	1,362	0.991	144,933
2005	MC Methow HE	16-Apr-07	153	None	633281	11,367	333	0.972	11,700
2004	MC Methow	18-Apr-06	169	None	631187	63,270	1,876	0.971	65,146
2004	MC Methow	18-Apr-06	169	None	632694	42,252	- -	1	42,252
2003	MC Methow	18-Apr-05	169	None	632568	46,521	2,310	0.953	48,831
2002	MC Methow	02-Apr-04	7	None	631524	35,075	694	0.981	35,769
2002	MC Methow	14-Apr-04	42	None	631891	142,804	2,662	0.982	145,466
2001	MC Methow	21-Apr-03	82	None	630976	49,960	312	0.994	50,272
2001	MC Methow	21-Apr-03	82	None	631179	32,152	4,080	0.887	36,232

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
2001	MC Methow	21-Apr-03	82	None	631477	43,273	1,110	0.975	44,383
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
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 salmon						
2005	Twisp	16-Apr-07	34	None	633483	26,552	1,106	0.96	27,658
2004	Twisp	18-Apr-06	27	None	631508	3,643	0	1	3,643
2004	Captive HE	22-Apr-06	4	None	632878	69,717	1,744	0.976	71,461
2004	Twisp HE	22-Apr-05	0	None	632988	24,380	620	0.975	25,000
2003	Twisp	18-Apr-05	35	None	632567	42,750	984	0.978	43,734
2003	Captive and HE	25-Apr-05	2	None	632499	44,660	2,114	0.955	46,774
2003	Captive and HE	25-Apr-05	2	None	632564	35,390	1,675	0.955	37,065
2003	Captive and HE	25-Apr-05	2	None	632565	8,999	426	0.955	9,425
2002	Twisp	13-Apr-04	27	None	631582	20,377	164	0.992	20,541
2002	Twisp Captive	13-Apr-04	28	None	631076	11,876	517	0.958	12,393
2002	Twisp Captive	13-Apr-04	28	None	631077	10,088	439	0.958	10,527
2002	Twisp Captive	13-Apr-04	28	None	631694	8,504	308	0.965	8,812
2002	Twisp Captive	13-Apr-04	0	None	631695	5,599	202	0.965	5,801
2001	Twisp	21-Apr-03	27	None	631478	50,454	1,198	0.977	51,652
2001	Twisp Captive	21-Apr-03	27	None	631068	5,656	163	0.972	5,819
2000	Twisp Captive	23-Apr-02	0	None	630994	978	9	0.991	987
2000	Twisp	15-Apr-02	20	None	630182	74,045	672	0.991	74,717
1999	Twisp	17-Apr-01	36	Ad-clip	630378	28,808	589	0.98	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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
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	0.99	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
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 salmon				
2005	154.9	13.4	8.6	42.1	10.6	25.1	10.7
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 salmon				
2005	108.5	7.4	6.8	14.3	3.6	25.3	31.7
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				
2006	180.6	21.9	12.1	65.7	22.3	33.8	6.9
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				
2006	181.5	20.4	11.2	68.8	23.1	33.1	6.5
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 salmon				
2005	139.0	10.0	7.2	33.9	7.8	22.9	13.0
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 salmon				
2005	130.8	13.9	10.6	27.4	9.3	34.1	17.0
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 salmon				
2005	126.0	15.3	12.2	24.7	10.2	41.1	18.0
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

All stocks of salmon and steelhead covered in this report were subject to commercial, sport, or tribal fisheries in ocean and/or freshwater environments. Based on analysis of coded-wire tag data, most Wells summer Chinook salmon adults were recovered in fisheries, while most Methow spring Chinook salmon stocks were recovered in hatchery broodstocks or on spawning grounds. Unlike earlier hatchery releases, recent releases of Methow spring Chinook salmon have not been adipose fin-clipped, which may result in a decrease in harvest rates and an increase in recoveries of coded-wire tagged fish on the spawning grounds. Harvest of adult hatchery steelhead occurring in the upper Columbia River ESU was monitored through local creel census. An estimated 1,612 hatchery and 17 wild steelhead were lethally removed from the 2006 brood of returning adults through sport fisheries. Overall, Wells Complex hatchery fish provided commercial, recreational, and limited tribal harvest, while meeting broodstock and spawning ground requirements.

Introduction

Wells Complex hatchery facilities funded by Douglas County Public Utility District 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 salmon; Methow and Okanogan summer steelhead) or to produce fish for commercial and recreational harvest (Wells summer Chinook salmon). 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.

- Ho: Stray rate $_{\text{Hatchery fish}} \geq 5\%$ of total brood return
- Ho: Stray hatchery fish $\geq 5\%$ of spawning escapement (based on run year) within other independent populations
- Ho: Stray hatchery fish $\geq 10\%$ of spawning escapement (based on run year) of any non-target streams within independent population

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Wells Chinook salmon).

- Ho: Harvest rate $\leq$ Maximum level to meet program goals
- Ho: Escapement $\leq$ Maximum level to meet supplementation 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 salmon stocks, an adipose fin clip typically identifies the presence of a coded-wire tag (CWT). Because fish released for supplementation purposes are intended to contribute to natural spawning populations and therefore aid in ESA recovery efforts, many of the steelhead and spring Chinook from Wells Complex hatcheries are marked with only a CWT or visual-implant elastomer. Leaving the adipose fin intact on these fish is designed to minimize fishery extraction. When the return of hatchery fish is greater than that needed to meet broodstock and spawning escapement objectives, fisheries may target the adipose fin-clipped portion of an ESA listed population (i.e., selective) to decrease the number of hatchery origin fish on the spawning grounds (e.g., Wells summer steelhead) or they may target both hatchery and wild origin fish (i.e., non-selective) of non-ESA listed populations (e.g., summer Chinook salmon).

Local Chinook salmon fisheries target non-listed summer Chinook salmon and are temporally and spatially designed to avoid impacting ESA-listed spring Chinook salmon. Through the use of CWT recovery data, the effectiveness of this segregation can be assessed. 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.

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 most river basins for all Chinook salmon stocks. 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 salmon 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.

Methods

Hatchery Chinook salmon

Fishery extraction and natural escapement rates of hatchery Chinook salmon, whether adipose fin-clipped or not, were calculated from CWT data available within the RMIS database. The RMIS database reports the number of fish observed and estimated for each type of recovery category. 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.

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 salmon in the Chewuch River were accomplished with a composite of Methow and Chewuch stocks or Methow Composite that were not uniquely tagged by release site. Thus, returning adults from these broods could not be identified by release site.

Wells summer Chinook salmon 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 salmon

All of the spring Chinook salmon broods covered in this chapter were subject to sport, commercial, or tribal fisheries. Prior to 2001, these fisheries were able to retain spring Chinook salmon 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 salmon (i.e., selective). Since 2002, both non-tribal sport and commercial fisheries in the Columbia River were conducted as selective fisheries. Because non-selective fisheries (i.e., tribal and ocean) retain spring Chinook salmon 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 population. 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 though the retention of wild fish is not allowed, selective fisheries impact wild fish through indirect mortality. To estimate this mortality, the proportion of hatchery fish harvested was multiplied by the indirect mortality rate calculated for specific fishery types. Indirect mortality rates for selective fisheries have been determined for Columbia River selective fisheries (Cindy Lafleur, WDFW, personal communication; 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 salmon Sport Fishery

A non-selective sport fishery on summer Chinook salmon 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 summer Chinook salmon.

2) Estimate rates of incidental catch and release of steelhead, Coho and sockeye salmon.

3) Help evaluate the success of Chelan PUD summer Chinook salmon mitigation efforts.

We used a two-stage non-uniform probability sampling as described in Creel Information from Sport Fisheries, WDFW Methods Manual (Hahn et al.1993). 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 salmon 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 requirements for abundance and genetic composition before a local fishery 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 roving creel census methodologies described by Malvestudo (1978). An estimated hooking mortality rate of 5% 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 salmon

Fishery contribution rates for individual brood years were combined for hatchery spring (1992 – 2001) and summer Chinook salmon (1992 – 2000). Most hatchery Chinook salmon from these broods, regardless of race, were adipose fin clipped and CWT prior to release (Chapter 1). The 2000 and 2001 spring Chinook broods were released with a coded-wire tag, but were not adipose fin-clipped. Thus, most fish intended for supplementation did not receive any protection from fishery retention afforded by selective fisheries until the 2000 brood. Mark rates for the years examined ranged from 88% to 100% for spring Chinook salmon and from 63% to 100% for summer Chinook salmon. Hatchery Chinook salmon stocks were recovered in fishery categories at different rates depending on race. For the current brood examined, summer Chinook salmon were primarily recovered in fisheries, while spring Chinook salmon were primarily recovered as broodstock or on spawning grounds (Table 3). Because spring Chinook of the 2001 brood were not adipose fin clipped, few of these fish were recovered in fisheries. However, indirect mortality, estimated from a surrogate stock (2001 brood Leavenworth NFH), did impact these stocks, primarily in freshwater selective sport fisheries. For the broods examined, spring Chinook salmon released into the Twisp River contributed to fisheries at a much lower rate than

other spring Chinook salmon stocks, and subsequently contributed to spawning ground recoveries at a much higher rate (Table 4; Appendix B).

Table 3. Percent of hatchery Chinook recoveries by race and recovery location for 2001 brood-year spring Chinook and 2000 brood-year summer Chinook. Recoveries are expanded by mark rate and sample rate for each category and adjusted for indirect mortality associated with selective fisheries.

Recovery category	Methow spring	Twisp spring	Chewuch spring	Wells summer-year	Wells summer-sub
Total recoveries (*N*)	521	44	738	7,917	185
Broodstock target stream	39.3	4.5	2.0	27.7	34.1
Broodstock non-target stream	16.1	0.0	6.2	0.0	0.5
Broodstock from Wells Dam	1.0	2.3	0.3	- -	- -
Spawning ground target stream	34.9	75.0	43.8	NA	NA
Spawning ground non-target stream	4.4	15.9	43.5	4.4	4.3
Ocean fishery-commercial	0.2	0.0	0.1	42.0	41.6
Ocean fishery-sport	0.0	0.0	0.0	6.4	5.4
Ocean fishery-tribal	0.0	0.0	0.0	1.7	1.1
Freshwater fishery-commercial	1.0	0.0	0.9	6.0	10.3
Freshwater fishery-sport	3.1	2.3	3.1	12.2	2.7
Freshwater fishery-tribal	0.0	0.0	0.0	0.4	0.0

Adult returns of hatchery summer Chinook salmon were great enough to provided fish for broodstock and harvest. Harvest of summer Chinook salmon occurred primarily in ocean fisheries and yearling releases provided 94.3% of all recoveries of summer Chinook salmon. Because Wells summer Chinook salmon are a production stock, no target stream was designated. Consequently, all spawning ground recoveries were considered to be in non-target areas. Because of this designation, greater than 5% of the total brood returns for the 1992 – 2000 broods have been to non-target areas (Figure 1; Appendix C1).

Summer Chinook salmon 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 salmon were inversely correlated with distance from Wells Hatchery (Figure 2; Appendix C2), and were seldom greater than 10% of other independent spawning populations in the Upper Columbia ESU (Wenatchee, Methow, and Okanogan). The highest proportion of Wells summer Chinook salmon are consistently recovered in the Chelan River, which is currently not identified as a summer Chinook salmon population.

Table 4. Percent of total hatchery Chinook recoveries by race and recovery location. Methow spring Chinook includes the 1993 – 1997, 1999, and 2001 broods. Twisp spring Chinook include the 1992 – 2001 broods; and Chewuch spring Chinook include the 1992 –1997, and 2001 broods. Summer Chinook include the 1992 –2000 broods. Recoveries are expanded by mark rate and sample rate for each category and adjusted for indirect mortality associated with selective fisheries.

Recovery category	Methow spring	Twisp spring	Chewuch spring	Wells summer Chinook	
				Yearling	Subyearling
Total recoveries (*N*)	2,426	694	1,256	36,811	2,209
Broodstock target stream	43.3	7.9	5.5	20.1	27.0
Broodstock non-target stream	0.0	16.7	10.0	1.6	1.5
Broodstock from Wells Dam	13.0	12.6	12.0	- -	- -
Spawning ground target stream	19.1	41.0	26.7	NA	NA
Spawning ground non-target stream	1.6	13.0	28.3	8.8	8.6
Ocean fishery-commercial	0.3	0.1	0.6	49.8	47.0
Ocean fishery-sport	0.0	0.0	0.0	9.1	6.6
Ocean fishery-tribal	0.0	0.0	0.0	1.8	1.1
Freshwater fishery-commercial	12.0	6.3	2.9	2.6	3.3
Freshwater fishery-sport	9.7	5.1	13.3	5.7	4.4
Freshwater fishery-tribal	1.1	1.0	0.7	0.6	0.5

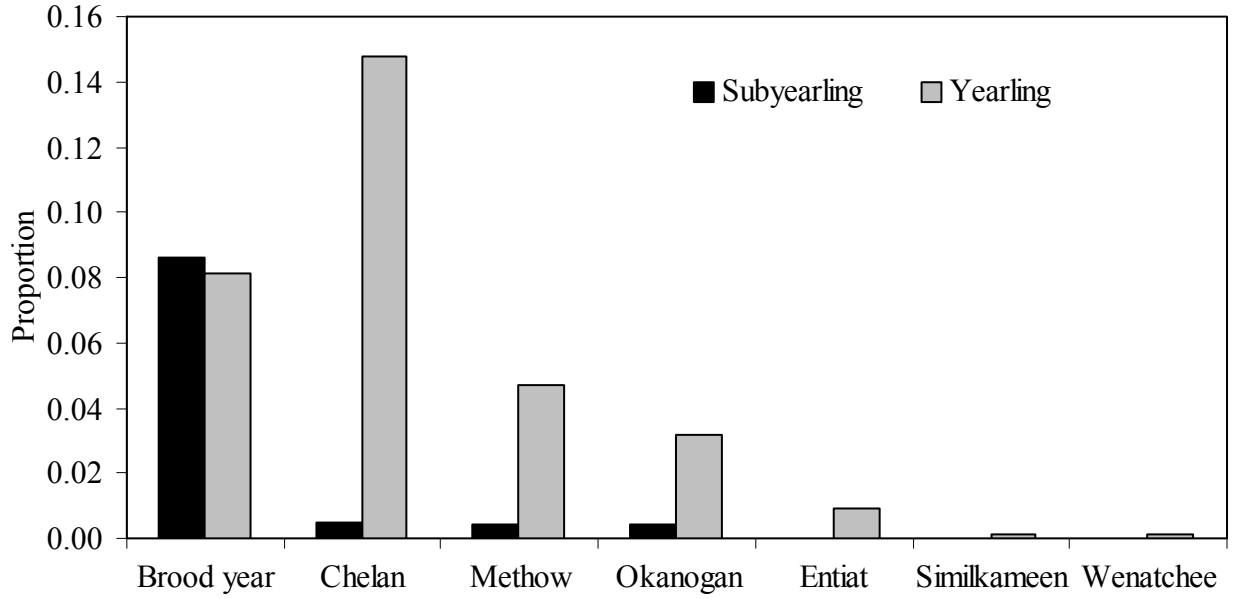


Figure 1. Mean proportion of Wells summer Chinook salmon hatchery adults from yearling (1992-2000 broods) and subyearling (1995-2000 broods) programs that strayed and the proportion of the spawning escapement composed of Wells summer Chinook salmon recovered in spawning areas within the Upper Columbia River ESU (1997-2006).

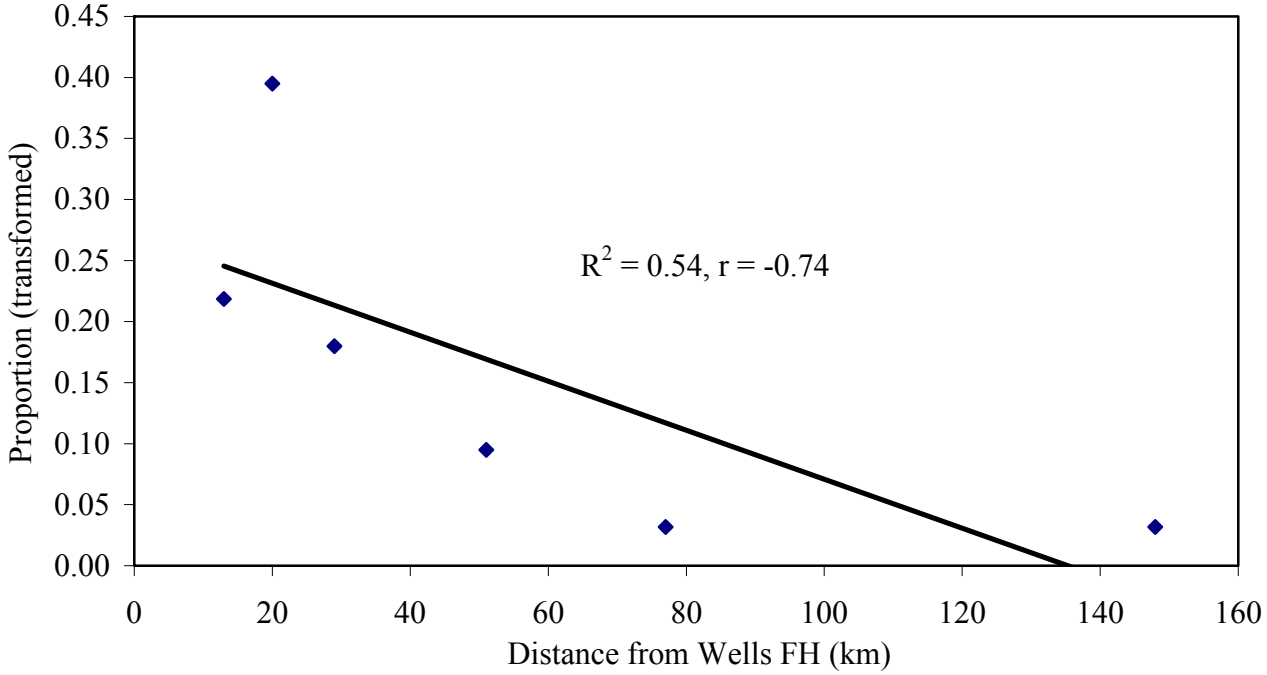


Figure 2. Relationship between the proportion of Wells summer Chinook salmon (yearling program) found on the spawning grounds and the distance from Wells Hatchery.

Most spring Chinook salmon hatchery releases covered in this chapter occurred prior to ESA-listing of the species in the upper Columbia ESU and were marked with an adipose-fin clip and a CWT. This marking combination did not allow upper Columbia ESU spring Chinook salmon to be exempted from selective fisheries that target hatchery fish based on the absence of an adipose fin. The 2000 brood was the first spring Chinook release covered in this report in which the adipose fin was not clipped, resulting in a decrease in the overall percent of spring Chinook recovered in fisheries from 26.7% (1992 – 1999 broods) to 20.2% (1992 – 2001 broods).

Wild Chinook salmon

Because Wells Hatchery summer Chinook are a production program with no reciprocal wild stock, no harvest estimate of wild summer Chinook was appropriate. Harvest of wild spring Chinook was estimated for the Methow River basin using Leavenworth National Fish Hatchery (LNFH) as a surrogate for brood years prior to 1996, and for 2001 because hatchery releases from Methow Hatchery (MH) included too few fish, or did not include enough adipose fin-clipped fish. Harvest of 2000 brood wild Chinook was estimated using Chiwawa stock Chinook. The percent of wild fish harvested from the 1992 – 2001 broods ranged from 2.09% to 22.0% (Table 5).

Based on the harvest rates of local hatchery stocks, an estimated 644 wild fish were harvested from the 1992 – 2001 broods (Table 6). Because the 2001 brood hatchery fish were not adipose fin-clipped, the harvest rate of hatchery and wild fish was considered equal. When adipose fin-clipped hatchery fish were used as surrogates (i.e., 1996-1999 broods), recoveries of hatchery fish were expanded by fishery-specific mortality rates. The 1997 brood provided the majority of wild fish harvested (81.3%). 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 salmon selective (S) and non-selective (NS) fisheries by brood year. Harvest rate is based on harvest of local hatchery stocks determined through CWT analysis (LNFH = Leavenworth NFH; MF = Methow Hatchery).

Brood	Fishery exposure 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	2.09	Chiwawa
2001	S	S	S	S	S	S	NS	NS	NS	4.38	LNFH

Table 6. Total wild adult return and number of wild spring Chinook salmon harvested by population and brood year.

Brood	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
2001	491	2	395	2	404	2	76	0	1,366	6
Total	1,532	110	1,935	207	2,064	303	255	24	5,786	644

Summer Chinook salmon Sport Fishery

Creel surveys have been conducted during the summer Chinook salmon sport fishery since 2004 and have generally increased in scope over time to ensure all river sections are surveyed. The greatest number of Chinook salmon harvested has been in the upper river sections (Table 7). Coded-wire tag analysis from the 2007 fishery is currently not available (Appendix A).

Table 7. Summary of creel surveys conducted during summer Chinook salmon 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
2007	545	32,491	1,774	204	13
	543	18,894	1,255	0	20
	541	8,149	132	0	0
	539	736	0	0	0
	627/629	697	29	0	0
	Total	60,967	3,190	204	33

Summer Steelhead

Upper Columbia River steelhead return during the summer/fall and overwinter prior to spawning the following spring; the brood year. Thus, the typical steelhead fishery period occurring between October and March encompasses two calendar years, but targets adult fish from a single

brood year. Steelhead returns met the abundance and composition requirements necessary to conduct local sport fisheries targeting the 2002 – 2007 broods of returning adults. Creel census estimated 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 CPUE for these areas has decreased over time, likely 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, or after collection has ended. Because local steelhead fisheries were based on local escapement objectives (i.e., above Priest Rapids Dam), all hatchery fish removed were considered excess fish appropriate for harvest. In most 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 closure of the fishery due to impact levels (i.e., indirect mortality) of wild fish being reached.

Table 8. Total number of steelhead removed in upper Columbia River sport fisheries by fishery location and brood (H = hatchery, W = wild). 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
2007[a]	- -	- -	- -	- -	- -	- -	- -	- -	- -	523	2	0.093	523	2	0.093
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[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	694	73	0.167

[a] Fishery occurred in Columbia River only.

[b] Fishery occurred in Okanogan and Similkameen rivers only. Data reflects the total number of fish captured, including those released.

Discussion

Wells summer Chinook salmon are an appropriate stock for commercial and recreational fisheries to target during years of high abundance. For the years examined, the majority of adult 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 mature, the exploitation rate of hatchery summer Chinook salmon in freshwater areas should 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. Most spring Chinook salmon broods examined in this chapter were adipose fin clipped prior to release, thus many of the returning adults (> 18%) were harvested in fisheries (i.e., primarily Columbia River). To protect these fish from exploitation, recent releases of Methow spring Chinook

salmon have not been adipose fin-clipped, which resulted in a dramatic decrease in harvest rates and an increase in spawning ground recoveries.

Stray rates of Twisp and Chewuch hatchery spring Chinook salmon 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, but longer acclimation at the current facilities may not be possible without acquisition of ground water to prevent freezing in the ponds.

For the brood years examined, an estimated 3.3 million subyearling and 3.2 million yearling summer Chinook salmon were released. Despite similar release numbers, yearling fish returned approximately 16 adults for each adult returned from subyearling releases. Yearling Chinook salmon were larger at release, 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.

References

Hahn P., Zeylmaker S. and S. Bonar. 1993. Creel information from sport fisheries, WDFW methods manual. Washington Department of Fish and Wildlife 600 Capitol Way North Olympia Washington 98501-1091.

Malvesto, S.P. 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 salmon spawning ground surveys. Memorandum dated 19 January 2006 to HCP Hatchery Committee members.

Appendix A

2007 Columbia River Summer Chinook salmon Sport Fishery Creel Survey

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Fish Program - Region 2 - Wenatchee District Office
3860 Chelan Highway Wenatchee, WA 98801 - (509) 665-3337

February 2008

2007 Columbia River Summer Chinook salmon Sport Fishery Creel Survey Methods, Results and Discussion

Abstract

From July 1 - October 15, 2007 the Washington Department of Fish and Wildlife (WDFW) managed a summer Chinook salmon sport fishery in the Columbia River from Priest Rapids Dam up-river to Wells Dam. The Okanogan River and the lower Similkameen River were also opened for Chinook salmon fishing July 14 through Sept 30, 2007. Criteria used to determine if a summer Chinook salmon season was warranted for 2007 is described in the Draft WDFW Harvest Framework for Non-treaty Fisheries directed at Salmonids originating above Priest Rapids Dam (April 2006).

We conducted a creel survey using a two-stage non-uniform probability method of sampling as described in Creel Information from Sport Fisheries, WDFW Methods Manual (Hahn et al. 1993) to estimate sport harvest of summer Chinook salmon, incidental catch and release of steelhead, Coho and sockeye salmon and to help evaluate the success of Chelan Public Utility District (PUD) summer Chinook salmon mitigation efforts.

We estimate that during the entire 2007 season in all upper Columbia waters open to angling for summer Chinook salmon 18,673 anglers fished 73,280 hours and harvested 3,929 - summer Chinook salmon. Anglers incidentally caught and released 32 steelhead and 204 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.

Methods

Season descriptions

Criteria used to determine if a summer Chinook salmon 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 2007 predicted Columbia River run size of summer Chinook salmon satisfied those criteria. The Columbia River sections and WDFW River (codes) open to angling that were sampled = Priest Rapids Dam – Wanapum Dam, (537), Wanapum

Dam – Rock Island Dam (539), Rock Island Dam – Rocky Reach Dam (541), Rocky Reach Dam to Wells Dam (543) and Wells Dam to Chief Joseph Dam (545).

The Okanogan River (627) and the lower Similkameen River (629) were also opened for Chinook salmon fishing from July 14 through Sept 30. Angling was allowed on the Okanogan River from the Highway 97 Bridge near the mouth to the Highway 97 Bridge just south of Oroville and in the Similkameen River from the mouth upstream to the county road bridge in Oroville.

Angling regulations for the sections of the Columbia River open to angling was a limit of six Chinook salmon salmon, no more than two adults. All steelhead, coho and sockeye must be released. Plus a non-buoyant lure restriction was in effect for all species. Complete descriptions of the Columbia River 2007 fishing regulations are on page 77 of the 2007/2008 WDFW Sport Fishing Rules.

Angling regulations for the sections of the Okanogan and Similkameen rivers open to angling were the same as those for the Columbia River except the regulations for these rivers included a night closure. Complete fishing regulations for the Okanogan and Similkameen rivers are in appendix B of this report.

Surveys

We used a two-stage non-uniform probability sampling as described in Creel Information from Sport Fisheries, WDFW Methods Manual (Hahn et. al.1993). This method minimizes some of the problems associated with sampling large rivers containing disproportional angler effort per river section. 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 salmon 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 summer Chinook salmon.

2) Estimate incidental catch and release of steelhead, Coho and sockeye salmon.

3) Help evaluate the success of Chelan PUD summer Chinook salmon mitigation efforts.

It is assumed that the survey will also provide other information that will assist us.

Personnel:

This effort requires at least four Scientific Technicians at the 2 level working from July 1 – October 15.

2007 Schedule:	Action:
Prior to July 1	Create a creel survey database.
Prior July 1	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 2007 – January 2008	Statistical analysis of data
February 2008	Write the report.

Results

We estimate that during the entire 2007 season in all upper Columbia waters open to angling 18,673 anglers fished 73,280 hours and harvested 3,929 - summer Chinook salmon. Anglers incidentally caught and released 32 steelhead and 204 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, tables 1 and 2.

Upper Columbia River:

We estimate that during the entire 2007 summer Chinook salmon season on the Columbia River 18,403 anglers fished for 72,583 hours and harvested 3,900 Chinook salmon. Thirty-two steelhead and 204 sockeye were caught and released. No Coho were encountered during the survey, Table 1.

Table 1. Season creel survey results for all sampled sections of the Columbia River.

Columbia River by Section	Actual	Estimates					
	Anglers Interviewed (Sample Rate) %	Total Anglers (95% CI)	Total Hours (95% CI)	Chinook salmon Harvested (95% CI)	Sockeye caught + Released (95% CI)	Steelhead caught + Released (95% CI)	Coho caught + Released (95% CI)
545	2,452(44.5)	5,513(305)	32,491(1,653)	1,774(113)	204(17)	13(2)	0.00
543	1,161 (13.8)	8,413(94)	18,894 (571)	1,255 (58)	0.00	20 (4)	0.00
541	357 (17.9)	1,991(173)	8,149 (705)	132 (24)	0.00	0.00	0.00
539	32(24.5)	131(15)	736(71)	0.00	0.00	0.00	0.00
537	382(16.2)	2,355(150)	12,313(747)	739(66)	0.00	0.00	0.00
Totals	4,384(23.8)	18,403(56.0)	72,583(285.1)	3,900(20.6)	204(2.2)	32(0.7)	0

Okanogan and Similkameen Rivers:

We estimate that during the entire 2007 season in the Okanogan and Similkameen Rivers 270 anglers fished for 697 hours and caught and harvested 29 Chinook salmon. No steelhead, sockeye or coho were encountered during the survey, Table 2.

Table 2. 2007 River code 627 and 629, Okanogan and Similkameen river summer Chinook salmon creel survey results.

Columbia River by Section	Actual	Estimates					
	Anglers Interviewed (Sample Rate) %	Total Anglers (95% CI)	Total Hours (95% CI)	Chinook salmon Harvested (95% CI)	Sockeye caught + Released (95% CI)	Steelhead caught + Released (95% CI)	Coho caught + Released (95% CI)
627 + 629	22 (8.1)	270 ---	697 ---	29 ---	----	----	----

Discussion

Chinook salmon Harvest:

The 3,929 summer Chinook salmon harvested in 2007 was statistically equal to the 4,009 salmon harvested in 2006, but represented 179.2% and 67.2% of the 2,192 and the 5,849 summer Chinook salmon harvested in 2005 and 2004, respectively, Table 3. Harvest has not been closely correlated with run size, but seems to be correlated with angling effort. The CPUE increased in 2007 when compared to previous years suggesting that anglers are learning and becoming more effective at catching summer Chinook salmon.

Table 3. Run size, numbers of anglers, hours fished, Chinook salmon Harvest, catch per Unit effort and the percent of the run that was harvested 2004 –2007.

	Year			
	2004	2005	2006	2007
Run size	67,060	61,227	57,236	30,664
Number of anglers	21,892	10,644	16,927	18,673
Fishing effort (hours)	90,520	43,457	80,262	73,280
Harvest	5,849	2,192	4,009	3,929
Catch per unit effort (CPUE)	0.087	0.036	0.070	0.128
% of run harvested	8.7	3.6	7.0	12.8

Endangered Species Act considerations:

The upper Columbia River summer Chinook salmon population is healthy and is not listed under the ESA. However, to minimize the incidental hooking and release of listed steelhead and spring Chinook salmon WDFW sets the dates and locations of this fishery to ensure the fewest number of ESA listed fishes are present. In 2007 we estimate that anglers incidentally caught and released only 33 steelhead.

Contribution of hatchery reared summer Chinook salmon to the sport fishery:

Snouts from 546 coded wire tagged hatchery summer Chinook salmon 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.

Appendix A: 2007 Survey results for the entire season by Columbia River section.

Table 1	*River Section*	*545*							
	Avg Ang. Day Ang.	Estimated Total Angs Total	Estimated Total Hours Total	Anglers Interviewed Anglers	Sample Rate (%)	Chinook salmon Harvest	Sockeye C&R	Steelhead C&R	Coho C&R
Avg or sum	5.96	5513.09	32491.18	2452.00	44.48	1773.51	203.56	12.57	0
Var	6.55	290789.97	8533016.31			39535.27	870.34	11.14	0
Std	2.56	539.25	2921.13			198.83	29.50	3.34	0
95%CI	1.45	305.10	1652.75			112.50	16.69	1.89	#NUM!

Table 2	*River Section*	*543*							
	Avg Ang. Day	Estimated Total Angs	Estimated Total Hours	Anglers Interviewed	Sample Rate (%)	Chinook salmon Harvest	Sockeye C&R	Steelhead C&R	Coho C&R
Avg or sum	4.58	8413.18	18893.89	1161.00	13.80	1255.18	0.00	19.89	0.00
Var	18.00	34652.42	1270912.35			13260.97	0.00	64.50	0.00
Std	4.24	186.15	1127.35			115.16	0.00	8.03	0.00
95%CI	2.15	94.20	570.51			58.28	#NUM!	4.06	#NUM!

Table 3	*River Section*	*541*							
	Avg Ang. Day	Estimated Total Angs	Estimated Total Hours	Anglers Interviewed	Sample Rate (%)	Chinook salmon Harvest	Sockeye C&R	Steelhead C&R	Coho C&R
Avg or sum	2.45	1991.05	8149.10	357.00	17.93	132.10	0.00	0.00	0.00
Var	1.38	124507.49	2064574.92			2465.52			
Std.	1.17	352.86	1436.86			49.65			
95%CI	0.58	172.90	704.05			24.33			

Table 4	*River Section*	*539*							
	Avg Ang. Day	Estimated Total Angs	Estimated Total Hours	Total Anglers Interviewed	Sample Rate (%)	Chinook salmon Harvest	Sockeye C&R	Steelhead C&R	Coho C&R
Avg or sum	3.10	130.73	735.76	32.00	24.48	0.00	0.00	0.00	0.00
Var	14.39	946.46	21019.60			0.00	0.00	0.00	0.00
Std	3.79	30.76	144.98						
95%CI	1.86	15.07	71.04						

Appendix A, continued

Table 5	*River Section*	*537*							
	Avg Ang. Day	Estimated Total Angs	Estimated Total Hours	Total Anglers Interviewed	Sample Rate (%)	Chinook salmon Harvest	Sockeye Catch/Rel	Steelhead Catch/Rel	Coho Catch/Rel
Avg or sum	5.48	2355.18	12312.86	382.00	16.22	739.06	0.00	0.00	0.00
Var	8.41	93549.51	2323065.28			18064.78			
Std	2.90	305.86	1524.16			134.41			
95%CI	1.42	149.87	746.82			65.86			

Table 6	*Columbia River Grand Totals*								
	Avg Ang. Day	Estimated Total Angs	Estimated Total Hours	Total Anglers Interviewed	Sample Rate (%)	Chinook salmon Harvest	Sockeye Catch/Rel	Steelhead Catch/Rel	Coho Catch/Rel
Avg or sum	5.48	18403.22	72582.78	4384.00	23.82	3899.85	203.56	32.47	0.00
Var	8.41	544445.86	14212588.46			73326.53	870.34	75.64	
Std	2.90	737.87	3769.96			270.79	29.50	8.70	
95%CI	1.42	55.99	286.09			20.55	2.24	0.66	

References

Hahn P., Zeylmaker S. and S. Bonar. 1993. Creel Information from Sport Fisheries, WDFW Methods Manual. Washington Department of Fish and Wildlife 600 Capitol Way North Olympia Washington 98501-1091.

Harvest Framework for Non-treaty Fisheries directed at Salmonids originating above Priest Rapids Dam, Draft (April 2006). Washington Department of Fish and Wildlife, Olympia, Washington.

Fishing Rule Change

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

600 Capitol Way North, Olympia, Washington 98501-1091

Internet Address: www.wa.gov/wdfw

July 14, 2007

Salmon Fishing Opens in the Okanogan River and Lower Similkameen River

Action 1: Open Chinook salmon fishing in the Okanogan River and the lower Similkameen River July 14th through Sept 30th

Action 2: Allow game fish, except trout, to be retained in the Okanogan River (upstream of the highway bridge in Malott) September 1st through September 30th

Effective dates: July 14th through September 30th

Species affected: Chinook salmon in the Okanogan and Similkameen Rivers and game fish in the Okanogan River

Location 1: The Okanogan River from the Highway 97 Bridge near the mouth to the Highway 97 Bridge just south of Oroville

Location 2: The Similkameen River from the mouth upstream to the county road bridge in Oroville

Reason for action: The upper Columbia River summer Chinook salmon return is close to the ten year average at Rocky Reach Dam as of July 2nd. The stocks are stable and not listed under the ESA.

Other information: Daily limit is six Chinook salmon, no more than two adults. All Coho and sockeye must be released. **Non-buoyant lure restriction and night closure are in effect for all species.**

RELEASE ALL SALMON WITH COLORED ANCHOR TAG

Information contact: Bob Jateff, District Fish Biologist, Omak (509) 826-7341.

# # #

Appendix B. Coded-wire tag recoveries from the RMIS database by broodyear and stock expanded by sample rate and tag rate. Fishery categories include commercial (C), sport (S), and tribal (T) recoveries.

Brood	Broodstock			Spawning ground		Ocean fishery			Freshwater fishery			Total
	Target	Non-target	Wells	Target	Non-target	C	S	T	C	S	T	
Wells summer Chinook salmon yearling												
1992	359	9	- -	NA	40	81	37	6	0	4	16	552
1993	1,141	346	- -	NA	56	645	54	2	14	16	50	2,324
1994	89	5	- -	NA	2	30	6	0	0	0	9	141
1995	392	23	- -	NA	183	332	122	19	22	44	5	1,142
1996	501	28	- -	NA	308	593	182	6	2	32	0	1,652
1997	1,412	132	- -	NA	1,733	5,757	1,102	308	118	317	61	10,940
1998	1,192	42	- -	NA	500	6,736	1,191	141	230	474	39	10,545
1999	126	15	- -	NA	55	818	147	50	96	231	6	1,544
2000	2,190	1	- -	NA	345	3,325	503	133	472	968	34	7,971
Wells summer Chinook salmon subyearling												
1993	19	2	- -	NA	0	15	0	0	3	0	0	39
1994	9	0	- -	NA	0	3	0	0	0	0	3	15
1995	62	4	- -	NA	2	42	6	6	3	1	0	126
1996	267	21	- -	NA	78	266	54	5	2	8	3	704
1997	44	3	- -	NA	30	115	9	3	7	29	0	240
1998	44	0	- -	NA	40	226	30	1	7	25	4	377
1999	88	2	- -	NA	31	295	37	8	31	30	1	523
2000	63	1	- -	NA	8	77	10	2	19	5	0	185
Methow spring Chinook salmon												
1993	43	0	134	6	1	0	0	0	0	4	3	191
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
1996	200	0	58	221	8	0	0	0	2	0	11	500
1997	422	0	3	16	1	3	0	0	280	209	12	946
1998	- -	- -	- -	- -	- -	3	0	0	462	428	30	923
1999	93	0	- -	35	7	1	0	0	3	6	0	145
2000	- -	- -	- -	- -	- -	5	0	0	21	6	0	32
2001	289	0	5	182	23	3	0	0	0	0	0	502
Twisp spring Chinook salmon												
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
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
1997	21	6	- -	14	0	0	0	0	14	9	1	65
1998	1	8	- -	0	2	0	0	0	11	0	0	22
1999	3	25	- -	8	20	1	0	0	4	0	0	61
2000	22	12	- -	67	40	0	0	0	7	0	0	148
2001	2	0	1	33	7	0	0	0	0	0	0	43
Chewuch spring Chinook salmon												
1992	0	1	38	0	0	0	0	0	0	0	0	39
1993	0	19	79	8	3	5	0	0	0	0	1	115
1994	0	0	3	0	0	0	0	0	0	0	0	3
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1996	- -	15	15	0	4	0	0	0	6	0	1	41
1997	54	44	14	4	27	2	0	0	24	144	7	320
2001	15	46	2	323	321	0	0	0	2	0	0	709

NA = Not applicable.

Appendix C1. Proportion by brood year of Wells Hatchery summer Chinook salmon that strayed onto spawning grounds of other Chinook salmon populations. All recoveries are considered to be non-target areas.

Brood year	Summer Chinook salmon spawning population					
	Methow	Okanogan	Similkameen	Chelan	Entiat	Wenatchee
	Wells summer Chinook salmon 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	0.013	0.013	0.001	0.013	0.001	0.001
2001	0.007	0.000	0.000	0.007	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.003
2003	0.000	0.000	0.000	0.000	0.000	0.000
	Wells summer Chinook salmon 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	0.017	0.013	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.000
2003	0.000	0.000	0.000	0.000	0.000	0.000

Appendix C2. Proportion by return year of Wells Hatchery summer Chinook salmon that strayed onto spawning grounds of other Chinook salmon populations. All recoveries are considered to be non-target areas.

Return year	Summer Chinook salmon spawning population					
	Methow	Okanogan	Similkameen	Chelan	Entiat	Wenatchee
	Wells summer Chinook salmon 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	0.029	0.012	0.002	0.158	0.000	0.002
2006	0.012	0.002	0.000	0.079	0.000	0.000
	Wells summer Chinook salmon 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
2006	0.005	0.000	0.000	0.000	0.000	0.000

Chapter 3

Methow River Basin Spring Chinook Salmon and Steelhead Smolt Monitoring in 2007

Abstract

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 salmon and summer steelhead smolts emigrating from the Twisp and Methow River basins. We captured 401 wild spring Chinook salmon smolts at the Methow River trap and 283 smolts at the Twisp River trap. A total of 180 and 333 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 33,710 wild spring Chinook salmon smolts emigrated from the Methow River, including 3,329 smolts emigrating from the Twisp River. An estimated 15,003 wild steelhead emigrated from the Methow River, including 3,312 fish from the Twisp River. Utilizing data gathered during spring Chinook salmon spawning ground surveys in 2005, we estimated that the number of emigrants produced from each 2005 brood spring Chinook salmon redd in the Twisp River (121) was 39.1% greater than the number of emigrants produced in the remainder of the Methow River basin (87). Steelhead in the Methow Basin and in the Twisp River produced an estimated four and five emigrants from 2003 brood redds, respectively, although no estimate of age-1 emigration could be calculated for the Twisp River. Excluding Twisp River production, Methow Basin steelhead produced an estimated 4.1 emigrants per 2003 brood steelhead redd. While data for spring Chinook salmon 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.

Introduction

An important component of both past and present monitoring and evaluation programs has been monitoring the freshwater productivity of spring Chinook salmon *Oncorhynchus tshawytscha* and steelhead *O. mykiss* in the Methow River Basin (MBSCSP 1995; Wells HCP HC 2005). Estimates of natural production by spring Chinook salmon 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 screw 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. Screw traps were 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 was to estimate juvenile production of spring Chinook salmon 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 chapter 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.

- Ho: Slope of Ln(juveniles/redd) vs. redds $_{\text{Supplemented population}}$ = Slope of Ln(juveniles/redd) vs. redds $_{\text{Non-supplemented population}}$
- Ho: The relationship between proportion of hatchery spawners and juveniles/redd is ≥ 1

The M&E Plan requires that smolt production data from supplemented populations be 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 salmon and steelhead have not yet been identified, comprising a data gap with respect to these populations.

Methods

Methods used in trap operation and in calculating population estimates are provided in more detail in Appendix E of the Monitoring and Evaluation Plan (Wells HCP HC 2005).

Smolt Trap Operation

Rotary smolt traps of different sizes were operated in several configurations depending on the specific requirements of each site. The Twisp River site used a single trap with a 1.5-m cone diameter because of low stream flow and a relatively narrow stream channel. The Methow River site used traps with cone diameters of 2.4 m and 1.5 m to increase trap efficiency at greater ranges of river discharge. Large variation in discharge in the Methow River also required the use of three trapping positions due to the channel configuration and safety for personnel and fish. A 1.5 m trap was deployed in the lower position at the Methow site at discharges below 56.6 m^3/s. At discharges greater than 56.6 m^3/s, an additional 2.4 m trap was installed and operated in tandem with the 1.5 m trap. In this configuration, we utilized two positions depending on river discharge (high and flood), but because of changes to the river morphology at the site, the high position was abandoned, and the flood position was renamed as the upper position.

Trapping occurred mostly after dark. Trap cones were lowered 1-2 hours before sunset and raised 1-2 hours after sunrise. 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 smolt abundance, fish were removed from the traps each morning. During periods of greater discharge and/or smolt abundance, traps were monitored 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 for a rotary screw trap operated on the Tucannon River located in southeastern Washington.

Debris were 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 tire that caused the drum-screen to rotate (1.5-m traps). 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 and recapture trials or tagged with passive integrated transponder (PIT) tags 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 equal to or 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.

Most hatchery spring Chinook salmon and some hatchery steelhead were not adipose fin clipped and the origin of adipose-present migrating salmonids was determined from the presence of coded-wire tags (e.g., spring Chinook salmon and coho [*O. kisutch*]), or elastomer tags and dorsal fin erosion (e.g., steelhead). Most hatchery summer Chinook salmon released in the Methow River were adipose fin clipped. Juvenile salmonids lacking any tags, visible marks, 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 millimeter, and weighed to the nearest 0.1 g. Scale samples were collected from the majority of wild summer steelhead captured 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 salmon, 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*). We used age and trap location to determine race (spring or summer) of captured juvenile Chinook salmon. All Chinook salmon captured in the Twisp River trap were considered spring

Chinook salmon, regardless of size (i.e., summer Chinook salmon have not been documented spawning upstream of the trap). All yearling Chinook salmon captured at the Methow River trap during the spring migration period were considered spring Chinook salmon because spring Chinook salmon are yearling migrants and summer Chinook salmon are typically subyearling migrants. All fry and parr captured at the Methow River trap during spring were considered summer Chinook salmon. Some spring Chinook salmon juveniles migrate as fry or parr from natal areas and some summer Chinook salmon may migrate as yearlings. Hence, a small yet unknown proportion of spring Chinook salmon may be misclassified as summer Chinook salmon and vice versa. Although the number of misclassified spring Chinook salmon should be relatively small compared with the numerically dominant summer Chinook salmon, production estimates for the less abundant spring Chinook salmon could be profoundly influenced by such misclassifications. In order to determine the proportion of spring and summer Chinook salmon in the total catch, we collected tissue samples (i.e., fin clips) of outmigrating yearling Chinook salmon captured during the spring and subyearling Chinook salmon captured during the fall trapping period at the Methow River site for DNA analysis. 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 salmon, summer Chinook salmon, 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 juvenile 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 in a 1,211 L two-chamber transport tank, or 18.9 L snap-lid buckets, and released the evening of the next trapping period after the trap was set. 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). Marked fish from the Methow River trap were transported and released approximately 5.6 km upstream of the trap (rkm 36). Fish for Twisp River trap mark groups were transported and released approximately 0.81 km upstream of the trap (rkm 3). 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:

Variance of daily migration estimate $= \operatorname{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \dfrac{\mathrm{MSE}\left(1 + \dfrac{1}{n} + \dfrac{\left(X_i - \overline{X}\right)^2}{(n-1)s_X^2}\right)}{\hat{e}_i^2}$

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., $P < 0.05$; $r^2 \approx 0.5$), 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:

Variance for daily emigration estimate $= \operatorname{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \dfrac{E_p(1 - E_p) / \sum M}{E_p^2}$

The total emigration estimate and confidence interval were calculated using the following formulas:

Total emigration estimate $= \sum \hat{N}_i$

95% confidence interval $= 1.96 \times \sqrt{\sum \operatorname{var}\left[\hat{N}_i\right]}$

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

Production estimates for each age class and trapping location was summed to produce a total brood year emigration estimate. For spring Chinook salmon, the estimate of fall-migrant spring Chinook salmon 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 pattern analysis. The total number of smolts produced from one brood of spawning adults requires 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. The number of smolts per redd were calculated by dividing the total estimated smolt production by the total number of redds for the brood year.

For spring Chinook salmon, egg deposition values used to calculate egg-to-emigrant survival were derived from carcass surveys and hatchery broodstock sampling. For each brood examined, the number of redds deposited was estimated by age and origin of the female spawning population within each basin as determined through spawning ground surveys. Each redd was then multiplied by the mean fecundity values by age and origin determined through sampling of Methow Hatchery broodstock, and adjusted by the percent of eggs retained in the body cavity determined through spawning ground surveys. For summer steelhead, egg deposition values were derived by multiplying the total number of redds in each basin by mean fecundity values by age and origin of the female steelhead population as determined through run composition and hatchery broodstock sampling at Wells Hatchery.

Spawning ground surveys identified summer steelhead and spring Chinook salmon redds downstream of the Methow and Twisp River trap sites in some years. We assumed that redds located downstream from each trap site did not contribute to production estimates calculated at upstream smolt traps. To calculate total production and emigration estimates for species, we applied the egg-to-smolt survival rates calculated for those redds upstream of trap to the estimated number of eggs deposited downstream of the trap. Confidence intervals (95%) were adjusted in a similar manner. Total brood year smolt production estimates were calculated by adding the estimated number of smolts produced downstream of the trap to the estimate of smolts produced upstream of the trap location.

Results

Smolt Trap Operation

Trapping in the Methow River basin in 2007 began at the Methow River site on 22 February and at the Twisp River site on 8 March. Trapping at both locations was interrupted on several occasions over the course of the trapping season because of unfavorable environmental conditions (e.g., flooding, low flow, and ice). Discharge during the spring was above annual mean values (Figures 1-2), and briefly exceeded safe trap operation ranges at both sites. River discharge in the fall was near mean values at both sites.

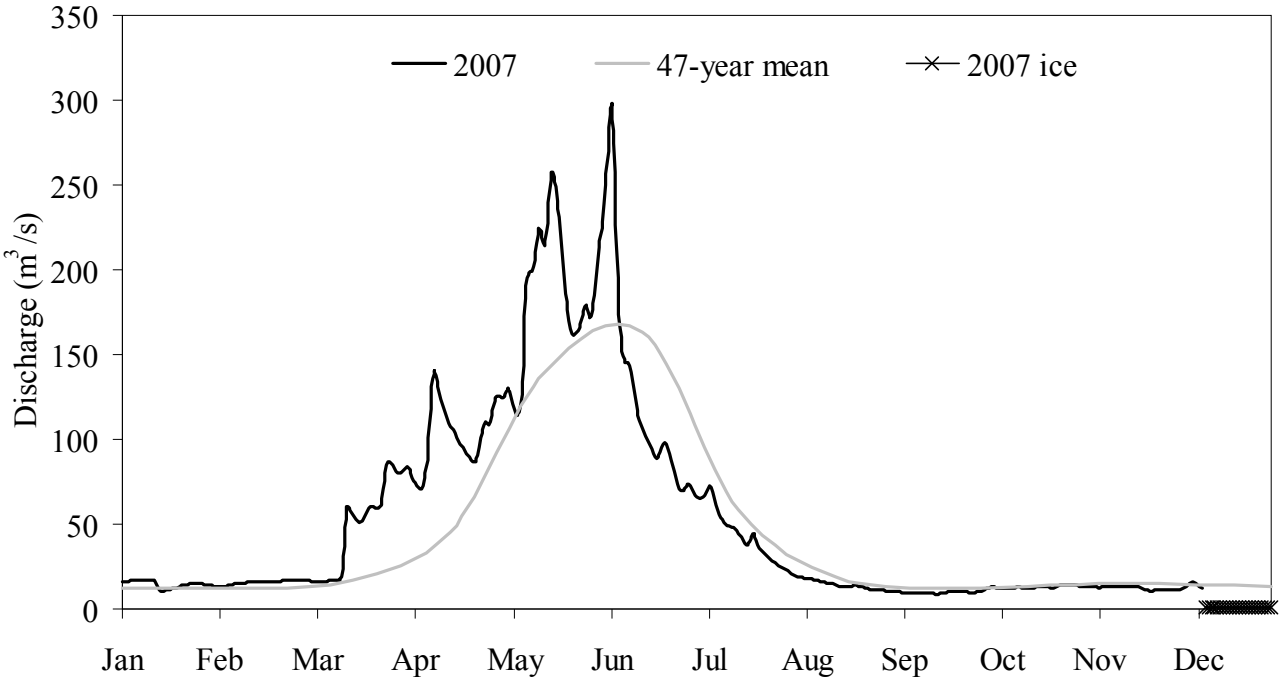


Figure 1. Methow River 2007 daily discharge and 47-year mean as measured at the USGS gauging station No. 12449950 (Methow River near Pateros, Washington).

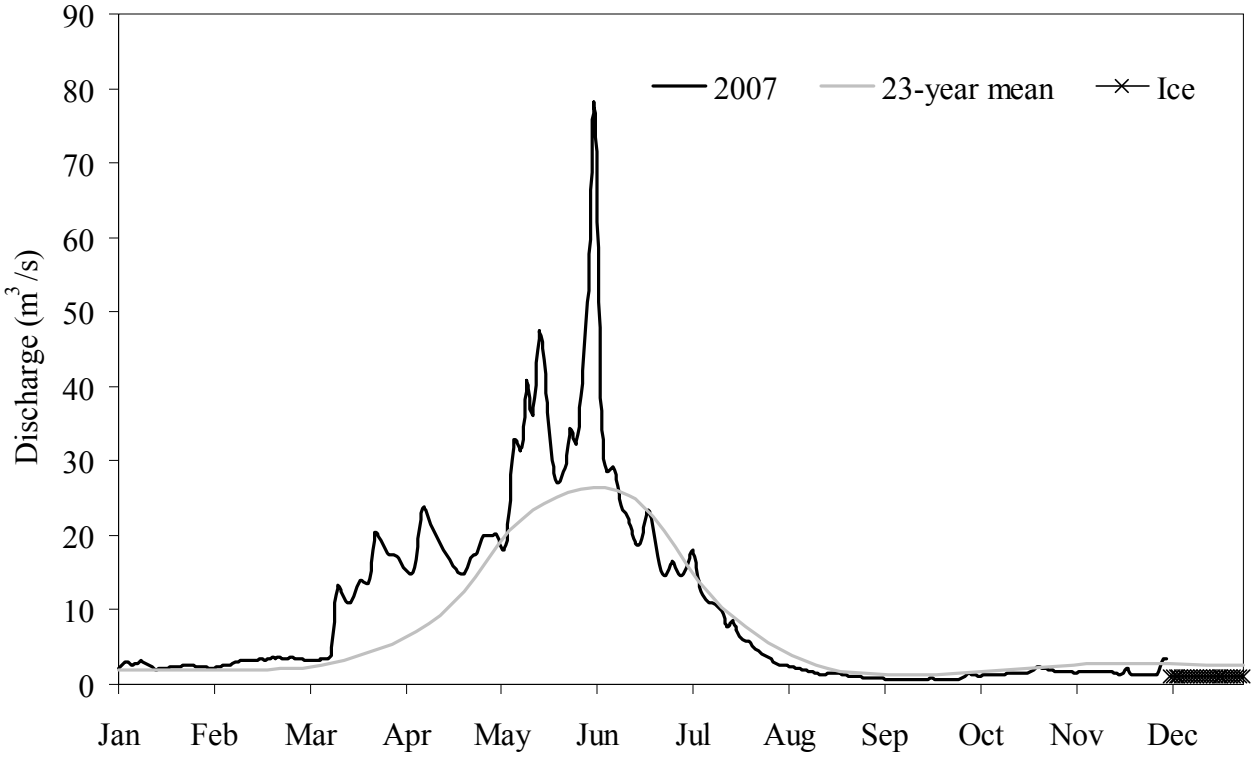


Figure 2. Twisp River 2007 daily discharge and 23-year mean as measured at the USGS gauging station No.12448998 (Twisp River near Twisp, Washington).

Daily Captures and Biological Sampling

Methow River Trap

2005 Brood Chinook salmon

A total of 390 wild yearling Chinook salmon smolts were captured between 22 February and 8 May. Peak captures occurred 14 March (*N* = 32; Figure 3). We estimated we would have captured 42 additional smolts had the trap operated without interruption (Appendix A1). Analysis of tissue samples (i.e., fin clip) collected from yearling Chinook salmon indicated that 0.87% (*N* = 3) of the migrating smolts were summer Chinook salmon (Appendix C). PIT tags were implanted in 381 wild smolts, but 378 fish were released with PIT tags after mortalities (*N* = 2) and a single non-functioning tag were subtracted (Appendix B1). We also implanted PIT tags into 1,257 of the 19,339 hatchery Chinook salmon captured for survival comparison, but released 1,248 after subtracting mortalities (*N* = 8) and shed tags (*N* = 1). Mortalities of wild Chinook salmon smolts totaled 0.5% (*N* = 2) of the wild smolts captured. Mortalities of hatchery spring Chinook salmon were 0.04% (*N* = 8) of the total captured. Wild spring Chinook salmon smolts had a mean fork length (*N*; SD) of 100.7 mm (395; 8.6).

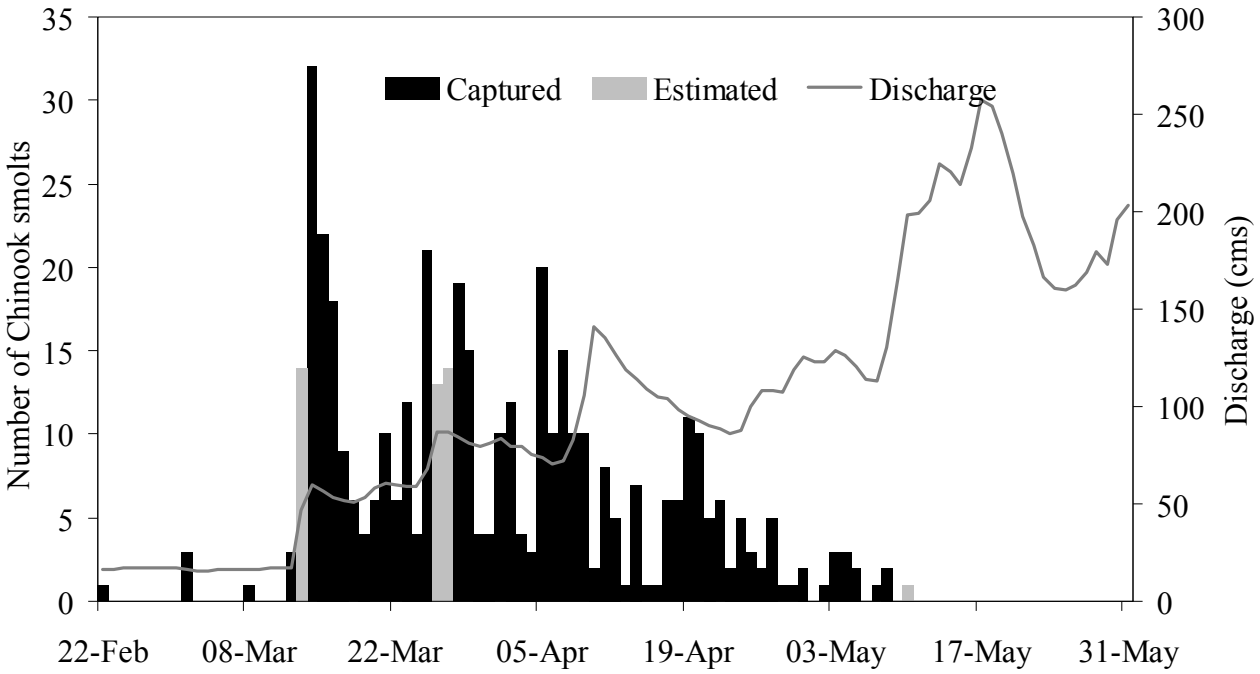


Figure 3. Daily capture of wild Chinook salmon smolts at the Methow river smolt trap during 2007.

2006 Brood Chinook salmon

Subyearling Chinook salmon were captured at the Methow trap between 22 February and 12 September (*N* = 14,868), and mortality totaled 294 fish (1.9%). A total of 67 emigrant Chinook salmon parr were captured during the fall trapping period between 6 October and 21 November and had a mean fork length (*N*; SD) of 90.7 mm (67; 10.8; Table 1). Of those Chinook salmon parr captured, DNA analysis determined 59 parr were spring Chinook salmon and the remaining 8 parr were summer Chinook salmon. The trap was not operated for four days during the fall due to freezing conditions and low river discharge, and we estimated four additional Chinook salmon parr would have been captured had the trap operated during the entire period (Appendix A2). Peak captures of Chinook salmon during the fall period occurred on 27 October and 1 November (*N* = 6; Figure 4). We identified four Chinook salmon (6%) captured during the fall trapping period as spring Chinook salmon PIT tagged at the Twisp River site. We inserted PIT tags into 62 Chinook salmon parr at the Methow trap, of which 60 fish were released with PIT tags after mortalities were subtracted (*N* = 2; Appendix B2). The two mortalities represented 2.9% of all Chinook salmon parr captured between 6 October and 26 November. Analysis of tissue samples collected from parr Chinook salmon captured during fall trapping indicated that 13% were summer Chinook salmon (Appendix C).

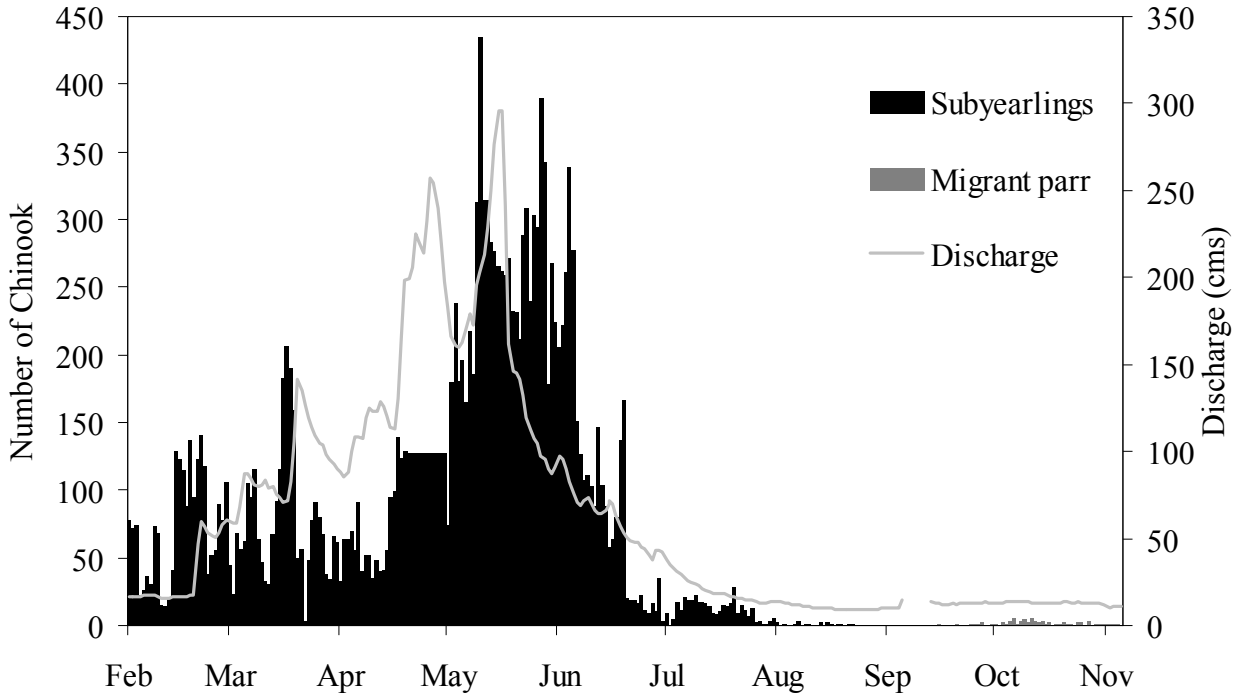


Figure 4. Daily capture of wild subyearling Chinook salmon (Feb – Sep) and migrant parr (Oct – Nov) at the Methow River smolt trap in 2007.

Table 1. Summary of length and weight sampling of Chinook salmon captured at the Methow River smolt trap in 2007.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2005	Wild smolt	100.7	395	8.6	11.6	393	2.9	1.1
2005	Hatchery smolt	129.9	186	17.5	27.8	186	11.2	1.3
2006	Wild fall parr	90.7	67	10.8	8.9	67	3.1	1.2

Summer Steelhead

We captured 180 wild summer steelhead emigrants (smolt and transitional) between 15 March and 31 June in the Methow River trap, with peak capture on 9 May ($N = 24$; Figure 5). We estimated an additional 61 steelhead would have been captured if the traps had operated during the entire period (Appendix A3). We PIT tagged 164 wild steelhead emigrants, but only 162 were released with PIT tags after shed tags ($N = 2$) were removed. No wild steelhead mortalities occurred during 2007 at the Methow trap (Appendix B3). We inserted PIT tags into 997 of the 1,769 hatchery origin steelhead captured at the trap for survival comparison, and released 993

fish with PIT tags after subtracting shed tags ($N = 2$) and mortalities ($N = 2$). No additional mortality of hatchery steelhead occurred at the Methow trap site in 2007.

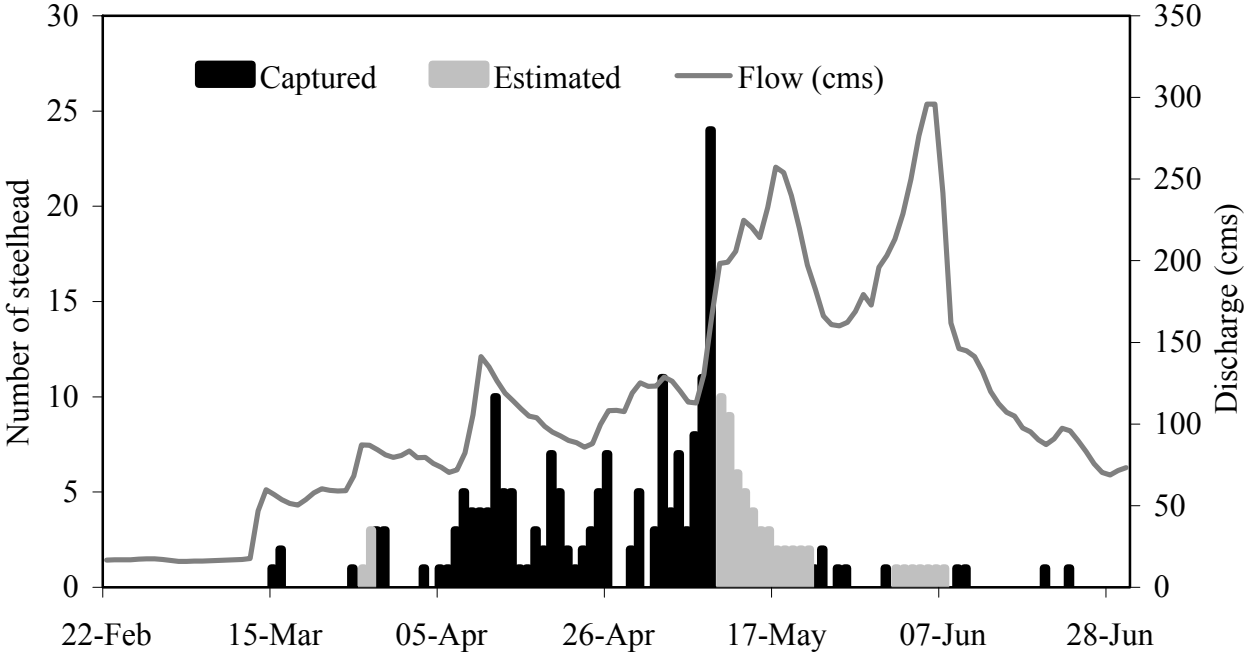


Figure 5. Daily capture of wild steelhead smolt and transitional migrants at the Methow River smolt trap in 2007.

We captured 72 wild fry and 29 wild summer steelhead parr between 22 February and 17 November. Steelhead parr greater than 65 mm and in good physical condition were PIT tagged ($N = 16$) prior to release (Appendix B4). Wild steelhead parr had a mean fork length (N; SD) of 84.5 mm (28; 24.9) and mean weight of 8.4 g (26; 8.0). No steelhead fry or parr mortalities occurred during Methow River trapping.

Most wild summer steelhead migrants were age-2 fish (86.5%) with a mean fork length (N; SD) of 175.2 mm (122; 20.1; Table 2). Hatchery steelhead captured at the Methow River trap had a mean fork length (N; SD) of 194.1 mm (996; 17.6).

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	6 (4.3)	138.7	6	17.8	32.6	6	14.4	1.2
2	122 (86.5)	175.2	122	20.1	55.3	117	20.1	1.0
3	12 (8.5)	181.5	12	22.4	58.4	10	22.7	1.0
4	1 (0.7)	174.0	1	- -	51.3	1	- -	0.9

Twisp River Trap

2005 Brood Spring Chinook salmon

The Twisp trap captured 283 wild yearling spring Chinook salmon smolts between 9 March and 31 May. Peak captures occurred on 9 April (*N* = 20; Figure 6). We estimated an additional 13 smolts would have been captured had the trap operated without interruption during the entire period (Appendix A4). We inserted PIT tags into 272 of the captured fish, and released 271 smolts after subtracting one shed tag (Appendix B5). We inserted PIT tags into 1,096 of the 2,372 hatchery spring Chinook salmon captured for survival comparison, with no shed tags or mortalities resulting from tagging. Mortalities unrelated to tagging totaled 0.3% (*N* = 8) of all hatchery Chinook salmon captured at the Twisp River trap.

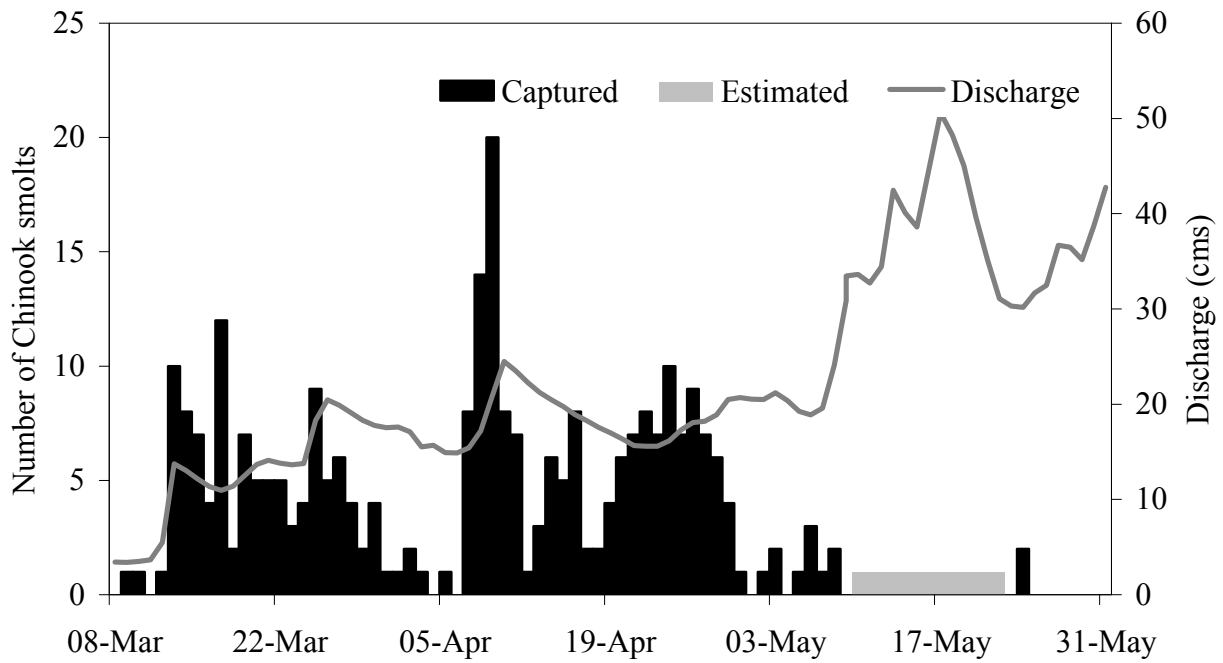


Figure 6. Daily capture of wild spring Chinook salmon smolts at the Twisp River smolt trap in 2007.

Wild spring Chinook salmon had a mean fork length (*N*; SD) of 100.0 mm (282; 8.3), and a mean condition factor of 1.1 (Table 3). Hatchery spring Chinook salmon had a mean fork length (*N*; SD) of 137.6 mm, and a mean condition factor of 1.7 (Table 3).

Table 3. Summary of length and weight sampling conducted on Chinook salmon captured at the Twisp River smolt trap in 2007.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2005	Wild smolt	100.0	282	8.3	10.7	281	2.5	1.1
2005	Hatchery smolt	137.6	781	10.1	43.1	781	6.9	1.7
2006	Wild fall parr	85.9	222	7.0	7.3	212	1.9	1.1

2006 Brood Spring Chinook salmon

We captured 682 subyearling spring Chinook salmon between 8 March and 14 August, of which eight fish were recorded as mortalities (1.2%). An additional 223 migrant parr were captured between 5 October and 21 November, only one of which was recorded as a mortality (0.4%). The smolt trap was not operated between 15 August and 4 October, or between 6 and 8 October because river discharge was too low to adequately rotate the trap cone. Peak captures of migrant spring Chinook salmon parr occurred 5 October (*N* = 14; Figure 7) and 31 October (*N* = 14). We estimated 26 additional spring Chinook salmon parr would have been captured had the trap operated during the entire fall emigration period (Appendix A5). We implanted 30 PIT tags into subyearling parr between 2 and 15 August, and implanted 223 tags into migrant parr between 5 October and 21 November, but only 251 were released with tags after subtracting one shed tag and one mortality (Appendix B6). Four subyearling spring Chinook salmon originally tagged at the Twisp trap were recaptured at the Methow smolt trap, exhibiting a mean travel time between the two sites of 6.7 days. Fall migrant parr had a mean fork length of 85.9 mm (see Table 3).

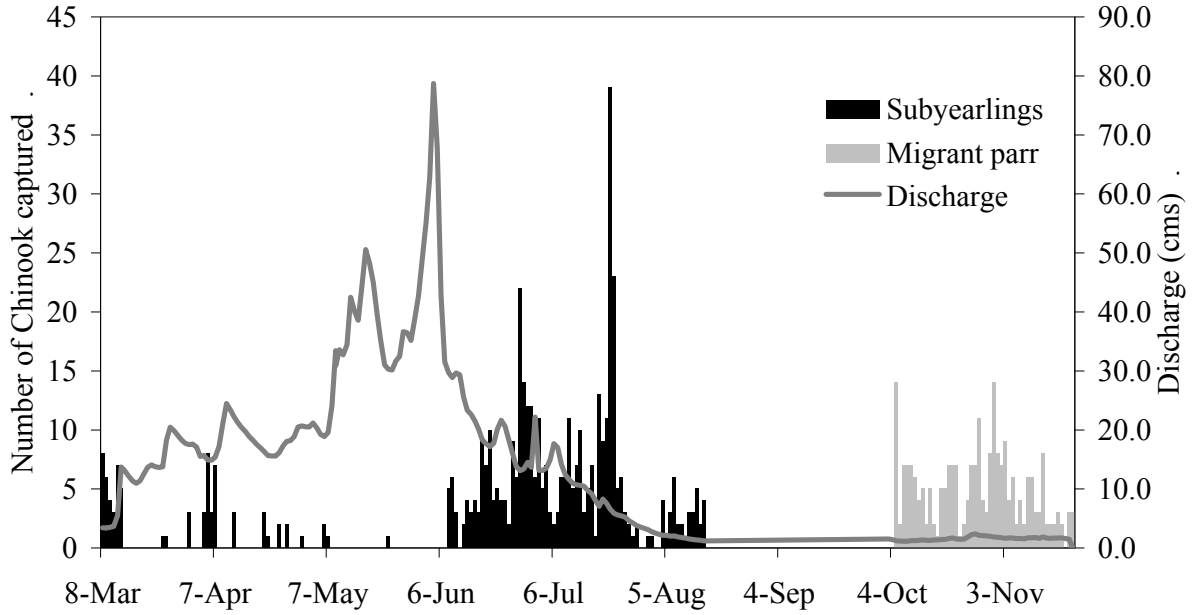


Figure 7. Daily capture of subyearling wild spring Chinook salmon (Mar – Aug) and migrant parr (Oct – Nov) at the Twisp River smolt trap in 2007.

Summer Steelhead

We captured 333 wild summer steelhead emigrants (smolt and transitional) between 13 March and 30 June. Peak capture occurred on 29 April ($N = 21$; Figure 8). We estimated 13 additional steelhead would have been captured if the trap had operated without interruption (Appendix A6). Most wild summer steelhead migrants were age-2 fish (80.8%; Table 4). No mortalities of wild summer steelhead migrants occurred during 2007 at the Twisp River trap. We inserted PIT tags into 327 wild steelhead emigrants, but only 324 tagged fish were released after three shed tags were subtracted (Appendix B7). We implanted PIT tags into 1,480 of the 6,099 hatchery origin steelhead captured at the trap for survival comparison. However, only 1,292 hatchery summer steelhead were released with tags after one PIT tag was shed and 187 mortalities were subtracted. Hatchery steelhead captured at the Twisp River trap had a mean fork length of 201.6 mm and were significantly larger than wild summer steelhead captured at the trap (KW ANOVA: $P < 0.01$). Hatchery summer steelhead mortalities were 3.1% ($N = 192$) of all hatchery summer steelhead captured in 2007. The majority of these mortalities ($N = 189$) occurred during a single event in which the trap cone became clogged with debris. The debris jam caused the upstream end of the trap to sink slightly, elevating the downstream end of the trap. While the downstream end of the trap was elevated, the live boxes affixed to the rear of each pontoon dewatered, thus asphyxiating some of the hatchery steelhead being held for mark/recapture trials.

Non-migrant summer steelhead captured at the trap included 133 wild fry and 150 wild parr captured between 12 March and 14 November (Figure 9). Steelhead parr greater than 65 mm and in good condition were PIT tagged prior to release ($N = 128$), and 126 were released with PIT tags after subtracting two shed tags (Appendix B8). Wild summer steelhead parr had a mean fork length (N; SD) of 103.2 mm (144; 35.2), and mean weight of 16.9 g (140; 18.7). Mortalities of wild summer steelhead fry and parr were 1.1% ($N = 3$) of the fry and parr captured.

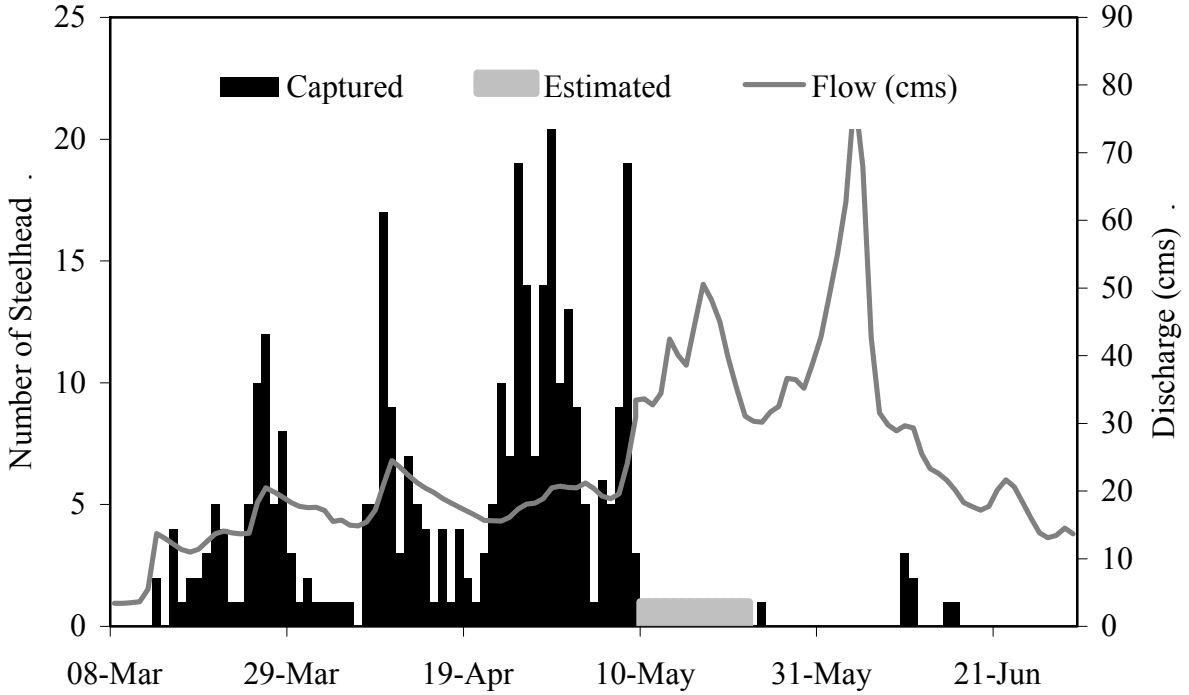


Figure 8. Daily capture of wild steelhead smolt and transitional migrants at the Twisp River smolt trap in 2007.

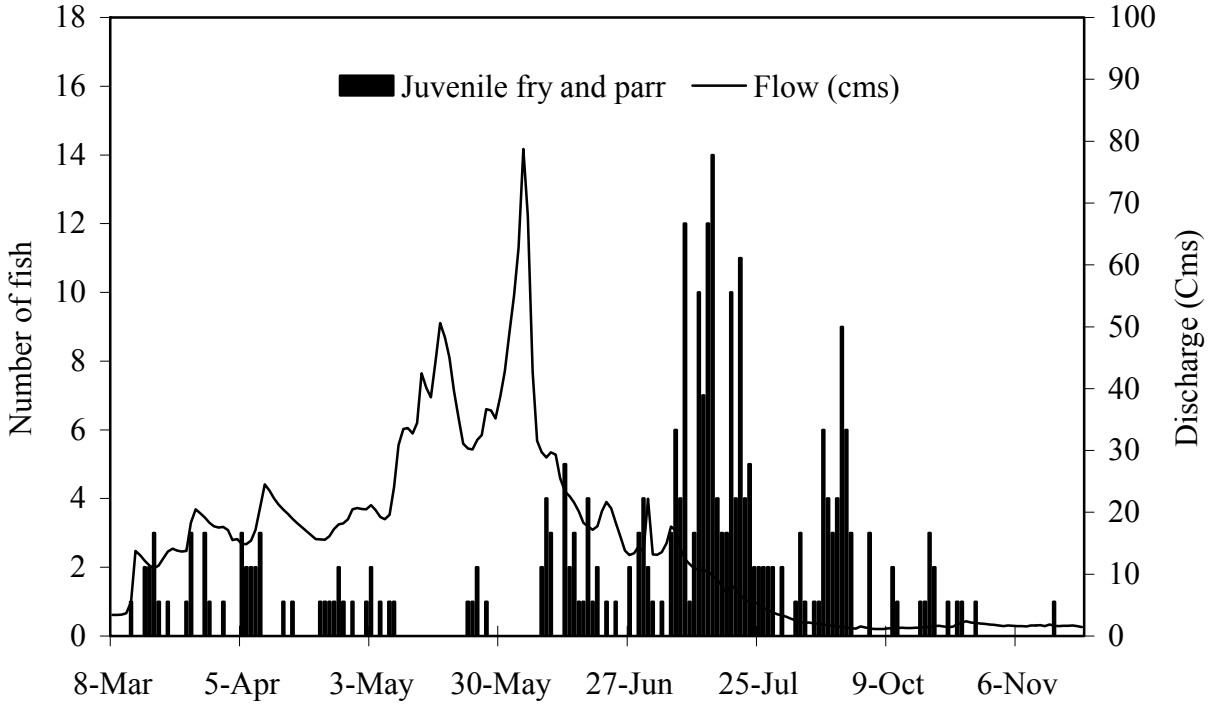


Figure 9. Daily capture of wild steelhead fry and parr at the Twisp River smolt trap in 2007.

Table 4. Mean length at migration age of wild transitional and smolt summer steelhead captured at the Twisp River trap in 2007.

Age	*N* (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
1	7 (2.4)	128.6	7	14.6	24.3	6	7.8	1.1
2	231 (80.8)	162.2	229	17.4	42.7	226	12.9	1.0
3	43 (15.0)	180.6	43	20.5	58.6	43	17.7	1.0
4	5 (1.7)	177.2	5	9.6	56.8	5	11.1	1.0

Population Estimates

Methow River Basin

2005 Brood Chinook salmon

Mark/recapture efficiency trials for wild spring Chinook salmon smolt production should be conducted with wild Chinook salmon. Due to the low abundance of wild fish, hatchery spring Chinook salmon, and hatchery and wild coho were used when too few wild Chinook salmon were available. We could not conduct a linear regression for the Methow River smolt trap in the low position during the fall of 2006 or the spring of 2007 because too few mark/recapture trials were conducted (Table 5). The linear regression model for the upper position in the spring of 2007 was significant and explained a large amount of the variation in trap efficiency ($P = 0.047$, $r^2 = 0.58$). Hence, the 2005 brood wild spring Chinook salmon parr and smolt migration estimate was calculated using pooled trap efficiency for the low position and a flow-efficiency regression model for the upper position (Table 5). The estimated number of yearling spring Chinook salmon was 33,710 (± 15,616, 95% CI). When combined with the estimate of parr that emigrated in 2006 (17,490 ± 5,914, 95% CI), we estimated that 51,200 (± 21,539, 95% CI) 2005 brood wild spring Chinook salmon migrated from the Methow River basin between 22 September 2006 and 31 May 2007 (Snow et al. 2007).

Table 5. Mark and recapture efficiency trials used to estimate emigration of 2005 brood spring Chinook salmon (YCH = yearling Chinook salmon hatchery origin, YCW = yearling Chinook salmon wild origin, COW = yearling coho wild origin, and COH = yearling coho hatchery origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC	21-Nov-06	Low	15	1	6.67	28.5
SBC	18-Nov-06	Low	46	0	0.00	30.6
SBC	14-Nov-06	Low	71	1	1.41	36.7
	Pooled		132	2	1.52	
YCW, YCH, COW	05-Apr-06	Low	33	1	3.00	59.5
YCW, COW	02-Apr-06	Low	87	0	0.00	50.4
	Pooled		120	1	0.83	
YCH	27-Mar-07	High	42	2	4.76	84.3
YCH	24-Apr-06	High	199	11	5.53	67.4
COH	12-May-05	High	114	5	4.39	116.1
COH	07-May-05	High	96	0	0.00	91.5
COH	05-May-05	High	120	2	1.67	83.1
COH	30-Apr-05	High	200	17	8.50	80.4
COH	28-Apr-05	High	200	5	2.50	104.9
	Pooled		971	42	4.33	
COH	30-Apr-07	Upper	600	3	0.50	123.0
COH	25-Apr-07	Upper	373	4	1.07	108.2
YCH	20-Apr-07	Upper	305	8	2.62	89.9
YCH	18-Apr-07	Upper	361	10	2.77	95.1
YCH, YCW	14-Apr-07	Upper	224	3	1.34	105.8
YCH	12-Apr-07	Upper	448	9	2.01	119.0
YCW, COH	06-Apr-07	Upper	109	3	2.75	71.9
	Flow model		2,420	40	1.65	

2006 Brood Chinook salmon

The regression model used to estimate trap efficiency in the low position in the fall of 2007 was not significant ($P = 0.410$). Hence, a pooled trap efficiency was used to estimate the number of emigrant parr during the fall trapping period. Tissue samples were collected from 66 Chinook salmon parr to determine race composition (i.e., spring or summer) through DNA analysis (Appendix C). Based on the results of the DNA analysis, an estimated 52 parr captured in the fall were spring Chinook salmon (86.6%) and 8 parr were summer Chinook salmon (13.3%). Six samples were not included because of PCR failure, contamination, or the presence of alleles that had atypical sizes or electropherogram morphologies for Chinook salmon (Appendix C). Based

on the DNA assignment results, we estimated 2,913 (± 614, 95% CI) spring Chinook salmon parr (Appendix A2) emigrated past the Methow River trap during fall 2007 trapping.

Table 6. Mark and recapture efficiency trials used to estimate emigration of 2006 brood Chinook salmon parr at the Methow River smolt trap in 2007 (SBC Parr = wild subyearling Chinook salmon).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC Parr	20-Nov-07	Low	7	0	0.00	12.1
SBC Parr	13-Nov-07	Low	6	0	0.00	12.8
SBC Parr	09-Nov-07	Low	12	0	0.00	13.3
SBC Parr	01-Nov-07	Low	28	2	7.14	13.1
SBC Parr	21-Nov-06	Low	15	1	6.67	28.5
SBC Parr	18-Nov-06	Low	46	0	0.00	30.6
SBC Parr	14-Nov-06	Low	71	1	1.41	36.7
	Pooled		185	4	2.16	

Summer Steelhead

Hatchery summer steelhead (SHH) and wild yearling Chinook salmon were used as surrogate mark groups to estimate capture efficiency for wild steelhead. Lack of significant regression models in both the low position ($P = 0.46$, $r^2 = 0.56$) and high position ($P = 0.75$, $r^2 = 0.02$), or too few mark/recapture trials in the upper position required the use of a pooled trap efficiency for each position (Table 7). Combining estimates from all positions, we calculated that an estimated 15,003 (± 1,391, 95% CI) summer steelhead emigrated from the Methow River basin in 2007. Most migrants were age-2 fish from the 2005 brood (Table 8). With the addition of the age-4 migrants, we estimate that the total number of migrant steelhead from the 2003 brood was 8,640 (± 757, 95% CI) fish. Steelhead spawning ground surveys in 2003 identified 89 redds downstream of the Methow trap. Using the egg-to-emigrant ratio calculated for redds deposited upstream of the trap, we estimate an additional 398 migrant steelhead were produced from those redds downstream of the trap, thus, the total 2003 brood migration is estimated to be 9,038 (± 792, 95% CI) fish.

Table 7. Mark and recapture efficiency trials used to estimate emigration of wild summer steelhead at the Methow River smolt trap in 2007.

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCW	09-Apr-06	Low	18	1	5.56	30.8
YCW	05-Apr-06	Low	43	1	2.33	17.8
YCW	02-Apr-06	Low	25	1	4.00	15.9
	Pooled		86	3	3.49	
SHH	05-May-06	High	205	0	0.00	129.3
SHH	03-May-06	High	221	11	4.98	117.6
SHH	24-May-05	High	100	1	1.00	61.9
SHH	19-May-05	High	104	10	9.62	92.0
SHH	14-May-05	High	110	3	2.73	119.6
SHH	02-May-05	High	100	2	2.00	74.5
SHH	29-Apr-05	High	150	6	4.00	90.6
	Pooled		990	33	3.33	
SHH	07-May-07	Upper	300	5	1.67	130.4
SHH	05-May-07	Upper	400	9	2.25	119.1
SHH	14-May-06	Upper	200	0	0.00	121.2
	Pooled		900	14	1.56	

Table 8. Number of steelhead emigrants from the Methow River basin in 2007 by age and brood.

Age	Brood	Percent of emigrants	Number
1	2006	4.3	639
2	2005	86.5	12,981
3	2004	8.5	1,277
4	2003	0.7	106
Total		100.0	15,003

Twisp River

2005 Brood Spring Chinook salmon

Capture efficiency in the low position of wild spring Chinook salmon smolts was not significantly related to discharge ($P = 0.065$, $r^2 = 0.46$) at the Twisp River trapping site (Table 9). Using a pooled efficiency estimate, we estimated that 3,268 (± 77, 95% CI) smolts emigrated from the Twisp River between 08 March and 31 May. Spawning ground surveys identified one redd downstream of the Twisp trap in 2005. Using the emigrant-per-redd ratio calculated for redds upstream of the trap site, we estimate that an additional 61 yearling spring Chinook salmon were produced from redds deposited downstream of the trap, yielding a total Twisp River basin yearling spring Chinook salmon migration estimate of 3,329 (± 78, 95% CI) fish.

Table 9. Mark/recapture efficiency trials used to estimate the 2007 emigration of wild spring Chinook salmon smolts from the Twisp River (YCH = yearling Chinook salmon hatchery origin, YCW = yearling Chinook salmon wild origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCH	27-Apr-07	Low	250	30	12.0	18.9
YCH	22-Apr-07	Low	331	31	9.4	15.6
YCH	19-Apr-07	Low	486	43	8.8	16.3
YCH	17-Apr-07	Low	285	20	7.0	17.3
YCW, YCH	16-Apr-07	Low	25	0	0.0	18.3
YCH	13-Apr-07	Low	232	24	10.3	20.4
YCW	11-Apr-07	Low	57	2	3.5	22.3
YCW	06-Apr-07	Low	4	1	25.0	15.4
YCW, YCH	01-Apr-07	Low	13	0	0.0	17.1
YCW	27-Mar-07	Low	52	4	7.7	19.1
YCW, YCH	18-Mar-07	Low	35	5	14.3	12.5
	Pooled		1,770	160	9.0	

Snow et al. (2007) estimated that 3,188 (± 122, 95% CI) 2005 brood spring Chinook salmon parr emigrated from the Twisp River between 22 September and 28 November 2006. Applying the redd-to-parr ratio to the single redd deposited downstream of the trap, an estimated 59 additional spring Chinook salmon parr emigrated from the Twisp River in 2006. The total parr-migration estimate thus increased to 3,247 (± 124, 95% CI) fish, with the total 2005 brood migration (parr and smolts) increasing to 6,576 (± 202, 95% CI) fish.

2006 Brood Spring Chinook salmon

Trap efficiency in the low position for 2006 brood spring Chinook salmon parr was not significantly related to discharge ($P = 0.76$). Because of this, trap efficiency was pooled (Table 10) to estimate that 1,461 (± 43, 95% CI) 2006 brood spring Chinook salmon parr emigrated from the Twisp River between 5 October and 21 November 2007. Stream surveyors located three spring Chinook salmon redds downstream of the Twisp smolt trap in 2006. Expanding those redds by the egg to fall migrant parr ratio, an estimated 48 additional parr were produced from redds deposited downstream of the trap. The total migration of 2006 brood migrant parr from the Twisp River basin was 1,403 (± 42, 95% CI) fish.

Table 10. Mark and recapture efficiency trials used to estimate emigration of 2006 brood wild spring Chinook salmon parr at the Twisp River trap (SBC = subyearling Chinook salmon wild origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC	14-Nov-07	Low	32	7	21.9	1.6
SBC	06-Nov-07	Low	36	4	11.1	1.6
SBC	31-Oct-07	Low	60	4	6.7	1.8
SBC	22-Oct-07	Low	45	2	4.4	1.5
SBC	11-Oct-07	Low	34	3	8.8	1.4
SBC	21-Nov-06	Low	53	13	24.5	5.8
SBC	18-Nov-06	Low	56	8	14.3	6.3
SBC	14-Nov-06	Low	164	42	25.6	7.6
SBC	09-Nov-06	Low	59	7	11.9	13.9
SBC	02-Nov-06	Low	34	6	17.6	1.2
SBC	30-Oct-06	Low	18	4	22.2	1.2
SBC	28-Sep-06	Low	12	3	25.0	1.2
	Pooled		603	103	17.1	

Summer Steelhead

A significant relationship existed between discharge and trap efficiency for summer steelhead at the Twisp River trap site ($P = 0.013$, $r^2 = 0.90$). However, the efficiency/discharge relationship was positive and trials could only be conducted over a limited range of discharge. The positive relationship between discharge and trap efficiency may be real and the result of trap avoidance at low levels of discharge or may simply be a result of the lack of trials at lower discharge levels. We therefore used a pooled efficiency from four mark groups to estimate the 2007 migration of summer steelhead (Table 11). We estimated that 3,326 (± 85, 95% CI) wild summer steelhead

migrated from the Twisp River basin between 8 March and 30 June 2007. Most migrants were age-2 fish from the 2005 brood (Table 12).

Table 11. Mark/recapture efficiency trials used to estimate emigration of wild summer steelhead migrants from the Twisp River (SHH = hatchery origin steelhead).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SHH	06-May-07	Low	413	44	10.7	19.6
SHH	03-May-07	Low	400	48	12.0	20.4
SHH	30-Apr-07	Low	302	35	11.6	20.5
SHH	26-Apr-07	Low	273	18	6.6	18.2
	Pooled		1,388	145	10.4	

Table 12. Number of steelhead emigrants from the Twisp River in 2007 by age and brood.

Age	Brood	% of total emigrants	Number
1	2006	2.45	81
2	2005	80.77	2,687
3	2004	15.03	500
4	2003	1.75	58
Total			3,326

Smolts Per Redd

2005 Brood Spring Chinook salmon

The number of emigrants per redd for the 2005 brood spring Chinook salmon in the Twisp River was greater than that value for the entire Methow Basin (Table 13). When Twisp River production was excluded from the Methow Basin, we estimated that 39.1% more emigrants were produced per redd in the Twisp River than were produced in the rest of the Methow River basin for the 2005 brood. Age-1 smolts accounted for 50.6% of all 2005 brood emigrants from the Twisp River, and 63.7% of all emigrants from the rest of the Methow River basin (Table 13). The proportion of age-1 emigrants estimated at both trap sites may not reflect long-term emigration-at-age trends because age-0 emigration was likely greater than historic mean age-0 emigration rates due to flooding during the fall trapping period in 2006.

Table 13. Estimated emigrant-per-redd and egg-to-emigrant survival for 2005 brood Methow basin spring Chinook salmon. Methow and Twisp River estimates are for redds deposited upstream of the trap sites, and do not include redds that dewatered. Age-0 emigrants from the Methow basin were calculated by incorporating results from DNA analysis of individual broods (2005-2006), or were estimated based on samples collected from the 2005 brood (2003). DNOT = Did not operate trap.

Basin	Brood	Redds	Estimated eggs	Number of emigrants			Egg to emigrant (%)	Emigrant per redd
				Age-0	Age-1	Total		
Twisp	2006	84	288,372	1,461	--	--	--	--
Twisp	2005	54	233,874	3,247	3,329	6,576	2.8	122
Twisp	2004	135	496,530	1,184	5,092	6,276	1.3	47
Twisp	2003	18	81,558	DNOT	723	723	0.9	40
Methow	2006	922	3,362,156	2,913	--	--	--	--
Methow	2005	566	2,069,906	17,490	33,710	51,200	2.5	91
Methow	2004	543	1,933,506	DNOT	15,869	15,869	0.8	29
Methow	2003	462	2,167,026	8,170	15,306	23,476	1.1	51
Methow	2002	1,105	4,235,465	DNOT	26,044	26,044	0.6	24

Summer Steelhead

Because juvenile steelhead may emigrate as age-4 fish, the 2003 brood was the first brood for which a complete emigration estimate was calculated. We estimated that 106 age-4 steelhead emigrated in 2007, resulting in a complete 2003 brood emigration of 9,038 (± 758, 95% CI; Table 14) fish. The 2003 brood produced four emigrants from each redd in the Methow River basin (including Twisp River) and five emigrants from each redd in the Twisp River basin, although no estimate of age-1 production was calculated for the Twisp River. Excluding Twisp River production, Methow basin steelhead produced an estimated 4.1 emigrants per 2003 brood steelhead redd.

Table 14. Estimated emigrant-per-redd and egg-to-emigrant survival of Methow basin steelhead. Emigrant-per-redd values were not calculated for incomplete brood years. Number of emigrants at age did not incorporate production downstream of each trap site except for the Methow 2003 brood. 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	2006	386	2,465,382	81	--	--	--	81	0.00	--
Twisp	2005	452	2,806,016	292	2,687	--	--	2,979	0.11	- -
Twisp	2004	254	1,166,876	79	3,192	500	--	3,771	0.32	--
Twisp	2003	606	3,849,312	DNOT	1,787	1,357	58	3,202	0.08	5
Methow	2006	785	5,013,795	639	--	--	--	639	0.01	--
Methow	2005	1,685	10,460,480	2,030	12,981	--	--	15,011	0.14	--
Methow	2004	947	4,350,518	1,883	9,082	1,277	--	12,242	0.28	--
Methow	2003	2,019	12,824,688	1,596	4,872	2,459	106	9,038	0.07	4

Incidental Species

Pacific lamprey were the most abundant incidental species captured at the Methow River trap, while longnose dace were the most abundant incidental species captured at the Twisp River trap (Table 15). We captured 22 wild coho smolts from the 2005 brood in 2007. Utilizing the same mark/recapture efficiency trial data used at the Methow River site for spring Chinook salmon, we estimate that 1,999 (± 1,378, 95% CI) wild coho from the 2005 brood emigrated from the Methow River in 2007. Some species (e.g., Pacific lamprey) were abundant at the Methow River trap, but were not encountered in the Twisp River.

Table 15. Biological sampling conducted on selected incidental species captured at Methow River basin smolt traps in 2007.

Species	Captured	Fork length (mm)			Weight (g)		
		Mean	*N*	SD	Mean	*N*	SD
Methow River trap							
Pacific lamprey (*Lampetra tridentata*)	2,183	132.4	28	20.5	9.5	20	27.9
Hatchery coho (*O. kisutch*)	1,853	127.0	67	8.9	22.9	1	- -
Longnose dace (*Rhinichthys cataractae*)	1,409	38.5	389	20.3	7.4	3	7.5
Sucker juvenile (*Catostomus spp.*)	1,404	58.7	247	31.9	8.7	2	13.1
Whitefish (*Prosopium williamsoni*)	296	34.8	182	6.3	1.2	1	- -
Redside shiner (*Richardsonius balteatus*)	162	30.4	68	14.3	12.5	67	4.6
Sculpin (*Cottus spp.*)	48	42.9	37	23.8	11.3	58	3.9
Bridge lip sucker (*Catostomus columbianus*)	34	119.7	20	38.2	28.7	22	20.7
Wild coho smolt (*O. kisutch*)	22	118.2	21	15.5	19.8	3	2.7
Wild coho fry (*O. kisutch*)	12	40.6	12	6.1	- -	8	18.8
Wild coho parr (*O. kisutch*)	12	69.6	12	14.2	6.9	- -	- -
Sockeye fry (*O. nerka*)	9	34.7	6	0.5	- -	112	11.4
Bull trout (*Salvelinus confluentus*)	4	170.0	4	5.8	48.8	3	4.4
Umatilla dace (*Rhinichthys umatilla*)	4	100.7	3	10.6	15.3	2	0.5
Cutthroat trout (*O. clarki*)	2	217.5	2	9.2	94.4	- -	- -
Brown bullhead (*Ameiurus nebulosus*)	1	160.0	1	- -	74.6	7	3.3
Eastern brook trout (*Salvelinus fontinalis*)	1	120.0	1	- -	19.3	19	8.3
Twisp River trap							
Longnose dace (*Rhinichthys cataractae*)	1,070	98.9	448	15.1	13.7	439	6.5
Sculpin (*Cottus spp.*)	102	52.2	81	22.7	5.3	51	6.8
Whitefish (*Prosopium williamsoni*)	90	45.8	72	17.9	2.9	29	5.5
Bull trout (*Salvelinus confluentus*)	10	195.3	10	31.9	74.5	10	36.8
Cutthroat trout (*O. clarki*)	22	183.9	22	25.8	66.2	22	24.3
Sockeye fry (*O. nerka*)	3	39.6	3	3.1	- -	- -	- -
Wild coho fry (*O. kisutch*)	1	37.0	1	- -	- -	- -	- -
Sucker (*Catostomus spp.*)	11	74.5	11	21.3	7.5	9	4.7
Brown bullhead (*Ameiurus nebulosus*)	5	86.6	5	10.5	11.1	5	3.8

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. Despite moderate observed trap efficiencies for salmon and steelhead (range 2-9%), the relatively low abundance of wild yearling Chinook salmon and steelhead severely limit the number and size of trials that can be conducted. Although a common alternative, the use of hatchery fish as surrogates should also be carefully examined because of potential behavioral and size differences between wild and hatchery fish. At emigration, hatchery fish are typically greater in size than their wild conspecifics and size-related biases related to trap efficiency might preclude the use of some hatchery fish. Because we have been unable to conduct paired mark/recapture trials with hatchery and wild fish, we cannot test whether capture efficiency at specific discharges for hatchery fish is similar to that of wild fish.

Changes in river morphology at the Methow trapping site due to heavy flooding and sediment deposition required abandonment of the high trap position during the trapping period. The traps were instead fished in the previous flood position, which was renamed to the upper position, reducing the number of trap positions. Mark/recapture efficiency trials from previous years were utilized to estimate trap efficiency for the few days the high position was used in 2007. Mark/recapture trials conducted in the upper position resulted in the first efficiency/discharge relationship developed at the site.

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%). A retrospective analysis of data from previous years should provide more robust smolt-production estimates once trap efficiency models have been established.

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 salmon and steelhead limited the number of PIT tags deployed in 2007. Low sample sizes of PIT-tagged fish may preclude any statistical analysis of over-winter mortality and subsequent smolt survival of PIT tagged subyearling Chinook salmon.

Previous estimates of spring Chinook salmon and summer steelhead egg-to-emigrant survival utilized total redd counts and mean fecundity values from multiple brood years to estimate egg deposition (Snow and Fowler 2006; Snow and Perry 2005). We used brood-specific fecundity values, excluded dewatered redds, and included the estimated production from those redds downstream from each trap site to recalculate egg-to-emigrant and emigrant-per-redd estimates in 2007. Recalculation of egg to emigrant survival resulted in increased estimates of survival rates for spring Chinook salmon from the Twisp and Methow basins. Recalculated egg

deposition using brood-specific mean fecundity values and excluding redds that were downstream of the trap sites provided a lower estimate of the number of eggs deposited.

In subbasins with spring and summer Chinook salmon populations, smolt traps are intentionally located far downstream of spawning areas for spring Chinook salmon to minimize encounters with subyearling spring Chinook salmon emigrating from spawning tributaries. Hence, all yearling Chinook salmon were assumed to be spring Chinook salmon and subyearling Chinook salmon were assumed to be summer Chinook salmon. Based on this assumption, subyearling spring Chinook salmon migrating past the Methow smolt trap may be misclassified as summer Chinook salmon. Conversely, summer Chinook salmon may be misclassified if the yearling life history is more prevalent than adult scale samples suggest or subyearling summer Chinook salmon are misclassified as yearling Chinook salmon. Ongoing studies (e.g., DNA analysis) should determine to what extent spring Chinook salmon migrate as subyearling fish and summer Chinook salmon as yearlings. Tissue samples collected during the spring from yearling Chinook salmon at the Methow trap indicated that few yearling fish were summer Chinook salmon. However, tissue samples collected from subyearling Chinook salmon at the Methow trap during the fall period indicated that the majority of fish were spring Chinook salmon.

We utilized those samples considered to be fall migrants to estimate the passage of 2006 brood spring Chinook parr at the Methow River trap. We did not include fish sampled between 31 May and 10 July in production estimates even though the majority of those fish were classified genetically as non-Twisp spring Chinook. Scale and tissue samples were collected during this period to ensure that all potential age-1 fish were included in the DNA analysis of the 2005 brood smolts. Sampling therefore targeted the largest and presumably age-1 fish. However, scale samples indicated that fish were age-0 (2006 brood) and were not yearling smolts (2005 brood). The mean fork length of the DNA-sampled fish within this time period was 95.1 mm (N = 97), while the mean fork length of non-DNA sampled subyearling Chinook captured within the same time period was significantly smaller (52.5 mm; two-sample t-test; $P < 0.05$). These data suggest, based on the genetic analysis and length of those subyearlings misclassified as yearlings, that these larger fish originated from an age-0 release of 2006 brood Methow Composite spring Chinook (N = 37,787) that were released prior to the trapping season in the Winthrop NFH outfall channel. These fish were otolith-marked, but were not adipose fin clipped or CWT prior to release. Origin could not be determined from scales because of the limited time spent in the hatchery. Data from previous years suggest that naturally produced subyearling spring Chinook could not have obtained the size observed during this period. Furthermore, if naturally produced subyearling spring Chinook were emigrating from the Methow Basin, we would have expected some representation from the Twisp River, as observed in each other group analyzed (see Table 4 of Appendix C). These facts suggest that the fish sampled between 31 May and 10 July were primarily from age-0 hatchery releases. Additional years of trapping and DNA analysis will be required to estimate emigration and species-composition trends for spring and fall migrant Chinook salmon at the Methow River site. However, hatchery release strategies that include non-adipose fin clip, non-CWT fish may confound our ability to address some M&E Plan objectives.

The low freshwater production of yearling Chinook salmon and steelhead may suggest severe density dependent mortality, low reproductive success, or both as factors contributing to the

observed survival rates. Egg deposition estimates for spring Chinook salmon were based on total ground counts of redds throughout the basin. Error associated with spring Chinook salmon redd counts are 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.

Preliminary comparisons between the Twisp and Methow/Chewuch rivers suggest the Twisp River spring Chinook salmon are more productive than the Methow/Chewuch population. Summer steelhead productivity may 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 salmon and steelhead in the Methow Basin. In addition, 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.

References

Cheng, Y., and M. Gallinat. 2004. Statistical analysis of the relationship among environmental variables, inter-annual variability and smolt trap efficiency of salmonids in the Tucannon River. Fisheries Research 70:229-238.

Hubble, J., and H. Sexauer. 1994. Methow basin spring Chinook salmon salmon supplementation plan. Natural production study 1994 annual report. Report to Douglas County Public Utility District. Yakama Indian Nation Fisheries Resource Management Program, Toppenish, Washington.

Hubble, J., and D. Harper. 1999. Methow basin spring Chinook salmon salmon supplementation plan. Natural production study 1995 annual report. Report to Douglas County Public Utility District. Yakama Indian Nation Fisheries Resource Management Program, Toppenish,Washington.

Hubble, J., J. Jorgensen, and R. Kiona. 2003. Methow basin spring Chinook salmon natural production report for 2002. Report to Douglas County Public Utility District. Yakama Indian Nation Fisheries Resource Management, Toppenish, Washington.

Murdoch A., K. Petersen, T. Miller, M. Tonseth, and T. Randolph. 2001. Freshwater production and emigration of juvenile spring Chinook salmon salmon from the Chiwawa River in 2000. Washington Department of Fish and Wildlife, Olympia WA.

Snow, C. and K. Perry. 2005. Methow River spring Chinook salmon and steelhead smolt monitoring in 2004. Report to Douglas County Public Utility District. Washington Department of Fish and Wildlife, Olympia WA.

Snow, C. and A. Fowler. 2006. Methow River basin spring Chinook salmon and steelhead smolt monitoring in 2005. Report to Douglas County Public Utility District. Washington Department of Fish and Wildlife, Olympia WA.

Snow, C, C. Frady, A. Fowler, and A. Murdoch, 2007. Monitoring and evaluation of Wells and Methow hatchery programs in 2006. Report to Douglas County Public Utility District. Washington Department of Fish and Wildlife, Olympia, WA.

Thedinga, J.F., M.L. Murphy, S.W. Johnson, J.M. Lorenz, and K.V. Koski. 1994. Determination of salmonid smolt yield with rotary-screw traps in the Situk River, Alaska to predict effects of glacial flooding. North American Journal of Fisheries Management 14:837-851.

Wells HCP Hatchery Committee (HC). 2005. Conceptual approach to monitoring and evaluation for hatchery programs funded by Douglas County Public Utility District. Douglas PUD HCP HC, East Wenatchee, WA.

Appendix A1. Daily capture of wild spring Chinook salmon smolts emigrating from the Methow River, 22 February through 31 May 2007. Estimated number of Chinook salmon 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
02/22/2007	1	0.008	120	**03/27/2007**	**14[a]**	**0.043**	**326**
02/23/2007	0	0.008	0	03/28/2007	19	0.043	442
02/24/2007	0	0.008	0	03/29/2007	15	0.043	349
02/25/2007	0	0.008	0	03/30/2007	4	0.028	143
02/26/2007	0	0.008	0	03/31/2007	4	0.027	146
02/27/2007	0	0.008	0	04/01/2007	10	0.026	385
02/28/2007	0	0.008	0	04/02/2007	11	0.028	393
03/01/2007	0	0.008	0	04/03/2007	4	0.028	143
03/02/2007	3	0.008	360	04/04/2007	3	0.030	100
03/03/2007	0	0.008	0	04/05/2007	20	0.031	637
03/04/2007	0	0.008	0	04/06/2007	9	0.032	279
03/05/2007	0	0.008	0	04/07/2007	15	0.032	465
03/06/2007	0	0.008	0	04/08/2007	10	0.027	376
03/07/2007	0	0.008	0	04/09/2007	9	0.016	562
03/08/2007	1	0.008	120	04/10/2007	2	0.010	205
03/09/2007	0	0.008	0	04/11/2007	8	0.010	819
03/10/2007	0	0.008	0	04/12/2007	5	0.010	512
03/11/2007	0	0.008	0	04/13/2007	1	0.011	90
03/12/2007	3	0.008	360	04/14/2007	7	0.013	552
03/13/2007	**14**	**0.008**	**1,680**	04/15/2007	1	0.014	69
03/14/2007	32	0.008	3,840	04/16/2007	1	0.016	62
03/15/2007	22	0.008	2,640	04/17/2007	6	0.017	359
03/16/2007	18	0.008	2,160	04/18/2007	6	0.019	317
03/17/2007	9	0.008	1,080	04/19/2007	11	0.020	538
03/18/2007	6	0.008	720	04/20/2007	10	0.022	463
03/19/2007	4	0.008	480	04/21/2007	5	0.023	219
03/20/2007	6	0.008	720	04/22/2007	5	0.024	212
03/21/2007	9	0.008	1,080	04/23/2007	2	0.025	80
03/22/2007	6	0.008	720	04/24/2007	5	0.024	211
03/23/2007	12	0.008	1,440	04/25/2007	3	0.018	163
03/24/2007	4	0.008	480	04/26/2007	2	0.015	134
03/25/2007	21	0.008	2,520	04/27/2007	5	0.015	336
03/26/2007	**13[a]**	**0.008**	**1,560**	04/28/2007	1	0.015	66

[a] Estimate based on two preceding or following days at same trap efficiency.

Appendix A1, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate
04/29/2007	1	0.011	90
04/30/2007	2	0.010	205
05/01/2007	0	0.010	0
05/02/2007	1	0.010	102
05/03/2007	2	0.010	187
05/04/2007	3	0.010	307
05/05/2007	2	0.011	187
05/06/2007	0	0.013	0
05/07/2007	1	0.013	76
05/08/2007	2	0.010	205
05/09/2007	0	0.010	0
05/10/2007	**1**	**0.010**	**102**
05/11/2007	**0**	**0.010**	**0**
05/12/2007	**0**	**0.010**	**0**
05/13/2007	**0**	**0.010**	**0**
05/14/2007	**0**	**0.010**	**0**
05/15/2007	**0**	**0.010**	**0**
05/16/2007	**0**	**0.010**	**0**
05/17/2007	**0**	**0.010**	**0**
05/18/2007	**0**	**0.010**	**0**
05/19/2007	**0**	**0.010**	**0**
05/20/2007	**0**	**0.010**	**0**
05/21/2007	**0**	**0.010**	**0**
05/22/2007	0	0.010	0
05/23/2007	0	0.010	0
05/24/2007	0	0.010	0
05/25/2007	0	0.010	0
05/26/2007	0	0.010	0
05/27/2007	0	0.010	0
05/28/2007	0	0.010	0
05/29/2007	0	0.010	0
05/30/2007	0	0.010	0
05/31/2007	0	0.010	0

Appendix A2. Daily capture of wild spring Chinook salmon parr emigrating from the Methow River, 6 October through 26 November 2007. Estimated number of Chinook salmon captured when the trap was not operating (bold) were 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
10/06/2007	1	0.022	46	11/14/2007	2	0.022	93
10/07/2007	0	0.022	0	11/15/2007	2	0.022	93
10/08/2007	0	0.022	0	11/16/2007	0	0.022	0
10/09/2007	0	0.022	0	11/17/2007	3	0.022	139
10/10/2007	0	0.022	0	11/18/2007	0	0.022	0
10/11/2007	1	0.022	46	11/19/2007	1	0.022	46
10/12/2007	0	0.022	0	11/20/2007	1	0.022	46
10/13/2007	0	0.022	0	11/21/2007	1	0.022	46
10/14/2007	0	0.022	0	**11/22/2007**	**1**	**0.022**	**46**
10/15/2007	1	0.022	46	**11/23/2007**	**1**	**0.022**	**46**
10/16/2007	1	0.022	46	**11/24/2007**	**1**	**0.022**	**46**
10/17/2007	1	0.022	46	**11/25/2007**	**1**	**0.022**	**46**
10/18/2007	1	0.022	46	11/26/2007	0	0.022	0
10/19/2007	0	0.022	0				
10/20/2007	0	0.022	0				
10/21/2007	0	0.022	0				
10/22/2007	1	0.022	46				
10/23/2007	0	0.022	0				
10/24/2007	2	0.022	93				
10/25/2007	0	0.022	0				
10/26/2007	1	0.022	46				
10/27/2007	6	0.022	278				
10/28/2007	1	0.022	46				
10/29/2007	4	0.022	185				
10/30/2007	5	0.022	231				
10/31/2007	2	0.022	93				
11/01/2007	6	0.022	278				
11/02/2007	4	0.022	185				
11/03/2007	2	0.022	93				
11/04/2007	2	0.022	93				
11/05/2007	1	0.022	46				
11/06/2007	2	0.022	93				
11/07/2007	0	0.022	0				
11/08/2007	0	0.022	0				
11/09/2007	1	0.022	46				
11/10/2007	1	0.022	46				
11/11/2007	1	0.022	46				
11/12/2007	1	0.022	46				
11/13/2007	0	0.022	0				

Appendix A3. Daily capture of wild steelhead smolt and transitional fish emigrating from the Methow River, 22 February to 30 June 2007. 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
02/22/2007	0	0.035	0	03/28/2007	3	0.033	90
02/23/2007	0	0.035	0	03/29/2007	3	0.033	90
02/24/2007	0	0.035	0	03/30/2007	0	0.016	0
02/25/2007	0	0.035	0	03/31/2007	0	0.016	0
02/26/2007	0	0.035	0	04/01/2007	0	0.016	0
02/27/2007	0	0.035	0	04/02/2007	0	0.016	0
02/28/2007	0	0.035	0	04/03/2007	1	0.016	64
03/01/2007	0	0.035	0	04/04/2007	0	0.016	0
03/02/2007	0	0.035	0	04/05/2007	1	0.016	64
03/03/2007	0	0.035	0	04/06/2007	1	0.016	64
03/04/2007	0	0.035	0	04/07/2007	3	0.016	193
03/05/2007	0	0.035	0	04/08/2007	5	0.016	321
03/06/2007	0	0.035	0	04/09/2007	4	0.016	257
03/07/2007	0	0.035	0	04/10/2007	4	0.016	257
03/08/2007	0	0.035	0	04/11/2007	4	0.016	257
03/09/2007	0	0.035	0	04/12/2007	10	0.016	643
03/10/2007	0	0.035	0	04/13/2007	5	0.016	321
03/11/2007	0	0.035	0	04/14/2007	5	0.016	321
03/12/2007	0	0.035	0	04/15/2007	1	0.016	64
03/13/2007	**0**	**0.035**	**0**	04/16/2007	1	0.016	64
03/14/2007	0	0.035	0	04/17/2007	3	0.016	193
03/15/2007	1	0.035	29	04/18/2007	2	0.016	129
03/16/2007	2	0.035	57	04/19/2007	7	0.016	450
03/17/2007	0	0.035	0	04/20/2007	5	0.016	321
03/18/2007	0	0.035	0	04/21/2007	2	0.016	129
03/19/2007	0	0.035	0	04/22/2007	1	0.016	64
03/20/2007	0	0.035	0	04/23/2007	2	0.016	129
03/21/2007	0	0.035	0	04/24/2007	3	0.016	193
03/22/2007	0	0.035	0	04/25/2007	5	0.016	321
03/23/2007	0	0.035	0	04/26/2007	7	0.016	450
03/24/2007	0	0.035	0	04/27/2007	0	0.016	0
03/25/2007	1	0.035	29	04/28/2007	0	0.016	0
03/26/2007	**1**	**0.035**	**29**	04/29/2007	2	0.016	129
03/27/2007	**3**	**0.033**	**90**	04/30/2007	5	0.016	321

Appendix A3, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
05/01/2007	0	0.016	0	**06/07/2007**	**1**	**0.016**	**64**
05/02/2007	3	0.016	193	06/08/2007	0	0.016	0
05/03/2007	11	0.016	707	06/09/2007	1	0.016	64
05/04/2007	4	0.016	257	06/10/2007	1	0.016	64
05/05/2007	7	0.016	450	06/11/2007	0	0.016	0
05/06/2007	3	0.016	193	06/12/2007	0	0.016	0
05/07/2007	8	0.016	514	06/13/2007	0	0.016	0
05/08/2007	11	0.016	707	06/14/2007	0	0.016	0
05/09/2007	24	0.016	1543	06/15/2007	0	0.016	0
05/10/2007	**10**	**0.016**	**643**	06/16/2007	0	0.016	0
05/11/2007	**9**	**0.016**	**579**	06/17/2007	0	0.016	0
05/12/2007	**6**	**0.016**	**386**	06/18/2007	0	0.016	0
05/13/2007	**5**	**0.016**	**321**	06/19/2007	0	0.016	0
05/14/2007	**4**	**0.016**	**257**	06/20/2007	1	0.016	64
05/15/2007	**3**	**0.016**	**193**	06/21/2007	0	0.016	0
05/16/2007	**3**	**0.016**	**193**	06/22/2007	0	0.016	0
05/17/2007	**2**	**0.016**	**129**	06/23/2007	1	0.016	64
05/18/2007	**2**	**0.016**	**129**	06/24/2007	0	0.016	0
05/19/2007	**2**	**0.016**	**129**	06/25/2007	0	0.016	0
05/20/2007	**2**	**0.016**	**129**	06/26/2007	0	0.016	0
05/21/2007	**2**	**0.016**	**129**	06/27/2007	0	0.016	0
05/22/2007	1	0.016	64	06/28/2007	0	0.016	0
05/23/2007	2	0.016	129	06/29/2007	0	0.016	0
05/24/2007	0	0.016	0	06/30/2007	0	0.016	0
05/25/2007	1	0.016	64				
05/26/2007	1	0.016	64				
05/27/2007	0	0.016	0				
05/28/2007	0	0.016	0				
05/29/2007	0	0.016	0				
05/30/2007	0	0.016	0				
05/31/2007	1	0.016	64				
06/01/2007	**1**	**0.016**	**64**				
06/02/2007	**1**	**0.016**	**64**				
06/03/2007	**1**	**0.016**	**64**				
06/04/2007	**1**	**0.016**	**64**				
06/05/2007	**1**	**0.016**	**64**				
06/06/2007	**1**	**0.016**	**64**				

Appendix A4. Daily capture of wild spring Chinook salmon smolts emigrating from the Twisp River, 8 March to 31 May 2007. Estimated number of Chinook salmon 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
08-Mar-07	0	0.090	0	16-Apr-07	8	0.090	89
09-Mar-07	1	0.090	11	17-Apr-07	2	0.090	22
10-Mar-07	1	0.090	11	18-Apr-07	2	0.090	22
11-Mar-07	0	0.090	0	19-Apr-07	4	0.090	44
12-Mar-07	1	0.090	11	20-Apr-07	6	0.090	66
13-Mar-07	10	0.090	111	21-Apr-07	7	0.090	77
14-Mar-07	8	0.090	89	22-Apr-07	8	0.090	89
15-Mar-07	7	0.090	77	23-Apr-07	7	0.090	77
16-Mar-07	4	0.090	44	24-Apr-07	10	0.090	111
17-Mar-07	12	0.090	133	25-Apr-07	7	0.090	77
18-Mar-07	2	0.090	22	26-Apr-07	9	0.090	100
19-Mar-07	7	0.090	77	27-Apr-07	7	0.090	77
20-Mar-07	5	0.090	55	28-Apr-07	6	0.090	66
21-Mar-07	5	0.090	55	29-Apr-07	4	0.090	44
22-Mar-07	5	0.090	55	30-Apr-07	1	0.090	11
23-Mar-07	3	0.090	33	01-May-07	0	0.090	0
24-Mar-07	4	0.090	44	02-May-07	1	0.090	11
25-Mar-07	9	0.090	100	03-May-07	2	0.090	22
26-Mar-07	5	0.090	55	04-May-07	0	0.090	0
27-Mar-07	6	0.090	66	05-May-07	1	0.090	11
28-Mar-07	4	0.090	44	06-May-07	3	0.090	33
29-Mar-07	2	0.090	22	07-May-07	1	0.090	11
30-Mar-07	4	0.090	44	08-May-07	2	0.090	22
31-Mar-07	1	0.090	11	09-May-07	0	0.090	0
01-Apr-07	1	0.090	11	09-May-07	0	0.090	0
02-Apr-07	2	0.090	22	**10-May-07**	**1**	**0.090**	**11**
03-Apr-07	1	0.090	11	**11-May-07**	**1**	**0.090**	**11**
04-Apr-07	0	0.090	0	**12-May-07**	**1**	**0.090**	**11**
05-Apr-07	1	0.090	11	**13-May-07**	**1**	**0.090**	**11**
06-Apr-07	0	0.090	0	**14-May-07**	**1**	**0.090**	**11**
07-Apr-07	8	0.090	89	**15-May-07**	**1**	**0.090**	**11**
08-Apr-07	14	0.090	155	**16-May-07**	**1**	**0.090**	**11**
09-Apr-07	20	0.090	221	**17-May-07**	**1**	**0.090**	**11**
10-Apr-07	8	0.090	89	**18-May-07**	**1**	**0.090**	**11**
11-Apr-07	7	0.090	77	**19-May-07**	**1**	**0.090**	**11**
12-Apr-07	1	0.090	11	**20-May-07**	**1**	**0.090**	**11**
13-Apr-07	3	0.090	33	**21-May-07**	**1**	**0.090**	**11**
14-Apr-07	6	0.090	66	**22-May-07**	**1**	**0.090**	**11**
15-Apr-07	5	0.090	55	23-May-07	0	0.090	0

Appendix A4, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate
24-May-07	2	0.090	22
25-May-07	0	0.090	0
26-May-07	0	0.090	0
27-May-07	0	0.090	0
28-May-07	**0**	**0.090**	**0**
29-May-07	**0**	**0.090**	**0**
30-May-07	**0**	**0.090**	**0**
31-May-07	**0**	**0.090**	**0**

Appendix A5. Daily capture of wild spring Chinook salmon parr emigrating from the Twisp River, 5 October to 21 November 2007. Estimated number of Chinook salmon 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
10/05/2007	14	0.171	82	11/08/2007	2	0.171	12
10/06/2007	9	0.171	53	11/09/2007	6	0.171	35
10/07/2007	9	0.171	53	11/10/2007	6	0.171	35
10/08/2007	8	0.171	47	11/11/2007	3	0.171	18
10/09/2007	7	0.171	41	11/12/2007	3	0.171	18
10/10/2007	6	0.171	35	11/13/2007	8	0.171	47
10/11/2007	4	0.171	23	11/14/2007	2	0.171	12
10/12/2007	5	0.171	29	11/15/2007	2	0.171	12
10/13/2007	2	0.171	12	11/16/2007	2	0.171	12
10/14/2007	5	0.171	29	11/17/2007	3	0.171	18
10/15/2007	2	0.171	12	11/18/2007	2	0.171	12
10/16/2007	1	0.171	6	11/19/2007	0	0.171	0
10/17/2007	5	0.171	29	11/20/2007	3	0.171	18
10/18/2007	5	0.171	29	11/21/2007	3	0.171	18
10/19/2007	7	0.171	41				
10/20/2007	7	0.171	41				
10/21/2007	7	0.171	41				
10/22/2007	1	0.171	6				
10/23/2007	2	0.171	12				
10/24/2007	4	0.171	23				
10/25/2007	7	0.171	41				
10/26/2007	7	0.171	41				
10/27/2007	11	0.171	64				
10/28/2007	4	0.171	23				
10/29/2007	3	0.171	18				
10/30/2007	8	0.171	47				
10/31/2007	14	0.171	82				
11/01/2007	8	0.171	47				
11/02/2007	7	0.171	41				
11/03/2007	9	0.171	53				
11/04/2007	4	0.171	23				
11/05/2007	6	0.171	35				
11/06/2007	2	0.171	12				
11/07/2007	4	0.171	23				

Appendix A6. Daily capture of wild steelhead smolt and transitional fish emigrating from the Twisp River, 8 March to 30 June 2007. 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
03/08/2007	0	0.104	0	04/16/2007	4	0.104	38
03/09/2007	0	0.104	0	04/17/2007	1	0.104	10
03/10/2007	0	0.104	0	04/18/2007	4	0.104	38
03/11/2007	0	0.104	0	04/19/2007	2	0.104	19
03/12/2007	0	0.104	0	04/20/2007	1	0.104	10
03/13/2007	2	0.104	19	04/21/2007	3	0.104	29
03/14/2007	0	0.104	0	04/22/2007	5	0.104	48
03/15/2007	4	0.104	38	04/23/2007	10	0.104	96
03/16/2007	1	0.104	10	04/24/2007	7	0.104	67
03/17/2007	2	0.104	19	04/25/2007	19	0.104	182
03/18/2007	2	0.104	19	04/26/2007	14	0.104	134
03/19/2007	3	0.104	29	04/27/2007	7	0.104	67
03/20/2007	5	0.104	48	04/28/2007	14	0.104	134
03/21/2007	4	0.104	38	04/29/2007	21	0.104	201
03/22/2007	1	0.104	10	04/30/2007	10	0.104	96
03/23/2007	1	0.104	10	05/01/2007	13	0.104	124
03/24/2007	5	0.104	48	05/02/2007	9	0.104	86
03/25/2007	10	0.104	96	05/03/2007	5	0.104	48
03/26/2007	12	0.104	115	05/04/2007	1	0.104	10
03/27/2007	5	0.104	48	05/05/2007	6	0.104	57
03/28/2007	8	0.104	77	05/06/2007	5	0.104	48
03/29/2007	3	0.104	29	05/07/2007	9	0.104	86
03/30/2007	1	0.104	10	05/08/2007	19	0.104	182
03/31/2007	2	0.104	19	05/09/2007	3	0.104	29
04/01/2007	1	0.104	10	05/09/2007	1	0.104	10
04/02/2007	1	0.104	10	**05/10/2007**	**1**	**0.104**	**10**
04/03/2007	1	0.104	10	**05/11/2007**	**1**	**0.104**	**10**
04/04/2007	1	0.104	10	**05/12/2007**	**1**	**0.104**	**10**
04/05/2007	1	0.104	10	**05/13/2007**	**1**	**0.104**	**10**
04/06/2007	0	0.104	0	**05/14/2007**	**1**	**0.104**	**10**
04/07/2007	5	0.104	48	**05/15/2007**	**1**	**0.104**	**10**
04/08/2007	5	0.104	48	**05/16/2007**	**1**	**0.104**	**10**
04/09/2007	17	0.104	163	**05/17/2007**	**1**	**0.104**	**10**
04/10/2007	9	0.104	86	**05/18/2007**	**1**	**0.104**	**10**
04/11/2007	3	0.104	29	**05/19/2007**	**1**	**0.104**	**10**
04/12/2007	7	0.104	67	**05/20/2007**	**1**	**0.104**	**10**
04/13/2007	5	0.104	48	**05/21/2007**	**1**	**0.104**	**10**
04/14/2007	4	0.104	38	**05/22/2007**	**1**	**0.104**	**10**
04/15/2007	1	0.104	10	05/23/2007	0	0.104	0

Appendix A6, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
05/24/2007	1	0.104	10	**06/28/2007**	**0**	**0.104**	**0**
05/25/2007	0	0.104	0	06/29/2007	0	0.104	0
05/26/2007	0	0.104	0	06/30/2007	0	0.104	0
05/27/2007	0	0.104	0				
05/28/2007	0	0.104	0				
05/29/2007	0	0.104	0				
05/30/2007	0	0.104	0				
05/31/2007	0	0.104	0				
06/01/2007	0	0.104	0				
06/02/2007	0	0.104	0				
06/03/2007	0	0.104	0				
06/04/2007	0	0.104	0				
06/05/2007	0	0.104	0				
06/06/2007	0	0.104	0				
06/07/2007	0	0.104	0				
06/08/2007	0	0.104	0				
06/09/2007	0	0.104	0				
06/10/2007	3	0.104	29				
06/11/2007	2	0.104	19				
06/12/2007	0	0.104	0				
06/13/2007	0	0.104	0				
06/14/2007	0	0.104	0				
06/15/2007	1	0.104	10				
06/16/2007	1	0.104	10				
06/17/2007	0	0.104	0				
06/18/2007	0	0.104	0				
06/19/2007	0	0.104	0				
06/20/2007	0	0.104	0				
06/21/2007	0	0.104	0				
06/22/2007	0	0.104	0				
06/23/2007	0	0.104	0				
06/24/2007	0	0.104	0				
06/25/2007	0	0.104	0				
06/26/2007	0	0.104	0				
06/27/2007	0	0.104	0				

Appendix B1. Loss of PIT tags inserted into wild (YCW) and hatchery (YCH) spring Chinook salmon smolts (S) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07151.JBZ	YCW	S	N	1	0	0	1
CGS07131.JBC	YCW	S	N	2	0	0	2
CGS07127.JBC	YCW	S	N	1	0	0	1
CGS07125.JBC	YCW	S	N	2	0	0	2
CGS07124.JBC	YCW	S	N	5	0	0	5
CGS07120.JBC	YCW	S	N	2	0	0	2
CGS07119.JBC	YCW	S	N	1	0	0	1
CGS07117.JBC	YCW	S	N	5	0	0	5
CGS07116.JBC	YCW	S	N	2	0	0	2
CGS07114.JBC	YCW	S	N	5	0	1[a]	4
CGS07113.JBC	YCW	S	N	1	0	0	1
CGS07112.JBC	YCW	S	N	6	0	0	6
CGS07111.JBC	YCW	S	N	26	0	0	26
CGS07108.JAZ	YCW	S	N	6	0	0	6
CGS07107.JBC	YCW	S	N	6	0	0	6
CGS07105.JBC	YCW	S	N	1	0	0	1
CGS07104.JAC	YCW	S	Y	7	0	0	7
CGS07103.JAC	YCW	S	Y	1	0	0	1
CGS07101.JAC	YCW	S	Y	8	0	0	8
CGS07100.JAC	YCW	S	Y	2	0	0	2
CGS07099.JAC	YCW	S	Y	10	0	0	10
CGS07098.JAC	YCW	S	Y	11	0	0	11
CGS07097.JAC	YCW	S	Y	15	0	0	15
CGS07096.JAC	YCW	S	Y	10	0	0	10
CGS07095.JAC	YCW	S	Y	20	0	0	20
CGS07093.JAC	YCW	S	Y	4	0	0	4
CGS07092.JAC	YCW	S	Y	12	0	0	12
CGS07091.JAC	YCW	S	Y	10	0	0	10
CGS07090.JAC	YCW	S	Y	4	0	0	4
CGS07089.JAC	YCW	S	Y	4	0	0	4
CGS07088.JAC	YCW	S	Y	15	0	0	15
CGS07087.JAC	YCW	S	Y	18	0	0	18
CGS07086.JAC	YCW	S	Y	4	0	0	4
CGS07084.JAC	YCW	S	Y	20	0	0	20
CGS07083.JAC	YCW	S	Y	4	0	0	4
CGS07082.JAC	YCW	S	Y	12	0	0	12
CGS07081.JAC	YCW	S	Y	6	0	0	6
CGS07080.JAC	YCW	S	Y	10	0	0	10
CGS07079.JAC	YCW	S	Y	6	0	0	6
CGS07078.JAC	YCW	S	Y	4	0	0	4
CGS07077.JAC	YCW	S	Y	6	2	0	4
CGS07076.JAC	YCW	S	Y	9	0	0	9
CGS07075.JAZ	YCW	S	Y	17	0	0	17

Appendix B1, continued.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07074.JAC	YCW	S	Y	22	0	0	22
CGS07073.JAC	YCW	S	Y	31	0	0	31
CGS07071.JBC	YCW	S	Y	3	0	0	3
CGS07064.JBC	YCW	S	N	3	0	0	3
CGS07054.JAC	YCW	S	N	1	0	0	1
Total				381	2	1	378
CGS07131.JBA	YCH	S	N	2	0	0	2
CGS07110.JAA	YCH	S	Y	306	0	1	305
CGS07109.JAA	YCH	S	Y	394	1	0	393
CGS07108.JAZ	YCH	S	Y	362	0	0	362
CGS07104.JAA	YCH	S	Y	21	0	0	21
CGS07103.JAA	YCH	S	Y	170	7	0	163
CGS07081.JAA	YCH	S	Y	2	0	0	2
Total				1,257	8	1	1,248
Grand total				1,638	10	2	1,626

[a] Non-functioning tag.

Appendix B2. Loss of PIT tags inserted into wild Chinook salmon parr (P) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07324.JAZ	SBC	P	Y	1	0	0	1
CGS07323.JAZ	SBC	P	Y	4	0	0	4
CGS07319.JAZ	SBC	P	Y	2	0	0	2
CGS07318.JAZ	SBC	P	Y	2	0	0	2
CGS07317.JAZ	SBC	P	Y	4	0	0	4
CGS07313.JAZ	SBC	P	Y	1	0	0	1
CGS07312.JAZ	SBC	P	Y	1	1	0	0
CGS07310.JAZ	SBC	P	Y	2	0	0	2
CGS07309.JAZ	SBC	P	Y	6	1	0	5
CGS07306.JAZ	SBC	P	Y	4	0	0	4
CGS07305.JAZ	SBC	P	Y	6	0	0	6
CGS07304.JAZ	SBC	P	Y	2	0	0	2
CGS07303.JAZ	SBC	P	Y	4	0	0	4
CGS07302.JAZ	SBC	P	Y	10	0	0	10
CGS07299.JAZ	SBC	P	Y	3	0	0	3
CGS07298.JAZ	SBC	P	Y	1	0	0	1
CGS07297.JAZ	SBC	P	Y	1	0	0	1
CGS07295.JBZ	SBC	P	N	1	0	0	1
CGS07291.JBZ	SBC	P	N	2	0	0	2
CGS07290.JBZ	SBC	P	N	1	0	0	1
CGS07289.JBZ	SBC	P	N	1	0	0	1
CGS07288.JBZ	SBC	P	N	1	0	0	1
CGS07284.JBZ	SBC	P	N	1	0	0	1
CGS07281.JBZ	SBC	P	N	1	0	0	1
Grand total				62	2	0	60

Appendix B3. Loss of PIT tags inserted into wild (SHR) and hatchery (SHH) steelhead migrants at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07192.JBZ	SHR	Migratory	N	1	0	0	1
CGS07176.JBZ	SHR	Migratory	N	1	0	0	1
CGS07171.JBZ	SHR	Migratory	N	1	0	0	1
CGS07162.JBZ	SHR	Migratory	N	2	0	0	2
CGS07151.JBZ	SHR	Migratory	N	1	0	0	1
CGS07149.JBZ	SHR	Migratory	N	1	0	0	1
CGS07145.JBZ	SHR	Migratory	N	1	0	0	1
CGS07143.JBG	SHR	Migratory	N	3	0	0	3
CGS07131.JBG	SHR	Migratory	N	33	0	0	33
CGS07127.JAG	SHR	Migratory	Y	7	0	0	7
CGS07126.JBG	SHR	Migratory	N	3	0	0	3
CGS07125.JBG	SHR	Migratory	N	6	0	0	6
CGS07124.JBG	SHR	Migratory	N	15	0	0	15
CGS07120.JBG	SHR	Migratory	N	5	0	0	5
CGS07119.JBG	SHR	Migratory	N	2	0	0	2
CGS07116.JBG	SHR	Migratory	N	7	0	0	7
CGS07114.JBG	SHR	Migratory	N	3	0	0	3
CGS07113.JBG	SHR	Migratory	N	2	0	0	2
CGS07111.JBG	SHR	Migratory	N	14	0	1	13
CGS07108.JAZ	SHR	Migratory	N	2	0	0	2
CGS07107.JBG	SHR	Migratory	N	3	0	0	3
CGS07106.JBG	SHR	Migratory	N	1	0	0	1
CGS07105.JBG	SHR	Migratory	N	1	0	0	1
CGS07104.JBG	SHR	Migratory	N	4	0	0	4
CGS07103.JBG	SHR	Migratory	N	14	0	1	13
CGS07101.JBG	SHR	Migratory	N	4	0	0	4
CGS07100.JBG	SHR	Migratory	N	4	0	0	4
CGS07099.JBG	SHR	Migratory	N	4	0	0	4
CGS07098.JBG	SHR	Migratory	N	5	0	0	5
CGS07097.JBG	SHR	Migratory	N	3	0	0	3
CGS07096.JBG	SHR	Migratory	N	1	0	0	1
CGS07093.JBG	SHR	Migratory	N	1	0	0	1
CGS07088.JBG	SHR	Migratory	N	3	0	0	3
CGS07087.JBG	SHR	Migratory	Y	2	0	0	2
CGS07084.JBG	SHR	Migratory	*N*	1	0	0	1
CGS07075.JBG	SHR	Migratory	N	2	0	0	2
CGS07074.JBG	SHR	Migratory	N	1	0	0	1
Total				164	0	2	162
CGS07131.JBE	SHH	Migratory	N	246	2	1	243
CGS07126.JAE	SHH	Migratory	Y	179	0	0	179
CGS07124.JAE	SHH	Migratory	Y	571	0	1	570
CGS07086.JBE	SHH	Migratory	N	1	0	0	1
Total SHR				164	0	2	162
Total SHH				997	2	2	993
Grand total				1,161	2	4	1,155

Appendix B4. Loss of PIT tags inserted into wild steelhead parr (P) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07232.JBZ	SHR	P	N	2	0	0	2
CGS07225.JBZ	SHR	P	N	1	0	0	1
CGS07207.JBZ	SHR	P	N	1	0	0	1
CGS07192.JBZ	SHR	P	N	1	0	0	1
CGS07171.JBZ	SHR	P	N	1	0	0	1
CGS07170.JBZ	SHR	P	N	1	0	0	1
CGS07164.JBZ	SHR	P	N	1	0	0	1
CGS07159.JBZ	SHR	P	N	1	0	0	1
CGS07144.JBH	SHR	P	N	1	0	0	1
CGS07116.JBH	SHR	P	N	1	0	0	1
CGS07112.JBH	SHR	P	N	1	0	0	1
CGS07108.JAZ	SHR	P	N	1	0	0	1
CGS07101.JBH	SHR	P	N	1	0	0	1
CGS07089.JBH	SHR	P	N	1	0	0	1
CGS07074.JBH	SHR	P	N	1	0	0	1
Grand total				16	0	0	16

Appendix B5. Loss of PIT tags inserted into wild (YCW) and hatchery (YCH) spring Chinook salmon smolts (S) at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07144.KBC	YCW	S	N	2	0	0	2
CGS07129.KBC	YCW	S	N	2	0	0	2
CGS07127.KBC	YCW	S	N	4	0	0	4
CGS07125.KBC	YCW	S	N	1	0	0	1
CGS07122.KBC	YCW	S	N	3	0	0	3
CGS07120.KBC	YCW	S	N	1	0	0	1
CGS07119.KBC	YCW	S	Y	4	0	0	4
CGS07118.KBC	YCW	S	N	6	0	0	6
CGS07117.KBC	YCW	S	N	7	0	0	7
CGS07116.KBC	YCW	S	N	5	0	0	5
CGS07115.KBC	YCW	S	N	7	0	0	7
CGS07114.KBC	YCW	S	N	10	0	0	10
CGS07113.KBC	YCW	S	N	7	0	0	7
CGS07112.KBC	YCW	S	N	8	0	0	8
CGS07111.KBC	YCW	S	N	7	0	0	7
CGS07110.KBC	YCW	S	N	6	0	0	6
CGS07109.KBC	YCW	S	N	2	0	0	2
CGS07108.KBC	YCW	S	N	2	0	0	2
CGS07107.KBC	YCW	S	N	2	0	0	2
CGS07106.KAC	YCW	S	Y	8	0	0	8
CGS07105.KAC	YCW	S	Y	5	0	0	5
CGS07104.KAC	YCW	S	Y	6	0	0	6
CGS07103.KAC	YCW	S	Y	3	0	0	3
CGS07102.KAC	YCW	S	Y	1	0	0	1
CGS07101.KAC	YCW	S	Y	7	0	0	7
CGS07100.KAC	YCW	S	Y	8	0	0	8
CGS07099.KAC	YCW	S	Y	20	0	0	20
CGS07098.KAC	YCW	S	Y	13	0	0	13
CGS07097.KAC	YCW	S	Y	8	0	0	8
CGS07095.KAC	YCW	S	Y	1	0	0	1
CGS07093.KAC	YCW	S	Y	1	0	0	1
CGS07092.KAC	YCW	S	Y	2	0	0	2
CGS07090.KAC	YCW	S	Y	1	0	0	1
CGS07089.KAC	YCW	S	Y	4	0	0	4
CGS07088.KAC	YCW	S	Y	2	0	0	2
CGS07087.KAC	YCW	S	Y	3	0	0	3
CGS07086.KAC	YCW	S	Y	6	0	0	6
CGS07085.KAC	YCW	S	Y	5	0	0	5
CGS07084.KAC	YCW	S	Y	8	0	0	8
CGS07083.KAC	YCW	S	Y	4	0	0	4
CGS07082.KAC	YCW	S	Y	3	0	1	2
CGS07081.KAC	YCW	S	Y	0	0	0	0
CGS07080.KAC	YCW	S	Y	10	0	0	10

Appendix B5, continued.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07079.KAC	YCW	S	Y	5	0	0	5
CGS07078.KAC	YCW	S	Y	7	0	0	7
CGS07077.KAC	YCW	S	Y	2	0	0	2
CGS07076.KAC	YCW	S	Y	12	0	0	12
CGS07075.KAC	YCW	S	Y	4	0	0	4
CGS07074.KAC	YCW	S	Y	7	0	0	7
CGS07073.KBC	YCW	S	N	1	0	0	1
CGS07073.KAC	YCW	S	Y	7	0	0	7
CGS07072.KBC	YCW	S	N	9	0	0	9
CGS07071.KBC	YCW	S	N	1	0	0	1
CGS07069.KBC	YCW	S	N	1	0	0	1
CGS07068.KBC	YCW	S	N	1	0	0	1
Total				272	0	1	271
CGS07107.KAA	YCH	S	Y	315	0	0	315
CGS07108.KAA	YCH	S	Y	224	0	0	224
CGS07109.KAA	YCH	S	Y	236	0	0	236
CGS07110.KAA	YCH	S	Y	321	0	0	321
Total				1,096			
Grand total				1,368			

Appendix B6. Loss of PIT tags inserted into wild spring Chinook salmon parr (P) at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07325.KBZ	SBC	P	N	3	0	0	3
CGS07324.KAZ	SBC	P	Y	3	0	0	3
CGS07323.KAZ	SBC	P	Y	5	0	0	5
CGS07320.KAZ	SBC	P	Y	2	0	0	2
CGS07319.KAZ	SBC	P	Y	2	0	0	2
CGS07318.KAZ	SBC	P	Y	2	0	0	2
CGS07317.KAZ	SBC	P	Y	19	0	0	19
CGS07313.KAZ	SBC	P	Y	5	0	0	5
CGS07312.KAZ	SBC	P	Y	2	0	0	2
CGS07311.KAZ	SBC	P	Y	4	1	0	3
CGS07310.KAZ	SBC	P	Y	2	0	0	2
CGS07309.KAZ	SBC	P	Y	19	0	0	19
CGS07306.KAZ	SBC	P	Y	7	0	0	7
CGS07305.KAZ	SBC	P	Y	8	0	0	8
CGS07304.KAZ	SBC	P	Y	14	0	0	14
CGS07303.KAZ	SBC	P	Y	8	0	0	8
CGS07302.KAZ	SBC	P	Y	18	0	0	18
CGS07299.KAZ	SBC	P	Y	7	0	0	7
CGS07298.KAZ	SBC	P	Y	11	0	0	11
CGS07296.KAZ	SBC	P	Y	2	0	0	2
CGS07295.KAZ	SBC	P	Y	15	0	0	15
CGS07292.KAZ	SBC	P	Y	7	0	0	7
CGS07291.KAZ	SBC	P	Y	10	0	0	10
CGS07289.KAZ	SBC	P	Y	1	0	0	1
CGS07288.KAZ	SBC	P	Y	9	0	1	8
CGS07285.KAZ	SBC	P	Y	5	0	0	5
CGS07284.KAZ	SBC	P	Y	4	0	0	4
CGS07283.KAZ	SBC	P	Y	6	0	0	6
CGS07282.KAZ	SBC	P	Y	7	0	0	7
CGS07281.KBZ	SBC	P	Y	2	0	0	2
CGS07278.KAZ	SBC	P	Y	14	0	0	14
CGS07226.KBZ	SBC	P	N	2	0	0	2
CGS07225.KBZ	SBC	P	N	10	0	0	10
CGS07222.KBZ	SBC	P	N	1	0	0	1
CGS07221.KBZ	SBC	P	N	2	0	0	2
CGS07220.KBZ	SBC	P	N	1	0	0	1
CGS07219.KBZ	SBC	P	N	6	0	0	6
CGS07218.KBZ	SBC	P	N	7	0	0	7
CGS07213.KBZ	SBC	P	N	1	0	0	1
Grand total				253	1	1	251

Appendix B7. Loss of PIT tags inserted into hatchery (SHH) and wild (SHR) steelhead migrants at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07208.KBZ	SHR	Migratory	N	1	0	0	1
CGS07207.KBZ	SHR	Migratory	N	1	0	0	1
CGS07206.KBZ	SHR	Migratory	N	1	0	0	1
CGS07198.KBZ	SHR	Migratory	N	1	0	0	1
CGS07190.KBZ	SHR	Migratory	N	1	0	0	1
CGS07187.KBZ	SHR	Migratory	N	1	0	0	1
CGS07162.KBZ	SHR	Migratory	N	2	0	0	2
CGS07161.KBG	SHR	Migratory	N	3	0	0	3
CGS07144.KBG	SHR	Migratory	N	1	0	0	1
CGS07130.KBG	SHR	Migratory	N	4	0	0	4
CGS07128.KBG	SHR	Migratory	N	19	0	0	19
CGS07127.KBG	SHR	Migratory	N	13	0	0	13
CGS07125.KBG	SHR	Migratory	N	6	0	0	6
CGS07122.KBG	SHR	Migratory	N	10	0	0	10
CGS07121.KBG	SHR	Migratory	N	13	0	0	13
CGS07120.KBG	SHR	Migratory	N	10	0	0	10
CGS07119.KBG	SHR	Migratory	N	21	0	0	21
CGS07118.KBG	SHR	Migratory	N	13	0	0	13
CGS07117.KBG	SHR	Migratory	N	7	0	0	7
CGS07116.KBG	SHR	Migratory	N	14	0	0	14
CGS07115.KBG	SHR	Migratory	N	19	0	0	19
CGS07114.KBG	SHR	Migratory	N	7	0	0	7
CGS07113.KBG	SHR	Migratory	N	10	0	0	10
CGS07112.KBG	SHR	Migratory	N	5	0	0	5
CGS07111.KBG	SHR	Migratory	N	3	0	0	3
CGS07110.KBG	SHR	Migratory	N	1	0	0	1
CGS07109.KBG	SHR	Migratory	N	2	0	0	2
CGS07108.KBG	SHR	Migratory	N	3	0	0	3
CGS07107.KBG	SHR	Migratory	N	1	0	0	1
CGS07106.KBG	SHR	Migratory	N	4	0	0	4
CGS07105.KBG	SHR	Migratory	N	1	0	0	1
CGS07104.KBG	SHR	Migratory	N	5	0	0	5
CGS07103.KBG	SHR	Migratory	N	5	0	0	5
CGS07102.KBG	SHR	Migratory	N	6	0	0	6
CGS07100.KAG	SHR	Migratory	Y	9	0	0	9
CGS07099.KAG	SHR	Migratory	Y	17	0	1	16
CGS07098.KAG	SHR	Migratory	Y	5	0	0	5
CGS07097.KAG	SHR	Migratory	Y	5	0	0	5
CGS07095.KAG	SHR	Migratory	Y	1	0	0	1
CGS07094.KAG	SHR	Migratory	Y	1	0	0	1
CGS07093.KAG	SHR	Migratory	Y	1	0	0	1
CGS07092.KAG	SHR	Migratory	Y	1	0	1	0
CGS07091.KAG	SHR	Migratory	Y	1	0	0	1

Appendix B7, continued.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07090.KAG	SHR	Migratory	Y	2	0	0	2
CGS07089.KAG	SHR	Migratory	Y	1	0	0	1
CGS07088.KAG	SHR	Migratory	Y	3	0	0	3
CGS07087.KAG	SHR	Migratory	Y	8	0	0	8
CGS07086.KAG	SHR	Migratory	Y	5	0	0	5
CGS07085.KAG	SHR	Migratory	Y	12	0	0	12
CGS07084.KAG	SHR	Migratory	Y	10	0	0	10
CGS07083.KAG	SHR	Migratory	Y	5	0	0	5
CGS07082.KAG	SHR	Migratory	Y	1	0	0	1
CGS07081.KAG	SHR	Migratory	Y	1	0	0	1
CGS07080.KAG	SHR	Migratory	Y	4	0	0	4
CGS07079.KAG	SHR	Migratory	Y	5	0	0	5
CGS07078.KAG	SHR	Migratory	Y	3	0	1	2
CGS07077.KAG	SHR	Migratory	Y	2	0	0	2
CGS07076.KAG	SHR	Migratory	Y	2	0	0	2
CGS07075.KBG	SHR	Migratory	N	1	0	0	1
CGS07074.KBG	SHR	Migratory	N	4	0	0	4
CGS07073.KBG	SHR	Migratory	N	1	0	0	1
CGS07072.KBG	SHR	Migratory	N	2	0	0	2
Total				327	0	3	324
CGS07125.KAE	SHH	Migratory	Y	200	1	0	199
CGS07122.KAE	SHH	Migratory	Y	399	0	0	399
CGS07120.KAE	SHH	Migratory	Y	305	1	0	304
CGS07117.KBE	SHH	Migratory	N	300	185	1	114
CGS07116.KAE	SHH	Migratory	Y	97	0	0	97
CGS07115.KAE	SHH	Migratory	Y	177	0	0	177
CGS07100.KAG	SHH	Migratory	Y	1	0	0	1
CGS07076.KAE	SHH	Migratory	Y	1	0	0	1
Total				1,480	187	1	1,292
Grand total				1,807	187	4	1,616

Appendix B8. Loss of PIT tags inserted into wild steelhead parr (P) at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07318.KBZ	SHR	P	N	1	0	0	1
CGS07298.KBZ	SHR	P	N	2	0	0	2
CGS07295.KBZ	SHR	P	N	1	0	0	1
CGS07292.KBZ	SHR	P	N	2	0	0	2
CGS07291.KBZ	SHR	P	N	4	0	0	4
CGS07289.KBZ	SHR	P	N	1	0	0	1
CGS07284.KBZ	SHR	P	N	1	0	0	1
CGS07283.KBZ	SHR	P	N	2	0	0	2
CGS07278.KBZ	SHR	P	N	3	0	0	3
CGS07226.KBZ	SHR	P	N	1	0	0	1
CGS07225.KBZ	SHR	P	N	7	0	0	7
CGS07221.KBZ	SHR	P	N	1	0	0	1
CGS07220.KBZ	SHR	P	N	4	0	0	4
CGS07212.KBZ	SHR	P	N	1	0	0	1
CGS07205.KBZ	SHR	P	N	1	0	0	1
CGS07204.KBZ	SHR	P	N	1	0	0	1
CGS07201.KBZ	SHR	P	N	2	0	1	1
CGS07193.KBZ	SHR	P	N	1	0	0	1
CGS07183.KBZ	SHR	P	N	6	0	0	6
CGS07180.KBZ	SHR	P	N	1	0	0	1
CGS07178.KBZ	SHR	P	N	1	0	0	1
CGS07175.KBZ	SHR	P	N	1	0	0	1
CGS07173.KBZ	SHR	P	N	1	0	0	1
CGS07172.KBZ	SHR	P	N	1	0	0	1
CGS07171.KBZ	SHR	P	N	2	0	0	2
CGS07170.KBZ	SHR	P	N	1	0	0	1
CGS07169.KBZ	SHR	P	N	6	0	0	6
CGS07166.KBZ	SHR	P	N	4	0	0	4
CGS07165.KBZ	SHR	P	N	2	0	0	2
CGS07164.KBZ	SHR	P	N	5	0	0	5
CGS07161.KBH	SHR	P	N	3	0	0	3
CGS07160.KBH	SHR	P	N	4	0	0	4
CGS07159.KBH	SHR	P	N	2	0	0	2
CGS07149.KBZ	SHR	P	N	1	0	0	1
CGS07145.KBZ	SHR	P	N	1	0	0	1
CGS07144.KBH	SHR	P	N	1	0	0	1
CGS07143.KBH	SHR	P	N	1	0	0	1
CGS07129.KBH	SHR	P	N	1	0	0	1
CGS07127.KBH	SHR	P	N	1	0	0	1
CGS07125.KBH	SHR	P	N	1	0	0	1
CGS07122.KBH	SHR	P	N	3	0	1	2

Appendix B8, continued.

Tag file	Species	Stage	Eff. trial	Tagged	Mortalities	Shed	Released
CGS07119.KBH	SHR	P	N	1	0	0	1
CGS07117.KBH	SHR	P	N	1	0	0	1
CGS07116.KBH	SHR	P	N	1	0	0	1
CGS07115.KBH	SHR	P	N	1	0	0	1
CGS07114.KBH	SHR	P	N	1	0	0	1
CGS07113.KBH	SHR	P	N	1	0	0	1
CGS07112.KBH	SHR	P	N	1	0	0	1
CGS07106.KBH	SHR	P	N	1	0	0	1
CGS07104.KBH	SHR	P	N	1	0	0	1
CGS07099.KAH	SHR	P	Y	3	0	0	3
CGS07098.KAH	SHR	P	Y	2	0	0	2
CGS07097.KAH	SHR	P	Y	2	0	0	2
CGS07096.KAH	SHR	P	Y	2	0	0	2
CGS07095.KAH	SHR	P	Y	3	0	0	3
CGS07091.KAH	SHR	P	Y	1	0	0	1
CGS07088.KAH	SHR	P	Y	1	0	0	1
CGS07087.KAH	SHR	P	Y	4	0	0	4
CGS07084.KBH	SHR	P	N	3	0	0	3
CGS07083.KBH	SHR	P	N	1	0	0	1
CGS07083.KAH	SHR	P	N	0	0	0	0
CGS07079.KBH	SHR	P	N	1	0	0	1
CGS07077.KBH	SHR	P	N	1	0	0	1
CGS07076.KBH	SHR	P	N	3	0	0	3
CGS07075.KBH	SHR	P	N	2	0	0	2
CGS07074.KBH	SHR	P	N	2	0	0	2
CGS07073.KBH	SHR	P	N	1	0	0	1
CGS07071.KBH	SHR	P	N	1	0	0	1
Grand total				128	0	2	126

Appendix C

Stock-of-origin assignments of Chinook salmon (*Oncorhynchus tshawytscha*) smolts from the Methow drainage in Washington, 2007

by

Sewall F. Young
Cheryl Dean
Denise K. Hawkins
and
Kenneth I. Warheit

Conservation Biology, Genetics Lab
Washington Department of Fish and Wildlife
Final Report, January 18, 2008

Abstract

We assigned Chinook salmon captured in a Methow River smolt trap during 2007 to one of three groups: non-Twisp spring Chinook salmon, Twisp spring Chinook salmon, or Methow summer Chinook salmon. Our baseline included samples from spring and summer Chinook salmon from all substantial production groups in the Methow drainage. Spring Chinook salmon stocks in the baseline included fish from Twisp River, Methow River, and Chewuch River as well as from supplementation programs using Twisp, Methow, and Chewuch broodstock and a sample of Carson stock from Winthrop National Fish Hatchery. Several sources were sampled in multiple years. The baseline also included samples of Methow summer Chinook salmon collected in 3 years. We defined six temporal strata for our analyses based on the date of capture. Three of 345 Chinook salmon smolts from March and April assigned to the summer stock. Sub-yealing smolts captured in June and early July were assumed to be summer Chinook salmon, but 86 of 104 assigned to the non-Twisp spring Chinook salmon stock. The fall parr included fish from all three assignment groups, but the non-Twisp spring Chinook salmon stock predominated.

Introduction

Spring and summer Chinook salmon (*Oncorhynchus tshawytscha*) spawn in the Methow basin and maintain distinct stock affinities consistent with times and areas of spawning (Washington Department of Fisheries and Washington Department of Wildlife 1992; Small and Dean, 2007). Spring Chinook salmon spawn from August through early September in the Methow River, mainly above the town of Twisp, Washington, and in Twisp River, Chewuch River, Lost River and possibly other tributaries to the Methow River; and summer Chinook salmon spawn from late-September to early November primarily in the Methow River below Winthrop, Washington (Washington Department of Fisheries and Washington Department of Wildlife 1992).

Both spring Chinook salmon and summer Chinook salmon are subjects of supplementation efforts in the Methow drainage. The spring-type supplementation programs initially sought to maintain separate stocks in the Twisp River, the Chewuch River, and the Methow River, but faced with extremely low numbers of returning spawners during the mid- to late-1990s, managers combined the Methow and Chewuch broodstocks into a Methow composite supplementation stock. The Twisp River broodstock was maintained as a separate stock.

Small et al. (2007) conducted genetic analyses to characterize 35 spring Chinook salmon temporal samples, comprised of 982 individuals collected between 1992 and 2006 from the Methow drainage in the upper Columbia Basin in Washington as part of a spring Chinook salmon genetic monitoring and evaluation project. Their goal was to evaluate the genetic effects of hatchery-based supplementation efforts that were instigated in the early 1990s to reverse a generally declining trend in Chinook salmon production in the system. In a related analysis, Small and Dean (2007) showed that spring and summer groups are differentiated sufficiently to allow genotypic-based spring-type versus summer-type assignments of naturally produced Chinook salmon smolts. Their individual assignments revealed that contrary to expectations, most fall-emigrant sub-yearling Chinook salmon sampled in the Methow drainage during 2006 were of the spring-type, not the summer-type. That finding prompted this analysis to determine if Methow drainage spring-emigrant yearling Chinook salmon are all spring-type as the smolt

production estimates assume. Furthermore, we wanted to determine the run type of 2007 fall parr samples. Among the fish that we identify as spring-type, we want to separate the Twisp stock from the aggregated other spring-type stocks to allow separate monitoring of Twisp production.

Methods

Staff from WDFW Methow Field office collected Chinook salmon emigrants at a smolt trap at river kilometer 28.3 in the Methow River between 12 March and 10 July (WDFW collection code 07CD). Two additional samples were taken from Chinook salmon captured in the Twisp River on 9 and 10 March (WDFW collection code 07CD). We do not know the collection dates for fall parr in 2007. (WDFW collection code 07HF). The algorithm for individual assignments uses stock proportion signals in the data to refine population membership probabilities. If the population proportions among the smolts migrating past the trap change over the sampling period, then we need to subdivide the samples into strata that are concordant with the composition trends in the smolts to allow the analytical program to make the correct refinements. The numbers collected per day showed a declining trend between early March and the end of May, and then picked-up again in early June. The numbers captured oscillated within the March to May period and we could not dismiss the possibility that the oscillations were related to stock-specific migration timing. Based on the temporal distribution of the samples, we subdivided them into six strata: 9 March – 18 March, 19 March – 31 March, 4 April – 17 April, 18 April – 8 May, 31 May – 10 July, and Fall parr.

We used the same suite of 13 microsatellite loci (Table 1; and see Seeb et al. 2008) and the same assay conditions that Small and Dean (2007) used for the 2006 Methow Chinook salmon smolt assignment study. We amplified the genomic segments specified by the microsatellite primers using the polymerase chain reaction (PCR). Following amplification, we denatured the PCR reactions with Hi-Di formamide and added the internal lane size standard GeneScan500 Liz (Applied Biosystems, Foster City, CA) following the manufacturer's recommendation, and performed fragment analyses on an Applied Biosystems 3730 DNA analyzer fitted with a 50cm capillary array filled with POP6 polymer. We used the software, Genemapper v 3.7 (Applied Biosystems, Foster City, CA) to convert amplified-fragment electrophoretic migration rates to estimated lengths in base pairs and assign them to allele bins. We eliminated samples from subsequent analyses if they were missing genotypes at more than four loci, if we observed three or more alleles at a locus that were not obviously reaction or detection artifacts, or if the morphology of their electropherograms or size(s) of their alleles were inconsistent with Chinook salmon alleles.

Small and Dean (2007) used a genetic baseline data set that included one Methow spring-type collection, 05HW, and one Methow summer-type collection, 93EC, to assign Chinook salmon juveniles captured in the Methow trap during 2006. The spring-type and summer Chinook salmon in the drainage are sufficiently differentiated that the Methow spring-type collection was an adequate surrogate for the spring-type in general, and the assignments were robust. To further refine assignments, we expanded the baseline to include sample collections of summer Chinook salmon from two additional years and samples taken over several years from spring-type natural production in the Twisp, Chewuch, and Methow Rivers and hatchery production of the Twisp,

Methow, Chewuch, and Methow composite populations (Appendix A). In our analyses, we used an assign-then-pool strategy to combine assignments into three pooled baseline stocks: Twisp spring Chinook salmon including hatchery and wild production, non-Twisp spring Chinook salmon including all spring Chinook salmon that were not in the Twisp group, and Methow summer Chinook salmon.

We used the "leave-one-out" routine, also called a jack-knife routine, implemented in the software Oncor (Kalinowski et al.2007) to test the reliability of individual assignments done with our baseline dataset. This implementation of the jack-knife does not assign incomplete genotypes but it uses them in the baseline to assign the complete genotypes. We generated a graphic depiction of structure in the baseline data with a factorial correspondence analysis (FCA) on population centroids using the program Genetix v. 4.02 (Belkhir et al. 2002) and superimposed individual profiles onto the population plots. See Small et al. (2007) for descriptions of the leave-one-out procedure and FCA plots.

We used the computer program GMA v. 1.0 (Kalinowski 2003) to assign each smolt to its most likely population of origin. We used GMA rather than Geneclass 2, the program used by Small and Dean (2007), because GMA exploits signals of uneven stock composition within the mixture data to refine individual assignments and Geneclass 2 does not. Consequently, Geneclass 2 generates an assignment bias in favor of minor contributors that increases as major and minor stock proportions diverge. For each smolt, GMA estimates its probability of membership in each of the potential donor stocks from the baseline data set using conditional probabilities and the EM algorithm. The mixture signal in the data is re-evaluated in each EM iteration and weights the probabilities of membership in the succeeding iteration. We assigned an individual to a pooled baseline stock when the summed probabilities to a pooled stock equaled 0.9 or greater.

Results

Staff from the WDFW Methow Field Office collected fin-clip samples from 562 outmigrant Chinook salmon captured in the Methow River during 2007 (Table 2) and preserved them in 2-mL, pre-labeled, ethanol-filled tubes. Two of those fin-clip samples from different individuals were preserved in a single tube with the 07CD0211 label; we analyzed only one of those. Although we received field collection data for sample 07CD0477 we did not receive a fin-clip with that sample identifier. Associated field data for most individuals included date of sampling, sampling location, yearling or sub-yearling determination by scale analysis, fork length in mm, and weight. All samples were shipped to the WDFW Molecular Genetics Laboratory for analysis.

We processed 559 samples in the laboratory. We excluded seven samples from the analysis due to PCR failure, contamination, or the presence of alleles that had atypical sizes or electropherogram morphologies for Chinook salmon.

Our jack-knife test of the baseline suggests a bias in assignments away from Twisp spring Chinook salmon (Table 2). Almost 17% of the fish from the Twisp baselines assigned to the non-Twisp spring Chinook salmon pooled stock in the jack-knife, whereas, only about 6% of the

non-Twisp fish assigned to Twisp. Two of 860 jack-knifed spring Chinook salmon misassigned to the pooled Methow summer stock. There were no jack-knife misassignments of summer Chinook salmon to either spring Chinook salmon stock.

The factorial correspondence analysis plot of the baseline with the three pooled stocks (Figure 1) is consistent with the jack-knife results. There is considerable overlap between the Twisp and non-Twisp spring Chinook salmon populations, and substantial but not complete separation of the summer stock from the two spring stocks. In this analysis, six individuals from the non-Twisp spring Chinook salmon pool plot within the Methow summer Chinook salmon cloud.

Forty-three of the 552 remaining samples were ambiguous with respect to group-of-origin with a 0.9 probability threshold for assignment. Four hundred and twenty of the 509 individuals that assigned with probability greater than 0.9 assigned to the non-Twisp Spring Chinook salmon group, 60 assigned to the Twisp spring Chinook salmon group, and 29 assigned to the Methow Summer Chinook salmon group. Individual assignments are listed in Table 3.

Forty-nine of the 60 individuals assigned to the Twisp spring Chinook salmon group were captured between early March and early April. Although 18 of the 29 individuals that assigned to the summer Chinook salmon group were captured during early summer (31 May – 10 July), they accounted for only 17% (18/104) of the Chinook salmon captured during that period. (See Table 3 for details and Table 4 for a summary.) Non-Twisp Spring Chinook salmon were the most abundant group collected from all temporal sampling strata (Table 4).

Discussion

Our jack-knife and FCA assessments of the baseline dataset are concordant with the error rate estimates among the spring Chinook salmon in Small et al. (2007) that used the same data. Our jack-knife tests included three collections of Methow summer Chinook salmon that were not included in Small et al. (2007), but the spring and summer groups separate well genotypically and it is unlikely that the Small et al. (2007) spring Chinook salmon results would have changed substantially if summer Chinook salmon were included in the baseline. The numbers from the two tests are slightly different, and probably a result of differences in the details of the two implementations of the jack-knife (how they deal with missing data and setting assignment probability thresholds, for example). Both analyses suggest a bias that would result in over-assignment to the non-Twisp spring Chinook salmon pooled stock at the expense of the Twisp spring Chinook salmon pooled stock. Our analyses included summer Chinook salmon in the baseline and suggest that there is a low, but non-zero bias that could result in misassigning a small proportion of the non-Twisp spring Chinook salmon pooled stock as summer Chinook salmon.

Our assignments of the fall parr are concordant with previous analyses of fall 2006 migrants that revealed a substantial spring-type component. If the samples we analyzed are representative of the outmigrant pool, our assignments also suggest that few yearling summer-type Chinook salmon were captured in the Methow smolt trap between 12 March and 8 May 2007. Only three of 345 samples from that period that we were able to assign with confidence assigned to the summer-type. Considering the assignment error that our jack-knife results suggest, we cannot be

certain of the stock affinities of those three individuals. This result matches our expectation that early spring migrant, yearling Chinook salmon in the Methow drainage are predominantly spring Chinook salmon. The jack-knife and FCA results suggest that, using this set of loci, finer-scale assignments of the spring Chinook salmon to either the non-Twisp group or the Twisp group might include a considerable number of misassignments.

Our finding that 86 of 104 smolts that were captured between the end of May and early July 2007 were spring-type was unexpected. All samples taken during the end of May – early July period were determined by scale aging to be from sub-yearlings. The Molecular Genetics Lab's baseline sampling database has adult scale age data for 615 spring-type and 172 summer Chinook salmon collected in the Methow drainage between 1986 and 1999. All 615 spring-type and 110 of the 172 summer Chinook salmon in that data set had yearling outmigrant scale patterns; no adults in that dataset had sub-yearling outmigrant scale patterns. At least some of the summer Chinook salmon yearling patterns might have resulted from reservoir rearing (John Sneva, personal communication).

Our jack-knife and FCA results suggest that misassignments of Methow summer Chinook salmon as either non-Twisp spring Chinook salmon or Twisp spring Chinook salmon are very unlikely so we must look for an alternative explanation for the assignments of late-spring – early-summer migrant sub-yearling Chinook salmon to the spring Chinook salmon populations. Our results suggest that some sub-yearling spring Chinook salmon moved below the trap site, presumably to freshwater rearing areas where they over-wintered before migrating to salt water as yearlings. If this is typical of the outmigration patterns in other years, it strongly suggests that a substantial portion of the spring Chinook salmon production in the Methow drainage may not be accounted for in smolt trapping efforts and in production estimates.

Acknowledgments

Charlie Snow (WDFW) collected the juvenile samples. Douglas Co. PUD and Washington State General Funds provided funding.

Literature cited

Belkhir, K., P. Borsa, L. Chikhi, N. Raufaste, and F. Bonhomme. 2002. GENETIX 4.03, logiciel sous Windows TM pour la génétique des populations, Laboratoire Génome, Populations, Interactions: CNRS UMR 5000, Université de Montpellier II, Montpellier, France.

Buchholz, W., S.J. Miller, and W.J. Spearman. 1999. Summary of PCR primers for salmonid genetic studies. US Fish. Wild. Serv. Alaska Fish. Prog. Rep. 99-1.

Cairney M., J. B. Taggart, and B. Hoyheim. 2000. Atlantic salmon (*Salmo salar* L.) and cross-species amplification in other salmonids. Molecular Ecology 9: 2175- 2178.

Kalinowski, S. T. 2003. Genetic Mixture Analysis. Department of Ecology, Montana State University, Bozeman MT 59717. : Available for download from http://www.montana.edu/kalinowski.

Kalinowski, S. T. 2007. Oncor: A computer program for genetic stock identification, Department of Ecology, Montana State University, Bozeman MT 59717.: : Available for download from http://www.montana.edu/kalinowski.

Nelson, R. J., and T.D. Beacham. 1999. Isolation and cross species amplification of microsatellite loci useful for study of Pacific salmon. Animal Genetics 30:228-229.

Olsen, J. B., P. Bentzen, and J. E. Seeb. 1998. Characterization of seven microsatellite loci derived from pink salmon. Molecular Ecology 7: 1083-1090.

O'Reilly, P. T., Hamilton, L. C., McConnell, S. K. & Wright, J. M. 1996. Rapid analysis of genetic variation in Atlantic salmon (Salmo salar) by PCR multiplexing of dinucleotide and tetranucleotide microsatellites. Canadian Journal of Fisheries and Aquatic Science.

Piry S, Alapetite A, Cornuet, J.-M., Paetkau D, Baudouin, L., Estoup, A. 2004. GeneClass2: a software for genetic assignment and first generation migrants detection. Journal of Heredity. 95(6): 536–539.

Rexroad, C. E., III, R. L. Coleman, A. M. Martin, W. K. Hershberger, and J. Killefer. 2001. Thirty-five polymorphic microsatellite markers for rainbow trout (Oncorhynchus mykiss). Animal Genetics 32: 317-319.

Rexroad, C. E. III 1; Coleman, R. L. 1; Hershberger, W. K. 1; Killefer, J. 2. 2002. Eighteen polymorphic microsatellite markers for rainbow trout (Oncorhynchus mykiss). Animal Genetics. 33(1):76-78.

Small, M. P., Kenneth I. Warheit, Cheryl Dean, and Andrew Murdoch (2007). Genetic monitoring of Methow Spring Chinook salmon, Molecular Genetics Laboratory, Washington Department of Fish and Wildlife: 48 pp.

Small, M. P. a. C. D. (2007). Methow Chinook salmon juvenile assignments, Molecular Genetics Laboratory, Washington Department of Fish and Wildlife.

Williamson, K. S., J. F. Cordes, and B. May. 2002. Characterization of microsatellite loci in Chinook salmon (*Oncorhynchus tshawytscha*) and cross-species amplification in other salmonids. Molecular Ecology Notes 2:17-19.

Figure 1. Factorial correspondence analysis plot of the baseline data set with 3 pooled populations revealed six individuals from the non-Twisp spring Chinook salmon pooled stock (red blocks) were genotypically similar to the Methow summer Chinook salmon in the loose cloud of white blocks on the right. The Twisp pooled stock forms the cloud of white blocks on the lower left.

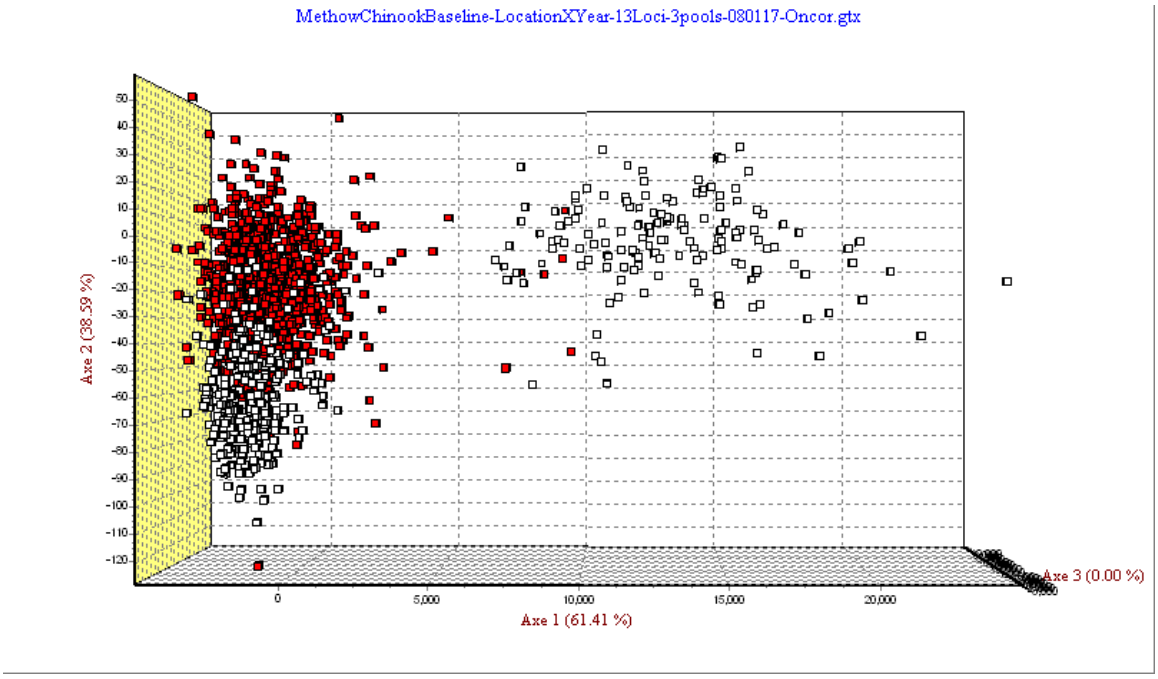


Table 1. Locus names, PCR multiplex configurations and parameters, allele counts and size ranges, and locus citations for the 13 microsatellite loci used in this study. Table adapted from Small and Dean (2008).

Multiplex	Locus	Anneal temp	Primer 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
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

Table 2. Results of the jack-knife test of the baseline. The main diagonals contain the numbers and proportions of correct assignments in the jack-knife. Rows show how individuals from each stock were assigned. For example, 40 individuals from the pooled Non-Twisp spring Chinook salmon stock assigned to the pooled Twisp spring Chinook salmon stock.

	Non-TwispSp	TwispSp	MetSum	Total
Numbers				
Non-TwispSp	616	40	2	658
TwispSp	34	168	0	202
MetSum	0	0	58	58
Total	650	208	60	918
Proportions				
Non-TwispSp	0.936	0.061	0.003	1.000
TwispSp	0.168	0.832	0.000	1.000
MetSum	0.000	0.000	1.000	1.000
Total	1.104	0.892	1.003	3.000

Table 3. Field collection data and genetic assignments for Chinook salmon smolt and parr samples collected from the Methow drainage in spring and summer 2007. An unassigned entry in the Comment column indicates that the sample's summed probability of assignment didn't meet the greater than or equal to 0.9 criterion.

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0001	09 Mar-18 Mar	Twisp	YCW	101	TwispH&W	0.96	Disregard, Twisp fish
07CD0002	09 Mar-18 Mar	Twisp	YCW	99			Disregard, Twisp fish; unassigned
07CD0003	09 Mar-18 Mar	Methow	YCW	101	TwispH&W	0.99	
07CD0004	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	1.00	
07CD0005	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0006	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0007	09 Mar-18 Mar	Methow	YCW	102	non-TwispSp	0.99	
07CD0008	09 Mar-18 Mar	Methow	YCW	113	non-TwispSp	0.99	
07CD0009	09 Mar-18 Mar	Methow	YCW	101	non-TwispSp	0.99	
07CD0010	09 Mar-18 Mar	Methow	YCW	103	non-TwispSp	1.00	
07CD0011	09 Mar-18 Mar	Methow	YCW	108	non-TwispSp	1.00	
07CD0012	09 Mar-18 Mar	Methow	YCW	102	non-TwispSp	1.00	
07CD0013	09 Mar-18 Mar	Methow	YCW	103	non-TwispSp	0.99	
07CD0014	09 Mar-18 Mar	Methow	YCW	95	non-TwispSp	1.00	
07CD0015	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	0.99	
07CD0016	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	0.99	
07CD0017	09 Mar-18 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0018	09 Mar-18 Mar	Methow	YCW	90	non-TwispSp	0.97	
07CD0019	09 Mar-18 Mar	Methow	YCW	92	non-TwispSp	0.99	
07CD0020	09 Mar-18 Mar	Methow	YCW	99	non-TwispSp	1.00	
07CD0021	09 Mar-18 Mar	Methow	YCW	103	TwispH&W	0.99	
07CD0022	09 Mar-18 Mar	Methow	YCW	115	non-TwispSp	0.99	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0023	09 Mar-18 Mar	Methow	YCW	104			unassigned
07CD0024	09 Mar-18 Mar	Methow	YCW	123	non-TwispSp	1.00	
07CD0025	09 Mar-18 Mar	Methow	YCW	102	non-TwispSp	1.00	
07CD0026	09 Mar-18 Mar	Methow	YCW	94	non-TwispSp	1.00	
07CD0027	09 Mar-18 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0028	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	0.99	
07CD0029	09 Mar-18 Mar	Methow	YCW	97	non-TwispSp	0.99	
07CD0030	09 Mar-18 Mar	Methow	YCW	101	non-TwispSp	0.99	
07CD0031	09 Mar-18 Mar	Methow	YCW	101	non-TwispSp	1.00	
07CD0032	09 Mar-18 Mar	Methow	YCW	112			unassigned
07CD0033	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	0.99	
07CD0034	09 Mar-18 Mar	Methow	YCW	96	non-TwispSp	1.00	
07CD0035	09 Mar-18 Mar	Methow	YCW	94	non-TwispSp	1.00	
07CD0036	09 Mar-18 Mar	Methow	YCW	90	non-TwispSp	1.00	
07CD0037	09 Mar-18 Mar	Methow	YCW	109	non-TwispSp	1.00	
07CD0038	09 Mar-18 Mar	Methow	YCW	110	non-TwispSp	0.99	
07CD0039	09 Mar-18 Mar	Methow	YCW	114	non-TwispSp	1.00	
07CD0040	09 Mar-18 Mar	Methow	YCW	106	non-TwispSp	0.99	
07CD0041	09 Mar-18 Mar	Methow	YCW	97	non-TwispSp	0.99	
07CD0042	09 Mar-18 Mar	Methow	YCW	109	TwispH&W	1.00	
07CD0043	09 Mar-18 Mar	Methow	YCW	106	non-TwispSp	1.00	
07CD0044	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0045	09 Mar-18 Mar	Methow	YCW	106	non-TwispSp	0.99	
07CD0046	09 Mar-18 Mar	Methow	YCW	106	non-TwispSp	1.00	
07CD0047	09 Mar-18 Mar	Methow	YCW	106	non-TwispSp	0.97	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0048	09 Mar-18 Mar	Methow	YCW	115	non-TwispSp	1.00	
07CD0049	09 Mar-18 Mar	Methow	YCW	99	non-TwispSp	0.99	
07CD0050	09 Mar-18 Mar	Methow	YCW	100	non-TwispSp	0.99	
07CD0051	09 Mar-18 Mar	Methow	YCW	91	TwispH&W	0.98	
07CD0052	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	1.00	
07CD0053	09 Mar-18 Mar	Methow	YCW	90	non-TwispSp	0.99	
07CD0054	09 Mar-18 Mar	Methow	YCW	101			unassigned
07CD0055	09 Mar-18 Mar	Methow	YCW	101	non-TwispSp	0.99	
07CD0056	09 Mar-18 Mar	Methow	YCW	100	non-TwispSp	0.99	
07CD0057	09 Mar-18 Mar	Methow	YCW	108	non-TwispSp	0.98	
07CD0058	09 Mar-18 Mar	Methow	YCW	76	non-TwispSp	1.00	
07CD0059	09 Mar-18 Mar	Methow	YCW	97	non-TwispSp	0.99	
07CD0060	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	0.99	
07CD0061	09 Mar-18 Mar	Methow	YCW	89	non-TwispSp	1.00	
07CD0062	09 Mar-18 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0063	09 Mar-18 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0064	09 Mar-18 Mar	Methow	YCW	92	non-TwispSp	1.00	
07CD0065	09 Mar-18 Mar	Methow	YCW	108	non-TwispSp	1.00	
07CD0066	09 Mar-18 Mar	Methow	YCW	100	TwispH&W	1.00	
07CD0067	09 Mar-18 Mar	Methow	YCW	102	non-TwispSp	0.99	
07CD0068	09 Mar-18 Mar	Methow	YCW	102	TwispH&W	1.00	
07CD0069	09 Mar-18 Mar	Methow	YCW	97	TwispH&W	0.94	
07CD0070	09 Mar-18 Mar	Methow	YCW	108	non-TwispSp	0.99	
07CD0071	09 Mar-18 Mar	Methow	YCW	91	non-TwispSp	0.99	
07CD0072	09 Mar-18 Mar	Methow	YCW	99	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0073	09 Mar-18 Mar	Methow	YCW	107	non-TwispSp	1.00	
07CD0074	09 Mar-18 Mar	Methow	YCW	96	non-TwispSp	1.00	
07CD0075	09 Mar-18 Mar	Methow	YCW	101	non-TwispSp	1.00	
07CD0076	09 Mar-18 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0077	09 Mar-18 Mar	Methow	YCW	92	non-TwispSp	1.00	
07CD0078	09 Mar-18 Mar	Methow	YCW	92	non-TwispSp	1.00	
07CD0079	09 Mar-18 Mar	Methow	YCW	95	non-TwispSp	0.99	
07CD0080	09 Mar-18 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0081	09 Mar-18 Mar	Methow	YCW	100	non-TwispSp	0.99	
07CD0082	09 Mar-18 Mar	Methow	YCW	96	non-TwispSp	1.00	
07CD0083		Methow	YCW	97			PCR failure
07CD0084	09 Mar-18 Mar	Methow	YCW	95	non-TwispSp	0.99	
07CD0085	09 Mar-18 Mar	Methow	YCW	95	non-TwispSp	1.00	
07CD0086	09 Mar-18 Mar	Methow	YCW	95	non-TwispSp	0.99	
07CD0087	09 Mar-18 Mar	Methow	YCW	99	non-TwispSp	0.99	
07CD0088	09 Mar-18 Mar	Methow	YCW	103	non-TwispSp	1.00	
07CD0089	09 Mar-18 Mar	Methow	YCW	100	non-TwispSp	1.00	
07CD0090	09 Mar-18 Mar	Methow	YCW	97			unassigned
07CD0091	09 Mar-18 Mar	Methow	YCW	90	non-TwispSp	1.00	
07CD0092	19 Mar-31 Mar	Methow	YCW	102	non-TwispSp	1.00	
07CD0093	19 Mar-31 Mar	Methow	YCW	98	non-TwispSp	0.99	
07CD0094	19 Mar-31 Mar	Methow	YCW	99	TwispH&W	0.99	
07CD0095	19 Mar-31 Mar	Methow	YCW	109			unassigned
07CD0096	19 Mar-31 Mar	Methow	YCW	125			unassigned
07CD0097	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0098	19 Mar-31 Mar	Methow	YCW	102			unassigned
07CD0099	19 Mar-31 Mar	Methow	YCW	98			unassigned
07CD0100	19 Mar-31 Mar	Methow	YCW	94	non-TwispSp	1.00	
07CD0101	19 Mar-31 Mar	Methow	YCW	88	non-TwispSp	0.99	
07CD0102	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	1.00	
07CD0103	19 Mar-31 Mar	Methow	YCW	99	non-TwispSp	0.99	
07CD0104	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	0.99	
07CD0105	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	0.99	
07CD0106	19 Mar-31 Mar	Methow	YCW	115	non-TwispSp	0.99	
07CD0107	19 Mar-31 Mar	Methow	YCW	106			unassigned
07CD0108	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	1.00	
07CD0109	19 Mar-31 Mar	Methow	YCW	102	non-TwispSp	1.00	
07CD0110	19 Mar-31 Mar	Methow	YCW	74	MetSumm	1.00	
07CD0111	19 Mar-31 Mar	Methow	YCW	99	non-TwispSp	1.00	
07CD0112	19 Mar-31 Mar	Methow	YCW	82			unassigned
07CD0113	19 Mar-31 Mar	Methow	YCW	115	non-TwispSp	0.99	
07CD0114	19 Mar-31 Mar	Methow	YCW	107	non-TwispSp	0.94	
07CD0115	19 Mar-31 Mar	Methow	YCW	99	non-TwispSp	0.99	
07CD0116	19 Mar-31 Mar	Methow	YCW	106	non-TwispSp	0.99	
07CD0117	19 Mar-31 Mar	Methow	YCW	86	non-TwispSp	0.98	
07CD0118	19 Mar-31 Mar	Methow	YCH				Disregard, hatchery fish; unassigned
07CD0119	19 Mar-31 Mar	Methow	YCH		non-TwispSp	0.99	Disregard, hatchery fish
07CD0120	19 Mar-31 Mar	Methow	YCW		non-TwispSp	0.99	
07CD0121	19 Mar-31 Mar	Methow	YCW	113	non-TwispSp	0.96	
07CD0122	19 Mar-31 Mar	Methow	YCW	113	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0123	19 Mar-31 Mar	Methow	YCW	98	non-TwispSp	0.99	
07CD0124	19 Mar-31 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0125	19 Mar-31 Mar	Methow	YCW	99			unassigned
07CD0126	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	0.99	
07CD0127	19 Mar-31 Mar	Methow	YCW	104	TwispH&W	0.99	
07CD0128	19 Mar-31 Mar	Methow	YCW	98	non-TwispSp	1.00	
07CD0129	19 Mar-31 Mar	Methow	YCW	98			unassigned
07CD0130	19 Mar-31 Mar	Methow	YCW	100	non-TwispSp	1.00	
07CD0131	19 Mar-31 Mar	Methow	YCW	103	non-TwispSp	1.00	
07CD0132	19 Mar-31 Mar	Methow	YCW	74	non-TwispSp	1.00	
07CD0133	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	0.99	
07CD0134	19 Mar-31 Mar	Methow	YCW	93	non-TwispSp	0.99	
07CD0135	19 Mar-31 Mar	Methow	YCW	84	non-TwispSp	0.99	
07CD0136	19 Mar-31 Mar	Methow	YCW	114	non-TwispSp	1.00	
07CD0137	19 Mar-31 Mar	Methow	YCW	100	non-TwispSp	1.00	
07CD0138	19 Mar-31 Mar	Methow	YCW	105	TwispH&W	0.95	
07CD0139	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	0.99	
07CD0140	19 Mar-31 Mar	Methow	YCW	113			unassigned
07CD0141	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	0.99	
07CD0142	19 Mar-31 Mar	Methow	YCW	94	non-TwispSp	1.00	
07CD0143	19 Mar-31 Mar	Methow	YCW	90	non-TwispSp	0.99	
07CD0144	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	1.00	
07CD0145	19 Mar-31 Mar	Methow	YCW	95	non-TwispSp	0.99	
07CD0146	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0147	19 Mar-31 Mar	Methow	YCW	100	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0148	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	1.00	
07CD0149	19 Mar-31 Mar	Methow	YCW	96	non-TwispSp	0.99	
07CD0150	19 Mar-31 Mar	Methow	YCW	111	non-TwispSp	0.91	
07CD0151	19 Mar-31 Mar	Methow	YCW	94	non-TwispSp	0.99	
07CD0152	19 Mar-31 Mar	Methow	YCW	106			unassigned
07CD0153	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	1.00	
07CD0154	19 Mar-31 Mar	Methow	YCW	105	TwispH&W	1.00	
07CD0155	19 Mar-31 Mar	Methow	YCW	102	non-TwispSp	0.98	
07CD0156	19 Mar-31 Mar	Methow	YCW	100	non-TwispSp	0.99	
07CD0157	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0158	19 Mar-31 Mar	Methow	YCW	118	non-TwispSp	0.99	
07CD0159	19 Mar-31 Mar	Methow	YCW	98	non-TwispSp	0.99	
07CD0160	19 Mar-31 Mar	Methow	YCW	85	non-TwispSp	1.00	
07CD0161	19 Mar-31 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0162	19 Mar-31 Mar	Methow	YCW	112	non-TwispSp	0.99	
07CD0163		Methow	YCW	110			Contaminated
07CD0164	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0165	19 Mar-31 Mar	Methow	YCW	104			unassigned
07CD0166	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	0.99	
07CD0167	19 Mar-31 Mar	Methow	YCW	108	TwispH&W	0.98	
07CD0168	19 Mar-31 Mar	Methow	YCW	103	non-TwispSp	1.00	
07CD0169	19 Mar-31 Mar	Methow	YCW	109	TwispH&W	1.00	
07CD0170	19 Mar-31 Mar	Methow	YCW	98	non-TwispSp	0.98	
07CD0171	19 Mar-31 Mar	Methow	YCW	84	non-TwispSp	1.00	
07CD0172	19 Mar-31 Mar	Methow	YCW	109	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0173	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0174	19 Mar-31 Mar	Methow	YCW	104			unassigned
07CD0175	19 Mar-31 Mar	Methow	YCW	107	non-TwispSp	0.99	
07CD0176	19 Mar-31 Mar	Methow	YCW	102	non-TwispSp	0.99	
07CD0177	19 Mar-31 Mar	Methow	YCW	110	non-TwispSp	1.00	
07CD0178	19 Mar-31 Mar	Methow	YCW	89			unassigned
07CD0179	19 Mar-31 Mar	Methow	YCW	100	TwispH&W	1.00	
07CD0180	19 Mar-31 Mar	Methow	YCW	104	non-TwispSp	1.00	
07CD0181	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	0.99	
07CD0182	19 Mar-31 Mar	Methow	YCW	102			unassigned
07CD0183	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0184	19 Mar-31 Mar	Methow	YCW	100	non-TwispSp	0.98	
07CD0185	19 Mar-31 Mar	Methow	YCW	95	non-TwispSp	1.00	
07CD0186	19 Mar-31 Mar	Methow	YCW	103	non-TwispSp	0.99	
07CD0187	19 Mar-31 Mar	Methow	YCW	112	non-TwispSp	0.99	
07CD0188	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	0.99	
07CD0189	19 Mar-31 Mar	Methow	YCW	103	non-TwispSp	0.99	
07CD0190	19 Mar-31 Mar	Methow	YCW	95			unassigned
07CD0191	19 Mar-31 Mar	Methow	YCW	100			unassigned
07CD0192	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	1.00	
07CD0193	19 Mar-31 Mar	Methow	YCW	95	TwispH&W	0.98	
07CD0194	19 Mar-31 Mar	Methow	YCW	96	non-TwispSp	0.99	
07CD0195	19 Mar-31 Mar	Methow	YCW	105	TwispH&W	1.00	
07CD0196	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0197	19 Mar-31 Mar	Methow	YCW	108	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0198	19 Mar-31 Mar	Methow	YCW	95	non-TwispSp	1.00	
07CD0199	19 Mar-31 Mar	Methow	YCW	103	non-TwispSp	0.99	
07CD0200	19 Mar-31 Mar	Methow	YCW	122	non-TwispSp	1.00	
07CD0201	19 Mar-31 Mar	Methow	YCW	100			unassigned
07CD0202	19 Mar-31 Mar	Methow	YCW	105	non-TwispSp	0.99	
07CD0203	04 Apr-17 Apr	Methow	YCW	110	non-TwispSp	0.99	
07CD0204	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	1.00	
07CD0205	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	0.99	
07CD0206	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.99	
07CD0207	04 Apr-17 Apr	Methow	YCW	78			unassigned
07CD0208	04 Apr-17 Apr	Methow	YCW	108	non-TwispSp	0.99	
07CD0209	04 Apr-17 Apr	Methow	YCW	106	non-TwispSp	0.99	
07CD0210	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.99	
07CD0211	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	2 different samples in vial
07CD0211		Methow	YCW	94			2 different samples in vial; We ran one of two samples submitted as 211
07CD0212	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0213	04 Apr-17 Apr	Methow	YCW	102	TwispH&W	0.90	
07CD0214	04 Apr-17 Apr	Methow	YCW	98	MetSumm	1.00	
07CD0215	04 Apr-17 Apr	Methow	YCW	87	non-TwispSp	1.00	
07CD0216	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	0.99	
07CD0217	04 Apr-17 Apr	Methow	YCW	103	non-TwispSp	1.00	
07CD0218	04 Apr-17 Apr	Methow	YCW	108	non-TwispSp	1.00	
07CD0219	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	1.00	
07CD0220	04 Apr-17 Apr	Methow	YCW	98	TwispH&W	0.99	
07CD0221	04 Apr-17 Apr	Methow	YCW	98	non-TwispSp	0.99	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0222	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	0.99	
07CD0223	04 Apr-17 Apr	Methow	YCW	92	non-TwispSp	0.98	
07CD0224	04 Apr-17 Apr	Methow	YCW	99	non-TwispSp	1.00	
07CD0225	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	1.00	
07CD0226	04 Apr-17 Apr	Methow	YCW	109	TwispH&W	1.00	
07CD0227	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0228	04 Apr-17 Apr	Methow	YCW	116	non-TwispSp	1.00	
07CD0229	04 Apr-17 Apr	Methow	YCW	109	non-TwispSp	1.00	
07CD0230	04 Apr-17 Apr	Methow	YCW	98	TwispH&W	0.97	
07CD0231	04 Apr-17 Apr	Methow	YCW	94	TwispH&W	0.99	
07CD0232	04 Apr-17 Apr	Methow	YCW	99	non-TwispSp	0.99	
07CD0233	04 Apr-17 Apr	Methow	YCW	94	TwispH&W	0.90	
07CD0234	04 Apr-17 Apr	Methow	YCW	102	TwispH&W	1.00	
07CD0235	04 Apr-17 Apr	Methow	YCW	94	non-TwispSp	0.99	
07CD0236	04 Apr-17 Apr	Methow	YCW	83	non-TwispSp	0.93	
07CD0237	04 Apr-17 Apr	Methow	YCW	109	non-TwispSp	0.97	
07CD0238	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.99	
07CD0239	04 Apr-17 Apr	Methow	YCW	102	non-TwispSp	0.99	
07CD0240	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	
07CD0241	04 Apr-17 Apr	Methow	YCW	94	non-TwispSp	1.00	
07CD0242	04 Apr-17 Apr	Methow	YCW	108	non-TwispSp	1.00	
07CD0243	04 Apr-17 Apr	Methow	YCW	115	non-TwispSp	0.99	
07CD0244	04 Apr-17 Apr	Methow	YCW	116	non-TwispSp	1.00	
07CD0245	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	1.00	
07CD0246	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0247		Methow	YCW	110			Not a Chinook salmon
07CD0248	04 Apr-17 Apr	Methow	YCW	96	non-TwispSp	0.99	
07CD0249	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	0.94	
07CD0250	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	
07CD0251	04 Apr-17 Apr	Methow	YCW	102	non-TwispSp	0.99	
07CD0252	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	0.94	
07CD0253	04 Apr-17 Apr	Methow	YCW	105	TwispH&W	1.00	
07CD0254	04 Apr-17 Apr	Methow	YCW	99	non-TwispSp	1.00	
07CD0255	04 Apr-17 Apr	Methow	YCW	102	non-TwispSp	0.99	
07CD0256	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	
07CD0257	04 Apr-17 Apr	Methow	YCW	93	non-TwispSp	0.99	
07CD0258	04 Apr-17 Apr	Methow	YCW	109	non-TwispSp	1.00	
07CD0259	04 Apr-17 Apr	Methow	YCW	103	non-TwispSp	0.99	
07CD0260	04 Apr-17 Apr	Methow	YCW	106	non-TwispSp	0.99	
07CD0261	04 Apr-17 Apr	Methow	YCW	113	TwispH&W	1.00	
07CD0262	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	
07CD0263	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0264	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	1.00	
07CD0265	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	1.00	
07CD0266	04 Apr-17 Apr	Methow	YCW	101	non-TwispSp	0.99	
07CD0267	04 Apr-17 Apr	Methow	YCW	105	TwispH&W	1.00	
07CD0268	04 Apr-17 Apr	Methow	YCW	97	non-TwispSp	0.99	
07CD0269	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.97	
07CD0270	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0271	04 Apr-17 Apr	Methow	YCW	90	non-TwispSp	0.99	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0272	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	0.99	
07CD0273	04 Apr-17 Apr	Methow	YCW	107	non-TwispSp	0.99	
07CD0274	04 Apr-17 Apr	Methow	YCW	114			unassigned
07CD0275	04 Apr-17 Apr	Methow	YCW	107	non-TwispSp	0.99	
07CD0276	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0277	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	1.00	
07CD0278	04 Apr-17 Apr	Methow	YCW	103	TwispH&W	1.00	
07CD0279	04 Apr-17 Apr	Methow	YCW	98	non-TwispSp	0.99	
07CD0280	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	1.00	
07CD0281	04 Apr-17 Apr	Methow	YCW	104	non-TwispSp	0.99	
07CD0282	04 Apr-17 Apr				non-TwispSp	1.00	No record
07CD0283	04 Apr-17 Apr	Methow	YCW	114	non-TwispSp	0.99	
07CD0284	04 Apr-17 Apr	Methow	YCW	102	non-TwispSp	0.99	
07CD0285	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.99	
07CD0286	04 Apr-17 Apr	Methow	YCW	109	non-TwispSp	0.98	
07CD0287	04 Apr-17 Apr	Methow	YCW	108	non-TwispSp	0.99	
07CD0288	04 Apr-17 Apr	Methow	YCW	96	non-TwispSp	0.99	
07CD0289	04 Apr-17 Apr	Methow	YCW	83			unassigned
07CD0290		Methow	YCW	106			Not a Chinook salmon
07CD0291	04 Apr-17 Apr	Methow	YCW	100	non-TwispSp	0.99	
07CD0292	04 Apr-17 Apr	Methow	YCW	93	non-TwispSp	1.00	
07CD0293	04 Apr-17 Apr	Methow	YCW	118	TwispH&W	0.96	
07CD0294	04 Apr-17 Apr	Methow	YCW	101	TwispH&W	1.00	
07CD0295	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	1.00	
07CD0296	04 Apr-17 Apr	Methow	YCW	96	TwispH&W	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0297	04 Apr-17 Apr	Methow	YCW	87	TwispH&W	1.00	
07CD0298	04 Apr-17 Apr	Methow	YCW	93			unassigned
07CD0299							No record; No sample
07CD0300							No record; No sample
07CD0301	04 Apr-17 Apr	Methow	YCW	97	TwispH&W	0.90	
07CD0302	04 Apr-17 Apr	Methow	YCW	99	non-TwispSp	0.99	
07CD0303		Methow	YCW	102			Contaminated
07CD0304	04 Apr-17 Apr	Methow	YCW	121	non-TwispSp	1.00	
07CD0305							No record; No sample
07CD0306	04 Apr-17 Apr	Methow	YCW	94	TwispH&W	1.00	
07CD0307	04 Apr-17 Apr	Methow	YCW	115	non-TwispSp	0.99	
07CD0308	04 Apr-17 Apr	Methow	YCW	99	non-TwispSp	0.99	
07CD0309	04 Apr-17 Apr	Methow	YCW	96	TwispH&W	1.00	
07CD0310	04 Apr-17 Apr	Methow	YCW	98			unassigned
07CD0311	04 Apr-17 Apr	Methow	YCW	101	non-TwispSp	1.00	
07CD0312	04 Apr-17 Apr	Methow	YCW	105	non-TwispSp	0.99	
07CD0313	04 Apr-17 Apr	Methow	YCW	91	TwispH&W	1.00	
07CD0314	04 Apr-17 Apr	Methow	YCW	95	non-TwispSp	0.98	
07CD0315	04 Apr-17 Apr	Methow	YCW	80	non-TwispSp	0.99	
07CD0316	04 Apr-17 Apr	Methow	YCW	92	non-TwispSp	1.00	
07CD0317	04 Apr-17 Apr	Methow	YCW	99	TwispH&W	1.00	
07CD0318	04 Apr-17 Apr	Methow	YCW	99			unassigned
07CD0319	04 Apr-17 Apr	Methow	YCW	93	non-TwispSp	0.99	
07CD0320	04 Apr-17 Apr	Methow	YCW	110	non-TwispSp	1.00	
07CD0321	04 Apr-17 Apr	Methow	YCW	84	TwispH&W	0.99	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0322	04 Apr-17 Apr				non-TwispSp	0.99	No record
07CD0323	18 Apr-08 May	Methow	YCW	98	non-TwispSp	1.00	
07CD0324	18 Apr-08 May	Methow	YCW	95			unassigned
07CD0325	18 Apr-08 May	Methow	YCW	96	non-TwispSp	0.99	
07CD0326	18 Apr-08 May	Methow	YCW	95	non-TwispSp	1.00	
07CD0327	18 Apr-08 May	Methow	YCW	99			unassigned
07CD0328	18 Apr-08 May	Methow	YCW	101	TwispH&W	1.00	
07CD0329	18 Apr-08 May	Methow	YCW	105	TwispH&W	1.00	
07CD0330	18 Apr-08 May	Methow	YCW	98	non-TwispSp	1.00	
07CD0331	18 Apr-08 May	Methow	YCW	88	non-TwispSp	1.00	
07CD0332	18 Apr-08 May	Methow	YCW	93	non-TwispSp	1.00	
07CD0333	18 Apr-08 May	Methow	YCW	95	non-TwispSp	0.99	
07CD0334	18 Apr-08 May	Methow	YCW	100	TwispH&W	0.97	
07CD0335	18 Apr-08 May	Methow	YCW	96	non-TwispSp	1.00	
07CD0336	18 Apr-08 May	Methow	YCW	108			unassigned
07CD0337	18 Apr-08 May	Methow	YCW	102	TwispH&W	0.97	
07CD0338	18 Apr-08 May	Methow	YCW	93	non-TwispSp	0.99	
07CD0339	18 Apr-08 May	Methow	YCW	98	non-TwispSp	0.99	
07CD0340	18 Apr-08 May	Methow	YCW	110	non-TwispSp	0.99	
07CD0341	18 Apr-08 May	Methow	YCW	105			unassigned
07CD0342	18 Apr-08 May	Methow	YCW	105	non-TwispSp	0.98	
07CD0343	18 Apr-08 May	Methow	YCW	76	non-TwispSp	1.00	
07CD0344	18 Apr-08 May	Methow	YCW	95			unassigned
07CD0345	18 Apr-08 May	Methow	YCW	87	non-TwispSp	1.00	
07CD0346	18 Apr-08 May	Methow	YCW	101	TwispH&W	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0347	18 Apr-08 May	Methow	YCW	82	TwispH&W	1.00	
07CD0348	18 Apr-08 May	Methow	YCW	71	non-TwispSp	1.00	
07CD0349	18 Apr-08 May	Methow	YCW	96	non-TwispSp	1.00	
07CD0350	18 Apr-08 May	Methow	YCW	85	non-TwispSp	0.99	
07CD0351	18 Apr-08 May	Methow	YCW	100	non-TwispSp	0.99	
07CD0352	18 Apr-08 May	Methow	YCW	111	non-TwispSp	0.98	
07CD0353	18 Apr-08 May	Methow	YCW	98			unassigned
07CD0354	18 Apr-08 May	Methow	YCW	107	TwispH&W	0.99	
07CD0355	18 Apr-08 May	Methow	YCW	95	non-TwispSp	1.00	
07CD0356	18 Apr-08 May	Methow	YCW	96	non-TwispSp	0.94	
07CD0357	18 Apr-08 May	Methow	YCW	102	non-TwispSp	0.99	
07CD0358	18 Apr-08 May	Methow	YCW	102	non-TwispSp	0.99	
07CD0359	18 Apr-08 May	Methow	YCW	71	non-TwispSp	1.00	
07CD0360		Methow	YCW	104			Not a Chinook salmon
07CD0361	18 Apr-08 May	Methow	YCW	106	TwispH&W	0.99	
07CD0362	18 Apr-08 May	Methow	YCW	107	non-TwispSp	1.00	
07CD0363	18 Apr-08 May	Methow	YCW	106	non-TwispSp	1.00	
07CD0364	18 Apr-08 May	Methow	YCW	95	non-TwispSp	1.00	
07CD0365	18 Apr-08 May	Methow	YCW	108	non-TwispSp	0.93	
07CD0366	18 Apr-08 May	Methow	YCW	86	non-TwispSp	1.00	
07CD0367	18 Apr-08 May	Methow	YCW	94	non-TwispSp	1.00	
07CD0368	18 Apr-08 May	Methow	YCW	100	non-TwispSp	0.99	
07CD0369	18 Apr-08 May	Methow	YCW	101	TwispH&W	1.00	
07CD0370	18 Apr-08 May	Methow	YCW	93	non-TwispSp	1.00	
07CD0371	18 Apr-08 May	Methow	YCW	102	TwispH&W	0.99	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0372	18 Apr-08 May	Methow	YCW	107			unassigned
07CD0373	18 Apr-08 May	Methow	YCW	110	non-TwispSp	1.00	
07CD0374	18 Apr-08 May	Methow	YCW	111	non-TwispSp	0.99	
07CD0375	18 Apr-08 May	Methow	YCW	95	non-TwispSp	1.00	
07CD0376	18 Apr-08 May	Methow	YCW	94	non-TwispSp	1.00	
07CD0377	18 Apr-08 May	Methow	YCW	84	non-TwispSp	0.90	
07CD0378	18 Apr-08 May	Methow	YCW	94	non-TwispSp	1.00	
07CD0379	18 Apr-08 May	Methow	YCW	104	non-TwispSp	0.92	
07CD0380	18 Apr-08 May	Methow	YCW	93	non-TwispSp	1.00	
07CD0381	18 Apr-08 May	Methow	YCW	91	non-TwispSp	0.99	
07CD0382	18 Apr-08 May	Methow	YCW	99	MetSumm	1.00	
07CD0383	18 Apr-08 May	Methow	YCW	103			unassigned
07CD0384	18 Apr-08 May	Methow	YCW	88	non-TwispSp	1.00	
07CD0385	18 Apr-08 May	Methow	YCW	76	non-TwispSp	0.99	
07CD0386	18 Apr-08 May	Methow	YCW	122	non-TwispSp	1.00	
07CD0387	18 Apr-08 May	Methow	YCW	117	non-TwispSp	0.99	
07CD0388	18 Apr-08 May	Methow	YCW	90	non-TwispSp	1.00	
07CD0389	18 Apr-08 May	Methow	YCW	90	non-TwispSp	0.99	
07CD0391	18 Apr-08 May	Methow	YCW	104	non-TwispSp	0.99	
07CD0392	18 Apr-08 May	Methow	YCW	112	TwispH&W	1.00	
07CD0393	31 May-10 July	Methow	SBC	78	MetSumm	1.00	Disregard age 0
07CD0394	31 May-10 July	Methow	SBC	52	MetSumm	1.00	Disregard
07CD0395	31 May-10 July	Methow	SBC	50	MetSumm	1.00	Disregard
07CD0396	31 May-10 July	Methow	SBC	41	MetSumm	1.00	Disregard
07CD0397	31 May-10 July	Methow	SBC	44	MetSumm	1.00	Disregard

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0398	31 May-10 July	Methow	SBC	38	MetSumm	1.00	Disregard
07CD0399	31 May-10 July	Methow	SBC	62	MetSumm	1.00	Disregard
07CD0400	31 May-10 July	Methow	SBC	43	MetSumm	1.00	Disregard
07CD0401	31 May-10 July	Methow	SBC	42	MetSumm	1.00	Disregard
07CD0402	31 May-10 July	Methow	SBC	71	non-TwispSp	1.00	Disregard age 0
07CD0403	31 May-10 July	Methow	SBC	92	non-TwispSp	0.99	Disregard age 0
07CD0404	31 May-10 July	Methow	SBC	91	non-TwispSp	0.99	Disregard age 0
07CD0405	31 May-10 July	Methow	SBC	92	non-TwispSp	0.99	Disregard age 0
07CD0406	31 May-10 July	Methow	SBC	91	non-TwispSp	0.99	Disregard age 0
07CD0407	31 May-10 July	Methow	SBC	92	non-TwispSp	0.99	Disregard age 0
07CD0408	31 May-10 July	Methow	SBC	102	non-TwispSp	0.99	Disregard age 0
07CD0409	31 May-10 July	Methow	SBC	93	non-TwispSp	1.00	Disregard age 0
07CD0410	31 May-10 July	Methow	SBC	92	MetSumm	1.00	Disregard age 0
07CD0411	31 May-10 July	Methow	SBC	99	MetSumm	1.00	Disregard age 0
07CD0412	31 May-10 July	Methow	SBC	96	non-TwispSp	0.99	Disregard age 0
07CD0413	31 May-10 July	Methow	SBC	96	non-TwispSp	0.99	Disregard age 0
07CD0414	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0415	31 May-10 July	Methow	SBC	101	non-TwispSp	0.99	Disregard age 0
07CD0416	31 May-10 July	Methow	SBC	99	non-TwispSp	1.00	Disregard age 0
07CD0417	31 May-10 July	Methow	SBC	99	non-TwispSp	0.99	Disregard age 0
07CD0418	31 May-10 July	Methow	SBC	102	non-TwispSp	1.00	Disregard age 0
07CD0419	31 May-10 July	Methow	SBC	96	non-TwispSp	1.00	Disregard age 0
07CD0420	31 May-10 July	Methow	SBC	97	non-TwispSp	0.99	Disregard age 0
07CD0421	31 May-10 July	Methow	SBC	90	MetSumm	1.00	Disregard age 0
07CD0422	31 May-10 July	Methow	SBC	97	non-TwispSp	1.00	Disregard age 0
07CD0423	31 May-10 July	Methow	SBC	90	non-TwispSp	1.00	Disregard age 0
07CD0424	31 May-10 July	Methow	SBC	95	non-TwispSp	0.99	Disregard age 0
07CD0425	31 May-10 July	Methow	SBC	91	non-TwispSp	1.00	Disregard age 0
07CD0426	31 May-10 July	Methow	SBC	97	non-TwispSp	0.99	Disregard age 0
07CD0427	31 May-10 July	Methow	SBC	93	non-TwispSp	0.99	Disregard age 0

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0428	31 May-10 July	Methow	SBC	113	non-TwispSp	1.00	Disregard age 0
07CD0429	31 May-10 July	Methow	SBC	99	non-TwispSp	1.00	Disregard age 0
07CD0430	31 May-10 July	Methow	SBC	103	non-TwispSp	0.97	Disregard age 0
07CD0431	31 May-10 July	Methow	SBC	101	non-TwispSp	1.00	Disregard age 0
07CD0432	31 May-10 July	Methow	SBC	98	non-TwispSp	1.00	Disregard age 0
07CD0433	31 May-10 July	Methow	SBC	101	non-TwispSp	1.00	Disregard age 0
07CD0434	31 May-10 July	Methow	SBC	91	non-TwispSp	0.99	Disregard age 0
07CD0435	31 May-10 July	Methow	SBC	94	non-TwispSp	1.00	Disregard age 0
07CD0436	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0437	31 May-10 July	Methow	SBC	92	non-TwispSp	1.00	Disregard age 0
07CD0438	31 May-10 July	Methow	SBC	96	non-TwispSp	0.99	Disregard age 0
07CD0439	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0440	31 May-10 July	Methow	SBC	97	non-TwispSp	1.00	Disregard age 0
07CD0441	31 May-10 July	Methow	SBC	94	non-TwispSp	1.00	Disregard age 0
07CD0442	31 May-10 July	Methow	SBC	108	non-TwispSp	0.99	Disregard age 0
07CD0443	31 May-10 July	Methow	SBC	94	non-TwispSp	1.00	Disregard age 0
07CD0444	31 May-10 July	Methow	SBC	104	non-TwispSp	0.99	Disregard age 0
07CD0445	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0446	31 May-10 July	Methow	SBC	99	non-TwispSp	0.99	Disregard age 0
07CD0447	31 May-10 July	Methow	SBC	100	non-TwispSp	0.99	Disregard age 0
07CD0448	31 May-10 July	Methow	SBC	103	MetSumm	1.00	Disregard age 0
07CD0449	31 May-10 July	Methow	SBC	92	non-TwispSp	0.99	Disregard age 0
07CD0450	31 May-10 July	Methow	SBC	99	non-TwispSp	1.00	Disregard age 0
07CD0451	31 May-10 July	Methow	SBC	108	non-TwispSp	1.00	Disregard age 0
07CD0452	31 May-10 July	Methow	SBC	108	non-TwispSp	1.00	Disregard age 0
07CD0453	31 May-10 July	Methow	SBC	97	non-TwispSp	1.00	Disregard age 0
07CD0454	31 May-10 July	Methow	SBC	92	non-TwispSp	1.00	Disregard age 0
07CD0455	31 May-10 July	Methow	SBC	95	non-TwispSp	0.99	Disregard age 0
07CD0456	31 May-10 July	Methow	SBC	101	non-TwispSp	0.99	Disregard age 0
07CD0457	31 May-10 July	Methow	SBC	95	non-TwispSp	0.99	Disregard age 0
07CD0458	31 May-10 July	Methow	SBC	96	non-TwispSp	0.99	Disregard age 0

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0459	31 May-10 July	Methow	SBC	93	MetSumm	1.00	Disregard age 0
07CD0460	31 May-10 July	Methow	SBC	102	non-TwispSp	0.98	Disregard age 0
07CD0461	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0462	31 May-10 July	Methow	SBC	111	non-TwispSp	0.99	Disregard age 0
07CD0463	31 May-10 July	Methow	SBC	105	non-TwispSp	0.99	Disregard age 0
07CD0464	31 May-10 July	Methow	SBC	103	non-TwispSp	1.00	Disregard age 0
07CD0465	31 May-10 July	Methow	SBC	96	non-TwispSp	1.00	Disregard age 0
07CD0466	31 May-10 July	Methow	SBC	95	non-TwispSp	1.00	Disregard age 0
07CD0467	31 May-10 July	Methow	SBC	112	non-TwispSp	1.00	Disregard age 0
07CD0468	31 May-10 July	Methow	SBC	124	non-TwispSp	0.99	Disregard age 0
07CD0469	31 May-10 July	Methow	SBC	95	MetSumm	1.00	Disregard age 0
07CD0470	31 May-10 July	Methow	SBC	113	non-TwispSp	0.93	Disregard age 0
07CD0471	31 May-10 July	Methow	SBC	97	MetSumm	1.00	Disregard age 0
07CD0472	31 May-10 July	Methow	SBC	114	non-TwispSp	1.00	Disregard age 0
07CD0473	31 May-10 July	Methow	SBC	101	non-TwispSp	1.00	Disregard age 0
07CD0474	31 May-10 July	Methow	SBC	103	non-TwispSp	0.95	Disregard age 0
07CD0475	31 May-10 July	Methow	SBC	115	non-TwispSp	1.00	Disregard age 0
07CD0476	31 May-10 July	Methow	SBC	94	non-TwispSp	1.00	Disregard age 0
07CD0477	31 May-10 July	Methow	SBC	102			Disregard age 0; No sample
07CD0478	31 May-10 July	Methow	SBC	95	non-TwispSp	1.00	Disregard age 0
07CD0479	31 May-10 July	Methow	SBC	101	non-TwispSp	1.00	Disregard age 0
07CD0480	31 May-10 July	Methow	SBC	96	non-TwispSp	1.00	Disregard age 0
07CD0481	31 May-10 July	Methow	SBC	101	non-TwispSp	1.00	Disregard age 0
07CD0482	31 May-10 July	Methow	SBC	115	non-TwispSp	1.00	Disregard age 0
07CD0483	31 May-10 July	Methow	SBC	98	non-TwispSp	1.00	Disregard age 0
07CD0484	31 May-10 July	Methow	SBC	97			Disregard age 0; unassigned
07CD0485	31 May-10 July	Methow	SBC	92	non-TwispSp	0.99	Disregard age 0
07CD0486	31 May-10 July	Methow	SBC	105	MetSumm	1.00	Disregard age 0
07CD0487	31 May-10 July	Methow	SBC	95	non-TwispSp	1.00	Disregard age 0
07CD0488	31 May-10 July	Methow	SBC	110	non-TwispSp	0.99	Disregard age 0
07CD0489	31 May-10 July	Methow	SBC	109	non-TwispSp	0.99	Disregard age 0

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07CD0490	31 May-10 July	Methow	SBC	100	non-TwispSp	1.00	Disregard age 0
07CD0491	31 May-10 July	Methow	SBC	104	non-TwispSp	0.99	Disregard age 0
07CD0492	31 May-10 July	Methow	SBC	110	non-TwispSp	1.00	Disregard age 0
07CD0493	31 May-10 July	Methow	SBC	103	non-TwispSp	1.00	Disregard age 0
07CD0494	31 May-10 July	Methow	SBC	90	non-TwispSp	0.99	Disregard age 0
07CD0495	31 May-10 July	Methow	SBC	93	non-TwispSp	1.00	Disregard age 0
07CD0496	31 May-10 July	Methow	SBC	105	non-TwispSp	0.99	Disregard age 0
07CD0497	31 May-10 July	Methow	SBC	95	MetSumm	1.00	Disregard age 0
07CD0498	31 May-10 July	Methow	SBC	109	non-TwispSp	0.99	Disregard age 0
07CD0499	31 May-10 July	Methow	SBC	105			Disregard age 0; Contaminated
07HF0001	Fall parr				TwispH&W	0.99	
07HF0002	Fall parr				non-TwispSp	1.00	
07HF0003	Fall parr				non-TwispSp	0.99	
07HF0004	Fall parr				non-TwispSp	1.00	
07HF0005	Fall parr				non-TwispSp	0.99	
07HF0006	Fall parr				TwispH&W	0.96	
07HF0007	Fall parr				MetSumm	1.00	
07HF0008	Fall parr				MetSumm	1.00	
07HF0009	Fall parr				non-TwispSp	0.95	
07HF0010	Fall parr						unassigned
07HF0011	Fall parr				MetSumm	1.00	
07HF0012	Fall parr				MetSumm	1.00	
07HF0013	Fall parr				MetSumm	1.00	
07HF0014	Fall parr				non-TwispSp	1.00	
07HF0015	Fall parr				non-TwispSp	1.00	
07HF0016	Fall parr				non-TwispSp	1.00	
07HF0017	Fall parr				TwispH&W	1.00	
07HF0018	Fall parr				non-TwispSp	1.00	
07HF0019	Fall parr				TwispH&W	1.00	
07HF0020	Fall parr				TwispH&W	1.00	
07HF0021	Fall parr						unassigned

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07HF0022	Fall parr						unassigned
07HF0023	Fall parr				non-TwispSp	1.00	
07HF0024	Fall parr						unassigned
07HF0025	Fall parr				non-TwispSp	1.00	
07HF0026	Fall parr				TwispH&W	1.00	
07HF0027	Fall parr				non-TwispSp	0.99	
07HF0028	Fall parr				non-TwispSp	0.90	
07HF0029	Fall parr						unassigned
07HF0030	Fall parr				non-TwispSp	1.00	
07HF0031	Fall parr				non-TwispSp	0.99	
07HF0033	Fall parr				non-TwispSp	0.99	
07HF0034	Fall parr				non-TwispSp	1.00	
07HF0035	Fall parr				non-TwispSp	0.92	
07HF0036	Fall parr				non-TwispSp	1.00	
07HF0037	Fall parr				non-TwispSp	0.99	
07HF0038	Fall parr				non-TwispSp	0.98	
07HF0039	Fall parr				non-TwispSp	0.98	
07HF0040	Fall parr				non-TwispSp	0.99	
07HF0041	Fall parr				TwispH&W	1.00	
07HF0042	Fall parr				non-TwispSp	0.93	
07HF0043	Fall parr				TwispH&W	0.92	
07HF0044	Fall parr				non-TwispSp	1.00	
07HF0045	Fall parr				non-TwispSp	0.99	
07HF0046	Fall parr				non-TwispSp	0.99	
07HF0047	Fall parr				MetSumm	1.00	
07HF0048	Fall parr				non-TwispSp	1.00	
07HF0049	Fall parr				non-TwispSp	1.00	
07HF0050	Fall parr				non-TwispSp	1.00	
07HF0051	Fall parr				MetSumm	1.00	
07HF0052	Fall parr				non-TwispSp	1.00	
07HF0053	Fall parr				MetSumm	1.00	

Animal ID	Sampling Stratum	Site	Class	Fork (mm)	Assigned origin	Assignment probability	Comment
07HF0054	Fall parr				TwispH&W	0.98	
07HF0055	Fall parr				non-TwispSp	1.00	
07HF0056	Fall parr				non-TwispSp	0.99	
07HF0057	Fall parr				TwispH&W	0.98	
07HF0058	Fall parr				non-TwispSp	1.00	
07HF0059	Fall parr				non-TwispSp	0.99	
07HF0060	Fall parr				non-TwispSp	0.99	
07HF0061	Fall parr				non-TwispSp	0.99	
07HF0062	Fall parr				non-TwispSp	0.97	
07HF0063	Fall parr				non-TwispSp	1.00	
07HF0064	Fall parr				non-TwispSp	0.99	
07HF0065	Fall parr				non-TwispSp	0.93	
07HF0066	Fall parr				TwispH&W	0.99	

Table 4. Summary abundance of groups-of-origin over time.

Sampling stratum	TwispH&W	Non-TwispSp	MetSumm
09 Mar-18 Mar	8	77	0
19 Mar-31 Mar	9	82	1
04 Apr-17 Apr	21	86	1
18 Apr-08 May	11	48	1
31 May-10 July	0	86	18
Fall migrants	11	41	8

Appendix A. Samples used to construct the genetic baseline and how we combined them into population aggregates.

Population aggregate	Collection name	Sample/Sample series	Series n
non-Twisp Spring Chinook salmon (n=923)	01ChewH (n=140)		
		01AAO0001	1
		01AAO0003 - 01AAO0004	2
		01AAO0006	1
		01AAO0008 - 01AAO0009	2
		01AAO0011	1
		01AAO0013 - 01AAO0014	2
		01AAO0016	1
		01AAO0018	1
		01AAO0021	1
		01AAO0023 - 01AAO0024	2
		01AAO0026	1
		01AAO0028 - 01AAO0029	2
		01AAO0031	1
		01AAO0033 - 01AAO0034	2
		01AAO0036	1
		01AAO0038 - 01AAO0039	2
		01AAO0041	1
		01AAO0043 - 01AAO0044	2
		01AAO0046	1
		01AAO0048 - 01AAO0049	2
		01AAO0051	1
		01AAO0056	1
		01AAO0058 - 01AAO0059	2
		01AAO0061	1
		01AAO0063 - 01AAO0064	2
		01AAO0066	1
		01AAO0068 - 01AAO0069	2
		01AAO0071	1
		01AAO0074	1
		01AAO0076	1
		01AAO0078 - 01AAO0079	2
		01AAO0081	1
		01AAO0083 - 01AAO0084	2
		01AAO0086	1
		01AAO0088 - 01AAO0089	2
		01AAO0091	1
		01AAO0093 - 01AAO0094	2
		01AAO0096	1
		01AAO0098	1
		01AAO0101	1
		01AAO0103 - 01AAO0104	2
		01AAO0106	1
		01AAO0108 - 01AAO0109	2
		01AAO0111	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAO0113 - 01AAO0114	2
		01AAO0116	1
		01AAO0118 - 01AAO0119	2
		01AAO0121	1
		01AAO0123 - 01AAO0124	2
		01AAO0126	1
		01AAO0128	1
		01AAO0131	1
		01AAO0133 - 01AAO0134	2
		01AAO0136	1
		01AAO0138 - 01AAO0139	2
		01AAO0141	1
		01AAO0143 - 01AAO0144	2
		01AAO0146	1
		01AAO0148 - 01AAO0149	2
		01AAO0151	1
		01AAO0154	1
		01AAO0156	1
		01AAO0158 - 01AAO0159	2
		01AAO0161	1
		01AAO0163 - 01AAO0164	2
		01AAO0166	1
		01AAO0169	1
		01AAO0171	1
		01AAO0173 - 01AAO0174	2
		01AAO0176	1
		01AAO0178 - 01AAO0179	2
		01AAO0181	1
		01AAO0183 - 01AAO0185	3
		01EL0008 - 01EL0009	2
		01EL0012	1
		01EL0015	1
		01EL0018	1
		01EL0046	1
		01EL0052	1
		01EL0063	1
		01EL0070	1
		01EL0081	1
		01EL0094	1
		01EL0113	1
		01EL0158	1
		01EL0213	1
		01EL0256	1
		01EL0259 - 01EL0260	2
		01EL0269	1
		01EL0271	1
		01EL0273	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01EL0275 - 01EL0276	2
		01EL0279	1
		01EL0292	1
		01EL0336	1
		01EL0425	1
		01EL0444	1
		01EL0448	1
		01EL0538	1
		01EL0550	1
		01EL0557	1
		01EL0568	1
		01EL0623	1
		01EL0638	1
		01EL0750	1
		01EL0792	1
	01MetH (n=139)		
		01AAK0003	1
		01AAK0007	1
		01AAK0010	1
		01AAK0014	1
		01AAK0017	1
		01AAK0021	1
		01AAK0024	1
		01AAK0028	1
		01AAK0031	1
		01AAK0035	1
		01AAK0038	1
		01AAK0042	1
		01AAK0045	1
		01AAK0049	1
		01AAK0052	1
		01AAK0056	1
		01AAK0059	1
		01AAK0063	1
		01AAK0066	1
		01AAK0070	1
		01AAK0073	1
		01AAK0077	1
		01AAK0080	1
		01AAK0084	1
		01AAK0087	1
		01AAK0091	1
		01AAK0094	1
		01AAK0098	1
		01AAK0101	1
		01AAK0104	1
		01AAK0108	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAK0112	1
		01AAK0115	1
		01AAK0119	1
		01AAK0122	1
		01AAK0126	1
		01AAK0129	1
		01AAK0133	1
		01AAK0136	1
		01AAK0140	1
		01AAK0143	1
		01AAK0147	1
		01AAK0150	1
		01AAK0154	1
		01AAK0157	1
		01AAK0161	1
		01AAK0164	1
		01AAK0168	1
		01AAK0171	1
		01AAK0175	1
		01AAK0178	1
		01AAK0182	1
		01AAK0185	1
		01AAK0189	1
		01AAK0192	1
		01AAK0199	1
		01AAK0203	1
		01AAK0206	1
		01AAK0210	1
		01AAK0213	1
		01AAK0217	1
		01AAK0220	1
		01AAK0227	1
		01AAK0231	1
		01AAK0234	1
		01AAK0238	1
		01AAK0241	1
		01AAK0245	1
		01AAK0248	1
		01AAK0252	1
		01AAK0255	1
		01AAK0259	1
		01AAK0262	1
		01AAK0266	1
		01AAK0269	1
		01AAK0273	1
		01AAK0276	1
		01AAK0280	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAK0283	1
		01AAK0287	1
		01AAK0301	1
		01AAK0304	1
		01AAK0308	1
		01AAK0311	1
		01AAK0322	1
		01AAK0325	1
		01AAK0327	1
		01AAK0329	1
		01AAK0332	1
		01AAK0336	1
		01AAK0339	1
		01AAK0343	1
		01AAK0346	1
		01AAK0350	1
		01AAK0353	1
		01AAK0357	1
		01AAK0360	1
		01AAK0364	1
		01AAK0367	1
		01AAK0371	1
		01AAK0374	1
		01AAK0378	1
		01AAK0381	1
		01AAK0385	1
		01AAK0388	1
		01AAK0392	1
		01AAK0395	1
		01AAK0399	1
		01AAK0402	1
		01AAK0406	1
		01AAK0409	1
		01AAK0413	1
		01AAK0416	1
		01AAK0420	1
		01AAK0423	1
		01AAK0427	1
		01AAK0430	1
		01AAK0434	1
		01AAK0437	1
		01AAK0441	1
		01AAK0444	1
		01AAK0448	1
		01AAK0451	1
		01AAK0455	1
		01AAK0458	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAK0462	1
		01AAK0469	1
		01AAK0472	1
		01AAK0476	1
		01AAK0479	1
		01AAK0483	1
		01AAK0486	1
		01AAK0490	1
		01AAK0493	1
		01AAK0497	1
		01AAK0500	1
		01AAK0504	1
		01AAK0507	1
		01AAK0511	1
	01WinH (n=93)		
		01EL0007	1
		01EL0013	1
		01EL0024	1
		01EL0031	1
		01EL0037	1
		01EL0045	1
		01EL0049	1
		01EL0071	1
		01EL0076	1
		01EL0078	1
		01EL0085	1
		01EL0089	1
		01EL0095	1
		01EL0098	1
		01EL0103	1
		01EL0109	1
		01EL0112	1
		01EL0120	1
		01EL0129	1
		01EL0137	1
		01EL0140	1
		01EL0151	1
		01EL0156	1
		01EL0172	1
		01EL0175	1
		01EL0226	1
		01EL0230	1
		01EL0235	1
		01EL0258	1
		01EL0281	1
		01EL0288	1
		01EL0297	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01EL0300	1
		01EL0310	1
		01EL0313	1
		01EL0321	1
		01EL0323	1
		01EL0330	1
		01EL0343	1
		01EL0347	1
		01EL0353	1
		01EL0363	1
		01EL0366	1
		01EL0368	1
		01EL0378	1
		01EL0383	1
		01EL0390	1
		01EL0404	1
		01EL0410	1
		01EL0420	1
		01EL0423	1
		01EL0429	1
		01EL0447	1
		01EL0457	1
		01EL0460	1
		01EL0466	1
		01EL0491	1
		01EL0506	1
		01EL0508	1
		01EL0514	1
		01EL0516	1
		01EL0527	1
		01EL0531	1
		01EL0545	1
		01EL0554	1
		01EL0556	1
		01EL0562	1
		01EL0571	1
		01EL0578	1
		01EL0582	1
		01EL0588	1
		01EL0602	1
		01EL0615	1
		01EL0620	1
		01EL0625	1
		01EL0628	1
		01EL0632	1
		01EL0640	1
		01EL0648	1

Population aggregate	Collection name	Sample/Sample series	Series n
		01EL0651	1
		01EL0653	1
		01EL0657	1
		01EL0662	1
		01EL0677	1
		01EL0699	1
		01EL0707	1
		01EL0715	1
		01EL0751	1
		01EL0765	1
		01EL0767	1
		01EL0771	1
		01EL0774	1
		01EL0777	1
	06MetComp (n=127)		
		06EP0001 - 06EP0004	4
		06EP0006 - 06EP0035	30
		06EP0037 - 06EP0041	5
		06EP0043 - 06EP0057	15
		06EP0059 - 06EP0062	4
		06EP0065 - 06EP0068	4
		06EP0070 - 06EP0080	11
		06EP0084	1
		06EP0087 - 06EP0090	4
		06EP0094 - 06EP0096	3
		06EP0098 - 06EP0100	3
		06EP0102 - 06EP0144	43
	01ChewW (n=134)		
		01EL0011	1
		01EL0014	1
		01EL0021	1
		01EL0072	1
		01EL0080	1
		01EL0082	1
		01EL0102	1
		01EL0267 - 01EL0268	2
		01EL0283	1
		01EL0432 - 01EL0443	12
		01EL0532 - 01EL0534	3
		01EL0553	1
		01EL0567	1
		01AAN0001	1
		01AAN0003 - 01AAN0007	5
		01AAN0009 - 01AAN0017	9
		01AAN0019 - 01AAN0026	8
		01AAN0028 - 01AAN0035	8
		01AAN0037 - 01AAN0044	8

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAN0046 - 01AAN0053	8
		01AAN0056 - 01AAN0062	7
		01AAN0064 - 01AAN0066	3
		01AAN0068 - 01AAN0071	4
		01AAN0073 - 01AAN0075	3
		01AAN0077 - 01AAN0080	4
		01AAN0082 - 01AAN0089	8
		01AAN0092 - 01AAN0098	7
		01AAN0100 - 01AAN0107	8
		01AAN0109 - 01AAN0115	7
		01AAN0118 - 01AAN0121	4
		01AAN0123	1
		01AAN0125 - 01AAN0128	4
	01MetW (n=62)		
		01AAJ0001 - 01AAJ0062	62
	05MetW (n=58)		
		05HW0003 - 05HW0004	2
		05HW0006 - 05HW0007	2
		05HW0009	1
		05HW0011 - 05HW0013	3
		05HW0015	1
		05HW0017 - 05HW0019	3
		05HW0022 - 05HW0025	4
		05HW0027 - 05HW0031	5
		05HW0033 - 05HW0035	3
		05HW0037 - 05HW0049	13
		05HW0051 - 05HW0053	3
		05HW0058	1
		05HW0061 - 05HW0066	6
		05HW0068	1
		05HW0072 - 05HW0073	2
		05HW0075 - 05HW0077	3
		05HZ0020	1
		05HW0060	1
		05HW0067	1
		05HW0071	1
		05HW0074	1
	05ChewW (n=83)		
		05HY0002 - 05HY0004	3
		05HY0006 - 05HY0010	5
		05HY0012 - 05HY0015	4
		05HY0017 - 05HY0018	2
		05HY0020 - 05HY0027	8
		05HY0029 - 05HY0032	4
		05HY0034 - 05HY0054	21
		05HY0057 - 05HY0060	4
		05HY0062 - 05HY0064	3

Population aggregate	Collection name	Sample/Sample series	Series n
		05HY0067 - 05HY0076	10
		05HY0078 - 05HY0096	19
	06MetW (n=33)		
		06DA0003	1
		06DA0006	1
		06DA0011	1
		06DA0013	1
		06DA0016	1
		06DA0018	1
		06DA0024	1
		06DA0055	1
		06DA0058	1
		06DA0074	1
		06DA0078	1
		06DA0085	1
		06DA0087	1
		06DA0093	1
		06DA0107	1
		06DA0124	1
		06DA0151	1
		06DA0169	1
		06DA0175	1
		06DA0191	1
		06DA0201	1
		06DA0244 - 06DA0249	6
		06DA0251	1
		06DA0253	1
		06DA0255 - 06DA0257	3
		06DA0268	1
	06ChewW (n=54)		
		06DC0001	1
		06DC0003	1
		06DC0007	1
		06DC0009	1
		06DC0011	1
		06DC0019	1
		06DC0021	1
		06DC0025 - 06DC0026	2
		06DC0030	1
		06DC0035	1
		06DC0039 - 06DC0040	2
		06DC0046	1
		06DC0054 - 06DC0055	2
		06DC0060	1
		06DC0065	1
		06DC0070 - 06DC0072	3
		06DC0080 - 06DC0082	3

Population aggregate	Collection name	Sample/Sample series	Series n
		06DC0088	1
		06DC0090	1
		06DC0093	1
		06DC0098	1
		06DC0106	1
		06DC0108	1
		06DC0111	1
		06DC0113	1
		06DC0126	1
		06DC0128	1
		06DC0144 - 06DC0147	4
		06DC0153 - 06DC0154	2
		06DC0164 - 06DC0166	3
		06DC0169 - 06DC0170	2
		06DC0172	1
		06DC0190	1
		06DC0193	1
		06DC0196	1
		06DC0199	1
		06DC0215	1
		06DC0220	1
		06DC0227	1
		06DC0230	1
Twisp Spring Chinook salmon (n=213)	01TwispH (n=60)		
		01AAM0001 - 01AAM0044	44
		01EL0002	1
		01EL0005	1
		01EL0033	1
		01EL0042 - 01EL0043	2
		01EL0064	1
		01EL0068	1
		01EL0203	1
		01EL0216	1
		01EL0254 - 01EL0255	2
		01EL0263 - 01EL0264	2
		01EL0524 - 01EL0525	2
		01EL0593	1
	05TwispH (n=18)		
		05HX0006	1
		05HX0015	1
		05HX0035 - 05HX0036	2
		05HZ0008	1
		05HZ0035 - 05HZ0036	2
		05IA0003	1
		05IA0007 - 05IA0008	2
		05IA0010 - 05IA0017	8
	01TwispW (n=93)		

Population aggregate	Collection name	Sample/Sample series	Series n
		01AAL0001 - 01AAL0011	11
		01AAL0013 - 01AAL0023	11
		01AAL0025 - 01AAL0031	7
		01AAL0033 - 01AAL0039	7
		01AAL0041 - 01AAL0065	25
		01EL0001	1
		01EL0004	1
		01EL0006	1
		01EL0065 - 01EL0067	3
		01EL0265 - 01EL0266	2
		01EL0498 - 01EL0499	2
		01EL0721 - 01EL0733	13
		01EL0745 - 01EL0748	4
		01EL0754 - 01EL0758	5
	05TwispW (n=42)		
		05HX0001	1
		05HX0003	1
		05HX0005	1
		05HX0002	1
		05HX0004	1
		05HX0007 - 05HX0010	4
		05HX0012 - 05HX0014	3
		05HX0016 - 05HX0032	17
		05HX0034	1
		05HX0037 - 05HX0045	9
		05IA0009	1
		05HZ0037 - 05HZ0038	2
Methow summer Chinook salmon (n=143)	92MetSU (n=22)		
		92FL0001 - 92FL0016	16
		92FL0032 - 92FL0037	6
	93MetSU (n=37)		
		93EC0001 - 93EC0034	34
		93EC0047 - 93EC0049	3
	94MetSU (n=84)		
		94EJ0001 - 94EJ0082	82
		94EJ0084 - 94EJ0085	2

Chapter 4

Summer Steelhead Spawning Ground Surveys Conducted in the Methow River Basin in 2007

Abstract

Steelhead spawning ground surveys were conducted to estimate the abundance of spawners, and the distribution, and timing of spawning in the Methow River basin. We divided the basin into four distinct subbasins and developed index areas of spawning activity within each subbasin. Weekly surveys were performed by walking or rafting the index areas between 12 March and 19 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 major tributaries of each subbasin was estimated by adding the number of redds within index areas and the estimated number of redds in non-index areas. Spawning within minor tributaries of each subbasin was estimated by multiplying the length of suitable spawning habitat by the redd density (redd/km) of a randomly selected tributary. We estimated a minimum of 740 steelhead redds were constructed in the Methow River basin in 2007. 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 upper Methow River subbasin (N = 343). The lower Methow River (N = 177) and Chewuch River (N = 138) had similar numbers of redds. Surveys in the Twisp River subbasin (82 redds counted) were affected by rapid and sustained increases in stream flow during peak spawning, and several reaches in the Chewuch and Twisp subbasins were not surveyed due to high flow and turbidity. Redd abundance in the lower Methow River mainstem was low in 2007 (N = 7).

Peak spawning was observed the week of 22 April in the lower Methow River and Twisp subbasins, but a week earlier (15 April) in the Chewuch River subbasin. Peak spawning in the upper Methow River subbasin was observed between 15 April and the end of the month. The spawning population in 2007 was composed primarily of hatchery origin steelhead (92.0%). Based on Monday sampling, no significant difference was detected in mean passage date to Wells Dam based on salt age or parentage. In the hatchery environment, there were no significant differences based on parentage in spawn timing of adult (female) steelhead. Distribution of redds by origin (hatchery vs. wild) cannot currently be evaluated due to the inability to differentiate hatchery and wild fish on spawning grounds. Based on biological sampling during broodstock collection at Wells Hatchery, 7.6% of the hatchery origin escapement was composed of out-of-basin stray hatchery fish, primarily from the Wenatchee River. Stray rates of steelhead released in the Methow basin cannot currently be estimated. Wild fish comprised 8.0% of the escapement and were primarily from the 2002 and 2003 broods. Based on run-escapement estimates, the mean natural replacement rate for the six most recent broods of steelhead spawning above Wells Dam (1996-2001) was 0.30 recruits per adult. For all brood years examined (1996 to 2001), HRR was significantly greater than NRR.

Introduction

Summer steelhead are propagated at Wells Hatchery and used to supplement the natural spawning populations in the Methow and Okanogan rivers. As such, hatchery adults returning to supplemented streams should have migration timing, spawn timing, and redd distribution similar to those 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 knowledge of both the productivity of the population (i.e., recruits per spawner), 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 were not uniquely marked by release location, and tributary adult traps that could be used for stock assessment on the lower Methow and Okanogan rivers do not exist. 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, while estimates of spawner abundance were calculated from tributary specific estimates of redd abundance. Adult summer steelhead were also subjected to a selective fishery occurring both downstream and upstream of Wells Dam that also affected escapement levels. 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 quantified the harvest and indirect mortality rates necessary in refining run escapement estimates 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 were released in 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 et al. 2007). This chapter addresses activities related to steelhead spawning ground surveys in 2007 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: Number of hatchery fish that spawn naturally ≥ number of naturally and hatchery produced fish taken for broodstock
- Ho: Δ NOR/Max recruitment $_{\text{Supplemented population}}$ > Δ NOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho: Δ NRR $_{\text{Supplemented population}}$ ≥ Δ NRR $_{\text{Non-supplemented population}}$

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.

- Ho: Migration timing $_{\text{Hatchery age X}}$ = Migration timing $_{\text{Naturally produced age X}}$
- 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 $_{\text{Year x}}$ ≥ NRR $_{\text{Year x}}$
- Ho: HRR ≥ BAMP value (preferred)

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% of total brood return
- Ho: Stray hatchery fish ≤ 5% of spawning escapement (based on run year) within other independent populations
- Ho: Stray hatchery fish ≤ 10% of spawning escapement (based on run year) of any non-target streams within independent populations

Methods

Migration Timing and Spawner Composition

Broodstock were collected from a composite of both the Methow and Okanogan populations passing Wells Dam. Adult fish were trapped a maximum of three days per week and were retained for broodstock as necessary to achieve collection goals for hatchery and wild fish. All trapped steelhead were sampled for hatchery marks. Additionally, scale samples were collected from fish trapped each Monday and from all fish lacking hatchery marks to determine origin and age of the entire run. Monday-samples were used for run evaluation because trapping occurs consistently at both the east-ladder and west-ladder traps on this day, and because fewer fish are typically collected on each consecutive trapping day. Migration timing was calculated using all fish of known age that were collected, and those released during Monday trapping (excluding strays and unmarked hatchery fish). Dam passage date (day of the year) was categorized by fish salt-age and origin and the mean passage dates for those categories were analyzed using a

Kruskal-Wallis Test because assumptions regarding normality and variance could not be met. All statistical analyses were performed at a significance level of 0.05.

English et al. (2001, 2003) conducted a radio-telemetry study on steelhead migration through the mid-Columbia using steelhead tagged at Priest Rapids Dam in 1999 and 2001. Using those results, hatchery and wild fish were assigned to the Methow and Okanogan basins based on the proportion of radio tagged steelhead passing Wells Dam during the study that spawned in the Methow and Okanogan basins, respectively. Because the steelhead passing Wells Dam in the present study were subjected to a local 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 indirect mortality estimates were applied to the basin-specific run escapement to estimate the number of steelhead available for natural spawning. No estimates were made of pre-spawn mortality, illegal removal (i.e., poaching) or dam fallback.

Spawn Timing and Redd Distribution

Because not all hatchery fish possessed an external mark (both local and stray hatchery fish), we were unable to distinguish the relative timing of spawning of hatchery and naturally produced spawners in the natural environment. As a surrogate, relative 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 between hatchery and wild fish in the broodstock may also be present in the natural environment. A comparison between spawning date and spawner origin was analyzed using a Kruskal-Wallis Test because assumptions regarding normality and variance could not be met.

The Methow River basin was divided into four geographic subbasins; the upper Methow, lower Methow, Chewuch, and Twisp. Index areas of annual spawning activity were established within each subbasin based on information from historic surveys (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 a hand-held global positioning system (GPS) device 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 by a naïve surveyor 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).

The logistical challenges of systematically sampling the numerous low-order tributaries in the Methow Basin precluded the use of annual index areas for each tributary. Thus, 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 subbasin (Table 5). Selected tributaries were surveyed weekly during

the spawning season and redd densities (redds/km) of index tributaries were expanded to other subbasin tributaries based on length (km) of available spawning habitat. Subsequently, as each stream was surveyed, the length of suitable habitat for steelhead spawning was determined and adjusted based on data from the previous studies (LFA 2000).

With the current spawning ground survey methodology, spawn timing and redd distribution can be determined and the total number of redds estimated. However, not all hatchery fish are adipose fin-clipped, and an external mark is therefore not available to visually distinguish between hatchery and naturally produced fish on the spawning grounds. Thus, a determination of any differences in the timing and distribution of spawning between hatchery and naturally produced steelhead remains a data gap in the Methow Basin.

Table 1. Upper Methow River subbasin 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**	**5.2**
	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	Hatchery to Methow River	MH1	0.4	0.0	0.4
WNFH Outfall	Hatchery to Methow River	WN1	0.4	0.0	0.4

Table 2. Lower Methow River subbasin 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	4.9
	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 subbasin 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	3.6
	Up. P'man Br. - Low. P'man Br.	T2	7.8	2.9	4.9
	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 subbasin 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	2.3
	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	5.7
	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**

Table 5. Low-order tributaries included in the rotating-panel sampling design by subbasin and survey year.

Stream (section)	Survey year	Code	Dist (km)
Upper Methow subbasin			
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 subbasin			
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 subbasin			
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 subbasin			
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 location(s) has been identified. Furthermore, spawning escapement estimates based on redd counts 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.

To estimate run escapement (parent broods) to the Methow Basin, steelhead returning to Wells Dam were apportioned to the Methow Basin according to radio telemetry data (English et al. 2001, 2003). The number of recruits (i.e., naturally produced fish) returning to the Methow Basin from each parent brood was also estimated using radio telemetry data based on Wells Dam returns. The NRR for each brood was calculated by adding the number of recruits (r) from successive return years (i) that originated from the same parent brood. The total number of recruits was divided by the number of spawners (S) for that brood year:

$$\text{NRR} = r_{i+1} + r_{i+2} + r_{i+3} + \ldots / S$$

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. Comparisons between HRR and NRR were conducted with a Mann-Whitney U-test because assumptions regarding normality could not be met.

Results

Migration Timing and Spawner Composition

Stock assessment and collection of the 2007 brood steelhead broodstock occurred at Wells Dam between 31 July and 26 October 2006. During that time, a total of 6,491 steelhead migrated to Wells Dam (Table 6). Of those fish, 749 fish were sampled for hatchery marks or were scale sampled to determine origin and 320 hatchery and 48 wild steelhead were retained for broodstock purposes. The remaining 377 hatchery and 4 wild steelhead were released upstream of Wells Dam. Based on weekly trapping results (i.e., Mondays), no significant difference was detected in mean passage date at Wells Dam based on salt age or genetic origin (Figure 1; KW ANOVA: $P = 0.19$).

Table 6. Migration of hatchery and wild steelhead to Wells Dam between 31 July and 26 October 2006.

Origin	*N*	Cumulative migration date			
		25%	50%	75%	100%
Hatchery	6,002	7-Sept	19-Sept	28-Sept	26-Oct
Wild	489	27-Aug	11-Sept	28-Sept	26-Oct

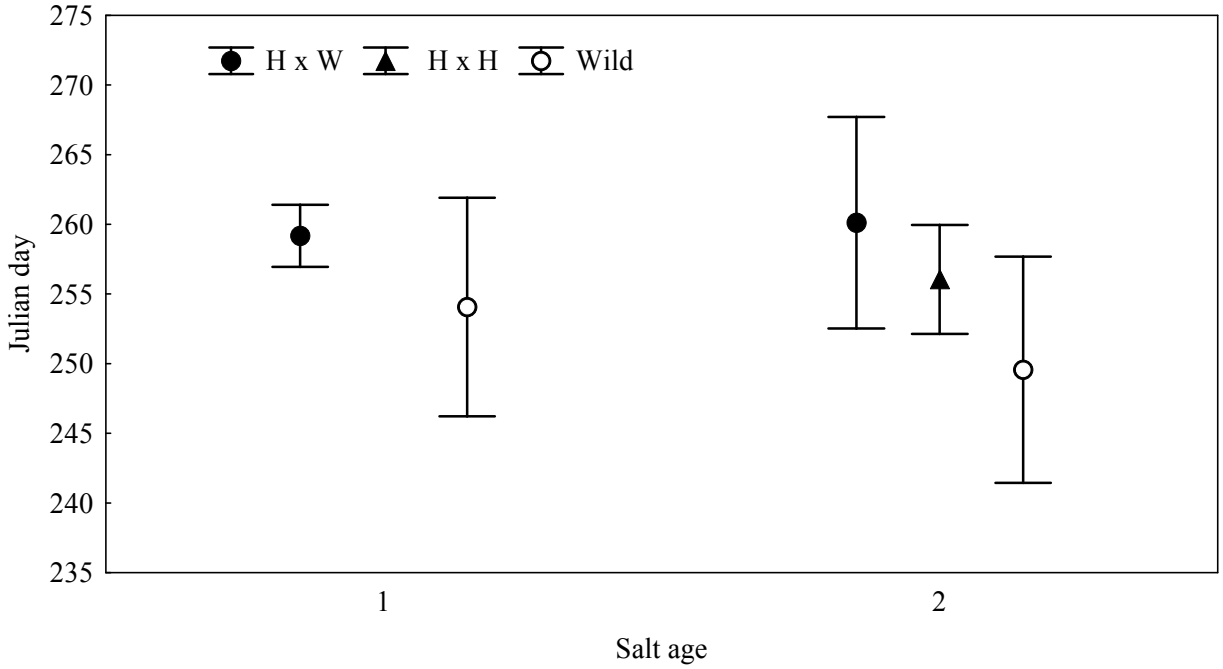


Figure 1. Mean passage date of summer steelhead passing Wells Dam between 31 July and 26 October 2006. Error bars are 95% confidence intervals.

After removal of Wells Hatchery broodstock, the estimated run escapement upstream of Wells Dam for the 2007 brood was 6,674. Analysis of scale samples and observations of hatchery marks indicated that wild fish comprised 8.7% of the steelhead run to Wells Dam. After removal of wild fish for hatchery broodstock, and adjusting for estimated indirect mortality from the fishery, 20.8% and 70.8% of the remaining wild fish were assigned to the Okanogan and Methow Basins, respectively (English et al. 2001, 2003). Because the abundance of wild steelhead in the 2007 brood return was low, a selective sport fishery occurred only in the mainstem Columbia River. This fishery occurred between 21 October 2006 and 16 March 2007. Creel census conducted during the fishery estimated that 518 adipose fin-clipped steelhead were retained during the fishery (Jateff 2007; Table 7). Indirect mortality of steelhead captured and released during the fishery was assumed to be 5% (K. Truscott, WDFW, personal communication) and resulted in an estimated mortality of two wild steelhead during the open fishery (Table 7).

Table 7. Estimated numbers of steelhead captured, retained, or mortalities, from expanded creel census above Wells Dam. Hatchery steelhead retained includes hooking mortality.

Species/disposition	Methow	Columbia	Okanogan	Similkameen	Total
Estimated total steelhead caught	N/A	658	N/A	N/A	658
Estimated hatchery steelhead removed	N/A	518	N/A	N/A	523
Estimated wild steelhead mortality	N/A	2	N/A	N/A	2

After removal of fishery related mortality, an estimated 120 and 409 wild fish were available for natural spawning in the Okanogan and Methow River basins, respectively (Table 8). Hatchery fish, including strays, were assigned to the Methow and Okanogan basins based on radio telemetry data (English et al. 2001, 2003).

Table 8. Escapement and disposition of the 2007 brood summer steelhead passing Wells Dam. Hatchery (N = 320) and wild (N = 48) fish removed for broodstock at Wells Dam are not included in the escapement estimate above Wells Dam. Methow and Okanogan River escapements are based on radio telemetry data (English et al. 2001, 2003), which account for 90.4% and 91.6% of the estimated hatchery and wild escapement, respectively.

Area	Description (*Variable*)		Number
Above Wells Dam	Local hatchery fish	(A)	5,426
	Stray hatchery fish	(B)	668
	Hatchery fish removed in fishery	(C)	523
	Above-Wells Hatchery run estimate	($D = (A + B) - C$)	5,571
	Wild fish	(E)	580
	Wild fish removed in fishery	(F)	2
	Above-Wells Wild run estimate	($G = E - F$)	578
Okanogan Basin[a]	Hatchery run-escapement estimate	($H = D * 0.324$)	1,798
	Wild run-escapement estimate	($I = G * 0.208$)	115
	Maximum spawning-escapement estimate	($J = H + I$)	1,913
Methow Basin	Hatchery run-escapement estimate	($K = D * 0.580$)	3,231
	Wild run-escapement estimate	($L = G * 0.708$)	409
	Maximum spawning-escapement estimate	($M = K + L$)	3,640

[a] Reflects the removal of seven hatchery and five wild fish from Omak Creek for CCT broodstock (C. Fisher, CCT, personal communication).

Overall, 58.0% of the hatchery fish passing Wells Dam were estimated to have returned to the Methow Basin. After broodstock and fishery removal, an estimated 3,231 hatchery and 409 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 = 1,913) was approximately 51.1% greater than the maximum spawning escapement of 1,266 fish calculated from expanded redd counts in 2007 (Arterburn et al. 2007).

Spawn Timing and Redd Distribution

In the hatchery environment, there were no significant differences based on parentage in spawn timing of adult (female) steelhead (Figure 2; KW ANOVA: P = 0.17). Wild and H x W females had mean spawn dates of 28 February and 25 February, respectively. The mean spawn date for H x H females was 6 March. Several wild females (N = 12; 46.0%) were injected with hormones designed to increase maturation timing and facilitate matings of wild and hatchery fish. Statistical tests were performed after removing these fish, but results did not change. Differences in spawn timing do exist between hatchery and wild fish, but are not evident because only the earliest maturing wild females were included in the analysis.

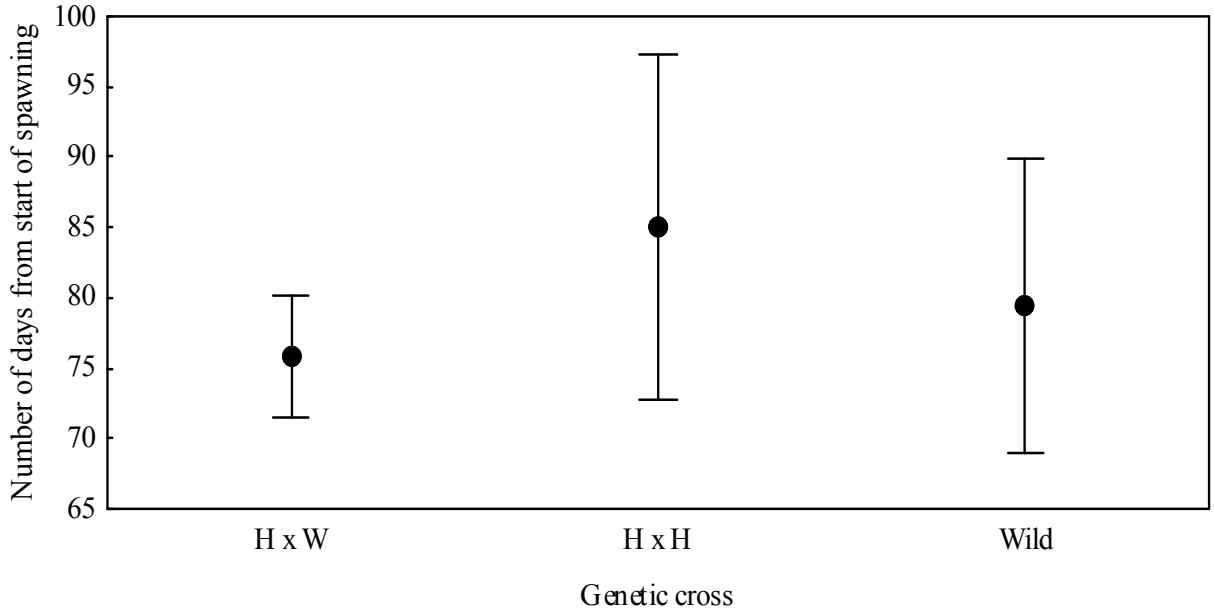


Figure 2. Spawn timing of 2007 brood female steelhead at Wells Hatchery by genetic cross. Spawning began on 10 December 2006 (Day 1). Error bars are 95% confidence intervals.

In the natural environment, observed spawn timing within the index areas suggested that the peak spawn timing in the Chewuch subbasin occurred during the week of 15 April. Peak spawning in the remaining three subbasins all occurred between 15 and 30 April (Figure 3; Table 9). Differences in spawn timing between hatchery and wild fish were not assessed on the spawning grounds because many hatchery fish did not possess an externally visible mark (i.e., ad-clip), thus confounding the surveyors ability to determine the origin of spawning adults.

Table 9. Methow River index area weekly redd counts by subbasin and week beginning (ns = not surveyed). Limited surveys were performed in June but no new redds were found.

Stream	Survey reach	Code	March			April					May				Total
			11	18	25	1	8	15	22	29	6	13	20	27	
						Upper Methow subbasin									
Methow	Mazama Br.-Susp. Br.	M11	ns	0	0	7	0	7	3	7	ns	ns	0	ns	24
Methow	Susp. Br.-Weeman Br.	M10	ns	0	4	1	3	20	7	20	ns	ns	1	ns	56
E. Winters	Div. Dam -Hwy 20 Br.	EW2	ns	0	0	0	ns	0	2	0	ns	ns	ns	ns	2
E. Winters	Hwy 20 Br.-Conf.	EW1	ns	0	0	0	ns	0	0	0	ns	ns	ns	ns	0
Lost	Lost River Br.-Conf.	L1	ns	0	0	0	ns	4	2	4	ns	ns	ns	ns	10
Suspension	Entire length	SP1	ns	0	5	9	8	6	5	7	6	3	0	ns	49
Little Susp.	Entire length	LSP1	ns	0	2	0	5	11	0	4	1	0	6	ns	29
	Subbasin total		ns	0	11	17	16	48	19	42	7	3	7	ns	170
						Lower Methow subbasin									
Methow	Carlton-Upp. Burma Br.	M2	0	0	0	0	ns	0	1	ns	ns	ns	ns	ns	1
Beaver	Hwy 20-Confluence	BV1	0	1	1	0	ns	1	2	ns	ns	4	ns	ns	9
	Subbasin total		0	1	1	0	ns	1	3	ns	ns	4	ns	ns	10
						Twisp subbasin									
Twisp	B'milk Br.-Lit. Br. Cr.	T5	ns	0	0	4	10	7	27	12	ns	ns	ns	ns	60
Twisp	Little Br. Cr.-Weir	T4	ns	0	0	0	1	6	4	2	ns	ns	ns	ns	13
	Subbasin total		ns	0	0	4	11	13	31	14	ns	ns	ns	ns	73
						Chewuch subbasin									
Chewuch	8 Mile Cr.-Boulder Cr.	C4	ns	0	0	2	ns	9	0	6	2	0	ns	0	19
Eightmile	500m above div.-Conf.	EM1	ns	0	0	0	ns	1	0	ns	ns	ns	ns	0	1
	Subbasin total		ns	0	0	2	ns	10	0	6	2	0	ns	0	20

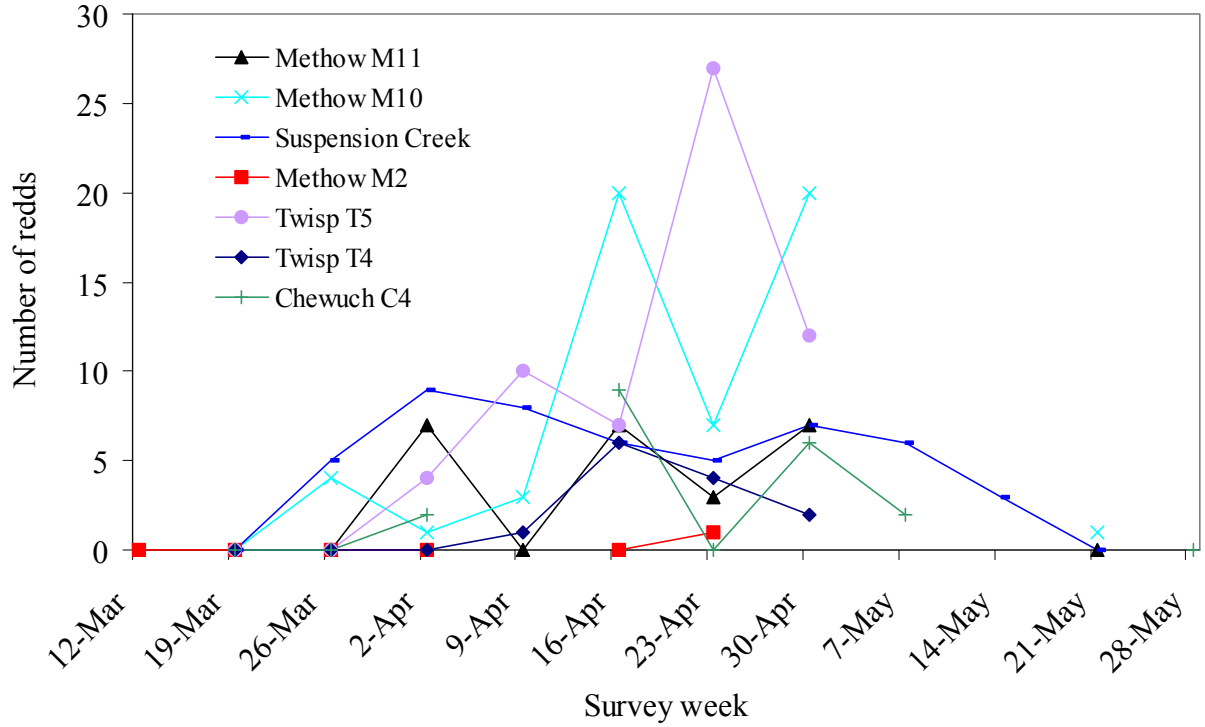


Figure 3. Temporal distribution of the steelhead spawning in selected index areas within the Methow Basin in 2007.

Based on expanded redd counts, an estimated 740 steelhead redds were deposited in the Methow River basin in 2007 (Tables 10 – 13). The Upper Methow River had the greatest density of steelhead redds within mainstem index areas (8.6 per km) of the four subbasins surveyed (Figures 4 – 7; Table 12). Based on the male-to-female ratio of hatchery (0.745) and wild (0.692) steelhead calculated during broodstock collection activities, the total redd count represents 1,288 fish, or 35.4% of the estimated run escapement to the Methow River basin of 3,640 fish. A determination of the abundance of redds in 2007 was affected by the early and rapid onset of high river discharge that occurred throughout the Methow Basin. Low redd counts ($N = 7$) in the lower Methow River mainstem reaches were likely the result of the early and abrupt onset of the spring freshet, which began in early March and persisted throughout the typical spawning period. Historic redd counts for each of the subbasins surveyed are listed in Appendices A1 – A4.

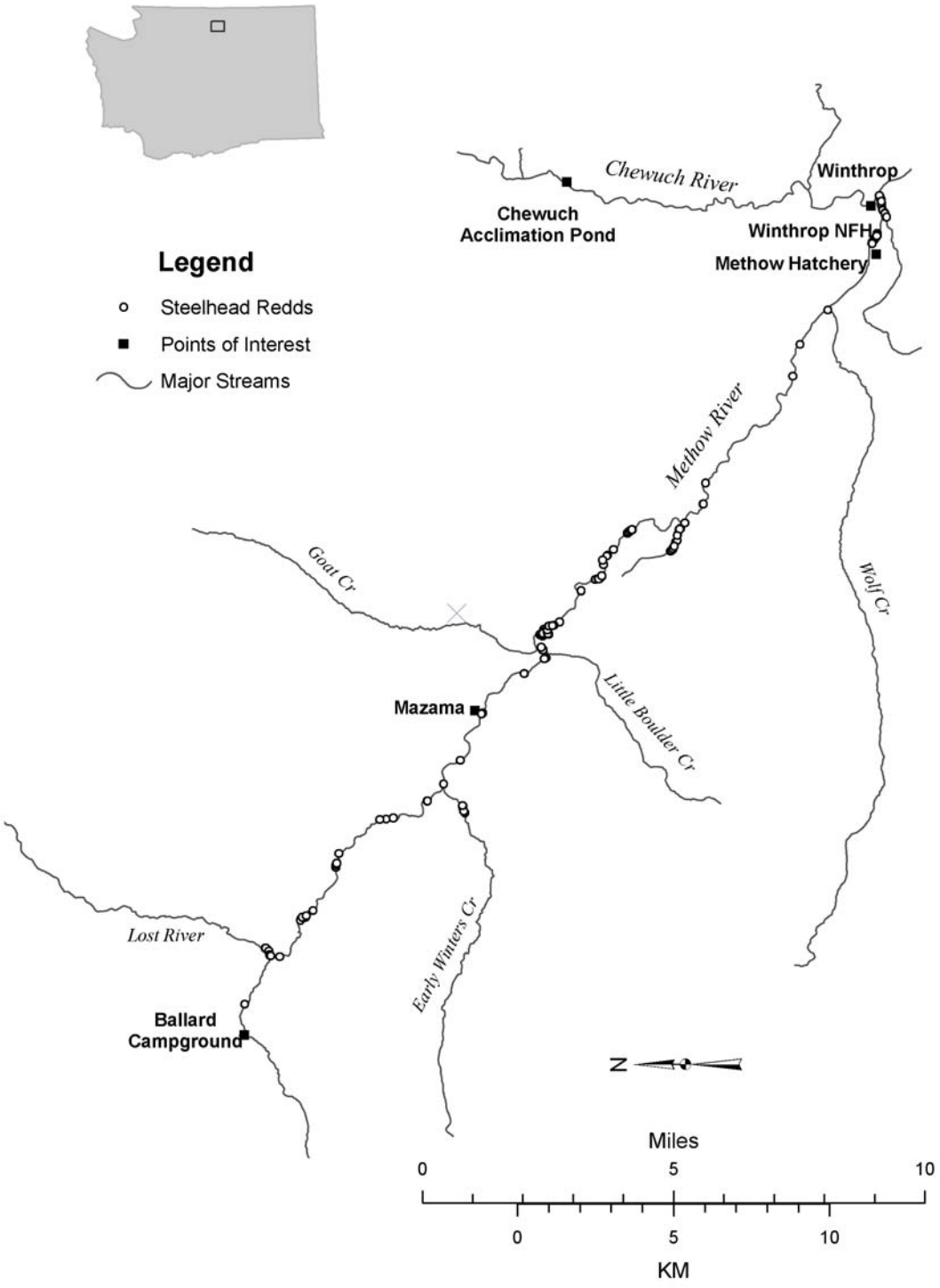


Figure 4. Spatial distribution of steelhead redds in the upper Methow River subbasin based on GPS waypoints collected during 2007 surveys.

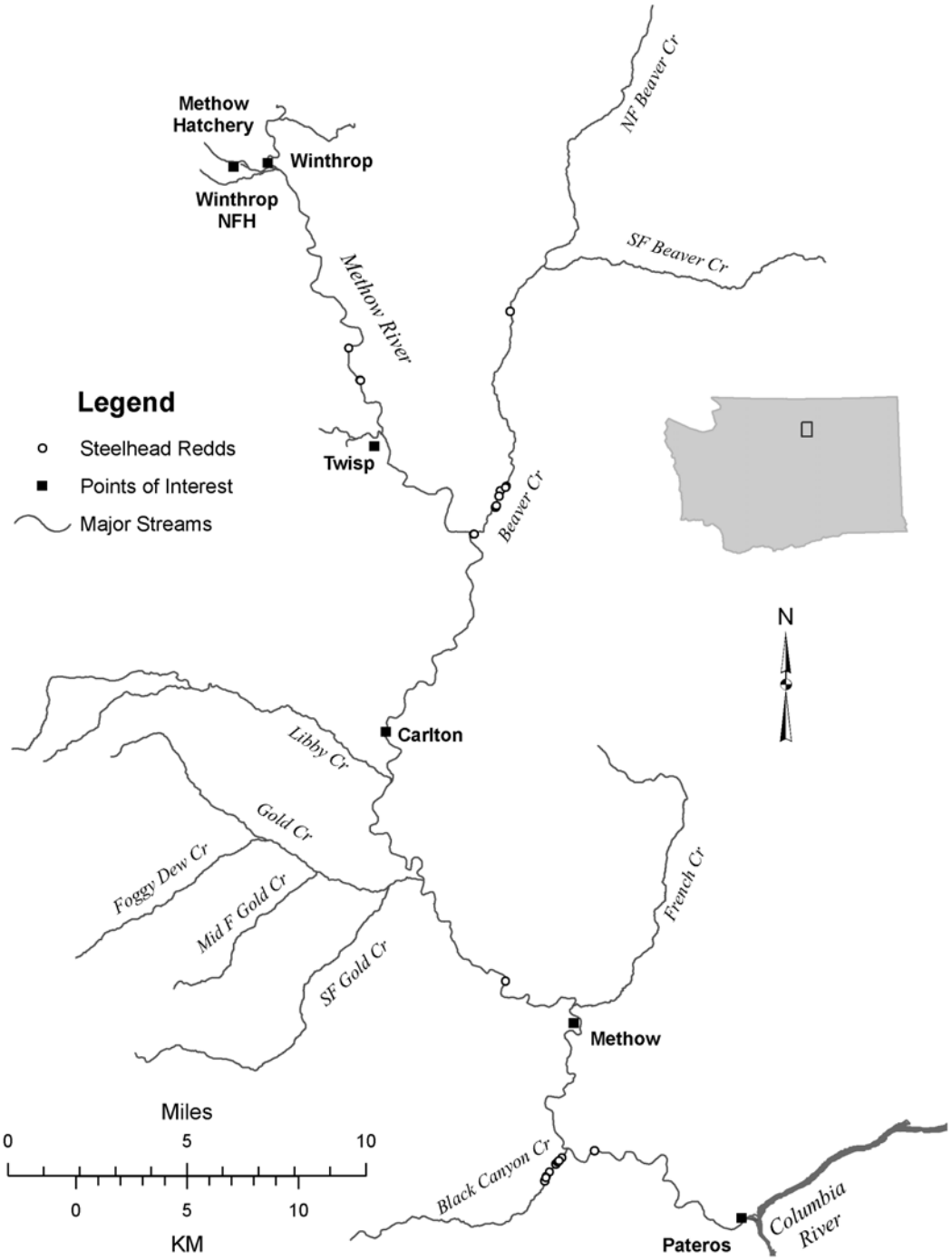


Figure 5. Spatial distribution of steelhead redds in the lower Methow River subbasin based on GPS waypoints collected during 2007 surveys.

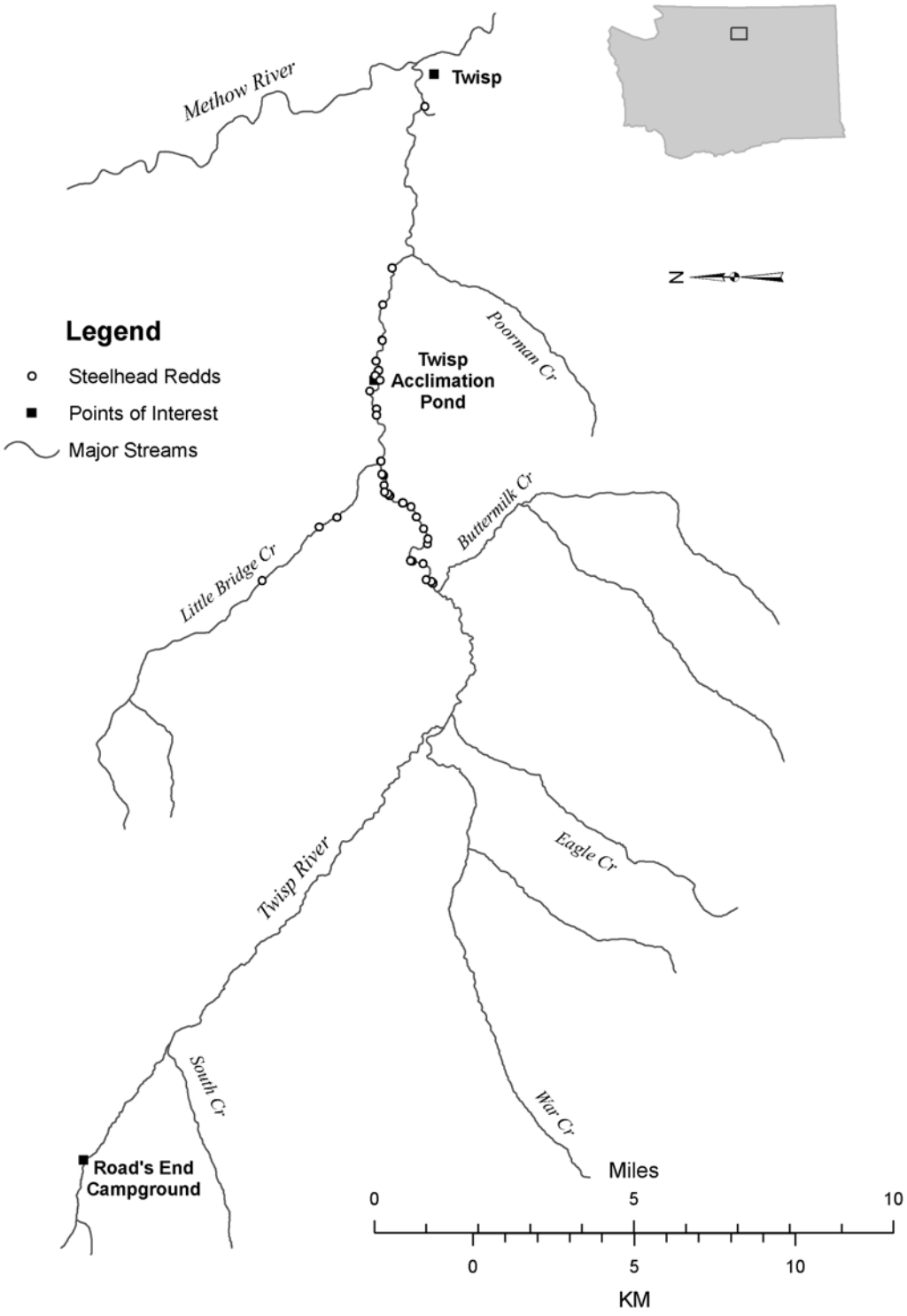


Figure 6. Spatial distribution of steelhead redds in the Twisp River subbasin based on GPS waypoints collected during 2007 surveys.

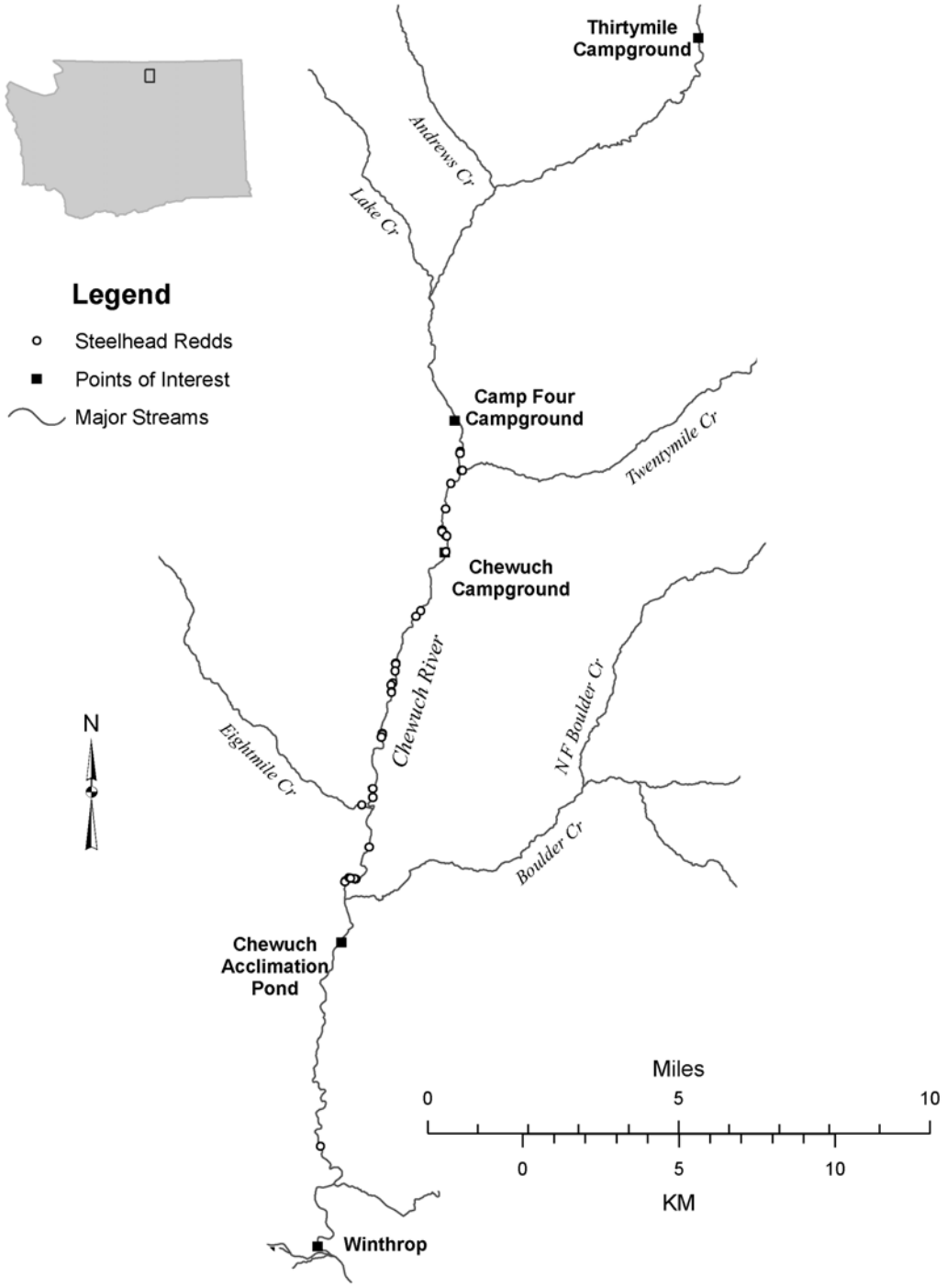


Figure 7. Spatial distribution of steelhead redds in the Chewuch River subbasin based on GPS waypoints collected during 2007 surveys.

Table 10. Upper Methow River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed).

Stream reach	Code	Length (km)	2005	2006	2007	
					Expand rate	Redds
Upper Methow River mainstem						
Ballard CG - Lost R.	M15	4.0	17	3	0.64	2
Lost R. - Gate Cr.	M14	4.8	51	0	0.64	19
Gate Cr. - Early Winters Cr.	M13	4.2	60	15	0.64	11
Early Winters Cr. - Mazama Br.	M12	3.2	43	3	0.64	5
Mazama Br. - Susp. Br.	M11	4.0	25	9	index	24
Susp. Br. - Weeman Br.	M10	5.3	52	26	index	56
Weeman Br. - Along Hwy 20	M9	9.0	180	30	0.07	14
Along Highway 20 - Wolf Cr.	M8	2.2	9	0	0.92	1
Wolf Cr. - Foghorn Dam	M7	1.8	9	5	0.92	0
Foghorn Dam - Winthrop Br.	M6	2.7	34	0	0.92	0
Upper Methow River total		41.2	480	91		132
Upper Methow River tributaries						
Suspension Creek (Entire length)	SP1	0.3	37	31	none	49
Little Suspension Creek (Entire length)	LSP1	0.3	ns	ns	none	29
Methow Hatchery Outfall (Entire length)	MH1	0.4	15	14	none	25
Winthrop NFH Outfall (Entire length)	WN1	1.0	83	29	none	68
RP-Wolf Creek (Rd 5505 access - footbridge)	W2	1.9	0	0	none	ns
RP-Wolf Creek (footbridge - Conf.)	W1	0.5	0	0	none[a]	1
RP-Little Boulder Creek (Hwy 20 - Conf.)	LBO1	0.2	3	0	none[a]	0
RP-Goat Creek (FR 52 Br. - Conf.)	GT1	2.2	4	0	none[a]	0
RP-Hancock Creek (Kumm Rd. - Wolf Cr. Rd.)	HA2	0.9	NA	NA	index	21
RP-Hancock Creek (Wolf Cr. Rd. - Conf.)	HA1	0.2	0	0	index	2
Lost River (Sunset Cr. - Eureka Cr.)	L3	4.6	6	ns	none	ns
Lost River (Eureka Cr. - Lost River Br.)	L2	5.8	7	ns	none	ns
Lost River (Lost River Br. - Confluence)	L1	0.8	7	2	none	10
Early Winters (Klipchuck - Early Winters Br.)	EW5	1.4	0	ns	none	ns
Early Winters (Early Winters Br. - Hwy 20)	EW4	2.1	0	ns	none	ns
Early Winters (Highway 20 - Div. Dam)	EW3	2.9	6	ns	none	4
Early Winters (Div. Dam - Hwy 20 Br.)	EW2	0.3	0	3	none	2
Early Winters (Hwy 20 Br. - Conf.)	EW1	0.5	0	1	none	0
Upper Methow River tributary total		26.3	168	80		211

[a] No expansions performed due to differences in habitat availability between Hancock Creek and other Upper Methow subbasin rotating panel tributaries.

Table 11. Lower Methow River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed).

Stream reach	Code	Length (km)	2005	2006	2007	
					Expand rate	Redds
Lower Methow River mainstem						
Winthrop Br. - MVID Dam	M5	8.0	44	15	none	0
MVID Dam - Twisp Confluence	M4	7.2	50	0	none	4
Twisp Conf - Carlton	M3	21.1	123	44	none	0
Carlton - Upper Burma Bridge	M2	23.7	79	28	index	1
Upper Burma Bridge - Mouth	M1	20.1	67	10	none	2
Lower Methow River total		80.1	363	97		7
Lower Methow River tributaries						
Beaver Cr. (Lester Rd. Br. - Balky Hill Rd.)	BV3	5.0	2	ns	0.11	9
Beaver Creek (Balky Hill Rd. - Hwy 20)	BV2	5.8	14	ns	none	ns
Beaver Creek (Hwy 20 - Conf.)	BV1	3.4	39	21	index	9
RP-Gold Cr. Upper NF (11.4 rkm - Ranch)	GD-N4	6.4	22	15	5.6 r/km	36
RP-Gold Cr. Mid. NF (Ranch - N.F. Br.)	GD-N3	0.9	3	2	5.6 r/km	5
RP-Gold Cr. Mid. NF (N.F. Br. - Whisp. Pines)	GD-N2	1.1	16	3	5.6 r/km	6
RP-Gold Cr. Lower NF (Whisp. Pines - 2nd Br.)	GD-N1	1.0	15	2	5.6 r/km	6
RP-Gold Cr. SF (1st Br. - 1.7 rkm)	GD-S3	4.4	30	10	5.6 r/km	25
RP-Gold Cr. SF (1.7 rkm - 0.6 rkm)	GD-S2	1.1	8	3	5.6 r/km	6
RP-Gold Cr. SF (0.6 rkm - Conf.)	GD-S1	0.6	4	1	5.6 r/km	3
RP-Gold Cr. Mainstem (2nd Br. - Private Land)	GD-M2	0.9	12	2	5.6 r/km	5
RP-Gold Cr. Mainstem (Private Land - Conf.)	GD-M1	1.1	15	3	5.6 r/km	6
RP-Foggy Dew Creek (FR 200 - Conf.)	FD1	4.2	14	10	5.6 r/km	24
RP-Black Canyon Cr. (2nd Br. - 0.8 rkm)	BC2	1.0	7	2	index	5
RP-Black Canyon Cr. (0.8 rkm - Conf.)	BC1	0.8	6	2	index	5
RP-Libby Creek (Lower Public Land)	LB4	1.0	7	2	5.6 r/km	6
RP-Libby Creek (Low Pub Land - Realty Land)	LB3	1.1	8	2	5.6 r/km	6
RP-Libby Creek (Realty Land)	LB2	0.3	2	1	5.6 r/km	2
RP-Libby Creek (Realty Land - Conf.)	LB1	1.0	7	3	5.6 r/km	6
Lower Methow tributary total		41.1	231	84		170

Table 12. Twisp River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed).

Stream reach	Code	Length (km)	2005	2006	2007	
					Expand rate	Redds
Twisp River mainstem						
Road End CG. - South Cr. Br.	T10	4.6	9	ns	none	ns
South Cr. Br. - Poplar Flats CG.	T9	3.2	6	4	none	ns
Poplar Flats CG. - Mystery Br.	T8	3.2	17	29	none	ns
Mystery Br. - War Cr. Br.	T7	6.9	112	47	none	ns
War Cr. Br. - Buttermilk Br.	T6	7.4	78	70	none	ns
Buttermilk Br. - Little Br. Cr.	T5	5.9	87	130	index	60
Little Br. Cr. - Twisp Weir	T4	3.8	25	34	index	13
Twisp Weir - Upper Poorman Br.	T3	3.5	32	32	none	5
Upper to Lower Poorman Bridge	T2	5	29	18	none	ns
Lower Poorman Br. - Confluence	T1	2.9	20	5	none	ns
Twisp River total		46.4	415	369		78
Twisp River tributaries						
Little Br. Cr. (Vetch Cr. - Upper Br.)	LBC3	3	3	0	none	1
Little Bridge Cr. (Upp. Br. - Lower Br.)	LBC2	2.4	4	1	none	0
Little Bridge Cr. (Lower Br. - Conf.)	LBC1	2.4	20	3	none	2
MSRF pond outfall[1]	MSRF1	0.1	11	0	none	1
RP-War Creek (FR 4430 - Conf.)	WR1	1	2	3	0.0 r/km	0
RP-Eagle Creek (Trailhead - Conf.)	EA1	1.3	2	3	0.0 r/km	0
RP-Buttermilk Cr. (Fork - Cattle Grd.)	BM2	2.1	13	5	0.0 r/km	0
RP-Buttermilk Cr. (Cattle Grd. - Conf.)	BM1	2	13	5	0.0 r/km	0
RP-South Creek (Falls - Conf.)	SO1	0.6	1	2	index	0
Twisp River tributary total		14.9	69	22		4

[1]Methow Salmon Recovery Foundation pond outfall.

.

Table 13. Chewuch River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed).

Stream reach	Code	Length (km)	2005	2006	2007	
					Expand rate	Redds
Chewuch River mainstem						
Chewuch Falls - 30 Mi. Br.	C13	4.2	0	ns	none	ns
30 Mi. Br. - Road Side Camp	C12	4.6	0	ns	none	ns
Road Side Camp - Andrews Cr.	C11	4.3	0	ns	none	ns
Andrews Cr. - Lake Cr.	C10	4	0	ns	none	ns
Lake Cr. - Buck Cr.	C9	2.2	0	ns	none	ns
Buck Cr. - Camp 4	C8	2.4	0	ns	none	ns
Camp 4 - Chewuch CG.	C7	5.1	0	ns	0.91	16
Chewuch CG. - Falls Cr. CG.	C6	5.8	0	ns	0.91	21
Falls Cr. CG. - 8 Mile Cr.	C5	3.7	0	ns	0.91	7
8 Mile Cr. - Boulder Cr.	C4	3.7	20	2	index	19
Boulder Cr - Chewuch Br.	C3	1.8	0	ns	0.63	0
Chewuch Br. - WDFW Land	C2	7.5	0	ns	0.63	3
WDFW Land - Confluence	C1	5.1	0	ns	0.63	0
Chewuch River total		54.4	20	2		66
Chewuch River tributaries						
Eightmile Creek (300m abv. div. - Bridge)	EM2	0.3	28	4	none	0
Eightmile Creek (Bridge - Conf.)	EM1	0.5			index	1
RP-Boulder Creek (Falls - 1st Bridge)	BD2	0.8	5	6	5.0 r/km	4
RP-Boulder Creek (1st Bridge - Conf.)	BD1	0.8	2	1	5.0 r/km	4
RP-Lake Creek (Black Lk. - 1st Bridge)	LK2	10.1	0	44	5.0 r/km	51
RP-Lake Creek (1st Bridge – Conf.)	LK1	0.8	0	4	5.0 r/km	4
RP-Andrews Creek (L. And. Cr. – 1st Br.)	AN2	0.3	1	1	5.0 r/km	2
RP-Andrews Creek (1st Bridge - Conf.)	AN1	0.2	1	1	5.0 r/km	1
RP-Twentymile Creek (Falls - FR 5010)	TW2	0.9	1	4	index	0
RP-Twentymile Creek (FR 5010 - Conf.)	TW1	0.1			index	5
Chewuch River tributary total		14.8	38	65		72

Based on biological sampling of the 2007 broodstock, most hatchery origin steelhead were 1-salt fish (81.3%), while the majority of wild steelhead were 2-salt fish (52.3%). Most wild fish spent two or more years in freshwater prior to emigration (95.5%), while no hatchery fish (N = 394) exhibited more than a single-year freshwater scale pattern. Using expanded redd counts by tributary and the mean fecundity from Wells Hatchery broodstock by salt age and origin, an

estimated 3,697,238 eggs were deposited in the Methow Basin (Table 14). Overall mean fecundity of females was lower in 2007 because of the large proportion of 1-salt hatchery females. Estimated egg deposition decreased in the Twisp and Lower Methow subbasins compared to 2006 due to lower numbers of observed redds and the lower fecundity value used in the 2007 estimate. Poor survey conditions in many reaches (e.g., high flow, turbidity) likely resulted in underestimates of total redds per subbasin. Egg deposition within each subbasin should be considered a minimum value.

Table 14. Estimated 2007 spawning escapement and steelhead egg deposition in Methow Basin.

Subbasin	Expanded redds	Subbasin proportion	Estimated egg deposition			
			2004	2005	2006	2007
Upper Methow	343	46.4%	2,230,826	3,756,517	1,068,066	1,713,720
Chewuch	138	18.6%	364,026	336,231	418,482	689,485
Twisp	82	11.1%	1,194,752	2,805,792	2,442,186	409,694
Lower Methow	177	23.9%	877,396	3,443,472	1,130,526	884,339
Methow Basin	740	100.0%	4,667,000	10,342,012	5,059,260	3,697,238

Natural Replacement Rate (NRR) and Stray Rates

A total of 749 steelhead were sampled during 2007, of which, 52 were determined to be wild, resulting in an estimated 628 wild fish return to Wells Dam (6.9%; Table 15). The NRR of the steelhead population above Wells Dam was less than the value necessary to replace the parent population (i.e., 1.0) in each of the six brood years examined (Table 16). The NRR values for Methow Basin steelhead were calculated using run-escapement values from both spawners and recruits at Wells Dam and adjusted using radio telemetry data (English et al. 2001, 2003). Ideally, these calculations should use the actual number of fish that spawned and only those progeny that survived to spawn or were harvested. The HRR of hatchery steelhead was significantly greatly than the NRR for the brood years examined (Table 16; Mann-Whitney U-test: $P < 0.01$).

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	
2007	628	52	0.0828	0	308	280	40	628
2006	705	88	0.1248	8	208	433	56	705
2005	773	66	0.0854	12	351	410	0	773
2004	945	115	0.1216	16	732	189	8	945
2003	818	25	0.0306	0	0	720	98	818
2002	844	18	0.0214	47	281	422	94	844
2001	537	26	0.0484	21	413	103	0	537
2000	444	39	0.0880	34	239	148	23	444
1999	216	25	0.1163	9	69	138	0	216

Table 16. Run escapement and NRR of Methow Basin steelhead populations calculated from broodstock sampling at Wells Hatchery. Escapement values and recruits produced were derived from radio telemetry data (English et al. 2003).

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	563	1999	2000	2001	2002	315	0.56	14.3
1997	2,427	2000	2001	2002	2003	684	0.28	16.1
1998	2,396	2001	2002	2003	2004	730	0.30	39.0
1999	1,574	2002	2003	2004	2005	167	0.11	48.0
2000	2,114	2003	2004	2005	2006	848	0.40	6.6
2001	3,709	2004	2005	2006	2007	595	0.16	40.5

Discussion

Non-supplemented spatial references are necessary to determine if supplementation has benefited target populations, but non-supplemented reference streams for Methow and Okanogan steelhead populations have not been identified. The lack of spatial reference populations or a suitable alternative has been identified as a data gap.

Analyses of differences in spawn timing between hatchery and wild steelhead are still reliant on data collected from Wells Hatchery broodstock. It is unlikely that this data reflects differences in spawn timing in the natural environment because many wild fish at the hatchery are injected with hormones to increase maturation rate, and all broodstock are held on well water, and therefore do not experience natural temperature fluctuations that may affect maturation. Pending successful

construction of the Twisp River weir, spawning ground surveys in 2009 will attempt to document spawn timing and redd distribution of hatchery and wild steelhead in the Twisp River.

The number of out-of-basin stray steelhead (e.g., Wenatchee basin fish) upstream of Wells Dam was estimated at 668 fish (2007 brood). The estimated number of stray fish in the 2006 brood spawning escapement above Wells dam was 520 hatchery fish. Although these fish were assigned to a basin for escapement purposes, the ultimate fate or spawning stream of these fish is unknown. Antenna arrays designed to detect PIT tags in returning adult salmonids are scheduled for installation in the Methow and Twisp Rivers in 2008. These arrays will assist in determining the ultimate fate of stray fish passing Wells Dam. The ability to detect Wells Hatchery steelhead straying into 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, though 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 be uniquely marked by release location (i.e., elastomer or PIT tagged).

The 2007 total redd count in the Methow River Basin was adversely affected by flooding in several subbasins, thus the estimated spawning escapement was likely underestimated. Access in the Chewuch and Twisp subbasins was limited early in the year because of high snow levels, and surveys on the Twisp River were limited because of high flow and turbidity. Surveys of some river sections in mid-June did not detect any redds, suggesting that the high flows erased evidence of all previous spawning activity. Chewuch River steelhead production has been underestimated for a number of years due to prolonged post-wildfire effects (i.e., increased runoff, sedimentation, turbidity). Total redd counts from the Chewuch River were higher in 2007 than the previous two years because surveyors were able to conduct multiple surveys before stream flows increased.

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. Methods need to be developed to annually estimate the number of hatchery and wild steelhead that spawn (spawning escapement) in the Methow and Okanogan rivers. The installation of PIT tag antenna arrays in the Methow River may provide the ability to estimate basin-specific escapement of hatchery and wild fish.

Given extreme differences in habitat conditions between the Methow and Okanogan basins, determining the number of wild and hatchery steelhead returning to each population on an annual basis 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 for 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.

References

Arterburn, J., K. Kistler, C. Fisher, and M. Rayton. 2007. Okanogan Basin spring spawner report for 2007. 2007 annual report for Bonneville Power Administration project #200302200. Colville Confederated Tribes Fish and Wildlife Department. Omak, Washington.

English, K. K., C. Sliwinski, B. Nass, and J. Stevenson. 2001. Assessment of adult steelhead migration through the Mid-Columbia River using radio-telemetry techniques, 1999-2000. Report prepared for Public Utility District No. 1 of Douglas County, Washington.

English, K. K., C. Sliwinski, B. Nass, and J. Stevenson. 2003. Assessment of adult steelhead migration through the Mid-Columbia River using radio-telemetry techniques, 2001-2002. Report prepared for Public Utility District No. 1 of Douglas County, Washington.

Jateff, B. 2007. Memo dated 21 March 2007 from Bob Jateff, WDFW, to Kris Petersen, National Oceanic and Atmospheric Administration Salmon Recovery Division.

LFA 2000. Salmon, steelhead and bull trout habitat limiting factors. Washington State Conservation Commission (SCC). Olympia, Washington.

Wells HCP Hatchery Committee (HC). 2005. Conceptual approach to monitoring and evaluation for hatchery programs funded by Douglas County Public Utility District. Douglas PUD HCP HC, East Wenatchee, WA.

Appendix A1. Upper Methow River subbasin steelhead redd counts by section and survey year. Section descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006	2007
			Upper Methow River				
Ballard CG. - Lost R.	M15	ns	15	27	17	3	2
Lost R. - Gate Cr.	M14	ns		10	51	0	19
Gate Cr. - Early Winters Cr.	M13	ns	215[a]	23	60	15	11
Early Winters Cr. - Mazama Br.	M12	ns		0	43	3	5
Mazama Br. - Susp. Br.	M11	70	44[a]	12	25	9	24
Susp. Br. - Weeman Br.	M10	156		8	52	26	56
Weeman Br. - Along Hwy 20	M9	ns		93	180	30	14
Along Highway 20 - Wolf Cr.	M8	ns	325[a]	0	9	0	1
Wolf Cr. - Foghorn Dam	M7	ns		0	9	5	0
Foghorn Dam - Winthrop Br.	M6	ns		0	34	0	0
Upper Methow River total		226	599	173	480	91	132
			Lost River				
Sunset Cr. - Eureka Cr.	L3	ns	ns	17	6	ns	ns
Eureka Cr. - Lost River Br.	L2	10	25	11	7	ns	ns
Lost River Br. - Confluence	L1	1	0	3	7	2	10
			Early Winters Creek				
Klipchuck CG. - Early Winters Br.	EW5	ns	ns	0	0	ns	ns
Early Winters Br. - Highway 20 Br.	EW4	ns	ns	0	0	ns	ns
Highway 20 Br. - Diversion Dam	EW3	ns	ns	23	6	ns	4
Diversion Dam - Hwy 20 Br.	EW2	ns	ns	0	0	3	2
Hwy 20 Br. - Confluence	EW1	ns	ns	1	0	1	0
			Methow River tributaries				
Suspension Creek	SP1	ns	ns	43	37	31	49
Little Suspension Creek	LSP1	ns	ns	ns[b]	ns[b]	ns[b]	29
MH Outfall	MH1	15	ns	18	15	14	25
WNFH Outfall	WN1	171	61	113	83	29	68
Hancock Cr. - Kumm Rd. to Wolf Cr. Rd.	HA2	ns	ns	ns	ns	ns	21
Hancock Cr. - Wolf Cr. Rd. to Conf.	HA1	ns	ns	3	0	0	2
Wolf Creek	W2	ns	ns	29	0	0	ns
Wolf Creek	W1	ns	ns	8	0	0	1
Little Boulder Creek	LBO1	ns	ns	3	3	0	0
Goat Creek	GT1	ns	ns	33	4	0	0
Upper Methow River subbasin total		423	685	478	648	171	343

[a] Reaches M12-M14, M10 and M11, and M6-M9 were combined in 2003.
[b] Unsuitable habitat 2004 to 2006.
ns = not surveyed.

Appendix A2. Lower Methow River subbasin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006	2007
			Lower Methow River				
Winthrop Br. - MVID Dam	M5	ns	89[a]	14	44	15	0
MVID - Twisp Confluence	M4	ns		24	50	0	4
Twisp Confluence - Carlton	M3	ns	69	38	123	44	0
Carlton - Upper Burma Bridge	M2	ns	99	33	79	28	1
Upper Burma Bridge - Mouth	M1	ns	58	42	67	10	2
Lower Methow River total		ns	315	151	363	97	7
			Beaver Creek				
Lester Rd Br. - Balky Hill Rd	BV3	ns	ns	16[b]	2	ns	9[c]
Balky Hill Rd - Hwy 20	BV2	ns	ns		14	ns	ns
Hwy 20 - confluence	BV1	70	15	21	39	21	9
			Lower Methow River tributaries				
Gold Cr. Upper North Fork	GD-N4	ns	ns	0	22	15	36
Gold Cr. Upper North Fork	GD-N3	ns	ns	0	3	2	5
Gold Cr. Upper North Fork	GD-N2	ns	ns	0	16	3	6
Gold Cr. Lower North Fork	GD-N1	ns	ns	0	15	2	6
Gold Cr. South Fork	GD-S3	ns	ns	0	30	10	25
Gold Cr. South Fork	GD-S2	ns	ns	0	8	3	6
Gold Cr. South Fork	GD-S1	ns	ns	0	4	1	3
Gold Cr. - Mainstem Index	GD-M2	ns	ns	0	12	2	5
Gold Cr. - Mainstem Index	GD-M1	ns	2	0	15	3	6
Foggy Dew Creek	FD1	ns	ns	0	14	10	24
Black Canyon Creek	BC2	ns	ns	0	7	2	5
Black Canyon Creek	BC1	ns	ns	0	6	2	5
Libby Creek	LB4	ns	ns	0	7	2	6
Libby Creek	LB3	ns	ns	0	8	2	6
Libby Creek	LB2	ns	ns	0	2	1	2
Libby Creek	LB1	ns	ns	0	7	3	6
Lower Methow River subbasin total		70	332	188	594	181	177

[a] Reaches M5 and M4 were combined in 2003.
[b] Reaches BV2 and BV3 were combined in 2004.
[c] Partial survey.
ns = not surveyed.

Appendix A3. Twisp River subbasin steelhead redd counts by section and survey year. Section descriptions in bold indicate rotating panel tributaries.

River/section	Code	2001	2002	2003	2004	2005	2006	2007
			Twisp River					
Road End CG. - South Cr. Br.	T10	ns	ns	33	15	9	ns	ns[b]
South Cr. Br. - Poplar Flats CG.	T9	ns	ns	5	9	6	4	ns[b]
Poplar Flats CG. - Mystery Br.	T8	ns	ns	17	2	17	29	ns[b]
Mystery Br. - War Cr. Br.	T7	2	ns	36	88	112	47	ns[b]
War Cr. Br. - Buttermilk Br.	T6	40	ns	91	9	78	70	ns[b]
Buttermilk Br. - Little Br. Cr.	T5	47	156	322[a]	22	87	130	60
Little Br. Cr. - Twisp Weir	T4	100	194		94	25	34	13
Twisp Weir - Upper Poorman Br.	T3	48	ns	88	3	32	32	5
Up. P'man Br. - Low. P'man Br.	T2	46	ns	14	1	29	18	ns[b]
Lower Poorman Br. - Confluence	T1	29	ns	90	0	20	5	ns[b]
Twisp River total		312	350	696	243	415	369	78
			Twisp River tributaries					
Little Bridge Cr.	LBC3	ns	ns	ns	ns	3	0	1
Little Bridge Cr.	LBC2	ns	ns	ns	ns	4	1	0
Little Bridge Cr.	LBC1	ns	ns	ns	11	20	3	2
MSRF pond outfall	MSRF1	ns	ns	ns	2	11	0	1
War Creek	WR1	ns	0	0	0	2	0	0
Eagle Creek	EA1	ns	ns	ns	0	2	3	0
Buttermilk Creek	BM2	ns	ns	ns	0	13	5	0
Buttermilk Creek	BM1	ns	4	0	0	13	5	0
South Creek	SO1	ns	ns	ns	0	1	2	0
Twisp River subbasin total		312	354	696	256	484	388	82

[a] Reaches T4 and T5 were combined in 2003.
[b] Not surveyed due to prolonged high flow.
ns = not surveyed.

Appendix A4. Chewuch River subbasin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries.

River/section	Code	2002	2003	2004	2005	2006	2007
			Chewuch River				
Chewuch Falls - 30 Mi. Br.	C13	ns	ns	0	0	ns	ns
30 Mi. Br. - Road Side Camp	C12	ns	14	3	0	ns	ns
Road Side Camp - Andrews Cr.	C11	ns	3	8	0	ns	ns
Andrews Cr. - Lake Cr.	C10	ns	8	23	0	ns	ns
Lake Cr. - Buck Cr.	C9	ns	9	0	0	ns	ns
Buck Cr. - Camp 4	C8	ns	3	3	0	ns	ns
Camp 4 - Chewuch CG.	C7	ns	6	10	0	ns	16
Chewuch CG. - Falls Cr. CG.	C6	ns	26	3	0	ns	21
Falls Cr. CG. - 8 Mile Cr.	C5	ns	44	8	0	ns	7
8 Mile Cr. - Boulder Cr.	C4	105	134	5	20	2	19
Boulder Cr. - Chewuch Br.	C3	ns	0	0	0	ns	0
Chewuch Br. - WDFW Land	C2	ns	35	8	0	ns	3
WDFW Land - Confluence	C1	ns	3	3	0	ns	0
Chewuch River total		105	285	74	20	2	66
			Chewuch River tributaries				
Eightmile Creek	EM2	5[a]	20[a]	0	11	0	0
Eightmile Creek	EM1			1	17	4	1
Boulder Creek	BD2	ns	0	0	5	6	4
Boulder Creek	BD1	4	0	0	2	1	4
Lake Creek	LK2	ns	ns	0	0	44	51
Lake Creek	LK1	1	1	0	0	4	4
Andrews Creek	AN2	ns	ns	0	1	1	2
Andrews Creek	AN1	ns	ns	0	1	1	1
Twenty mile Creek	TW2	ns	ns	0[b]	1[b]	4[b]	0
Twenty mile Creek	TW1	ns	ns				5
Chewuch River subbasin total		115	306	78	58	67	138

[a] Reaches EM2 and EM1 combined 2002 and 2003.
[b] Reaches TW2 and TW1 combined 2004 to 2006.
ns = not surveyed.

Chapter 5

Spring Chinook salmon Spawning Ground Surveys Conducted in the Methow River Basin in 2007

Abstract

The Methow River basin was divided into three subbasins (i.e., Methow River upstream of the Twisp River, Chewuch River, and Twisp River) to determine spring Chinook salmon spawning distribution and abundance. Index areas in each subbasin were used to compare the spawn timing of hatchery and wild spring Chinook salmon. Spawning ground surveys were performed on foot between 1 August and 27 September. We estimated a total of 307 redds were constructed in the Methow River basin in 2007. The Methow River subbasin, which includes the Lost River, Early Winters Creek, and both hatchery outfalls had the greatest number of redds (N = 198). The Twisp River (N = 30) had the lowest redd count compared to the Chewuch River (N = 79) and mainstem Methow River (N = 174). Peak spawning occurred between 27 August and 8 September in the index area of all three subbasins. An estimated 2,131 spring Chinook salmon migrated past Wells Dam in 2007, but dam fallback, poaching, and pre-spawn mortality were not estimated. Significant differences in migration timing to Wells Dam were present among, but not within, age-classes. Based on male-to-female ratios at Wells Dam (2.5:1), an estimated 1,075 fish spawned in the Methow River basin. After removing fish collected for hatchery broodstock (N = 626), and fish bound for the Okanogan River (N =178), the estimated spawning population represents only 81.0% of the estimated run escapement. The estimated overall spawning population in 2007 was composed primarily of hatchery origin fish (75.3%). However, differences in the estimated proportion of wild fish were evident among subbasins, with the Twisp and Chewuch Rivers having greater proportions of wild fish (38.1% and 26.7%, respectively) than the Methow River and tributaries (21.9%).

There were no significant differences in spawn timing between hatchery and wild fish (females) within or among subbasins. No significant differences were detected in the distribution of hatchery and wild carcasses (females) within each subbasin. For the most recent brood year with complete recovery data (i.e., 2001 brood), the natural replacement rate (NRR) was highest in the Twisp River subbasin (0.15 recruits per spawner). The geometric mean NRR for brood years 1992 to 2000 was less than 1.0 in each subbasin. No significant differences were detected between the NRR and HRR within any subbasin. However, when evaluating MetComp or Methow basin HRR values with corresponding NRR values, the HRR was greater than NRR. Of the expanded coded-wire-tagged hatchery fish recovered on Methow Basin spawning grounds in 2007 (N = 639), 21.9% were classified as strays from Methow Hatchery and 18.3% were stray fish from other basins. Greater than 5% of the 2001 brood spring Chinook released in the Twisp and Chewuch rivers strayed to non-target spawning areas. Less than 5% of the 2001 brood Methow River spring Chinook strayed into non-target spawning areas. Methow Hatchery stocks comprised significantly less than 10% of the estimated spawning escapement into non-target subbasins, with the exception of Chewuch-release fish straying into the Methow subbasin. Methow Hatchery stocks have comprised less than 5% of the estimated spawning escapement in the Entiat River between run years 1997 to 2006.

Introduction

Spring Chinook salmon spawning ground surveys were used to evaluate spawn timing, distribution, spawner demographics, and tributary specific spawning escapement estimates within the Methow River basin. Spring Chinook salmon propagated at Methow Fish Hatchery (MH) are used to supplement natural spawning populations in the Methow, Twisp, and Chewuch river subbasins. Hence, returning hatchery adults should have similar migration timing, spawn timing, and redd distributions to that of naturally produced fish. Most spring Chinook salmon reared at MH were marked with unique coded wire tags (CWTs) based on their subbasin of release. In some cases, individual families, progeny from adults with elevated ELISA values, or juveniles released as subyearling parr were also marked with unique CWT codes. Recovery of CWTs from spawning ground surveys provides 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 spring Chinook salmon stocks and data are directly comparable.

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 examine hypotheses regarding supplementation programs in the Methow Basin. This chapter addresses elements of the M&E Plan related to spring Chinook salmon spawning ground surveys in 2007 and data was collected that specifically addresses the following 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 if the change in the natural replacement rate (NRR) of the supplemented population is similar to that of the non-supplemented population.

- Ho: Number of hatchery fish that spawn naturally ≥ number of naturally and hatchery produced fish taken for broodstock
- Ho: Δ NOR/Max recruitment $_{\text{Supplemented population}} \geq \Delta$ NOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$

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.

- Ho: Migration timing $_{\text{Hatchery age X}}$ = Migration timing $_{\text{Naturally produced age X}}$
- 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 HRR expected value based on survival rates listed in the BAMP (1998).

- Ho: $HRR_{Year\ x} \geq NRR_{Year\ x}$
- Ho: HRR $\geq$ BAMP value (preferred)

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

- Ho: Stray rate $_{Hatchery\ fish} \leq$ 5% of total brood return
- Ho: Stray hatchery fish $\leq$ 5% of spawning escapement (based on run year) within other independent populations
- Ho: Stray hatchery fish $\leq$ 10% of spawning escapement (based on run year) of any non-target streams within independent populations

Methods

Migration Timing and Run Composition

Adult spring Chinook salmon were trapped and sampled at Wells Dam every third day between 4 May and 30 June 2007 to assess migration timing, origin composition, and to collect broodstock for MH. All trapped fish were sampled for hatchery marks (i.e., CWT, adipose fin-clip), and hatchery fish originating from the Okanogan Basin (i.e., left ventral fin-clip and left ventral + adipose fin-clip) were released without further sampling. All potential wild and CWT-only (CWTO) fish trapped were tissue sampled for DNA analysis and retained for MH broodstock. Age-3 male Chinook salmon were retained as necessary to maintain the 1:1 male to female ratio outlined in broodstock collection protocols (Truscott 2007). Fish not retained for hatchery broodstock were tagged in the dorsal sinus on the left side of the body with passive integrated transponder (PIT) tags to assess sex ratio of the 2007 brood and to examine the influence of size on carcass recovery rates. Released fish were also sampled for length and scales were collected to determine age. Adipose fin-clipped fish that were exposed to anesthetic (i.e., MS-222) were marked with an anchor tag near the dorsal fin to allow exclusion from consumptive fisheries. Gender was estimated using secondary sexual characteristics (e.g., snout elongation, body depth). All trapped fish were either transported to MH as broodstock, or were released into the Columbia River upstream of Wells Dam.

We reviewed videotape records of fish passage at Wells Dam between June 10 and July 2 for both east and west ladders to exclude summer Chinook salmon from the spring Chinook salmon count and vise versa. Summer Chinook salmon were distinguished from spring Chinook salmon based on body color and shape. No estimates of prespawn 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 subbasins, Methow River (upstream of the Twisp River), Chewuch River, and Twisp River. Index areas of annual spawning activity

were established within each subbasin, based on historic survey information, to estimate spawn timing of hatchery and wild fish. Spring Chinook salmon redds were individually flagged, with survey date, redd number, and instream location on each flag. Each location was also recorded with hand-held global positioning system (GPS) devices for subsequent mapping and analysis. All mainstem reaches were surveyed each week during the spawning season (August and September). Dewatered redds were quantified in areas where stream flow went subsurface following the completion of spawning.

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 from selected fish (e.g., wild, local hatchery fish) for genetic analyses. Carcass locations were recorded using hand-held GPS devices and all carcasses were sampled for CWTs using hand-held electronic detection wands. Tails from all sampled carcasses were removed to prevent repeat sampling. Regardless of CWT presence, all snouts were collected and re-scanned with a V-detector to verify field detection. Most spring Chinook salmon released from Methow Basin 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 determination. Fish age was determined either through CWT or scale analysis. Scale analysis was also used to confirm origin for fish with no hatchery mark (i.e., no CWT, intact adipose fin).

Egg retention was determined for female carcasses with an intact abdomen by counting the number of eggs present. The percent of eggs retained was determined by dividing the number of eggs counted by the mean fecundity by specific age and origin derived from hatchery broodstock (C. Snow, WDFW unpublished data). Female carcasses with intact abdominal cavities, a large number of eggs, and no external signs of spawning (i.e., eroded caudal fin) were categorized as prespawn mortalities. Estimated egg deposition was calculated using mean fecundities from Methow Hatchery broodstock (i.e., MetComp stock for the Methow and Chewuch subbasins, Twisp stock for the Twisp subbasin) adjusted for mean egg-retention rates.

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, and dividing the sum by the number of spawners (S) for that brood year calculated from expanded spawning-ground carcass surveys, as follows:

$$\text{NRR} = r_{i+1} + r_{i+2} + r_{i+3} + \ldots / S$$

Estimated spawning escapement was derived from redd counts expanded by fish-per-redd values. Prior to 2006, fish-per-redd values were calculated from Wells Dam counts and adjusted for the

proportion of jacks (age-3 fish) in the run (Meekin 1967). In 2006 and 2007, fish-per-redd values were calculated using the male-to-female sex ratio from run-at-large sampling at Wells Dam. Recruits were expanded to account for non-selective fishery harvest and indirect mortality attributed to selective fisheries.

Stray Rates

The composition of hatchery origin fish on spawning grounds was determined by expanding all CWT recoveries by the tag rate for each tag code and the reach-specific sampling rates from spawning ground surveys. Hatchery fish were assigned to one of five categories depending on release and recovery location (local, within-basin, Winthrop releases, out-of-basin, or unknown hatchery). Local fish were composed of Methow Hatchery fish recovered in the stream, or subbasin from which they were released. Within-basin strays were all fish released within the Methow River basin recovered in a stream or subbasin in the Methow River basin from which they were not released. Fish released from Winthrop National Fish Hatchery (WNFH) are expected to return to the Methow River. Out-of-basin strays included 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 (e.g., ad-clip only, no mark, lost tag).

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). Datasets were tested for normality using Shapiro-Wilk's *W*-tests. Nonparametric tests were used when datasets could not be normalized through transformations. Differences in migration timing among age classes of hatchery and wild fish were tested using Kruskal-Wallis analysis of variance (KW ANOVA). Post-hoc multiple comparisons were made for all run-timing groups. Female carcass locations (river kilometers [rkm]) were used as surrogates for redd distribution because most hatchery fish lack externally visible marks, thus confounding the ability to determine origin of actively spawning fish. Subbasin redd distribution was tested using two-sample t-tests adjusting for separate variance estimates if necessary. Spawning ground recoveries were low in 2007, so female carcasses from multiple reaches adjacent to index reaches were used to assess spawn timing. Differences in spawn timing between hatchery and wild females by subbasin were tested using KW ANOVA. Stray rates were tested using one-sample t-tests using transformed data (i.e., arcsine square root). Comparisons of NRR and HRR by subbasin were tested using a Mann-Whitney U-test. All statistical tests were performed at a significance level of 0.05 (i.e., a 5% chance of erroneously rejecting a null hypothesis).

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 2007 spring Chinook salmon migration to Wells Dam was monitored between 4 May and 30 June. During this period, the majority of fish migrated between 15 May and 19 June (Figure 1). Differences in migration timing were present between, but not within age classes (KW ANOVA: $P < 0.01$; Figure 2). Hatchery three year olds migrated to Wells Dam later than hatchery four and five year olds as well as wild five year olds ($P < 0.01$; see Figure 2).

The spring Chinook salmon 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 73.8% accurate for female Chinook salmon and 86.8% accurate for male fish. After correction, the gender ratio of males (including jacks) to females of fish sampled at Wells Dam was 2.5 to 1.0, resulting in a fish-per-redd value of 3.5, assuming that females constructed a single redd and males spawned with a single female. After removing fish bound for the Okanogan River (N = 178), and fish collected for hatchery broodstock (N = 626), the estimated run escapement to the Methow River was 1,327 fish.

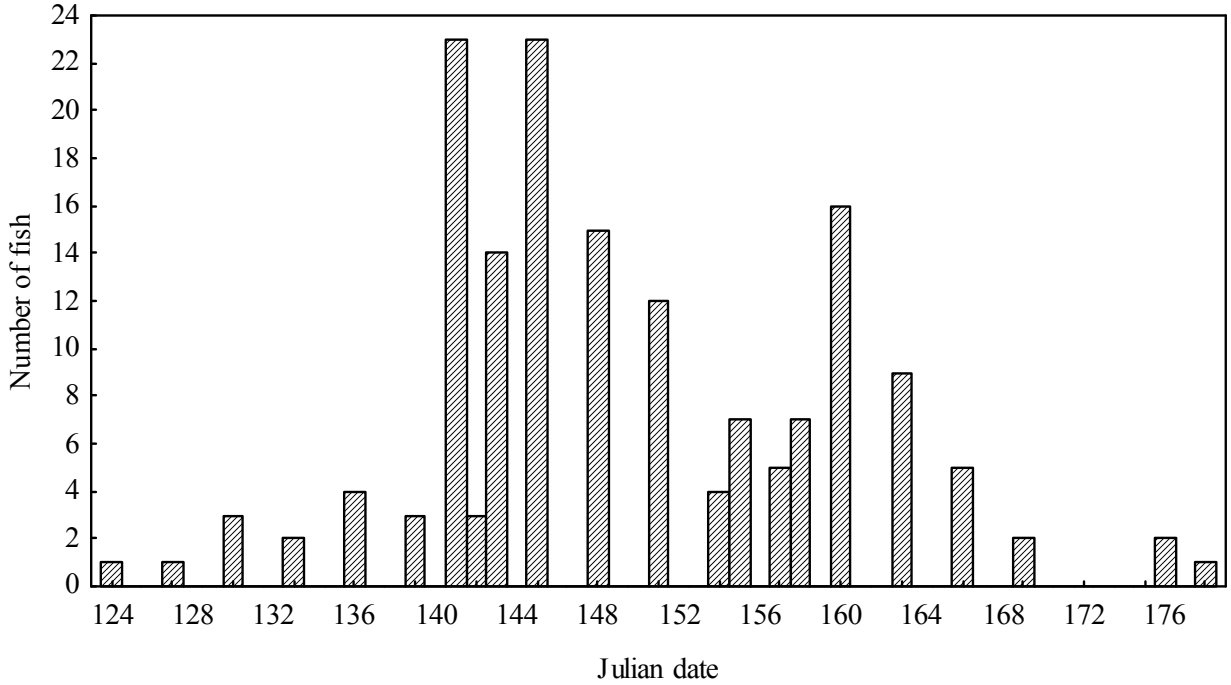


Figure 1. 2007 spring Chinook salmon migration timing to Wells Dam. All fish sampled during trapping operations are included.

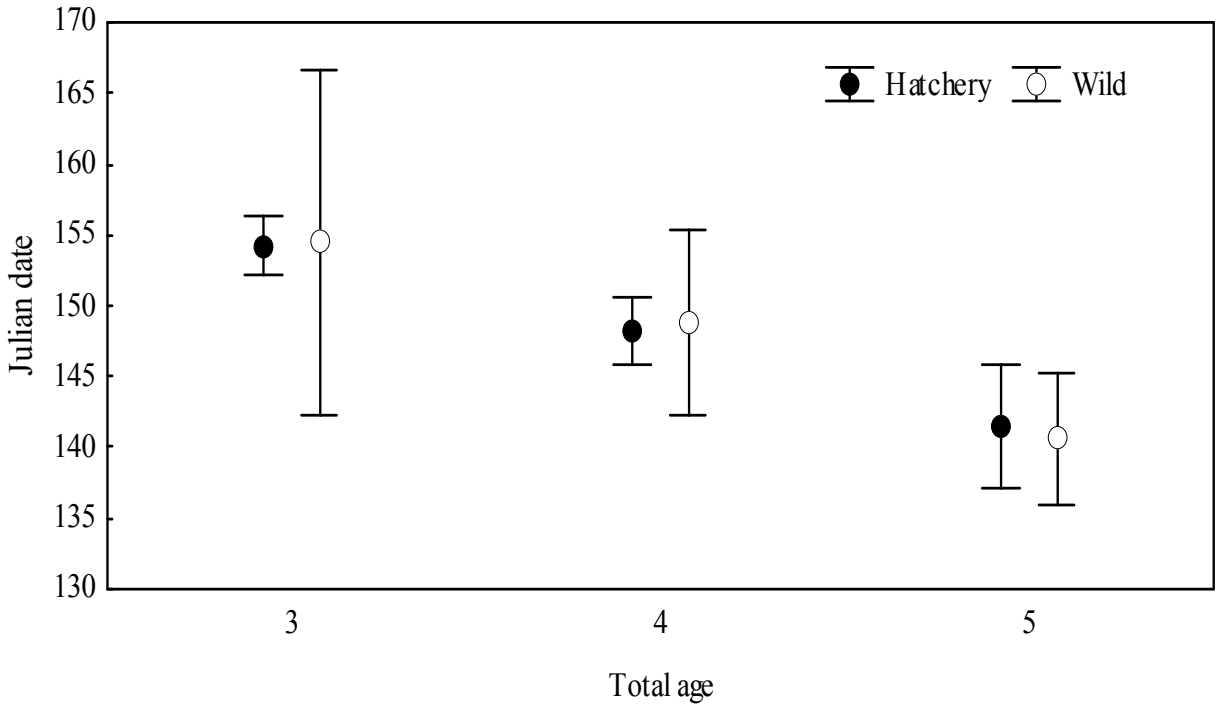


Figure 2. Mean migration timing (Julian date) to Wells Dam by age of wild- and hatchery origin spring Chinook salmon in 2007. Error bars represent 95% confidence intervals.

Table 1. Estimated 2007 spring Chinook salmon run composition above Wells Dam based on trapping every third day. Left-ventral fin-clip and left-ventral + ad-clip fish were from Okanogan River releases. Estimated run above Wells Dam includes fish collected for broodstock (*N* = 626).

Origin	Mark	Adults		Jacks		Total	
		%	*N*	%	*N*	%	*N*
Hatchery	Coded wire tag only	47.1	642	76.8	590	57.8	1,232
	Ad-clip only	10.4	142	7.5	58	9.3	199
	None	10.4	142	2.0	15	7.4	157
	Ad-clip + CWT	5.9	80	10.7	82	7.6	163
	Left-ventral + ad-clip	9.0	123	0.0	0	5.8	123
	Left-ventral fin-clip	4.0	55	0.0	0	2.6	55
Wild	None	13.2	179	3.0	23	9.5	202
Total		100.0	1,363	100.0	768	100.0	2,131

Redd Distribution and Spawn Timing

Spawning ground surveys were performed on foot between 1 August and 27 September. The majority of the redds (64.5 %; *N* = 198) were found in the Methow River subbasin (Table 2;

Figure 3). The greatest number of redds within that subbasin were found in the 9 km reach downstream of Weeman Bridge ($N = 84$). Only 24 redds were found in Methow River tributaries and no redds were found in Suspension Creek (Table 2). The Chewuch River subbasin had 79 redds (Table 3; Figure 4) and 30 redds were found in the Twisp subbasin (Table 4; Figure 5). The distribution of carcasses of wild females was not significantly different than hatchery females in the Methow (two-sample t-test adjusted for unequal variance, $P = 0.32$), Chewuch (two-sample t-test, $P = 0.60$), or Twisp (two-sample t-test, $P = 0.52$) subbasins (Figure 6).

Peak spawning occurred between 27 August and 8 September in index areas of all three subbasins. Recovery dates of female carcasses from M12-M9, C8-C6, and T6-T4 were used to assess spawn timing, and no differences in spawn timing (Julian date) between hatchery and wild fish were detected within or among subbasins (Figure 7; KW ANOVA: $P = 0.55$).

Table 2. 2007 spring Chinook salmon redd distribution, estimated spawning escapement, and carcass recoveries in the Methow River subbasin.

Reach	Redds		Estimated spawning escapement	Carcasses				
	Count	Subbasin proportion (%)		Recoveries			Expanded count	
				H	W	Total	H	W
Methow River								
M15	4	2.0	14	0	0	0	7	7
M14	12	6.1	42	6	6	12	21	21
M13	3	1.5	10	3	0	3	10	0
M12	13	6.6	45	4	4	9[a]	25	20
M11	15	7.6	53	12	6	18	35	18
M10	19	9.6	67	7	3	10	47	20
M9	84	42.4	294	46	1	49[a]	285	16
M8	2	1.0	7	7	2	9		
M7	10	5.0	35	10	0	10	76	1
M6	12	6.1	42	53	1	55[a]		
Total	174	87.9	609	148	23	175[a]	506	103
Lost River								
L3	0	0.0	0	0	0	0	0	0
L2	11	5.6	39	0	1	1	0	39
L1	0	0.0	0	0	0	0	0	0
Total	11	5.6	39	0	1	1	0	39
Early Winters Creek								
EW5	0	0.0	0	0	0	0	0	0
EW4	0	0.0	0	0	0	0	0	0
EW3	3	1.5	10	0	1	1	0	10
EW2	0	0.0	0	0	0	0	0	0
EW1	0	0.0	0	0	0	0	0	0
Total	3	1.5	10	0	1	1	0	10
Methow River tributaries								
MH1	7	3.5	25	6	0	6	25	0
SP1	0	0.0	0	0	0	0	0	0
WN1	3	1.5	10	5	0	5	10	0
Total	10	5.0	35	11	0	11	35	0
Grand total	198	100.0	693	159	25	188[a]	541	152

[a] Includes fish of unknown origin.

Table 3. 2007 spring Chinook salmon redd distribution, estimated spawning escapement, and carcass recoveries in the Chewuch River subbasin.

Reach	Redds		Estimated spawning escapement	Carcasses				
				Recoveries			Expanded count	
	Count	Subbasin proportion (%)		H	W	Total	H	W
C12	5	6.3	18	0	0	0	18	0
C11	1	1.3	3	1	0	1	3	0
C10	0	0.0	0	0	0	0	0	0
C9	0	0.0	0	0	0	0	0	0
C8	7	8.9	24	3	4	7	10	14
C7	9	11.4	32	3	4	7	14	18
C6	23	29.1	80	12	2	15[a]	69	11
C5	8	10.1	28	3	1	4	21	7
C4	9	11.4	32	7	2	9	25	7
C3	0	0.0	0	0	0	0	0	0
C2	13	16.4	46	4	2	6	31	15
C1	4	5.1	14	10	2	12	12	2
Total	79	100.0	277	43	17	61[a]	203	74

[a] Includes fish of unknown origin.

Table 4. 2007 spring Chinook salmon redd distribution, estimated spawning escapement, and carcass recoveries in the Twisp River subbasin.

Reach	Redds		Estimated spawning escapement	Carcasses				
				Recoveries			Expanded count	
	Count	Subbasin proportion (%)		H	W	Total	H	W
T10	0	0.0	0	0	0	0	0	0
T9	0	0.0	0	0	0	0	0	0
T8	0	0.0	0	0	0	0	0	0
T7	7	23.3	24	0	1	1	0	24
T6	14	46.7	49	7	2	9	38	11
T5	9	30.0	32	10	2	12		
T4	0	0.0	0	3	1	4		
T3	0	0.0	0	1	0	1	27	5
T2	0	0.0	0	0	0	0		
T1	0	0.0	0	1	0	1		
Total	30	100.0	105	22	6	28	65	40

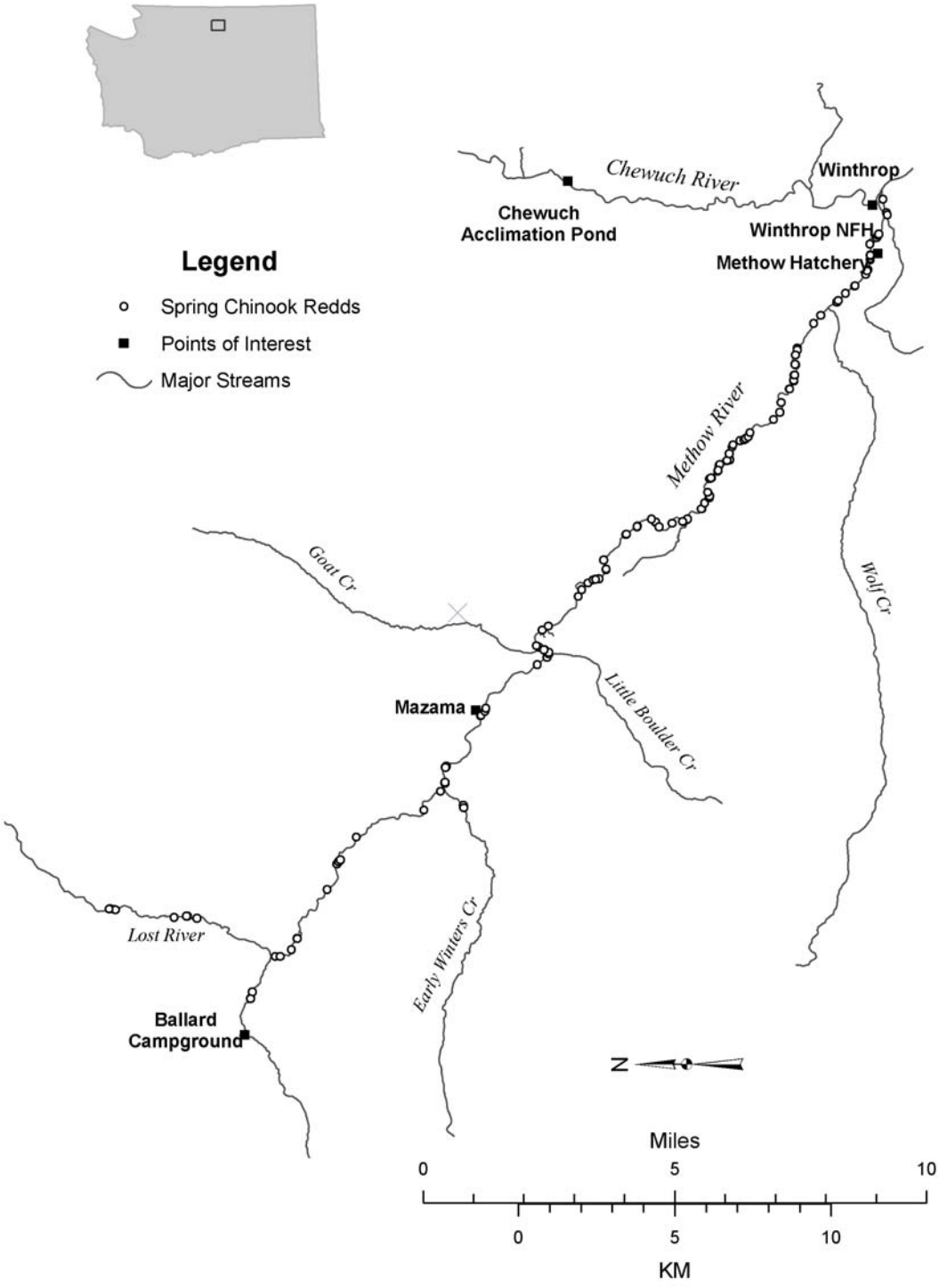


Figure 3. Spatial distribution of spring Chinook salmon redds in the Methow River subbasin based on GPS waypoints collected during 2007 surveys.

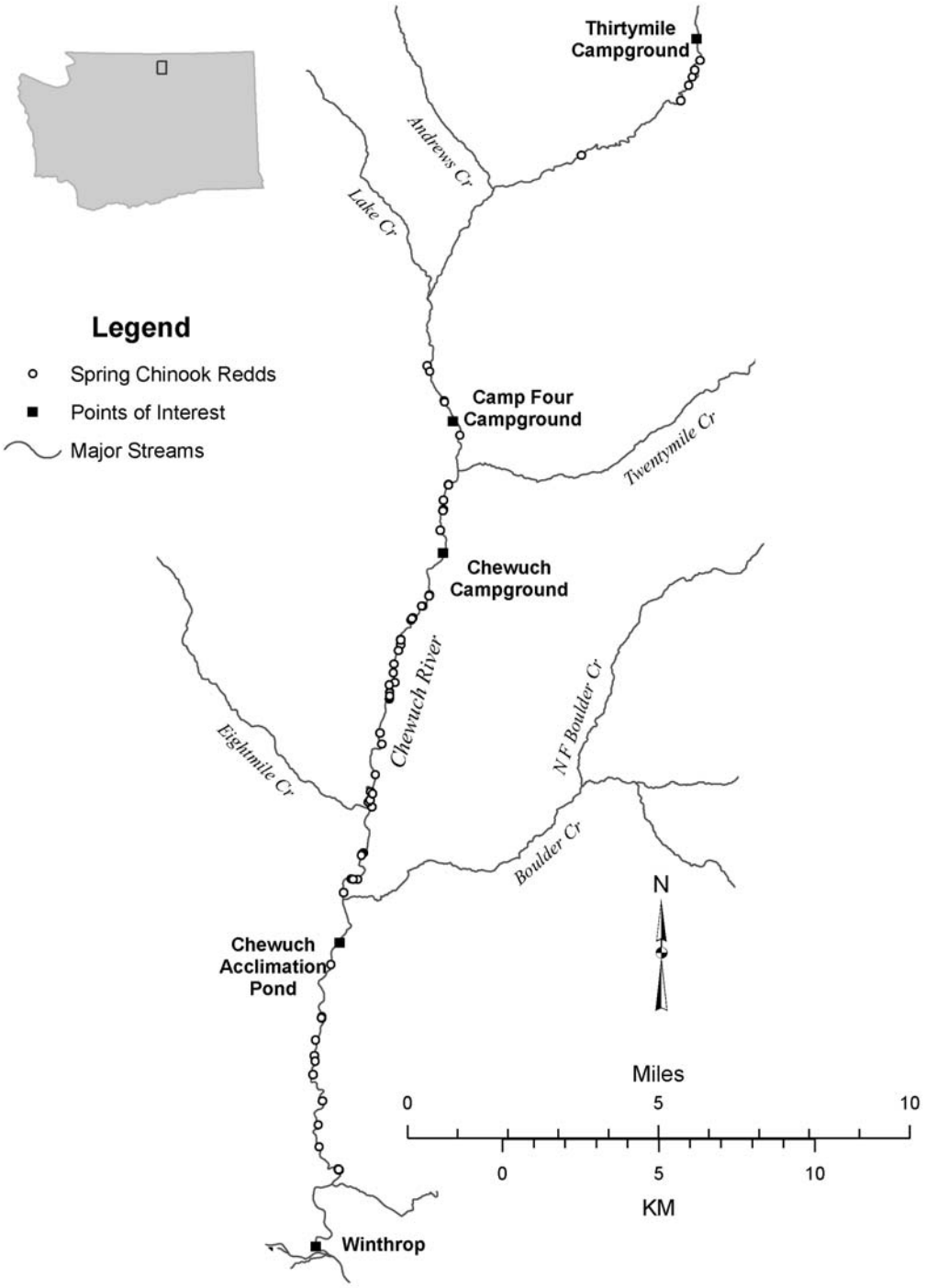


Figure 4. Spatial distribution of spring Chinook salmon redds in the Chewuch River subbasin based on GPS waypoints collected during 2007 surveys.

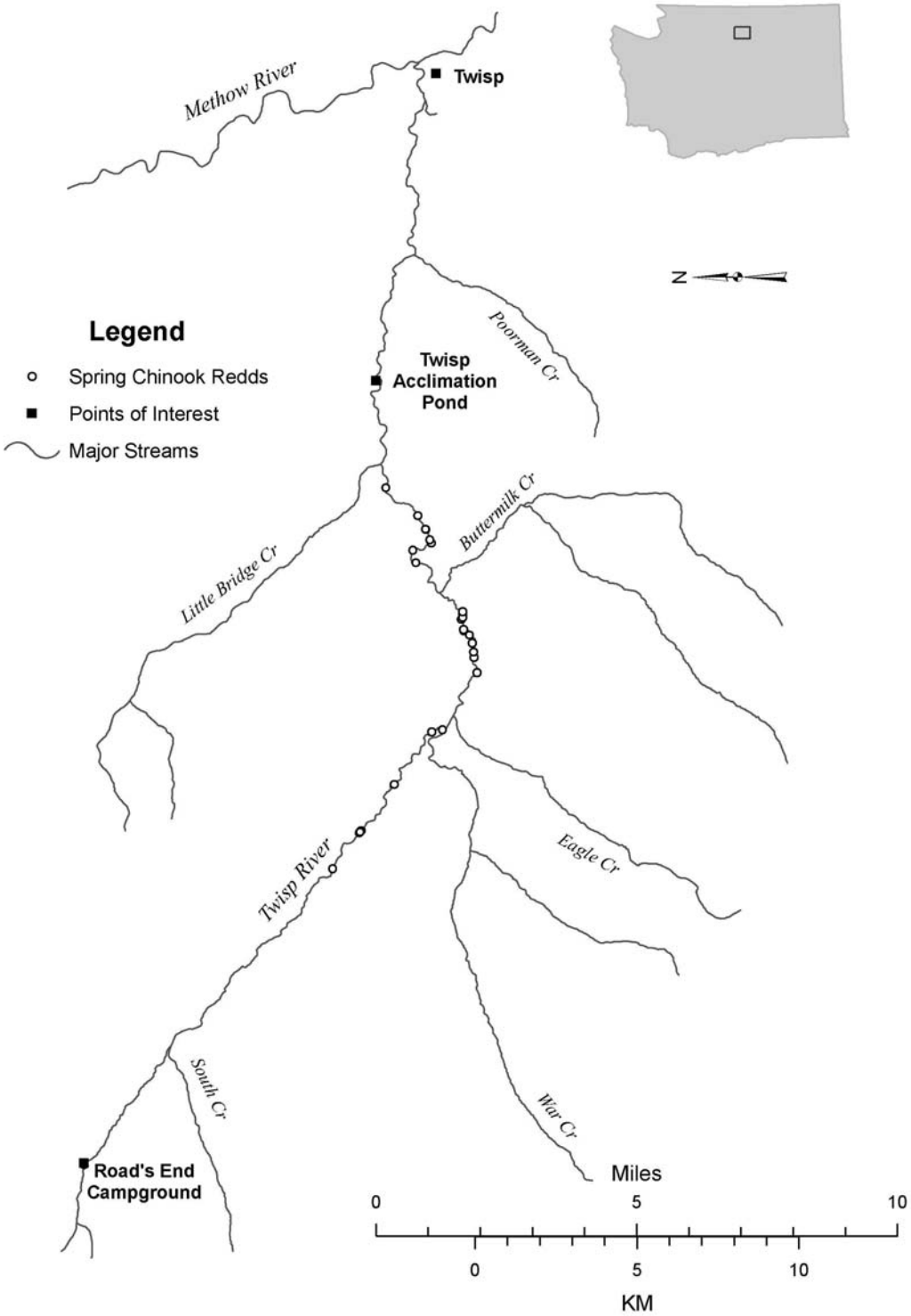


Figure 5. Spatial distribution of spring Chinook salmon redds in the Twisp River subbasin based on GPS waypoints collected during 2007 surveys.

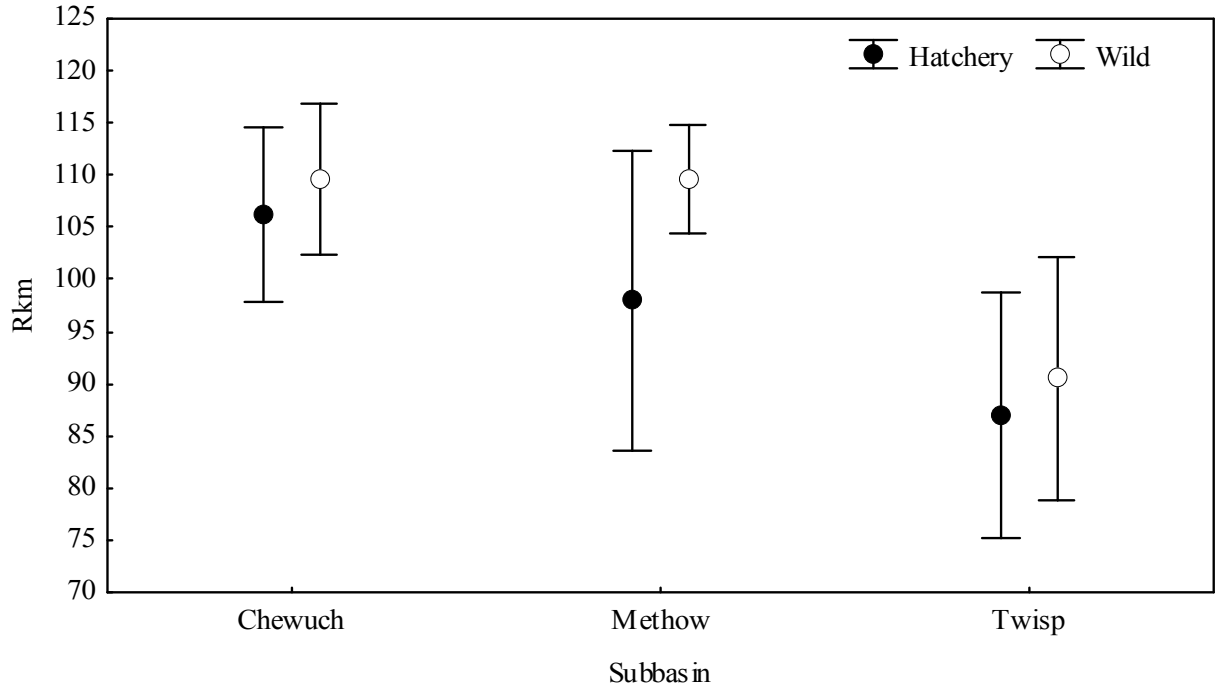


Figure 6. Mean redd distribution (rkm) of hatchery and wild females in the Methow River basin in 2007. Error bars represent 95% confidence intervals.

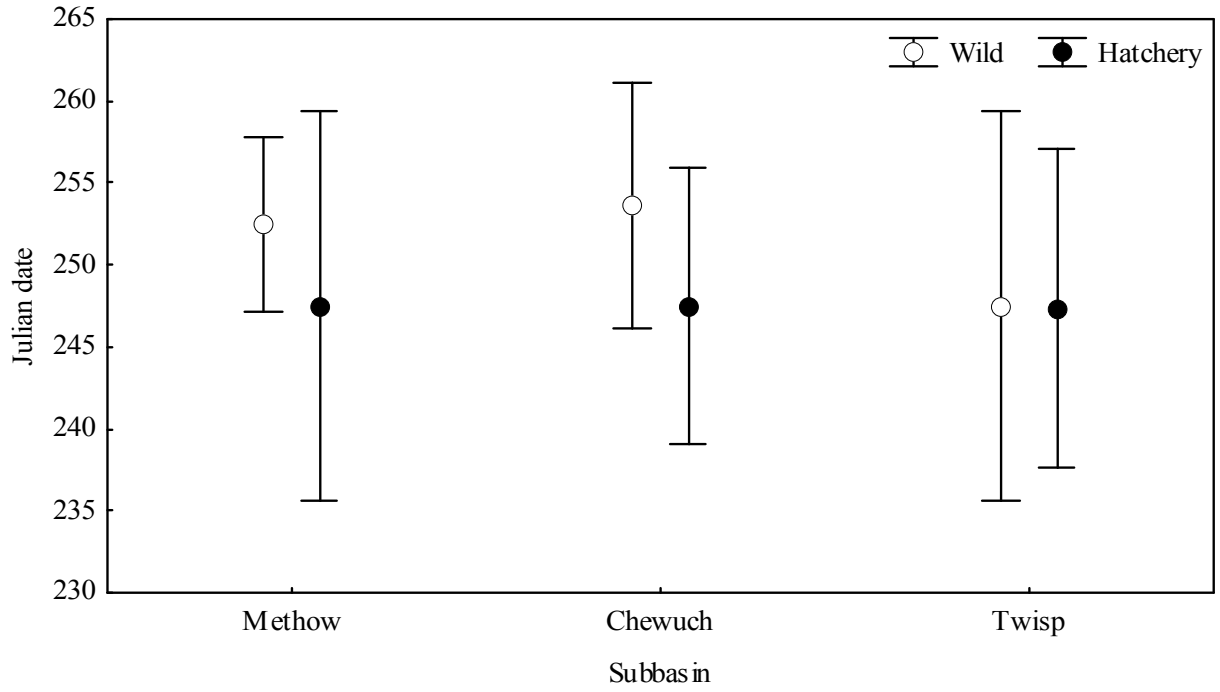


Figure 7. Mean spawn timing (Julian date) of hatchery and wild females in the Methow River basin in 2007. Error bars represent 95% confidence intervals.

Spawner Composition, Demographics, and Egg Deposition

An estimated 1,075 fish spawned in the Methow River basin based on redd counts, of which 809 (75.3%) were hatchery-origin based on carcass recoveries. The majority of carcasses (*N* = 188) were recovered in the Methow subbasin, followed by the Chewuch subbasin (*N* = 61), and the Twisp subbasin (*N* = 28; Table 5; Figures 8-10). Wild fish comprised the largest proportion of estimated spawners in the Twisp River subbasin (38.1%) followed by the Chewuch River subbasin (26.7%) and Methow River subbasin (21.9%). The estimated spawning escapement does not include hatchery or wild fish collected for broodstock. A total of 269 snouts were used to calibrate field detection success of CWTs. Based on V-detector validation of collected snouts, surveyors were 98.9% accurate in detecting CWTs in the field with hand-held devices.

Table 5. 2007 spring Chinook salmon carcass recoveries by origin, stock, and recovery subbasin.

Origin	Release site/mark	Recovery subbasin		
		Chewuch	Methow	Twisp
Hatchery	Chewuch	12	24	0
	Methow	5	13	0
	Twisp	0	14	15
	Winthrop	5	71	0
	Ad-clip only	7	14	1
	Left ventral-clip only	0	1	0
	Out-of-basin strays	4	3	0
Unknown hatchery	No mark[a]	10	20	6
Wild	Wild	18	28	6
Total		61	188	28

[a] Includes lost tags and hatchery fish missing heads.

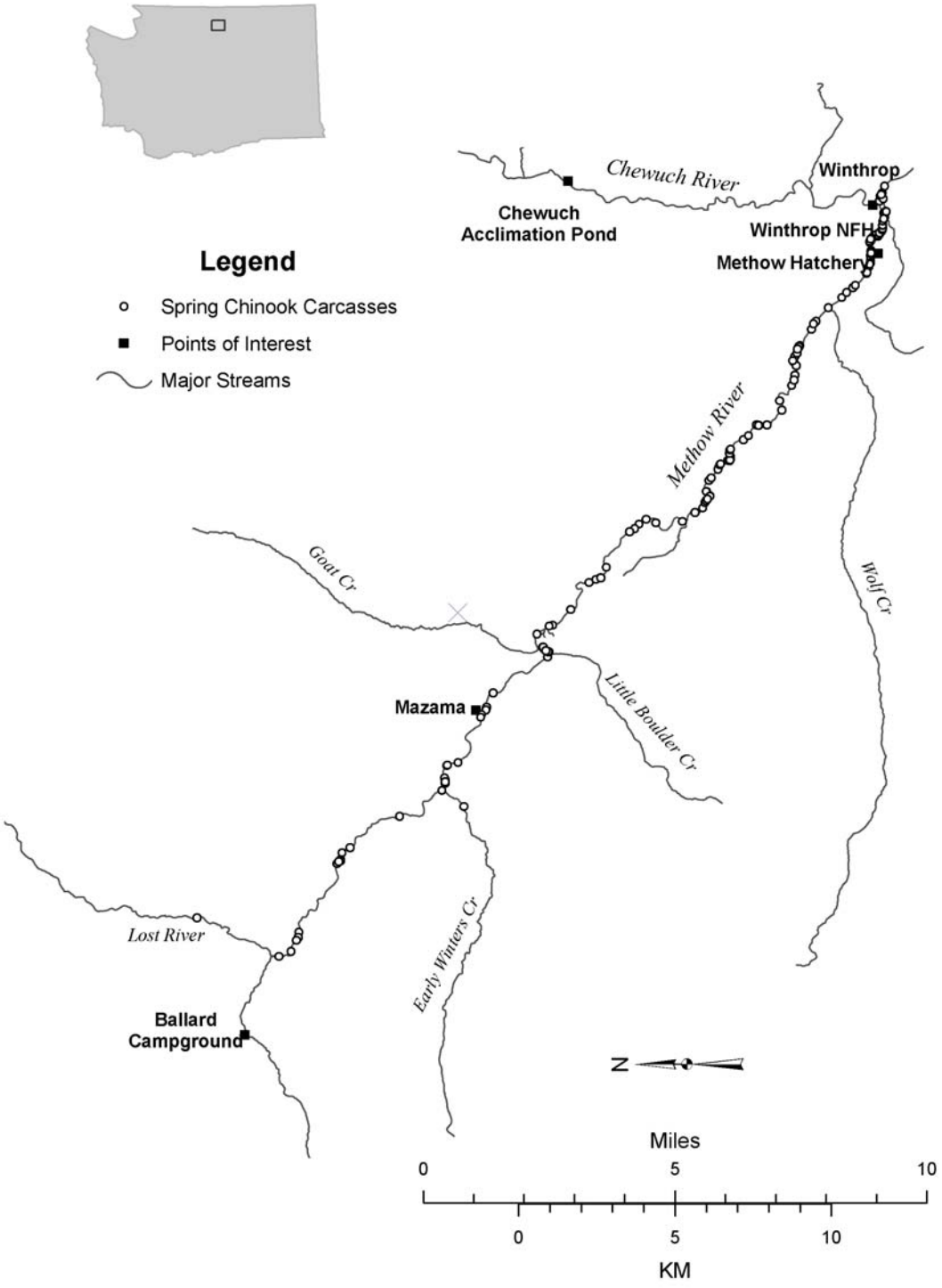


Figure 8. Spatial distribution of spring Chinook salmon carcasses in the Methow River subbasin based on GPS waypoints collected during 2007 surveys.

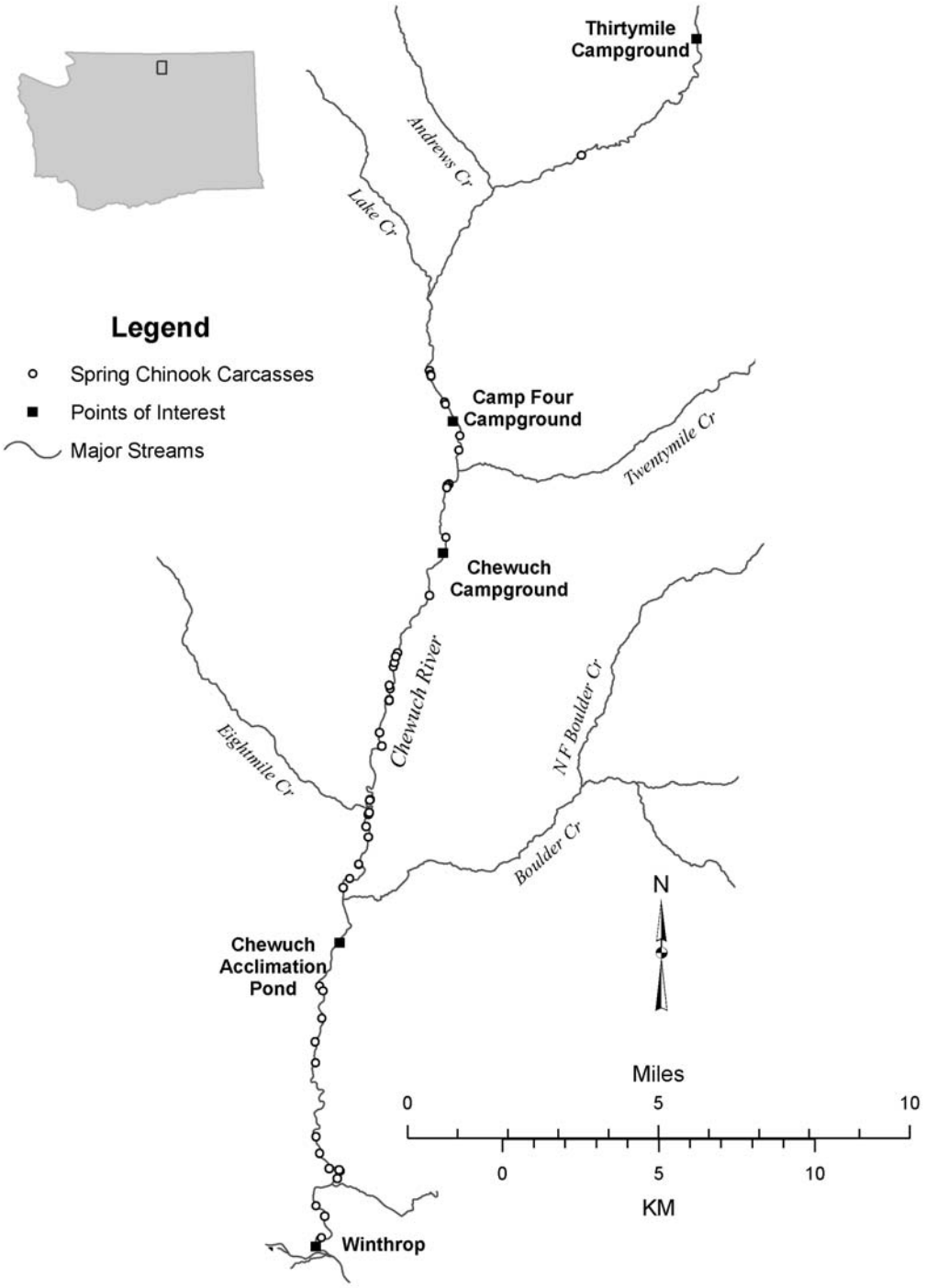


Figure 9. Spatial distribution of spring Chinook salmon carcasses in the Chewuch River subbasin based on GPS waypoints collected during 2007 surveys.

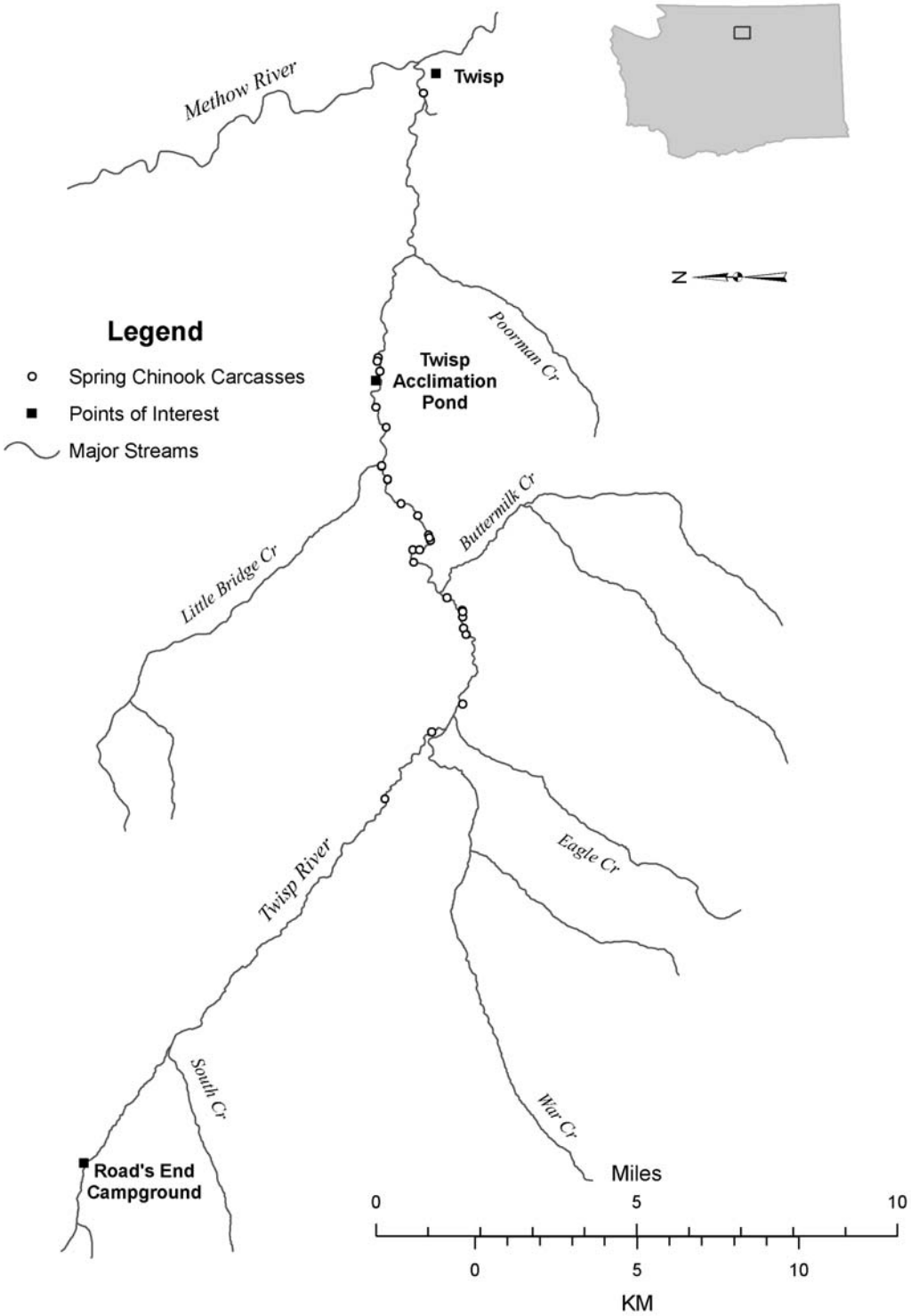


Figure 10. Spatial distribution of spring Chinook salmon carcasses in the Twisp River subbasin based on GPS waypoints collected during 2007 surveys.

Of the 277 carcasses recovered, the age, hatchery origin, gender, and length was determined for 237 (85.6%). The modal age of carcasses of MH and wild fish was age-5 (*N* = 44; 50.6%; Table 6). Carcass recovery bias was not calculated because few age-5 fish were tagged at Wells Dam (*N* = 2) and some broodstock fish were released prior to spawning without being scanned for PIT tags. Only eight fish PIT tagged at Wells Dam were recovered on spawning grounds, representing 11.3% of potential recoveries. Overall recovery rates were higher for age-4 fish compared to age-3 fish (Table 7).

Of the 112 female carcasses examined on the spawning grounds for egg retention, only 97 had intact abdominal cavities. Using mean fecundities from MH broodstock (MetComp = 3,987, Twisp = 4,273) and adjusting for the mean egg-retention rates and the proportion of hatchery and wild females by age class on the spawning grounds, the total estimated egg deposition in the Methow River basin was 1,174,545 eggs (Table 8). Fourteen redds in the upper Methow River were dewatered in 2007 and were not included in egg-deposition estimates.

Table 6. Mean POH length (*N*; SD) by age and sex of spring Chinook salmon carcasses recovered during Methow Basin spawning ground surveys in 2007. Only hatchery fish recovered in their release stream are reported within each subbasin.

Age	Male		Female	
	Hatchery	Wild	Hatchery	Wild
		Chewuch subbasin		
1.1	43.0 (2; 0.0)	43.0 (1; - -)	- -	- -
1.2	- -	60.0 (2; 1.4)	50.0 (1; - -)	57.0 (1; - -)
1.3	74.3 (4; 0.5)	68.4 (5; 7.4)	66.6 (5; 1.5)	70.0 (7; 2.4)
		Methow subbasin		
1.1	38.0 (9; 1.4)	37.5 (2; 6.4)	- -	- -
1.2	57.0 (1; - -)	55.0 (2; 1.4)	- -	56.9 (7; 3.1)
1.3	72.0 (1; - -)	70.3 (6; 3.2)	66.5 (2; 0.7)	66.9 (8; 4.1)
		Twisp subbasin		
1.1	39.3 (6; 1.9)	39.0 (1; - -)	- -	- -
1.2	50.2 (5; 5.9)	- -	58.7 (3; 5.5)	- -
1.3	80.0 (1; - -)	70.0 (2; 2.8)	- -	74.0 (3; 4.9)

Table 7. Spawning ground recovery rates of hatchery spring Chinook salmon PIT tagged at Wells Dam in 2007. U = unknown age.

Recovery subbasin	Hatchery				Total
	1.1	1.2	1.3	U	
Chewuch	0	2	0	0	2
Methow	5[a]	1	0	0	6
Twisp	0	0	0	0	0
Total tagged	60	19	2	1	82
Total collected in broodstock	7[b]	1	0	0	8
Total recovered below Wells	1	2	0	0	3
Potential spawning total	52	16	2	1	71
Total recovered	5	3	0	0	8
Recovery rate (%)	9.6	18.8	0.0	0.0	11.3

[a] Two recoveries were fish originally trapped and held at WNFH before being released.
[b] Trapped and held at WNFH but may have been released.

Table 8. Estimated egg deposition for spring Chinook salmon in the Methow Basin in 2007. Mean fecundities were derived from Methow Hatchery broodstock (MetComp or Twisp).

Subbasin	Females examined	Mean fecundity	Mean egg retention (%)	Redds	Subbasin proportion (%)	Estimated egg deposition		
						2005	2006	2007
Chewuch	19	4,355	0.2	79	25.7%	775,219	1,025,965	343,357
Methow	68	3,870	0.2	184[a]	64.5%	1,047,311	2,025,945	710,656
Twisp	10	4,277	0.1	30	9.8%	237,729	298,074	128,182
Total	97			293	100.0%	2,060,259	3,349,984	1,182,195

[a] 14 dewatered redds in the upper Methow River were removed.

Natural Replacement Rate

Natural replacement rates for the latest complete brood (2001) were low in all subbasins (Twisp = 0.15, Chewuch = 0.11, Methow = 0.03; Table 9; Appendix A). Historical NRR values of the spring Chinook stocks in the Methow River basin did not 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 (Table 10; Appendix A). No statistically significant difference was detected between the NRR and HRR in any individual subbasin, but the HRR for the combined Methow and Chewuch subbasin (MetComp) and the entire population (Methow Basin) were significantly greater than their respective NRR during the evaluation period (Mann-Whitney tests, one-tailed $P = 0.03$; see Table 10).

Table 9. Estimated natural spawning escapement and Natural Replacement Rates (NRR) of spring Chinook salmon populations in the Methow River basin. Escapement values are derived from annual redd counts expanded by fish-per-redd values. Total expanded adults were adjusted for harvest and indirect mortality associated with non-selective fisheries. Mean NRR values reported for 1992 – 2000 are geometric means.

Parent brood	Est. spawning escapement	Returns			Total expanded adults	NRR
		1.1	1.2	1.3		
			Chewuch River			
2001	2,493	0	205	49	266	0.11
1992-2000[a]	129	1	118	17	167	0.63
			Methow River and tributaries			
2001	7,588	3	183	36	232	0.03
1992-2000[a]	357	5	105	26	156	0.36
			Twisp River			
2001	890	27	77	20	129	0.15
1992-2000[a]	169	6	120	28	179	0.72

[a] Excludes 1996 and 1998 brood years (100% collection at Wells Dam).

Table 10. Arithmetic mean NRR and HRR values for Methow spring Chinook for brood years 1992 – 2001. Mann-Whitney U-tests for all subbasins exclude the 1996 and 1998 brood years because no spawning ground surveys were conducted (i.e., 100% collection at Wells Dam). Methow and Chewuch HRR values do not include brood years 1998 and 2000 (one CWT code for both release groups).

Subbasin	Mean (± SD) values for all years		
	NRR	HRR	*P*-value
Methow (92-01)[a]	0.90 (1.39)	5.76 (4.41)	0.06
Chewuch (92-01)[b]	1.85 (2.91)	2.94 (3.30)	0.22
Twisp (92-01)[b]	1.97 (3.47)	2.42 (1.88)	0.07
MetComp (92-01)	1.21 (1.96)	4.92 (4.02)	0.03
Methow Basin (92-01)	1.37 (2.25)	4.95 (4.26)	0.03

[a] Statistical test excludes 1992 brood year (no hatchery program).
[b] Statistical test excludes 1995 brood year (no hatchery program).

Stray Rates by Brood Year

All statistical tests were conducted including and excluding fish removed in fisheries (i.e., harvest). Although the inclusion of harvested fish did not influence the results of the analysis, we only discuss those results from which harvested fish were excluded. An estimated 16.3% of

the 2001 brood Twisp spring Chinook were recovered on the spawning grounds of non-target areas (Appendix B). The mean brood year stray rate of Twisp River fish (12%; SD = 13) was not significantly different than the 5% target (one-sample t-test: $P = 0.26$). Of the 2001 brood Chewuch spring Chinook salmon, 45.4% returned to non-target spawning areas. The mean stray rate of Chewuch River fish (13%; SD = 17) was not significantly different than the 5% target (one-sample t-test: $P = 0.32$). Spring Chinook salmon released into the Methow River typically exhibit lower stay rates than other programs. Only 4.6% of the estimated number of 2001 brood Methow spring Chinook were recovered in non-target areas. The mean stray rate of Methow River fish (2%; SD = 2) was significantly less than the 5% target (one-sample t-test: $P = 0.03$).

Stray Rates within the Methow Basin

A total of 166 CWTs were successively decoded from 2007 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 639 fish (Appendix C). Stray rates within the Methow Basin were greatest in the Methow River (i.e., Chewuch), while stray rates of out-of-basin stocks were the greatest in the Chewuch River (Table 11).

Table 11. Expanded CWT recoveries by subbasin and stray status in the Methow River basin in 2007. Proportions based on total expanded CWT recoveries (MH = Methow Hatchery, WNFH = Winthrop National Fish Hatchery).

Subbasin	% Local		% Within-basin strays		% Out-of-basin strays	Expanded CWT recoveries
	MH	WNFH	MH	WNFH		
Chewuch	39.2	- -	9.1	14.0	37.8	143
Methow	7.3	50.4	28.2	- -	14.0	450
Twisp	100	- -	0.0	0.0	0.0	46
Total	21.1	35.5	21.9	3.1	18.3	639

Table 12 shows the proportion of CWT recoveries comprising the estimated spawning escapements from 2000-2007 by subbasin. For run years 2000 to 2007, Twisp hatchery spring Chinook salmon comprised significantly less than 10% of the estimated spawning escapement in both the Methow and Chewuch subbasins (one-sample t-tests, $P < 0.01$). Methow and Chewuch hatchery spring Chinook salmon also comprised significantly less than 10% of the estimated spawning escapement in the Twisp subbasin, respectively (one sample t-tests, $P < 0.01$). Fish from brood years 1998 and 2000 released into the Methow and Chewuch rivers were not uniquely tagged and stray rates were only assessed in the Twisp River (one sample t-tests, $P < 0.001$). While Methow hatchery spring Chinook salmon comprised significantly less than 10% of the estimated spawning population in the Chewuch subbasin (one sample t-test: $P < 0.01$), Chewuch hatchery spring Chinook salmon did not comprise significantly less than 10% of the estimated spawning population in the Methow subbasin (one sample t-test: $P = 0.46$). Fish released as MetComp (Methow and Chewuch) between 2001 and 2005, comprised less than 10% of the Twisp River spawning population (one-sample t-test: $P < 0.01$). The estimated number of out-of-basin strays recovered in the Methow River basin has increased from 14 to 117 (0.2% to

14.5% of the estimated hatchery escapement on the spawning grounds) between 2001 and 2007 (Appendices D-J).

Table 12. Proportion of CWT recoveries comprising estimated spawning escapements from 2000-2007 by subbasin.

Run year	Estimated spawning escapement			Hatchery stock (% of spawning escapement)					
	Hatchery	Wild	Total	Chewuch	Methow	Twisp	Winthrop	MetComp[a]	Out-of basin
				Chewuch River					
2000[b]	52	31	83	2.7	2.7	0.0	3.2		5.9
2001	1,761	732	2,493	31.8	2.2	0.3	12.6	1.6	0.1
2002	588	78	666	2.9	0.0	0.0	7.5	73.1	0.0
2003	465	25	490	0.0	1.3	0.0	3.7	76.7	0.5
2004	289	46	335	5.4	1.1	0.0	3.2	71.8	0.0
2005	289	219	508	41.1	3.3	0.4	1.9	4.0	3.9
2006	378	135	513	28.4	3.2	1.2	5.5		8.4
2007	203	74	277	20.2	4.6	0.0	7.3		19.4
				Methow River					
2000	546	65	611	1.1	45.4	3.0	22.3		0.0
2001	6,994	594	7,588	7.5	27.9	0.2	42.6	1.6	0.1
2002	1,644	86	1,730	0.2	3.9	1.0	27.2	48.6	0.0
2003	596	8	604	0.0	4.8	3.0	28.3	43.5	0.6
2004	622	199	821	4.0	4.0	5.2	15.6	37.9	0.0
2005	526	221	747	28.6	16.9	2.6	11.5	0.7	1.6
2006	942	128	1,070	21.0	23.7	4.2	20.8		1.3
2007	541	152	693	11.8	4.7	6.5	32.8		9.1
				Twisp River					
2000	235	21	256	0.0	0.0	58.0	0.7		0.0
2001	384	506	890	1.5	0.7	19.1	0.7	0.0	0.0
2002	60	181	241	0.0	0.0	9.2	12.3	3.1	0.0
2003	18	25	43	0.0	0.0	34.7	0.0	0.0	0.0
2004	98	243	341	0.0	0.0	16.9	0.9	0.9	3.1
2005	34	87	121	3.0	0.0	16.9	0.0	0.0	0.0
2006	100	65	165	0.0	1.9	36.6	0.7		0.0
2007	65	40	105	0.0	0.0	44.1	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 in both broods).
[b] 2000 run year data not used in statistical analysis of Chewuch subbasin strays.

Stray Rates outside the Methow Basin

Since 1997, an estimated total of 30 Methow Hatchery fish have been recovered on spawning grounds outside the Methow River Basin, and only 11 of those fish have strayed to other spring Chinook salmon populations (e.g., Chiwawa and Entiat Rivers; 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 run year and recovery location.

Run year	Recovery location	CWT	Stock	Expanded count	Estimated escapement	% of population
2006	Chiwawa River	631976	MetComp	2	529	0.38
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
2006	Entiat River	631976	MetComp	1	257	0.39
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

From 2001 through 2003, the estimated number of unknown hatchery fish (ad-clip only or unmarked fish) comprised between 13.2% and 18.2% of the hatchery origin escapement to the Methow River Basin (Appendices D-F). In 2004 and 2005, these values were slightly lower (N_{2004} = 123, 12.2%; N_{2005} = 95, 11.2%; Appendices G and H), but the 2006 estimated escapement of unknown hatchery origin fish was considerable higher (N = 358, 25.2%; Appendix I). The proportion of unknown hatchery fish comprising total hatchery spawning escapement in the Methow River Basin in 2007 was 21.3% (N = 172; Appendix J).

Discussion

Estimated spawning escapement in the Methow River Basin represented 81.0% of the potential run escapement to the Methow River. In 2007, a fish-per-redd value was calculated from the male-to-female ratio at Wells Dam. This ratio was used to expand the number of redds to overall spawning escapement under the assumption that each female Chinook salmon constructed only a single redd and males spawned with a single female. The fish-per-redd value in 2007 (3.5) was much higher than that used in the previous four years (1.88 to 2.86). A high fish-per-redd value (4.76) was also reported for Wenatchee Basin spring Chinook salmon in 2007; although the proportion of the run escapement accounted for on the spawning grounds was only 59% (A. Murdoch, WDFW, personal communication). Similar methods were used for both populations, 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. The specific factors (i.e., lack of habitat, water temperature, poor fish condition) that contribute to the observed differences in run and spawning escapement in the Methow Basin are unknown.

Based on the number of carcasses recovered on the spawning grounds, wild fish comprised 24.7% ($N = 266$) of the estimated spawning escapement to the Methow River basin, but only 9.5% ($N = 202$) of the estimated run above Wells Dam. These data suggest that the carcass recovery data underestimate the proportion of hatchery fish on the spawning grounds. Studies have reported that the probability of carcass recovery is size dependent (Zhou 2002; Murdoch et al. 2007). If the age and size distribution of hatchery and wild fish were not identical, carcass recovery data would be biased towards the larger and probably older-aged component of the population (i.e., wild fish). Results of ongoing studies in the Wenatchee River basin should provide the information necessary to correct the bias in the carcass-recovery data. After which, the estimates of the number of hatchery and wild fish on the spawning grounds will be recalculated. It is worth noting that correcting for the bias in carcass data will result in lower NRR values for all stocks.

In 2007, no difference was detected in the spawn timing or distribution of hatchery and wild fish. Although a more comprehensive analysis will be conducted during the five-year review, current hatchery operations appear to be producing fish that are similar to wild fish with respect to spawn timing and distribution. In the Methow River basin, spring Chinook salmon spawn during a relatively narrow timeframe. Only 37 female fish could be used to determine differences in spawn timing between hatchery ($N = 11$) and wild ($N = 26$) fish because of the need to use only local-released hatchery fish in statistical analyses (e.g., juveniles released in the Chewuch River and recovered as adults in the Chewuch River). The ability to detect differences between groups was further complicated by testing differences between subbasins. 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 any statistical differences between stocks.

Recent trends in stray rates by brood year of hatchery fish are greater than the goals set in the M&E Plan for Chewuch and Twisp hatchery fish. Methow Hatchery spring Chinook salmon are typically released in three locations in the Methow River basin. All of the acclimation sites use

surface water for rearing (i.e., acclimation) prior to release to increase homing fidelity. Despite this, an estimated 49% of the Twisp-released fish spawning in the Methow Basin spawned in areas other than the Twisp River. However, because abundance of Twisp-stock fish is relatively low, their prevalence typically comprises a small proportion of the escapement within other spawning areas (i.e., Methow and Chewuch rivers). Similarly, an estimated 60% of the Chewuch-released fish spawned in areas other than the Chewuch River, but because release numbers are much greater, contribution of these fish to other spawning areas can be high. Conversely, an estimated 28% of Methow-released fish spawned in areas other than the Methow River. These data suggest that the duration of acclimation at the Twisp and Chewuch ponds may be inadequate to meet the stray rate objectives. For the broods that returned to spawn in 2007 (2002-2004), Methow program fish were acclimated on local river water an average of 98 and 113 days longer than Chewuch and Twisp program fish, respectively. Furthermore, Chewuch and Twisp program fish are typically reared on Methow River water at Methow Hatchery prior to transfer to the acclimation ponds (2002 brood = 12-18 days, 2003 and 2004 brood = > 4 months). In an effort to reduce stray rates, the relationship between the acclimation periods at the Twisp and Chewuch ponds and the surface-water rearing period for Twisp and Chewuch fish at Methow Hatchery should be investigated. Increasing the period of acclimation on tributary water and/or eliminating or significantly reducing the period of acclimation on Methow River water at the hatchery may improve homing fidelity for Twisp and Chewuch fish.

Overall, 14.5% of the estimated number of hatchery fish spawning in the Methow River basin in 2007 strayed from other independent populations (Entiat, Chiwawa, and Dworshak Hatchery releases). These fish comprised 26.6% of the hatchery fish spawning in the Chewuch River basin, and 17.2% of those spawning in the upper Methow; no out-of-basin strays were recovered in the Twisp River. Current methodologies for estimating hatchery stock on spawning grounds incorporate reach-specific sample rates, and tag-specific marking rates. Because some hatchery spring Chinook salmon produced outside the Methow River basin have low CWT mark rates, the presence or absence of a single CWT code may greatly affect the estimated number of out-of-basin strays.

Spring Chinook salmon released from Methow Hatchery do not stray at significant rates to other independent populations. Nevertheless, short acclimation periods may negatively affect homing fidelity within basin. Inadequate acclimation periods on surface water from the release rivers may have also contributed to the lower smolt-to-adult survival rates of Chewuch and Twisp stock (i.e., smolt quality). Hatchery replacement rates for Chewuch and Twisp stock spring Chinook salmon have not met expected HRR values (Chapter 1) and in some years are no different than the respective NRR values. The HRR must exceed the NRR of the target stock to meet Objective 4 of the M&E Plan. Studies should be initiated that examine life-stage survival rates in order to detect possible limiting factors (e.g., smolt-to-smolt survival).

References

BAMP. 1998. Mid-Columbia River hatchery program, biological assessment and management plan.

Meekin, T.K. 1967. Report on the 1966 Wells Dam Chinook salmon tagging study. Washington Department of Fisheries. Olympia, Washington.

Murdoch, A.R., T.N. Pearsons, T.W. Maitland, C. Deason, M. Ford, and K. Williamson. 2007. Monitoring the reproductive success of naturally spawning hatchery and natural spring Chinook salmon in the Wenatchee River. Project No. 2003-039-00. Bonneville Power Administration. Portland, Oregon.

Supplementation Research Team (SRT). 2005. Proposal for the implementation of the Douglas County PUD hatchery monitoring and evaluation plan. Submitted to Rick Klinge, Douglas County Public Utility District.

Truscott, K. 2007. Draft 2007 upper Columbia River salmon and steelhead broodstock objectives and site-based broodstock collection protocols. Memo to Mid-Columbia HCP Hatchery Committee.

Wells HCP Hatchery Committee (HC). 2005. Conceptual approach to monitoring and evaluation for hatchery programs funded by Douglas County Public Utility District. Douglas PUD HCP HC, East Wenatchee, WA.

Zhou, S. 2002. Size-dependent recovery of Chinook salmon salmon in carcass surveys. Transactions of the American Fisheries Society 131: 1194-1202.

Appendix A. Natural Replacement Rate (NRR) summary by subbasin for brood years 1992 through 2001 with corresponding hatchery replacement rates (HRR). NOR = natural origin recruits.

Parent brood	Est. spawning escapement	Return age 1.1	1.2	1.3	Total expanded adults (NOR)	NRR	HRR
			Chewuch River				
1992	422	0	21	14	37	0.09	1.77
1993	184	2	69	18	91	0.49	1.13
1994	63	0	13	3	16	0.26	0.17
1995	6	1	12	19	33	5.46	- -
1996	- -	0	13	86	102	- -	0.58
1997	123	1	662	55	921	7.47	5.63
1998	- -	11	23	19	60	- -	- -
1999	21	0	2	0	2	0.10	- -
2000	83	6	47	13	67	0.81	- -
2001	2,493	0	205	49	266	0.11	8.36
			Methow River				
1992	924	0	38	43	85	0.09	- -
1993	537	4	79	27	113	0.21	2.16
1994	172	0	19	7	27	0.16	0.50
1995	27	1	54	18	76	2.79	10.17
1996	- -	1	30	230	268	- -	4.85
1997	155	21	348	50	538	3.48	5.05
1998	- -	16	34	2	58	- -	- -
1999	70	3	2	0	4	0.06	1.61
2000	611	5	197	39	246	0.40	- -
2001	7,588	3	183	36	232	0.03	7.36
			Twisp River				
1992	316	0	47	37	88	0.28	1.19
1993	426	4	27	14	47	0.11	0.69
1994	74	0	11	9	21	0.28	1.00
1995	12	0	26	12	39	3.20	- -
1996	- -	0	11	56	69	- -	6.47
1997	72	0	460	109	729	10.17	4.47
1998	- -	24	72	21	133	- -	2.30
1999	25	0	7	0	7	0.30	1.91
2000	256	37	264	17	325	1.27	2.31
2001	890	27	77	20	129	0.15	1.43

Appendix B. Methow Hatchery CWT recoveries by program and brood year. Stray rate is the percent of spawning ground recoveries collected in non-target spawning grounds (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 rate	
	T	NT	W	T	NT	Com.	Sp.	Trbl.	Com.	Sp.	Trbl.		W/ harvest	No harvest
Chewuch spring Chinook salmon														
1992	0	1	38	0	0	0	0	0	0	0	0	39	0.0%	0.0%
1993	0	19	79	8	3	5	0	0	0	0	1	115	2.6%	2.8%
1994	0	0	3	0	0	0	0	0	0	0	0	3	0.0%	0.0%
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
1996	0	15	15	0	4	0	0	0	6	0	1	41	9.8%	11.8%
1997	54	44	14	4	27	2	0	0	24	144	7	320	8.4%	18.9%
2001	15	46	2	323	321	0	0	0	2	0	0	709	45.3%	45.4%
Methow spring Chinook salmon														
1992	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
1993	43	0	134	6	1	0	0	0	0	4	3	192	0.5%	0.5%
1994	0	0	1	0	0	0	0	0	0	0	0	1	0.0%	0.0%
1995	3	0	114	3	0	2	0	0	0	0	0	122	0.0%	0.0%
1996	200	0	58	221	8	0	0	0	2	0	11	500	1.6%	1.6%
1997	422	0	3	16	1	3	0	0	280	209	12	946	0.1%	0.2%
1998	730	1	0	630	17[a]	3	0	0	462	428	30	2,301	0.7%	1.2%
1999	93	0	- -	35	7	1	0	0	3	6	0	145	4.8%	5.2%
2000	217	0	0	598	4[a]	5	0	0	69	111	0	1,004	0.4%	0.5%
2001	289	0	5	182	23	3	0	0	5	16	0	523	4.4%	4.6%
Twisp spring Chinook salmon														
1992	0	0	21	0	0	0	0	0	0	0	0	21	0.0%	0.0%
1993	0	3	18	1	1	0	0	0	0	4	0	27	3.7%	4.3%
1994	0	0	4	0	0	0	0	0	0	0	0	4	0.0%	0.0%
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
1996	4	58	40	151	17	0	0	0	1	0	6	277	6.1%	6.3%
1997	21	6	- -	14	0	0	0	0	14	9	1	65	0.0%	0.0%
1998	1	8	- -	0	2	0	0	0	11	0	0	22	9.1%	18.2%
1999	3	25	- -	8	20	1	0	0	4	0	0	61	32.8%	35.7%
2000	22	12	- -	67	40	0	0	0	12	20	0	173	23.1%	28.4%
2001	2	0	1	33	7	0	0	0	0	1	0	44	15.9%	16.3%

[a] Only includes spawning ground recoveries in the Twisp River or outside the Methow Basin.

Appendix C. Expanded coded wire tag recoveries in 2007 by release site and recovery location.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
Chewuch River	2002	051270	Methow	Within-basin (WNFH)	6
Chewuch River	2002	631976	Chewuch	Local	39
Chewuch River	2003	050864	Clearwater	Out-of-basin	27
Chewuch River	2003	054135	Entiat	Out-of-basin	14
Chewuch River	2003	632569	Chewuch	Local	8
Chewuch River	2004	051588	Methow	Within-basin (WNFH)	1
Chewuch River	2004	051591	Methow	Within-basin (WNFH)	4
Chewuch River	2004	052180	Methow	Within-basin (WNFH)	8
Chewuch River	2004	052181	Methow	Within-basin (WNFH)	1
Chewuch River	2004	631187	Methow	Within-basin (WNFH)	13
Chewuch River	2004	632898	Chiwawa	Out-of-basin	13
Chewuch River	2004	632899	Chewuch	Local	9
MH outfall	2002	051268	Methow	Local (WNFH)	4
MH outfall	2003	051567	Methow	Local (WNFH)	5
MH outfall	2004	052181	Methow	Local (WNFH)	9
MH outfall	2004	631187	Methow	Local	4
MH outfall	2004	632899	Chewuch	Within-basin	4
Methow River	2002	051268	Methow	Local (WNFH)	13
Methow River	2002	051270	Methow	Local (WNFH)	7
Methow River	2002	051273	Methow	Local (WNFH)	11
Methow River	2002	054917	Methow	Local (WNFH)	5
Methow River	2002	631582	Twisp	Within-basin	4
Methow River	2002	631891	Methow	Local	10
Methow River	2002	631976	Chewuch	Within-basin	34
Methow River	2003	051266	Methow	Local (WNFH)	25
Methow River	2003	051567	Methow	Local (WNFH)	9
Methow River	2003	051787	Methow	Local (WNFH)	35
Methow River	2003	054637	Methow	Local (WNFH)	13
Methow River	2003	054854	Methow	Local (WNFH)	1
Methow River	2003	107173	Clearwater	Out-of-basin	24
Methow River	2003	107273	Clearwater	Out-of-basin	39
Methow River	2003	632499	Twisp	Within-basin	4
Methow River	2003	632566	Chewuch	Within-basin	12
Methow River	2003	632567	Twisp	Within-basin	11
Methow River	2003	632568	Methow	Local	5
Methow River	2003	632569	Chewuch	Within-basin	6
Methow River	2004	051591	Methow	Local (WNFH)	1
Methow River	2004	052180	Methow	Local (WNFH)	31
Methow River	2004	052181	Methow	Local (WNFH)	47
Methow River	2004	631187	Methow	Local	14
Methow River	2004	632878	Twisp	Within-basin	25

Appendix C, continued.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
Methow River	2004	632899	Chewuch	Within-basin	26
Methow River	2004	632988	Twisp	Within-basin	1
Twisp River	2002	631077	Twisp	Local	6
Twisp River	2003	632499	Twisp	Local	2
Twisp River	2003	632564	Twisp	Local	6
Twisp River	2003	632565	Twisp	Local	2
Twisp River	2003	632567	Twisp	Local	16
Twisp River	2004	632878	Twisp	Local	11
Twisp River	2004	632988	Twisp	Local	3
WNFH outfall	2002	051271	Methow	Local (WNFH)	3
WNFH outfall	2002	051272	Methow	Local (WNFH)	2
WNFH outfall	2003	051566	Methow	Local (WNFH)	2
WNFH outfall	2003	051787	Methow	Local (WNFH)	2
WNFH outfall	2004	052181	Methow	Local (WNFH)	2

Appendix D. Estimated escapement from 2001 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (Win), 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. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish							Wild fish				Estimated escapement
		L	WB	Win	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	0
M14	1	0	0	0	0	0	2	2	0	0	0	0	2
M13	2	19	18	0	0	0	5	6	0	0	0	0	6
M12	15							36	0	0	0	0	36
M11[a]	8	10	4	0	0	0	0	14	0	0	5	5	19
M10	445	1,713	433	2,532	80	0	502	989	0	67	14	81	1,070
M9	1,893							4,271	16	181	83	280	4,551
M8	100	0	0	0	0	0	225	225	0	6	9	15	240
M7	188	114	32	163	16	0	99	424	0	12	16	28	452
M6	272	172	69	328	9	9	45	632	0	15	7	22	654
M5	38	16	11	49	2	2	0	80	0	2	9	11	91
L2	56	28	0	0	0	0	6	34	0	0	101	101	135
L1	16	0	0	0	0	0	0	0	0	0	38	38	38
EW3	8	0	0	0	0	0	14	14	0	0	5	5	19
EW2	7	0	0	0	0	0	13	13	0	0	4	4	17
EW1	2	0	0	0	0	0	4	4	0	0	1	1	5
MH1	19	15	3	19	1	0	8	46	0	0	0	0	46
WN1	86	31	19	136	11	0	7	204	0	3	0	3	207
WLF1	0	0	0	0	0	0	0	0	0	0	0	0	0
Methow total	3,156	2,118	589	3,227	119	11	930	6,994	16	286	292	594	7,588
C12	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
C11	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
C10	11	9	9	0	0	0	8	26	0	0	0	0	26
C9	1	1	0	0	0	0	1	2	0	0	0	0	2
C8	23	22	1	2	1	0	6	32	1	19	3	23	55
C7	86	35	6	18	0	0	63	122	0	73	12	85	207
C6	146	71	5	18	9	0	61	164	0	169	18	187	351
C5	246	217	15	22	0	0	148	402	7	168	15	190	592
C4	185	192	6	61	16	3	63	341	0	86	18	104	445
C3	59	41	7	42	0	0	11	101	0	41	0	41	142
C2	101	104	13	13	13	0	49	192	0	51	0	51	243
C1	179	101	0	139	0	0	139	379	0	34	17	51	430
Chewuch total	1,037	793	62	315	39	3	549	1,761	8	641	83	732	2,493
T10	1	0	0	0	0	0	0	0	0	2	0	2	2
T9	0	0	0	0	0	0	0	0	0	0	0	0	0
T8	7	0	0	0	0	0	0	0	0	17	0	17	17
T7	29	0	0	0	0	0	0	0	0	70	0	70	70
T6	190	92	20	7	0	0	75	194	14	208	41	263	457
T5	79	38	0	0	0	0	43	81	4	97	8	109	190
T4	25	15	0	0	0	0	0	15	0	45	0	45	60
T3	21	0	0	0	0	0	51	51	0	0	0	0	51
T2	8	25	0	0	0	0	18	19	0	0	0	0	19
T1	10							24	0	0	0	0	24
Twisp total	370	170	20	7	0	0	187	384	18	439	49	506	890
2001 total	4,563	3,081	671	3,549	158	14	1,666	9,139	42	1,366	424	1,832	10,971

[a] Includes redds from Suspension Creek. ns = not surveyed (fire).

Appendix E. Estimated escapement from 2002 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (Win), 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. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish							Wild fish				Estimated escapement
		L	WB	Win	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	0
M14	4	11	0	19	27	0	5	62	0	4	7	11	9
M13	29												64
M12	12	0	0	4	15	0	0	19	0	0	8	8	27
M11[a]	19	2	2	7	20	0	6	37	0	0	5	5	42
M10	36	6	2	7	50	0	13	78	0	0	2	2	80
M9	306	13	7	159	356	0	118	653	0	6	20	26	677
M8	1												2
M7	78	15	0	51	77	0	30	173	0	0	0	0	173
M6	116	17	8	98	153	0	75	351	1	11	7	19	257
M5	51												113
L2	40	3	0	24	76	0	1	104	0	0	15	15	88
L1	14								0	0	0	0	31
EW3	0	0	0	0	0	0	0	0	0	0	0	0	0
EW2	6	0	0	0	13	0	0	13	0	0	0	0	13
EW1	0	0	0	0	0	0	0	0	0	0	0	0	0
MH1	43	0	0	42	36	0	17	95	0	0	0	0	95
WN1	26	0	2	42	9	0	4	57	0	0	0	0	57
WLF1	1	0	0	0	1	0	1	2	0	0	0	0	2
Methow total	782	67	21	453	833	0	270	1,644	1	21	64	86	1,730
C12	3	0	0	0	0	0	0	0	0	0	7	7	7
C11	0	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	0
C9	0	0	0	0	0	0	0	0	0	0	0	0	0
C8	10	0	0	3	14	0	5	22	0	0	0	0	22
C7	27	0	0	0	28	0	13	41	0	11	8	19	60
C6	27	2	0	9	30	0	10	51	0	2	7	9	60
C5	32	9	0	4	46	0	2	61	0	3	7	10	71
C4	113	0	0	19	217	0	0	236	0	4	14	18	250
C3	2								0	0	0	0	4
C2	47	9	0	15	151	0	2	177	0	0	12	12	104
C1	40								0	3	0	3	88
Chewuch total	301	20	0	50	486	0	32	588	0	23	55	78	666
T10	0	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	0
T8	6	0	0	0	0	0	0	0	0	0	13	13	13
T7	14	7	0	0	0	0	1	8	0	0	23	23	31
T6	72								0	66	60	126	159
T5	13								0	0	19	19	29
T4	0	15	0	30	7	0	0	52	0	0	0	0	0
T3	0								0	0	0	0	0
T2	3								0	0	0	0	7
T1	1								0	0	0	0	2
Twisp total	109	22	0	30	7	0	1	60	0	66	115	181	241
2002 total	1,192	109	21	533	1,326	0	303	2,292	1	110	234	345	2,637

[a] Includes redds from Suspension Creek.

Appendix F. Estimated escapement from 2003 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (Win), 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. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish							Wild fish				Estimated escapement
		L	WB	Win	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	0
M14	4	0	0	10	0	0	0	10	0	0	0	0	10
M13	0								0	0	0	0	0
M12	6	0	0	3	7	0	3	13	0	1	0	1	14
M11	7	0	1	4	4	0	8	17	0	0	0	0	17
M10	34	0	0	23	44	0	14	81	0	0	0	0	81
M9	105	13	5	61	118	0	49	246	4	0	2	6	252
M8	2	0	0	1	2	0	1	4	1	0	0	1	5
M7	20							48	0	0	0	0	48
M6	19	7	7	25	53	0	14	46	0	0	0	0	46
M5	5							12	0	0	0	0	12
L2	1	0	0	0	0	0	2	2	0	0	0	0	2
L1	0	0	0	0	0	0	0	0	0	0	0	0	0
EW3	3	0	0	4	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	0
MH1	13	5	0	10	13	0	3	31	0	0	0	0	31
Susp1	19	4	4	12	8	0	18	46	0	0	0	0	46
WN1	11	0	0	15	8	3	0	26	0	0	0	0	26
WLF1	2	0	0	3	2	0	0	5	0	0	0	0	5
Methow total	252	29	17	171	263	3	113	596	5	1	2	8	604
C12	0	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	0
C10	0	0	0	0	0	0	0	0	0	0	0	0	0
C9	2	0	0	0	0	0	5	5	0	0	0	0	5
C8	14	0	0	0	34	0	0	34	0	0	0	0	34
C7	25	0	2	2	45	0	7	56	0	0	4	4	60
C6	16	0	0	0	31	0	2	33	0	0	6	6	39
C5	18	0	0	0	38	0	5	43	0	0	0	0	43
C4	49	0	0	3	94	0	24	114	0	0	4	4	118
C3	3							7	0	0	0	0	7
C2	51	0	4	2	92	2	11	111	4	2	5	11	122
C1	26	0	0	11	43	0	8	62	0	0	0	0	62
Chewuch total	204	0	6	18	377	2	62	465	4	2	19	25	490
T10	0	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	0
T8	0	0	0	0	0	0	0	0	0	0	0	0	0
T7	1	0	0	0	0	0	1	1	0	0	1	1	2
T6	8	6	0	0	0	0	0	6	0	0	13	13	19
T5	7	9	0	0	0	0	0	9	4	4	0	8	17
T4	1	0	0	0	0	0	1	1	2	0	0	2	3
T3	1	0	0	0	0	0	1	1	0	0	0	0	2
T2	0	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	0
Twisp total	18	15	0	0	0	0	3	18	6	4	15	25	43
2003 total	474	44	23	189	640	5	178	1,079	15	7	36	58	1,137

Appendix G. Estimated escapement from 2004 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (Win), 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. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish							Wild fish				Estimated escapement
		L	WB	Win	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	0
M14	9	0	4	0	15	0	0	19	0	7	0	7	26
M13	14	0	8	0	32	0	0	40	0	0	0	0	40
M12	9	0	0	9	13	0	0	22	0	4	0	4	26
M11	10	4	0	0	12	0	0	16	0	12	0	12	28
M10	51	3	6	16	49	0	16	90	0	56	0	56	146
M9	104	13	28	45	82	0	35	203	3	90	0	93	296
M8	3	1	0	0	6	0	2	9	0	0	0	0	9
M7	16	0	0	12	24	0	10	46	0	0	0	0	46
M6	17	3	3	11	21	0	7	45	0	4	0	4	49
M5	0												0
L2	10	0	14	0	15	0	0	29	0	0	0	0	29
L1	5	0	0	3	3	0	0	6	0	8	0	8	14
EW3	10	0	0	0	15	0	7	22	0	7	0	7	29
EW2	0	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	0
MH1	9	5	5	2	13	0	1	26	0	0	0	0	26
Susp1	12	4	4	11	7	0	0	26	0	8	0	8	34
WN1	8	0	4	19	0	0	0	23	0	0	0	0	23
Methow total	287	33	76	128	307	0	78	622	3	196	0	199	821
C12	0	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	0
C10	0	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	0
C8	10	0	0	0	22	0	0	22	0	7	0	7	29
C7	2	0	0	0	3	0	2	5	0	1	0	1	6
C6	19	0	0	0	39	0	10	49	0	5	0	5	54
C5	27	4	0	4	53	0	0	61	0	16	0	16	77
C4	20	4	0	0	42	0	0	46	0	11	0	11	57
C3	0	0	0	0	0	0	0	0	0	0	0	0	0
C2	29	10	4	7	55	0	4	80	0	3	0	3	83
C1	10	0	0	0	21	0	5	26	0	3	0	3	29
Chewuch total	117	18	4	11	235	0	21	289	0	46	0	46	335
T10	0	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	0
T8	1	0	0	0	0	0	0	0	0	2	0	2	2
T7	24	0	0	0	0	0	0	0	0	59	0	59	59
T6	62	31	0	0	0	0	15	46	4	102	0	106	152
T5	26	21	3	3	0	4	1	32	6	26	0	32	64
T4	9	6	0	0	0	0	5	11	0	11	0	11	22
T3	5	0	0	0	0	3	0	3	0	9	0	9	12
T2	8	0	0	0	0	3	0	3	3	14	0	17	20
T1	4	0	0	0	0	0	3	3	3	4	0	7	10
Twisp total	139	58	3	3	0	10	24	98	16	227	0	243	341
2004 total	543	109	83	142	542	10	123	1,009	19	469	0	488	1,497

Appendix H. Estimated escapement from 2005 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop (Win), 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. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish							Wild fish				Estimated escapement
		L	WB	Win	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	0
M14	7	0	0	0	0	0	0	0	0	18	0	18	18
M13	0	0	0	0	0	0	0	0	0	0	0	0	0
M12	10	0	0	0	0	0	10	10	0	15	0	15	25
M11	12	0	11	0	0	0	2	13	0	9	8	17	30
M10	45	11	41	11	4	0	5	72	0	35	7	42	114
M9	136	73	107	46	0	5	42	273	0	54	19	73	346
M8	5	0	9	0	0	0	2	11	0	2	0	2	13
M7	19	13	13	8	0	4	0	38	0	10	0	10	48
M6	18	10	23	7	1	2	2	45	0	1	0	1	46
M5	7	2	8	2	0	0	0	12	0	5	1	6	18
M4	0												0
L2	12	0	4	4	0	0	0	8	0	18	4	22	30
L1	1	0	0	0	0	0	1	1	0	2	0	2	3
EW3	0	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	0
EW1	2	0	0	0	0	0	2	2	0	3	0	3	5
MH1	8	4	8	4	0	0	0	16	0	4	0	4	20
Susp1	7	0	9	3	0	0	0	12	0	6	0	6	18
WN1	5	13	0	0	0	0	0	13	0	0	0	0	13
Methow total	294	126	233	85	5	11	66	526	0	182	39	221	747
C12	3	0	0	0	0	0	0	0	0	7	0	7	7
C11	1	0	0	0	0	0	0	0	0	2	0	2	2
C10	7	2	2	0	0	12	0	16	0	0	0	0	16
C9	0	0	0	0	0	0	0	0	0	0	0	0	0
C8	5	6	0	0	0	0	0	6	0	6	0	6	12
C7	16	5	0	0	2	0	0	7	2	25	4	31	38
C6	33	24	2	0	2	0	0	28	0	47	2	49	77
C5	32	22	0	0	2	0	4	28	0	47	0	47	75
C4	44	44	2	3	7	0	4	60	0	38	5	43	103
C3	10	17	2	0	0	0	1	20	0	3	0	3	23
C2	55	76	8	6	6	0	7	103	0	26	0	26	129
C1	11	13	3	1	1	0	3	21	0	5	0	5	26
Chewuch total	217	209	19	10	20	12	19	289	2	206	11	219	508
T10	0	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	0
T8	0	0	0	0	0	0	0	0	0	0	0	0	0
T7	5	0	0	0	0	0	0	0	0	11	0	11	11
T6	24	4	4	0	0	0	3	11	0	35	7	42	53
T5	10	2	0	0	0	0	5	7	0	15	0	15	22
T4	3	3	0	0	0	0	0	3	0	3	0	3	6
T3	8	2	0	0	0	0	0	2	0	9	7	16	18
T2	4	9	0	0	0	0	0	9	0	0	0	0	9
T1	1	0	0	0	0	0	2	2	0	0	0	0	2
Twisp total	55	20	4	0	0	0	10	34	0	73	14	87	121
2005 total	566	355	256	95	25	23	95	849	2	461	64	527	1,376

Appendix I. Estimated escapement from 2006 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (Win), and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	
M15	6	0	0	0	0	6	6	0	5	0	5	11
M14	17	2	0	0	0	13	15	0	11	3	14	32
M13	5	0	2	0	0	3	5	0	6	1	7	9
M12	20	10	6	4	0	15	35	0	3	0	3	38
M11	24	5	9	4	2	15	35	0	8	2	10	45
M10	36	10	13	25	0	14	62	0	3	3	6	68
M9	173	82	79	91	4	43	299	0	10	16	26	325
M8	9	3	7	0	0	4	14	0	3	0	3	17
M7	59											111
M6	46	64	74	32	0	27	197	0	0	0	0	86
M5	0											0
L2	26	0	0	0	8	0	8	0	41	0	41	49
L1	2	0	0	0	0	1	1	0	3	0	3	4
EW3	9	6	7	0	0	6	19	0	0	0	0	17
EW2	1											2
EW1	4	0	0	0	0	0	0	0	8	0	8	8
MH1	75	48	51	28	0	12	139	0	0	2	2	141
Susp1	36	23	11	11	0	23	68	0	0	0	0	68
WN1	21	0	10	27	0	2	39	0	0	0	0	39
Methow total	569	253	269	222	14	184	942	0	101	27	128	1,070
C12	1	0	0	0	0	2	2	0	0	0	0	2
C11	1	0	0	0	0	2	2	0	0	0	0	2
C10	9	9	0	2	0	1	12	0	5	0	5	17
C9	0											0
C8	10	5	0	1	1	8	15	0	3	1	4	19
C7	32	5	0	0	2	34	41	0	14	5	19	60
C6	54	23	7	4	16	22	72	0	20	10	30	102
C5	22	10	3	0	0	13	26	0	10	5	15	41
C4	63	31	3	14	3	32	83	0	29	15	44	118
C3	5											9
C2	51	36	6	3	19	17	81	0	3	12	15	96
C1	25	26	5	4	3	6	44	0	2	1	3	47
Chewuch total	273	145	24	28	44	137	378	0	86	49	135	513
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	3	0	0	0	0	0	0	0	6	0	6	6
T7	19	9	0	0	0	0	9	0	18	9	27	36
T6	39	21	0	0	0	24	45	0	17	11	28	73
T5	15	19	3	0	0	2	24	0	4	0	4	28
T4	3	0	0	0	0	6	6	0	0	0	0	6
T3	2	4	0	0	0	0	4	0	0	0	0	4
T2	2	1	0	1	0	2	4	0	0	0	0	4
T1	4	5	0	0	0	3	8	0	0	0	0	8
Twisp total	87	59	3	1	0	37	100	0	45	20	65	165
2006 total	929	457	296	251	58	358	1,420	0	232	96	328	1,748

Appendix J. Estimated escapement from 2007 Methow River basin spawning ground surveys. The total of local (L), within-basin (WB) strays, Winthrop stock (W), and out-of-basin (OB) strays are the sum total of expanded CWT recoveries. U = ad-only or unmarked hatchery fish.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	
M15	4	0	0	0	0	7	7	0	3	4	7	14
M14	12						21	0	10	11	21	42
M13	3	5	11	22	15	3	10	0	0	0	0	10
M12	13						25	0	5	15	20	45
M11	15	3	12	6	0	14	35	0	6	12	18	53
M10	19	0	14	7	0	26	47	0	13	7	20	67
M9	84	11	68	125	48	33	285	5	5	6	16	294
M8	2											7
M7	10	10	18	38	0	10	76	1	0	0	1	35
M6	12											42
L2	11	0	0	0	0	0	0	0	0	39	39	39
L1	0	0	0	0	0	0	0	0	0	0	0	0
EW3	3	0	0	0	0	0	0	0	0	10	10	10
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	7	4	4	17	0	0	25	0	0	0	0	25
Susp1	0	0	0	0	0	0	0	0	0	0	0	0
WN1	3	0	0	10	0	0	10	0	0	0	0	10
Methow total	198	33	127	225	63	93	541	6	42	104	152	693
C12	5	0	0	0	0	18	18	0	0	0	0	18
C11	1	0	0	0	0	3	3	0	0	0	0	3
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	7						10	0	7	7	14	24
C7	9	32	5	6	32	18	14	0	0	18	18	32
C6	23						69	0	0	11	11	80
C5	8	7	0	0	14	0	21	0	0	7	7	28
C4	9	7	4	4	0	10	25	0	0	7	7	32
C3	0	0	0	0	0	0	0	0	0	0	0	0
C2	13	8	0	8	8	7	31	0	7	8	15	46
C1	4	1	4	3	0	4	12	1	0	1	2	14
Chewuch total	79	55	13	21	54	60	203	1	14	59	74	277
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	7	0	0	0	0	0	0	0	0	24	24	24
T6	14	28	0	0	0	10	38	0	0	11	11	49
T5	9											32
T4	0											0
T3	0	18	0	0	0	9	27	2	0	3	5	0
T2	0											0
T1	0											0
Twisp total	30	46	0	0	0	19	65	2	0	38	40	105
2007 total	307	134	140	246	117	172	809	9	56	201	266	1,075