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

Via Electronic Filing

April 25, 2012

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, 2011 through December 31, 2011.

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
Natural Resources Supervisor

Enclosure: (1) 2011 Wells HCP Annual Report. Wells Hydroelectric Project No. 2149. March 2012.

Cc: Mr. Walt Davis, FERC, Portland
Mr. James Hastreiter, FERC, Portland
Mr. Erich Gaedeke, FERC, Portland
Mr. Matt Cutlip, FERC, Portland
Wells HCP Coordinating, Hatchery and Tributary Committees
Tom Kahler, Douglas PUD
Greg Mackey, Douglas PUD
Scott Kreiter, Douglas PUD
Brad Hawkins, Douglas PUD

ANNUAL REPORT

CALENDAR YEAR 2011

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
720 Olive Way, Suite 1900
Seattle, Washington 98101
and
Public Utility District No. 1
of Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

March 2012

ANNUAL REPORT
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March 2012

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1 INTRODUCTION

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

Designated representatives of the signatories of the Mid-Columbia HCPs (HCPs for 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 did not meet in 2011 because there were no disputes. However, on November 15, 2011, Chelan PUD convened a Director Level meeting of the HCP signatories to provide an update on the achievement of NNI for the Rocky Reach and Rock Island HCPs, and they invited Douglas PUD to provide an update on the continued achievement of NNI for the Wells HCP. Appendix D lists members of the Wells HCP Committees. The Coordinating Committee for the Wells HCP oversaw the preparation of this eighth Annual Report for calendar year 2011, which covers the period from January 1 to December 31, 2011. (The first through seventh Annual Reports covered January 1 to December 31, 2004 through 2010.)

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 programs and 2 percent through tributary programs (Section 3.1 of the HCP). In 2011, Douglas PUD has successfully met or exceeded all requirements for NNI under the Wells HCP.

The remainder of this section of the report summarizes decisions and agreements reached by the Wells Coordinating, Hatchery, and Tributary committees in 2011 in support of achieving and maintaining NNI. This is followed by individual sections summarizing achievements, actions, and activities specific to the areas of Project survival and dam operations, hatchery compensation, and Tributary Committee funding of habitat protection and restoration.

Throughout 2011, the HCP Coordinating, Hatchery, and Tributary Committees reached agreement on numerous issues during meetings, all of which were documented in the meeting minutes, with many described in stand-alone Statements of Agreement (SOAs). These agreements are summarized in Table 1 and are discussed in the remainder of this report.

Table 1
Summary of 2011 Decisions by the Wells HCP Committees

Meeting Date	Agreement	HCP Committee	Reference
January 25, 2011	Approved the 2011 Wells HCP Action Plan	Coordinating	Appendix A
February 16, 2011	Approved the collection of 75 wild-origin summer/fall Chinook juveniles from the Upper Columbia Evolutionarily Significant Unit (ESU) for a National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center (NWFSC) study	Hatchery	Appendix B
March 16, 2011	Approved the Wells Steelhead Hatchery and Genetics Management Plan (HGMP)	Hatchery	Appendix B and Appendix F
March 22, 2011	Approved the Wells 2011 Juvenile Bypass Operating Plan	Coordinating	Appendix A
April 20, 2011	Approved a NOAA Fisheries request for 4,000 excess Wells yearling summer Chinook for a PIT-tag study at Bonneville Dam	Hatchery	Appendix B
April 26, 2011	Approved a sampling request by Columbia River Inter-Tribal Fish Commission (CRITFC) for a maximum of 870 sockeye from Wells Dam in 2011	Coordinating	Appendix A
June 15, 2011	Approved the 2011 collection of summer Chinook broodstock at the Wells Hatchery for the Entiat National Fish Hatchery (NFH)	Hatchery	Appendix B and Appendix F
June 15, 2011	Agreed to a 1-year implementation of the 2011 Wells steelhead interim marking plan	Hatchery	Appendix B
June 15, 2011	Agreed to implementation of Washington Department of Fish and Wildlife's (WDFW's) electro-anesthesia study	Hatchery	Appendix B
July 14, 2011	Approved funding of the Twisp River Acquisition General Salmon Habitat Project proposal	Tributary	Appendix C
July 14, 2011	Along with Rocky Reach Tributary Committee, approved $250,000 in funding for the Silver Protection General Salmon Habitat Project proposal	Tributary	Appendix C
July 20, 2011	Approved the 2013 NNI Hatchery Recalculation Methodology (for recalculated hatchery production levels)	Hatchery	Appendix B and Appendix F
July 26, 2011	Approved request to implement 2011 Wells Lamprey Operations at the Wells Dam adult fishway entrance to improve lamprey passage	Coordinating	Appendix A and Appendix E
July 26, 2011	Approved an adjustment in timing of future juvenile bypass operations at Wells Dam	Coordinating	Appendix A and Appendix E
August 17, 2011	Approved the Yakama Nation 2012 Expanded Multispecies Acclimation Program Study Plan	Hatchery	Appendix B

Meeting Date	Agreement	HCP Committee	Reference
August 17, 2011	Approved, as final, the hatchery recalculation database (for recalculated hatchery production levels)	Hatchery	Appendix B
August 30, 2011	Agreed to move forward with development of the 2013–2023 NNI Hatchery Implementation Plan (using the recalculated hatchery production levels)	Hatchery	Appendix B
November 17, 2011	Approved Grant PUD's request for utilizing excess capacity at Douglas PUD hatcheries in 2011 as per the Hatchery Sharing Agreement	Hatchery	Appendix B
November 17, 2011	Agreed to conduct the Non-Target Taxa of Concern (NTTOC) risk analysis using recalculated hatchery production numbers	Hatchery	Appendix B
December 14, 2011	Approved Douglas PUD's 2013 NNI recalculated hatchery production levels and 2013–2023 Hatchery Committees' Implementation Plan	Hatchery	Appendix B and Appendix F
December 14, 2011	Approved the Douglas PUD 2012 Hatchery Monitoring and Evaluation (M&E) Workplan	Hatchery	Appendix B

2.1 Project Survival and Dam Operations

2.1.1 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 2). 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 were transferred to the Yakama Nation pursuant to Douglas PUD's coho mitigation agreement. This completes Douglas PUD's coho mitigation obligation through 2017. No changes in phase designations occurred in 2011.

Under Phase III conditions (Standard Achieved), Douglas PUD is required to re-evaluate survival at 10-year intervals following initial completion of three years of valid juvenile project survival studies. Douglas PUD conducted valid juvenile survival studies in 1998, 1999, and 2000. In 2010, Douglas PUD completed the first 10-year juvenile survival validation study, verifying the continued achievement of Phase III (Standards Achieved) for yearling Chinook and steelhead migrating through the Wells Project.

Table 2
Phase Designations for Wells Dam

Plan Species	Phase Designation	Date
Upper Columbia River (UCR) steelhead	Phase III (Standard Achieved)	February 22, 2005; verified November 16, 2010 [1]
UCR yearling spring Chinook	Phase III (Standard Achieved)	February 22, 2005; verified November 16, 2010 [1]
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

Note:
1 Verified in a Statement of Agreement on November 16, 2010, by the Wells HCP Coordinating Committee.

2.1.2 Assessment of Project Survival

As previously reported, 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. As required by Section 4.2.5.1 of the Wells HCP, Douglas PUD re-evaluated survival in 2010, constituting the first 10-year "verification" survival study. The Wells HCP Coordinating Committee selected yearling summer Chinook as representative of spring migrant salmonids (juvenile spring Chinook and yearling summer Chinook and steelhead) for the 2010 study. The results of the 2010 survival study, 96.38 percent Project survival for yearling Chinook smolts, confirmed the continued achievement of Phase III (Standards Achieved) for yearling Chinook and steelhead migrating through the Wells Project, even during the second lowest flow year in the past 25 years. Douglas PUD is required to re-evaluate juvenile project survival for yearling migrants again in 2020.

2.1.2.1 Adult Passage Monitoring

When the HCP was completed in 2002, the signatories acknowledged that no scientific methodology currently existed 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 marine mammals and harvest activities; or fish not detected for other reasons, such as spawning in locations downstream from Wells Dam or loss of body cavity PIT-tags due to gonadal maturation during migration). This limitation remains—technology still does not allow a determination of the fates of tagged fish detected passing a dam but not detected at the next dam upstream—but calculations of total losses of tagged fish between projects provide a means for evaluating compliance with the HCP standards for adult passage. Sequential detections of PIT-tagged adult salmonids through PIT-tag-detection systems in the fishways of each dam provide data for calculating conversion rates through the hydrosystem. Calculated per-project conversion rates furnish sufficient evidence for the achievement of adult survival standards, in that project-related mortality must be below 2 percent when per-project conversion rates exceed 98 percent.

Table 3 details, for all run-years available, PIT-tag detections at Priest Rapids Dam of known-origin adult spring and summer Chinook salmon and steelhead, the number of those adults redetected at the fishway exits 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. The per-project conversion rate is 99.2 percent for spring Chinook (that is, mortalities from all sources averaged less than 2 percent through each project), is 98.2 percent for steelhead, and is just under 98 percent for summer Chinook. All summer Chinook used in the conversion-rate analyses originate from Wells and Eastbank hatcheries below Wells Dam, as do most steelhead, and these fish are also subjected to popular recreational fisheries between Priest Rapids and Wells dams. Spring Chinook are not subjected to a fishery in the mainstem Columbia between Priest Rapids and Wells dams. Insufficient numbers of sockeye have been PIT-tagged to develop a per-project conversion rate.

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 Return Years 2004-2011	5,947	5,532	93.0%	98.2%
All Releases[3] Spring Chinook Return Years 2003-2011	667	646	97.0%	99.2%
All Releases[4] Summer Chinook Return Years 2003-2004, 2011	283	255	90.1%	97.4%

Source: Columbia River DART website: http://www.cbr.washington.edu/dart/pit_obs_adult_conrate.html
Notes:
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: BEAV2C, CHEWUR, GOLD2C, LIBBYC, METH, METHR, METTRP, OKANR, OMAKC, SGOLDC, SIMILR, TWIS2P, TWISPR, TWISPW, WINT, and STAPAC. Please note that many fish detected at Priest Rapids in 2011 will not pass Wells Dam until spring of 2012.
3 Spring Chinook salmon released into Methow River System—PIT-tag release site designations: CHEWUP, METH, METHR, METTRP, TWISPP, TWISPR, BEAV2C, WINT, and WOLFC. Minijacks were excluded from the calculations.
4 Summer Chinook salmon released into Columbia River System above Wells Dam—PIT-tag release site designations: CARP, METHR, and OKANR. Minijacks were excluded from the calculations. All summer Chinook in these release groups originated from hatcheries below Wells Dam.

Conversion rates provide a minimum survival estimate between 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). As noted above, conversion rates reflect a combination of mortality attributable to both non-project related causes (e.g., recreational and tribal harvest, predation, and disease) and dam passage, as well as non-detections resulting from straying and spawning below Wells Dam. For this reason, the actual per-project survival rate for adult Plan Species exceeds the 98 percent per-project assumption set forth in the HCP.

Although not addressed in the HCP, passage of adult bull trout was considered in the operation of Wells Dam in 2011. In 2004, FERC issued an order incorporating the HCP and the U.S. Fish and Wildlife Service's (USFWS's) *Bull Trout Biological Opinion* into the FERC license for the Wells Dam Project. Article 62 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*. On December 24, 2008, Douglas PUD filed a report of bull trout monitoring and management activities conducted in 2005 and 2006, through late 2008. In March 2010, Douglas PUD filed a 2009 Bull Trout Monitoring and Management Plan annual report with FERC that included activities that occurred from late 2008 through 2009. On March 28, 2011, Douglas PUD filed with FERC the 2010 Wells Bull Trout Monitoring and Management Plan Annual Report that included activities that took place between January 1, 2010 and December 31, 2010 (Appendix N). The next reporting deadline associated with reporting annual activities for the *Bull Trout Monitoring and Management Plan* is March 31, 2012 (2011 Wells Bull Trout Monitoring and Management Plan Annual report).

2.1.2.2 Completed Studies 2011

Douglas PUD documented the removal of 16,302 northern pikeminnow from the Wells Reservoir and tailrace during annual removal efforts occurring from April 7 to November 11, 2011. Catch Per Unit Effort (CPUE) levels in 2011 were the lowest to date of any of the annual pikeminnow removal projects. A trend in decreased annual CPUE has been documented over the previous 8 years. This suggests that removal efforts are effectively reducing the pikeminnow population within Wells Reservoir and the Wells tailrace area. Additionally, high spring flows in the Columbia River during 2011 prevented pikeminnow capture during the seasonal period when capture has been historically the highest. From 1995 to present, the pikeminnow removal programs, funded by Douglas PUD, have resulted in the removal of approximately 228,000 pikeminnow from the Wells Project. Annual capture numbers have ranged from approximately 22,000 to 16,000 fish over the last 10 years, with a decreasing trend observed over the last 3 years. A comprehensive review of

2011 efforts will be presented to the Wells Coordinating Committee and Aquatic Settlement Work Group in early 2012.

In 2009 and 2010, Douglas PUD conducted studies of fishway entrance efficiencies for lamprey at both 1.0-foot and 1.5-foot head differentials in water surface elevations between the Wells fishway collection gallery and the Wells tailrace, using Dual Frequency Identification Sonar (DIDSON) cameras. The effect of the different operating conditions on Wells fishway residency times for salmonids was evaluated by species. In 2009, no differences were detected in fishway residency times for any salmonid species evaluated (coho, sockeye, steelhead, and Chinook), although the sample size was too low to detect significant differences. In 2010, there was a large sample size of steelhead and Chinook and no differences were detected at either the 1.0-foot or 1.5-foot head differential. Based on the study findings, it was concluded that lamprey appeared to have increased entrance efficiency at the 1.0-foot head differential with no apparent decrease in salmonid passage. National Oceanic and Atmospheric Administration (NOAA Fisheries) questioned whether the statistical tests applied were appropriate for the study design, and requested additional statistical analysis of the data on salmonid passage during the lamprey studies. That additional analysis is forthcoming in 2012.

In March 2011, at the direction of the Wells Coordinating Committee, Douglas PUD conducted a test of entrance velocities at the Wells Dam fish ladder using Acoustic Doppler Velocimeters (ADV). Entrance velocities between the collection gallery and the tailrace were measured at a high and a low tailwater elevation with both a 1.5-foot and a 1-foot head differential. Of particular interest was an analysis of the extent to which the 1.5-foot head differential would present difficulties for lamprey attempting to enter the fishway, and the extent to which a reduced head differential would impact attraction flows for salmonids. Tests identified velocities at the entrance sill greater than the burst speed of adult lamprey at the 1.5-foot head differential, but lower than lamprey burst speed at the 1-foot head differential. These results support the DIDSON study results identifying improved entrance efficiencies for lamprey at the 1-foot differential.

In 2011, Douglas PUD conducted an analysis comparing 2005 through 2010 migration timing of salmon and steelhead to the timing of operation of the Wells bypass. According to the

Wells HCP, Wells bypass operations must provide bypass passage for 95 percent of the spring and summer HCP Plan Species outmigration. Results of the analyses indicated that the spring operation was covering steelhead and sockeye salmon, but fell just short of full coverage for yearling Chinook in 2005 and 2007. Summer bypass operations were found to fully cover migrating subyearling Chinook; operations could have been shut down earlier in each of the 6 years analyzed and still would have provided greater than 95 percent protection. Based on this analysis, juvenile bypass operations at Wells Dam will be adjusted in 2012 to commence at 0000 hours on April 9 (three days earlier than the current start date of April 12) and end at 2400 hours on August 19 (7 days earlier than the current end date of August 26). Following the 2011 juvenile bypass period, Douglas PUD conducted an analysis of the spring and summer migration season to evaluate whether Douglas PUD would have met the HCP standard for passing at least 95 percent of summer and spring migrants with the agreed upon new spill start and stop dates of April 9 and August 19, respectively. The analysis verified that had the new bypass dates been implemented during 2011, 95 percent of both the spring and summer juvenile migration would have passed during bypass operations.

In 2010, Douglas PUD and Chelan PUD initiated a study of life history diversity of subyearling Chinook salmon originating in the upper Columbia River. A focus of the study was to determine outmigration timing and size-at-migration, both necessary steps before attempting to estimate survival of migratory summer/fall Chinook salmon. However, the initial year of study (2010) revealed limited numbers of PIT-tagged subyearlings in the Upper Columbia. Accordingly, Douglas PUD conducted a pilot study in 2011 to investigate spatial and temporal distribution of subyearling Chinook in the Wells Reservoir and to identify opportunities to increase the numbers of PIT-tagged subyearling Chinook for the life history investigation. In 2011, Douglas PUD staff tagged and released 13,223 subyearling Chinook, and successfully captured over 17,000 wild subyearling Chinook. The highest CPUE occurred in clear water with cobble bottom just outside the Okanogan River confluence plume. Douglas PUD is monitoring these PIT-tagged individuals as they move through the Columbia River hydrosystem and will track their progress through their return migration as adults. A final report of 2011 tagging efforts and migration tracking will be available in the spring of 2012.

2.1.2.3 Planned Studies 2012

Section 4.3.2 of the HCP requires Douglas PUD in 2012 to conduct a 10-year verification of the effectiveness of the timing of bypass operations at Wells Dam in passing 95 percent of the spring and summer migration of HCP Plan Species. Historically, hydroacoustic and fyke-netting studies at Wells Dam provided the data on passage timing necessary to determine the timing of annual bypass operations. Douglas PUD discussed the requirement found in Section 4.3.2 of the HCP with the Wells Coordinating Committee in early 2011 toward planning for a study in 2012. The Wells Coordinating Committee representatives at first questioned the need for such a study. As an alternative to using the past methods of hydroacoustic monitoring and fyke netting for species verification, Douglas PUD proposed to instead verify run-timing by comparing Rocky Reach Dam juvenile bypass index samples to bypass operations at Wells Dam, using the run-timing of fish passing through the Rocky Reach Juvenile Fish Bypass (RRJFB) as a surrogate for run timing at Wells Dam. As described in Section 2.1.2.2, results of the analysis of run timing at the RRJFB confirmed that in most years the Wells bypass was appropriately operated to cover 95 percent of the spring and summer migration at Wells Dam. However, two years of the past six years, an earlier start of the Wells bypass would have provided additional benefits to spring Chinook. Also, the analysis determined that the Wells bypass system could have been shut down earlier in each of the six years analyzed and would still have provided greater than 95 percent protection for summer migrating Chinook. The Wells Coordinating Committee agreed that this data would be used to guide the operations of the Wells Bypass System starting in 2012 (Appendix E). Douglas PUD will repeat the analysis in 2012 following the termination of sampling at the RRJFB, as they did in 2011.

In 2012, Douglas PUD had planned to study passage performance of PIT-tagged lamprey through the Wells fishways under different operating conditions using half-duplex (HD) PIT-tag detection systems. However, due to the late release of the new HD-PIT detection transceiver (FS2020) by Biomark and due to the short (2 weeks) maintenance window in 2011/2012 for the east fish ladder, as described in Section 2.1.3.2, installation of the HD PIT detection arrays in the east fishway has been delayed until the winter of 2012/2013. Installation of the HD-PIT system in the east ladder is moving forward as planned. Consequently, Douglas PUD no longer anticipates conducting a passage study of PIT-tagged lamprey in 2012. However, they do intend to request approval from the HCP Coordinating

Committees to implement lamprey operations in 2012 as was approved for 2011 and described in Section 2.1.3.1.

Douglas PUD will continue the annual implementation of pikeminnow removal program in 2012.

Douglas PUD will implement a second year of study on the life-history diversity of subyearling Chinook in the Wells Reservoir, using the same methods as in the 2011 pilot study. In 2012, Douglas PUD hopes to identify productive capture locations near the mouth of the Methow River, similar to those identified near the mouth of the Okanogan River in 2011, to increase sample size, refine capture techniques, and examine annual changes in subyearling migration, behavior, and growth rates.

In response to the request by NOAA Fisheries, Douglas PUD will provide the HCP Coordinating Committees with a re-analysis of the data on salmonid passage from the 2009 and 2010 studies of lamprey operations. The original analysis used a different statistical test for each year to evaluate passage effects on Chinook and steelhead related to the change from a 1.5-foot head differential to a 1.0-foot head differential at the Wells fishway entrance. Columbia Basin Research, University of Washington, School of Aquatic and Fishery Sciences, will perform the statistical analyses.

2.1.3 Project Operations and Improvements

This section summarizes project operations toward meeting and maintaining HCP requirements at Wells Dam in 2011. Actions in 2011 were guided by the 2011 Wells HCP Action Plan (Appendix I), as approved by the Coordinating Committees (Appendix A).

2.1.3.1 Operations

As in past years, operation of the juvenile bypass system in 2011 was guided by the Juvenile Bypass Operating Plan (Appendix G) and criteria contained within Section 4.3 of the Wells HCP. The 2011 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 used a total discharge of 18.83 million acre feet (MAF), or 5.0 percent of total project discharge volume. Summer bypass started on June 14 at 0000 hours and ran until August 26 at 2400 hours, for a total of 74 days. There were 25.86 MAF, or 5.1 percent of the total discharge volume, dedicated to summer bypass. River flows at Wells Dam during the 2011 juvenile migration of Plan Species (April to August) were at 122 percent of the 20-year average, and the third highest during that period (behind 1996 and 1997).

Exceptionally high flows began in mid-May and persisted into August. As a result, some exceptions to normal bypass operations occurred during 2011. To manage total dissolved gas (TDG) levels, and as required by the 2011 Wells Emergency Action Plan to meet the Washington State Department of Ecology (Ecology) and FERC requirements, Bypass Barrier 6 was pulled on May 14, 2011. Following increasing flows, on May 20, 2011, bypass barriers were removed from Spill Bays 4 and 8. Finally, on June 1, 2011, near the peak of the hydrograph, bypass barriers were removed from Spill Bay 2. As flows declined, reinstallation of bypass barriers occurred in the reverse order of their removal, to maintain the bulk of the spill in the center of the project. Thus, bypass barriers were reinstalled in Spill Bays 2, 4, 8, and 6 on July 5, July 18, July 29, and August 4, 2011, respectively.

In July 2011, the HCP Wells Coordinating Committee approved implementation of a 1.0-foot head differential at Wells Dam fishway entrances (lamprey operations) during the 2011 lamprey migration to enhance lamprey entrance success. Studies in 2009 and 2010 at Wells Dam indicated that the reduction of the fishway collection gallery-to-tailwater head differential from 1.5 feet to 1.0 foot may enhance lamprey entrance efficiencies into the Wells Dam fishways by reducing velocities at the entrance. Prior to approving the changes, an evaluation of the effects of the change in entrance velocities on steelhead passage rates was conducted. The evaluation showed no differences in passage rates for steelhead in 2009 and 2010. Timing of the initiation of lamprey operations at Wells Dam fishways was based on lamprey passage numbers at Rocky Reach Dam and began at 1700 hours on August 19, 2011. The 1.0-foot differential was implemented from 17:00 hours to 00:59 hours each night from August 19 to September 30, 2011. Douglas PUD committed to conducting a full study of the effects of the 1.0-foot head differential on salmonid passage rates prior to considering any permanent change in fishway operations.

A contingency bypass operations plan was developed and included as part of the 2011 Bypass Operations Plan to prescribe bypass operations to implement in the event of a mechanical failure affecting operations of the bypass system, similar to what occurred in 2010 when a gate-hoist cable broke. On June 1, 2011, Wells Dam maintenance staff discovered that a cable on spillway No. 6 needed immediate repair to avoid a breakage that would have resulted in loss of control of the flows within spillway No. 6. The emergency repair was implemented along with temporary operations to provide sufficient excess spill so as not to exacerbate flooding in the Okanogan River. The repair took less than 1 day to complete and ensured that spillway 6 would be available for bypass operations once the flood flows subsided and total spill at the dam dropped back to more manageable levels.

2.1.3.2 Improvements

Facility improvements and maintenance at Wells Dam in 2011 that had the potential to affect Plan Species included the following activities.

The fishways at Wells Dam are inspected annually during each winter, and each fishway receives, according to an alternating schedule, either a routine annual or more substantial bi-annual maintenance. The east fishway was taken out of service for bi-annual inspection and maintenance from January 6 through January 26, 2011. The east fishway was again taken out of service in 2011 for inspection and annual maintenance from December 7 through December 22, 2011. The west fishway will receive bi-annual inspection and maintenance in January 2012. Besides annual and bi-annual servicing of the fishways, the hydromechanics at Wells Dam also replaced the drain valves in the collection gallery of the west fishway, with the intention of increasing control over the drainage process and improving drainage rates.

During dewatering for normal 2011/2012 winter annual maintenance of the east and west fishways, Douglas PUD planned to install HD PIT tag detection arrays in each ladder; however, due to delays with the manufacturing and delivery of the new equipment and unforeseen design complications associated with potential interference with the existing full duplex (FD) PIT tag detection system, the HD PIT detection arrays were not installed in the east fishway as planned. It is anticipated that the HD PIT detection arrays will be installed in the west fishway during the January 2012 maintenance period, and in the east fishway during December 2012 and January 2013.

2.2 Hatchery Compensation

As required by the HCP, Douglas PUD supported hatchery production in 2011 to compensate for unavoidable project mortality and loss of habitat resulting from 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.

The HCP Hatchery Committees reviewed the 2011 Broodstock Collection Protocols in March and April 2011 (for Chinook, sockeye, coho, and steelhead). The protocols were finalized in April 2011 and implemented at program hatcheries (Appendix H); in-season revisions were made as needed in coordination with the Wells Hatchery Committee. Coho broodstock collection protocols were provided by the Yakama Nation and incorporated into the 2011 Broodstock Collection Protocols. The 2011 Broodstock Collection Protocols were intended to guide the collection of salmon and steelhead broodstock in the Methow, Okanogan, Wenatchee, and Columbia River basins. The protocols are consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation) and mitigation production levels (HCPs, Priest Rapids Dam 2008 Biological Opinion), and they comply with Endangered Species Act (ESA) permit provisions. Hatchery compensation for NNI and inundation compensation in 2011 included the release of 990,682 yearling and 442,821 subyearling salmonids from hatcheries associated with the Wells Project (Tables 4 and 5). These totals do not include the increased production of natural-origin sockeye smolts attributed to Douglas PUD's sockeye NNI compensation—the continued implementation of the Fish-Water Management Tool project administered by the Okanagan Nation Alliance and funded by Douglas PUD. The total also does not include NNI compensation paid by Douglas PUD to the Yakama Nation for the Coho Enhancement Program in the Methow Basin. Lastly, these totals also do not include the Methow Basin spring Chinook raised by Douglas PUD for Chelan and Grant PUDs or the yearling steelhead produced at the Wells Hatchery by Douglas PUD for Grant PUD.

2.2.1 Hatchery Production Summary

Tables 4 and 5 summarize and compare HCP hatchery production objectives and actual 2011 production levels for both the fixed hatchery compensation for original inundation, harvest enhancement programs, and HCP passage loss (NNI) compensation programs.

2.2.1.1 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 of fish to be released each year for the Inundation and Harvest Enhancement Program can be found in Section 8.4.6 of the Wells HCP Agreement.

Table 4
Production Objectives and Release Numbers for the Inundation and Harvest Enhancement Programs in 2011

Inundation and Harvest Compensation Program	Numeric Target	Number Released
Yearling Summer/Fall Chinook (2009 BY)	320,000	446,313[1]
Subyearling Summer/Fall Chinook (2010 BY)	484,000	442,821[2]
Yearling Summer Steelhead (2010 BY)	300,000	322,130[3]

Notes:
1 C. Snow (WDFW 2011, personal communication) for the total released. Total release includes approximately 96,587 fish originally reared for a DCPUD survival study.
2 C. Snow (WDFW 2011, personal communication) released on May 19, 2011
3 C. Snow (WDFW 2011, personal communication).

2.2.1.2 NNI Compensation Program

Section 8.4.3 of the Wells HCP contained the initial numbers of juvenile HCP Plan Species to be produced to meet Douglas PUD's NNI production levels for unavoidable juvenile losses at the Wells Project. These initial production targets were adjusted downward in 2011 following the demonstration of higher than expected survival through the Wells Project for spring migrating yearling Chinook and steelhead. The new NNI production goals for 2011 are contained in Table 5 (Numeric Target). 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 Released in 2011

NNI Compensation Program	Numeric Target	Number Released
Yearling Summer Steelhead (2009 BY)	47,571	51,080[1]
Yearling Summer/Fall Chinook (2008 BY)	105,714	109,915[2]
Yearling Spring Chinook (2008 BY)	59,464	61,244[3]
Yearling Osoyoos Lake Sockeye[4]	NNI achieved by annually funding the Fish-Water Management Tool	
Methow Coho[5]	NNI achieved by payment to the Yakama Nation for the Coho Enhancement Program in the Methow Basin	

Notes:

1 C. Snow (WDFW 2011, personal communication).

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

3 There were 504,906 spring Chinook smolts released from the Methow Hatchery in 2011 (May 2011 Memo from C. Snow), and an additional 59,980 spring Chinook from Methow Hatchery were transferred to the Yakama Nation and released into Wolf Creek (Biddle's Pond). The target release of 550,000 fish was a combination of Wells NNI (59,464) and the sharing agreements with Chelan PUD (288,000) and Grant PUD (201,000). Releases from the Yakama Nation and Methow Hatchery were combined and the excess applied to the three mitigation/compensation programs, giving Wells NNI 61,244fish, Chelan PUD 296,623 fish, and Grant PUD 207,018 fish in 2011.

4 Okanogan Sockeye obligation for NNI is covered by Douglas PUD funding of the Fish-Water Management Tool (FWMT) program (Wells HCP, Sections 8.4.4 and 14, Figure 3) managed through the Okanagan Nation Alliance.

5 NNI for Methow coho is achieved through the funding provided to the Yakama Nation for the Coho Enhancement Program as approved by the HCP HC at the December 12, 2007 meeting.

2.2.2 Hatchery Planning

2.2.2.1 Monitoring and Evaluation Plan Implementation

In 2007, Douglas PUD and Washington Department of Fish and Wildlife (WDFW) updated the 2005 Monitoring and Evaluation (M&E) Plan for the operation of Douglas PUD hatchery programs. The M&E Plan is implemented to assist in the determination of whether the specific hatchery objectives defined by the HCP are being met (the M&E Plan is 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 2011 in accordance with two documents: the *Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs*, prepared in 2006 (and updated in 2007), 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 2012 M&E Implementation Plan was approved by the Hatchery Committees in December 2011 (Appendix O). The Douglas PUD M&E Report documenting M&E activities in 2010, titled *Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2010*, was finalized in September 2011 after a 60-day review and approval by the Hatchery Committee; it is included in this annual report as Appendix K. A similar report will be completed in 2012 for 2011 monitoring and evaluation of natural production and hatchery operations.

2.2.2.2 Five-Year Monitoring and Evaluation Report

During 2011, as directed by the HCP (Section 8.5.1), Douglas PUD conducted an analysis of available salmon and steelhead survival and productivity data for use in evaluating the performance of Douglas PUD's spring Chinook and steelhead hatchery supplementation programs over the past five years (2006 through 2011). This 5-Year M&E Report will be the first 5-year report written under the direction of the HCP. At the November 2011 Hatchery Committees' meeting, Douglas PUD's hatchery monitoring and evaluation contractor (WDFW) presented the preliminary results of the analysis conducted for the 5-Year M&E Report (Appendix B). Douglas PUD anticipates having a draft 5-Year M&E Report ready for review by the Hatchery Committees in early 2012 with a final report due by mid-2012.

2.2.2.3 Hatchery and Genetic Management Plans

In October 2008, NOAA Fisheries requested that the Wells HCP Hatchery Committee prepare updated Hatchery and Genetic Management Plans (HGMPs) for Douglas PUD hatchery programs, including the Methow spring Chinook and Wells steelhead hatchery programs. NOAA Fisheries will use the new HGMPs to write new Biological Opinions and issue new Incidental Take Permits for those programs. The HGMP for the Methow Hatchery Spring Chinook Program was developed and refined throughout 2009 and approved by the Wells HCP Hatchery Committee on February 17, 2010 (Appendix B), and was then submitted to NOAA Fisheries for ESA consultation on March 12, 2010.

The Wells Hatchery Steelhead HGMP took longer to develop, requiring most of 2009 and 2010. The extended time required to reach consensus on this HGMP was largely the result of efforts to coordinate federal, state, and tribal interests in the Methow Basin. On March 7, 2011, the Wells HCP Hatchery Committee approved the Wells Hatchery Steelhead HGMP (Appendix B), which was then submitted to NOAA on April 13, 2011 for ESA consultation. In November 2011, NOAA Fisheries began reviewing the Wells steelhead HGMP.

2.2.2.4 2013–2023 NNI Recalculation

Section 8.4.5 of the Wells HCP requires that hatchery production, except for original inundation mitigation, be adjusted in 2013 and every ten years thereafter to achieve and maintain NNI. In September 2010, the process to recalculate hatchery production was initiated within the HCP Hatchery Committees (Appendix B, Appendix F, and Appendix M). Recalculated hatchery production levels are scheduled for release beginning in 2013 (steelhead) and 2014, which requires adjustments to broodstock collection as early as 2012. After approving a method for recalculating hatchery production on July 20, 2011 (Appendix F), and approving as final a database containing the numeric inputs for use in the recalculation efforts on August 17, 2011, on December 14, 2011, the Hatchery Committees approved recalculated hatchery production levels for Douglas PUD's NNI supplementation programs for 2013 through 2023 (Table 6 and Appendix F).

Table 6
Douglas PUD's 2011 and recalculated (2013-2023) NNI hatchery obligations by species.

Species	Facility	Recalculated Obligation	2011 HCP Obligation
Spring Chinook	Chief Joseph	33,300	- -
	Methow	29,123	59,464
Summer Chinook	Chief Joseph (yearling)	48,100	- -
	Chief Joseph (subyearling)	49,000	- -
	Carlton Pond (yearling)	0	105,714
Steelhead	Wells	8,000	47,571
Sockeye	NNI met through funding of Fish-Water Management Tool		
Coho	Funding Agreement for the Yakama Nation Coho Reintroduction Program		

2.2.2.5 Hatchery Production Management Plan

In 2011, WDFW, in coordination with the HCP Hatchery Committees, drafted a Hatchery Production Management Plan to document criteria, measures, and actions that contribute to better meeting hatchery production targets, and minimize overproduction. Although not finalized in 2011, WDFW began implementing those actions identified in the draft 2011 Hatchery Production Management Plan for which there was support among the fishery co-managers. Once finalized and approved, the Hatchery Production Management Plan will be included as an appendix to the annually prepared Broodstock Collection Protocols.

2.2.2.6 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 review of risks to NTTOC using an expert-panel and 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, in November 2008. The final documentation for this decision, titled *Summary and Strategy for Monitoring and Evaluation Plan Objective 10 (NTTOC)*, was made available as Attachment B to the January 21, 2009, Hatchery Committees' meeting minutes.

In August 2009, the Hatchery Committees directed the Hatchery Evaluation Technical Team (HETT) to conduct the NTTOC assessment. For Hatchery Committees' review, input, and approval, the HETT developed a list of regional and local ecological experts to invite to serve on a panel to estimate the risk of HCP Plan Species hatchery programs to NTTOC, developed a strategy and logistics for conducting the assessment panel workshops (by phone, in person, or a combination of the two), and scheduled the workshops. In 2010, the HETT worked on completing the NTTOC risk assessment template (a dataset structured for modeling and expert panel review) and a draft manuscript describing the risk assessment approach. The template and the manuscript will be provided to potential panel members, along with a cover letter requesting their participation. In May 2011, the risk assessment manuscript was completed, and in October 2011, the HETT completed the risk assessment template. In November 2011, the Hatchery Committees directed the HETT to use the recalculated hatchery production numbers in the risk assessment. In January 2012, the HETT will begin working on preliminary runs of the risk assessment model using the recalculated production numbers.

2.2.2.7 M&E Program Reference/Control Groups

In 2007, the HETT was tasked with making recommendations to the Hatchery Committees on reference/control streams for the Chelan and Douglas PUDs' Hatchery M&E Programs. The HETT develop a three-phased approach for selecting reference populations. Phase I included the identification of non-supplemented populations within the Columbia River and Fraser River basins. Phase II included a coarse screening of all populations identified during Phase I. The coarse screening phase included examination and comparison of life-history characteristics, proportion of hatchery-origin spawners, length of population time series, sampling methods, freshwater habitat trends, and out-of-basin effects. Populations that met these criteria were then evaluated in more detail under Phase III, which included examination of correlations, trends, and minimal detectable differences in spawner abundance, natural-origin recruits (NORs), and productivity. The HETT developed density-dependent corrections for analysis of NORs and productivity. In addition, as part of Phase III, the HETT developed an analytical model that scored the relationship between potential reference populations and supplemented populations. The analyses included population performance metrics (spawner abundance, NORs, and productivity) with and without density-dependent corrections. Populations that scored 81 or higher (out of 100 possible points) were considered suitable reference populations.

The HETT identified reference populations for the Chiwawa, Methow, Twisp, and Chewuch spring Chinook programs. They also found a suitable reference population for the Wenatchee, Methow, and Okanogan summer Chinook programs. The Methow, Twisp, and Chewuch reference populations were used in analyses for the 5-year M&E report (Section 2.2.2.2). They did not find suitable reference populations for sockeye or steelhead. For steelhead, however, additional data have recently become available. Therefore, the HETT will re-evaluate potential steelhead reference populations in 2012.

2.2.2.8 Wells Steelhead Interim Marking Plan

In April 2011, Douglas PUD began working with WDFW to develop marking alternatives for Douglas PUD hatchery-produced steelhead. Section 10(a)(1)(A) of the ESA requires all operators of artificial propagation program in waters with ESA-listed species to undergo consultation with NOAA and to obtain a permit authorizing the take of ESA-listed species through operation of their program (Permit 1395). Douglas PUD's Permit 1395 for the operation of the Wells steelhead program requires all hatchery-produced fish to be externally marked to support monitoring and evaluation efforts assessing survival rates and straying levels for Wells hatchery-produced steelhead. In May 2011, WDFW presented to the Hatchery Committees a proposed interim steelhead marking plan for steelhead produced at the Wells Fish Hatchery for Douglas PUD and Grant PUD. On June 15, 2011, the Hatchery Committees approved the Steelhead Interim Marking Plan for a 1-year implementation in 2012, while the Joint Fisheries Parties (JFP) develop an overall steelhead marking strategy for Upper Columbia steelhead.

2.2.2.9 Steelhead Reproductive Success Study

Section 8.5.3 of the Wells HCP requires Douglas PUD to fund and implement a steelhead reproductive success study (RSS). On February 1, 2010, the Wells HCP Hatchery Committee approved the Twisp Steelhead Reproductive Success Study plan. The study covers a 12-year period beginning in 2010 (and also includes samples collected in 2009), focusing on an adult-to-adult assessment of relative reproductive success of hatchery and wild fish, and includes the measurement of covariates of fitness. The study is designed to provide data to distinguish genetic and environmental influences on reproductive success. Study results will be used in management of summer steelhead in the Methow subbasin.

In 2010, genetic analyses were completed by the WDFW Molecular Genetics Laboratory on the first two brood years in the study of adult steelhead returns to the Twisp River. Fish were genotyped used 192 single nucleotide polymorphism (SNP) loci. For brood year 2009, 361 adult steelhead were genotyped, and for brood year 2010, 346 adult steelhead were genotyped. The loci were assessed for appropriateness for the Twisp steelhead population and study goals, and several population genetic analyses were conducted. These data will be used to conduct parentage analysis in future years. Field work for this study was conducted under the Monitoring and Evaluation program (see Section 2.4.2.1, M&E Plan Implementation).

2.2.2.10 Multi-species Acclimation at Twisp Pond

In the spring of 2011, the Hatchery Committees agreed on a trial of mixed-species acclimation at Twisp Pond in the Methow Basin using steelhead and spring Chinook. Regular observations suggested the absence of negative interspecies interactions during the acclimation, and there were no indications that co-acclimation resulted in increased mortalities for either species once co-mingled in the pond.

2.2.3 Maintenance and Improvements

Several minor maintenance and improvement activities were completed in 2011 in support of hatchery production under the Wells HCP. These activities included completion of a new pollution-abatement system at the Methow Fish Hatchery, installation of variable frequency drive controllers to several of the large groundwater hatchery pumps located at the Methow and Wells hatcheries, and completion of upgrades to the west ladder trapping, holding, and adult handling/spawning facilities associated with the Wells Fish Hatchery.

2.3 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. During 2011, the Tributary Committees met on ten different occasions.

An initial task of the Tributary Committees in 2011 was to review and update their operating procedures that provide a mechanism for decision making; these were initially developed in 2005 and were included in the 2005 annual report (Anchor 2005)[1]. The Tributary Committees also developed Policies and Procedures for soliciting, reviewing, and approving project proposals (Anchor 2005); this document was last reviewed and updated in January 2011. 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 Tributary Committees established two complementary funding programs, the General Salmon Habitat Program and the Small Projects Program.

2.3.1 Regional Coordination

Similar to the Hatchery Committees and to improve coordination, a representative from Grant PUD and the facilitator of the Priest Rapids Coordinating Committees (PRCC) Habitat Subcommittee were invited to the Tributary Committees monthly meetings. In addition, they received 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 Habitat Subcommittee facilitator have no voting authority. The Tributary Committees, through the Coordinating Committees, also invited American Rivers and the Confederated Tribes of the Umatilla Indian Reservation to participate in Tributary 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

[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.

deliberations of the Tributary Committees in 2011, nor did they respond to offers to participate in a Fish Forum designed to provide a summary of annual progress implementing the HCPs.

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. The Tributary Committees also invite representatives from the UCSRB to at least one meeting per year to update the Tributary Committees on activities proposed by the Board. In addition, some members of the Tributary Committees typically attend the UCSRB meetings to foster coordination in developing and selecting projects for funding. Some members of the Tributary Committees are also members of the UCSRB's Regional Technical Team (RTT), which increases coordination in selecting projects for funding. The Tributary Committees utilize the RTT as a regionally accepted source of technical review for projects submitted under the Tributary Committees' General Salmon Habitat Program. 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.

The Tributary Committees held funding coordination meetings with the UCSRB, RTT, PRCC Habitat Subcommittee, Yakama Nation, Colville Tribes, and Bonneville Power Administration in July and September 2011. The purpose of the meetings, according to Section 2 of the Tributary Fund Policies and Procedures for Funding Projects, was to collaborate with regional, local, state, tribal, and national organizations that fund salmon habitat projects. The meetings served to unify funding entities in project prioritization and resulted in identification of cost-shares for suitable habitat restoration projects.

2.3.2 Fiscal Management of the Wells Plan Species Account

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 internally manage the accounting services for the Wells Plan Species Account (Account), and to structure the relationship between Douglas PUD and the Account so that it can invoice these administrative costs to the Account.

On September 15, 2004, Douglas PUD provided an initial contribution of $2,272,740 ($1,982,000 in 1998 dollars) to establish the Account. This initial lump-sum contribution covered Douglas PUD's obligation for the first five years of the HCP agreement. Section 7.4 of the Wells HCP describes options for contributions to the Account subsequent to the initial contribution. In January 2009, the Wells Tributary Committee recommended to the Fisheries Parties (via the Wells Coordinating Committee) that Douglas PUD make annual payments of $176,780 (in 1998 dollars) to the Account beginning in 2010, per Section 7.4.1 of the Wells HCP. In February 2009, the Wells Coordinating Committee accepted the Tributary Committee's recommendation. Douglas PUD made the first annual payment in January 2010, and will continue with subsequent payments each January through the term of the HCP agreement. In January 2011, Douglas PUD deposited $238,153.00 into the Account.

The beginning balance of the Account on January 1, 2011, was $739,492.33; Douglas PUD's 2011 annual contribution was $238,153.00; interest accrued during 2011 was $3,481.71; funds disbursed for projects in 2011 totaled $32,788.40; other disbursements included $5,629.69 to Chelan PUD and Douglas PUD for administrative support provided to the Account during 2011; resulting in an ending balance of $942,708.95 on December 31, 2011. The 2011 Annual Financial Report for the Account is provided in Appendix J.

The Wells Tributary Committee delegated signatory authority to the Tributary Committees Chairperson for processing of payments for invoices approved by the Wells Tributary Committee. The Coordinating Committees' Chairperson serves as the alternate chair, and also received delegated signatory authority. The Tributary Committees' Chairperson works for a limited liability corporation, and the Tributary Committees provide funds for liability insurance.

2.3.3 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 assisting 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, and may require funds from multiple funding sources for successful implementation. 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 projects with relatively long implementation timelines. There is no limit (other than the Account balance) to the financial request in the General Salmon Habitat Program. The minimum request is $50,000; although, the Tributary 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 geographic area, and worked with the other funding programs to identify cost-sharing procedures (see Section 2.3.1).

2.3.3.1 2011 General Salmon Habitat Projects

The Tributary Committees announced their 2011 funding cycle in March, with pre-proposal applications due on May 9, 2011, and full proposals due on June 30, 2011. The Tributary Committees received 27 pre-proposal applications, but three of these pre-proposals were withdrawn by the sponsors. Therefore, the Tributary Committees reviewed 24 pre-proposals. The Tributary Committees identified 17 projects that they believed warranted full proposals and dismissed seven projects because they lacked strong technical merit.

In June, the Tributary Committees received 11 full proposals to the General Salmon Habitat Program. All were "cost-shares" with the SRFB or other funding entities. The Tributary Committees approved funding for eight projects. Table 7 identifies the projects, sponsors, total cost of each project, amount requested from Tributary Funds, and, if funded, which Plan Species Account supported the project.

Table 7

General Salmon Habitat Program Projects Reviewed by the Tributary Committees in 2011

Project Name	Sponsor[1]	Total Cost	Request from T.C.	Plan Species Account[2]
Coulter Creek Barrier Replacement	CCNRD	$83,126	$12,469	RR: $12,469
Upper Chumstick Barrier Removal	CCNRD	$439,944	$65,991	Not funded
Lower White Pine Upper Connection B+	CCNRD	$2,162,290	$250,000	RI: $150,000
Methow River Acquisition (Peters)	MSRF	$37,327	$6,310	Not funded
Twisp River Acquisition (Hovee)	MSRF	$140,700	$29,000	W: $29,000
Silver Protection	WDFW	$660,000	$360,000	W/RR: $250,000
Wenatchee Nutrient Assessment Design	CCFEG	$240,000	$120,000	RI: $80,000
Wolf Creek Ditch and Fish Return Improvement	CCFEG	$270,000	$120,000	Not funded
White River Large Wood Atonement	CCFEG	$352,392	$147,050	RI: $100,000
Entiat Stormy Reach Acquisition	CDLT	$336,000	$56,000	RR: $56,000
Nason Creek Lower White Pine Acquisition	CDLT	$294,700	$44,700	RR: $44,700

Notes:

1 CCNRD = Chelan County Natural Resource Department; MSRF = Methow Salmon Recovery Foundation; WDFW = Washington Department of Fish and Wildlife; CCFEG = Cascade Columbia Fisheries Enhancement Group; CDLT = Chelan-Douglas Land Trust.

2 RI = Rock Island Plan Species Account; RR = Rocky Reach Plan Species Account; W = Wells Plan Species Account.

In 2011, the Wells Tributary Committee agreed to fund the following General Salmon Habitat Program projects:

- Twisp River Acquisition 2011 RM 0.9 (Hovee) for the amount of $29,000 (with cost-share, the total cost of this acquisition was $140,700). The project will purchase and protect about 4.3 acres of riparian habitat adjacent to the Twisp River at river mile (RM) 0.9. The acquisition would include about 1,200 lineal feet of high quality shoreline habitat.
- Silver Protection for the amount of $125,000 (with cost-share, the total cost of this acquisition was $660,000). The project will protect about 45 acres along the Methow River downstream from the Town of Twisp. The easement/acquisition would include about 3,500 lineal feet of spring-fed perennial channel.

In 2010, The Methow Salmon Recovery Foundation submitted a proposal titled Methow River Acquisition 2010 MR 41.5 LR (Risley). The Tributary Committees elected not to fund this project because it included uplands, which the Committees determined should not be part of the acquisition. However, the Tributary Committees stated that they would consider funding the project if the upland parcel was removed from the proposal. The landowner has since agreed to separate the parcels. Therefore, in May 2011, the Methow Salmon Recovery Foundation resubmitted the proposal requesting funding from the Tributary Committees only for the 13.5-acre floodplain/riparian parcel. The total cost of the parcel was $136,353.92. The sponsor requested $31,853.92 from HCP Tributary Funds. The Wells Committee approved funding for this project.

2.3.3.2 Modifications to General Salmon Habitat Program Contracts

In December 2011, the Wells Tributary Committee received a request from the Methow Salmon Recovery Foundation for an additional $16,780 for the Methow River Acquisition MR 48.7 (Bird) project. The cost increase reflected the landowner's desire to include additional land in the acquisition. The landowner reduced their retained property to a single 1.61-acre parcel and forfeited the potential for future subdivision. This increased the floodplain acreage from 16.74 acres to 17.13 acres, and the appraised value of the now-larger conservation easement increased accordingly. Thus, the Wells Committee portion of the total cost increased from $94,900 to $111,680. The SRFB contributed $172,220, which is the remainder of the total cost of the acquisition. The Wells Committee agreed to increase their portion of the total cost of the project from $94,900 to $111,680.

2.3.4 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 Tributary 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 funding decision within three months. The maximum contract allowed under the Small Projects Program is $50,000.

2.3.4.1 2011 Small Projects

The Wells Tributary Committee funded no Small Projects in 2011.

2.3.4.2 Modifications to Small Project Contracts

The Wells Tributary Committee received no requests from sponsors in 2011 asking for modifications to Small Projects funded by the Committee.

2.3.5 Tributary Assessment Program

In 2008, the Okanagan Nation Alliance responded to the Tributary Committees request for a proposal to monitor the Okanagan River Restoration Initiative Project. The Wells Tributary Committee agreed to fund three monitoring tasks of the Okanagan River Restoration Initiative: 1) Fish Holding and Rearing, 2) Channel Morphometry and Hydraulics, and 3) Substrate Composition. As required in the Wells HCP, 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.

In August 2011, the Okanagan Nation Alliance submitted a report titled, “Aquatic Monitoring of the Okanagan River Restoration Initiative—Post Construction 2010” for Wells Tributary Committee review. The Wells Tributary Committee reviewed the report and noted that the monitoring efforts should continue as planned. Thus, the Wells Tributary Committee directed Douglas PUD to fund the following component for another year: Fish Holding and Rearing for $4,164. The Wells Tributary Committee elected not to fund any other “unfunded” components of the monitoring plan and directed the sponsor to submit another report and budget at the end of the monitoring year (April 2012).

3 HCP ADMINISTRATION

This chapter lists events of note that occurred in 2011 related to the administration of the HCPs, as well as gives a list of reports published in 2011 that relate to the HCPs.

3.1 Mid-Columbia HCP Forums

In 2005 and 2006, Mid-Columbia Forums (Forums) 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 through 2010, these parties were invited by letter in 2011 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 (Appendix L). The non-signatory parties indicated no interest in attending a Forum in 2011, and thus a Forum was not held in 2011.

3.2 HCP Related Report Published in Calendar Year 2011

The following is a list of reports released in 2011 related to the implementation of the Wells HCP:

- Anchor QEA, 2011. Annual Report, Calendar Year 2010, of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan. Wells Hydroelectric Project. FERC License No. 2149. Prepared for FERC. March 2011.
- Bickford, S.A., T. Kahler, J.R. Skalski, R.L. Townsend, R. Richmond, S. McCutcheon, and R. Fechhelm, 2011. Project Survival Estimates for Yearling Chinook Migrating through the Wells Hydroelectric Project, 2010 (2010 Spring Migrant Survival Verification Study). Funded by Public Utility District No. 1 of Douglas County, East Wenatchee, WA. 47 pp. + Appendices.
- Jerald, T., 2011. 2010 Public Utility District No. 1 of Douglas County Northern Pikeminnow Removal and Research Program. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA. 21 pp.
- McGrath, E, C. Rivard-Sirois, and C. Louie. 2011. Aquatic Monitoring of the Okanagan River Restoration Initiative (ORRI) – Post-construction 2010. Prepared by Okanagan Nation Alliance Fisheries Department. Westbank, BC.

- Northwest Hydraulic Consultants, 2011. Wells Dam Fishway Entrance Velocity Measurements Memo. May, 5, 2011.
- Public Utility District No. 1 of Douglas County, 2011. Annual Report of Operations, Fish Facilities: 2010. Wells Hydroelectric Project, FERC No. 2149. 25 pp.
- Public Utility District No. 1 of Douglas County, 2011. Wells Bull Trout Monitoring and Management Plan 2010 Annual Report. Wells Hydroelectric Project, FERC No. 2149. March 28, 2010.
- Snow, C., C. Frady, A. Repp, A. Murdoch, M.P. Small, and C. Dean, 2011. Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2010. Prepared for Douglas County PUD and Wells HCP Hatchery Committee. WDFW Supplementation Research Team, Methow Field Office, Twisp, Washington.

APPENDIX A
HABITAT CONSERVATION PLAN COORDINATING COMMITTEES 2011 MEETING MINUTES AND CONFERENCE CALL MINUTES

Note: The Coordinating Committees did not meet in December 2011.

ANCHOR QEA

1423 Third Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	February 22, 2011
From:	Michael Schiewe, Chair,		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of January 25, 2011 HCP Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, January 25, 2011, from 8:30 am to 10:00 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Carmen Andonaegui will provide the Coordinating Committees a summary of documents out for review by the Committees and comment due dates (Item II-B).
- Steve Hemstrom will check with the Fish Forum regarding their interest in additional information on non-target species captured during the annual predator control efforts (Item II-B).
- Steve Hemstrom will check if the sturgeon by-catch from the 2010 predator control efforts were screened for passive integrated transponder (PIT)-tags (Item II-B).
- Steve Hemstrom will check on the possibility of conducting a mid-season juvenile bypass spot-check for problems that might affect survival (Item II-C).
- Steve Hemstrom will confirm the Rocky Reach fishway tour date in February and report to the Coordinating Committees (Item II-E).
- Carmen Andonaegui will email a copy of Casey Baldwin's radio telemetry summer/fall Chinook study proposal to the Coordinating Committees (Item IV).

DECISION SUMMARY

- The Coordinating Committees approved the 2011 Wells HCP Action Plan as revised. The 2011 Wells Action Plan will be finalized and distributed by February 28 to all the HCP Committees, along with Chelan PUD's 2011 Rocky Reach and Rock Island Action Plan (Item III-A).

REVIEW ITEMS

- Draft 2010 Rocky Reach and Rock Island Pikeminnow Predator Control Program Report: 60-day review period with comments due March 18.
- Draft 2010 Rocky Reach Juvenile Bypass System Report: 60-day review period with comments due March 18.
- Draft 2011 Rocky Reach and Rock Island HCP Action Plan: 30-day review period with comments due February 18.

I. Welcome

The Coordinating Committees reviewed the agenda and the December 14, 2010 meeting minutes. Steve Hemstrom added one item to the agenda—an invitation to attend the February 7, 1:00 pm Chelan PUD commissioners' meeting (Item II-H). The Committees approved the December 14, 2010 meeting minutes, as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

During review of the December 14 meeting Action Items, Hemstrom reported that he is working with John Skalski, Columbia Basin Research, on an appendix to the 2010 Rocky Reach Yearling Chinook Survival Study as requested at the last meeting. The appendix will provide additional interpretation and discussion of the survival study results. For example, it was suggested that the issue of tag life should be addressed. Hemstrom said in 2010 that tag life exceeded on average the specified 24-day tag life; therefore, in 2010, tag life did not influence fish survival results. Mike Schiewe said the idea is to present in the appendix any information that might not be reflected in the statistical analysis as presented, but would add to the understanding of the study results. Bryan Nordlund said he would like to see a discussion in the appendix of the range of travel times observed over the years during sockeye and Chinook studies, including a comparison of travel times over the course of the 2010 season as flows changed. Nordlund said he would like to see some discussion of how flows relate to passage survival. Nordlund and Hemstrom discussed the Rocky Reach 2010 survival study conclusion that the day and night releases did appear to influence survival. Hemstrom said that although it appears that release-timing did have an effect on survival in 2010, he did not feel confident saying there was an effect related to release timing based on only one year of study. Nordlund suggested this be discussed in the appendix. Hemstrom agreed to include the items discussed in the survival study appendix.

II. Chelan PUD

A. Discussion: 2010 Rocky Reach yearling Chinook Survival Study

Steve Hemstrom said John Skalski and he are working on finalizing the Rocky Reach yearling Chinook survival study report. Hemstrom said he received no comments from Coordinating Committees' members; comments were due January 14. There were no additional comments from Committees' members other than the comments on the appendix to be added to the study report.

B. Discussion: Final Summary – 2010 Predator Control Report

Steve Hemstrom reported that Lance Keller had completed the draft 2010 Predator Control report and that it was distributed earlier this month. He reported that about 80,000 pikeminnow were removed from the Rocky Reach and Rock Island projects in 2010 and asked for comments on the draft report. Carmen Andonaegui agreed to provide to the Coordinating Committees a summary of documents out for review by the Committees and comment due dates. Members asked about the other species captured during the predator control efforts. Hemstrom confirmed that no additional information is being collected other than species identification. He said he would check if sturgeon by-catch from the 2010 predator control efforts were screened for passive integrated transponder (PIT)-tags. Bob Rose suggested Hemstrom look into whether the Rocky Reach Fish Forum might be interested in additional information from the by-catch. He said the Fish Forum is working on an ecological interaction study in the reservoirs. Hemstrom said he would check with Fish Forum staff regarding interest in by-catch information from the predator control efforts. Jim Craig said he would provide some additional comments on the draft report to Chelan PUD. Comments are due March 18 (60-day review).

C. Discussion: Final Summary – 2010 Rocky Reach Juvenile Bypass Operation Report

Steve Hemstrom reported that Lance Keller completed the draft Rocky Reach Juvenile Bypass Operation Report, and it was distributed earlier in the month. Comments on the draft report are due March 18. Hemstrom noted that survival through the bypass in 2010 was about 96 percent, which was the lowest to date. Bypass survival has typically been about 99 percent. Hemstrom said that he had no explanation for the reduced bypass fish survival in 2010. He said Chelan PUD intends to look at bypass operations in 2011 to see if something was missed in 2010 that could be improved in this year's bypass operation and asked for comments. Bryan Nordlund asked if the bypass operation evaluation is done prior to survival studies, and Hemstrom confirmed that it was. Nordlund asked if there was a way to spot-check bypass operations mid-season to see if any problems were evident. Hemstrom said that a specific test would be difficult once the bypass is operational, but that any problems (e.g., descaling, mortality) would be evident in the daily samples. However, he agreed to check into whether there is a way to conduct a mid-season spot-check. Nordlund asked if, given the lower tailrace water levels in 2010, the drop from the bypass tube could have negatively impacted juvenile survival. Hemstrom said he will review data from past years and compare tailrace elevation in 2010 to past years. He said the higher mortality could also be related to loss in the tailrace from predation.

D. Discussion: Chelan 2011 HCP Action Plan

Steve Hemstrom said the draft 2011 HCP Action Plan is out for review and asked for comments. Mike Schiewe asked if there were any objections to a shorter review time (30 days rather than 60 days) of the Action Plan, and there were no objections. Comments on the 2011 Action Plan are due February 18 to facilitate moving it more quickly among the reviewing groups. Schiewe asked that a legend be added to the Action Plan to explain the significance of the colors used in the table. Hemstrom said the goal is to approve and finalize the 2011 Action Plan at the meeting in February.

E. Update: Rocky Reach Half-Duplex PIT-Tag Detector Installation and Fishway Modifications for Adult Lamprey Passage

Steve Hemstrom said that Chelan PUD had expected to complete installation of the half-duplex PIT-tag detector at Rocky Reach Dam by February 28, 2011, but that the contractor became concerned that a couple of areas in the fishway travel channels might be too wide to reliably detect passage. The contractor has asked for more engineering of the PIT detection system inside the fishway to improve detection. Hemstrom reported that installation of the new grating, part of the Rocky Reach Fish Forum passage improvements for lamprey, is complete. The lamprey ramp will be completed by mid-February, he said. Bob Rose said that Jeff Osborne, Chelan PUD, will conduct a tour of the modified fishway in February. Hemstrom said if Committee members are interested in attending, they are welcome and should contact him to set up their security clearance. Hemstrom will confirm the tour date, which he thought was February 17.

F. Update: Chelan (New) Annual Environmental Report

Steve Hemstrom reported that Chelan PUD is preparing an Annual Environmental Report. He said Chelan PUD has produced annual reports for other business areas, but never one on environmental activities. The report will be produced annually starting this year. Hemstrom specifically mentioned a section of the report that will highlight innovative environmental programs. One example he cited was how spill at the Rock Island Project was reduced while still meeting HCP Plan species survival standards.

G. Update: Status of the Rocky Reach License Amendment for Beebe Ranch, LLC, Boat Dock Construction

Steve Hemstrom said a proposal to allow construction of the Beebe Ranch boat dock on the Rocky Reach pool required the Chelan PUD to submit a license amendment application to the FERC for consideration. The original dock application was for a 100-boat-slip marina, but has been reduced to about 40 boat slips. Hemstrom said there was a recent article in a hydropower trade publication about the dock that contained several inaccuracies. He emphasized that Chelan PUD does not own the shoreline of the Rocky Reach Reservoir and therefore cannot put a moratorium on boat dock construction on the reservoir as was done by Douglas PUD, which owns the shoreline of the Wells Reservoir. As a result, it is the U.S. Army Corps of Engineers' (Corps') responsibility to conduct the environmental analysis, and not Chelan PUD's. The Endangered Species Act (ESA) consultation was between U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA), with the Corps as the Action Agency. Nordlund said the biological opinion on the Beebe Ranch Boat Dock originally covered only ESA-listed species and therefore did not include all the HCP Plan Species. National Marine Fisheries Service (NMFS) staff have expressed interest in potential predation impacts on subyearlings and asked the Corps to address it. Mike Schiewe reminded the Coordinating Committees that the Beebe Ranch Boat Dock project was discussed by the Coordinating Committees in 2006.

H. Presentation to PUD Commissioners on Rock Island and Rocky Reach HCP Accomplishments (Steve Hemstrom)

Steve Hemstrom extended an invitation to the Coordinating Committees to attend the February 7 Chelan PUD Commissioners' meeting. Chelan PUD staff will be giving a presentation to the Commissioners on the HCP and the many successes achieved over the past 6 years. Keith Truscott, Chelan PUD, joined the conference call to say that for example, staff will highlight recently completed tests at Rock Island Project that documented 93 percent or higher survival of all plan species under conditions of 10 percent spill. The presentation is at 1:00 pm on February 7, and he encouraged Committees' members to attend.

III. Douglas PUD

A. 2011 Wells HCP Action Plan – Request for Approval (Tom Kahler)

Tom Kahler said a revised draft of the 2011 Wells HCP Action Plan was emailed to the Coordinating Committee on January 5. The revision contained a change to Item No. 6, which addresses the verification of juvenile migration run-timing in relation to seasonal bypass operations at Wells Dam. First, Kahler noted that the Wells HCP doesn't require verification of the effectiveness of the timing of bypass operations at Wells until 2012. Second, the issue was raised at the December Committees meeting as to whether there was any evidence that the current timing of bypass operations did not encompass the HCP-required 95% of the migrations of both spring and summer migrants. Kahler said Douglas PUD intends to verify run-timing by comparing Rocky Reach Dam juvenile bypass index samples to bypass operations at Wells, using the timing of fish passing through the Rocky Reach juvenile bypass as a surrogate for run timing at Wells. John Skalski, Columbia Basin Research, will use Program Real Time to conduct the evaluation. The revisions to the 2011 Wells Action Plan represent this described approach to the verification study. The Tributary and Hatchery committees have approved their sections of the Action Plan. Mike Schiewe clarified that the revision to the Action Plan is only to correct the Action Plan and is not intended as approval of the run-timing verification approach. Bryan Nordlund asked about using Rock Island juvenile passage timing as well. Kahler said Skalski believed there were enough passage timing data collected at Rocky Reach to perform the analysis, and using index sampling at Rock Island would add the confounding factor of the timing of migrants from the Wenatchee Basin. There were no other comments on the Action Plan. The draft 2011 Wells Action Plan was approved as revised.

Kahler agreed to finalize the draft Wells Action Plan. Pending approval of the Rocky Reach and Rock Island 2011 Action Plans, all three HCP Action Plans will be distributed to the Tributary, Hatchery, Coordinating, and Policy committees in February.

B. 2011 Bypass Operations Planning (Tom Kahler)

Tom Kahler said bypass operations plans are usually done early in the year but that this year, Douglas PUD will be doing a few things differently and is working to include the changes in the 2011 plan. A contingency bypass-operations plan will be developed and included in the 2011 Operations Plan to prescribe bypass operations to implement in the event of a breakdown affecting operation of the bypass system similar to what occurred in 2010 when a gate-hoist cable broke and a spill gate had to be shut down. Also, changes are needed in the 2011 plan to incorporate operations necessary to meet dissolved-gas standards. Douglas PUD is working with Duncan Hay and others to develop an operation to meet bypass standards that will also reduce gas entrainment. This operation may involve the removal of a bypass barrier during extremely large spill events and using a single bay to concentrate spill in a manner that will engage the existing spillway ogee. Kahler said the draft 2011 Bypass Operations Plan will be ready to present at the February meeting. Douglas PUD intends to ask for approval of the 2011 Bypass Operations Plan at the March meeting.

IV. Hatchery and Tributary Committees Update (Mike Schiewe)

Mike Schiewe said the last Tributary Committees meeting was on January 13 and included mostly administrative actions. The only business item was a request for a contract extension of the Mission Creek Fish Passage Project, which was approved. The next meeting will be February 10 when there will be a presentation from the Cascade Fisheries Enhancement Group.

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on January 19. He said a couple of items dominated the meeting:

- The Hatchery Committees are still working to reach agreement on a few elements of the Wells Steelhead Hatchery Genetic Management Plan (HGMP). Having accepted a one-page summary of key items in the HGMP, they are now working toward approval of the full draft. Outstanding issues are the potential handoff in 2013 of a portion of Wells Hatchery production for Methow Basin releases to the Winthrop National Fish Hatchery (NFH) production with some Wells production going into the lower Methow River, the Twisp River, and the mainstem Columbia River. Another issue is regarding the broodstock source for the safety-net program so as not to lose its genetic connection with the conservation program. The approval point for the draft

HGMP will be after the February Hatchery Committees meeting by conference call or at the March meeting.

- Douglas PUD provided the Hatchery Committees with a proposed plan for recalculation of No Net Impact (NNI) production in 2013 for review.
- Chelan PUD presented an update on the sockeye enumeration study conducted in the upper Wenatchee Basin, comparing abundance estimates using PIT tag data versus data from traditional spawning ground surveys. PIT tag data turned out to be much more accurate. There is still discussion among the Hatchery Committees as to whether on-the-ground surveys are still needed to obtain data on redd distribution.
- The Hatchery Committees continue to work on Tumwater Dam facility improvements to meet all adult management needs. One result of this discussion is the realization that an annual operating plan is needed. Washington Department of Fish and Wildlife (WDFW) will likely take the lead in producing the annual plan.
- Chelan PUD presented a summary of all survival results at Rocky Reach and Rock Island projects in anticipation of using these numbers for calculating hatchery contribution to NNI in 2013.
- The Hatchery Committees were presented with Chelan PUD's draft 2011 HCP Action Plan. There were no initial comments. The Hatchery Committees will look to approve the Action Plan at the February meeting.
- The Hatchery Committees discussed ESA coverage of selected elements of the new HGMPs prior to issuance of a new permit by NMFS. In the past, ESA coverage had been provided in a letter exchange. NMFS now wants to discontinue the letter exchange.
- Casey Baldwin briefed the Hatchery Committees on a radio-telemetry study of summer/fall Chinook that WDFW will begin this year. The study will address data gaps identified during the 2009 summer Chinook summit. Carmen Andonaegui will email a copy of the study statement of work to the Coordinating Committees.
- Andrew Murdoch updated the Hatchery Committees on upper Columbia Monitoring and Evaluation (M&E) activities funded by Bonneville Power Administration (BPA) or NOAA, some of which are partially funded by the PUDs. In particular, he described an effort to work with Columbia Basin Research to make PIT tag info more readily available and more usable on the Data Access in Real Time (DART) page.

- Water supply at the Chiwawa Facility had to be switched over to Chiwawa River water because of flooding at the pump sites, but it will be switched back to Wenatchee River water as soon as possible.

V. HCP Administration (Mike Schiewe)

A. *Next Meetings*

The next scheduled Coordinating Committees' meetings will be on February 22, March 22, and April 26, all in SeaTac.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco*	CCT
Bob Rose*	Yakama Nation
Jim Craig*	USFWS
Bryan Nordlund*	NOAA
Teresa Scott *	WDFW

* Denotes Coordinating Committees member or alternate

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	March 24, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of February 22, 2011, HCP Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, February 22, 2011, from 9:30 am to 12:30 pm in SeaTac. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Lance Keller will provide an Excel file of data on white sturgeon captured by Chelan PUD's long-line contractor to Carmen Andonaegui for distribution to the Coordinating Committees (Item I).
- Lance Keller will finalize the Rocky Reach and Rock Island HCP Action Plan and send it to Carmen Andonaegui. Andonaegui will distribute the Final Rocky Reach and Rock Island HCP Action Plan and the Final Wells HCP Action Plan to the Coordinating Committees and post both HCP Action Plans on the ftp site (Item I).
- Steve Hemstrom will calculate 2010 single-release juvenile passage survival numbers, and send them to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-A).
- Steve Hemstrom will provide a draft 2011 Rocky Reach Dam Chinook Salmon Passage Survival Study proposal to Carmen Andonaegui for distribution to the Coordinating Committees by March 8 (Item II-A).
- Coordinating Committees' comments on the 2011 Wells Juvenile Bypass Operating Plan are due 10 days prior to the March 22 meeting (Item III-A).

DECISION SUMMARY

- There were no decision items up for approval at this meeting.

REVIEW ITEMS

- Draft 2010 Rocky Reach and Rock Island Pikeminnow Predator Control Program Report: 60-day review period with comments due March 18
- Draft 2010 Rocky Reach Juvenile Bypass System Report: 60-day review period with comments due March 18
- Draft Wells 2011 Juvenile Bypass Operating Plan: comments due 10 days prior to March 22 meeting

I. Welcome

Mike Schiewe welcomed the Coordinating Committees members and asked for any additions or changes to the agenda. Steve Hemstrom added a discussion item regarding a recent visit to Battelle Laboratories. Tom Kahler added an update on velocity testing at the Wells Dam fish ladder entrance. The Committees reviewed the draft January 25 conference call minutes for approval. Bryan Nordland asked for clarification on what was meant by "more engineering" in Item II-E of the January 25 conference call minutes. Hemstrom explained it referred to a need to reevaluate the passive integrated transponder (PIT)-tag detection system inside the fishway to improve detection. This clarification was added to the January 25 conference call minutes and the Committees approved the minutes, as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

Hemstrom updated the Committees on Chelan PUD action items from the January 25 conference call. He said Chelan PUD will continue collecting information on non-target species captured during predator removal efforts, and make that data available to the Committees. Hemstrom said Lance Keller will provide an Excel data file with information on white sturgeon captured during long-line fishing for pikeminnow. Keller will include information on origin of the captured sturgeon based on PIT-tags or scute markings. He reported that some sturgeon captured in the Rock Island Pool were traced to juvenile sturgeon released there by the Columbia River Intertribal Fisheries Commission (CRITFC). Hemstrom will forward these data to Carmen Andonaegui for distribution to the Committees.

Hemstrom also reported that he is working with Dr. John Skalski, Columbia Basin Research, on an appendix to the 2010 Rocky Reach Yearling Chinook Survival Study as requested by the Committees.

Regarding the potential to conduct a mid-season spot-check on the juvenile fish bypass at Rocky Reach Dam, Hemstrom said it is not possible to check inside the pipes once the bypass is in operation. However, he said daily fish condition checks are a good indicator of problems within the system, and that checking for descaling and injury is part of the standard operating protocol at the bypass. Hemstrom said there are also alarms on inside gates and pumps to indicate any operation malfunctions, and the alarms are checked regularly by on-site fish bypass attendants to make sure they are functioning appropriately.

Schiewe updated the Committees that the annual letters inviting non-signatories for a presentation on HCP activities were sent to American Rivers and to the Umatilla Tribes at the beginning of the year. He said no responses have been received by either American Rivers or the Umatilla Tribes.

Andonaegui said comments on the Draft 2011 Rocky Reach and Rock Island HCP Action Plan were due February 18 following a 30-day review period, and that no comments were received. Chelan PUD will finalize the Action Plan and email it to Carmen Andonaegui. Andonaegui will distribute the final Rocky Reach and Rock Island Action Plan and Wells Action Plan to the Committees and post both Action Plans on the ftp site.

II. Chelan PUD

A. Fish Optimization Team Meeting, Feb. 7 – 2011 Yearling Chinook Study Design for Rocky Reach Project (Steve Hemstrom)

Steve Hemstrom said that the Fish Optimization Team (Team) has been meeting since 2003, initially to address increasing the efficiency of the Rocky Reach Juvenile Bypass System (JBS). The Team now addresses bypass system efficiency issues, and reviews all elements of the survival studies. The Team meeting on February 7 at Chelan PUD included Bryan Nordlund. A main focus of the meeting was discussion of the relatively low JBS survival estimate in 2010. Based on the paired release model, the 2010 JBS survival estimate for yearling Chinook was 96.7 percent. This estimate was low compared to past years' survival estimates. However, Hemstrom noted that a 2010 JBS survival estimate based on the single-release model was 98.0 percent. He suggested that a single-release estimate, when higher than a paired release estimate, was more accurate. Although a paired-release model allows one to eliminate study effects or biases outside of passage that may affect survival (e.g., tagging or tagger effects), a single-release estimate represents absolute survival. Hemstrom explained that survival through the JBS is the survival route to which all other dam passage routes are normalized. He said that Chelan PUD is still discussing with Dr. Skalski the limitations of using single-release versus paired-release survival estimates.

Hemstrom said the Team also discussed the results of the 2010 day-night release yearling Chinook salmon passage survival study. For 2011, Hemstrom said Chelan PUD is proposing to repeat the day-night releases. The estimated survival of night-released fish in 2010 was 89.8 percent, and 95.2 percent for daytime releases. Hemstrom said survival estimates will be reported based on release timing, and as pooled estimates; each release will have separate treatment and control groups. Responding to a question about diel passage, Hemstrom said that the timing of juvenile salmon passage at Wells Dam is not well known, and without this information Chelan PUD cannot mirror fish releases with diurnal passage at Wells Project in the study design. The Committees' members agreed that there was currently no reliable method for determining diurnal passage timing for run-of-the-river fish at Wells Dam. Hemstrom said Chelan PUD will draft a study proposal for 2011, which will be available within the next 2 weeks, for approval by the Committees at the March meeting.

Bryan Nordlund asked Hemstrom if lower water surface elevation in the tailrace could negatively affect juvenile survival caused by the drop from the bypass pipe, the effect on fish dispersion, or both. Hemstrom agreed to review their data to see if there is a relationship between tailwater elevations and survival rates over the time of survival studies; however, he said that the bypass outlet was designed for a minimum tailrace elevation. Hemstrom said one of the things that can be determined is diel passage at Rocky Reach. He said that Skalski said that survivals can be applied to proportions of fish passing during certain times to emulate dam passage survival based on diurnal passage. He said this could be an option for a future study year. In response to Bryan Nordlund's question as to how survival might be higher for one route during the day or night than another route, Hemstrom said fish tend to move higher in the water column at night. He said past hydroacoustic data could be reviewed to compare vertical approach orientation between day and night passage.

B. Water Supply/Runoff Forecast for Upper Columbia, 2011 (Steve Hemstrom)

Steve Hemstrom reported that runoff at Coulee Dam was at 106 percent of average and it does not appear to be increasing. However, he said that typically snowpack builds in March in Canada.

C. Chelan PUD Battelle Pacific Northwest National Laboratory Trip Update (Steve Hemstrom)

Steve Hemstrom, Lance Keller, and Josh Murauskas met with staff at Battelle Pacific Northwest National Laboratory (PNNL). Hemstrom reported that they reviewed laboratory studies that evaluated the effect of hydrostatic pressure changes on the survival of tagged and untagged juvenile salmon. These changes were similar to those experienced by fish passing through hydroelectric turbine units. PIT-tagged, J-Sat acoustic-tagged, HTI acoustic-tagged, and double-tagged fish were evaluated. Hemstrom said the U.S. Army Corps of Engineers is funding a Battelle PNNL study of an external acoustic tag.

III. Douglas PUD

A. Draft 2011 Juvenile Bypass Operations Plan and TDG Compliance (Tom Kahler)

Tom Kahler presented the Draft 2011 Wells Project Juvenile Bypass Operating Plan (Bypass Plan). He pointed out new additions to the 2011 Bypass Plan compared to past years' Bypass Plans. At the bottom of page 2, the last paragraph describes operations designed to meet a Federal Energy Regulatory Commission (FERC) requirement that the Project be able to pass a complete load rejection via the spillway. The second FERC condition is that the Project do so at any time of year no matter what the extant load conditions. Table 2 illustrates operations designed to meet these FERC conditions, designating bypass barriers for removal with increasing river discharge at and above 250,000 cubic feet per second. The operating conditions have always been identified, Kahler said, but this is the first year they are being incorporated in the Juvenile Bypass Operations Plan. Mike Schiewe asked if Chelan PUD had similar conditions in their license. Hemstrom said he is not aware that they have this condition. Kahler explained that, unlike other dams where juvenile bypass systems are separate, additional routes through the dam, the bypass route at Wells Dam is the spillway, the capacity of which is limited by the installation of bypass barriers and baffles. Thus, because the barriers in the bypass are impediments to passing full flows, Douglas PUD is required to demonstrate how they can pass full flows during bypass operations. Although systematic removal of bypass structures is the prescribed methodology for meeting the FERC standard for automatic-gate spill capacity, in the event of an emergency, the bypass barriers and baffles in the spill bays are designed to fail.

Another difference in the 2011 Bypass Plan is the inclusion of a contingency plan describing operations in the event of failure of a bypass gate, or other unanticipated accident or mechanical failure that prevents normal bypass operations. The contingency plan is in response to the failure of a gate-hoist cable in a spill-bay last August. Based on Committees' input, Douglas PUD developed both a quick-fix and a long-time-repair option.

Finally, Kahler said there is a description of bypass operations designed to meet Total Dissolved Gas (TDG) standards. He said Douglas PUD has been conducting extensive studies, at Wells Dam and with scale modes at the University of Iowa, investigating TDG levels in relation to operations at Wells Dam. Monitoring at Wells Dam has shown that water entering the Wells Dam forebay from Chief Joseph Dam is often near 115 percent of saturation. Tests at Wells Project have determined that the best way to minimize gassing at the Wells Project is to concentrate all involuntary spill into Spill Bay 5 and then allocate additional spill beyond the capacity of Spill Bay 5 to adjacent Spill Bay 6, followed by Spill Bay 7. When supported by discharge from underlying turbine units (Units 4-7), this operation results in a spill pattern that tends to shoot out into the tailrace rather than plunge, thereby minimizing gassing. For 2011, Kahler said Douglas PUD will concentrate spill through Spill Bay 5 to near maximum capacity and then will ready Spill Bay 6 by removing the bypass barrier. The operation will be needed when involuntary spill is projected to exceed 40 thousand cubic feet per second (kcfs). Spill of at least 15 kcfs through each spill bay will also be necessary to create a spill pattern that engages the flip lips and directs flow out rather than plunging. Spill will be allocated to Spill Bay 7 when Spill Bays 5 and 6 are full.

Kahler said Douglas PUD will seek approval of the Bypass Plan at the March meeting and is requesting comments now. Comments are due 10 days prior to the March meeting.

B. Velocity Testing at the Wells Dam Fish Ladder Entrance (Tom Kahler)

Tom Kahler said preparation for the velocity meter tests at the Wells Dam fish ladder entrance is going well. Douglas PUD currently plans to measure a high and a low tailwater elevation with both a 1.5-foot head differential between the collection gallery and the tailrace and a 1.0-foot differential. The first test will occur March 4 between 2:00 am and 4:00 am. Tests will then be repeated once the tailwater elevation is increased by approximately 8 feet, which is the typical range between the low- and high-tailwater elevations experienced by lamprey at the fishway entrance in late summer and fall.

IV. Hatchery and Tributary Committee Update (Mike Schiewe)

Mike Schiewe updated the Coordinating Committees that the Tributary Committees met on February 10 and discussed the following items:

- Approved a purchase of a conservation easement on the Twisp River under the Small Project Program
- Received an update from Jason Lundgren of the Cascade Columbia Fisheries Enhancement Group on the Rock Island Tributary Committee-funded nutrient enhancement project
- Reviewed the schedule for 2011 General Salmon Habitat Program proposals
- Were provided an accounting of PUD contributions to HCP Plan Species Accounts consistent with what is required by the HCP
- Received a report that the Phase I of the Okanogan River Restoration Initiative (ORRI) project, funded in part by the Wells Tributary Committee, was nominated for an award

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on February 16:

- A request by the National Oceanic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center (NWFSC) to collect 75 wild spring/summer Chinook for otolith analysis was approved.
- Wells steelhead Hatchery and Genetics Management Plan (HGMP) was scheduled for formal vote on March 7 by conference call. Only the U.S. Fish and Wildlife Service (USFWS) representative was not in agreement, because of concern that the Winthrop National Fish Hatchery (NFH) steelhead program may not meet the 200,000 steelhead production goal by 2013. Also, USFWS is concerned about the planned release of 100,000 safety-net fish scheduled for release at the Methow Hatchery. Their concern is that returning adult safety-net fish to the same general area as supplementation intended to support recovery fish would be problematic. The goal of Douglas PUD is to get approval from the Hatchery Committees of the Wells steelhead HGMP and

submit it to the National Marine Fisheries Service (NMFS). Another issue being discussed is the relationship between what is agreed to under the HCP for production levels and how it relates to the *US v OR* agreed-to production levels. The understanding is that Hatchery Committees' members also involved in *US v OR* process, having worked though an issue in the Hatchery Committees, must then take HCP production agreements to *US v OR*. Jim Craig says he and Bill Gale will continue to have discussions regarding the issues of Winthrop and *US v OR* production levels.

- Douglas PUD proposed using the method described in the Biological Assessment and Management Plan (BAMP) to recalculate post-2013 hatchery No Net Impact (NNI) production. The proposal is scheduled for approval at the March Hatchery Committees' meeting. The 2013 Wells adjusted production programs will be slightly smaller than under current programs. The Committees discussed and clarified the timing for implementing the adjusted production levels. It was agreed that 2013 is the last year of full releases at current levels. Changes to the Chelan PUD production levels will be much more dramatic after 2013; originally, Chelan PUD agreed to a production level well over 7 percent (14 percent in some cases), and this level will be further modified by survival study results. Chelan PUD has not yet identified their preferred approach for recalculation but has indicated they will propose using monitoring and evaluation data when relevant. Chelan PUD will present their preferred approach at the March Committees' meeting.
- The Hatchery Committees discussed the issue of passage delay at Tumwater Dam (TWD). At the February Hatchery Committees' meeting, Chelan PUD presented an analysis of PIT-tag data that indicated there was a significant delay of returning adult spring Chinook salmon at TWD: about 18 percent attempting to pass, but never detected exiting upstream and no subsequent detection upriver. They noted that the level of sampling at TWD has increased to accommodate reproductive success studies. The Washington Department of Fish and Wildlife (WDFW) presented additional analysis of PIT-tag data and a review of selected aspects of the Chelan PUD PIT-tag data analysis. WDFW agreed there is a delay at TWD; however, the focus of WDFW analysis was an evaluation of mortality after passing TWD. WDFW's results did show elevated pre-spawning mortality upstream of TWD. USFWS expressed concern regarding potential bull trout and lamprey passage delays at TWD. According to WDFW's analysis, a critical component of delays appears to be co-passage of sockeye

and spring Chinook. WDFW is proposing to halt spring Chinook collection during sockeye passage, typically on or about July 15. WDFW also encouraged facility and staffing improvements to facilitate passage. Chelan PUD would like to see broodstock collection be the primary purpose of operations at TWD, which is what the HGMP covers, and a 3-days-on/4-days-off operating schedule. Chelan PUD said that facility operation beyond broodstock collection needs to be covered by a separate section 10 permit obtained by WDFW, NMFS, or the Bonneville Power Administration (BPA), the entities funding the studies. Andrew Murdoch and Mike Tonseth, along with Joe Miller and Josh Murauskas, are working through the two analyses to come up with a proposal to address delays at TWD. Steelhead broodstock collection starts soon but operational changes may not need to be in place to address delay until the June/July period. Chelan PUD is concerned that current operations result in exceeding their Endangered Species Act (ESA) permit take allowance, and that therefore they cannot allow continued operations until NMFS and USFWS agree that operational changes are sufficient to eliminate or minimize delay. Schiewe said he sees the passage delay issue as more of a Coordinating Committees' concern than a Hatchery Committees' issue. He has asked the Coordinating Committees when they think they should become involved in the discussion.

Bryan Nordlund asked how much longer reproductive success studies were scheduled to last. Schiewe said there are two reproductive success studies going on now; one with spring Chinook, which has 2 more years to completion and is a NOAA NWFSC and WDFW study, and a steelhead study, which is required of Chelan PUD under the Wenatchee steelhead HGMP and will finish this spring. He said it is not clear if more extensive interrogation at TWD will be needed to continue to support fish management objectives after these studies are completed. Nordlund asked if the potential gains from implementing the reproductive studies outweigh the impacts of delay on the fish populations affected. He said he would welcome any Hatchery Committees' recommendation that would achieve 98 percent passage at TWD. Steve Lewis had told the Hatchery Committees that allowed take for bull trout at the TWD trapping facility and the Dryden Facility combined is one fish. Nordlund said he would like to stay engaged in passage issues at TWD and will coordinate with Craig Busack, NOAA's Hatchery Committees' representative. He said he wants time to consider the Chelan PUD and WDFW passage delay analyses. Jim Craig says he had not seen WDFW's analysis yet but thinks the Hatchery Committees may welcome the Coordinating Committees' involvement at some point in the future; he thought that for the time being, the Hatchery Committees should take lead, with the Coordinating Committees monitoring their progress. Jerry Marco agreed with Craig; he said he was not sure how an integrated spring Chinook program could be implemented without using TWD to manage adults as described in the Wenatchee spring Chinook HGMP.

Schiewe said there will be an effort to continue to modify and monitor operations at TWD and that an operations plan will be taken to NOAA and USFWS to get their support. Schiewe summarized the discussion by saying that the Coordinating Committees would like the Hatchery Committees to continue to work on a solution for delays at TWD and that the Coordinating Committees will monitor progress.

- The Hatchery Committees discussed a proposal by Chelan PUD to reduce steelhead production levels for 2011, and move production/acclimation from Turtle Rock to the Chiwawa Facility. Chelan PUD also introduced a proposal to move spring Chinook production after 2013 from the Methow Hatchery to the Chiwawa facility. Both proposals are still under discussion.

V. HCP Administration (Mike Schiewe)

A. *Next Meetings*

The next scheduled Coordinating Committees' meetings will be on March 22, April 26, and May 24, all in SeaTac.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco* (by phone)	CCT
Bob Rose*	Yakama Nation
Teresa Scott*	WDFW
Jim Craig*	USFWS
Bryan Nordlund*	NOAA

* Denotes Coordinating Committees member or alternate

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	April 26, 2011
From:	Michael Schiewe, Chair,		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of March 22, 2011 HCP Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, March 22, 2011, from 9:30 am to 12:00 pm in SeaTac. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will email the letter from Dr. John Skalski regarding 2010 survival estimates of fish releases that passed through the Rocky Reach surface collector to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-A).
- Lance Keller will finalize the Rocky Reach and Rock Island Pikeminnow Predator Control Program Report and the Rocky Reach Juvenile Bypass System Report, and email them to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-D).
- Tom Kahler will finalize the Wells 2011 Juvenile Bypass Operating Plan and email it to Carmen Andonaegui for distribution to the Coordinating Committees (Item III-A).

DECISION SUMMARY

- The Coordinating Committees approved the Wells Dam 2011 Juvenile Bypass Operating Plan.
- The Coordinating Committees agreed to a 30-day review of Chelan PUD's Draft 2011 Rocky Reach and Rock Island Dams Fish Spill Plan.

REVIEW ITEMS

- Final Wells 2010 Yearling Survival Study Report: 60-day review period with comments due May 4, 2011

- Draft 2011 Rocky Reach Yearling Chinook Survival Study Plan: 60-day review period with comments due May 7, 2011
- Chelan PUD Draft 2011 Rocky Reach and Rock Island Dams Fish Spill Plan: 30-day review period with comments due April 13; the Spill Plan was distributed by email March 17 for a 30-day review and the expedited review was confirmed by the Coordinating Committees at the March meeting

I. Welcome

Mike Schiewe welcomed the Coordinating Committees members and asked for any additions or changes to the agenda. Tom Kahler asked that the Douglas PUD agenda item concerning velocity measurements at the Wells fishway entrance be removed from the agenda. He said that the report was not ready for distribution and the subject will be on next month's agenda.

The Committees reviewed the draft February 22 meeting minutes. The minutes were approved, as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Chelan PUD

A. Chelan PUD Action Items from the February Coordinating Committees Meeting (Steve Hemstrom)

Steve Hemstrom provided a letter from Dr. John Skalski of Columbia Basin Research summarizing 2010 day/night Rocky Reach surface collector passage survival estimates. These estimates were for fish released in the Wells tailrace, and for fish directly released into the surface collector (Attachment B). Direct release survival was 96.46 percent; single-release estimates for Wells tailrace-released Chinook were 98.56 percent for nautical day releases and 97.92 percent for nautical night releases. Hemstrom suggested several reasons for the lower survival of fish released directly into the surface collector. He said the lower survivals of the direct-release fish could be a function of handling and tagging effects. In the case of fish released in the Wells tailrace, any immediate tagging effects would likely have occurred before fish arrive at the surface collector and hence would not be attributed to the passage through the collector. Hemstrom said, however, that the test results do not provide an explanation for the lower survival estimates for the direct-release fish when compared to previous years. Hemstrom agreed to provide Carmen Andonaegui an electronic copy of Dr. Skalski's letter for distribution to the Coordinating Committees.

The Committees discussed the benefit of paired-release estimates, which are designed to remove handling and tagging effects in the survival estimation formula, as opposed to single-release estimates which do not do so. Hemstrom said that although paired release methods allow for the removal of handling effects, the results can be biased high or low depending on conditions, whereas single-release estimates will always provide a minimum estimate of survival because the estimates include mortality related to handling. Hemstrom suggested that if single-release survival estimates are higher than paired-release survival estimates, that the single release survivals should be accepted. When single release survival estimates are lower than paired-release survival, the paired-release survival estimates should be accepted because these would be adjusted for handling effects. Hemstrom reiterated that his concern is with ensuring that specific factors contributing to actual mortality are considered when studying passage survival.

Following up on another Chelan PUD Action Item, Lance Keller indicated he emailed two files to Carmen Andonaegui that contain sturgeon by-catch data collected over the past 2 years of the pikeminnow predator control program. Andonaegui said the files were distributed to the Committees. Keller said these data files include all captures and a summary of Columbia River Intertribal Fisheries Commission (CRITFC) releases and Lake Roosevelt sturgeon releases. He said these data indicated that the captured sturgeon in the Rock Island Reservoir are from the CRITFC releases; no Lake Roosevelt-released fish were identified. Jerry Marco confirmed this. Keller said the long-line fishing contractors will use a passive integrated transponder (PIT)-tag reader to search for tagged fish in 2011, as they have in the last 3 years. To date, they have found no Columbia Basin PIT Tag Information System (PITAGIS)-registered PIT-tags in captured sturgeon in the Rock Island Reservoir. The PIT-tags used in the CRITFC-released sturgeon were not registered to PITAGIS; the Lake Roosevelt sturgeon PIT-tags are in PITAGIS.

Hemstrom said he emailed the 2011 Rocky Reach Yearling Chinook Survival Study Plan to Andonaegui for distribution to the Committees on March 9. To date, only Bryan Nordlund has provided comments. Nordlund asked if the two years of diel sampling could be used to estimate day vs. night run-of-river arrival times at Rocky Reach Dam, and if survival study results could be weighted to reflect this passage timing. Hemstrom said that peak passage of run-of-river fish was different each year during the past 2 years of day/night studies, and he would like at least 3 years of data before applying a weighting factor to study results. Hemstrom said that passage was higher at night last year but that in 2009 the difference in day vs. night passage was a little more pronounced. Bob Rose asked if the difference in diel passage time might be related to flow. The Committees discussed diel passage and the extent to which passage patterns can be identified. Hemstrom said load usually ramps up early in the morning but that is not when you see juvenile fish passage increase; peak juvenile passage tends to be in the first hour or two of dark. Nordlund said he was satisfied with the discussion relative to his comment.

B. Rock Island and Rocky Reach Fishway Maintenance and Half-duplex PIT-tag Detector Installation (Steve Hemstrom and Lance Keller)

Steve Hemstrom reported that the annual Rocky Reach fishway maintenance was completed and the ladders were fully operational on March 1, 2011. An additional week was requested to complete maintenance at the Rock Island fishways; however, the entire week was not needed and all fish ladders were fully operational on March 4. Hemstrom reported that during the maintenance, Chelan PUD staff developed a way to test the condition of the diffusion grating bars in the Rock Island right bank fishway by tapping on them with a hammer. He said they had learned that if a bar did not sonically resonate after striking, the welds that held the bars in place were defective and required repair. Welds on several bars were repaired during this evaluation.

Lance Keller provided an update on half-duplex (HD) PIT-tag detector installation in the trifurcation pool. Keller indicated that the 16-foot wide trifurcation pool channel presents a particularly challenging environment in which to obtain high detection efficiency. The Rocky Reach Fish Forum came up with plan for installing HD PIT tag detection in each of the three fish ladder entrances at their last meeting that involves installing an unshielded cable down the center of the pool to improve detection. The installation will be done during the 2011/2012 scheduled fish ladder outage for maintenance.

C. Pre-season Efficiency Check of Rocky Reach Juvenile Bypass PIT Tag Detector (Lance Keller)

Lance Keller said crews are releasing fish into the juvenile bypass today to test for injuries or descaling of fish using the bypass. Crews are also evaluating PIT tag detection efficiency. The evaluation will continue tomorrow.

D. Finalize Rocky Reach Juvenile Bypass and Predator Control Reports and the 2011 HCP Action Plan (Lance Keller)

Lance Keller reported that March 18, 2011, was the deadline for providing comments on the Rocky Reach and Rock Island Pikeminnow Predator Control Program Report and the Rocky Reach Juvenile Bypass System Report. He said Jim Craig provided comments on the Juvenile Bypass System Report, suggesting that daily flow averages be added to Appendix A and Appendix B to allow for correlating flows with descaling. Keller will finalize the reports and email them to Carmen Andonaegui for distribution to the Coordinating Committees. Keller said he distributed the finalized 2011 Rocky Reach and Rock Island HCP Action Plans to Andonaegui for distribution.

E. Pool Raise and Pumped-Storage Projects Outreach Plan (Steve Hemstrom)

Steve Hemstrom said Chelan PUD is working with the Washington State Department of Ecology (Ecology) to evaluate a 3-foot pool raise for the Rocky Reach Project; Andrew Grassell of Chelan PUD is the overall project lead. Hemstrom said he is the biological lead for the pool raise project. He said that between now and May 2011, Chelan PUD will develop inundation maps for the pool raise. He said the inundation maps will be useful in identifying key concerns associated with the pool raise. From June thru mid-July, Chelan PUD will meet with key stakeholders and conduct one-on-one meetings. Depending on stakeholder meeting outcomes, Initial Consultation Package (ICP) documents would be developed. Hemstrom confirmed that a pool raise would require a license amendment.

Bryan Nordlund asked about potential effects of the pool raise on the juvenile bypass system and on the District's juvenile passage survival studies and work already completed. Hemstrom said Chelan PUD's intent is to fully evaluate all possible effects for benefits and costs to Chelan PUD and the region. He said the process has decision points for deciding whether to continue evaluating a pool raise or whether to discontinue the evaluation. Nordlund asked if a conceptual plan for the pool raise has been developed. Hemstrom said the concept will be developed as part of the ICP from mid-July thru September 2011, following stakeholder group meetings. The ICP documents will describe the project and potential issues. From October through mid-November 2011, as part of a three-stage consultation process, formal scoping meetings will be held with stakeholder groups to identify concerns and study plan needs. Bob Rose asked if the pool raise proposal would require a license reopener. Hemstrom confirmed that a license reopener is required to amend a license. He said this is the second time Rocky Reach will consider a pool raise. The current Federal Energy Regulatory Commission (FERC) license allows for a 707-foot maximum elevation and a 703-foot minimum elevation, with an option for a 710-foot operating level. Teresa Scott said when Ecology was directed by the Washington State legislature to pursue more opportunities for water, Ecology focused first on large, existing reservoirs. She said the idea was to look at opportunities associated with existing infrastructure to minimize potential environmental impacts while maximizing the amount of water to be gained. Scott said that the economic costs of meeting existing constraints at existing projects may be too high. She asked if the HCP Coordinating Committees would be considered a stakeholder in the process. Hemstrom said Chelan PUD is planning to deal directly with stakeholders, which will include the HCP signatories.

Hemstrom said Chelan PUD has finished a preliminary analysis on the pumped-storage concept for Ecology. Ecology will present the analysis at a May 2011 meeting of the Columbia River Policy Group. He said pumped storage involves pumping Columbia River water into storage reservoirs for later use. Hemstrom said some locations have been identified but not yet made public to prevent land speculation. He said the pool raise and the pumped-storage alternatives are not linked and are being evaluated independently.

III. Douglas PUD

A. DECISION: Wells 2011 Juvenile Bypass Operating Plan Approval (Tom Kahler)

Tom Kahler said comments were due on the Wells 2011 Juvenile Bypass Operating Plan (Bypass Plan) 10 days ago; no comments were received. Mike asked for any additional comments from the Coordinating Committees. Bob Rose asked for a summary explanation of any differences between the 2011 Bypass Plan and last year's Bypass Plan. Kahler explained the three differences to Rose, saying the explanation of differences was also captured in last month's Committees' meeting minutes. The Committees approved the Bypass Plan. Kahler will finalize the Bypass Plan and email it to Carmen Andonaegui for distribution to the Committees.

B. Spring 2011 Investigation of the Life History of Sub-yearling Chinook in the Wells Reservoir Study Plan (Tom Kahler)

Tom Kahler said that as discussed at the Coordinating Committees' November 2009 sub-yearling Chinook summit, it is clear that sub-yearling Chinook salmon exhibit a suite of life history strategies in the Snake River basin, but that not much is known regarding life history diversity among Mid- and Upper-Columbia River sub-yearlings. Earlier, Chelan and Douglas PUDs proposed a plan to evaluate sub-yearlings originating in the upper Columbia using PIT-tag data. However, initial analyses indicated that the availability of tagged sub-yearlings in the Upper Columbia was very limited. Accordingly, Douglas PUD plans to enhance the number of PIT-tagged sub-yearlings in the upper Columbia. In addition, Kahler said Douglas PUD wants to investigate sub-yearling life history strategies more systematically He said Douglas PUD's plans for 2011 are a pilot study to investigate how and where sub-yearling can best be captured. The goal will be to capture and PIT-tag up to 20,000 sub-yearlings in the Wells Reservoir. Kahler said this was not a license requirement, but that Douglas PUD thinks a study is necessary to make progress toward obtaining a valid passage survival estimate for sub-yearlings. He said the draft 2011 sub-yearling survival study plan is the basis for obtaining a collection permit for the study. Jim Craig asked about the use of night snorkeling as a way to locate sub-yearlings, saying it was often easier to locate sub-yearlings at night. Kahler noted that it may also be effective to dip-net along the shores at night, consistent with sub-yearlings' tendency to move into shallow shoreline areas at night. Kahler said he would appreciate any comments on the draft study plan; however, he clarified that he was not seeking formal approval by the Committees.

Bob Rose asked if Douglas PUD would consider double tagging PIT-tagged sub-yearlings with a dummy, injectible tag to simulate the use of injectable acoustic tags. The purpose would be to evaluate possible tag effects on various fish sizes, anticipating availability of the injectible acoustic tag in the future. Kahler said if Douglas were to investigate how tagged subyearlings respond to tag burdens, they would likely start in a lab environment. He said Douglas PUD already faces a considerable challenge obtaining large enough fish to handle the burden of a single PIT tag; adding the burden of a second "dummy" tag would further reduce the proportion of taggable fish in the population. Mike Schiewe suggested the issue of tag burden would be a good subject to pursue with Michelle Rub. Bryan Nordlund asked why spend time comparing sub-yearling reservoir residence time with acoustic tag life (as indicated in Hypothesis Three), since tag life is a "moving target." Kahler said Hypothesis Three is driven by available technology and a need to know if a critical assumption can be met; determining the average residence time of sub-yearlings will allow for comparison with tag life regardless of changes in tag life over time.

IV. Hatchery and Tributary Committee Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees did not meet in March so there is no update. The next Tributary Committees meeting is scheduled for April 14.

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on March 16:

- The Hatchery Committees met at Douglas PUD this month. Future meetings will alternate between Chelan and Douglas PUD offices.
- The Hatchery Committees approved the Wells Steelhead Hatchery and Genetics Management Plan (HGMP), which will be submitted to National Marine Fisheries Service (NMFS).
- Craig Busack reported that NMFS had completed consultations and issued permits for three Umatilla hatchery programs, and they are turning their attention to the upper Columbia HGMPs.
- The Hatchery Committees approved relocation of Chelan PUD's Wenatchee steelhead program from Turtle Rock to the Chiwawa Facility. In the past, 400,000 steelhead were produced at Turtle Rock and drop-planted in the Wenatchee Basin, a practice that contributed to a high stray rate. More recently, incremental changes in acclimation were made with 50,000 juvenile steelhead acclimated in Blackbird Island Pond and 30,000 acclimated in circular rearing ponds at the Chiwawa Facility. Part of the approved program relocation agreement included an agreement to implement the reduced program size of 247,000. The total number of steelhead juveniles produced could be reduced by about 30,000, if high-Bacterial Kidney Disease (BKD) Chinook need to be raised at the Chiwawa Facility.
- Chelan PUD has a proposal before the Hatchery Committees to relocate their Methow spring Chinook program from the Methow Hatchery to the Chiwawa Facility. The Hatchery Committees are presently working on recalculation methods for Chelan and Douglas PUDs with the expectation that both programs will be reduced. Chelan PUD currently produces 288,000 of the total 550,000 spring Chinook produced at the Methow Hatchery. Depending on recalculation method, Chelan PUD's Methow production would be reduced to about 90,000 to 120,000 smolts, and their Wenatchee spring Chinook program reared at the Chiwawa Facility could be reduced to about 20,000. As an alternative to such a large reduction in the Chiwawa program, Chelan PUD has proposed moving Methow spring Chinook

production to the Wenatchee at the Chiwawa Facility, and maintain a minimum production level of 200,000. A conference call has been scheduled for March 29, 2011 to vote on Chelan PUD's request for approval of their proposal.

- Chelan PUD presented their proposal for recalculating their hatchery No Net Impact (NNI) production. Their preferred method uses monitoring and evaluation (M&E) program data and an estimate of carrying capacity, using the Biological Assessment and Management Plan (BAMP) method only when adequate data are not available. Mike Schiewe said the decision on which recalculation methods to use needs to be made prior to October 2011. Douglas PUD has proposed to use the BAMP method for all recalculations. The Hatchery Committees are evaluating alternative outcomes if different methods are used. They have decided to hold off making a decision on recalculation methods to allow for further discussion. The Hatchery Committees want to be able to clearly explain why one method was chosen over another. Chelan and Douglas PUDs have agreed to put approval of their recalculation method on hold until after further discussion.
- Douglas PUD reported that the Twisp Weir trap is in place.
- The potential to acclimate steelhead at the Twisp Ponds in 2011 was discussed. Although further discussion among Douglas PUD, Washington Department of Fish and Wildlife (WDFW), and the Yakima Nation are scheduled, there was a tentative agreement to acclimate steelhead and Chinook together in the Twisp Ponds in 2011. It was further agreed that an observational approach would be developed to evaluate interactions.
- WDFW will deliver the 2011 draft broodstock protocols to the Hatchery Committees by the end of the month for discussion at the next meeting.
- WDFW provided a draft 2011 Tumwater Dam Operations Plan to the Hatchery Committees; current operations are not a high concern as only steelhead are arriving. Chelan PUD has asked parties conducting non-HCP operations at Tumwater Dam to obtain their own Endangered Species Act (ESA) permit for those operations from NMFS. The Hatchery Committees were not successful in getting full agreement on the impacts of the delay, although all parties agreed that there was a significant delay when multiple species were passing together and intensive trapping was taking place. Chelan PUD is coordinating with both NMFS and U.S. Fish and Wildlife Service (USFWS) to make sure ESA incidental take is not exceeded at Tumwater Dam. The issue of lamprey passage at Tumwater Dam was raised; the agencies and tribes will be

meeting to look at the issues and possible solutions. Mike Schiewe said the the steelhead reproductive study will be completed this spring, and the spring Chinook reproductive study has 2 more years before completion.

- WDFW presented a Hatchery Production Plan to the Hatchery Committees to better ensure that production targets are met but not exceeded. The goal is to reduce production overages and the subsequent need to dispose of excess.
- Douglas PUD and USFWS coordinated the potential collection of summer/fall Chinook gametes at Wells Dam for production at the Entiat National Fish Hatchery (NFH). USFWS is expanding production of summer/fall Chinook at the Entiat NFH to 400,000, and is requesting gamete collection at Wells rather than having to transfer adults to the Entiat NFH for spawning. An agreement will be worked out between USFWS and Douglas PUD contingent upon a determination by the Hatchery Committee that the collection will not impact HCP production.

V. HCP Administration (Mike Schiewe)

A. *Next Meetings*

The next scheduled Coordinating Committees' meetings are April 26, May 24, and June 28. The April and June meetings will be at SeaTac. The May meeting will occur in the Wenatchee/Leavenworth area. Suggested agenda items for the May meeting include site visits to Tumwater Dam and Blackbird Pond, and using the USFWS Leavenworth office as a meeting location.

List of Attachments

Attachment A – List of Attendees
Attachment B – John Skalski letter on 2010 juvenile survivals through the surface collector

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco* (by phone)	CCT
Bob Rose*	Yakama Nation
Teresa Scott*	WDFW
Jim Craig*	USFWS
Bryan Nordlund*	NOAA

* Denotes Coordinating Committees member or alternate

Attachment B

SCHOOL OF AQUATIC & FISHERY SCIENCES
COLUMBIA BASIN RESEARCH

UNIVERSITY OF WASHINGTON

7 March 2011

Steve Hemstrom
PUD No. 1 of Chelan County
P.O. Box 1231
327 North Wenatchee Avenue
Wenatchee, Washington 98801

Dear Steve,

At the last Wenatchee meeting, you asked about the single-release survivals of the Wells tailrace released fish through the surface collector. We calculated survivals through the collector to Rock Island hydropark for nautical day and nautical nighttime passed fish from Wells. For comparison, the same reach survival was also calculated for the surface collector released fish:

Group	Surface collector to RI Hydropark
Wells/nautical day	$\hat{S}$ = 0.9856 ($\widehat{SE}$ = 0.0083)
Wells/nautical night	$\hat{S}$ = 0.9792 ($\widehat{SE}$ = 0.0119)
Surface collector release	$\hat{S}$ = 0.9646 ($\widehat{SE}$ = 0.0028)

As you can see, the virtual released fish originating from Wells had better survival than the direct surface collector released fish. Part of the difference could be attributed to differences in survival between newly released fish and prior released fish. However, adjusting the survival of the surface collector fish for the tailrace controls, using the paired-release model, produces an estimate of $\hat{S}_{SC}$ = 0.9685 ($\widehat{SE}$ = 0.0091). This adjusted survival estimate is still smaller than the reach survivals for the Wells fish, despite the longer travel distance to Rock Island Hydropark for the Wells fish going through the surface collector.

These results, along with the higher estimates in previous years for surface collector passed fish, suggest there was something odd or unlucky with the surface collector release in 2010.

Sincerely,

John R. Skalski
Professor of Biological Statistics

1325 Fourth Avenue, Suite 1820, Seattle, Washington 98101-2509
(206) 616-4851 Fax (206) 616-7452 www.cbr.washington.edu

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	May 24, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of April 26, 2011, HCP Coordinating Committees' Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, April 26, 2011, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Jerry Marco will contact Jeff Fryer, Columbia River Intertribal Fish Commission (CRITFC), to determine if the sockeye salmon that CRITFC plan to mark at Wells Dam will be externally marked and if the fish which receive an acoustic tag will be anesthetized. He will email Fryer's response to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-A).
- Tom Kahler will contact Jeff Fryer to clarify the number of sockeye that CRITFC plans to tag at Wells Dam. He will email Fryer's response to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-A).
- Keith Truscott will email a copy of the Corral Creek Dock application to Carmen Andonaegui for distribution to the Coordinating Committees (Item III-B).
- Keith Truscott requested that Coordinating Committees' members send any comments on the Corral Creek Dock application to him within 30 days for compiling and forwarding on Douglas County (Item III-B).
- Carmen Andonaegui will forward Chelan PUD's comments on the Tumwater Dam (TWD) Operation Plan to the Coordinating Committees (Item III-E).
- Carmen Andonaegui and Mike Schiewe will work with Jim Craig and Steve Hemstrom to develop an agenda and meeting location for the May 24 , 2011, Coordinating Committees' meeting (Item V-A).

DECISION SUMMARY

- The Coordinating Committees approved a sampling request by CRITFC for a maximum of 870 sockeye from Wells Dam in 2011(Item II-A).

REVIEW ITEMS

- Final Wells 2010 Yearling Survival Study Report: 60-day review period with comments due May 4, 2011.
- Draft 2011 Rocky Reach Yearling Chinook Survival Study Plan: 60-day review period with comments due May 7, 2011.
- Draft 2010 Douglas PUD Pikeminnow Program Report: 60-day review period with comments due June 22, 2011.

I. Welcome

Mike Schiewe welcomed Coordinating Committees' members and asked for any additions or changes to the agenda. Keith Truscott requested three new agenda items: (1) an update on the Beebe Ranch dock application; (2) notification of a new, pending dock application at Corral Creek; and (3) an update on fish passage at TWD. The Committees reviewed the draft March 22, 2011, meeting minutes. The minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Douglas PUD

A. 2011 CRITFC Sampling Request for Wells Sockeye (Tom Kahler)

Tom Kahler said Douglas PUD had received the annual request from CRITFC (Attachment B) to sample and tag sockeye salmon at Wells Dam. The Committees agreed on the importance of the information generated by the tagging, but found the specifics of the request unclear on the total number of fish to be samples and tagged. The CRITIFC letter asked for between 600 and 870 adults. Last year, the request was for 400 adult sockeye. Kahler said there is a projected return of 130,000 sockeye this year.

Jerry Marco asked if the acoustic-tagged sockeye would also be marked externally so they could be readily identified if captured in the upstream Okanogan River 2011 Colville Confederated Tribes (CCT) seine fishery. He said that if the CRITFC acoustic-tagged fish were externally marked, they could be released rather than retained. Marco said CCT would have onboard passive integrated transponder (PIT)-tag readers. He agreed to contact Jeff Fryer, CRITFC, to determine if the sampled sockeye from Wells Dam would be externally marked. Kahler said he would follow up with Fryer as well to determine the exact number of adult sockeye CRITFC is asking to sample this year. Marco mentioned that there could also be a sports fishery at the mouth of the Okanogan River again this year and asked if sampled fish would be anesthetized. Kahler said he thought those receiving an acoustic tag need to be anesthetized. Marco said he would check with Fryer on this as well. He will email Fryer's response on both external marking and anesthetizing to Carmen Andonaegui for distribution to the Coordinating Committees. Kahler will also contact Fryer for clarification on the exact number of sockeye CRITFC is requesting to sample, and email Fryer's response to Andonaegui for distribution to the Committees. The Committees approved the CRITFC sampling request for a maximum of 870 sockeye from Wells Dam for sampling in 2011.

B. General Douglas PUD Updates (Tom Kahler)

Tom Kahler said Douglas PUD is working with their consultant to finalize a draft report on the results of velocity measurements at the entrance to the adult fishway at Wells Dam. He said he will present the results at the next Coordinating Committees' meeting.

Kahler said he spoke with Richie Graves, National Marine Fisheries Service (NMFS), regarding Endangered Species Act (ESA) coverage for the sub-yearling Chinook life history behavior study Douglas PUD plans to conduct in 2011. He said Bryan Nordlund had asked for update on the status of ESA coverage for this study at the last Committees' meeting. Kahler said Graves confirmed that a provision in Permit 1391 covers effects of studies such as that proposed on ESA-listed spring Chinook and steelhead, over which NMFS had ESA regulatory authority. He said he is waiting on a response from Jessie Gonzales, U.S. Fish and Wildlife Service (USFWS), regarding ESA coverage for bull trout.

III. Chelan PUD

A. Update on Beebe Ranch Dock Application (Keith Truscott)

Keith Truscott provided an update on the application for a large dock facility at the Beebe Ranch development located immediately upstream of Beebe Bridge. He said if Chelan PUD receives an application for a boat dock with less than ten slips, and the regulatory agencies approve the request through the Joint Aquatic Resource Permit Application (JARPA) process, Chelan PUD typically issues a dock permit directly to the applicant. If a dock application is for more than ten slips, Truscott said Chelan PUD has to file an application for the dock construction with the Federal Energy Regulatory Commission (FERC). They have done this for the Beebe Ranch dock application. He said NMFS provided comments on the application, which has been filed with FERC. Truscott said Chelan PUD has heard that FERC is preparing to conduct a Biological Assessment (BA) on potential impacts from construction of the Beebe Ranch dock on ESA-listed species and HCP Plan Species. In conversations with the Beebe Ranch developer and NMFS, both parties have expressed an interest in trying to find a compromise on design of a dock and river access that will not affect salmonid species. Truscott said Chelan PUD plans to write a letter to FERC requesting the evaluation of the Beebe Dock application be placed in abeyance so NMFS and the developer can meet and reconsider the design.

Bryan Nordlund asked if FERC's intended BA would include both ESA-listed and HCP Plan Species. Truscott was uncertain. Mike Schiewe suggested Truscott contact FERC and determine if both ESA-listed and HCP Plan Species were to be included in FERC's evaluation of potential Beebe Ranch dock impacts. Truscott said that as indicated in the HCP, Chelan PUD must consider cumulative effects of reservoir dock projects on HCP Plan Species, and that Chelan PUD intends to ensure this is done.

B. Notification of Corral Creek Dock Application on the Rocky Reach Reservoir (Keith Truscott)

Keith Truscott said the Corral Creek dock application to install a four-slip dock on the Rocky Reach Reservoir is currently under review by Douglas County. Corral Creek is immediately adjacent to the Beebe Ranch development. Truscott will email a copy of the Corral Creek Dock application to Carmen Andonaegui for distribution to the Coordinating Committees. Chelan PUD filed comments on the application on April 22, 2011, addressing flow easement and notifying Douglas County that Chelan PUD would be requesting comments from the Committees, which would need to be addressed by the applicant. Truscott asked the Committees to review the application and provide comments to Chelan PUD within 30 days. Truscott said he would compile the comments and provide them to Douglas County. He will provide Carmen Andonaegui an electronic copy of the compiled comments for distribution to the Committees. Truscott said Chelan PUD will be asking for Committees' comment on future dock applications.

Bryan Nordlund said his concerns regarding dock impacts include all ESA-listed species, and extends to HCP Plan Species as well. He said potential impacts from dock construction on the reservoir are most likely to affect sub-yearling Chinook. He said he did not think the science was currently available to understand how best to protect juvenile salmonids from the cumulative effects of dock construction, or to understand how impacts may affect achieving survival standards. Nordlund said he was glad to hear Chelan PUD was considering cumulative effects. Truscott said Chelan PUD is not only committed to looking at cumulative effects from docks, but is concerned that they be able to meet HCP survival standards.

Teresa Scott said she will speak internally with Washington Department of Fish and Wildlife (WDFW) staff to get her agency's thoughts on the Corral Creek dock application and the cumulative effects issue. She said she hoped the JARPA review process would address cumulative effects. Truscott said Chelan PUD's goals are to identify potential effects, understand if the effects are influencing Chelan PUD's ability to meet their HCP survival standard, and, if necessary, identify a solution. He said Chelan PUD does not currently have data to meet these goals. Mike Schiewe said that the Committees, by reviewing and commenting on the application, are potentially overlapping the JARPA permit process. Scott said, and Truscott agreed, that the Committees' review of the dock permits should force communication within the reviewing agencies and is beneficial to the evaluation.

Jim Craig said that he would speak with Steve Lewis, USFWS, regarding the dock application. Truscott mentioned that Chelan PUD is not a "noticed" agency on the JARPA form and that therefore they learn about dock applications late in the permitting process. Schiewe said that the permitting arms within agencies that review the applications need to communicate internally with their Committees' representatives on projects that might impact HCP Plan Species. Nordlund noted that internal communication within NMFS did occur regarding the dock project, and the conclusion was that given the uncertainty about cumulative effects of dock construction in the Upper Columbia on all salmonid species, and the current shortfall in achieving listed spring Chinook project performance standards at Rocky Reach, NMFS would intervene and protest the amendment before FERC. He noted that the ESA consultation process differs from an intervention under the FERC amendment process for HCP Plan Species. Nordlund stated that it is likely not possible to reach a jeopardy conclusion under the ESA for a single dock installation, because jeopardy to the population as a whole is very difficult to prove and cumulative dock effects are currently unknown. A no-jeopardy conclusion does not mean that ESA species would not be adversely affected, and the Biological Opinion written for the Beebe Ranch Development docks discussed several potential adverse effects on salmonids. NMFS has asked for a cumulative effects analysis from the U.S. Army Corps of Engineers that would assess a potential tipping point – one dock may not matter, but would 1000 docks matter? He noted that he had recently reviewed a Lake Washington study that clearly demonstrated that docks tend to provide cover for predators in the same shallow water habitat preferred by rearing juvenile salmon.

Truscott said Chelan PUD would keep the Committees informed on processing of dock applications. Nordlund said that if it turns out that docks have a negative effect on sub-yearling survival, and if increased dock installation increases predation on HCP Plan species and there is a project survival shortfall, it seems that the remaining option is to modify dam passage options to further increase Project survival. Nordlund questioned why Chelan PUD would be willing to mitigate for potential effects caused by others in dock construction, given their commitment to achieve project survival standards under the habitat conservation plan.

C. Rocky Reach Yearling Chinook Survival Study Preparation (Steve Hemstrom)

Steve Hemstrom said the yearling Chinook survival study at Rocky Reach began April 25, 2011, with Release One at Wells at about 12:30 pm, and then with a release at about midnight. He said there will be a total of 15 releases over 30 days. Hemstrom said they are continually looking at fish condition as the juveniles pass through the Rocky Reach juvenile bypass and are set up to take photos of fish. Lance Keller indicated that up to 10 percent of the fish observed had external fungus infections early in the migration, but that they are now seeing lower rates of infection. Hemstrom said the fish are otherwise looking good (i.e., no fin erosion). Jim Craig asked if fungus rate was being seen in both unmarked and adipose-clipped (ad-clipped) fish. Hemstrom responded that it is being seen mostly in ad-clipped fish. Craig said the USFWS is discussing whether the juveniles were pushed out of the rearing facility too early in the Entiat and what effect that might have had on the juveniles. Mike Schiewe asked if fish origin can be determined for the juveniles. Keller said not without PIT-tags, unless they sacrifice fish to look at coded wire tags (CWTs). Hemstrom said 80 to 85 percent of yearling Chinook used in the survival studies are hatchery fish from unknown locations.

Hemstrom said juvenile yearling Chinook will be released every other day during the study period, with 24-hour sampling at Rocky Reach to estimate time of passage. Hemstrom said river flows were about 140 kcfs on April 24 and 25, 2011, at Rocky Reach Dam; 2010 flows at this time were about 50 to 60 kcfs. Current high flows are the result of reservoir drafting at Grand Coulee Dam and refill may not start until mid-May, given the large snowpack. Keller provided some preliminary results on passage timing, saying it was much faster this year compared to last year. Hemstrom reminded Committees' members to call him with any questions on the study; final review comments are due no later than May 4.

D. Tagging/Release of First Juvenile Sturgeon into the Rocky Reach Reservoir (Josh Murauskas and Lance Keller)

Steve Hemstrom said, as required by the new FERC license for the Rocky Reach Hydroelectric Project, juvenile white sturgeon have been released into the Rocky Reach Reservoir. Josh Murauskas said all released fish were tagged and scute marked consistent with the Rocky Reach White Sturgeon Management Plan. Chelan PUD is now moving into broodstock collection activities for use in producing next year's juveniles.

E. Tumwater Dam Fish Passage Update (Josh Murauskas)

Steve Hemstrom reminded Committees' members that the next Coordinating Committees meeting will be in the Wenatchee area and that a site visit to TWD is on the agenda. In anticipation of the visit, Josh Murauskas provided an update on TWD passage issues. He said the Hatchery Committees have been discussing passage delays at TWD, which appear to have started in 2004 when 100 percent trapping was implemented for a spring Chinook reproductive success study. Murauskas said the length of the delay appears to influence the likelihood of upstream detection on the spawning grounds. He said approximately 20 percent of spring Chinook and 30 percent of sockeye are delayed in the TWD adult fish ladder. The delays are based on PIT tag detection of the adults at Station 15 in the adult fish ladder, without subsequent detections at upstream arrays. He said the fish do not appear to experience delays when the fish ladder is open. Murauskas said that Jeff Fryer, CRITFC, and the USFWS have noticed delays at TWD. He said WDFW feels modifications to staffing and facilities may solve many problems, but that this opinion is not accepted by all parties.

Murauskas said Chelan PUD is concerned about ladder delays of ESA-listed species because Chelan PUD is one of the ESA permit holders (WDFW and Douglas PUD are the other co-permit holders). Murauskas summarized Chelan PUD's recommendations for TWD trapping operations that are currently under discussion in the Hatchery Committees. These include real-time monitoring of fish passage using PIT-tag detections; opening the fish ladder between 9 p.m. and 6 a.m. when the trap is not being operated; and a 98 percent dam passage standard. Committees' members requested a copy of Chelan PUD's recommended TWD operational recommendations; Carmen Andonaegui will distribute to the Committees.

Mike Schiewe said this topic of fish passage delays at TWD will continue to be reviewed by the Hatchery Committees and asked if Murauskas would be available during the TWD tour to provide additional information as needed. Murauskas said he would be available. Schiewe noted that after the April Hatchery Committees meeting, NMFS and the USFWS acknowledged their individual regulatory roles under the ESA, and convened a meeting with WDFW and Chelan PUD to discuss acceptable solutions. Schiewe said more information will be available after the May 11, 2011, NMFS and WDFW meeting.

Bryan Nordlund noted that Douglas PUD is also listed on the permit that covers TWD operations and asked if they would be engaged in the discussions. Tom Kahler said Douglas PUD is not currently implementing any activities at TWD and have not discussed what if any input they may have on the issue of delay in passage. He said they might want to have input if it was determined there was threat of take at TWD. Nordlund noted that delay is "take", per ESA. Kahler will discuss the issue with Shane Bickford, Douglas PUD. Permit 1196 covers operations associated with the collection of spring Chinook broodstock, and Permit 1395 covers operations associated with collection of steelhead broodstock. Schiewe explained that new research and adult management activities have been added as covered by the permits, since they were originally issued for broodstock collection. The permits were issued for a 10-year period in 2004.

Hemstrom said the 2004 USFWS ESA consultation and subsequent Biological Opinion, prepared by the USFWS for Rocky Reach relicensing, evaluated trapping times and potential take at TWD during broodstock collection. He said he submits annual reports on "take" to the USFWS, and that Steve Lewis responded to the last annual report saying that a separate discussion is needed regarding the effect of trapping operations delays on bull trout.

Hemstrom said Chelan PUD believes trapping operations and not the fishway itself are the cause of delays at TWD. Schiewe said he hoped this issue could be discussed at the May 11, 2011, meeting with the NMFS and the USFWS.

IV. Hatchery and Tributary Committee Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees met on April 14, 2011 and discussed the following items:

- The schedule for review of General Salmon Habitat Program (GSHP) proposals has been issued.
- There was a brief discussion on a new tool recently developed by NMFS and the USFWS for evaluation of river restoration projects. The new tool is called RiverRAT. There will be a training on use of the software, with dates to be determined. Schiewe asked Tom Kahler to circulate the final meeting date to the Coordinating Committees when it is available.

The Tributary Committees decided to not submit a letter in support of an Upper Columbia Salmon Recovery Board's (UCSRB's) funding proposal to the Icicle Fund.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on April 20, 2011:

- Significant progress was made on a method to recalculate the sizes of HCP hatchery programs required to meet the hatchery No Net Impact (NNI) goals; recalculation is required every 10 years, with the first recalculation due to be implemented in 2013. Recently, the Joint Fisheries Parties (JFP) developed a method for recalculating sizes of hatchery programs considering the Biological Assessment and Management Plan (BAMP). The JFP analysis provided production estimates that were larger than the PUD estimates, which were based on different recalculation methods. (Note: Tom Kahler reminded the Committees that the BAMP calculation was not used to determine the original NNI mitigation calculation for the Wells or Rock Island projects. He said these production numbers came from settlement agreements that predated the HCP.) Schiewe said recalculation requires two metrics: an estimate of the number of hatchery and natural smolts passing a Project, and an estimate of smolt survival. The Hatchery Committees' agreed to use the number of hatchery fish released for the "estimate" of hatchery fish and to estimate the number of natural origin fish arriving at a dam based on returning natural origin adults. A subgroup of the Hatchery Committees is working on developing a natural production calculation. Agreement on a method to calculate natural production will need to be confirmed by HCP Hatchery Committees, and will likely include Grant PUD so that a uniform approach to calculating natural production will be used by all three PUDs.

- Chelan PUD has proposed discontinuing the use Bonaparte Pond as a rearing and acclimation site for summer/fall Chinook, based on persistent disease problems. Further, with Chief Joseph Hatchery coming on-line in the near future, the value of using Bonaparte Pond for acclimation will be reduced. CCT is reluctant to give up on Bonaparte Pond and is reviewing CWT data from Chinook spawning in the vicinity of Bonaparte Pond. (Note: Jerry Marco said CCT is looking for any strong correlations between spawners at this location and smolt releases at Bonaparte Pond.) Schiewe said there will be a decision on the future use of Bonaparte Pond made at the next Hatchery Committees meeting; if the Hatchery Committees approves continuing use, it will likely be for 100,000 or fewer juveniles rather than at the previous 200,000 level.
- The Hatchery Committees agreed to continue rearing 400,000 summer/fall Chinook at Ringold Hatchery in 2011 for acclimation at Chelan Falls as yearlings. Schiewe said the density index at Ringold Hatchery is 0.2 lbs/ft^3/in; although this is higher than HCP-allowed densities, rearing at those densities at the Ringold Hatchery has not been a problem.
- The Hatchery Committees are continuing to work to resolve TWD passage delays.
- There was discussion of the use of PIT-tag data to enumerate sockeye escapement in the Upper Wenatchee basin. It was agreed to use PIT-tag detections as one estimate, but to continue to conduct spawning ground surveys in the Little Wenatchee to compare with PIT-tag data.
- Mike Tonseth circulated a draft Hatchery Management Plan. The plan outlines steps and procedures to better achieve target production levels, allowing for adjustments to production at various life stages. Tonseth will have the document reviewed by WDFW staff in Olympia. Upon approval by the Hatchery Committees, it will appear as an appendix to the annual broodstock protocols.

- Tonseth distributed the draft 2011 broodstock collection protocols. He reviewed the changes from last year's protocols, all of which were associated with making the protocols consistent with the draft Hatchery and Genetic Management Plans (HGMPs).
- Douglas PUD briefed the Hatchery Committees on co-acclimation of spring Chinook and steelhead in the Twisp Ponds this spring. Greg Mackey told the Hatchery Committees that co-acclimation was going well and that sampling so far had shown no negative species interactions. Mackey said that as a result of cold water temperatures, the Chinook had not migrated from the pond yet but he anticipated they would move out this week.
- The USFWS reported on a U.S. Bureau of Reclamation (BOR)-funded process to site and locate a weir on the upper Methow River. Bill Gale, USFWS, requested participation of the Hatchery Committees' members in the process.
- Craig Busack reported that NMFS is starting to review Wenatchee Basin HGMPs, and is making steady progress.

V. HCP Administration (Mike Schiewe)

A. *Next Meetings*

The next scheduled Coordinating Committees' meetings are May 24, June 28, and July26, 2011. The May meeting will occur in the Wenatchee/Leavenworth area. Suggested agenda items for the May meeting include site visits to TWD and Blackbird Pond, and using the Chelan PUD Leavenworth office as a meeting location. The June 28, 2011, and July 26, 2011, meetings will be at SeaTac.

Mike Schiewe discussed the May 24, 2011 meeting. Within the next couple of weeks, Schiewe and Carmen Andonaegui will work with Steve Hemstrom and Jim Craig to develop an agenda with field visits and meeting items.

List of Attachments

Attachment A – List of Attendees
Attachment B – 2011 CRITFC Sockeye Sampling Request

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller *	Chelan PUD
Keith Truscott	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco*	CCT
Teresa Scott*	WDFW
Jim Craig*	USFWS
Bryan Nordlund*	NOAA

* Denotes Coordinating Committees member or alternate

Attachment B

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

729 N.E. Oregon, Suite 200, Portland, Oregon 97232

Telephone (503) 238-0667
Fax (503) 235-4228

March 28, 2011

NOTED
MAR 30 2011
S.A.B.

Shane Bickford
Public Utility District Number 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98801

Dear Shane:

In 2011, we are planning to once again sample sockeye salmon at Wells Dam. We hope to collect scale samples from up to 600 sockeye, all of which we will PIT tag (if they have not already been tagged). In addition, we will acoustic tag up to 70 sockeye salmon and affix temperature tags on to up to 200 sockeye salmon. We anticipate sampling from late June through late July. We will coordinate sampling activities with Wells Hatchery brood stock collection programs. Sampling personnel may include Ryan Branstetter and myself of CRITFC, and Greg Robisonand Barry Hodges of the Yakama Nation.

Please contact me if you have any questions. Thank you for your cooperation with this study.

Sincerely,

Jeff Fryer

Jeffrey Fryer

cc. Bob Clubb
Pat Phillips Wells Hatchery Complex Manager

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	June 28, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of May 24, 2011 HCP Coordinating Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, May 24, 2011, from 9:30 am to 3:00 pm at the Chelan PUD's Leavenworth office. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Beau Patterson will email the Draft 2010 Lamprey Dual Frequency Identification Sonar (DIDSON) Fishway Entrance Efficiency Study to Carmen Andonaegui for distribution to the Coordinating Committees as soon as it becomes available (Item II-B).
- Carmen Andonaegui will send Beau Patterson information on how to upload the lamprey fishway entrance video clips onto the Anchor QEA ftp site for access by the Coordinating Committees (Item II-B).
- Carmen Andonaegui will email the Washington Department of Fish and Wildlife (WDFW) Electro-anesthesia proposal to the Coordinating Committees (Item V).

DECISION SUMMARY

- There were no decisions made at today's meeting.

REVIEW ITEMS

- The draft 2010 Douglas PUD Pikeminnow Program Report has a 60-day review period. Comments are due June 22, 2011.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees' members and asked for any additions or changes to the agenda. Toms Kahler added an update on Columbia River flows and a briefing on Douglas PUD's Gas Bubble Trauma (GBT) sampling at the Wells Project. Steve Hemstrom added an update on Rocky Reach Juvenile Fish Bypass sampling. Jim Craig added an update on passive integrated transponder tag (PIT tag) detections of steelhead at Blackbird Pond. Bryan Nordlund asked for update on Tumwater Dam (TWD) operations.

Hemstrom noted that the review period for Chelan PUD's Draft 2011 Rocky Reach and Rock Island Dams Fish Spill Plan (Spill Plan) had ended; Carmen Andonaegui said comments on the Spill Plan were due to Chelan PUD on April 13, 2011. Hemstrom said that the Spill Plan had been finalized and that spill was being implemented. The Committees reviewed the draft April 26, 2011 conference call minutes. The minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Douglas PUD

A. Wells West Fishway Entrance Velocity-testing Results (Tom Kahler)

Tom Kahler said that in June 2010, Douglas PUD presented a proposal to the Coordinating Committees to conduct a Lamprey DIDSON Fishway Entrance Efficiency Study at the Wells Dam fishway. Based on discussions at that time, Douglas PUD agreed to develop a proposal to empirically measure fishway entrance velocities. In the fall of 2010, Douglas PUD presented a study design to the Coordinating Committees that described the use of Acoustic Doppler Velocimeters (ADV) to collect 3-dimensional (3-D) high-velocity measurements at the fishway entrance under different operating conditions. Kahler explained how the ADVs were aligned and deployed in the entrance by showing PowerPoint slides of the setup, which are included in the Final Wells Dam Fishway Field Velocity Testing Memo (Attachment B). Four operating conditions were tested: both high and low tailwater conditions at 1.5-foot and 1.0-foot head differentials. The study was conducted on March 2, 2011, with river operations modified to create tailwater and fishway entrance conditions that would be experienced by lamprey during the peak of their migration in September. Of particular interest was an evaluation of the extent to which the 1.5-foot head differential would present difficulties for lamprey attempting to enter the fishway, and the extent to which the different operating conditions would impact attraction flows for salmonids.

Kahler showed tables and figures of the results, saying the test results were unexpected in that at both tailwater elevations, highest velocities were measured along the sides of the entrance, particularly along the right side, with lowest velocities measured in the upper, center portion of the fishway entrance. Velocities were lowest overall at the 1.0-foot head differential. He presented the results of the 3-D measurements, and said that the Z dimension measurements (in feet per second [ft/sec]) were mostly negative, except immediately in front of the entrance sill. Beau Patterson said lamprey sustained swimming speed averages of 3 ft/sec with a burst speed of 7 ft/sec.

Kahler described the flow dynamics of the fishway entrance, explaining the unexpected velocity measurement. With an open flume, the expectation is that the highest velocities would occur in the center and the lowest velocities along the sides of the structure; however, at the fishway entrance, flows are compressed as they pass through the entrance, and are forced in from the sides and up from the sill, which increases velocities. The vectors shown in the results are sum vectors, averaged; tailwater elevations shown are the average tailwater ranges for September, which represent an 8-foot spread. Patterson said lamprey have been documented passing through the Wells fishway with a 1.5-foot head differential, but that the extent to which passage is inhibited is unknown. He said the DIDSON camera covers the area from the sill to approximately 4 feet upwards. Patterson said lamprey could potentially be attaching higher up on the sides of the entrance, and not detected by the camera. Bryan Nordlund asked if lamprey could pass through the space between the gate and the concrete wall and therefore not be detected. Patterson said that opening is about 1-inch wide and that lamprey could possibly pass through the space. Nordlund asked about attachment points in the center of the sill. Patterson described lamprey attaching to the sill at the 1.5-foot head differential, and being whipped around before attempting to burst through the entrance, either making it through or getting blown back out of the entrance. He said at the 1.0-foot head differential, lamprey were observed attaching to the sill before bursting very quickly through the entrance or free swimming through the entrance without first attaching.

B. 2010 Lamprey DIDSON Entrance Efficiency Study Results (Beau Patterson)

Beau Patterson presented the preliminary results of the Lamprey DIDSON Fishway Entrance Efficiency Study. He said the draft report should be available within 2 weeks for review; he will email the report to Carmen Andonaegui for distribution to the Coordinating Committees as soon as it is available.

The study was conducted August 7 through September 30, 2010, using a single DIDSON camera in each fishway collection gallery that provided 100 percent coverage of the entrance sill and 4 feet up from sill. Entrance efficiencies were tested at 1.0- and 1.5-foot head differentials using 27 randomized paired treatment blocks. Andonaegui agreed to email Patterson instructions on uploading the lamprey fishway entrance video clips to the Anchor QEA ftp site for access by the Coordinating Committees. Patterson said velocities were higher along the right side of the west fishway entrance and along the left side of east fishway entrance; lamprey favor the east fishway.

Patterson said the effect of the different operating conditions on salmonid fishway passage was evaluated using passage window count data for the test period, and evaluated by species. He said a 1-hour fishway residency offset was used for Chinook and a 6-hour offset for steelhead and sockeye. Both residency offsets were used to evaluate coho passage effects because there is no time delay information for coho. Patterson said that in 2009, no significant difference was detected, but the sample size was too low to detect significant differences. In 2010, there was a large sample of steelhead and Chinook; no differences in fish passage rates were detected between treatments at either the 1.0-foot or 1.5-foot head differential. Patterson said these data are preliminary and that Douglas PUD is still analyzing them.

Patterson reviewed Wells lamprey fishway passage studies since they began in 2004 with radio-tagged lamprey (Attachment C). Douglas PUD switched to using DIDSON cameras to study lamprey passage in 2009 and 2010. Although the small sample sizes in 2009 and 2010 did not yield statistically valid results, Patterson said the observed behavior of the lamprey at the fishway entrance suggests that the lower head differential (1.0-foot) probably enhances entrance and passage success. Bryan Nordlund asked how well the DIDSON camera counts of lamprey compared to count station counts. Shane Bickford said the fish count station has a 25 percent count efficiency compared to the DIDSON camera detections; he noted that lamprey are going through the picketed leads and are not visible in the counting windows. Bickford said high-definition infra-red detection can be used to examine passage behind the picketed lead behind the count window, as long as there are not too many bubbles at the location to interfere with detection.

Patterson said Douglas PUD will monitor Half-Duplex (HD) PIT tags beginning in 2012 to allow for passive monitoring of lamprey passage. The HD detection arrays will be installed this winter. Patterson said to expect the Aquatic Settlement Work Group to make a request at the June or July Committees' meeting asking them to implement a non-study operational change to a 1.0-foot head differential at the fishway entrance from 5:00 pm to 1:00 am during the peak of the adult lamprey migration period.

C. Gas Bubble Trauma (GBT) Sampling (Beau Patterson)

Beau Patterson said that the Wells total dissolved gas (TDG) water quality standards exception for fish passage requires sampling juvenile salmonids for GBT when TDG exceedences above 125% hourly occur. Patterson said TDG levels of 125 percent were recorded in the Wells tailrace on Friday, May 20, 2011, with Wells forebay TDG levels also out of compliance as a result of high TDG levels from Grand Coulee Dam. Douglas PUD began sampling for GBT in juvenile salmonids at the Rocky Reach Dam Juvenile Bypass on Saturday, May 21; early signs of GBT were observed in 4 percent of juveniles sampled. GBT prevalences of 45 percent were recorded in fish sampled on Sunday, May 22, 2011. Most of these were early signs, but some were more severe. On Monday, May 23, 2011, the prevalences of GBT among sampled fish were down to 25 percent, but many fish sampled were in the severe category, predominantly for coho and mainly on the caudal fin. Tom Kahler said that to manage TDG levels, and as required by the Wells Emergency Action Plan, Bypass Barrier 6 was pulled on May 14, 2011, and Bypass Barrier 8 was pulled May 20, 2011.

III. Chelan PUD

A. Rocky Reach Survival Study Progress – River Flow Update (Steve Hemstrom)

Steve Hemstrom said the Rocky Reach Yearling Chinook Survival Study started April 25, 2011. With the high flow conditions in the Columbia River, Hemstrom said it has been difficult getting to the 1,000-foot release point below Wells Dam. As a result, they have had to do releases at 1,800 feet below Wells Dam and releases at Carpenter Island. He said the average discharge Sunday at Wells Dam was 272,000 cubic feet per second (cfs). Hemstrom said they have only been able to get to a no-spill scenario one time since the study began and that no study fish tag data have been retrieved. He said fish can be detected going over the spillway and that these data will be reported, although tag detection becomes very difficult at flows between 270,000 and 275,000 cfs. Hemstrom said they are collecting a large number of juveniles in the bypass.

B. Bypass Operations (Lance Keller)

Lance Keller provided a handout of Rocky Reach juvenile fish bypass sample data through May 22, 2011; sampling began on April 25, 2011 (Attachment C). He said the bypass is running without problems, and that June 2, 2011, is currently the anticipated 95 percent passage point for Chinook; an estimated 194,000 smolts have already passed through the bypass. He said the juvenile sockeye outmigration seems to be a little later this year, but it is expected to pick up; Keller said normally juvenile sockeye numbers pick up about May 15. Once high flows picked up, Keller said they began getting very high juvenile lamprey counts, with 952 lamprey collected on one night and more than 2,000 juvenile lamprey counted over two nights last week. Keller explained the expansion method used for the Rocky Reach passage estimates: the 20 (or less) minute index sample count is expanded to one hour and then expanded to a 24-hour period.

C. Pikeminnow Predator Control Progress Report (Lance Keller)

Lance Keller said river temperatures have been very cold this year. As a result, catch per unit effort of pikeminnow has been low. High flows are also making angling success low. As of May 24, 2011, Keller reported that approximately 14,000 pikeminnow have been captured by Tyson Jerald (Columbia Research) and 400 by the U.S. Department of Agriculture (USDA). Tyson is now capturing approximately 350 fish per day in the Rocky Reach Reservoir.

Keller said Tyson is equipped with a hand-held PIT tag detector, and had recaptured one tagged sturgeon in 70 feet of water and another at about 30 feet deep. Twenty-eight PIT-tagged sturgeon were detected at the Rocky Reach juvenile fish bypass; 25 of the 28 were detected immediately after release. All detected sturgeon were from the Marion Drain program, except for one Chelan Falls-reared fished. Results of a mobile tracking survey showed that a majority of the PIT-tagged sturgeon remained in the release location or close to it, although Keller said mobile tracking is not very efficient, given flow rates and ping rate. He said 38 sturgeon were tagged with acoustic tags. Beau Patterson said he believed the ratio of Marion Drain to Chelan Falls fish was about one-to-one.

IV. USFWS

A. Blackbird Pond (Jim Craig)

Jim Craig provided a handout summarizing detections of PIT-tagged steelhead outmigrants from Blackbird Pond to date (Attachment D). He said the PIT tag detectors were pulled out on May 13 because of flood warnings, but after they were reinstalled on May 16, there were very few detections. Craig said during high-flow conditions, the outlet becomes backwatered and does not function, so outmigration and detections drop off.

V. Hatchery and Tributary Committee Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees met on May 12, 2011, and discussed the following items:

- The Tributary Committees approved funding for two projects. One approval was for a change of scope for the Entiat National Fish Hatchery Improvement Project to include expanding riparian and floodplain habitat improvement actions. The other funded project was to secure riparian and floodplain habitat along the Methow River.
- There was a large response for requests for project proposals for the General Habitat Program pre-proposals, with 27 proposals submitted. Counting Bonneville Power Administration (BPA) and the Salmon Recovery Funding Board (SRFB) project proposal solicitations, Tom Kahler said there were a total of 35 pre-proposals. Nine pre-proposals were judged not likely to be acceptable, which is a high exception rate. Site visits are scheduled for May 25 and 26, 2011; project sponsor presentations are on June 8; and on June 9, the Tributary Committees will meet to consider the project pre-proposals. Funding entities intend to meet in July to coordinate project funding of projects.
- The Tributary Committees were given a presentation by Chelan County on the Nason Creek Lower White Pine side-channel reconnection project. Chelan County is planning an upstream reconnection and the Yakama Nation is planning a downstream reconnection. Chelan County is anticipating a funding contribution from Burlington Northern (BN) Railroad to help cover their expected project cost of more than $2 million.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on May 18, 2011:

- A large part of the Hatchery Committees' effort recently has been on recalculating the hatchery No Net Impact (NNI) contribution. Initial 10-year production levels end in 2013, with the recalculated production levels to begin in 2014. There has been considerable discussion of different methods for recalculation. The Committees established a working group in April 2011 to consider different recalculation methods and are now focusing in on two approaches. The Biological Assessment Management Plan (BAMP) method uses smolt-to-adult returns (SARs) and estimates the number of smolts necessary to replace hatchery and wild smolt mortality attributable to hydro-project operations. The other method under consideration uses hatchery release numbers directly, and adds to that an estimate of the numbers of hatchery smolts needed to replace the estimated number of wild adults that would have returned if project mortality was eliminated. The working group will meet again on June 7, 2011, to review data sets to use to estimate natural smolt production. The goal is to complete recalculation by October to allow time for the development of an implementation plan for broodstock collection activities to meet the recalculated production requirements.
- Chelan PUD has applied their survival estimates to identifying hatchery program production numbers. The big difference in Chelan PUD's hatchery production levels will be that the initial bonus production will end with the 2013 production year.
- The Hatchery Committees discussed whether to continue the use of Bonaparte Pond for acclimation of summer/fall Chinook. Bacterial Gill Disease has been a big problem at Bonaparte Pond. Chelan PUD put in a well at the site several years ago to address winter icing issues, but high mortalities have continued to be a problem. This year, Chelan PUD has not agreed to transfer fish to the site as they consider it a risk to their meeting production targets. Juvenile production previously identified for acclimation at Bonaparte Pond will go back into Similkameen production.
- Coho and steelhead being acclimated in Rohlfing Pond were washed out by high flows about 6 weeks ago and were being picked up in downstream smolt traps. Chelan PUD has asked WDFW and the Yakama Nation to put together a notification and reporting plan for the steelhead being acclimated at Rohlfing Pond. Chelan PUD also intends to review the Wenatchee steelhead acclimation program and evaluate

how acclimation at Rohlfing Pond fits into their Wenatchee steelhead program. They will provide the evaluation to the Committees for review.

- WDFW has agreed to a protocol for operating TWD for trapping operations, which includes real-time monitoring with criteria for when to change trapping activities. The critical period will be when sockeye arrive about July 15, 2011, and problems begin to appear for spring Chinook passage. Chinook jacks are passing TWD; however, larger Chinook, 2- to 3-year-olds, appear to have a harder time. TWD operators will monitor median passage time and if median delay exceeds 48 hours, trapping will stop until median passage time is down to 24 hours. The operating plan has been tentatively agreed to by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) as consistent with Endangered Species Act (ESA) permits. Staffing at TWD during trapping operations has been increased and facility improvements have been implemented to improve operations as well.
- The issue of the lack of external markings on Methow steelhead was raised at the April Hatchery Committees' meeting as being a problem during broodstock collection. Greg Mackey and Mike Tonseth have suggested the use of ventral clips as an interim fix for one or two years. All Committees' members agreed to the use of ventral clips except for the Yakama Nation; Keely Murdoch asked for time to consider this further and get back to the Committees by June 1, 2011. All Committees' members agreed that there is a need to have a visual external marking scheme for upper Columbia River steelhead to facilitate harvest and adult management.
- A proposal by WDFW to conduct an initial test of electro-anesthesia (EA) using Turtle Rock summer Chinook adults was discussed. The effects of EA on gamete development up to eyed-egg stage will be evaluated. The system uses a DC current to anesthetize fish, which then experience an immediate recovery once out of the current. Mike Tonseth, WDFW, is the contact on the proposal. Carmen Andonaegui will email the proposal to the Coordinating Committees.
- The Hatchery Committees have been discussing the issue of mitigating for mitigation fish. The Committees decided that they wanted to continue to try to resolve the issue but recognized that it might need to be addressed by the Coordinating Committees. The Hatchery Committees are aware that the issue needs to be resolved by August 2011 to meet the October 2011 deadline for recalculating NNI.

VI. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are June 28, July 26, and August 23, 2011. Mike Schiewe asked about the Committees' interest in holding any of the upcoming meetings by conference call when the agendas are light, as is typical for summer meetings. The Committees agreed to hold the June meeting in SeaTac, scheduled the July meeting as a conference call, and left the August meeting scheduled for SeaTac, to be adjusted if needed.

The Committees broke for lunch, to reconvene at TWD at 1:00 pm for a tour of that facility, followed by a tour of the Blackbird Pond acclimation site.

List of Attachments

Attachment A – List of Attendees
Attachment B – Final Wells Dam Fishway Field Velocity Testing Memo
Attachment C – Rocky Reach Juvenile Fish Bypass Count Summary, April 25 – May 22, 2011
Attachment D – Summary of 2011 Blackbird Island Pond PIT-tag detections, May 9–22

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford*	Douglas PUD
Beau Patterson	Douglas PUD
Jim Craig*	USFWS
Bryan Nordlund*	NOAA

* Denotes Coordinating Committees member or alternate

Memorandum

Northwest Hydraulic Consultants
16300 Christensen Road, Suite 350
Seattle, WA 98188
206.241.6000
206.439.2420 (fax)

DATE: May 5th, 2011 PROJECT: 21823

TO: Rolf Wieliek

COMPANY/AGENCY: Jacobs

FROM: André Ball and Lisa Larson

SUBJECT: Wells Dam Fishway Entrance Velocity Measurements

This memorandum summarizes field velocity testing at the Wells Dam West Fishway entrance conducted by Northwest Hydraulic Consultants (NHC) with the assistance of Douglas PUD (District) personnel on March 1st and 2nd, 2011. The purpose of the field tests was to provide field measurements of water velocity at the fishway entrance under different operating conditions. The District intends to use this data to assess the existing entrance conditions and to assist with the evaluation of the potential effects of operational changes and structural modifications on lamprey and salmonid passage through the fishway entrances. To assist with the development of these future modifications, a numerical model of the fishway entrance may be developed; and, the field data collected would be used to verify the numerical model.

The West Fishway collection gallery extends downstream from the main dam to the west of the spillway, and the main entrance is located perpendicular to the tailrace channel (Photo 1). The fishway entrance includes a set of vertical gates that swing outward and extend below the water surface to a sill located at elevation 693.0 ft (Photo 2). Collecting field data over a range of fishway entrance conditions was required; therefore, the test plan included collecting velocity measurements at the four different operating conditions shown below:

- Test 1: “Low” Tailwater, 1.5’ Fishway Entrance Head Drop
- Test 2: “Low” Tailwater, 1.0’ Fishway Entrance Head Drop
- Test 3: “High” Tailwater, 1.5’ Fishway Entrance Head Drop
- Test 4: “High” Tailwater, 1.0’ Fishway Entrance Head Drop

The test plan called for the “High” and “Low” tailwater conditions to vary by at least 10 feet. The fishway entrance head drop is measured as the difference between the “Collection Chamber” water surface elevation and the tailwater elevation.

Velocity measurements were collected using an array of three Nortek Vectrino Acoustic Doppler Velocimeters (ADVs), which collect high-frequency point velocity measurements in 3-dimensions. The ADVs were attached to a specialized trolley that was designed by Jacobs Engineering and constructed by a local fabricator. Wells Project staff assisted with the testing and deployment of the testing trolley. During testing, the trolley was lowered into the bulkhead gate slot by a crane (Photo 3). The ADVs were mounted to the trolley on three supporting arms (Photo 4 and Figure

1), which extended upstream into the fishway entrance and held the probes aligned with the upstream edge of the fishway entrance sill.

The ADVs were used to collect data along the left (east) side, center, and right (west) side of the fishway entrance simultaneously at a given elevation. The crane was used to move the trolley to selected elevations throughout the water column. A measuring tape was affixed to trolley to measure the relative depth. The height of the ADVs (when the trolley was lowered to the lowest depth) was known based on the trolley dimensions and ADV mounting locations. The fishway entrance is 8 feet wide, and the water depth at the entrance sill ranged from 22.9 feet to 14.4 feet during Tests 2 and 3, respectively. Due to distance requirements between the trolley, ADV instruments, and solid surfaces, velocity measurement points on the perimeter of the entrance were located approximately 7.5 inches from the sides and sill of the entrance. The 'left' and 'right' ADVs collected data 7.5 inches away from the edges of the fishway entrance, and the 'center' ADV was located in line with the center of the fishway entrance. Similarly, the lowest point at which the ADVs were able to collect data along the sill was approximately 7.5 inches above the entrance sill.

To allow for multiple tests in one day and varying tailwater elevations, river operations were modified for the testing period. These modified river operations were facilitated by the District and required communication and coordination with all of the mid-Columbia hydroelectric projects, and especially Chief Joseph Dam (USACE project upstream) and Rocky Reach Dam (Chelan PUD project downstream). In order to facilitate an efficient testing process and to minimize the duration of modified river operations, the trolley and the ADVs were set up and tested on the afternoon of Tuesday March 1st. This initial testing ensured that the equipment would be ready when the desired tailwater conditions were achieved. The equipment and crane were left in place until the river operations were set up for the test conditions. All four fishway entrance-velocity tests were completed between 2:45 a.m. and 6:30 a.m. on the morning of March 2nd (Photos 5-8).

Personnel on site assisting with the tests included:

André Ball, Engineer, NHC

Gavin Post, Engineer, NHC

Adrian Strain, Engineer, NHC

Tom Kahler, Biologist, Douglas PUD

Shane Scroggie, Operator, Douglas PUD

Steve Nieuwenhuis, Mechanic, Douglas PUD

Tim Harvey, Mechanic, Douglas PUD

Rich Miller, Mechanic, Douglas PUD

The Wells Dam operator targeted the four test-plan conditions described above and sought to maintain a constant tailwater elevation. Automated systems controlled the fishway auxiliary water supply to match any fluctuations in the tailwater elevations to maintain the desired head differential. Nevertheless, slight fluctuations in the head differentials occurred during testing due to the typical lag time in the automated system that coordinates river flows and auxiliary water supply flows. The average operating conditions that were achieved are shown below in Table 1.

Table 1. Wells Dam Fishway Velocity Testing Operating Conditions

Test Number	Start Time	End Time	Average Collection Chamber Elevation	Average Tailwater Elevation	Average Fishway Entrance Head Drop
			ft	ft	ft
1	02:47	03:14	707.8	706.3	1.5
2	03:21	03:42	707.4	706.4	1.0
3	05:29	05:57	715.9	714.4	1.5
4	05:59	06:24	715.5	714.5	1.0

Table 2 summarizes the averages of the velocity magnitudes collected at each distinct point during the testing. "Left" and "Right" are in reference to standing at the fishway and looking downstream. Table 3, provided at the end of the report, is an expanded version of Table 2 and provides the X, Y, and Z velocity components.

Table 2. Wells Dam West Fishway Entrance Velocity Measurements Summary

Test 1			
Elevation	Left	Center	Right
ft	Velocity Magnitude (ft/s)		
703.71	6.8	6.2	7.6
701.71	6.9	6.4	7.8
699.71	7.7	7.2	8.3
697.71	8.1	7.6	8.6
695.71	8.4	7.5	8.5
693.71	8.0	7.3	7.9

Test 2			
Elevation	Left	Center	Right
ft	Velocity Magnitude (ft/s)		
703.63	5.8	5.3	6.3
701.63	5.8	5.4	6.5
699.63	5.9	5.5	6.5
697.63	6.2	5.7	6.5
695.63	6.4	5.6	6.5
693.63	6.1	5.7	6.0

Test 3			
Elevation	Left	Center	Right
ft	Velocity Magnitude (ft/s)		
711.96	7.1	6.6	8.1
708.96	7.4	6.8	8.3
705.96	7.2	6.8	8.3
702.96	7.6	7.2	8.6
699.96	7.7	7.2	8.3
696.96	7.9	7.3	8.1
693.63	7.8	7.0	7.5

Test 4			
Elevation	Left	Center	Right
ft	Velocity Magnitude (ft/s)		
711.96	5.5	5.0	6.3
708.96	5.6	5.2	6.3
705.96	5.8	5.5	6.9
702.96	5.8	5.4	6.5
699.96	5.4	5.0	5.8
696.96	5.7	5.3	6.0
693.71	6.0	5.3	5.6

The velocity data were post processed to remove any erroneous readings or bad data. In general, the ADV data time series obtained at each location had auto-correlations between 80% and 85%. This high correlation is a good indication that the ADVs were collecting quality data. In addition, the velocities are in the range that would be expected for a fishway entrance with the range of head differentials evaluated. Variation in the point velocities was expected since the attraction flow approaching the entrance is not completely uniform.

Figures 2 through 5 provide graphical representations of the resultant velocity magnitudes. All four sets of test results show the highest velocities along the right side of the entrance, the next highest along the left side, and the lowest velocities in the center. At most, the variation between the right and center velocities is about 1.5 ft/s, and this variation is most prominent at the higher elevations. At elevations closer to the sill, there is less lateral variation in the velocities and in some cases the velocities on the left side are greater than the right.

A typical cross-section velocity distribution through a uniform channel shows lower velocities along boundary surfaces than at the center due to boundary roughness; however. since the velocity measurements were collected at the upstream edge of the entrance slot, boundary roughness is not applicable to the measured data. The higher velocities along the sides, relative to the center, may be caused by the increased acceleration around the upstream corners of the slot as the flow contracts into the slot entrance. The asymmetrical distribution of velocities when comparing the left side and right side measurements is likely due to the fact that the AWS diffuser screens are located in the floor and along the right wall of the collection chamber.

Figure 6 shows a plan view of the average velocity magnitude and direction in the XY plane for all three ADVS during Tests 1 through 4. All four tests show similar flow directions. Flow entering the left side of the entrance slot is aligned roughly 18 degrees towards the center while flow entering the right side of the slot is roughly 45 degrees towards the center. Flow entering the center of the slot is aligned 12 degrees off the centerline towards the left side. The asymmetrical alignment of flow can also be seen in the wake of the ADV support arms shown in Photo 3. Given that there are AWS diffusers to the right of the fishway entrance and that there is a solid wall to the left of the entrance, it is not surprising that the discharge alignment is not perfectly symmetrical.

In summary, velocity measurements were collected at the Wells Dam West Fishway entrance. This information was collected to provide prototype velocity data for the development of velocity maps to assist with lamprey and anadromous salmonid passage evaluations at the site.

Table 3. Wells Dam West Fishway Entrance Velocity Components and Magnitudes

Test 1: Tailwater 706.3', Head Drop 1.5 ft												
Elevation	Left Velocity Magnitude (ft/s)				Center Velocity Magnitude (ft/s)				Right Velocity Magnitude (ft/s)			
ft	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag
703.71	1.8	6.6	-0.3	6.8	-1.5	6.0	-0.5	6.2	-5.8	4.8	-0.4	7.6
701.71	2.0	6.6	-0.3	6.9	-1.6	6.1	-0.4	6.4	-6.2	4.7	-0.2	7.8
699.71	2.9	7.1	0.2	7.7	-1.6	7.0	-0.5	7.2	-6.1	5.5	0.7	8.3
697.71	2.6	7.7	-0.2	8.1	-1.5	7.4	0.0	7.6	-5.8	6.2	1.0	8.6
695.71	2.1	8.1	-0.3	8.4	-1.3	7.3	0.9	7.5	-5.8	6.0	0.9	8.5
693.71	3.4	7.2	0.5	8.0	-0.5	6.9	2.3	7.3	-4.5	6.1	1.8	7.9

Test 2: Tailwater 706.4', Head Drop 1.0 ft												
Elevation	Left Velocity Magnitude (ft/s)				Center Velocity Magnitude (ft/s)				Right Velocity Magnitude (ft/s)			
ft	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag
703.63	1.5	5.5	0.4	5.8	-1.2	5.1	-0.5	5.3	-4.7	4.2	-0.5	6.3
701.63	1.7	5.6	-0.2	5.8	-1.4	5.2	-0.3	5.4	-5.3	3.8	-0.2	6.5
699.63	2.1	5.5	0.2	5.9	-1.3	5.3	-0.3	5.5	-4.9	4.2	0.6	6.5
697.63	1.9	5.8	-0.2	6.2	-1.1	5.6	0.1	5.7	-4.5	4.6	1.0	6.5
695.63	1.6	6.1	-0.3	6.4	-1.1	5.4	0.9	5.6	-4.1	4.9	0.8	6.5
693.63	2.6	5.5	0.3	6.1	-0.5	5.3	1.9	5.7	-3.4	4.8	1.4	6.0

Test 3: Tailwater 714.4', Head Drop 1.5 ft												
Elevation	Left Velocity Magnitude (ft/s)				Center Velocity Magnitude (ft/s)				Right Velocity Magnitude (ft/s)			
ft	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag
711.96	2.2	6.6	-1.1	7.1	-1.9	6.2	-0.4	6.6	-5.9	5.5	-1.0	8.1
708.96	2.8	6.7	-0.2	7.4	-1.2	6.7	-0.1	6.8	-6.1	5.3	-1.8	8.3
705.96	1.9	6.9	0.1	7.2	-2.1	6.4	-0.4	6.8	-6.6	4.6	-1.9	8.3
702.96	3.0	7.0	-0.3	7.6	-1.6	7.0	-0.5	7.2	-6.3	5.5	1.3	8.6
699.96	3.0	7.0	0.4	7.7	-1.4	7.1	-0.1	7.2	-5.5	6.1	1.0	8.3
696.96	2.5	7.4	-0.1	7.9	-1.1	7.1	0.5	7.3	-5.3	6.0	0.4	8.1
693.63	3.3	7.0	0.3	7.8	-0.6	6.5	2.4	7.0	-4.2	5.9	1.7	7.5

Test 4: Tailwater 714.5', Head Drop 1.0 ft												
Elevation	Left Velocity Magnitude (ft/s)				Center Velocity Magnitude (ft/s)				Right Velocity Magnitude (ft/s)			
ft	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag	Avg. Vx	Avg. Vy	Avg. Vz	Avg. Vmag
711.96	1.8	5.1	-0.5	5.5	-1.3	4.8	-0.1	5.0	-4.6	4.2	-0.7	6.3
708.96	1.8	5.2	0.1	5.6	-1.0	5.1	-0.1	5.2	-4.6	4.0	-1.1	6.3
705.96	1.7	5.5	-0.1	5.8	-1.8	5.1	-0.3	5.5	-5.7	3.5	-1.5	6.9
702.96	2.1	5.3	-0.1	5.8	-1.2	5.2	-0.4	5.4	-4.8	4.1	1.0	6.5
699.96	2.0	4.9	0.3	5.4	-0.9	4.9	-0.2	5.0	-3.8	4.3	0.8	5.8
696.96	1.9	5.3	-0.1	5.7	-0.9	5.2	0.3	5.3	-4.0	4.4	0.4	6.0
693.71	2.5	5.4	0.1	6.0	-0.6	4.9	1.8	5.3	-3.2	4.4	1.3	5.6

Photo 1: Wells Dam shown with the West fishway entrance in the foreground. (This photo was taken by Jacobs Engineering during the trolley testing in Feb 2011)

Photo 2: Looking upstream at the de-watered West fishway entrance during maintenance. In this photo the two gates are closed. (Archival Photo from Douglas PUD)

Photo 3: Looking down on the ADV trolley shown inserted in the bulkhead gate slots. (This photo was taken by Jacobs Engineering during the trolley testing in Feb 2011)

Photo 4: ADVs shown mounted on the support arms prior to being lowered into the water for testing. (Photo by Douglas PUD)

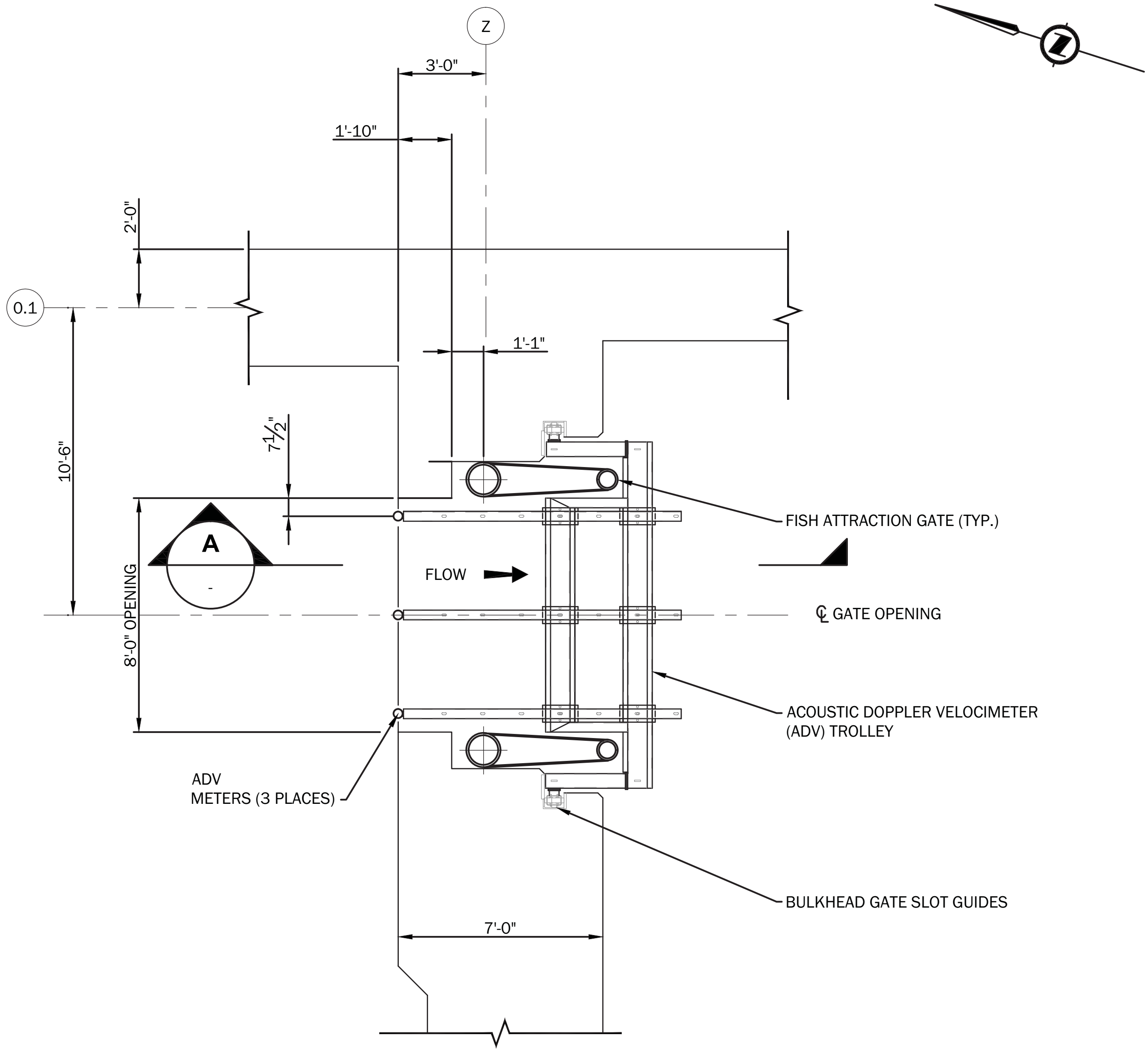
Photo 5: Wells Dam on morning March 2nd, 2011 during the velocity testing. (Photo by NHC)

Photo 6: Tailwater gage used to record the tailwater level. The Collection Chamber gage is in the background to the left. The difference between these two readings indicates the head drop across the fishway entrance. (Photo by NHC)

Photo 7: This photo shows the low tailwater condition used for Tests 1 and 2, roughly El. 706.5'. (Photo by NHC)

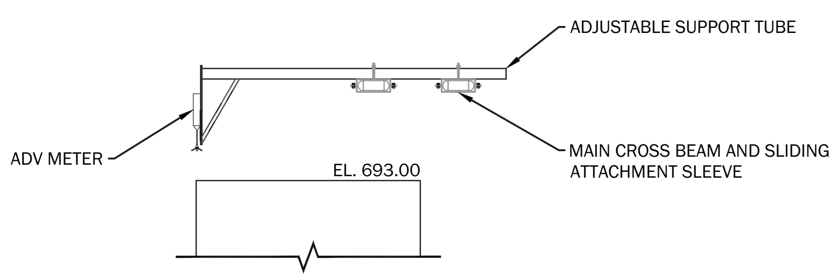
Photo 8: The high tailwater condition testing was concluded at dawn on March 2nd. The ADVs were controlled via a laptop under the tent shown on the left. (Photo by NHC)

Attachment B



ADV TROLLEY - PLAN AT EL. 693.00 (WEST FISH)

SCALE: 1" = 6'-0" (prototype)



A
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DETAIL

SCALE: 1" = 6'-0" (prototype)

nhc
northwest
hydraulic
consultants

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

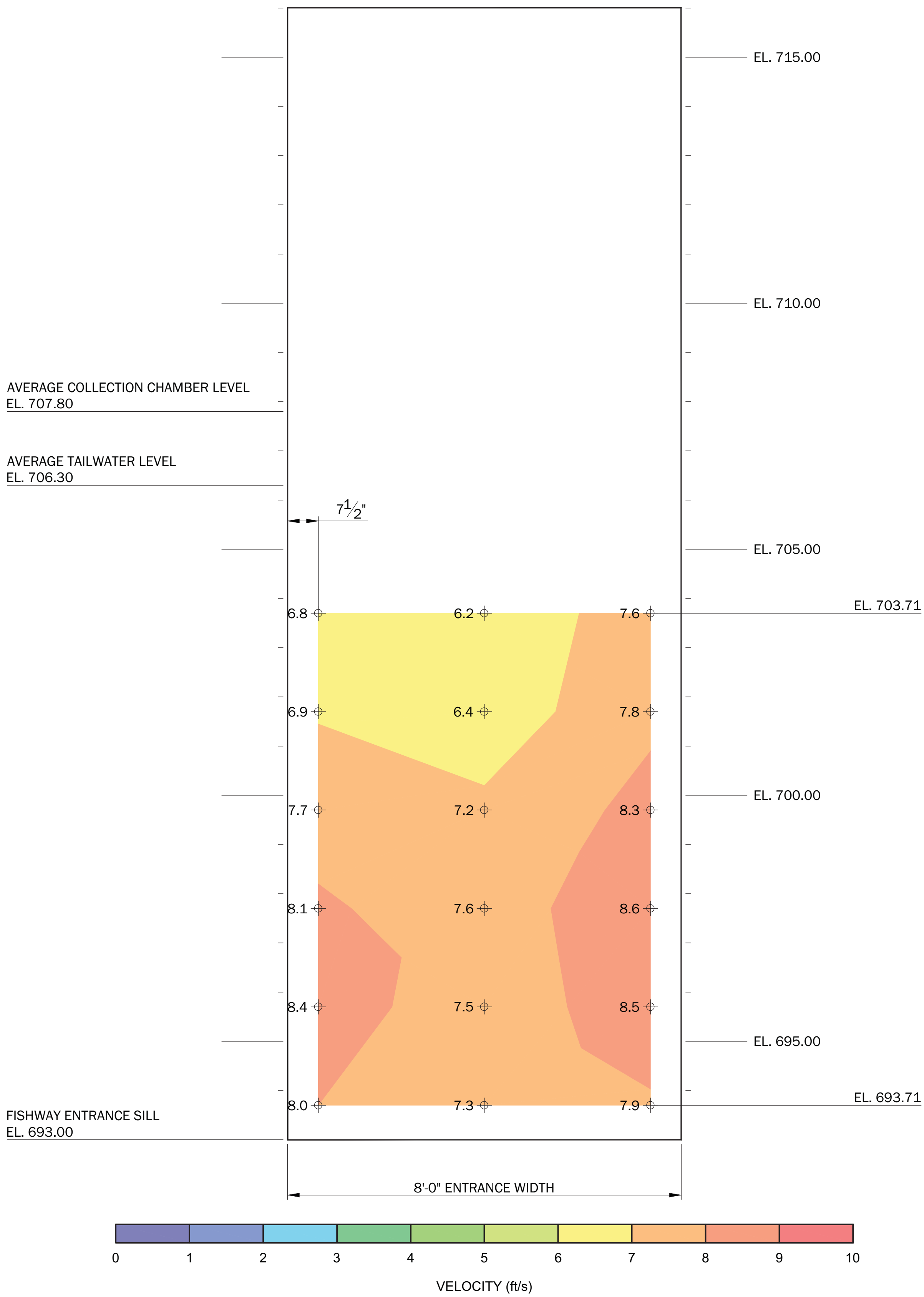
West Fishway Entrance Velocities
ADV Testing Trolley Configuration

SCALE:	1" = 6'-0"	REVISION NO:	0	DRAWN BY:	JAB	DATE:	31-MAR-2011	DRAWING NO:	21823-002

16300 Christensen Road, Suite 350 Seattle, Washington 98188
Office: 206.241.6000 Fax: 206.439.2420 www.nhcweb.com

FIGURE 1

Attachment B



nhc northwest hydraulic consultants

DOUGLAS COUNTY P.U.D.

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

West Fishway Entrance Velocities

Test 1

Tailwater Elevation 706.3 ft. with Head Drop of 1.5 ft.

SCALE:	N.T.S.	REVISION NO:	0	DRAWN BY:	JAB	DATE:	30-MAR-2011	DRAWING NO:	21823-001

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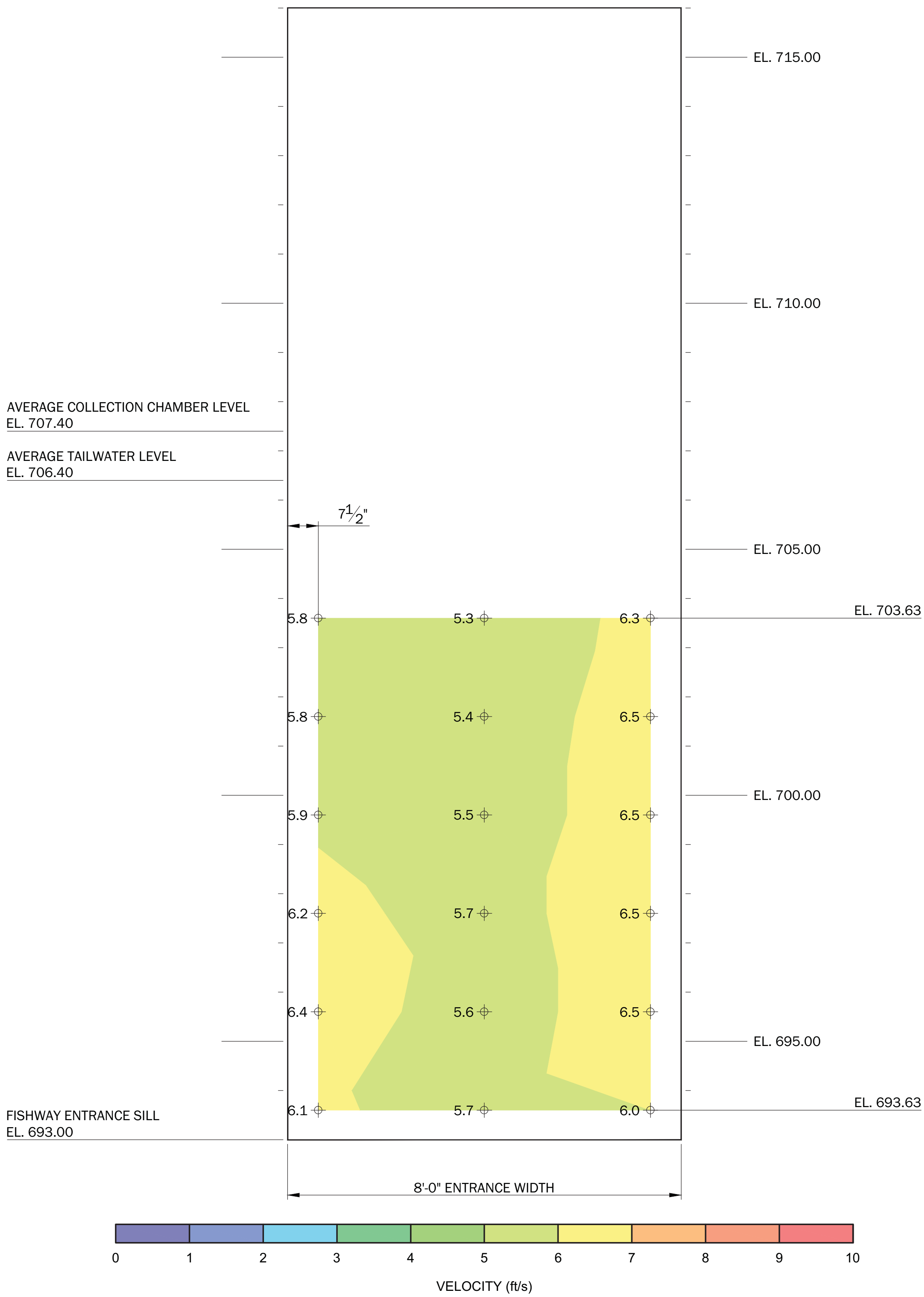
FIGURE 2



nhc northwest hydraulic consultants

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

West Fishway Entrance Velocities

Test 2

Tailwater Elevation 706.4 ft. with Head Drop of 1.0 ft.

SCALE:	N.T.S.	*REVISION NO:*	0	*DRAWN BY:*	JAB	*DATE:*	30-MAR-2011	*DRAWING NO:*	21823-001

16300 Christensen Road, Suite 350 Seattle, Washington 98188
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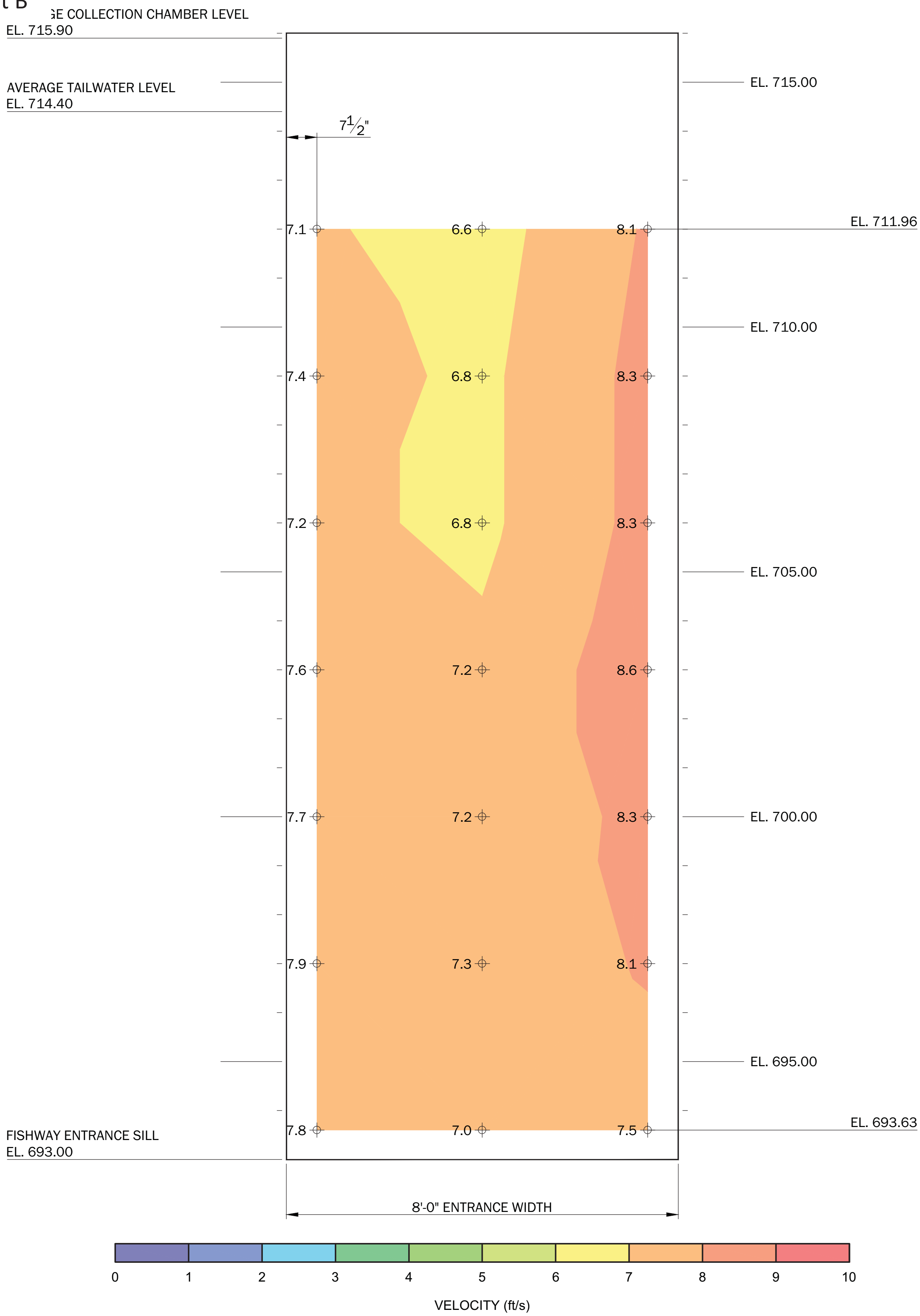
FIGURE 3

Attachment B



nhc northwest hydraulic consultants

DOUGLAS COUNTY P.U.D.

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

West Fishway Entrance Velocities

Test 3

Tailwater Elevation 714.4 ft. with Head Drop of 1.5 ft.

SCALE:	N.T.S.	REVISION NO:	0	DRAWN BY:	JAB	DATE:	30-MAR-2011	DRAWING NO:	21823-001

16300 Christensen Road, Suite 350 Seattle, Washington 98188
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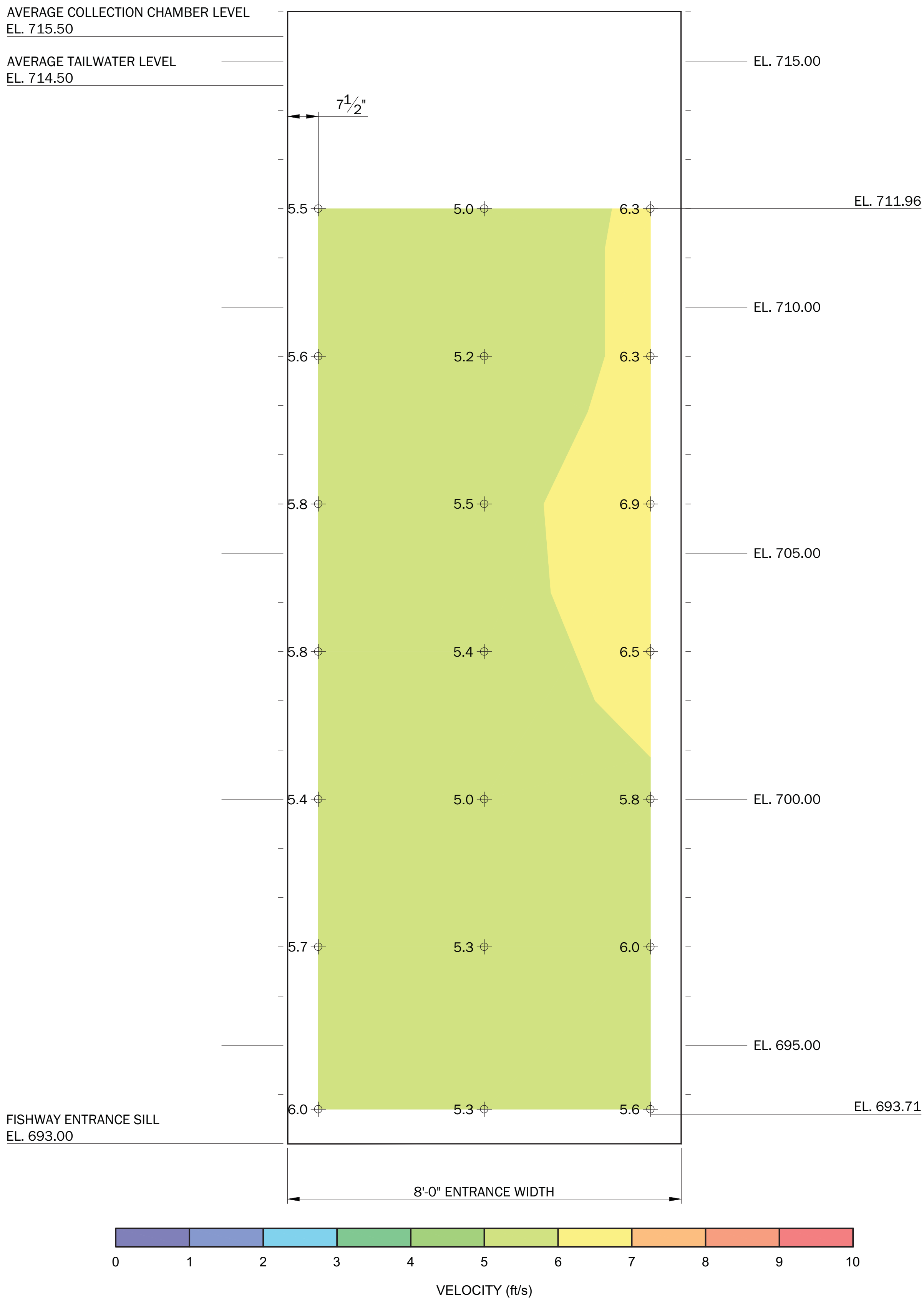
FIGURE 4

Attachment B



northwest hydraulic consultants

DOUGLAS COUNTY P.U.D.

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

West Fishway Entrance Velocities

Test 4

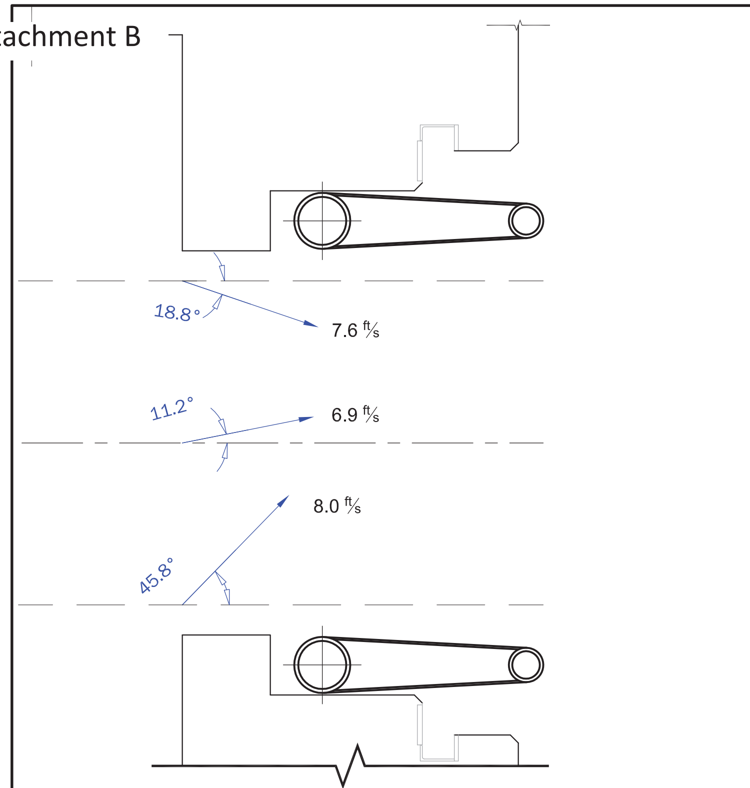
Tailwater Elevation 714.5 ft. with Head Drop of 1.0 ft.

SCALE:	N.T.S.	*REVISION NO:*	0	*DRAWN BY:*	JAB	*DATE:*	30-MAR-2011	*DRAWING NO:*	21823-001

16300 Christensen Road, Suite 350 Seattle, Washington 98188
Office: 206.241.6000 Fax: 206.439.2420 www.nhcweb.com

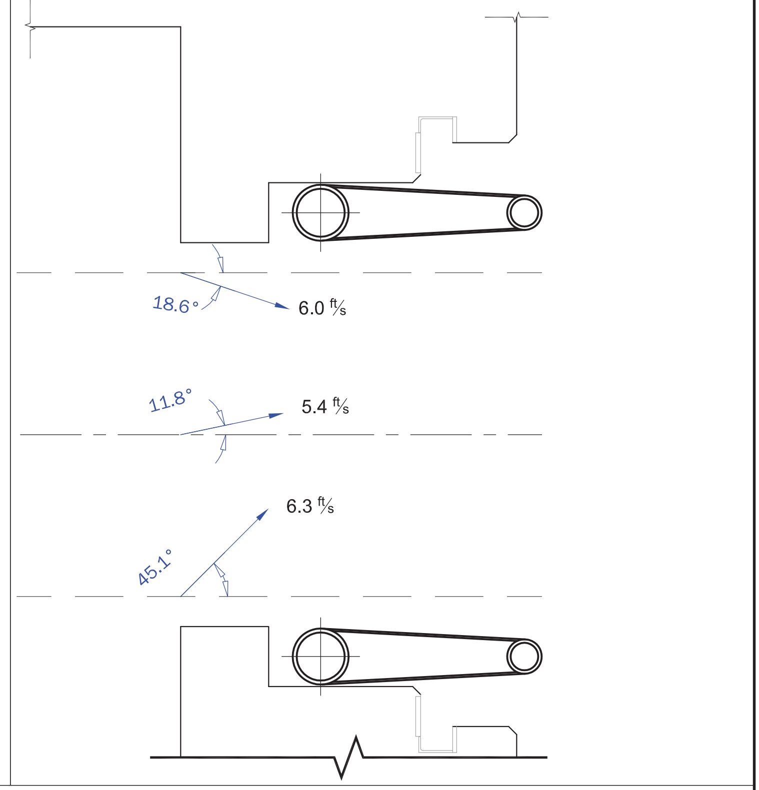
FIGURE 5

Attachment B



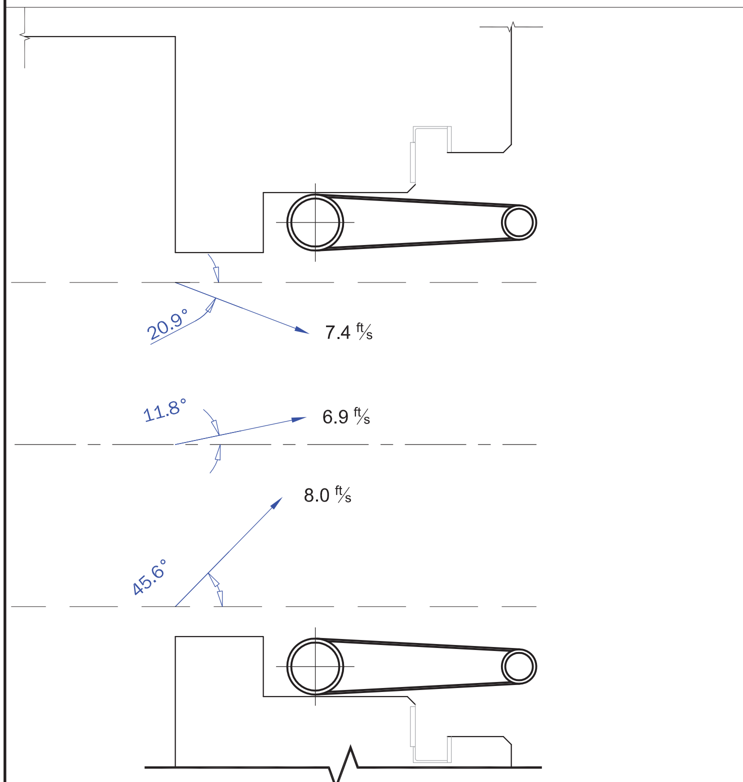
TEST 1 - Tailwater 706.3' , Head Drop 1.5 ft

SCALE: 1" = 4'-0" (prototype)



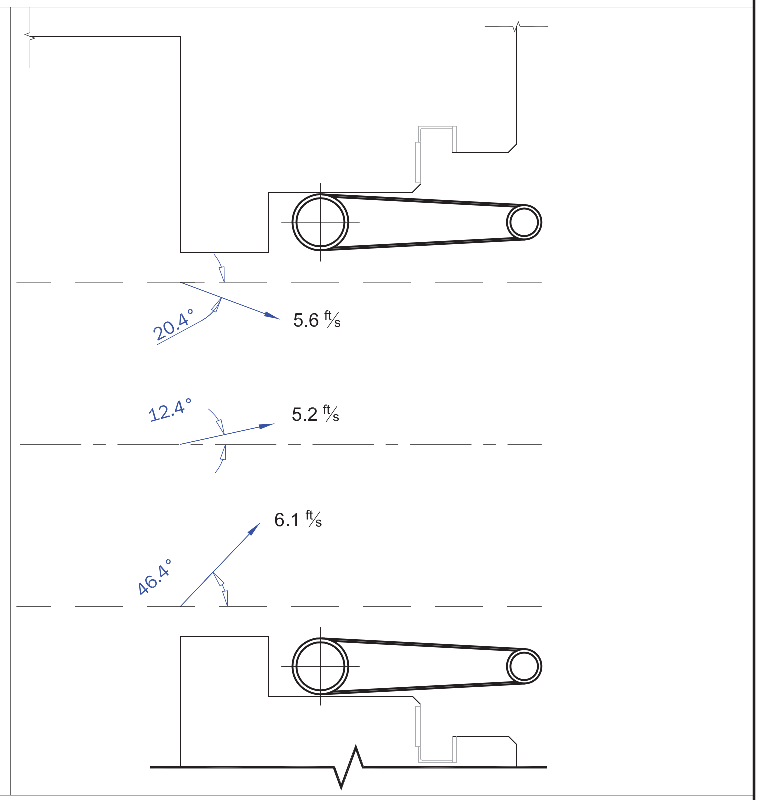
TEST 2 - Tailwater 706.4' , Head Drop 1.0 ft

SCALE: 1" = 4'-0" (prototype)



TEST 3 - Tailwater 714.4' , Head Drop 1.5 ft

SCALE: 1" = 4'-0" (prototype)



TEST 4 - Tailwater 714.5' , Head Drop 1.0 ft

SCALE: 1" = 4'-0" (prototype)

northwest hydraulic consultants

DOUGLAS COUNTY P.U.D.

WELLS HYDROELECTRIC PROJECT
FISHWAY LADDER ENTRANCE VELOCITY TESTING

West Fishway Entrance Velocities

Average XY Velocity Magnitudes and Directions

SCALE:	1" = 4'-0"	REVISION NO:	0	DRAWN BY:	ALS/JAB	DATE:	31-MAR-2011	DRAWING NO:	21823-003

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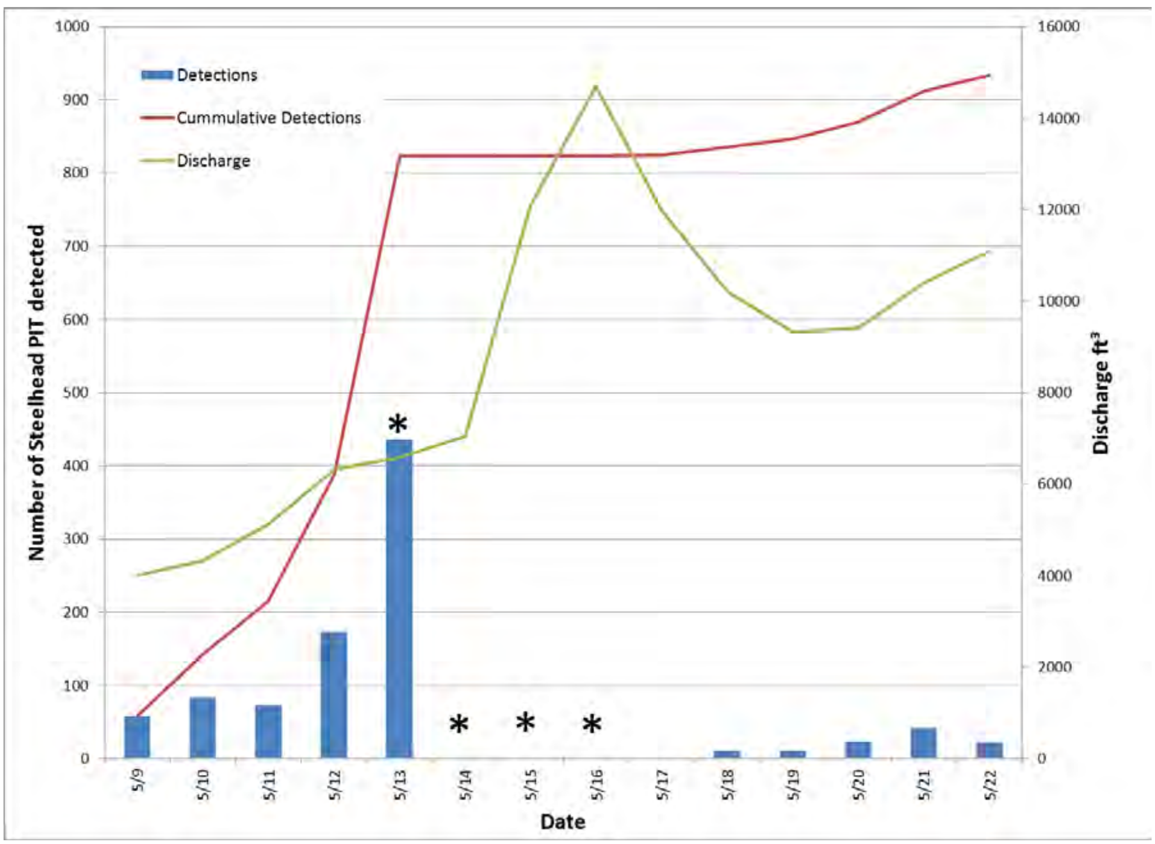
FIGURE 6

2011 Daily Summary

	Numbers of smolts handled						EXPANDED COUNT (Daily Hourly Expanded Total)					
Sample Date	Chinook Yearling	Chinook sub-yrling	Steelhead	Sockeye	Coho	Total Handled	Chinook Yearling	Chinook sub-yrling	Steelhead	Sockeye	Coho	Total Expanded
4/25/11	2,631	0	58	35	32	**2,756**	12,671	0	200	119	106	**13,096**
4/26/11	4,596	0	91	100	81	**4,868**	28,239	0	343	332	378	**29,292**
4/27/11	5,324	0	197	156	133	**5,810**	27,717	0	646	572	542	**29,477**
4/28/11	6,383	0	85	272	134	**6,874**	30,195	0	297	995	573	**32,060**
4/29/11	5,591	0	246	402	178	**6,417**	29,690	0	884	1,565	814	**32,954**
4/30/11	4,436	0	246	504	228	**5,414**	22,148	0	827	2,041	1,012	**26,027**
5/1/11	4,754	0	494	886	195	**6,329**	22,488	0	1,746	3,066	815	**28,115**
5/2/11	6,515	0	330	620	119	**7,584**	91,460	0	2,008	3,454	1,030	**97,952**
5/3/11	4,896	0	269	554	118	**5,837**	48,586	0	1,016	2,258	587	**52,447**
5/4/11	4,237	0	597	1,520	213	**6,567**	24,525	0	2,058	5,124	910	**32,617**
5/5/11	4,689	0	508	924	346	**6,467**	20,939	0	1,578	3,229	1,366	**27,112**
5/6/11	4,208	0	581	690	416	**5,895**	20,727	0	1,864	2,529	1,617	**26,736**
5/7/11	4,010	0	913	1,702	447	**7,072**	17,063	0	2,909	5,397	1,562	**26,931**
5/8/11	3,997	0	812	1,105	511	**6,425**	15,768	0	2,629	3,896	1,782	**24,074**
5/9/11	3,944	0	805	2,078	703	**7,530**	16,588	0	3,203	9,469	2,941	**32,200**
5/10/11	4,298	0	853	1,212	701	**7,064**	20,085	0	3,026	5,043	2,773	**30,928**
5/11/11	4,470	0	386	2,638	897	**8,391**	23,234	0	1,650	11,798	4,229	**40,911**
5/12/11	4,363	0	590	2,947	1,069	**8,969**	27,605	0	3,876	17,044	5,840	**54,364**
5/13/11	3,798	0	703	3,659	1,011	**9,171**	28,353	0	4,850	24,697	7,012	**64,913**
5/14/11	4,657	0	1,125	1,799	1,403	**8,984**	23,385	0	5,271	7,493	6,265	**42,414**
5/15/11	4,263	0	624	2,235	1,746	**8,868**	34,564	0	6,208	25,433	15,273	**81,478**
5/16/11	3,448	0	411	2,139	2,714	**8,712**	35,810	0	3,933	33,431	30,000	**103,173**
5/17/11	2,359	0	260	2,834	2,450	**7,903**	14,668	0	1,608	27,012	16,030	**59,317**
5/18/11	2,062	0	370	2,956	1,780	**7,168**	8,865	0	1,487	15,882	8,028	**34,262**
5/19/11	1,133	0	466	5,783	1,170	**8,552**	7,916	0	2,724	139,991	9,164	**159,795**
5/20/11	1,012	0	430	5,091	923	**7,456**	5,398	0	2,083	37,333	4,674	**49,488**
5/21/11	1,883	114	321	3,481	1,654	**7,453**	10,747	690	1,772	26,188	9,278	**48,675**
5/22/11	601	1,415	101	779	1,179	**4,075**						
Total	**108,558**	**1,529**	**12,872**	**49,101**	**22,551**	**194,611**	**669,434**	**690**	**60,694**	**415,391**	**134,600**	**1,280,809**

Blackbird Island Update - 2011

Using full duplex PIT-tag detection system, the USFWS has been monitoring the Blackbird steelhead Acclimation site for WDFW, CPUD and TU since 2008. Monitoring began this year on 9 May with the installation of an antenna on the pond side of the system. Due to antenna technical issues the river side monitoring station was abandoned. As of 22 May, 952 PIT-tagged steelhead have been detected at the antenna and assumed to have left the pond. Due to flood warnings the site was removed on 13 May at 1pm and reinstalled on 16 May at 2pm. A total of 9,858 steelhead were PIT- tagged of the approximately 50,000 fish in the pond.



* symbolize days when system not detecting due to high flood warnings.

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	August 10, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of June 28, 2011 HCP Coordinating Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, June 28, 2011, from 9:30 am to 12:30 pm in SeaTac. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Tom Kahler will finalize the draft 2010 Douglas PUD Pikeminnow Program Report and email it to Carmen Andonaegui for distribution to the Coordinating Committees.
- Carmen Andonaegui will add an update by Chelan PUD on pending shoreline permit applications as an agenda item to all future Coordinating Committees meetings (Item II-B).
- Coordinating Committees' comments on the Corral Creek dock application are due to Keith Truscott by August 29, 2011 (Item II-B).
- Steve Hemstrom will include an analysis of fish passage (including fish passed via spill) to the 2010 Yearling Chinook Survival Study report (Item II-C).
- Tom Kahler will email Carmen Andonaegui a copy of today's handout of Douglas PUD's analysis of out-migrant passage timing at the juvenile bypass, for distribution to the Coordinating Committees (Item III-A).
- Coordinating Committees' comments to Douglas PUD on proposed changes to the Wells juvenile bypass operations are due no later than July 15, 2011 (Item III-A).
- Tom Kahler will draft a Statement of Agreement (SOA) describing proposed changes to the Wells juvenile bypass operations, and will provide the SOA to Carmen Andonaegui for distribution to the Coordinating Committees by July 18, 2011, for a vote at the next Committees meeting on July 26, 2011 (Item III-A).
- Tom Kahler will revise the draft SOA on modification of adult fishway operations for lamprey passage, as agreed to in today's meeting, by July 1, 2011, and email it to

Carmen Andonaegui for distribution to the Coordinating Committees for their vote by July 8, 2011 (Item III-B).

DECISION SUMMARY

- There were no decisions made at today's meeting.

REVIEW ITEMS

- The final draft 2010 Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances study report (DIDSON Study Report) is out for 60-day review. Comments are due by August 10, 2011.

REPORTS FINALIZED

- The review period for the draft 2010 Douglas PUD Pikeminnow Program Report ended June 22, 2011. Jim Craig and Bryan Nordlund submitted comments. Tom Kahler will send Bryan Nordlund and Jim Craig a red-line version of the report with revisions based on comments received, and Nordlund and Craig will respond with whether or not they accept the revisions. Kahler will then provide the final report to Carmen Andonaegui for distribution to the Coordinating Committees.
- The 2010 Wells Spring Migrant Survival Verification Study report was finalized and distributed by email to the Coordinating Committees on June 13, 2011.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees' members and asked for any additions or changes to the agenda. The following changes were made to the agenda:

- Steve Hemstrom indicated that Keith Truscott, Chelan PUD, will call into the meeting to provide an update on the Rocky Reach Shoreline Management Plan
- Lance Keller added an update on the Rock Island Left Adult Fishway Passive Integrated Transponder Tag (PIT-Tag) Detection System
- Tom Kahler added an update on the Sub-yearling Behavioral Study
- Bryan Nordlund requested that the National Marine Fisheries Service's (NMFS') yearling and sub-yearling discussion item be merged with the PUD yearling and subyearling agenda items.

The Committees reviewed the draft May 24, 2011 meeting minutes. The minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Chelan PUD

A. Rocky Reach Total Dissolved Gas (TDG) Spill Pattern Test, Purpose, Initial Results (Waikele Hampton)

Waikele Hampton said the goal of the spill pattern tests is to determine if alternate spillway operations can reduce TDG production at Rocky Reach. Hampton said that Chelan PUD is required, per the 401 Water Quality Certification of the Rocky Reach License, to implement alternative spillway operations, using any of gates 2-12, to determine whether TDG levels can be reduced. If effective, Chelan PUD is to implement the alternative spillway operations to reduce TDG. Because high flows this year would allow Chelan PUD to test alternate spillway operations under flow/spill conditions not previously tested, Chelan PUD decided to take the opportunity to begin testing three alternate spillway operations (flat, shallow arc, and TDG). These were tested, along with the current "fish" pattern, on a 24-hr schedule. She said the results were generally positive, but Chelan PUD is waiting on further analysis to see which spill pattern or combination of spill patterns is most effective at reducing TDG levels. Hampton explained that there are many factors that affect TDG levels. She said Chelan PUD will likely hire a statistician to help evaluate and compare the effect of spill pattern on TDG production. Hampton said Chelan PUD will continue to test spill patterns under as many conditions as possible.

Bryan Nordlund asked for an explanation of the differences between the TDG and fish spill patterns. He said that he understood the shallow arc and flat spill patterns. Hampton said that the current fish spill pattern utilizes gates 2-8, while the TDG spill pattern utilizes gates 2-12, resulting in lower volumes of water through each gate for the same amount of total spill.

Nordlund asked if the time between testing different spill patterns was long enough to allow the TDG conditions created by the previous spill pattern to return to ambient. Hampton said that each test is run for 24 hours, and then the operation is changed to the next pattern to be tested. She stated that Chelan PUD intends to analyze these data to isolate the factors that are contributing to the generation of TDG. Nordlund commented that the ultimate goal should be to identify a spill pattern that minimizes the generation of TDG. Hampton said the default spill pattern is the fish spill pattern; however, if alternate spillway patterns can be shown to minimize TDG exceedances they will likely be implemented. It is expected that the current fish spill pattern will continue to be implemented when TDG exceedances are not likely to occur. Steve Hemstrom said any flow that exceeds 200,000 cubic feet per second (cfs) initiates spill.

Hampton said spill pattern testing was only planned for this year; Keith Truscott added that flow conditions in any given year determine what spill conditions can be tested. Jerry Marco noted that, assuming reduced flows as summer progresses, testing this year will allow for evaluation of conditions where TDG does not exceed State water quality standards. Hampton agreed, saying that Chelan PUD will continue testing this year through the summer under as many different operating conditions as possible.

Hemstrom reported that the Bonneville Power Administration (BPA) had invited Chelan, Douglas, and Grant PUDs to a meeting that BPA is holding to discuss outflow from Chief Joeseph and Grand Coulee dams through 2013. Hemstrom said that Grand Coulee Dam will be operating at reduced capacity through 2013 while they overhaul turbines. During the outage, higher flows can be expected out of the U.S. Army Corps of Engineers (Corps) projects. Hemstrom said that the meeting will be held on Friday, July 1, with BPA, the Corps, and Mid-Columbia PUD representatives, as well as the Mid-Columbia Coordinator.

B. Corral Creek Dock Application Comments and Shoreline Management Planning (Keith Truscott)

Keith Truscott provided an update on permitting activities for the Corral Creek dock application. He said that at the Coordinating Committees' April 2011 meeting, he advised the Committees of the more active role Chelan PUD is taking in the management of Rocky Reach Reservoir shorelines, consistent with the HCP. Truscott said he provided the Committees a copy of the Corral Creek dock permit application and asked Committees' members to submit any comments on the application to him for compilation. He said he had hoped agency representatives would have internal discussions regarding the application, and submit comments to him that he could then bring to Douglas County, the permitting agency. Truscott proposed a standing agenda item for future Coordinating Committees meetings for updates on Rocky Reach Reservoir shoreline land use decisions and permit applications. He said he did not think it the role of the Committees to get into the technical aspects of the permit applications, but rather to communicate concerns relative to achieving the goals of the HCP, and the need for responsible management of the reservoir shorelines. He said Chelan PUD intends to coordinate with interested agencies to work toward the creation of a shoreline management plan for the Rocky Reach Reservoir.

Teresa Scott thanked Truscott for bringing the issue forward, saying she believes it is important for Washington Department of Fish and Wildlife (WDFW) to track permit applications on the reservoir. She said that she had not provided WDFW's comments on the Corral Creek dock application to Truscott, assuming Chelan PUD would be made aware of the comments through the permitting process. Truscott suggested there are two ways to approach commenting on shoreline permit applications on the Rocky Reach Reservoir: agencies could provide comments at the Committees' meetings to Steve Hemstrom, and then the comments could be provided through Chelan PUD to Douglas County; or, if an update on shoreline permit applications is added to the Committees' monthly agendas, comments could be made by the Committees to Douglas County as Coordinating Committees' comments on the application.

Truscott said Chelan PUD does not own the reservoir shorelines, which are private property. He said rather than a shoreline management plan, Chelan PUD has FERC license articles requiring them to actively manage flow easements along the Project boundary. Truscott stated that a Chelan PUD shoreline management plan would describe the PUD's intended role in responding to shoreline development. He said that Chelan PUD intended to review Douglas County's and Chelan County's shoreline management plans in the development of their shoreline management plan, but that they would focus on the goals of the HCP as they relate to aquatic habitat and species protection. He said that Chelan PUD would also review shoreline management plans for other reservoirs.

Truscott said the standing agenda item would include a summary of shoreline applications received in the month preceding the meeting, allowing for discussion of the application. Mike Schiewe suggested that, at a minimum, such an agenda item would allow Committees' representatives to be made aware of the applications and bring that information back to their respective agencies. Schiewe asked if anyone had objections to adding the agenda item. Bryan Nordlund said he supported the agenda item and especially supported creating a shoreline management plan. He emphasized that an HCP is about preserving habitat and that having a comprehensive understanding of habitat impact effects would support a shoreline management plan. Nordlund further stated that a cumulative effects analysis is needed to understand how best to proceed regarding the development of the Rocky Reach Reservoir shorelines. Truscott agreed on the need for a cumulative effects analysis. Schiewe said that an update on shoreline permit applications will be added to the monthly agendas.

Tom Kahler asked for clarification on whether Chelan PUD intended to create an actual "shoreline management plan" as a jurisdictional program under the State of Washington's Shoreline Management Act, or instead, if the term "shoreline management plan" was only coincidental with the State's terminology. Truscott responded that Chelan PUD's goal is to develop a shoreline management plan under its FERC license, positioning the District to play an active role in managing Project shorelines to meet license requirements. The goal would be for Chelan PUD's plan to be consistent with Douglas County's plan, but Truscott said that this will be the challenge. Committees' members suggested that Chelan PUD use a name for the plan other than "shoreline management plan" to avoid confusion. Truscott said that they would have guidance from FERC on what to name the plan.

Truscott said that there is still time to provide comments on the Corral Creek dock permit application, asking that any comments be provided to Hemstrom by August 29, 2011. Nordlund asked Truscott his thoughts on the Committees providing a general comment on the need for a cumulative effects evaluation for dock construction on the Rocky Reach Reservoir. Truscott said that he thought it would be a very appropriate comment from the Committees or from NMFS.

Shane Bickford reminded the Committees that Douglas PUD's situation differs from Chelan PUD's situation in that Douglas PUD owns the Wells Reservoir shoreline, rather than having only flowage easements as does Chelan PUD. Bickford explained to the Committees that Section 5 of the Wells HCP addresses land use applications for the Wells Reservoir and that Douglas PUD currently has a moratorium on boat dock construction on the reservoir, and therefore will not need a monthly agenda item on shoreline development activities. He said that Douglas PUD sends each shoreline application they receive to HCP-signatory agencies and tribes and either conditions or rejects each permit based on any comments received.

C. 2011 Yearling Chinook Survival Study and Path Forward Through 2013 (Steve Hemstrom)

Steve Hemstrom said that the 2011 survival study was almost completed, but that the hydrophones at Rocky Reach and Rock Island are still operating and will continue operating until June 30, 2011. He said that despite the very high flows this year, they are still recording juvenile fish passing the dams. Hemstrom said that a juvenile was detected on June 16, 2011, passing the Rock Island hydropark detection array, although travel times have mostly been fast. He said tag life is 28 days and that unavoidable spill started May 18, 2011. Hemstrom said they do not yet have the route-specific analysis completed and that fish that were detected passing through the spillway will be removed from the study during the analysis.

Bryan Nordlund asked why fish passing by spill are removed from analysis if the operations during the study period are within the flow regime specified in the HCP, and spill was unavoidable. Hemstrom responded that this is because the purpose of the studies was to meet survival standards at Rocky Reach without spill, but in years when flows exceed 200,000 cfs, there is unavoidable spill, so the spilled fish are removed from the analysis. He said removing fish passing via spill biases the survival estimates low. Nordlund and Hemstrom discussed conducting the analysis with spilled fish included and reporting survival results based on a given year's conditions and on reservoir conditions encountered by migrating juveniles under higher flow conditions, and the effect of these conditions on survival. Nordlund said he would like to see an analysis of survival with spill fish included and with spill fish not included. Hemstrom agreed to provide this analysis. Mike Schiewe said that providing survival study results with both spilled and non-spilled fish would allow for discussion by the Coordinating Committees, saying the HCP defines flow conditions for a valid study.

Hemstrom said that currently they are analyzing survival study data. He said there is some concern regarding the loss of hydrophones in the Rock Island forebay due to debris and a lightning strike, and that therefore, there may be fewer detections, which may affect results. Hemstrom also reported that some of the fish release replicates closest to Wells Dam were not accessible due to flows in excess of 300,000 cfs during the release period. He said that this required the two releases to take place from the shoreline a little further downstream off Carpenter Island. Peak flow at Rocky Reach Dam during the study period was 335,700 cfs.

Hemstrom said that Chelan PUD would be conducting a yearling Chinook survival study in 2012, and depending on outcomes of this year's study and the 2012 study, they may ask the Coordinating Committees to consider approving the use of the results of the 2010 pilot survival study to calculate the required 3-year average survival to meet the project survival standard.

D. Subyearling Chinook Discussion (Steve Hemstrom, Tom Kahler)

Steve Hemstrom reported that Chelan PUD has been compiling data on and analyzing PIT-tag detections of sub-yearling Chinook detected at Rocky Reach Dam. The analysis includes estimating travel times from known release points to Rocky Reach Dam. The information will be used to try to improve understanding of sub-yearling life histories in the mainstem Columbia River upstream of Rocky Reach Dam. Hemstrom said that only a small number of PIT-tagged (less than 50) fish have been available for the analyses so far. The Coordinating Committees discussed the difficulties associated with capturing taggable-sized sub-yearlings in smolt traps. Shane Bickford said that, because of the lack of tagged fish for this analysis, Douglas PUD had determined that they need to augment tagged sub-yearling Chinook by capturing and tagging up to 20,000 tagged sub-yearling Chinook from the Wells Reservoir. He said that Douglas PUD will be funding crews to target sub-yearlings for PIT-tagging and that they hope this will lead to an increased sample size.

Tom Kahler said that Douglas PUD has been sampling sub-yearlings in the Wells Reservoir to determine the best time of year in which to focus tagging efforts, when migrating juveniles would be large enough to tag. He reported that BioMark started tagging on June 21, 2011, and as of Friday (June 24), the last tagging day, 2,050 sub-yearlings were tagged over a week's worth of effort. This is a very low number of fish for having seined Monday through Thursday using a minimum fork length of 65 mm for taggable fish. Kahler said that over time, the percent of sub-yearlings that are captured at a taggable size has increased. He further stated that different locations in the Wells Reservoir had different sized fish and species mixes and that average fish sizes change from day-to-day in the same location. Kahler said that reservoir elevations also change day-to-day, which changes the environmental conditions at a given location. Basically, he said Douglas PUD found no predictability in being able to identify preferable capture conditions or locations.

Bickford said that in the Columbia River upstream of the mouth of the Okanogan River, Douglas PUD crews observed a large number of fry, perhaps originating from mainstem fall Chinook spawning. He said that no one has been able to document fall Chinook spawning in the mainstem upstream of the mouth of the Okanogan River although Douglas PUD has sent divers down in the Washburn Pond reach of the Columbia River; Chinook are likely spawning much deeper than is commonly thought. Bickford said they are also finding large numbers of juvenile whitefish and sockeye fry in the Wells Reservoir. He said that their study report will include juvenile diversity encountered in the reservoir during the sampling effort.

Kahler summarized that the sub-yearling capture target is 1,000 fish per day with 60 percent or higher taggable fish. The goal of the tagging effort is to be able to define a wild migrant by its size, determine how long it takes to migrate, and then match up the migrant size with tag size and tag life. Kahler said the ability to capture sub-yearlings may be limited by the capture methods. At the moment, seining is the only technique available; however, the larger sized sub-yearlings occur deeper in the reservoir where purse-seining may have to be used, with the associated higher mortalities.

Bob Rose suggested that there might be a benefit for the three mid-Columbia PUDs to coordinate on identifying sub-yearling migrant size and timing. He asked if Douglas PUD had looked at sub-yearling passage at Wells Dam and compared those passage numbers to the seining results. Bickford said Douglas PUD has almost 25 years of fyke net sampling data to rely on as an estimate of migration timing and fish size, and they know the number and condition of sub-yearlings that migrate through Wells Dam. Historically, summer migrants at Wells Dam were defined at 108 to 110 mm. Bickford stated that Douglas PUD's study report would include observed historic migration and describe current observation.

Bryan Nordlund suggested the possibility of capturing sub-yearling Chinook in irrigation diversion bypass traps to increase the sample size, since these would not be as affected by high river flows. Bickford mentioned the difficulty with relying on smolt traps to capture sub-yearlings in the Methow subbasin, as currently located. Smolt traps in the Methow subbasin are located upstream of summer Chinook spawning areas and intended for capturing steelhead and yearling Chinook juveniles.

E. Rocky Reach Dam 50th Birthday Celebration Invitation (Steve Hemstrom)

Steve Hemstrom said the Rocky Reach Dam 50-Year anniversary celebration is scheduled for this Thursday evening (June 30, 2011) and invited anyone to attend the celebration.

F. Rock Island Adult PIT-tag Detection System Update (Lance Keller)

Lance Keller said that a May 31, 2011, lightening strike in the Rock Island forebay was logged by powerhouse operators. He said that since then, they are getting nothing but noise from the left bank adult ladder PIT-tag detectors, which remain offline. Keller said that most adult fish passed through the right bank adult ladder at Rocky Reach Dam.

III. Douglas PUD

A. Presentation on the Effectiveness of the Timing of Bypass Operations at Wells (Tom Kahler)

Tom Kahler provided a handout of a report analyzing juvenile salmon and steelhead migration timing at Wells Dam for the years 2005 through 2010, and comparing that timing with the timing of operation of the Wells Bypass (Attachment B). He said that according to the Wells HCP, Douglas PUD must verify on a 10-year cycle that bypass operation initiation and termination dates are adequate to provide bypass passage for 95 percent of the spring and summer HCP species outmigration. The 2011 Action Plan proposes using the program Realtime to analyze the dates of passage at Rocky Reach Dam and then extrapolate upstream to estimate passage timing at Wells Dam. Wells Dam passage timing would then be compared to bypass operations to evaluate whether 95 percent of the outmigration for both spring and summer migrants is being covered.

Results of the analyses were that only spring Chinook outmigration may not be fully covered in all years by existing bypass operation. Prior to initiation of bypass operations in the spring of 2005 and 2007, slightly more than 5 percent of spring Chinook had already passed the dam. Further, these analyses suggested that bypass operations would need to start up 1 and 3 days earlier, respectively, to cover the required 95 percent of the outmigration. In the other four years analyzed, the bypass could have started up 6 to 21 days later and still have passed 95 percent of the outmigration. Bryan Nordlund asked what might have been different in 2005 and 2007 that influenced the earlier run timing. Kahler responded that they did not analyze factors that may have influenced run timing. For sub-yearling Chinook passage timing, the bypass could have been shut off from 24 to 4 days earlier and still have passed 95 percent of the outmigration.

In summary, the bypass is operating longer into the summer than needed to pass 95 percent of summer migrants, based on the 2005 through 2010 data, but could begin operations a little earlier to meet the 95 percent passage target of spring migrants. Douglas PUD recommended that bypass operations be initiated 3 days earlier in spring, starting April 9 rather than April 12, and terminated earlier in the summer, stopping on August 19, rather than August 26.

Nordlund asked if there was any way for the Coordinating Committees to evaluate timing of outmigration to meet the 95 percent passage criteria on an annual basis, suggesting that factors such as water temperature, flow, and hatchery releases might be indicative of what might trigger the downstream migration. Then, prior to each outmigration season, the Coordinating Committees could make a call as to when to start and stop the bypass. Kahler said that given the uncertainty surrounding being able to accurately predict either migration timing or environmental conditions and the effect that those environmental conditions have on outmigration, he would recommend setting the dates and staying with them. Shane Bickford said that for 21 years, bypass operations were based on hydro-acoustic and fyke net data; after the ESA listings when fyke nets were no longer an option, Douglas PUD moved to the current protocol of fixed dates. Bickford proposed re-evaluating bypass operations in 2012 to see if the 95 percent spring and summer migrants' passage criteria were met.

The Committees agreed to review the juvenile bypass data; no Committees' members were opposed to the proposed date changes at this time. Kahler requested that the Committees' members provide any comments on the proposal by July 15, 2011, and agreed to prepare an SOA for the proposed changes in operation of the Wells juvenile bypass and to provide the SOA to Carmen Andonaegui for distribution to the Coordinating Committees by July 18, 2011, for a vote at the next Committees' meeting on July 26.

B. Implementation of Modified Fishway Operations at Wells in 2011 During the Lamprey Migration (Tom Kahler)

Tom Kahler handed out a draft SOA that was emailed to the Coordinating Committees by Carmen Andonaegui on June 17, 2011. Kahler summarized that at the last Committees meeting, he gave a presentation on the Wells Dam west adult fishway entrance velocities, and Beau Patterson presented the findings of a 2009 and 2010 evaluation of adult salmonid entrance conditions comparing passage efficiency at 1.5-foot and 1.0-foot head differentials.

Based on these findings, Kahler said that lamprey appear to have increased entrance efficiency at the 1.0-foot head differential with no apparent decrease in salmonid passage. Douglas PUD proposed implementing the 1.0-foot head differential between 1700 hours and 0059 hours daily from August 7 to September 30, to improve entrance efficiency for Pacific lamprey. The request covers operation only in 2011. Kahler said that the Aquatic Settlement Work Group wanted to enhance that likelihood of Pacific lamprey passing upstream into the Methow subbasin this year, and requested that Douglas PUD seek Committees' approval of lamprey operations for 2011. However, Douglas PUD is not proposing a lamprey passage study at Wells in 2011. Shane Bickford said that this winter, Douglas PUD will install HD PIT-tag detectors in the fishways. In 2012, they hope lamprey tagged with HD-PIT tags will pass Wells Dam in sufficient numbers to allow a comparison of passage performance under different operating conditions. If too few tagged lamprey pass in 2012, Douglas PUD will work with the Yakama Nation to obtain adult lamprey from the lower Columbia River to tag and transport upstream to Wells Dam for release into the tailrace for use in a lamprey passage study.

Bryan Nordlund asked why different statistical tests were used in each year of the previous studies (2009 and 2010) to evaluate passage success. Kahler said that he would follow up with Patterson on the reasoning, but believed it was a function of different numbers of treatments (3 in 2009 versus 2 in 2010). Bickford said that if the 1.0-foot head differential proves to be the best operating condition for Pacific lamprey passage, Douglas PUD will conduct a full study of the effects of the 1.0-foot head differential on salmonids before considering any permanent change. Kahler will revise the draft SOA to indicate in the first sentence that the change in operating conditions at the adult fishway is for one year only. He will add to the background section additional text describing the path forward as described by Bickford, if results do indicate that Pacific lamprey passage is improved at the 1.0-foot head differential. Nordlund said that he preferred to see the revisions and vote by email. Kahler will provide the revised SOA to Carmen Andonaegui by July 1, 2011, for distribution to the Committees, for a vote by email by July 8, 2011.

C. Wells Bypass/Spill Operations and TDG/Gas Bubble Trauma (GBT) (Tom Kahler)

Tom Kahler said that although he had no specific data to present, TDG levels had dropped at Wells Dam to below the 125 percent threshold at which juvenile sampling for GBT is required. During sampling last Sunday, there were no juvenile fish observed with signs of

GBT. Kahler said that spill bays 4, 6, and 8 still have the bypass barriers removed. As flows decline, the barriers with be replaced.

IV. Tributary and Hatchery Committees Update (Mike Schiewe and Carmen Andonaegui)

Mike Schiewe reported that the Tributary Committees met on June 9, 2011, and discussed the following items:

- The Tributary Committees are working through the 2011 General Salmon Habitat pre-proposals. They received 27 proposals, three of which were withdrawn and seven of which were not accepted. The Tributary Committees now have 17 projects for which they will accept full proposals. The next meeting is scheduled for July 14 to consider the full proposals.
- A project proposal on Roaring Creek to remove irrigation diversions that are fish passage barriers and convert them to groundwater wells was previously approved. However, it was subsequently discovered that an unexpected number of additional water-rights holders were also using the water diverted at the diversion. The project sponsor submitted a revised proposal to the Tributary Committees, which rejected it, concluding that the revised project was too different from the original proposal and telling the sponsor that the proposal needed to be resubmitted as a new proposal.

Carmen Andonaegui updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on June 15, 2011:

- The Hatchery Committees approved WDFW's study proposal to evaluate the effect of electroanesthesia (EA) on gamete maturation using adult summer Chinook. The purpose is to demonstrate that EA is a safe, feasible option for anesthetizing summer Chinook during broodstock collection, spawning, and biological sampling activities.
- The Hatchery Committees agreed to WDFW's proposed one-year Wells steelhead interim marking plan with the condition that it be implemented for one year only. The Hatchery Committees acknowledged the need to develop a comprehensive marking plan for Upper Columbia steelhead within the next year while the interim plan is in effect.
- The Hatchery Committees were provided a summary of discussions from the June 7, 2011 Hatchery Committees working group meeting on 2013 Hatchery No Net Impact (NNI) recalculations. To further progress towards a recalculation approach supported

by all parties, the PUDs will compile a database of smolt-to-adult returns (SARs) and adult returns to the Wells, Rocky Reach, and Rock Island dams, and Chelan PUD agreed to prepare a statement outlining their position on their hatchery mitigation obligations for discussion at the next Hatchery Committees' meeting on July 20, 2011. A third Hatchery Committees' NNI Recalculation workgroup meeting is scheduled for June 30, 2011. Mike Schiewe mentioned that the work group had adjusted the date at which adult counts change from enumerating spring Chinook to enumerating summer Chinook at Rocky Reach and Rock Island dams, rather than continuing to use the Fish Passage Center's arbitrary change date currently reported. Schiewe said there is also likely agreement on using the number of hatchery fish released as the number of hatchery fish produced, rather than back-calculating hatchery production using SARs. Shane Bickford said that the three PUDs are preparing an SOA for consideration at the next Hatchery Committees meeting to document an agreed-to calculation method. Schiewe said the recalculation method needs to be agreed to by October to be able to allow WDFW to prepare broodstock plans. Bickford said the other big driver for getting the NNI recalculations completed is that NMFS needs to know what the future hatchery programs will look like in order to evaluate the HGMPs.

Bob Rose suggested that the three PUDs and agencies and tribes may want to meet at the policy level to talk about the differences in the recalculation methods to be better prepared to consider the issue should it come to the Coordinating Committees. Schiewe suggested that the Hatchery Committees be allowed to continue to work through recalculation, saying that the time it would take for the Hatchery Committees members to brief the Coordinating Committees would delay their work. Schiewe recognized that the Priest Rapids Coordinating Committees (PRCC) process was different, saying he would like to see all the mid-Columbia PUDs do the NNI recalculations the same way. Bickford said there are two phases to recalculation: 1) getting agreement on how to calculate production for each subbasin, and 2) developing an implementation plan for the recalculated NNI production.

- An SOA was approved by the Hatchery Committees for the collection of additional summer Chinook broodstock at Wells Dam for the U.S. Fish and Wildlife Service's (USFWS's) Entiat National Fish Hatchery (NFH) summer Chinook program, agreeing it would not interfere with HCP obligations. This is the third year that USFWS has requested additional summer Chinook broodstock collection at Wells Dam. Douglas PUD agreed to explore internally the option of developing a multi-year agreement with USFWS for the collection of summer Chinook broodstock for the Entiat NFH program.

- Josh Murauskas provided preliminary results on the 2011 Wenatchee juvenile steelhead releases from Blackbird Pond, Turtle Rock, and the Chiwawa circular ponds. Murauskas reported that travel times were very good and noted that there were issues with last detections at Blackbird Pond. Average travel times reported were: Blackbird Pond – 15.6 days; Turtle Rock – 21.2 days; and the Chiwawa circular ponds – 8.0 days.
- The USFWS and NMFS provided their approvals by email of the Tumwater Dam (TWD) Operations Plan. NMFS' approval was conditional, noting that the contributing factors to adult fish passage delays at TWD need to be resolved. NMFS expressed their concern regarding the lack of consensus on causes and effects of the delays. NMFS will continue to consider adult delay concerns at Tumwater Dam and requested bi-monthly reports from Chelan PUD regarding operations at the dam. USFWS said they are also interested in lamprey passage conditions at TWD and have completed some basic research and fact finding concerning this issue but are not conducting any formal evaluations at this time.
- Chelan PUD advised the Hatchery Committees that due to flows exceeding 10,000 cfs at Tumwater Dam, headgates had to be placed in the fishway to protect the structural integrity of the fish passage facility. The headgates were in place from June 8, 2011 until the morning of June 14, 2011. During this time, fish were prevented from passage at Tumwater Dam. Chelan PUD will notify the Hatchery Committees in the case of future fishway closures due to the installation of headgates as a result of flows exceeding 10,000 cfs at TWD. Future closures are not expected this year due to flows.
- NMFS updated the Hatchery Committees that processing of the Upper Columbia Hatchery Genetic Management Plans (HGMPs) is stalled due to staffing limitations, the Sandy River lawsuit, and workload priorities, including refocusing on the lower Snake River fall Chinook HGMP. That said, Craig Busack reported that NMFS is drafting their comments on the USFWS Icicle Creek spring Chinook HGMP, but have not yet started reviewing any other Wenatchee hatchery program HGMPs or the Wells steelhead HGMP. Busack said that there is a draft biological opinion on the Entiat summer Chinook HGMP still undergoing internal review.

- The Yakama Nation reported that preliminary results on the co-acclimation of steelhead and yearling Chinook at Twisp Ponds were promising, citing no evidence of negative interactions between the two species. The Hatchery Committees gave their support for a second year of co-acclimation at Twisp Ponds, agreeing that some elements to consider during the 2012 acclimation period are species proportions, densities, and the effects of temperature on species interactions. The Yakama Nation stated that their interest is in acclimating steelhead juveniles in the upper Methow River.

V. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees meetings are July 26, 2011 (conference call), August 23, 2011 (SeaTac), and September 27, 2011 (SeaTac).

List of Attachments

Attachment A – List of Attendees
Attachment B – Analysis of Percent of Outmigration Affected by Bypass Operations at Wells Dam, 2005-2010

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Keith Truscott†	Chelan PUD
Waikele Hampton†	Chelan PUD
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford*	Douglas PUD
Beau Patterson	Douglas PUD
Bob Rose*	Yakama Nation
Jim Craig*	USFWS
Jerry Marco*	CCT
Teresa Scott*	WDFW
Bryan Nordlund*	NOAA

* Denotes Coordinating Committees member or alternate

†Participated by phone

Analysis of Percent of Outmigration Affected by Bypass Operations at Wells Dam, 2005-2010

Prepared for:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802 - 4497

Prepared by:

John R. Skalski
Richard L. Townsend

Columbia Basin Research
School of Aquatic and Fishery Sciences
University of Washington
1325 Fourth Avenue, Suite 1820
Seattle, Washington 98101-2509

15 March 2011

Outmigration has been monitored at the juvenile sampling facility at Rocky Reach Dam for four stocks of salmonids (yearling and subyearling Chinook, steelhead, and sockeye) from 2005 onward. The percent of each stock covered by the bypass operations at Wells Dam can be estimated using the historical daily counts at Rocky Reach, and adding the travel time from Wells to Rocky Reach Dam. Table 1 has the average travel times, based on recent acoustic-tag studies, for yearling Chinook, steelhead and sockeye. Due to a dearth of PIT-tag and acoustic-tag studies performed with subyearling Chinook, travel time was assumed to be 2 days.

Table 1: Average travel times from Wells tailrace to Rocky Reach Dam.

Stock	Travel time
Yearling Chinook	5 days
Subyearling Chinook	2 days
Steelhead	2 days
Sockeye	2 days

Plots of the historical cumulative percent of the outmigration for spring migrants (yearling Chinook, steelhead, and sockeye—Figure 1), and the subyearling Chinook in the summer (Figure 2) had fairly consistent start and end dates at Rocky Reach. Bypass operations for the spring outmigration at Wells is from 12:00 am 12 April – 11:59:59 pm 13 June of each year, and from 12:00 am 14 June – 11:59:59 pm 26 August for the summer. Table 2 has the estimated percent of the annual outmigration covered by the spring, summer, and total bypass operations. Steelhead, sockeye, and subyearling Chinook are estimated to have greater than 98% of their annual outmigration pass through Wells Dam during one or both of the two periods covered by bypass operations for the most recent six years of record. For yearling Chinook, being the earliest arriving stock, percent coverage ranged from 94.49% to 99.33%. To assess the 12 April annual start date for spring bypass operations, Table 3 has the date that, with hindsight, the spring bypass operations should have started to achieve 95% coverage of the yearling Chinook outmigration for that year. These dates ranged from 9 April to 3 May. For the two years when yearling Chinook coverage was less than 95%, bypass starting dates should have been 9 and 11 April, respectively, instead of 12 April.

Similarly, Table 4 compares the August 26 date of bypass termination with the date on which bypass operations covered 95% of the subyearling Chinook outmigration. In each year, an earlier termination of bypass operations would have been possible without jeopardizing the achievement of the HCP standard of providing a bypass route for ≥ 95% of outmigrating subyearling Chinook. During the six years analyzed, the 95% HCP standard was achieved 4 to 24 days prior to 26 August.

Table 2. Total percent of each stock's migration affected by bypass operations (spring, summer) at Wells Dam, based on travel times from Wells to Rocky Reach Dam, the cumulative percent of the annual migration of each stock at Rocky Reach, and the start and stop dates of Wells bypass operations.

	Annual migration percent					
Spring Outmigration Species	2005	2006	2007	2008	2009	2010
Yearling Chinook						
Percent passed prior to spring Bypass Ops period	0.0528	0.0259	0.0551	0.0025	0.0116	0.0067
Percent during spring Bypass Ops period	0.9455	0.9559	0.9154	0.9972	0.9827	0.9917
Percent during summer Bypass Ops period	0.0017	0.0.182	0.0296	0.0002	0.0056	0.0016
Percent passed after Bypass Ops period	0	0	0	0	0	0
Total Covered by Bypass ops	**0.9472**	**0.9741**	**0.9449**	**0.9975**	**0.9884**	**0.9933**
Steelhead						
Percent passed prior to spring Bypass Ops period	0.0015	0.0101	0.0066	0.0009	0.0019	0.0045
Percent during spring Bypass Ops period	0.9903	0.9762	0.9887	0.9901	0.9965	0.9763
Percent during summer Bypass Ops period	0.0081	0.0137	0.0042	0.0089	0.0016	0.0188
Percent passed after Bypass Ops period	0	0	0.0004	0.0001	0	0.0004
Total Covered by Bypass ops	**0.9985**	**0.9899**	**0.9930**	**0.9990**	**0.9989**	**0.9951**
Sockeye						
Percent passed prior to spring Bypass Ops period	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
Percent during spring Bypass Ops period	0.9983	0.9984	0.9998	0.9972	0.9957	0.9992
Percent during summer Bypass Ops period	0.0017	0.0016	0.0001	0.0028	0.0043	0.0008
Percent passed after Bypass Ops period	0	0	0	0	0	0
Total Covered by Bypass ops	**1.0000**	**1.0000**	**0.9999**	**1.0000**	**1.0000**	**1.0000**
Summer Outmigration Species						
Subyearling Chinook						
Percent passed prior to spring Bypass Ops period	0	0	0	0	0	0
Percent during spring Bypass Ops period	0.1937	0.1894	0.2136	0.1266	0.1029	0.5212
Percent during summer Bypass Ops period	0.8022	0.8077	0.7847	0.8620	0.8882	0.4723
Percent passed after Bypass Ops period	0.0041	0.0029	0.0017	0.0113	0.0089	0.0064
Total Covered by Bypass ops	**0.9959**	**0.9971**	**0.9983**	**0.9887**	**0.9911**	**0.9936**

Table 3. Comparison of the historical start date for spring bypass operations at Wells Dam each year, versus the start date necessary to have covered at least 95% of the yearling Chinook outmigration that year. Operations are assumed to begin at 12:00 AM for the date listed.

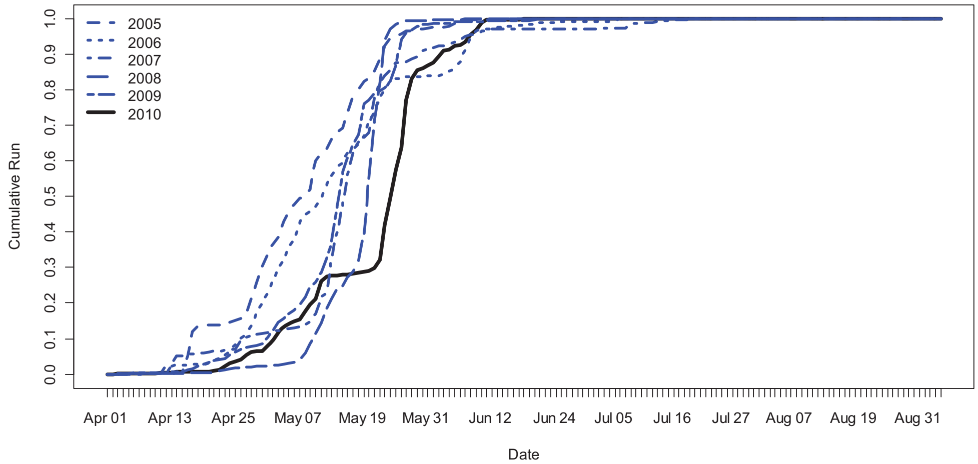
Migration Year	Historical Date	Cumulative proportion passed before 12:00 AM	Proportion Covered by Bypass Ops	Date by which the first 5% passed	Cumulative proportion passed before 12:00 AM	Bypass Ops would have Covered this Proportion	# Days before or after April 12 to get 95%
2005	April 12	0.0528	0.9472	April 11	0.0039	0.9961	1 before
2006	April 12	0.0259	0.9741	April 18	0.0468	0.9532	6 after
2007	April 12	0.0551	0.9449	April 9	0.0243	0.9757	3 before
2008	April 12	0.0025	0.9975	May 3	0.0406	0.9594	21 after
2009	April 12	0.0116	0.9884	April 19	0.0436	0.9564	7 after
2010	April 12	0.0067	0.9933	April 22	0.0410	0.9590	10 after

Table 4. Comparison of the historical stop date for summer bypass operations at Wells Dam each year, versus the stop date necessary to have covered at least 95% of the subyearling Chinook outmigration that year. Operations are assumed to end at 11:59:59 PM for the date listed.

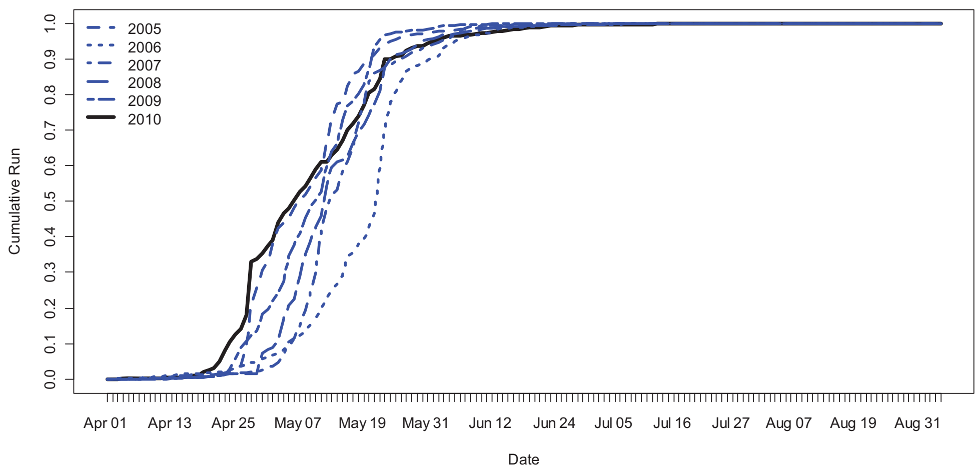
Migration Year	Historical Stop Date	Cumulative proportion passed by 11:59:59 PM	Date on or before the last 5% passed	Cumulative proportion passed by 11:59:59 PM (Bypass Ops would have Covered this Proportion)	# Days before August 26 to get 95%
2005	August 26	0.9959	August 3	0.9525	23
2006	August 26	0.9971	August 2	0.9524	24
2007	August 26	0.9983	August 11	0.9538	15
2008	August 26	0.9887	August 19	0.9502	7
2009	August 26	0.9911	August 22	0.9709	4
2010	August 26	0.9936	August 10	0.9537	16

Figure 1. Passage dates at Rocky Reach Dam for spring migrating stocks, 2005-2010. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008).

a. Yearling Chinook



b. Steelhead



c. Sockeye

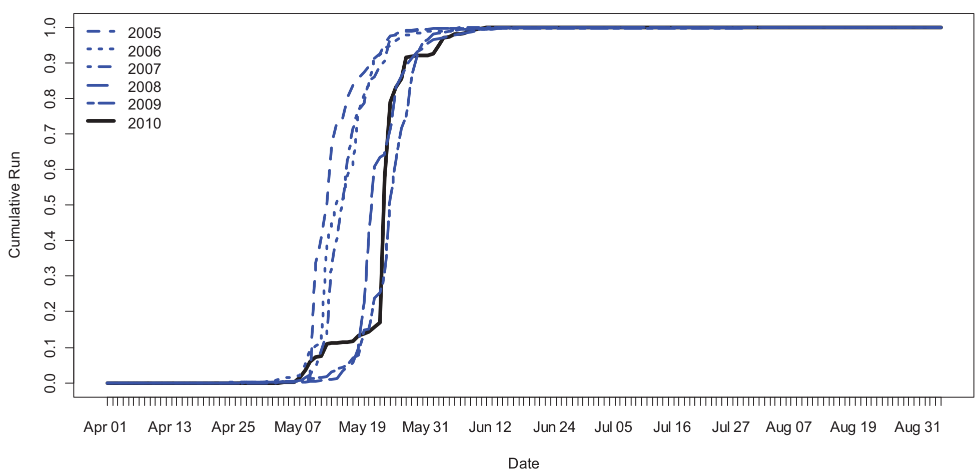
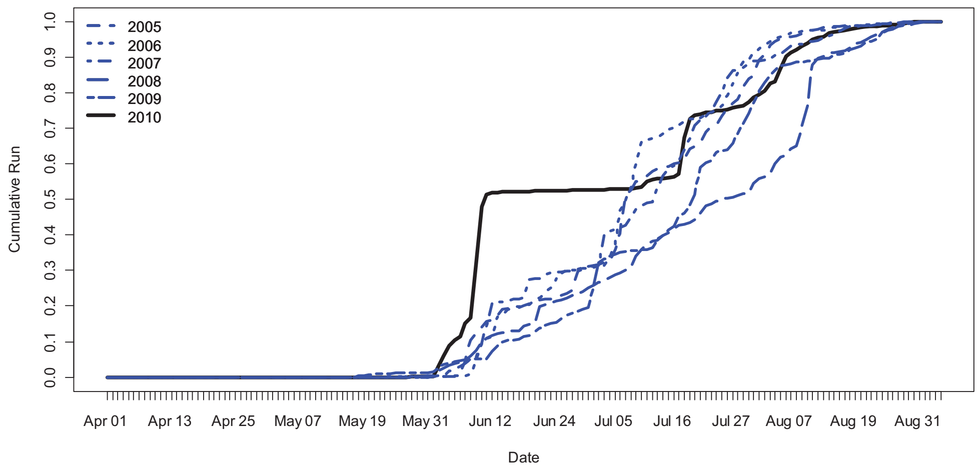


Figure 2. Passage dates at Rocky Reach Dam for summer migrating subyearlings, 2005-2010. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008).

d. Subyearling Chinook



720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
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FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	August 23, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of July 26, 2011 HCP Coordinating Committees Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, July 26, 2011, from 9:30 am to 11:30 am. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will provide edits to the draft June 28, 2011, Coordinating Committees meeting minutes and send to Carmen Andonaegui by July 29, 2011, for distribution to the Committees for email approval by August 3, 2011(Item I).
- Tom Kahler will send the revised draft 2010 Douglas PUD Pikeminnow Program Report with revisions shown in track changes to the Coordinating Committees for confirmation. Committees' members will have two weeks from the date of distribution of the Pikeminnow Report to provide comments to Kahler. After the two week review period, Kahler will finalize the Pikeminnow Report, assuming all edits are acceptable, and email to Carmen Andonaegui for distribution to the Committees (Item I).
- Tom Kahler will provide the analysis of 2009 and 2010 steelhead and Chinook passage times at Wells Dam passage to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-B).
- Tom Kahler will provide an analysis of the 2011 steelhead and Chinook passage times following the end of the 2011 adult migration season (Item II-B).
- Tom Kahler will provide an analysis of the effectiveness of using the 3-day delay start of lamprey operations at Wells Dam based on a cumulative count of 5 adult lamprey at Rocky Reach Dam, following the end of the 2011 adult lamprey migration season (Item II-B).
- Tom Kahler will revise the 2011 Wells Lamprey Operations Statement of Agreement

(SOA) as approved by the Coordinating Committees, and email it to Carmen Andonaegui for distribution to the Committees (Item II-B).
- Tom Kahler will email the final revised SOA for adjustment of future juvenile bypass operations at Wells Dam to Carmen Andonaegui for distribution to the Coordinating Committees (Item II-C).
- Steve Hemstrom will provide the memo from John Skalski on adult spring Chinook conversion rates for Rocky Reach to Carmen Andonaegui for distribution to the Coordinating Committees (Item III-D).

DECISION SUMMARY

- The Coordinating Committees approved the 2011 Wells Lamprey Operations SOA as revised.
- The Coordinating Committees approved the SOA to adjust the timing of future juvenile bypass operations at Wells Dam as revised.

REVIEW ITEMS

- The draft 2010 Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances study report (DIDSON Study Report) will be sent revised as per discussions at today's meeting, and distributed to the Coordinating Committees for a two-week review.

REPORTS FINALIZED

- No reports were finalized since the last Coordinating Committees meeting.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees' members and asked for any additions or changes to the agenda. The following changes were made to the agenda:
- Steve Hemstrom added two agenda items: a discussion of a Director-level meeting of HCP signatories that Chelan PUD is scheduling to update the Directors on HCP accomplishments; and an update on a water use proposal by the Pioneer Irrigation District to the HCP Rock Island Hatchery Committee.

The Committees reviewed the draft June 28, 2011, meeting minutes and discussed Douglas PUD edits to Item II-D, Sub-yearling Chinook Discussion, submitted by email to Carmen Andonaegui on June 21, 2011. The Committees also discussed Hemstrom's edits as presented at today's meeting. Hemstrom agreed to provide any addition comments to Andonaegui by July 29, 2011, for distribution to the Committees. The Committees will provide their concurrence with the June 28, 2011, meeting minute edits by Thursday, August 3, 2011. Upon receiving concurrence on the revised meeting minutes, Andonaegui will finalize the minutes and distribute them to the Committees.

Regarding finalizing the Pikeminnow Report (Pikeminnow Report), Tom Kahler said had confirmation from Jim Craig and Bryan Nordlund that Douglas PUD's revisions to the report based on their comments were acceptable. Kahler will send the revised report to all Committees' members for a final two week review. After two weeks, Kahler will finalize the Pikeminnow Report, assuming all edits are acceptable, and email the report to Andonaegui for distribution to the Committees.

II. Douglas PUD

A. 2011 Juvenile Bypass Operations Update (Tom Kahler)

Tom Kahler said that multiple bypass barriers at Wells Dam had been removed when river flows were at their peak this year and involuntary spill was occurring. He said that currently, only bypass barriers for bays 6 and 8 are still out, with those for Bay 8 going back in tomorrow, July 27, 2011. Kahler said that bypass barriers for Bay 6 will remain out as long as prolonged involuntary spill of greater than 40,000 cubic feet per second (cfs) is forecasted, as per the 2011 bypass operating plan. He said that Douglas expects involuntary spill to diminish by next week to the point where the barriers can be reinstalled in Spill Bay 6. However, Kahler said that Grand Coulee Dam is still passing inflow and usually starts drawing down in August. He said that if the same operations are conducted at Grand Coulee Dam this year, we will continue to see high flows in early August at the Wells Project. Nevertheless, as the hydrograph declines, involuntary spill should diminish regardless of whether or not they draft Grand Coulee. Kahler said that two turbine units are still out at Wells Dam, but that Unit 4 should be back in service by the end of this week or early next week. He said that Unit 4 can start taking flow that is now being passed at Wells Dam as excess (i.e., >40 kcfs), involuntary spill, which should hasten the re-installation of the bypass barriers in Bay 6.

B. Adjustment of 2011 Fishway Operations for Lamprey (Tom Kahler)

Tom Kahler summarized that Douglas PUD originally proposed changing to a 1.0-foot head differential at the adult fishway entrance from 1700 to 0059 hours daily from August 7 to September 30 at the June 28, 2011, Coordinating Committees' meeting. The change was requested by the Well Aquatic Settlement Work Group to improve lamprey passage. He said that the change in operations is consistent with the fishway entrance velocity test results, and the lamprey passage study results from 2009 and 2010 at Wells Dam. An SOA was distributed by Carmen Andonaegui by email to the Committees on July 6, 2011, for approval by an email vote. Bryan Nordlund responded with questions regarding the statistical tests used to assess passage effects on steelhead, and how effects on steelhead passage would be evaluated in the future. Kahler said that the version of the SOA provided for this meeting included revisions to address Nordlund's concerns and is up for approval.

Responding to a question about steelhead and Chinook passage times, Kahler said that there were no differences in passage rates for steelhead at the three head differentials tested in 2009 or the two head differentials tested in 2010. Kahler said that in 2009, 1,851 passive integrated transponder (PIT)-tagged steelhead were detected at Wells Dam; in 2010, 2,276 were detected. He said that there is an average 6-hour lag time between fish entrance into the fishway and their observation at the count windows. Since the count windows are only a few pools below the PIT-tag detection arrays, 6 hours were subtracted from the detection-time data to calculate time of entrance. Kahler said that he had not yet analyzed the available PIT-tag data for Chinook.

Nordlund and Jim Craig asked about employing a flexible start date based on a passage trigger to initiate lamprey operations. Nordlund suggested examining lamprey run timing at Rocky Reach to determine how long it typically takes lamprey to reach Wells Dam, and starting lamprey operations based on these data. Shane Bickford suggested setting a total count of five adult lamprey at Rocky Reach Dam as the trigger for starting lamprey operations at Wells Dam. The Committees discussed fish numbers and passage times in 2010. Bickford proposed starting lamprey operations at Wells Dam three days after the cumulative adult lamprey count at Rocky Reach Dam totals five fish, with lamprey operations terminating September 30, 2011.

Nordlund asked about having a flexible date for ending operations based on cumulative adult lamprey counts, so operations could be extended later in the year if the migration is late. Bickford said that the difficulty with having a flexible date is that the adult lamprey migration is very flat and very protracted over about a 2-month period. He said that the SOA, as written, tries to bracket the majority of the run.

Nordlund said that he would like to see Kahler's analyses on steelhead and Chinook passage times for Rocky Reach and Wells dams. He said if those analyses raised no concerns, he would be fine with the SOA as discussed. Kahler will provide the analysis of 2009 and 2010 steelhead and Chinook passage times at Wells Dam, based on PIT-tagged fish, to Andonaegui for distribution to the Committees and will provide an analysis of the 2011 steelhead and Chinook passage times data following the end of the 2011 adult migration season. Following the end of the 2011 adult lamprey migration season, Kahler will provide an analysis of the effectiveness of using the 3-day delay start of lamprey operations at Wells Dam based on a cumulative count of 5 adult lamprey at Rocky Reach Dam. Nordlund said that he did not need to see these analyses in writing before voting on the SOA. Schiewe said that both Jerry Marco and Bob Rose had provided him with their approval of the SOA, given that they could not attend today's meeting. The SOA was approved by the Committees with the revisions discussed at today's meeting. Kahler will revise the SOA to include the proposed start and end dates and an analysis of the effectiveness of setting the start date based on the five fish count/3 day delay for start of lamprey operations, and email it to Andonaegui for distribution to the Committees. Douglas PUD agreed to notify the Committee by email when lamprey operations are initiated this year.

C. Adjustment to Juvenile Bypass Operations (Tom Kahler)

Tom Kahler said that the SOA for adjustment of juvenile bypass operations is based on Dr. John Skalski's (Columbia Basin Research) analysis of juvenile bypass timing at Rocky Reach Dam over the past 9 years using the program Real Time. He said that Skalski's analysis determined that spring Chinook were the only spring migrants for which the 95 percent protection bypass flows were not met over the last 6 years. His analysis was presented at the June 28 Coordinating Committees' meeting. For spring Chinook, the 95 percent bypass protection flow standard was missed in 2 out the past 6 years; in 1 year by 1 day, and by 3 days the other year. Douglas PUD proposed to commence future bypass protection flow operations three days earlier, starting at 0000 hours on April 9, rather than April 12, which is the current start date. Kahler said Skalski's analysis also found that for summer migrants, bypass protection flows could be terminated earlier than current operations and still meet the 95 percent bypass flow protection standard. Douglas PUD proposed to end bypass protection flow operations starting in 2012, at 2400 hours on August 19, rather than the current end date of August 26.

In response to a question by Bryan Nordlund, Kahler said the HCP requires a juvenile survival validation study every 10 years. Kahler said in the analysis, Rocky Reach juvenile passage data was used with a five day lag time for yearling Chinook and a two day lag time of the other salmonid species. Mike Schiewe said that Bob Rose and Jerry Marco had provided their approval of the SOA, given they could not attend today's meeting. Carmen Andonaegui said that Marco had asked when the new SOA-proposed operations would take effect. Kahler said the operations would start in 2012, and that he will add the 2012 start date to the SOA. The SOA was approved by the Committees. Kahler will revise the SOA, adding the 2012 start date, and email the final revised SOA to Andonaegui for distribution to the Committees.

D. Sub-yearling Study Update (Tom Kahler)

Tom Kahler said that Douglas PUD staff has tagged over 13,200 sub-yearling Chinook and handled over 17,000 Chinook during this year's sub-yearling study. He said that after a slow start, they began capturing large numbers of taggable sub-yearlings (65 millimeters [mm] was the minimal size for tagging). Kahler said that the improved capture rate was the result of several factors, including higher reservoir levels, better capture techniques, concentrating effort at consistently productive locations, and the use of a more maneuverable boat. He said that over 600 PIT-tagged fish have already been detected at Rocky Reach Dam and that there have also been over 400 detections at other dams, although there have not yet been any detections reported from the estuary trawl. Kahler reported that the highest catch-per-unit-effort (CPUE) occurred in clear water with a cobble bottom just outside of the Okanogan River confluence plume. He said that they continually caught sub-yearlings coming out of the Okanogan River at this location. Kahler said that the last seining date for tagging was July 9, 2011. He said Douglas PUD is still seining once weekly for the purpose of collecting data on juvenile fish size, which has been increasing over the period of seining.

III. Chelan PUD

A. Update on Pending Douglas County Shoreline Permit Applications and Land Use Decisions on Rocky Reach Reservoir Shorelines (Keith Truscott)

Keith Truscott said that this agenda item is intended to keep the Coordinating Committees informed regarding shoreline and land use decisions associated with the Rocky Reach and Rock Island reservoirs, thereby doing a better job of implementing Section 6 of the respective HCPs. Truscott said Chelan PUD has received notice from Douglas County of a new application for a single dock/private use permit. He said that there are now dock permit applications in process for four new docks on the Rocky Reach Reservoir. Truscott said Chelan PUD intends to provide a general comment to Douglas County on the permit applications, indicating that concerns have been raised regarding the potential negative impact of overwater structures on juvenile Chinook salmon survival in the Reservoir.

B. Director-level HCP meeting (Keith Truscott)

Keith Truscott provided an update on a proposal by Chelan PUD to hold a Director-level meeting of HCP signatory parties this year. Truscott said that in the past, meetings of the Directors of the signatory parties' agencies and tribes have been organized to provide updates on the past year's HCP accomplishments. He said Chelan PUD has been working to find a date that would work best for a 2011 meeting and that an afternoon meeting on September 7, 2011 in Lacey, Washington, appears acceptable to the Directors. Truscott said that Mike Schiewe would facilitate the meeting, with one or two members from each HCP committee providing updates on activities and accomplishments. Truscott said he would keep Committees informed of the progress in finalizing the meeting time, place, and agenda.

C. Pioneer Irrigation District Project Proposal Update (Keith Truscott)

Keith Truscott said that the proposed Pioneer Irrigation District (PID) water use project was proposed to the HCP Tributary Committee for funding approximately 1 year ago by Trout Unlimited. The proposal is to install a water pump station on the Columbia River upstream of the Wenatchee confluence and pump water up to Monitor, Washington, to serve its irrigation water users. He said that the Monitor PID water diversion on the Wenatchee River would then be shut down. To accomplish the project, the project sponsor needs an easement from Chelan PUD, which will take a Federal Energy Regulatory Commission

(FERC) license amendment, a process through which agencies and tribes would have the opportunity to comment on the project. Bryan Nordlund asked if the Washington Department of Ecology (Ecology) would have issue with the required transfer of water rights. Truscott said that he is not aware of Ecology's position on the transfer of water rights, but that Ecology is one of the entities from which Trout Unlimited is seeking funding. Truscott said he will ask the project sponsor about the water rights issue. Nordlund said that the fish screen for the existing water diversion, which is an open channel off the Wenatchee River, is outdated and needs replacing. He said that he would prefer to discontinue the use of the diversion structure and not to have to replace the outdated fish screen.

D. Review of Recent-Years' PIT-Tag Data for Adult Spring Chinook Conversion Rates for Rocky Reach (Steve Hemstrom)

Steve Hemstrom said Chelan PUD has been reviewing recent adult dam count data and adult conversion rates using PIT-tagged adult spring Chinook. He said that the adult survival rates Rock Island to Wells Dams is exceptionally high. Hemstrom said that the Rocky Reach HCP (page 9, Section 5) states that the measurement of adult survival shall be implemented when such measures are available and should be combined with juveniles survival to achieve the 91 percent project survival standard. He said that measured, combined survival is the HCP preferred metric. Hemstrom said that for the years 2009 to 2011, adult survival can be computed for Rocky Reach, and Chelan PUD is evaluating whether the Phase III survival rate has been already met using the combined adult and juvenile survivals.

Hemstrom said that in the last 3 years combined (2009, 2010, and 2011), there have been 240 adult spring Chinook (Methow-origin fish) detected at Rock Island Dam. Hemstrom said that 239 of the 240 adults detected at Rock Island Dam were also detected at Wells Dam in that 3-year period. He said that this count captures survival from the Rock Island ladder upper PIT tag detection array through the entire Rock Island pool, past Rocky Reach Dam, and through the Rocky Reach pool to the PIT-tag detection arrays in the adult fishways at Wells Dam. Survival for this distance is documented at greater than 99 percent. Hemstrom said Chelan PUD is still working on the analysis. Shane Bickford asked how the analysis differed from adult conversion and survival rates reported in the annual reports over the last 3 years, which have achieved at least a 98 percent survival. Hemstrom said that the current analysis isolates adult survival at Rocky Reach Dam based on PIT-tag data. Bickford said that there may be additional PIT-tag detections available for Methow fish that Douglas PUD had tagged; he will provide these data to Hemstrom. Hemstrom said that within the next couple weeks, after Dr. Skalski verifies the analysis, he will provide a memo on adult spring Chinook conversion rates for Rocky Reach to Carmen Andonaegui for distribution to the Committees. Nordlund asked if Chelan PUD plans to combine adult and juvenile survival results and to see how the combined survivals compare to the combined HCP survival standard of 91 percent. Hemstrom said that is what Chelan PUD plans as a next step. Bill Tweit asked how the two different survivals (juvenile and adult) are combined mathematically. Hemstrom said the survival rates would be multiplied.

Schiewe asked for questions from the Committees on Chelan PUD's plan to look at integrating adult and juvenile survival rates into a combined project survival. Tweit asked if Chelan PUD had looked at steelhead or any other HCP Plan Species. Hemstrom said that they are looking at summer/fall Chinook, but that there are not many returning adults that were PIT-tagged. He said that they do have returning steelhead adults with PIT-tags, and that these conversion rates, like for spring Chinook, are also turning out to be quite high. Hemstrom said that for steelhead, the difficulty is in estimating the loss from harvest when calculating conversion rates. He said that mainstem steelhead harvest, natural mortality, or straying cannot be differentiated from project mortality. He said that for spring Chinook, harvest is not an issue, so they feel a reliable survival estimate can be calculated.

E. Rocky Reach Yearling Chinook Study Update (Steve Hemstrom)

Steve Hemstrom said that Chelan PUD is working on analyzing data from the 2010 yearling Chinook survival study. He said that by next Friday, August 5, 2011, he should have the paired-release survival study results available. Hemstrom said that there was excellent tag performance this year.

F. Pikeminnow Predator Control Efforts Update (Lance Keller)

Lance Keller said that 41,860 pikeminnow have been captured to date between the Tyson and U.S. Department of Agriculture (USDA) removal efforts. He said that CPUE was low early in the season, and that Chelan PUD has extended Tyson's fishing period. USDA's hook-and-line fish capture rate has been increasing as the season has progressed.

IV. Tributary and Hatchery Committees Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees met on July 14, 2011, and discussed the following items:

- The Tributary Committees reviewed 11 full proposals, all of which were for cost-sharing with other funding entities, with eight receiving funding approval. The Tributary Committees will proceed with coordinating with other funding entities to determine final contribution amounts for the funded projects.
- Tom Kahler provided clarification, saying that this year (for the first time), the Tributary Committees committed funding for some approved proposals at a lesser amount than requested by project sponsors because of limited Tributary Fund accounts. Also, he said, the original intent of the Tributary Committees was to coordinate with the Salmon Recovery Funding Board (SRFB) annual funding rounds and to serve as a matching source for projects that receive the bulk of funding from the SRFB or other funding sources such as BPA and the PRCC.
- Bryan Nordlund asked if the PID had previously proposed a project for funding by the Tributary Committees, and if so, what the outcome of that request was. Kahler said that in 2010, the PID received approximately $200,000 from the Rock Island Species Account for the proposed change in point-of-diversion from the Wenatchee River to the Columbia River. He said that this year, there was another funding request before the Tributary Committees for a PID project sponsored by the Chelan County Natural Resources Department. The 2011 project proposal is to fund restoration of the PID diversion channel once the change in point-of-diversion was complete. Kahler said that the Tributary Committee decided not to fund the project due primarily to issues with project sequencing and scope, not because there was any disagreement by the Tributary Committee with the request to change the point-of-diversion.

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees meeting on July 20, 2011, at Douglas PUD:

- The majority of the Hatchery Committees' meeting involved working on the upcoming hatchery No Net Impact (NNI) recalculation. Douglas and Chelan PUDs developed a two-pronged approach for enumerating smolt production, using hatchery release numbers for number of hatchery smolts subject to recalculation and the

Biological Assessment and Management Plan (BAMP) approach for estimating the number of natural-origin smolts arriving at the dams. The Hatchery Committees approved the PUDs' proposed recalculation method. The next step is to decide which mitigation hatchery programs are subject to recalculation; there is not yet consensus on this issue. The next Hatchery Recalculation subgroup meeting is scheduled for August 9, 2011, to finalize the database and continue the discussion of which hatchery programs are subject to recalculation. In preparation of the subgroup meeting, the PUDs will run a sensitivity analysis with hatchery programs in or out of the calculation to see what differences it makes in production levels. It is estimated that recalculation of post-2012 hatchery production will be completed by October, and that the Hatchery Committees will move on to developing an implementation plan for the recalculated production, including which species will be produced and where the smolts will be released. The goal is to have an implementation plan ready prior to April 15, 2012, when Washington Department of Fish and Wildlife (WDFW) is scheduled to produce broodstock collection protocols based on recalculated production needs.

- Steve Parker, along with Tom Scribner, attended the Hatchery Committees' meeting. Tom Scribner presented a proposal for implementing recalculated production, prioritizing spring Chinook over summer Chinook. The proposal will be discussed in the Hatchery Committees meeting over the coming months.
- The Chelan PUD Annual Monitoring and Evaluation (M&E) Program Report is out for review, with comments due in early September.
- Mike Tonseth, WDFW, distributed a second draft Hatchery Production Management Plan (Plan) to the Hatchery Committees for review. The Plan describes a protocol for meeting production targets for hatchery programs. Tonseth's second draft includes revisions based on review by WDFW staff in Olympia. He expects to ask for approval of the Plan at the August Hatchery Committees' meeting.
- Bill Bosch, Yakama Nation fisheries biologist, made a presentation to the Hatchery Committees entitled, "*The Flip Side of the Risk Monologue: the Unheralded Benefits of Hatchery Supplementation*". The presentation was a response to Mark Chilcote's paper on the negative impacts of some hatchery programs on natural production. A copy of the Power Point presentation can be provided to any interested Coordinating Committees' members.
- The Yakama Nation started a discussion on the use of coded-wire-tags (CWT) in non-

traditional body locations in fish; this was in response to the temporary use of fin-clipping other than the adipose fins for Methow steelhead this year. The Yakama Nation does not support fin clipping as a long-term solution to the growing need to mark large numbers of different groups of steelhead. Part of the difficulty in coming up with marking schemes for Upper Columbia steelhead is that fisheries managers agreed to no longer use elastomer tags. The Yakama Nation approved additional fin-clipping for Upper Columbia steelhead for 2011 only, but both the Yakama Nation and the U.S. Fish and Wildlife Service (USFWS) have said they prefer not to repeat the 2011 fin-clipping.

- Craig Busack said that National Marine Fisheries Service (NMFS) is requesting a consensus white paper on passage issues at Tumwater Dam for inclusion as an appendix to the Hatchery Genetic Management Plans (HGMPs) they are reviewing. He said that he will provide a list of questions to Josh Murauskas, Chelan PUD, and Mike Tonseth, WDFW, to use as the basis for development of the white paper. Busack said that the appendix will undergo public review along with the draft HGMP.
- Regarding the USFWS's Endangered Species Act (ESA) section 10(j) request to NMFS to reintroduce spring Chinook to the Okanogan subbasin, Craig Busack said there will be National Environmental Policy Act (NEPA) steps required and that NEPA would not be completed until spring 2012 at the earliest. Bill Gale, USFWS) informed Busack that this fall (2011), the USFWS will be providing Winthrop National Fish Hatchery (NFH), pre-smolt spring Chinook salmon to the Colville Confederated Tribes (CCT) for over-winter acclimation and release next spring (2012) into the Okanogan subbasin. Gale, USFWS, will talk with Busack about how the timing issue might be worked through in the short-term.

V. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are August 23, 2011, September 27, 2011, and October 25, 2011, all in SeaTac, Washington.

Keith Truscott said that there had been a reorganization of staff and programs within Chelan PUD and that he will be making changes for the HCP committees' representatives. He said Josh Murauskas will become the designated representative on the Hatchery Committees, replacing Joe Miller; and that Lance Keller will be the alternate to Steve Hemstrom on the

Coordinating Committees. Greg Carrington will be replaced on the Policy Committee by Kirk Hudson. Truscott said that he would get a memo out documenting the changes to Carmen Andonaegui for distribution to the Committees.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Keith Truscott	Chelan PUD
Lance Keller*	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford*	Douglas PUD
Jim Craig*	USFWS
Bill Tweit*	WDFW
Bryan Nordlund*	NMFS

* Denotes Coordinating Committees member or alternate

ANCHOR QEA
720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	September 27, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of August 23, 2011 HCP Coordinating Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, August 23, 2011, from 9:30 am to 12:00 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Carmen Andonaegui will check Washington State Department of Fish and Wildlife (WDFW) and National Marine Fisheries Service (NMFS) availability for a conference call on Tuesday, August 30, 2011, at 10 am, to discuss and vote on approval of Chelan PUD's SOA for Phase III Standards Achieved for Combined Adult and Juvenile survival at Rocky Reach. If the WDFW or NMFS representative is not available, Andonaegui will schedule an alternate date for the conference call (Item III-C).
- Steve Hemstrom will provide a revised Statement of Agreement (SOA) for Phase III Standards Achieved for Combined Adult and Juvenile survival at Rocky Reach for distribution to the Coordinating Committees prior to the August 30, 2011, conference call (Item III-C).
- Steve Hemstrom will provide an updated table of standards achieved for the Rocky Reach Project for distribution to the Coordinating Committees prior to the August 30, 2011, conference call (Item III-C).

DECISION SUMMARY

- The Coordinating Committees approved by email on August 11, 2011, ending summer spill at Rocky Reach Dam at midnight on August 12, 2011.

REVIEW ITEMS

- There are no items under review by the Coordinating Committees at this time.

REPORTS FINALIZED

- No reports have been finalized since the last Coordinating Committees meeting.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees' members and asked for any additions or changes to the agenda. The following items were added to the agenda:

- Tom Kahler added an update on the analysis of differences in travel times between Rocky Reach and Wells dams for Chinook and steelhead during lamprey operations at Wells Dam.

The Committees reviewed the draft July 26, 2011, meeting minutes. The minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Douglas PUD

A. Sub-yearling Study Update (Tom Kahler)

Tom Kahler gave an update on Douglas PUD's 2011 sub-yearling Chinook life-history study. He reported that 13,220 fish had been passive integrated transponder tagged (PIT-tagged) and released to date, and that there have already been 1,943 unique detections and 2,250 total detections. Growth has averaged 0.6 millimeters a day (mm/day), but rates varied greatly and increased over time to 1.27 mm and 1.15 mm for the two most recent captures. Kahler said that daily counts at the Rocky Reach Juvenile Bypass have not increased since spill was ended at Rocky Reach on midnight, August 12, 2011. The distribution of juvenile sub-yearling detections by location and arrival date showed that detections at Rocky Reach Dam peaked about mid-July, with detections at McNary Dam peaking about 1.5 weeks later. Kahler said that they had not yet analyzed detection efficiencies at McNary Dam but suspects they may be low, given the amount of spill at that dam. He said that the analysis was ongoing and that what he was presenting today were preliminary data. Kahler reported that the highest time-of-day passage rates at Rocky Reach Dam occurred in the early morning hours, decreasing during the day, and then increasing during late evenings. At McNary

Dam, high passage occurred in the middle of day, dropping off in the evenings. John Day Dam passage timing was similar to that at Rocky Reach Dam. Kahler said median travel time for sub-yearling Chinook from Wells Reservoir release locations to Rocky Reach Dam juvenile bypass center detector was about 10 days, with another 10 days' time to reach McNary Dam. He said, however, that median travel time from McNary Dam to John Day Dam, and continuing through the other lower Columbia River dams, was only one day. Mike Schiewe said that this may be a function of faster swimming speeds as smolt increased in size over the time of travel and also higher spill in 2011 allowed for faster downstream movement. Kahler said that they would be calculating detection efficiencies for the lower Columbia River dams. Kahler said that they had not yet analyzed travel time data other than median travel times and that sub-yearling Chinook smolts were still passing the dams. He said that he anticipates a final report following the outmigration of any yearling migrants during the spring of 2012.

B. Steelhead and Chinook Travel Times During Lamprey operations in 2009 and 2010 (Tom Kahler)

Douglas PUD's initial analyses of the data on salmonid passage behavior during the testing of lamprey operations found no significant differences in the numbers of passing salmonids during operational treatments in either 2009 or 2010. In addition to those analyses, Bryan Nordlund specifically requested analyses of the data on PIT-tagged salmonids that passed during the testing of lamprey operations to detect any differences in travel times between Rocky Reach and Wells dams during the various treatments. Tom Kahler reported on the results of a coarse-scale analysis of travel times of PIT-tagged Chinook and steelhead between Rocky Reach and Wells dams during lamprey operations at Wells Dam in 2009 and 2010 (Attachment B). He reported that passage times for adults migrating from Rocky Reach to Wells dams were distributed over a protracted period, but that there was a peak between 3 and 6 days; the tails of the distributions were distributed out to 40 or 50 days. Kahler said that the median travel times under the three treatments in 2009 and the two treatments in 2010 were not significantly different when including the full distribution, but significant differences emerge when comparing medians from greatly truncated distributions. However, the test results were equivocal: the differences were not predictably associated with treatment operations, indicating the influence of confounding factors; and the observed differences did not represent biologically meaningful differences. Kahler said that it could not conclusively be determined from these data whether the treatment lamprey operations had any effect on salmonid passage.

Kahler reported that lamprey operations had started at Wells Dam on August 19, 2011, and will run through August 31, 2011. Bob Rose said that these same types of passage time studies are being conducted at lower Columbia River dams.

III. Chelan PUD

A. Adult Spring Chinook Conversion Rates at Rocky Reach (Steve Hemstrom)

Steve Hemstrom said a draft SOA was emailed to the Coordinating Committees on August 5, 2011. He said that the SOA provided background information on adult spring Chinook conversion rates from Rock Island Dam to Wells Dam and juvenile project survival estimates for Rocky Reach. Hemstrom said that while reviewing PIT-tag data for the 2013 No Net Impact (NNI) recalculation effort, Chelan PUD realized that with the number of PIT-tagged spring Chinook, they could reliably estimate adult spring Chinook conversion rates between Rock Island and Wells dams. Hemstrom said that when the HCP was written, it was not anticipated that adult survival could be reliably measured; hence, adult passage survival was assumed to be 98 to 100 percent per project, until such time as technology would be available to differentiate hydro-related mortality from natural adult losses. He cited Section 5.4.2 of the Rocky Reach HCP, which states that the PUD shall emphasize adult project passage to give high priority to adult survival in the achievement of 91 percent combined adult and juvenile project survival for each HCP Plan Species.

Hemstrom said that with PIT-tag data from 2009 through 2011, Chelan PUD now has data to calculate spring Chinook adult project passage survival, and concludes they have met the combined standard for juvenile and adult survival of 91 percent. He said the calculation uses the number of adult spring Chinook detected passing Rocky Reach Dam and the number of adult spring Chinook detected passing Wells Dam. The estimated adult conversion (adult project passage survival) is 99.90 percent.

Josh Murauskas explained that data on adult spring Chinook returns are available from 2003 on, but that the sample sizes prior to 2009 were low and may not be representative of the run-at-large, being mostly comprised of hatchery returns. However, adult passage survival based on the arithmetic mean survival from 2003 through 2005 is 99.49 percent. Murauskas said that this represents all relevant data that Chelan PUD could find for calculating spring Chinook passage survival.

Hemstrom provided data and analysis in support of a combined juvenile and adult project survival. He described the origin and run composition of the fish used in the analysis. He provided an explanation of why jack Chinook are included in the analysis and how including jacks in the analysis influenced the results. He presented the results of an analysis of adult spring Chinook survival from Rock Island Dam to Wells Dam using the very limited adult return data from 2003 through 2008 (99.49 percent arithmetic mean survival; Attachment C). Hemstrom said that the adult spring Chinook used to estimate adult conversion rates from 2009 through 2011 were representative of the spring Chinook run-at-large.

Hemstrom discussed the difficulties in estimating adult conversion for other upper Columbia River salmonids. He cited the lack of PIT-tags for non-Endangered Species Act [ESA]-listed salmonid species as an impediment to calculating adult conversion for summer Chinook. For species subject to recreational harvest in the upper Columbia reservoirs, like steelhead, Hemstrom said that it is difficult to isolate harvest mortality from hydro-related mortality. Adult steelhead project passage survival between Rocky Island Dam and Wells Dam, based on an arithmetic mean, was 98.4 percent, including harvest mortality. Hemstrom said that there are not yet any adult PIT-tagged sockeye detections upstream of the Wenatchee confluence.

Jerry Marco suggested that a conference call be scheduled in the coming weeks to allow for any additional discussion and to vote on approval of the SOA, since WDFW and NMFS representatives could not be present at today's meeting. Marco said that he was comfortable that the data presented today on adult project passage survival was representative of adult returns to the project area.

B. 2011 Yearling Chinook Survival Results at Rocky Reach (Steve Hemstrom)

Steve Hemstrom said that John Skalski provided a 2-page letter dated August 5, 2011, summarizing analysis of tagger effects and tag lots on survival estimates and providing survival results for the 2011 yearling Chinook acoustic-tag survival study (Attachment D). The analysis concluded that there was no bias introduced into the study as a result of tag-lot or tagger effects. Paired-release survivals were calculated and pooled for project survival.

Estimated survival of day-released smolts was 92.89 percent, and estimated survival of night-released smolts was 92.99 percent, with no significant differences between the two estimates. The pooled survival estimate was 92.94 percent.

Hemstrom said that Chelan PUD used 4 years of juvenile survival estimates in calculating the combined juvenile and adult survival for the Rocky Reach Project (2004, 2005, 2010, and 2011), although only three survival estimates are required. The arithmetic average of the juvenile survivals (92.37 percent) multiplied by the adult conversion rate from Rocky Reach Dam to Wells Dam (99.90 percent) equals 92.28 percent combined adult and juvenile survival for the Rocky Reach Project, exceeding the HCP combined standard of 91 percent.

Hemstrom said that during the 2011 yearling Chinook survival study, there was involuntary spill. He said that route-specific passage and survival had not yet been analyzed (route-specific passage and survival results will not be available until September or October 2011), but that the route-specific results will not affect the preliminary survival estimate of 92.94 percent, reported today. Hemstrom said that if you assume spill provides a survival benefit, then the 2011 preliminary juvenile survival results will include survival for those fish passing through spill, to what degree will depend on the proportion and survival of fish passing through the spill route. Hemstrom said that the survival to the Hydropark detection array and the Rock Island Boat Restriction Zone (BRZ) detection array were not included in the preliminary results presented today; however, a sensitivity analysis was conducted, and preliminary survival results could be as low as 88 percent, and the 91 percent combined adult and juvenile survival standard would still be met.

C. SOA Phase III Standards Achieved for Rocky Reach Yearling Chinook Combined Adult-Juvenile Survivals (Steve Hemstrom)

Summarizing, Steve Hemstrom said that the estimated 3/4-year combined adult-juvenile survival at Rocky Reach Project is 92.37 percent. The Coordinating Committees discussed a path forward for approving the SOA. The Committees agreed to schedule a conference call when WDFW and NMFS representatives would be available for final discussion and a vote for approval. Carmen Andonaegui will contact Teresa Scott and Bryan Nordlund to check their availability for a conference call on Tuesday, August 30, 2011, at 10 am. If neither of them is available, Andonaegui will work with them to find an alternate date and reschedule the conference call with the Committees.

Steve Hemstrom agreed to provide a revised SOA, to include the analysis presented today on run-composition and origin for the adult returns, for distribution to the Committees prior to the August 30, 2011, conference call. Hemstrom will also provide an updated table of standards achieved for the Rocky Reach Project.

D. Rocky Reach and Rock Island Summer Spill Update (Steve Hemstrom)

Steve Hemstrom reported that summer spill at Rocky Reach ended on August 12, 2011. The Real Time Forecasters (Real Time) fish modeling tool (from Columbia Basin Research) had predicted that 95 percent passage of the sub-yearling Chinook out-migration would be met by August 3, 2011. Hemstrom said that by waiting until August 12, 2011, to end spill, the 95 percentile mark was well exceeded for the Rocky Reach Project. He reported that the summer percent spill target was 9 percent of river flow, but that from June 3 to August 12, 2011, total project spill was well above 9 percent at Rocky Reach, due to involuntary spill.

Hemstrom said that spill is ongoing at Rock Island Dam. The 95 percentile point of the sub-yearling outmigration has been met, but the second criteria requiring that the cumulative run total at the juvenile bypass for any three out of five consecutive days equal 0.3 percent or less of the total count, has not been met. He predicted that the second spill criteria could be met as early as Thursday. Jerry Marco asked whether approval is required for ending spill, since criteria for ending spill is in the annual spill plan and there is no explicit requirement for approval. The Committees agreed to include in the 2012 annual spill plan the rules for notification or approval of termination of spill.

E. Director-Level Meeting Update (Steve Hemstrom)

Steve Hemstrom said that Chelan PUD is still working on scheduling a date for the Director-Level meeting. Mike Schiewe said November 15, 2011, currently seems to be the most viable date. Hemstrom said that he will let the Coordinating Committees know as soon as a date has been set.

F. Pending Douglas County Shoreline Permit Applications and Land Use Decisions on Rocky Reach & Rock Island Reservoirs (Steve Hemstrom)

Steve Hemstrom said that no new applications for shoreline permits have been received by Chelan or Douglas counties since the last Coordinating Committees' meeting on July 26,

2011. He said that there has been no action on the pending shoreline applications and, therefore, he has no update to provide on the applications.

IV. Tributary and Hatchery Committees Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees met on August 11, 2011, and discussed the following items:

- The Tributary Committees completed their evaluation of the 2010 General Salmon Habitat Program Fund project proposals. They will work closely with the Salmon Recovery Funding Board (SRFB) on the coordination of funding, since most of the successful applications were also submitted to the SRFB for cost-share funding.
- The Tributary Committees decided to continue funding the Okanogan River Restoration Initiative (ORRI) out of Douglas PUD's Monitoring Fund, which is a separate account from the Tributary Fund.
- Chelan County Natural Resources Department's second effort to secure funding from the Tributary Committees for the Chumstick Barriers' Removal project was not successful although it was submitted the second time as a smaller funding request.

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees' meeting on August 17, 2011, at Douglas PUD:

- The Hatchery Committees have made excellent progress on the NNI 2013 recalculation. At the July 20, 2011 meeting, they approved an SOA on the recalculation method, using hatchery release targets as the compensation level for hatchery fish and the Biological Assessment and Management Plan (BAMP) method for calculating compensation for natural-origin smolts. The SOA did not address which current hatchery programs were subject to mitigation under NNI. At the August 17, 2011, meeting, the Committees approved as final a database for use in the recalculations. The Committees also discussed the PUDs' sensitivity analysis of estimated production levels for each PUD, based on which hatchery programs would be included in the NNI recalculation. The analysis provided minimum and maximum production levels, creating a range of production levels, depending on which hatchery programs were included or excluded. A future step is to develop an implementation plan during which production levels will be agreed upon. The

Hatchery Committees will meet by conference call on August 30, 2011, to discuss the concept of moving forward with the development of the implementation plan based on acceptance of a range of hatchery program production levels. During the call, Committees members will also discuss species of interest and preferred hatchery juvenile release locations, working with existing infrastructure. NMFS will also need to provide their opinions on what is feasible, given ESA-listings in the Upper Columbia. The Yakama Nation already indicated at the July 20, 2011, Committees' meeting that their priority for recalculation is spring Chinook.

- WDFW had the Hatchery Production Management Plan up for approval but withdrew the agenda item so WDFW and the Yakama Nation could hold discussions about management authorities between co-managers.
- WDFW gave an update on the second year of the Parental-Based Tagging (PBT) pilot study results. The preliminary analysis of the feasibility of using PBT as a way to identify broodstock was not encouraging. Assignment probability to tributary-of-origin was 30 percent. Unclipped spring Chinook were trapped at the Off-ladder Adult Fish Trap (OLAFT) and PIT-tagged. Scales and DNA samples were taken and PIT-tag data collected. The study objective was to determine reliability of predicting the tributary-of-origin of the trapped fish so they could be identified at Tumwater Dam (TWD) for broodstock. WDFW will be giving a presentation to the Hatchery Committees on the combined Year 1 and Year 2 study results in October or November, 2011. WDFW needs to determine if the low assignment probability is the result of poor assignment or of straying, and whether or not to conduct a third year of study.
- WDFW received approval for the collection of four additional adult Chiwawa spring Chinook to provide eggs for an egg box study in the Chiwawa River to look at egg-to-fry survival estimates for use in modeling.
- Chelan PUD will distribute their 2012 Monitoring and Evaluation (M&E) Work Plan to the Hatchery Committees for review. There will be a placeholder in the Work Plan for the PBT study.
- Chelan PUD will work with WDFW and the Yakama Nation to develop a steelhead acclimation and release strategy for Wenatchee steelhead. With transition from the Turtle Rock acclimation facility, steelhead production has gone from 400,000 to 247,000 smolts. Currently, acclimation is occurring at the Chiwawa Facility, Blackbird Pond, and at selected Yakama Nation multi-species acclimation ponds.

Once the steelhead acclimation strategy is developed, it will be distributed to the Hatchery Committees for review and approval by email to meet the timing need for juvenile steelhead marking.

- Cory Kamphaus presented the 2010 Yakama Nation Multi-species Acclimation Program results to the Hatchery Committees and solicited input on possible program changes for 2011. He reported that co-mingling of coho with Chinook and steelhead went well in general.
- NMFS provided an update on the processing of Hatchery and Genetic Management Plans (HGMPs) for the Upper Columbia hatchery programs, saying that it was progressing, but very slowly. Right now, progress is being made on the HGMPs for the U.S. Fish and Wildlife Service (USFWS) hatchery programs and NMFS is still considering bundling HGMPs for spring Chinook hatchery programs in the upper Wenatchee subbasin. Work will begin on the Chiwawa spring Chinook program HGMP soon. NMFS reported that they had brought on a consultant to help with the Chiwawa HGMP, but made no mention of the Methow HGMPs.
- At the July 20, 2011, Hatchery Committees' meeting, NMFS expressed an interest in having WDFW and Chelan PUD prepare an addendum to HGMPs covering activities at Tumwater Dam (TWD) as they relate to Wenatchee hatchery programs. However, with the success in reducing adult passage delays at TWD with implementation of the new operating protocol, NMFS has decided that this will not be necessary and will instead modify the HGMPs submitted.
- The Hatchery Evaluation Technical Team (HETT) continues to work on the Non-target Taxa of Concern (NTTOC) analysis and is nearing completion of the control group analysis, which will be included as an appendix to the 5-Year M&E reports.

IV. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are September 27, 2011, October 25, 2011, and November 15, 2011, in SeaTac, Washington.

Carmen Andonaegui will confirm with Becky Gallaher, Chelan PUD, that she has a current list of the remaining Committees' meeting dates in 2011.

Steve Hemstrom said that he is writing a letter to the USFWS Ecological Services Unit, Wenatchee, Washington, regarding the draft bull trout recovery plan. He said that the letter will state that the Rocky Reach and Rock Island HCPs are providing benefits for bull trout even though bull trout are not a covered species in the Chelan PUD HCPs. Hemstrom said that he will request that the USFWS provide Chelan PUD credit for addressing bull trout critical habitat through its funding of tributary habitat projects. The letter will also request Grant PUD and Douglas PUD-funded tributary habitat projects be given credit for benefits to bull trout critical habitat. Tom Kahler said that the Upper Columbia Regional Technical Team evaluates PUD tributary habitat projects and includes benefits to bull trout as a rating factor. Jim Craig asked Hemstrom to include him as a cc on the letter.

Josh Murauskas said that TWD operations of running trapping 3 days on and 4 days off during the sockeye migration resulted in a median travel time of less than 7 minutes, compared to last year's average delay of 6 days when trapping operations were running. He said that the maximum passage time for sockeye was 19 minutes when the trap was not operating. Murauskas said that flows were higher this year and that there were fewer sockeye migrating past TWD compared to last year, but that the effort to reduce passage delays at TWD was very successful this year.

List of Attachments

Attachment A – List of Attendees
Attachment B – Analysis of Salmonid Travel Times during Lamprey Operations at Wells Dam
Attachment C – Questions Regarding Adult Survival at Rocky Reach Project
Attachment D – Skalski Letter on 2011 yearling spring Chinook survival estimates at Rocky Reach

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller*	Chelan PUD
Josh Murauskas	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco*†	Colville Confederated Tribes
Jim Craig*	USFWS
Bob Rose*†	Yakama Nation

* Denotes Coordinating Committees member or alternate
† Joined by phone

Attachment B

Coarse Analysis of Data on the Travel Time of PIT-tagged Salmonids Between Rocky Reach and Wells Dams During the Testing of Lamprey Response to Fishway Operations at Wells Dam in 2009 and 2010

Attachment B

2010 Chinook Travel Time from RRH to WEA

Treatment			
1 Foot		*1.5 Feet*	
Mean	7.12966	Mean	7.810744
Standard Error	0.643672	Standard Error	1.118417
Median	5.28956	Median	4.874352
Mode	#N/A	Mode	#N/A
Standard Deviation	6.072392	Standard Deviation	9.154634
Sample Variance	36.87395	Sample Variance	83.80733
Kurtosis	6.9569	Kurtosis	11.39322
Skewness	2.4704	Skewness	3.319053
Range	34.5197	Range	48.79144
Minimum	1.983877	Minimum	1.382616
Maximum	36.50358	Maximum	50.17405
Sum	634.5398	Sum	523.3198
Count	89	Count	67
Mean (hrs)	171.1118	Mean (hrs)	187.4579
Median (hrs)	126.9494	Median (hrs)	116.9844

Attachment B

2010 Chinook Travel Time from RRH to WEA Outliers Excluded

Treatment			
1 Foot		*1.5 Feet*	
Mean	4.633691	Mean	4.95921
Standard Error	0.190103	Standard Error	0.248255
Median	4.321204	Median	4.500179
Mode	#N/A	Mode	#N/A
Standard Deviation	1.601839	Standard Deviation	1.890655
Sample Variance	2.565889	Sample Variance	3.574576
Kurtosis	-0.6339	Kurtosis	-0.35743
Skewness	0.396848	Skewness	0.513567
Range	6.511944	Range	7.496829
Minimum	1.983877	Minimum	1.382616
Maximum	8.495822	Maximum	8.879444
Sum	328.9921	Sum	287.6342
Count	71	Count	58
Mean (hrs)	111.2086	Mean (hrs)	119.021
Median (hrs)	103.7089	Median (hrs)	108.0043

Attachment B

2009 Steelhead Travel Time from RRH to WEA

Treatments (all data)					
0.5 Foot		*1 Foot*		*1.5 Feet*	
Mean	4.562548	Mean	4.1844711	Mean	4.536168
Standard Error	0.185284	Standard Error	0.1740834	Standard Error	0.209159
Median	3.027436	Median	3.0332928	Median	3.027512
Mode	4.148808	Mode	#N/A	Mode	#N/A
Standard Deviation	4.477596	Standard Deviation	4.1269142	Standard Deviation	5.165845
Sample Variance	20.04887	Sample Variance	17.031421	Sample Variance	26.68596
Kurtosis	11.13383	Kurtosis	33.954797	Kurtosis	28.91454
Skewness	3.142726	Skewness	4.914717	Skewness	4.67265
Range	30.85802	Range	45.408877	Range	53.01378
Minimum	1.061678	Minimum	1.2621181	Minimum	1.165949
Maximum	31.9197	Maximum	46.670995	Maximum	54.17973
Sum	2664.528	Sum	2351.6728	Sum	2767.062
Count	584	Count	562	Count	610
Mean (hrs)	109.5012	Mean (hrs)	100.42731	Mean (hrs)	108.868
Median (hrs)	72.65847	Median (hrs)	72.799028	Median (hrs)	72.66028

Attachment B

2009 Steelhead Travel Time from RRH to WEA Outliers Excluded

Treatments (travel time < 7 days)

0.5 Feet		*1 Foot*		*1.5 Feet*	
Mean	3.062691	Mean	3.143042	Mean	3.1083
Standard Error	0.051575	Standard Error	0.054034	Standard Error	0.051433
Median	2.860249	Median	2.952176	Median	2.90658
Mode	4.148808	Mode	#N/A	Mode	#N/A
Standard Deviation	1.153248	Standard Deviation	1.216663	Standard Deviation	1.195195
Sample Variance	1.329982	Sample Variance	1.48027	Sample Variance	1.428491
Kurtosis	0.922369	Kurtosis	0.509293	Kurtosis	0.246764
Skewness	1.094959	Skewness	0.960956	Skewness	0.927181
Range	5.932708	Range	5.719236	Range	5.645903
Minimum	1.061678	Minimum	1.262118	Minimum	1.165949
Maximum	6.994387	Maximum	6.981354	Maximum	6.811852
Sum	1531.345	Sum	1593.522	Sum	1678.482
Count	500	Count	507	Count	540
Mean (hrs)	73.50458		75.43302		74.59919
Median (hrs)	68.64597		70.85222		69.75792

Attachment B

2010 Steelhead Travel Time from RRH to WEA

Treatment			
1 Foot		*1.5 Feet*	
Mean	7.188129	Mean	6.848527
Standard Error	0.353964	Standard Error	0.380039
Median	4.147755	Median	3.905336
Mode	#N/A	Mode	3.926759
Standard Deviation	7.914872	Standard Deviation	8.23027
Sample Variance	62.64519	Sample Variance	67.73734
Kurtosis	7.586953	Kurtosis	9.409963
Skewness	2.654841	Skewness	2.972569
Range	47.83244	Range	53.6277
Minimum	1.304583	Minimum	1.030856
Maximum	49.13703	Maximum	54.65855
Sum	3594.064	Sum	3211.959
Count	500	Count	469
Mean (hrs)	172.5151	Mean (hrs)	164.3646
Median (hrs)	99.54611	Median (hrs)	93.72806

2010 Steelhead Travel Time from RRH to WEA Outliers Excluded

Treatment (cut off at <7 days)			
1 Foot		*1.5 Feet*	
Mean	3.588672	Mean	3.442022
Standard Error	0.070742	Standard Error	0.07375
Median	3.338495	Median	3.111782
Mode	#N/A	Mode	3.926759
Standard Deviation	1.351528	Standard Deviation	1.38368
Sample Variance	1.826627	Sample Variance	1.914572
Kurtosis	-0.64875	Kurtosis	-0.46421
Skewness	0.417392	Skewness	0.637642
Range	5.667153	Range	5.925625
Minimum	1.304583	Minimum	1.030856
Maximum	6.971736	Maximum	6.956481
Sum	1309.865	Sum	1211.592
Count	365	Count	352
Mean (hrs)	86.12814	Mean (hrs)	82.60852
Median (hrs)	80.12389	Median (hrs)	74.68278

Questions Regarding the Adult Survival at Rocky Reach

What are the origins of fish used in the analysis?

The adult spring Chinook salmon used in the survival analysis included 79% hatchery-origin and 21% wild-origin fish (Table 1). These proportions are consistent with proportions reported in the recent stock assessment by Washington Department of Fish and Wildlife at Wells Dam (2006-2010 = 82.0% to 89.4% hatchery-origin adults; personal communication C. Snow, WDFW).

Table 1. Origin of adult spring Chinook salmon used in estimation of adult survival through the Rocky Reach Hydroelectric Project, 2009-2011.

Origin	Release location	Adults
Hatchery	Methow Hatchery	53
	Methow River	5
	Twisp River	5
	Winthrop Hatchery	53
	Wolf Creek	69
	Hatchery sub-total	*185*
Wild	Methow River	11
	Twisp River	37
	Wild sub-total	*48*
Grand Total		**233**

What river basins (i.e., tributaries) are included in the analysis?

All fish used in the analysis originate from the Methow River Basin. No known spring Chinook populations currently exist in the Okanogan River Basin and therefore are not available for analysis.

Why hasn't Chelan used this approach for steelhead, sockeye, or summer Chinook?

No PIT-tagged sockeye salmon released above Wells Dam have returned to date. However, analysis of adult counts at Rocky Reach and Wells dams indicate that 99.5% of sockeye convert between these projects (DART, 2003-2010). Juvenile sockeye survival at Rocky Reach Hydroelectric Project is 93.59%. The minimum combined adult and juvenile survival for sockeye at Rocky Reach project would be 93.12% based on these data, exceeding the combined 91% survival goal. This includes losses due to recreational harvest, which may contribute to substantial rates of mortality during some years (i.e., 2010).

Only seven (7) PIT-tagged summer Chinook adults prior to the current return year are available for analysis (n = 1 in 2004; n = 6 in 2003). Summer Chinook migrate during a substantial recreational fishery and therefore project-specific mortality is not attainable without a statistical approach to isolate harvest mortality.

Steelhead are exposed to a recreational fishery, though an adequate number of PIT tagged adults have returned in recent years to provide a three-year estimate of project survival (including harvest). Despite inclusion of non-project losses incurred by harvest in recreational fishery, the minimum combined adult and juvenile steelhead survival rate for Rocky Reach Dam exceeds 91% (2008-2010). The combined adult and juvenile steelhead survival, including recreational harvest, is currently 94.50% (i.e., 95.79% juvenile survival × 98.40% adult survival = 94.26% combined survival; Table 2).

Table 2. Minimum estimated survival of adult steelhead at Rocky Reach Hydroelectric Project including mortality associated with recreational harvest, 2008-2010.

Year	RIS	WEL	RIS-WEL	RRH Survival
2010	69	66	95.7%	97.8%
2009	128	126	98.4%	99.2%
2008	28	27	96.4%	98.2%
Total	225	219	97.3%	98.7%
Arithmetic mean				**98.4%**

Why are jacks included in the analysis?

Jacks – defined as sexually mature male fish that return a year earlier than their female counterparts – contribute to a large portion of the adult Chinook run in the Columbia River. For example, an average of 13% of the spring Chinook run at Rocky Reach Dam has been comprised of jacks over the past ten years. The inherent proportion of jacks observed at Rocky Reach Dam is highly variable, ranging from 2% (in 2002) to as high as 33% (in 2011). Jacks are observed in both natural- and hatchery-origin fish and are representative of the run at large. Conversely, mini-jacks are Chinook that ultimately did not enter the ocean and, as juveniles, are not included in the analysis.

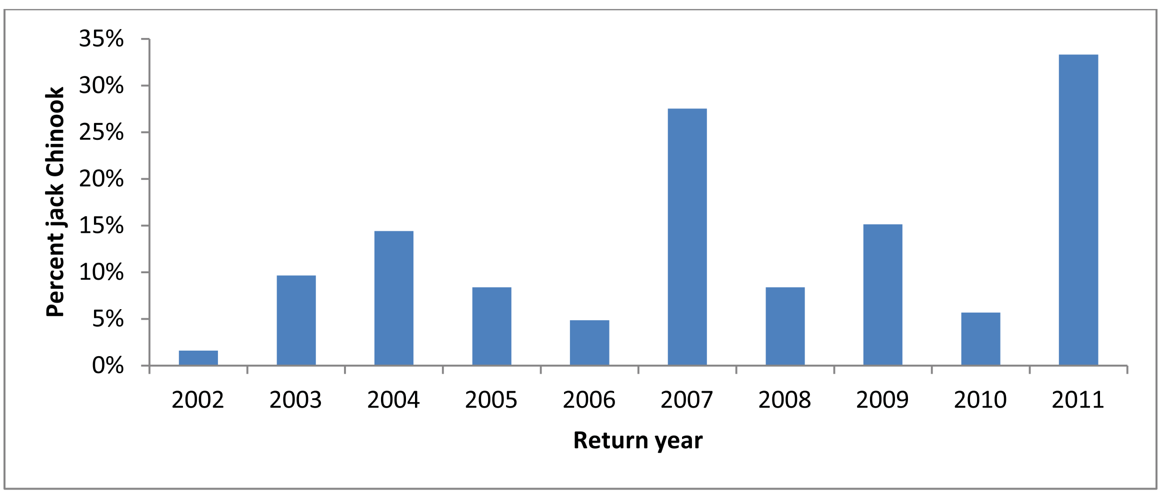


Figure 1. Proportion of jacks within the adult spring Chinook return observed at Rocky Reach Dam, 2002-2011.

What happens to the precision of the point estimate if jacks were excluded?

If survival was separated between jacks and adults, jack survival would equal 99.7% and 2+ salt adult survival rate would equal 100%. The survival rate of 2+ salt adults would have a standard error of ± 0.00% since all fish converted and variation would be equal to zero. In other words, survival of 2+ salt adults would be 100% ± 0.00% SE (n = 71) and the combined juvenile and adult survival would increase.

Are data from previous years available to provide additional assurance that the standard has been met?

Adult returns varied between 2006 and 2008, with only a few fish returning in both 2007 and 2008 (9 and 11 adults, respectively). Based on the limited sample size, the standard error of the annual survival estimates between Rock Island and Wells reached as high as ± 10.5%, with all three years exceeding the precision required in the Rocky Reach HCP. However, sample sizes and precision between 2003 and 2005 provide an acceptable three-year average of adult survival through the Rocky Reach Hydroelectric Project. Although these return data do not include wild-origin adults, upstream performance of wild-origin fish can be assumed to be equal to or better than that observed in hatchery-origin fish. For example, adult survival of wild-origin spring Chinook between McNary and Rock Island dams has historically been nearly one-third higher for wild-origin adults (Table 3). Given these data, the combined adult (Table 4) and juvenile survival for Rocky Reach Hydroelectric Project based on historical data exceeds the 91% criteria established in the Rocky Reach HCP (i.e., 92.37% juvenile × 99.49% adult = 91.90%).

Table 3. Comparative survival of adult hatchery- and wild-origin spring Chinook between McNary and Rock Island dams, 2003-2011 (including all fish released above Rock Island Dam).

Origin	MCN	RIS	MCN-RIS	SE
Hatchery	3098	2157	69.63%	0.83%
Wild	455	410	90.11%	1.40%

Table 4. Survival of adult spring Chinook at Rocky Reach Hydroelectric Project, 2003-2005.

Year	RIS	WEL	RIS-WEL	SE	RRH Survival
2005	102	101	99.02%	0.98%	99.51%
2004	49	48	97.96%	2.02%	98.97%
2003	14	14	100.00%	0.00%	100.00%
03-'05	165	163	98.79%	0.85%	99.39%
Arithmetic mean					**99.49%**

Attachment D

SCHOOL OF AQUATIC & FISHERY SCIENCES
COLUMBIA BASIN RESEARCH

UNIVERSITY OF WASHINGTON

3 August 2011

Steve Hemstrom
PUD No. 1 of Chelan County
P.O. Box 1231
327 North Wenatchee Avenue
Wenatchee, Washington 98801

Dear Steve,

My staff and I have analyzed the 2011 yearling Chinook salmon acoustic-tag data from the Rocky Reach survival study. We found the effort of the four fish taggers was evenly distributed between the Wells and Rocky Reach tailrace release groups, and the downstream survival of the fish tagged by different taggers was homogeneous. Three different tag lots were used to tag the fish in the 2011 study. We found the different tag lots also to be evenly distributed among the release groups and no evidence of differential survival among the fish tagged by the different lots. Therefore, all fish tagged by the four different taggers and the three different tag lots were included in our survival analysis.

Average tag life for the tags used in the 2011 study was 32.7 days. Tag life was sufficiently long for the fish to have passed through the study area before tag failure became an issue. The probability of an acoustic tag being active when the fish arrived at a detection site was estimated to be ≥ 0.9946.

The paired release-recapture model was used to estimate project passage survival at Rocky Reach using the Wells and Rocky Reach tailrace releases, as in previous years. Separate estimates were calculated for daytime and nighttime release pairs. Using just the daytime releases, project passage survival at Rocky Reach was estimated to be $\hat{S}_{\text{RR-Day}} = 0.9289$ ($\widehat{\text{SE}} = 0.0135$). The nighttime releases estimated project passage survival to be $\hat{S}_{\text{RR-Night}} = 0.9299$ ($\widehat{\text{SE}} = 0.0135$). There was no significant difference between these two estimates ($P = 0.9582$). Pooling all the day and nighttime releases resulted in an overall estimate of project passage survival at Rocky Reach for yearling Chinook salmon of $\hat{S}_{\text{RR}} = 0.9294$ ($\widehat{\text{SE}} = 0.0097$). This is the same value as would be produced by an arithmetic average because sample sizes were nearly equal for day and nighttime releases (day = 851, night = 853).

Currently, the route-specific passage information from the acoustic-tag study is not available to assess how spill in the latter part of the study may have affected the study-wide estimate of $\hat{S}_{RR}$ = 0.9294 ($\widehat{SE}$ = 0.0097). More detailed analyses will be performed when that data becomes available and will be presented in the draft and final reports.

Sincerely,

John R. Skalski
Professor of Biological Statistics

ANCHOR QEA
720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	September 12, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of the August 30, 2011, HCP Rocky Reach Coordinating Committee Conference Call		

The Rocky Reach Hydroelectric Projects Habitat Conservation Plan (HCP) Coordinating Committee met by conference call on Tuesday, August 30, 2011, from 10:00 to 10:30 am. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will revise the Statement of Agreement (SOA) as agreed to during today's conference call, and email it to Carmen Andonaegui for distribution to the Rocky Reach Coordinating Committee; Andonaegui will request email concurrence with the Committees' approval of the SOA from Jerry Marco, Colville Confederated Tribes (CCT), and Teresa Scott, Washington Department of Fish and Wildlife (WDFW) (Item II).

DECISION SUMMARY

- The Rocky Reach Coordinating Committee approved the SOA for Phase III Standards Achieved for 91 percent combined adult and juvenile spring Chinook survival at Rocky Reach Project, subject to email concurrence by the WDFW and CCT Rocky Reach Coordinating Committee representatives.

I. Welcome

Mike Schiewe opened the call by stating that the purpose of the conference call was to allow those persons not present at the August 23, 2011, Coordinating Committees' meeting the opportunity to ask questions and have additional discussion on Chelan PUD's SOA for approval for Phase III Standards Achieved for 91 percent combined adult and juvenile spring Chinook survival at the Rocky Reach Project.

Schiewe said that this conference call is mostly for the benefit of WDFW and the National Marine Fisheries Service (NMFS), but that other Committee members can use this call as an opportunity to ask additional questions and engage in further discussion. He said he would like to put the SOA to a vote by the Committee during this call.

II. Discussion

Steve Hemstrom said that he had no additional information to present to the Rocky Reach Coordinating Committee on the SOA. Bryan Nordlund said that he had had discussions with Richie Graves, NMFS, and Teresa Scott, WDFW, and that he agrees that the request for approval of Phase III Standards Achieved for the combined adult and juvenile spring Chinook survival at Rocky Reach follows the requirements of the HCP. He said that NMFS and WDFW would like to discuss a requirement in the SOA that adult survival will be reviewed yearly, or every 5 years using a rolling average, to ensure that the high survival continues. Nordlund said that he was looking for Committee members' feedback on how best to check in on adult survival over the years. Mike Schiewe reminded the Committee that an annual adult survival estimate is routinely included in the Rock Island, Rocky Reach, and Wells projects' HCP annual reports. The Committees discussed the availability of future passive integrated transponder tag (PIT–tag) data, and how many PIT-tagged juveniles would be needed to allow calculation of a reasonably precise adult survival estimate. Hemstrom acknowledged that Chelan PUD will conduct juvenile survival verification study in 10 years, and that if they plan to utilize a combined adult/juvenile survival estimate, they will need to make sure they have enough tagged fish in the river.

Josh Murauskas said that the opportunity to calculate adult dam-to-dam survival was the result of having a relatively large number of returning PIT-tagged adults over the last few years, and that this was attributable to a large number of non-Chelan PUD program PIT-tagged juveniles released in earlier years. He said that based on smolt-to-adult returns (SARs), it might take as many as 4,000 PIT-tagged juveniles to get one returning PIT-tagged adult, which would take a substantial commitment in terms of PIT-tags allowed for the calculation of adult survival using a rolling average. Nordlund said it was not his expectation to require Chelan PUD to PIT-tag more fish to allow for calculating annual adult survivals, but that he had thought sufficient PIT tag data would exist from other sources to allow that calculation to be made. If sufficient PIT-tagged fish are not available to calculate adult survival for individual years, then annual adult survival estimates would not be expected. He said that he was looking for discussion on how annual adult survival rates could continue to be monitored and reported to the Committees along with a report of the annual combined adult/juvenile survival estimates, and language to that effect be included in the SOA. Specifically, Nordlund suggested that text could be added indicating that the HCP requires juvenile survival to be validated in 10 years, and that the acceptable project survival standards are a minimum juvenile project survival of 93 percent or a combined minimum adult/juvenile survival of 91 percent. Hemstrom said that he will add Nordlund's suggested text to the SOA and include that adult passage will be continuously monitored and will be reported annually to the Committees and reported in the Rocky Reach HCP annual report. Hemstrom also agreed to add language in the SOA specifying that in 2021, Chelan PUD will conduct a spring Chinook juvenile survival check-in study. The spring Chinook juvenile survival check-in estimate and the adult survival data from the Rock Reach HCP annual reports (summarized for that 10 year period) will be considered by the HCP CC in deciding whether the combined survival standard can be calculated and has been maintained. In the interim period, annual adult spring Chinook survival levels will be considered by the HCP CC to assure the combined survival is being maintained, and to discuss appropriate action if there are unexpected results.

Schiewe said that with the approval of this SOA, a process has been established for calculating a combined adult/juvenile survival estimate, subject only to whether enough PIT-tagged adults return to allow for an adult survival count. Hemstrom agreed, saying Chelan PUD intends to use adult survival and juvenile survival in the 2021 10-year survival check-in study. Nordlund confirmed that he was given proxy by Scott to vote for approval of the SOA.

All Committee members present on the conference call voted to approve the SOA. Hemstrom will revise and finalize the SOA as agreed to at today's conference call, and will email it to Carmen Andonaegui for distribution to the Coordinating Committees. Andonaegui will include in the email a notification that the SOA has been approved subject to email concurrence by Marco and Scott. She will ask for Marco's and Scott's concurrence within one week and notify the Committees when this is received.

List of Attachments

Attachment A – List of Attendees

Attachment B – Phase III Standards Achieved 91 Percent Combined Adult and Juvenile Survival at Rocky Reach Project

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Josh Murauskas	Chelan PUD
Bob Rose*	Yakama Nation
Jim Craig*	USFWS
Bryan Nordlund*	NMFS

Note:
* Denotes Coordinating Committees member or alternate

Final
Rocky Reach HCP Coordinating Committee
Statement of Agreement

Phase III Standards Achieved for 91% Combined Adult and Juvenile Spring Chinook Survival at the Rocky Reach Project

SOA Approved with Amendment, August 30, 2011

Agreement Statement
The Rocky Reach HCP Coordinating Committee (HCP CC) has reviewed results of Chelan PUD's 2004-2005, and 2010-2011 survival estimates (mean =0.9237) for juvenile yearling spring Chinook at Rocky Reach, and the 2009-2011 adult spring Chinook passage survival rates (mean=0.9990) at Rocky Reach using PIT tags. Combined survival for three years of adult Project passage and four years of juvenile Project survival at Rocky Reach is **0.9228**, which achieves the HCP Combined Adult and Juvenile Survival Standard of 91%. Together, these survivals demonstrate that Chelan PUD has achieved the HCP Combined Juvenile and Adult Spring Chinook survival rate for three years of studies at Rocky Reach. The HCP CC agrees that in 2011, Spring Chinook salmon are now in Phase III, Standards Achieved for the Rocky Reach Project.

In 2021, Chelan PUD will verify that the Combined Adult and Juvenile Project Survival rates continue to meet the Phase III Standards Achieved criteria for the Rocky Reach Project.

Background

Section 5 of the Rocky Reach HCP (Passage Survival Plan) contains a decision matrix and language that directs Chelan PUD to measure and achieve, if possible, the combined adult and juvenile project survival standard of 91%**:**

> *Section 5.4.2 Adult Measures. "The District shall emphasize adult project passage Measures in order to give high priority to adult survival in the achievement of 91% Combined Adult and Juvenile Project Survival for each Plan Specie."*

Adult Passage Survival

Data from the last three years (2009-2011) of spring Chinook salmon adult and jack migrations (1-ocean) passing Rocky Reach allows for measurement and estimation of adult passage survival, and calculation of the combined adult and juvenile survival standard as specified in the HCP.

PIT tag data for adult (min-jacks excluded) passage (2009- 2011) was used to estimate the adult conversion rate (Project passage survival) for the Rocky Reach Project. The three-year conversion estimate is **0.9990** (Table 1). The tagged fish in the three-year sample include 20.6% natural-origin spring Chinook, and 79.4% hatchery-origin spring Chinook, all from the Methow Basin (Table 2). This proportion is representative of the spring Chinook "run-at-large" that passes Rocky Reach, as verified by samples taken at Wells Dam during adult stock assessments conducted by Washington Department of Fish and Wildlife. From 2006-2010 between 6.8% and 15.2% of spring Chinook passing at Wells Dam were natural-origin Chinook (C. Frady, personal communication, WDFW, 2011). Adult fish in the Rocky Reach passage survival analysis include all PIT tagged spring Chinook, that as smolts, were either naturally produced in the Methow basin and tagged at a smolt trap, or were hatchery-released in the basin (HUC code: 1702008).

Adult In-River Migration Conditions

River migration conditions (river flows) for spring Chinook through the Rocky Reach Project in years 2009-2011 provided a very representative range of flows to evaluate passage survival (Table 3). Low, average, and high flow years occurred during adult migration years represented in the passage survival analysis. No differences in passage success were observed between the years, despite are large differences in river flow rates during the passage period.

Table 1. Estimates of adult spring Chinook conversion rates from Rock Island Dam to Wells Dam for Chinook salmon released as juveniles in the Methow River Basin. The single-project conversion rate (three-year average) for Rocky Reach is **99.90,** calculated as the square root of the Rock Island to Wells conversion rate. The 95% confidence intervals are profile likelihood confidence intervals for the year-specific results, and asymptotic confidence intervals for the three-year averages (adapted from Buchanan and Skalski, 2011).

			Rock Island-Wells Conversion Rate			Rocky Reach-Project Conversion Rate		
Year	Rock Island	Wells	Estimate	SE	95% CI	$\hat{S}$ Estimate	SE	95% CI
2009	22	22	1.0000	0	(0.9164, 1.0000)	1.0000	0	(0.9573, 1.0000)
2010	45	45	1.0000	0	(0.9582, 1.0000)	1.0000	0	(0.9789, 1.0000)
2011	166	165	0.9940	0.0060	(0.9738, 0.9997)	0.9970	0.003 0	(0.9868, 0.9998)
Average			0.9980	0.0020	(0.9941, 1.0000)	**0.9990**	0.0006	(0.9979, 1.0000)

Table 2. Origins and proportions of hatchery-wild of adult spring Chinook salmon used in estimation of adult passage survival through the Rocky Reach Hydroelectric Project, 2009-2011.

Origin	Release location	# Adults
Hatchery	Methow Hatchery	53
	Methow River	5
	Twisp River	5
	Winthrop Hatchery	53
	Wolf Creek	69
	Hatchery sub-total	*185 (79.4%)*
Wild	Methow River	11
	Twisp River	37
	Wild sub-total	*48 (20.6%)*
Grand Total		**233**

Table 3. Rocky Reach Dam day average and median flows during periods when PIT tagged adult spring Chinook passed through the Rocky Reach Project April-June, 2009-2011.

		Rocky Reach Flow		
Year	Dates	mean Q (cfs)	median Q (cfs)	relative Q
2009	5/14-6/11	137,420	140,450	Average
2010	4/26-6/11	114,110	107,930	Low
2011	5/11-6/30	257,170	262,480	Very high

Juvenile Passage Survival

Juvenile survival studies in 2010 and 2011 yielded Project survival estimates of 0.9250 (0.0142) and 0.9294 (0.0094), respectively, and the 2004 and 2005 survival estimates were 0.9293 (0.0196) and 0.9109 (0.0179), respectively (Table 4). The four-year arithmetic mean of all four Yearling Chinook studies at Rocky Reach is 0.9237 (0.0044).

Table 4. Annual juvenile project survival estimates and the arithmetic mean for all yearling spring Chinook survival studies at the Rocky Reach Project, 2004-2011.

Year	RR Juvenile $\hat{S}$ (SE)
2004	0.9293 (0.0196)
2005	0.9109 (0.0179)
2010	0.9250 (0.0142)
2011	0.9294 (.0097)
Arith Avg.	**0.9237 (0.0044)**

Rocky Reach Combined Adult and Juvenile Project Survival

The calculation for combined adult and juvenile survival for spring Chinook at the Rocky Reach Project is shown by the expression:

[(Adult passage survival) x (juvenile passage survival)] = Combined Adult and Juvenile Survival

= (0.9990) x (0.9237) = **0.9228**

The combined juvenile and adult survival at the Rocky Reach Project for three years of survival estimates is **0.9228**, achieving compliance the HCP combined passage survival standard of 91% for adult and juvenile spring Chinook salmon.

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	October 25, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of September 27, 2011 HCP Coordinating Committees' meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met on Tuesday, September 27, 2011, from 9:30 am to 11:30 am in SeaTac, Washington. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will provide the Coordinating Committees with data from Chelan PUD's 2011 spill gate configuration test once it was completed (Item II-A).
- Lance Keller will provide the Coordinating Committees a summary of the Half-Duplex (HD) detection arrays' installation locations and design (Item II-C).
- Carmen Andonaegui will email to the Coordinating Committees Chelan PUD's summary of the preliminary results of the partial water re-use technology study (Item III).

DECISION SUMMARY

- There were no decisions made at today's meeting.

REVIEW ITEMS

- There are no documents under review by the Coordinating Committees at this time.

REPORTS FINALIZED

- There are no reports to finalize at this time.

I. Welcome

Mike Schiewe welcomed the Coordinating Committees' members and asked for any additions or changes to the agenda. The following item was added to the agenda:

- Steve Hemstrom requested time on the agenda for additional questions on the Rocky Reach Phase III Standards Achieved for combined Chinook adult/juvenile survival.

The Committees reviewed the draft August 23, 2011, meeting minutes and the draft August 30, 2011, conference call minutes. Tom Kahler asked that a correction be made to the August 23, 2011, meeting minutes at the top of page 3 in the second sentence. He asked that "Wells Dam" be changed to "Wells Reservoir." The August 23, 2011, meeting minutes and the August 30, 2011, conference call minutes were approved as revised. Jerry Marco commented on the median travel times from Wells Reservoir to Rocky Reach Dam of 10 days being the same as the median travel times from Rocky Reach Dam to McNary Dam. Kahler said the travel times recorded by Douglas PUD included time from release in Wells Reservoir to Rocky Reach, rather than from Wells Dam to Rocky Reach. Douglas has no way to interrogate the fish when they pass Wells, so the estimates of travel time include the time spent by the fish in Wells Reservoir prior to migration plus their transit time to Rocky Reach once they pass Wells Dam. The fish were held for overnight after capture, tagged the next day, and then held for overnight before being released. He said he did not know whether the travel times included the time the fish are held after tagging prior to release or to what extent the fish were ready to migrate when they were released. We know that the fish were feeding while migrating because we have calculated growth from those fish that were recaptured during sampling at the Rocky Reach bypass. The feeding migration is in contrast to the directed migration exhibited by yearling smolts. The more rapid migration pace of the sub-yearlings between dams in the lower river may indicate the transition to directed migration. Carmen Andonaegui will finalize the meeting minutes and distribute them to the Committees.

II. Chelan PUD

A. Rocky Reach and Rock Island Spill Program End of Season Report (Steve Hemstrom)

Steve Hemstrom reported the results of the 2011 Rocky Reach and Rock Island fish spill program (Attachment B). For summer spill at Rocky Reach and for spring and summer spill at Rock Island, Hemstrom reported: spill target species, start and stop spill dates, percent spill targets, percent spill, percent of run with spill, average river flow, average spill flow, cumulative index count for target species, and total days with spill. He also reported juvenile index counts for Chinook, sockeye, and steelhead from 2003 through 2011 for the Rocky Reach and Rock Island juvenile bypasses. Hemstrom reported that the Rocky Reach juvenile bypass ran through August 31, 2011, passing 96.85 percent of the outmigration. He remarked on the high average flows in 2011, saying that the average flow during spring spill at Rock Island was 195,400 cubic feet per second (cfs), from April 17 through June 3, 2011. The average flow during summer spill at Rocky Reach was 221,041 cfs (from June 4 through August 12, 2011), and it was 212,290 cfs at Rock Island (from June 4 through August 24, 2011). In all cases, percent spill targets were exceeded because of the need for involuntary spill, and in all cases, the targets for percent of run with spill were exceeded.

Bryan Nordlund asked why the index count for sockeye at Rock Island was so low relative to the sockeye index count at Rocky Reach; it was 18,697 compared to 67,879, respectively. Hemstrom said that this may have been related to trap efficiency at Rock Island and that the counts reported are expanded index counts. The index counts are expanded for flow for passage through all routes at Rock Island dam. He said the counts cannot be adjusted for bypass efficiency except in years when there is acoustic tag data, which allows for estimates of route-specific passage at Rocky Reach Dam. Hemstrom said that juvenile numbers at Rocky Reach Dam are expanded based on four, thirty-minute index samples counted daily during the juvenile bypass operating season.

After a question regarding the spill gate testing at Rocky Reach and Total Dissolved Gas (TDG) monitoring from Bryan Nordlund, Hemstrom said that Chelan PUD is required by the Washington State Department of Ecology's Section 401 Clean Water Act certification to record and report evidence of gas bubble trauma (GBT) observed in smolts during operation of the Rock Island juvenile bypass and collection system. He said that a high prevalence of GBT was recorded in 2011 and that data are posted on the Fish Passage Center (FPC) website. Hemstrom said that Chelan PUD did test changes in spill patterns at Rocky Reach Dam during the 2011 spill season to try to reduce tailrace TDG levels. A briefing on the spill pattern test was provided to the Coordinating Committees at the June 28, 2011, meeting. Hemstrom said that a report on the results has not been completed. Nordlund requested that the TDG test report be distributed to the Committees. Hemstrom agreed to provide the Committees with data from the 2011 spill pattern tests once it was completed.

B. Pikeminnow Control Program Update (Lance Keller)

Lance Keller reported that the 2011 pikeminnow removal effort was nearing completion. He said that the U. S. Department of Agriculture (USDA) would complete their pikeminnow removal efforts on October 4, 2011. He said that currently, 67,168 pikeminnow have been removed from the Rocky Reach and Rock Island reservoirs. Keller said that the USDA boats were catching approximately 100 fish per day. He said that, overall, removal efforts were successful given the difficult fishing conditions for April through June as a result of high flows. Keller said that the total number of fish removed included all pikeminnow captured, including the pikeminnow sampled at the juvenile bypass and the 3,274 pikeminnow captured in the 2011 annual East Wenatchee Rotary northern Pikeminnow Derby. He said that he would provide to the Coordinating Committees the draft annual report of the 2011 northern pikeminnow removal efforts as soon as it was available.

C. Rocky Reach Fish Forum Update on Rocky Reach Fishway Lamprey Passage Improvements (Lance Keller)

Lance Keller said that during the 2011/2012 dewatering of the Rocky Reach fishway for annual maintenance, Chelan PUD would be installing HD-detection arrays at multiple locations in the adult fishway, including in all three fishway entrances and the fishway transportation channel. He said that because the transportation channel is so wide, the consultant working on the design, Cramer Fish Sciences, has designed an unshielded antenna that would extend down the middle of the fishway for better fish detection. A detection array will also be installed at A10 in the adult fishway weir. Combined with the already-installed antenna at the fishway exit, this will bring the number of HD-detection locations in the Rocky Reach adult fishway to six for the 2012 monitoring season. Keller said plating will also be installed in the fishway orifices and will extend into the upper chamber. Keller agreed to have Jeff Osborn, Chelan PUD, summarize the HD-detection arrays' installation locations and design for the Coordinating Committees. Bryan Nordlund said that he had spoken with a representative from Cramer Fish Sciences, and that he did not see any concerns with the detection array design. In response to a question concerning lamprey detections at Wells Dam since lamprey operations had been implemented, Tom Kahler said that no lamprey have been observed, and year-to-date, there has only been one lamprey counted in the Wells adult fishway, and that was in June. He said that the adult lamprey may be passing unobserved through the picketed leads at the count windows in the Wells Dam fishways.

D. Director Level Meeting Scheduling Update (Steve Hemstrom)

Mike Schiewe reported that the Director Level meeting had been scheduled for November 15, 2011, from 1:00 to 4:00 pm, in Lacey, Washington. He said that the meeting will be on the same day as the November Coordinating Committees meeting, which is scheduled for 9:30 am to 12:00 pm, in the same location. Schiewe said that the Director Level meeting was a Chelan PUD meeting, but that Chelan PUD had offered Douglas PUD the opportunity to provide an update on implementation of the Wells HCP as well.

E. Request for Any Additional Questions on the Rocky Reach Phase III Standards Achieved for Combined Adult/Juvenile Spring Chinook Survival (Steve Hemstrom)

There were no additional questions from the Coordinating Committees on the Rocky Reach Phase III Standards Achieved designation for combined adult/juvenile spring Chinook at Rocky Reach Dam.

III. Tributary and Hatchery Committees Update (Mike Schiewe)

Mike Schiewe reported that the Tributary Committees met on September 14, 2011, and discussed the following items:

- The Methow Conservancy asked the Tributary Committees for their position on allowing acclimation facility development on properties with conservation easements funded through HCP Tributary Fund Accounts. Tom Kahler said that the Tributary Committees' policy is not to explicitly exclude such uses, but to reserve the right to review proposals and grant permission for uses on an individual basis.
- The Tributary Committees discussed level of participation in the U.S. Bureau of Reclamation's (Reclamation's) and the U.S. Fish and Wildlife Service's (USFWS's) request for Committees members' participation in the Project Alternative Solutions Studies (PASS) process intended to consider the alternatives for locating an adult fish weir in the upper Methow subbasin. The PASS process meetings are scheduled for a duration of 3 days.
- The Tributary Committees are waiting on final Salmon Recovery Funding Board (SRFB) funding decisions prior to making any additional funding decisions for 2011

Tributary Fund Account awards. SRFB funding is typically announced in early December 2011. Waiting on the SRFB funding decisions allows the Tributary Committees to coordinate funding request for projects also funded by the SRFB.

Mike Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees' meeting on September 21, 2011, at Douglas PUD:

- The Hatchery Committees finalized two HCP Monitoring and Evaluation (M&E)-related documents (the Chelan PUD 2010 annual M&E report and the Douglas PUD 2010 M&E hatchery programs report), and completed the review period for comments on one draft M&E document (the Chelan PUD 2012 M&E annual work plan).
- Josh Murauskas reported preliminary results of Chelan PUD's evaluation of partial water re-use technology for rearing of yearling summer Chinook. The re-use study evaluated juveniles acclimated in circular tanks with partial re-use water and compared the results to fish reared in traditional raceway environments. The results were promising with re-use fish in as good a condition as raceway-reared fish, if not in better condition. About three-quarters of the fish raised under re-use conditions returned after 2 years in the ocean: twice as many raceway-reared fish returning as jacks or mini-jacks compared to re-use fish. Chelan PUD's preliminary study results indicated a correlation between jack and mini-jack return rates and hatchery environment, which is consistent with National Marine Fisheries Service (NMFS) Science Center research results on the influence of hatchery conditions on jack and mini-jack return rates. Carmen Andonaegui will email to the Coordinating Committees Chelan PUD's preliminary results of the re-use study. Jerry Marco commented on the use of yearling summer Chinook in the study rather than sub-yearling Chinook, with sub-yearlings being the more natural rearing strategy for summer Chinook, and questioned if using yearlings in the study rather than sub-yearlings might bias the study results. Bryan Nordlund mentioned a study of the effects of rearing in spiral raceways, which showed better growth and larger size with less food waste. Schiewe said that the use of circular and spiral tank rearing vessels is a technology that comes from aquaculture, and Chelan PUD's use of a circular tank is one of the first times this had been tried with fish released to perform in the wild. He noted that the re-use study started as a pilot study to investigate the potential for

conserving East Wenatchee aquifer water at the Eastbank Hatchery.

- The Hatchery Committees were informed that the Coordinating Committees approved the Phase III survival standards achieved designation for Chinook at the Rocky Reach Project based on combined juvenile and adult survival.
- The Hatchery Committees provisionally approved providing 2,500 eyed summer Chinook eggs for use in a Chelan River egg-to-fry survival study required by Chelan PUD's settlement agreement.
- The Hatchery Committees discussed an initial draft Hatchery Implementation Plan (Plan) for 2013 recalculated hatchery production levels. The draft Plan was developed by Chelan, Douglas, and Grant PUDs and addressed among other things the Joint Fisheries Parties (JFP) request to optimize spring Chinook hatchery production; it also was designed to be implementable using current and planned PUD hatchery facilities. The JFP said they needed additional time to consider the draft, and were waiting to review results of the 5-Year PUD M&E reports, particularly as they related to Wenatchee spring Chinook. Preliminary analyses of 5-Year M&E data were apparently indicating that productivity was unacceptably low. Andrew Murdoch, Washington Department of Fish and Wildlife (WDFW), and Tracy Hillman, BioAnalysts, are scheduled to give a presentation on the 5-Year M&E results to the Hatchery Committees at their October 19, 2011 meeting. Bryan Nordlund asked if there had been discussion at the Hatchery Committees' meeting on the possible effects of Tumwater Dam (TWD) adult trapping operations on the 5-Year M&E results. Schiewe said that some Hatchery Committees' members did not think the issue had been explored adequately, but because the 5-Year M&E report has not been completed yet, there was still opportunity to conduct further analyses. He said Chelan PUD had asked Hillman to consider the TWD trapping operation effects more closely; if TWD operations were to skew adult survival and delay adult passage, this could have an effect on abundance and productivity values. Schiewe said that if the draft Plan were to maximize spring Chinook hatchery production, then steelhead production levels would be minimized. Schiewe said the PUDs were proposing summer Chinook near the maximum estimated during recalculation, as driven by the Chief Joseph Hatchery agreements. Schiewe said that sockeye production requirements are driven by production under the water management tool and as agreed to in the Skaha Hatchery program. He said that the Plan needs to be approved in time to allow for the completion and approval of the 2012 broodstock collection

plan and final approval of the draft Hatchery and Genetic Management Plans (HGMPs). The next steps for the Hatchery Committees are to firm up hatchery program production levels after the draft 5-Year M&E report is provided to them on October 11, 2011, and discussed at the October 19, 2011, Hatchery Committees' meeting, and then to approve the Plan before the end of 2011.

- The Yakama Nation reported to the Hatchery Committees on their reduced ability to collect coho broodstock with the right bank adult ladder down at Dryden Dam. However, Keely Murdoch said that they should be able meet their coho broodstock production needs by working with WDFW's trapping operation schedule at TWD.
- Greg Mackey gave an update to the Hatchery Committees on the results of co-acclimation of steelhead and spring Chinook at the Twisp Pond in 2011, and provided to them Charlie Snow's short report on the acclimation. The results of co-acclimation were positive, with a majority of the smolts volitionally released and the remainder forced out.
- Bill Gale informed the Hatchery Committees about a planned early release of 70,000 spring Chinook juveniles to make room for steelhead rearing at the Winthrop National Fish Hatchery. He said that the spring Chinook to be released were marked.
- NMFS provided an update on the processing of the Upper Columbia HGMPs. Good progress was being made on the USFWS programs and the tribal coho program; however, not much progress has been made on the PUDs' Wenatchee and Methow programs' HGMPs. Craig Busack reported that there was a lack of agreement between Chelan PUD and WDFW on adult management. He said that NMFS preferred to produce a single Biological Opinion to cover all the Wenatchee programs, but to do that, they would need a single adult management plan.

IV. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are October 25, 2011 (in SeaTac, Washington), November 15, 2011 (in Lacey, Washington), and December 13, 2011 (in SeaTac, Washington).

Mike Schiewe said that he will inform Shaun Seaman, Chelan PUD, of the Coordinating Committees' interest in seeing an agenda for the Director Level meeting as soon as possible.

List of Attachments

Attachment A – List of Attendees

Attachment B – Chelan PUD 2011 RR and RI Final Fish Spill Program Results Report

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller*	Chelan PUD
Tom Kahler*†	Douglas PUD
Jerry Marco*	Colville Confederated Tribes
Jim Craig*	USFWS
Bryan Nordlund*	NMFS

* Denotes Coordinating Committees member or alternate
† Joined by phone

Final
Chelan PUD
2011 Rocky Reach and Rock Island
Fish Spill Program Report

ROCKY REACH

Summer Fish Spill at Rocky Reach
Target species: Subyearling Chinook
Spill target percentage: 9% of day average river flow
Spill start date: June 4, 0001 hrs
Spill stop date: August 12, 2400 hrs
Percent of run with spill: **96.85%** (as of August 31)
Summer spill percentage: **28.50%**
Ave river flow at RR: 221,041 cfs (June 4- Aug 12)
Ave spill flow at RR: 63,007 cfs
Cumulative index count: 17,246 subyearling Chins (final on Aug 31)
Total spill days: 70

ROCK ISLAND

Spring Fish Spill at Rock Island
Target species: Yearling Chinook, steelhead, sockeye
Spill target percentage: 10% of day average river flow
Spill start date: April 17, 0001 hrs
Spill stop date: June 3, 2400 hrs (immediate increase to 20% summer spill)
Percent of run with spill: **Yearling Chins 99.75%; Steelhd 99.82%; Sockeye 99.90%**
Spring spill percentage: **20.77%** (April 17 through June 3)
Ave river flow at RI: 195,400 cfs (April 17- June 3)
Ave spill flow at RI: 40,590 (April 17- June 3)
Cumulative index count: 26,407 Yearling Chins; 28,408 Steelhead; 18,697 sockeye;
Total spill days: 48

Summer Fish Spill at Rock Island
Target species: Subyearling Chinook
Spill target percentage: 20% of day average river flow
Spill start date: June 4, 0001 hrs
Spill stop date: August 24, 2400 hrs
Percent of run with spill: **99.24%** (as of Aug 31)
Summer spill percentage**:** **27.29%** (June 4 through August 24)
Ave river flow at RI: 212,290 cfs (June 4- August 24)
Ave spill flow at RI: 57,920 cfs (June 4- August 24)
Cumulative index count: 27,397 subyearling Chins (final on Aug 31)
Total spill days: 82

Juvenile Index Counts 2003-2011 from the Rocky Reach Juvenile Fish Bypass sampling facility and the Rock Island Bypass Trap, April 1 – August 31.

Table 1. Rocky Reach Juvenile Bypass index counts, 2003-2011

Species	2003	2004	2005	2006	2007	2008	2009	2010	**2011**
Sockeye	71,683	30,935	17,575	239,185	169,937	136,206	40,758	724,394	**67,879**
Steelhead	10,585	6,433	5,821	4,329	4,532	8,721	6,309	4,931	**5,683**
Yrlng Chins	13,918	53,946	27,611	23,461	18,080	38,394	18,946	33,840	**24,400**
Subyrlng Chins	172,392	20,062	10,978	19,996	13,496	11,820	11,944	59,751	**17,246**

Table 2. Rock Island juvenile bypass trap index counts, 2003-2011

Species	2003	2004	2005	2006	2007	2008	2009	2010	**2011**
Sockeye	10,312	7,114	1,991	34,604	16,410	38,965	4,926	37,404	**18,697**
Steelhead	15,507	10,735	15,974	26,930	18,482	22,780	17,636	17,194	**28,408**
Yearling Chins	15,355	12,574	14,797	37,267	23,714	22,562	9,225	11,802	**26,407**
Subyearling Chins	25,916	23,563	18,710	27,106	15,686	15,940	8,189	23,205	**27,397**

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	November 15, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of October 25, 2011 HCP Coordinating Committees' conference call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met by conference call on Tuesday, October 25, 2011, from 9:30 am to 10:30 am. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will provide the draft 2011 Yearling Spring Chinook Survival Study to Carmen Andonaegui no later than November 9, 2011, for distribution to the Coordinating Committees for a 30-day review (Item II-C).
- Mike Schiewe will forward to the Coordinating Committees the draft agenda for the November 15, 2011, Director Level meeting (Item IV-A).

DECISION SUMMARY

- There were no decisions items at today's meeting.

REVIEW ITEMS

- There are no documents under review by the Coordinating Committees at this time.

REPORTS FINALIZED

- There are no reports to finalize at this time.

I. Welcome

Mike Schiewe welcomed Coordinating Committees' members and asked for any additions or changes to the agenda. The following items were added to the agenda:

- Keith Truscott will provide an update on U.S. Representative Doc Hastings' office's contact of Chelan PUD regarding their HCP.
- Tom Kahler notified the Committees that on December 6 (or later that week), the Wells Dam right adult fish ladder was being dewatered for normal annual maintenance during which time the half-duplex (HD) Passive Integrated Transponder (PIT) tag detection array will be installed. The left fish ladder is scheduled to be dewatered for normal maintenance in January 2012.

The Committees reviewed the draft September 27, 2011, meeting minutes. The September 27, 2011, meeting minutes were approved as revised. Carmen Andonaegui will finalize the meeting minutes and distribute them to the Committees.

II. Chelan PUD

A. Agreement with Pioneer Water Users Association (Steve Hemstrom)

Keith Truscott reported that Chelan PUD had reached agreement with the Pioneer Water Users Association (Pioneer). The agreement allows Pioneer access to Chelan PUD lands in the event that they receive all required permits to construct a pump station on the Columbia River. Truscott said that with this agreement in place, Pioneer could begin the Joint Aquatic Resources Permit Application (JARPA) process for their project. Truscott said that the agreement with Pioneer states that Pioneer understands final approval for access to Chelan PUD's lands will require the Federal Energy Regulatory Commission's (FERC's) approval.

Teresa Scott asked how the FERC approval process worked in context of all the other permits required for the project. Truscott said that FERC approval is a final approval required for the project to proceed regardless of the outcome of any other permits approving the project. He said that Chelan PUD will submit an application to FERC in support of Pioneer's request for permission to access Chelan PUD lands and that FERC could then approve or deny the request. He said that in his experience, the JARPA permitting process for the Pioneer project could take up to one year and then an application for approval would need to be submitted to

FERC. Truscott said that the FERC process could take from six months to more than a year, based on past experience, but that it is all dependent on FERC's schedule.

Bryan Nordlund suggested that the Coordinating Committees could draft a letter of support for Pioneer's request to FERC. Truscott said that this could be helpful and that the FERC permitting process will allow time for comments. Scott said that the Columbia River Water Project (CRWP) was providing funding for a portion of the Pioneer project. She said that during the CRWP grant review process, the project was reviewed for its benefit to fish and that the Washington Department of Fish and Wildlife (WDFW) supports the Pioneer project. Scott said that a side-channel restoration feasibility study would be part of Pioneer's project.

B. Update of contact by Doc Hastings office of HCP (Keith Truscott)

Keith Truscott said that Todd Ungerecht from Representative Doc Hastings' office contacted Chelan PUD recently asking for Chelan PUD's experience developing and implementing their Rocky Reach and Rock Island HCPs. Truscott said that they provided positive feedback to Representative Hastings' office. He said that Chelan PUD explained that developing the HCPs was a very long process and that it involved a lot of up-front work, which was very worthwhile, to ensure that the final agreement was workable. Truscott said the inquiry was likely related to Representative Hastings' participation on a U.S. House Subcommittee on Endangered Species Act (ESA) reform in Washington, DC. He said that this inquiry was perhaps part of that process.

C. Draft 2011 Rocky Reach Yearling Spring Chinook Survival Study Report (Steve Hemstrom)

Steve Hemstrom gave an update on the timeline for completion of the draft 2011 Rocky Reach Yearling Spring Chinook Survival Study Report. He said that Dr. John Skalski, Columbia Basin Research, and Tracy Steig, HTI, were very close to completing the draft reports, with Steig preparing the route-specific study report and Skalski preparing the survival study report. Hemstrom said that he anticipated releasing the draft reports no later than November 9, 2011. Mike Schiewe said that in past years, Skalski has been invited to present the survival study results to the Coordinating Committees and asked the Committees' preference for an in-person presentation by Skalski on the 2011 survival study results. Bryan Nordlund and Teresa Scott expressed their preference for the presentation. Schiewe asked the Committees whether they wanted the standard 60-day review period to provide comments on the draft reports or if a 30-day review period would suffice. The Committees agreed to a 30-day review period. When Hemstrom provides the draft survival study to Carmen Andonaegui for distribution to the Committees, the Committees can also consider inviting Skalski to present the results at the next meeting. When Andonaegui distributes the draft survival study to the Committees, she will indicate that the draft study is available for a 30-day review period.

III. Tributary and Hatchery Committees Update (Mike Schiewe)

Mike Schiewe reported that the HCP Tributary Committees did not meet in October 2011, so there is no update.

Teresa Scott informed the Coordinating Committees that Casey Baldwin would be leaving WDFW for a position with the Colville Confederated Tribes (CCT). Baldwin was WDFW's representative, along with Dennis Beich, on the HCP Tributary Committees, and facilitated the Upper Columbia Regional Technical Team (UCRTT). She said that WDFW was uncertain whether or not they would provide a replacement for Baldwin on the Tributary Committees.

Schiewe updated the Coordinating Committees on the following actions and discussions that occurred at the most recent Hatchery Committees' meeting on October 19, 2011, at Chelan PUD's headquarters offices in Wenatchee:

- The Hatchery Committees have been working on two important issues: completing the 5-Year Monitoring and Evaluation (M&E) reports; and developing new hatchery implementation plans for 2013 to 2023. A preview of Chelan PUD's 5-Year M&E analysis was presented by Tracy Hillman, BioAnalysts, and Andrew Murdoch, WDFW. The preview covered the analysis of the Chiwawa spring Chinook supplementation program, and has bearing on Wenatchee program production levels. The analysis indicated that supplementation did not increase abundance of natural recruits, and suggested that high stray rates could be an indication that the current Chiwawa spring Chinook supplementation program was too large. The analysis concluded that the smolt carrying capacity of the Chiwawa River system was approximately 60,000 smolts, which equates to about 1,300 spawners. Douglas PUD expects to present the Methow spring Chinook analysis at the November 16, 2011, Hatchery Committees meeting.

- The Hatchery Committees moved another step forward on implementation of recalculation. The three PUDs have completed a draft Implementation Plan (Plan) that proposes to maximize production levels within the ranges identified in the Sensitivity Analysis. The Joint Fisheries Parties (JFP) said that the draft Plan was a good start and that they were working to formalize some recommended changes, but that the JFP had not yet reached consensus on the recommended changes. The JFP committed to a timeline for submitting their recommendations on the PUD proposal in the draft Plan, saying that if they could not reach consensus, that they would inform the PUDs of that fact within the timeline. The changes being discussed by the JFP include: bringing recalculated production levels for Douglas PUD's Twisp No Net Impact (NNI) steelhead program to previous levels (ca. 50,000 smolts); and a species swap in place of Chelan PUD's Lake Wenatchee sockeye production.
- Todd Pearsons, Grant PUD, requested the opportunity to present Grant PUD's recalculated production levels, which are part of the Implementation Plan. This triggered a heated discussion in the Hatchery Committees regarding Grant PUD's Wenatchee programs, particularly Nason Creek spring Chinook. Pearsons suggested that with the apparent need to decrease Wenatchee spring Chinook supplementation levels, that Nason Creek might be a lower priority for supplementation. At this point, the three PUDs have provided what they believe is a reasonable proposal for implementation of recalculated production. They are open to some adjustments but need a completed Plan in order to move forward with budgets, permitting, and Douglas PUD relicensing. The JFP have agreed to provide their proposal by November 4, 2011, with a conference call scheduled on November 8, 2011 to try to finalize the Plan for a vote at the November 16, 2011 meeting. The PUDs need Statements of Agreement (SOAs) to lock in production levels for individual programs, but have said that if most unresolved issues are related to Grant PUDs programs, Douglas and Chelan PUDs may need to move forward with SOAs for their programs rather than wait for agreement on Grant PUD's program. Schiewe said that if the Plan is not approved, the default production would probably be the maximum production levels identified in the sensitivity analysis; however, this will require further discussion by the Committees.
- The Hatchery Committees approved the use of 2,500 eyed-summer Chinook eggs for

use by Chelan PUD in a Chelan River, Reach 4, egg-to-fry survival study.

- Joe Miller announced that the Chelan PUD commissioners had approved the Okanagan Nation Alliance (ONA) Skaha Sockeye Reintroduction Experiment funding agreement. This agreement funds Chelan PUD's portion of construction and operation of the Penticton, British Columbia, hatchery and the reintroduction of sockeye into Skaha Lake.
- Douglas PUD announced they would provide to the Hatchery Committees the draft Douglas PUD 2012 M&E Plan by the end of October 2011.

IV. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are November 15, 2011 (Lacey, Washington), December 13, 2011 (SeaTac, Washington), and January 24, 2012 (SeaTac, Washington).

Mike Schiewe said that the Director Level meeting will be in the afternoon of November 15, 2011, following the Coordinating Committees' meeting in the morning which would start at 9:30 am. He said it is possible that the December 14, 2011, Committees' meeting could be held as a conference call if the agenda is light, and that this could be discussed later. Chelan PUD has set up a Director Level meeting predominantly as an opportunity to present their HCP successes in anticipation of their required 2013 HCP check-in. Schiewe said that he would be facilitating the Director Level meeting but that it is not a Coordinating Committees' function. Douglas PUD has been offered a brief spot on the agenda. Schiewe said that he would forward to Carmen Andonaegui for distribution to the Committees, the draft agenda which was distributed this morning. He said that Committees' members needed to be aware that after the PUD presentations on the agenda, each HCP party will be asked to identify challenges ahead for their respective organization, of implementing the HCP specifically and recovery in general. He said that this is an opportunity for organizations to say how they will move forward on both of these fronts.

Steve Hemstrom said in terms of integrating HCPs into ESA recovery, National Oceanic and Atmospheric Administration's (NOAA's) COMPASS (Comprehensive Passage Model) modelers have requested that the PUDs provide salmon and steelhead survival data back to 1998. He said he and staff would meet with NOAA staff Thursday, October 27, 2011, to verify the data NOAA intends to use for the model. Hemstrom said he does not have any information on how NOAA plans to use the data but that Chelan PUD wants to make sure they have the correct data for input into the model.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller*	Chelan PUD
Keith Truscott	Chelan PUD
Tom Kahler*	Douglas PUD
Jerry Marco*	Colville Confederated Tribes
Teresa Scott*	WDFW
Jim Craig*	USFWS
Bryan Nordlund*	NMFS

* Denotes Coordinating Committees member or alternate

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

COORDINATING COMMITTEES' MEETING MINUTES MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Coordinating Committees	**Date:**	January 20, 2012
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of November 15, 2011, HCP Coordinating Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Coordinating Committees met at the Lacey Community Center in Lacey, Washington, on Tuesday, November 15, 2011, from 9:30 am to 11:00 am. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Steve Hemstrom will contact Dr. John Skalski regarding his availability to present the Draft 2011 Rocky Reach Yearling Chinook Survival Study results at the Coordinating Committees' December 13, 2011, meeting (Item II-B).
- Tom Kahler will email the 2005-2011 Juvenile Bypass Passage Dates Analysis to Carmen Andonaegui for distribution to the Coordinating Committees (Item III-A).
- Shane Bickford will check with Douglas PUD's Information Technology (IT) department about sharing their document management system with the HCP Coordinating Committees (Item V-A).
- Mike Schiewe will speak with Anchor QEA's IT staff about setting up a SharePoint site for managing HCP documents (Item V-A).

DECISION SUMMARY

- The Rocky Reach Coordinating Committee agreed to start the fishway maintenance outage at Rocky Reach Dam on December 5, 2011, and end no later than February 28, 2011 (Item II-A).
- The Rocky Reach Coordinating Committee agreed to extend the review period for the Draft 2011 Rocky Reach Yearling Chinook Survival Study report until December 16,

2011 (Item II-B).

REVIEW ITEMS

- The Draft 2011 Rocky Reach Yearling Chinook Survival Study report is out for a 30-day review. The review period has been extended to end on December 16, 2011. Comments are due by December 16, 2011.

REPORTS FINALIZED

- There are no reports to finalize at this time.

I. Welcome

Mike Schiewe welcomed Coordinating Committees' members and asked for any additions or changes to the agenda. The following items were added to the agenda:

- Tom Kahler added an update on the status of installation of the Half-Duplex Passive Integrated Transponder (HD PIT) tag detection antennas at Wells Dam.

The Committees reviewed the draft October 25, 2011, meeting minutes, and approved them as revised. Carmen Andonaegui will finalize the meeting minutes and distribute them to the Committees.

II. Chelan PUD

A. 2011/2012 Rocky Reach Fishway Maintenance (Steve Hemstrom)

Steve Hemstrom said that Chelan PUD would like to start the Rocky Reach fish ladder maintenance outage earlier than usual this year, beginning December 5, 2011, and complete maintenance by the usual end date of not later than February 28, 2012. He said that Chelan PUD is requesting an additional outage of 25 days to make sure there is time to install all the planned lamprey fish ladder improvements, along with completing normal annual maintenance. Hemstrom said that there is also an outage of Unit 4 that will require maintenance time. Bryan Nordlund asked about recent steelhead passage counts. Hemstrom said that, as of yesterday (November 14, 2011), steelhead counts were 5, which is typical of this time of year. He said he looked at fish passage from this same time in 2010, and that this year's counts are similar. Hemstrom said that there are still 3 weeks to go before shutting down the ladder for maintenance and that fish counts are expected to continue to drop during this time. The Coordinating Committees agreed to the extended fishway outage period for 2011-2012 requested by Chelan PUD.

B. Draft 2011 Rocky Reach Yearling Chinook Survival Study (Steve Hemstrom)

Steve Hemstrom said that the Draft 2011 Rocky Reach Yearling Chinook Survival Study was distributed by email on November 9, 2011. He said that originally, the intent was to evaluate juvenile survival without spill; however, high flows required involuntary spill during the study period. River flow averaged 143,000 cubic feet per second (cfs) during the first 10 survival study releases and 266,000 cfs during the last 5 releases, during which time the involuntary spill occurred and 17 fish passed via spill. These 17 spilled fish equaled 0.49 percent of total fish detected. The estimated project survival calculated using only the first 10 releases was 91.61 percent. The estimated project survival calculated using only the last 5 releases (and including the spilled fish) was 95.60 percent. Removing the spilled fish from the survival estimate for the last releases yielded an estimate of 94.74 percent.

Mike Schiewe asked the Coordinating Committees about scheduling a presentation on the study results by Dr. John Skalski, Columbia Basin Research, who is the report author. The Committees indicated their preference to have Dr. Skalski present the results at the December 13, 2011, meeting. Hemstrom said that he would confirm Dr. Skalski's availability for that date. Schiewe asked the Committees about extending the review period, originally scheduled for December 9, 2011, until after Dr. Skalski's presentation. The Committees agreed to extend the study report review period until December 16, 2011, to allow for the presentation by Dr. Skalski.

C. Rocky Reach Pool Raise Feasibility Study (Steve Hemstrom)

Steve Hemstrom said that Chelan PUD has been pursuing possible sources of additional water for the Washington State Department of Ecology (Ecology) through implementing a pool raise at the Rocky Reach Project. After evaluating uncertainties and the economics of pursuing the pool raise, Hemstrom said that the PUD has indefinitely postponed the investigation and this message has been transmitted to Ecology.

D. Update on Meeting with Compass Modelers (Steve Hemstrom)

Steve Hemstrom said that Chelan PUD met with the Compass modelers to review spill efficiencies and passage route survival data for use in their model. Hemstrom said that the Compass model was being used to evaluate fish impacts of hydroelectric project operations being considered as part of the Columbia River Treaty negotiations.

III. Douglas PUD

A. Wells Dam 2011 Bypass Operations Summary (Tom Kahler)

Tom Kahler said that he had received no questions on the Wells Dam 2011 juvenile bypass operations summary (Attachment B), which was distributed to the Hatchery Committees by Carmen Andonaegui on November 1, 2011. He reviewed an analysis (Attachment C) conducted on the 2011 spring and summer migration season to evaluate whether Douglas PUD would have met the HCP standard for passing at least 95 percent of summer and spring migrants with the agreed upon new spill start and stop dates of April 9 and August 26, respectively.

For yearling Chinook, bypass passage provided for 99.15 percent of the run with an April 12 start date (see Table 3 of Attachment C). The analysis showed that, had bypass spill started as late as April 15, 2011, 95 percent of the spring run would have passed during bypass operations. Spill could have been terminated as early as July 25, 2011, and still provided bypass for 95 percent of the sub-yearling run in 2011. In 2011, it appeared that sub-yearlings migrated over a shorter than typical time period, likely pushed out early by the high 2011 spring flows. Kahler said that the updated analysis of bypass operation, including the 2011 migration data, confirmed that the decision by the Committees to modify fish bypass operation dates was justified. Kahler said he will email the 2005-2011 Juvenile Bypass Passage Dates analysis to Andonaegui for distribution.

B. HD PIT Detection Installation Update (Tom Kahler)

Tom Kahler said that the normal fish ladder maintenance outage is scheduled for the week of December 5, 2011, with December 6, 2011, scheduled for fish salvage. He said that installation of the HD PIT-tag detection system will be accomplished during the outage. Kahler reported that in the process of advertising for the HD PIT-tag detection installation work, Douglas PUD learned that BioMark could install a new reader (a model 2020 receiver) that detects both HD PIT tags and full PIT tags. Using a 2020 receiver would extend existing PIT tag detection capabilities to HD and expand full-duplex (FD) detection capabilities to five detection sites per ladder. The installation at the fishway entrance, in particular, will be the biggest HD PIT-tag detection array system designed and installed at a hydroelectric project on the Columbia River. Compared to the current receivers (model 1001 receivers), which detect only FD PIT tags, the 2020 receiver can detect both FD and HD, but when set to do so, alternates between reading HD and full PIT tags. When cycling between tag detection types the result is slower detection frequency for FD PIT tags compared to non-cycling receivers, but Kahler said the system can be set to FD PIT-tag detection outside of the lamprey passage season. Only the new PIT-tag detection sites will be set up with the 2020 receivers; existing sites will keep FD PIT-tag detectors to not compromise HCP Plan Species detections. Kahler said that after installation, the new detection system will be tested to determine detection efficiency for comparison to detection efficiencies of the 1001 receivers.

IV. Tributary and Hatchery Committees Update (Tom Kahler)

Tom Kahler reported that the HCP Tributary Committees met on November 10, 2011, and discussed the following items:

- Chelan County Natural Resources Department (CCNRD) gave two presentations to the Tributary Committees on projects CCNRD is working to develop on upper Nason Creek. Kahler said there is currently a lot of emphasis on restoring Nason Creek. One potential project being pursued involves a levy that disconnects a wetland from the main channel. Complications include needing to protect a Chelan PUD transmission line that cuts through the project area. CCNRD has been working with Chelan PUD to come up with project alternatives that would accommodate the transmission line but allow for reconnection of the wetland. HDR, Inc., is doing the alternatives analysis.
- The second presentation was on CCNRD's efforts to reconnect channel meanders disconnected from Nason Creek by the Burlington Northern (BN) railroad. Kahler said that the Yakama Nation is developing a project to connect a meander in the same vicinity, which is being referred to as the Lower Nason Creek Connection; the Upper

Nason Creek Connection is the project CCNRD is working on. To agree to implement changes to the BN railroad, BN is requesting that mitigation costs be paid up-front, which would include bridge maintenance expenses and the cost of building a second bridge to accommodate a future second rail line. The BN mitigation request would cost almost as much as the cost of the habitat improvement project. The Bonneville Power Administration (BPA) and the Priest Rapids Coordinating Committee (PRCC) Habitat Subcommittee (HSC) participated in the discussion by phone. Negotiations continue.

Mike Schiewe reported that the Hatchery Committees will not meet this month until November 17, 2011, having shifted meeting dates with the PRCC Hatchery Subcommittee. He said that the change in dates would allow the PRCC Hatchery Subcommittee to try to make some progress on Grant PUD-related Recalculation Implementation Plan (RIP) issues that the Joint Fisheries Parties (JFP) see as having bearing on Chelan PUD and Douglas PUD recalculation issues. Schiewe said that the JFP are hoping to get an agreement-in-principal on all three PUD RIPs concurrently, but still recognize that the three PUD HCPs (Wells, Rocky Reach, and Rock Island) have independent contracts, and Grant PUD does not have an HCP but operates according to a Settlement Agreement. Schiewe reported that most recently, the three PUDs produced a draft RIP that proposed the highest recalculated hatchery production levels generated in the Sensitivity Analysis. Subsequently, the JFP provided a counter-proposal, for which there are outstanding issues which the Committees are still discussing. He said that Chelan PUD is prepared to accept the JFP proposal but that there are significant issues to resolve on Grant PUD's RIP Wenatchee River programs. Schiewe said that it was a major accomplishment for the JFP to come up with a consensus document that represented compromises within the JFP, but that he does not want the HCP process held up by issues between Grant PUD and the JFP.

V. HCP Administration (Mike Schiewe)

A. Next Meetings

The next scheduled Coordinating Committees' meetings are December 13, 2011, January 24, 2012, and February 28, 2011, all in SeaTac, Washington.

Steve Hemstrom briefed the Committees about a phone call with Dave Benner, Fish Passage Center (FPC). He said Benner contacted him recently asking for all spill plans for the Rocky

Reach and Rock Island projects for the last 4 years, and for the 2012 spill plan. Hemstrom said that Benner told him the FPC was interested in learning more about the HCP process and about how the upper Columbia River PUD projects are managing spill.

Bryan Nordlund asked about potential organizational improvements to the HCP ftp website. Shane Bickford said that Douglas PUD developed a document management tool during relicensing and that the Committees may want to look into using document management software instead of, or in addition to, the ftp site. Mike Schiewe asked Bickford if Douglas PUD would be willing to share their document management system with all three HCP committees. Bickford said that he would speak to Douglas PUD's IT department about the possibility. Schiewe said that if Douglas PUD's document management system turns out not to be available, the Committees could evaluate other options. Schiewe said that he would speak with Anchor QEA's IT staff to see about using SharePoint, which is the document management system used by Anchor QEA. Hemstrom said the Chelan PUD also is using SharePoint.

List of Attachments

Attachment A – List of Attendees
Attachment B – Wells Dam 2011 Bypass Operations Summary
Attachment C – 2005-2011 Juvenile Bypass Passage Dates Analysis

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Steve Hemstrom *	Chelan PUD
Lance Keller*	Chelan PUD
Shaun Seaman	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford*	Douglas PUD
Jerry Marco*	Colville Confederated Tribes
Teresa Scott*	WDFW
Jim Craig*	USFWS
Bryan Nordlund*	NMFS

* Denotes Coordinating Committees member or alternate

Attachment B

Commissioners:
T. JAMES DAVIS
LYNN M. HEMINGER
RONALD E. SKAGEN

General Manager:
WILLIAM C. DOBBINS

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Memorandum

TO: **Wells HCP Coordinating Committee**
FROM: **Tom Kahler, Douglas PUD**
DATE: **November 1, 2011**
SUBJECT: **Summary of 2011 Bypass Operations at Wells Dam**

The 2011 spring smolt outmigration at Wells Dam consisted primarily of the progeny of stream-type salmonids that spawned in the natural environment during brood years 2008, 2009, and 2010 (steelhead) and 2009 (spring Chinook, coho, and sockeye salmon). Steelhead escapement over Wells Dam was 7,500 in 2007, 9,808 in 2008, and 25,422 in 2009 (corresponding with *brood years* 2008, 2009, and 2010, respectively). For brood year 2009, 8,174 spring Chinook, 2,989 coho, and 134,937 sockeye passed Wells Dam.

Hatchery releases above Wells Dam in 2011 included yearling spring Chinook releases from the Chewuch, Twisp, and Methow Acclimation Ponds; from the Winthrop National Fish Hatchery (WNFH); and from the Okanogan spring Chinook reintroduction program. Coho were released from the WNFH, and summer Chinook yearlings were released from the Carlton (Methow Basin), Similkameen and Bonaparte (Okanogan Basin) acclimation ponds. Hatchery steelhead were also released above Wells Dam from programs at Wells, Winthrop, and Cassimer Bar hatcheries.

The sub-yearling summer Chinook outmigration over Wells Dam in 2011 consisted entirely of naturally produced ocean-type summer/fall Chinook spawned during brood year 2010. Escapement of summer/fall Chinook over Wells Dam in 2010 was 33,206 fish.

We initiated and terminated Wells bypass operations in 2011 as guided by the Wells HCP Coordinating Committee in accordance with the *2011 Bypass Operating Plan* contained within Section 4.3 of the Wells HCP Agreement. The initiation and termination dates for the bypass system in 2011 were based upon 21 years of hydroacoustic data and 14 years of species composition data on run patterns of juvenile hatchery and wild salmonids at Wells Dam. Based upon analysis of the run-timing information at Wells Dam, the HCP Coordinating Committee agreed to initiate the Wells bypass system on April 12th. The analysis indicated that on average initiating the bypass system on April 12th would provide a non-turbine passage alternative for 95.5% of the spring emigrants. Similarly, running the bypass system through August 26th would, on average, provide non-turbine passage for 95% of the summer emigrants. We operated the bypass system continuously during the transition period between the spring and summer juvenile fish migrations. For accounting purposes, the end of the 2011 spring bypass season was June 13th at 2400 hours and the beginning of the summer bypass season was June 14th at 0000 hours.

Flows at Wells Dam during the 2010 juvenile plan species migration (April – August) were at 122 percent of the twenty-year average, and the third highest during that period (behind 1996 and 1997). We initiated the spring bypass season on April 12th at 0000 hours, and operated the bypass continuously through June 13th at 2400 hours for a total of 63 days. Spring bypass operations utilized a total volume of 18.83 million acre-feet (MAF), or 5.0 percent of total project discharge volume.

We initiated summer bypass operations on June 14th at 0000 hours and continued until August 26th at 2400 hours, for a total of 74 days. Summer bypass operations utilized 25.86 MAF, or 5.1 percent of the total discharge volume.

The *2011 Bypass Operating Plan* included measures for complying with Federal Energy Regulatory Commission (FERC) requirements for maintaining minimum automatic-gate-opening capacity and Washington Department of Ecology (WDOE) requirements for compliance with total dissolved gas (TDG) standards. Compliance with the requirements of both FERC and WDOE was achieved by systematic removal of bypass barriers under increasing discharge as described in the *2011 Bypass Operating Plan*. The strategy for compliance with the WDOE TDG standards included the concentration of spill through the center of Wells Dam and spilling over the discharge from active turbine units, and this strategy also sufficed for compliance with the FERC gate-capacity standard.

Exceptionally high flows began in mid May and persisted into August. To meet the WDOE and FERC requirements, Douglas PUD removed bypass barriers on Spill Bay 6 on May 16, and, with increasing flows, removed bypass barriers from Spill Bays 4 and 8 on May 20, and finally Spill Bay 2 on June 1, near the peak of the hydrograph. As flows declined, reinstallation of barriers occurred in the reverse order of their removal, to maintain the bulk of the spill in the center of the project. Thus, barriers were reinstalled in Spill Bays 2, 4, 8, and 6 on July 5, 18, 29, and August 4, respectively.

Based on analysis conducted by Dr. John Skalski and Richard Townsend of Columbia Basin Research, Douglas PUD provided bypass passage for 99.2 percent of the yearling Chinook, 98.1 percent of the steelhead, 100 percent of the sockeye, and 99.6 percent of the sub-yearling Chinook passing Wells Dam in 2011.

Analysis of Percent of Outmigration Affected by Bypass Operations at Wells Dam, 2005-2011

Prepared for:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802 - 4497

Prepared by:

John R. Skalski
Richard L. Townsend

Columbia Basin Research
School of Aquatic and Fishery Sciences
University of Washington
1325 Fourth Avenue, Suite 1820
Seattle, Washington 98101-2509

27 October 2011

Outmigration has been monitored at the juvenile sampling facility at Rocky Reach Dam for four stocks of salmonids (yearling and subyearling Chinook, steelhead, and sockeye) from 2005 onward. The percent of each stock covered by the bypass operations at Wells Dam can be estimated using the historical daily counts at Rocky Reach, and adding the travel time from Wells to Rocky Reach Dam. Table 1 has the average travel times, based on recent acoustic-tag studies, for yearling Chinook, steelhead and sockeye. Due to a dearth of PIT-tag and acoustic-tag studies performed with subyearling Chinook, travel time was assumed to be 2 days.

Table 1: Average travel times from Wells tailrace to Rocky Reach Dam.

Stock	Travel time
Yearling Chinook	5 days
Subyearling Chinook	2 days
Steelhead	2 days
Sockeye	2 days

Plots of the historical cumulative percent of the outmigration for spring migrants (yearling Chinook, steelhead, and sockeye—Figure 1), and the subyearling Chinook in the summer (Figure 2) had fairly consistent start and end dates at Rocky Reach. Bypass operations for the spring outmigration at Wells is from 12:00 am 12 April – 11:59:59 pm 13 June of each year, and from 12:00 am 14 June – 11:59:59 pm 26 August for the summer. Table 2 has the estimated percent of the annual outmigration covered by the spring, summer, and total bypass operations. Steelhead, sockeye, and subyearling Chinook are estimated to have greater than 98% of their annual outmigration pass through Wells Dam during one or both of the two periods covered by bypass operations for the most recent seven years of record. For yearling Chinook, being the earliest arriving stock, percent coverage ranged from 94.49% to 99.33%. To assess the 12 April annual start date for spring bypass operations, Table 3 has the date that, with hindsight, the spring bypass operations should have started to achieve 95% coverage of the yearling Chinook outmigration for that year. These dates ranged from 9 April to 3 May. For the two years when yearling Chinook coverage was less than 95%, bypass starting dates should have been 9 and 11 April, respectively, instead of 12 April.

Similarly, Table 4 compares the August 26 date of bypass termination with the date on which bypass operations covered 95% of the subyearling Chinook outmigration. In each year, an earlier termination of bypass operations would have been possible without jeopardizing the achievement of the HCP standard of providing a bypass route for ≥ 95% of outmigrating subyearling Chinook. During the seven years analyzed, the 95% HCP standard was achieved 4 to 32 days prior to 26 August.

Table 2. Total percent of each stock's migration affected by bypass operations (spring, summer) at Wells Dam, based on travel times from Wells to Rocky Reach Dam, the cumulative percent of the annual migration of each stock at Rocky Reach, and the start and stop dates of Wells bypass operations.

	Annual migration percent						
Spring Outmigration Species	2005	2006	2007	2008	2009	2010	2011
Yearling Chinook							
Percent passed prior to spring Bypass Ops period	0.0528	0.0259	0.0551	0.0025	0.0116	0.0067	0.0085
Percent during spring Bypass Ops period	0.9455	0.9559	0.9154	0.9972	0.9827	0.9917	0.9910
Percent during summer Bypass Ops period	0.0017	0.0.182	0.0296	0.0002	0.0056	0.0016	0.0005
Percent passed after Bypass Ops period	0	0	0	0	0	0	0
Total Covered by Bypass ops	**0.9472**	**0.9741**	**0.9449**	**0.9975**	**0.9884**	**0.9933**	**0.9915**
Steelhead							
Percent passed prior to spring Bypass Ops period	0.0015	0.0101	0.0066	0.0009	0.0019	0.0045	0.0190
Percent during spring Bypass Ops period	0.9903	0.9762	0.9887	0.9901	0.9965	0.9763	0.9513
Percent during summer Bypass Ops period	0.0081	0.0137	0.0042	0.0089	0.0016	0.0188	0.0297
Percent passed after Bypass Ops period	0	0	0.0004	0.0001	0	0.0004	0
Total Covered by Bypass ops	**0.9985**	**0.9899**	**0.9930**	**0.9990**	**0.9981**	**0.9951**	**0.9810**
Sockeye							
Percent passed prior to spring Bypass Ops period	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
Percent during spring Bypass Ops period	0.9983	0.9984	0.9998	0.9972	0.9957	0.9992	0.9923
Percent during summer Bypass Ops period	0.0017	0.0016	0.0001	0.0028	0.0043	0.0008	0.0077
Percent passed after Bypass Ops period	0	0	0	0	0	0	0
Total Covered by Bypass ops	**1.0000**	**1.0000**	**0.9999**	**1.0000**	**1.0000**	**1.0000**	**1.0000**
Summer Outmigration Species							
Subyearling Chinook							
Percent passed prior to spring Bypass Ops period	0	0	0	0	0	0	0
Percent during spring Bypass Ops period	0.1937	0.1894	0.2136	0.1266	0.1029	0.5212	0.5628
Percent during summer Bypass Ops period	0.8022	0.8077	0.7847	0.8620	0.8882	0.4723	0.4331
Percent passed after Bypass Ops period	0.0041	0.0029	0.0017	0.0113	0.0089	0.0064	0.0041
Total Covered by Bypass ops	**0.9959**	**0.9971**	**0.9983**	**0.9887**	**0.9911**	**0.9936**	**0.9959**

Table 3. Comparison of the historical start date for spring bypass operations at Wells Dam each year, versus the start date necessary to have covered at least 95% of the yearling Chinook outmigration that year. Operations are assumed to begin at 12:00 AM for the date listed.

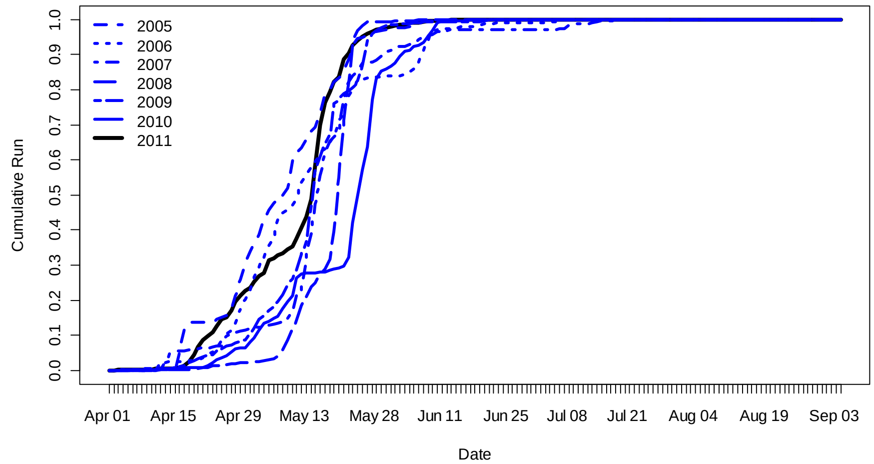
Migration Year	Historical Date	Cumulative proportion passed before 12:00 AM	Proportion Covered by Bypass Ops	Date by which the first 5% passed	Cumulative proportion passed before 12:00 AM	Bypass Ops would have Covered this Proportion	# Days before or after April 12 to get 95%
2005	April 12	0.0528	0.9472	April 11	0.0039	0.9961	1 before
2006	April 12	0.0259	0.9741	April 18	0.0468	0.9532	6 after
2007	April 12	0.0551	0.9449	April 9	0.0243	0.9757	3 before
2008	April 12	0.0025	0.9975	May 3	0.0406	0.9594	21 after
2009	April 12	0.0116	0.9884	April 19	0.0436	0.9564	7 after
2010	April 12	0.0067	0.9933	April 22	0.0410	0.9590	10 after
2011	April 12	0.0085	0.9915	April 15	0.0446	0.9554	3 after

Table 4. Comparison of the historical stop date for summer bypass operations at Wells Dam each year, versus the stop date necessary to have covered at least 95% of the subyearling Chinook outmigration that year. Operations are assumed to end at 11:59:59 PM for the date listed.

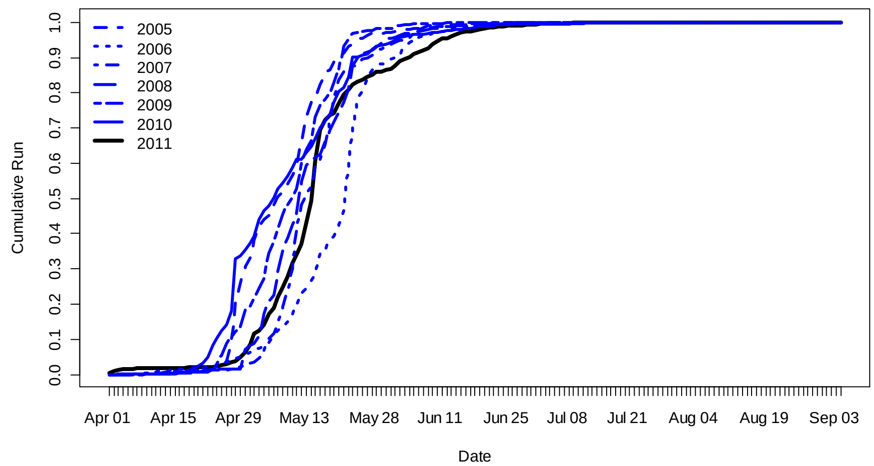
Migration Year	Historical Stop Date	Cumulative proportion passed by 11:59:59 PM	Date on or before the last 5% passed	Cumulative proportion passed by 11:59:59 PM (Bypass Ops would have Covered this Proportion)	# Days before August 26 to get 95%
2005	August 26	0.9959	August 3	0.9525	23
2006	August 26	0.9971	August 2	0.9524	24
2007	August 26	0.9983	August 11	0.9538	15
2008	August 26	0.9887	August 19	0.9502	7
2009	August 26	0.9911	August 22	0.9709	4
2010	August 26	0.9936	August 10	0.9537	16
2011	August 26	0.9959	July 25	0.9528	32

Figure 1. Passage dates at Rocky Reach Dam for spring migrating stocks, 2005-2011. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008).

a. Yearling Chinook



b. Steelhead



c. Sockeye

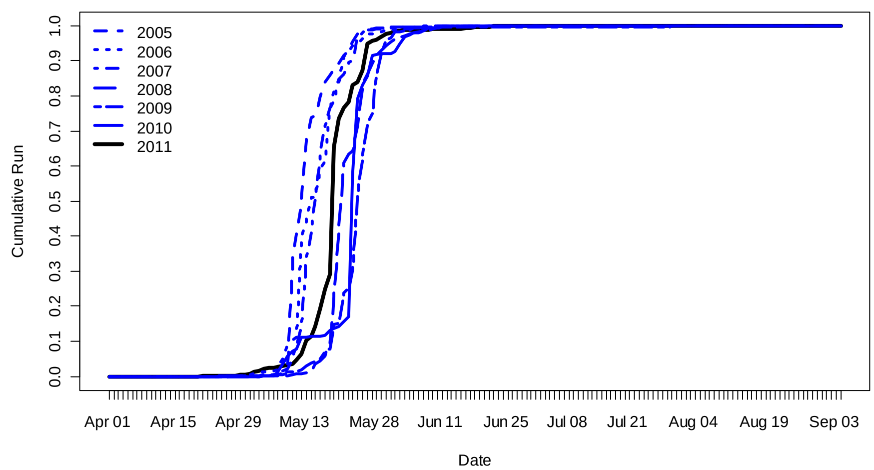
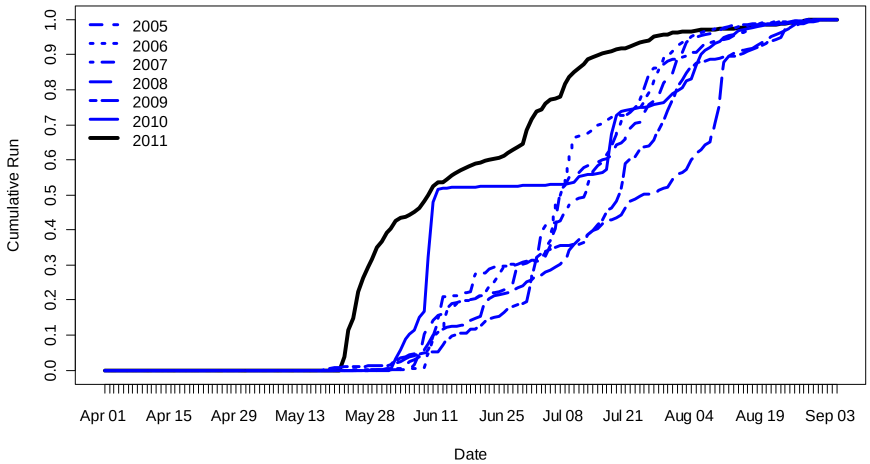


Figure 2. Passage dates at Rocky Reach Dam for summer migrating subyearlings, 2005-2011. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008).

d. Subyearling Chinook



APPENDIX B
HABITAT CONSERVATION PLAN HATCHERY COMMITTEES 2011 MEETING MINUTES AND CONFERENCE CALL MINUTES

1423 Third Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCP Hatchery Committees	**Date:**	February 17, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of January 19, 2011 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, January 19, 2011, from 9:30 am to 3:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Craig Busack will provide Mike Schiewe an email or letter confirming Busack as National Oceanic and Atmospheric Administration's (NOAA's) new Hatchery Committees designee, with Rob Jones as the alternate (Item I).
- When received, Bill Gale will provide Carmen Andonaegui with NOAA's comments to the U.S. Fish and Wildlife Service (USFWS) on the USFWS's draft Winthrop National Fish Hatchery (NFH) steelhead Hatchery Genetic Management Plan (HGMP), for distribution to the Hatchery Committees (Action Item from the December meeting).
- Greg Mackey will send Carmen Andonaegui the revised Wells Steelhead HGMP Key Points one-page document for distribution to the Hatchery Committees (Item II-A).
- Carmen Andonaegui will send out the revised draft Wells Steelhead HGMP to the Hatchery Committees for review (Item II-A).
- Comments on the draft Wells Steelhead HGMP are due to Douglas PUD by February 9, 2011, with copies to Carmen Andonaegui for distribution to the Hatchery Committees (Item II-A).
- Following approval by the Coordinating Committees, Douglas PUD will finalize the Wells 2011 Action Plan and email it to Carmen Andonaegui for distribution to the Hatchery Committees (Item II-D).
- Carmen Andonaegui will distribute Josh Murauskas' sockeye PowerPoint presentation to the Hatchery Committees (Item III-A).

- Josh Murauskas will provide a report on the Sockeye Enumeration Study to the Hatchery Committees in March 2011 (Item III-A).
- Mike Tonseth agreed that Washington Department of Fish and Wildlife (WDFW) will take the lead on producing an operating plan for handling adults at the Tumwater Facility (Item III-B).
- Comments on the Chelan PUD Rocky Reach and Rock Island 2011 Action Plan are due next week to Chelan PUD with a copy to Mike Schiewe and Carmen Andonaegui for distribution to Hatchery Committees (Item III-D).

DECISION SUMMARY

- There were no decision items at today's meeting.

REVIEW ITEMS

- Draft 2009 Douglas PUD Monitoring and Evaluation (M&E) Report: 60-day review period with comments due February 7, 2011.
- Draft Well Steelhead HGMP: Comments due February 9, 2011.
- Chelan 2011 Rocky Reach and Rock Island Hatchery Action Plan: Comments due January 28, 2011.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

The Hatchery Committees reviewed the agenda, the December 7 conference call minutes, and the December 15 meeting minutes. Chelan PUD deleted two items from the agenda: the update on Ringold and an update of Federal Energy Regulatory Commission (FERC) reports. Mike Tonseth added a briefing to the Hatchery Committees on the circulars tanks at the Chiwawa Facility. He reported that the Wenatchee River intakes were taken off line due to flooding of the pump sites and the circular tanks have been switched to Chiwawa River water. The water source will be switched back to the Wenatchee River water as soon as high waters recede. The Hatchery Committees approved the December 7 conference call minutes and the December 15 meeting minutes, as revised.

Craig Busack reported that he will be the new NOAA Hatchery Committee designee, and will participate in meetings mostly by phone. Schiewe asked Busack to arrange for a letter from Rob Jones confirming the change of designee.

No comments were received on the Draft Wells 2011 M&E Implementation Plan. Comments were due December 10, 2010. The plan was finalized and emailed to Carmen Andonaegui for posting on the ftp site.

II. Douglas PUD

A. Wells Steelhead HGMP draft for HC (Greg Mackey)

Greg Mackey distributed a revised Wells Steelhead HGMP one-page handout outlining key points based on the December 7 Hatchery Committees conference call discussion. Mackey also revised the draft Wells Steelhead HGMP consistent with discussions during the December 7 conference call. He emailed the draft HGMP to Carmen Andonaegui for distribution to the Committees.

Mackey presented the key points of the revised HGMP as outlined in the one-page handout, noting the changes. He explained that there are three components to the program: the Twisp River, the Lower Methow, and the mainstem Columbia River. The revised draft HGMP has one acclimation/release site identified for each component, each with the ability to perform adult management.

Smolt Releases: The Committees discussed releasing 100,000 steelhead smolts at the Methow Hatchery as a safey-net program, and the potential impact on natural spawners. Bill Gale stated that he was concerned about the release of safety-net steelhead juveniles from the Methow Hatchery which is in close proximity to natural spawning grounds. He said he was also concerned about the release in proximity to the Winthorp National Fish Hatchery. Craig Busack shared Gale's concern. Mike Tonseth suggested that the release site could be moved lower in the river if straying to the upper Methow Basin becomes a problem. Mackey explained that by acclimating and releasing fish at the Methow Acclimation Pond, the rates of straying throughout the Methow Basin are expected to be lower than if the fish are planted in the lower river. Tom Scribner asked about production and release of Wells steelhead in 2013 and beyond if Winthrop NFH production does not increase. Mackey responded that the Wells steelhead production numbers for 2013 and beyond are not tied to Winthrop NFH production. With regard to smolt release strategy, he said fish transferred to the Methow Acclimation Pond would be pre-smolts, and would be volitionally released beginning the first week of May. Mackey acknowledged that a plan for how to manage non-migrants will need to be developed. Mike Tonseth suggested that non-migrants could be planted in ponds or lakes in the region.

Broodstock Collection: Mackey stated that the Lower Methow safety-net component had previously been proposed as a hatchery-by-hatchery (HxH) cross. The Lower Methow releases have been changed to hatchery-by-wild (HxW) cross and broodstock will be collected in the Methow Basin. Mackey said up to half of the hatchery-origin broodstock could be collected at the Twisp Weir from surplus hatchery returns, with the rest collected at the Methow Hatchery outfall trap. Douglas PUD may conduct elemental scale analysis to explore the potential for collecting Methow natural-origin fish for broodstock at Wells Dam. Bill Gale asked about the reasoning behind collecting wild adults for a safety-net program when theWinthop NFH program will also need to collect wild fish from the Methow Basin. Busack stated that only a minimum number of Natural Origin Recruits (NORs) are needed for a safety-net program; just enough to keep the stock from drifting genetically from the Winthrop NFH program. Mackey asked for an estimate of the rate at which the safety-net program should incorporate wild fish into the broodstock. Tonseth said collecting natural-origin broodstock for the Winthrop NFH program should be a priority given its conservation status. Safety-net programs, such as the Lower Methow steelhead program, should use surplus returns from the Twisp and Winthrop NFH programs. Mackey will incorporate the recommended change to a HXH program for the Lower Methow component [pending formal comments from the Hatchery Committee] in the revised draft HGMP.

Mackey stated that the mainstem Columbia River component is a safety-net program mainly for the Methow Basin and that, therefore, surplus hatchery-origin fish returning to the Methow Hatchery will be used as broodstock for this program in conjunction with hatchery-origin fish returning to the Wells Hatchery.

Truscott explained that it is difficult to develop a reliable broodstock collection plan for the Grant PUD mitigation program in the Okanogan subbasin given the nature of steelhead returns to the Okanogan River. He said the current Cassimer Bar permit allows up to 16 adults to be collected for broodstock in the Okanogan Basin.

Adult Management: Mackey explained the key points of the adult management strategy for each program component. There were no questions.

The Committees agreed that comments on the current draft HGMP are due by February 9 to Douglas PUD. Revisions will be considered at the February 16 Hatchery Committees meeting, with a vote for approval either by subsequent conference call or at the March meeting.

B. Douglas PUD NNI Re-Calculation Proposal (Greg Mackey)

Greg Mackey reported that Douglas PUD has prepared a proposal for population dynamics recalculation of NNI production for released following 2013. The proposal was sent to Carmen Andonaegui for distribution to the Hatchery Committees for discussion at the next meeting in February.

C. Wells HCP Hatchery Compliance Report (Greg Mackey)

Greg Mackey said Douglas PUD is not seeking approval of the Wells HCP Hatchery Compliance Report at today's Hatchery Committees meeting. He explained that the Compliance Report is redundant because the same production information will be documented in the HCP annual report.

D. Wells HCP 2011 Action Plan (Tom Kahler)

Tom Kahler said Douglas PUD was seeking approval for the Wells HCP 2011 Action Plan, which was distributed at the last Hatchery Committees' meeting. He said the Tributary Committees approved sections relevant to their committees at their last meeting and the Coordinating Committees will be asked to approve the Action Plan at their meeting next week. No comments were received from Hatchery Committees' members. Assuming the Coordinating Committees approves the Action Plan, Douglas will finalize and email it to Carmen Andonaegui for distribution to the Hatchery Committees.

III. Chelan PUD PUD

A. Discussion: 2010 PIT Tag-based Wenatchee River Basin Sockeye Escapement Results (Josh Murauskas)

Josh Murauskas presented preliminary results of the 2009/2010 Wenatchee Basin sockeye escapement study (Attachment B). The purpose of the study was to obtain more accurate escapement estimates based on detections of passive integrated transponder (PIT)-tagged adults by in-river arrays (as opposed to estimates based on visual observations). Returning adult sockeye were PIT-tagged at Bonneville Dam (by Columbia River Inter-Tribal Fish Commission [CRITFC] staff) and at Tumwater Dam. Detection arrays are located in the Little Wenatchee River, White River, Nason Creek, Chiwawa River, and at Tumwater Dam. A second array was installed in the White River in 2010 just downstream from the original White River PIT-tag detection array to provide for estimation of detection efficiency and provide directionality.

Preliminary results indicated that most sockeye tagged at Tumwater Dam return to the White River, where detection efficiency was over 90 percent. Bill Gale asked how undetected fish were accounted for in the analysis. Murauskas said that based on common methodologies described in the literature, 10 percent was used as an estimate of non-detections. Murauskas presented the escapement estimates, alongside recreational harvest (assuming that marked fish were all released), for the Little Wenatchee River, the White River, and combined, for 2009 and 2010, and as a proportion of the Tumwater Dam count.

Murauskas concluded that the second White River PIT-tag array proved very beneficial in improving detection efficiency, and that there was a substantial under-estimation of escapement using traditional spawner survey methods. He noted the difficulties in counting adults during spawning ground surveys in the White River with the low visibility that is compounded by high escapement in some years. Tom Scribner asked Murauskas what changes to estimating escapement are recommended based on the 2009 and 2010 study. Murauskas said Chelan PUD planned to continue the PIT-tagging program, and had asked John Skalski to evaluate existing data to determine the optimal number of fish needed to achieve a level of statistical confidence. Murauskas said a draft report will be available by the March Committees meeting. He suggested that with the continuation of this program, Chelan PUD may eliminate spawning ground surveys of sockeye salmon since escapement based on PIT-tag data is more accurate. The Hatchery Committees discussed the continued value of spawner surveys as a means of documenting spawner distribution. Murauskas stated that Chelan would continue spawner distribution through carcass surveys, but ask that the inaccurate portions of survey efforts be eliminated.

B. Update: Tumwater Facility Activities (Josh Murauskas)

Josh Murauskas reported that he coordinated with Travis Maitlin (WDFW) and Cory Kamphaus (Yakama Nation) on Tumwater Facility improvements, and that the revised list had been distributed to the Hatchery Committees (Attachment C). Murauskas said the three remaining improvements are the anesthetics tank, the holding tank, and the hopper modifications. Bill Gale asked that Chelan PUD coordinate with the Leavenworth NFH hatchery manager regarding how fish to handle surplus fish. Tom Scribner suggested that an annual operating plan for the Tumwater Facility would be useful. Mike Tonseth agreed, and said that because WDFW was the primary operator, WDFW would take the lead. The Hatchery Committees agreed to have an update on operation of the Tumwater facility in 2011 at the next meeting.

C. Discussion: Summary of Rocky Reach and Rock Island Survival Results (Josh Murauskas)

Josh Murauskas reported that survival estimates for all plan species at Rock Island Dam have been approved by the Coordinating Committees, and estimates for all plan species at Rocky Reach Dam had been approved with the exception of the yearling Chinook; yearling Chinook survival is still being tested. He asked the Hatchery Committees to keep in mind how the survival estimates will be used in calculating No Net Impact (NNI)-based hatchery production numbers in the future. Mike Schiewe said the Coordinating Committees recently agreed to restart up to three years of testing yearling Chinook at the Rocky Reach Project, and that 7 percent NNI production will remain the default until the survival studies are completed and the survival estimates approved.

D. Discussion: 2011 Rocky Reach and Rock Island HCP Hatchery Action Plan (Joe Miller)

Josh Murauskas introduced the draft 2011 Chelan PUD Hatchery Action Plan. Comments on the Action Plan are due within the next week and should be sent to Chelan PUD with copies to Carmen Andonaegui for distribution to the Hatchery Committees.

IV. WDFW

A. Upper Columbia River Summer Chinook Radio Telemetry Project (Casey Baldwin)

Casey Baldwin introduced a WDFW summer Chinook radio-telemetry study scheduled to begin in 2011. The study is designed to address several questions, including the extent of mainstem Columbia River spawning of summer/fall Chinook above Wells Dam, and if present, their population structure (Attachment D). Casey described methods for implementing study objectives, which could include trapping additional fish at existing broodstock collection traps, and using mobile tracking, PIT-tag data, and juvenile trapping methods to monitor fish movement.

Tom Kahler asked about using aerial surveys rather than mobile surveying, noting that aerial surveys are more efficient and provide superior signal detection. Baldwin said that the choice of mobile tracking was primarily based on budget considerations. It was suggested that if BioAnalysts is still doing aerial surveys, there might be an opportunity to work with them to incorporate some aerial surveys when schedules coincided.

B. Non-PUD-funded Projects and How They Relate to Upper Columbia Supplementation Program HGMPs (Mike Tonseth and Andrew Murdoch)

Andrew Murdoch updated the Hatchery Committees on the status of several NOAA- and Bonneville Power Administration (BPA)-funded studies that WDFW was conducting in the Upper Columbia (Attachment E). He encouraged Hatchery Committees members to contact him directly if they had any questions on the studies, and would be willing to provide summaries of results for the Hatchery Committees as studies are completed. He noted that WDFW was working with NOAA and the managers of the Data Access in Real Time (DART) website to expand access to PIT-tag data from the growing number of in-river detection arrays.

V. NOAA

A. ESA Coverage for Wenatchee and Methow Supplementation Programs (Craig Busack and Tom Scribner)

Tom Scribner introduced this topic by expressing concern that, with the delay in approval of the new HGMPs by NMFS, some of the hatchery programs were not fully covered under existing Endangered Species Act (ESA) permits. He noted that one example was the Yakama Nation coho program, which in the past received coverage by letter from NOAA. Craig Busack indicated NOAA no longer wanted to handle this issue by exchange of letters. He said that NOAA plans to complete a single consultation covering all six Wenatchee programs by spring 2011when the Yakama Nation would be ready to start implementing their coho program.

Busack said NOAA is waiting for three responses from Action Agencies related to the Wenatchee Basin hatchery programs: 1) language on stream flow and water diversion with respect to the Leavenworth NFH; 2) feedback on permit language for Chelan PUD, Grant PUD, and WDFW Section 10 permits; and 3) a response from BPA to an Initial Consultation letter, sent by NOAA and describing their understanding of the coho program. Busack noted that NOAA is conducting a required National Environmental Policy Act (NEPA) analysis of the Section 10 consultations, and that this will be completed at the same time as the consultations. He stated that the NEPA analysis for the Wenatchee programs will take approximately 6 months.

Busack said the Methow Basin (this also included the Okanogan programs) has nine hatchery programs requiring ESA consultation, one with a Section 7 requirement and the rest with Section 10 requirements. NOAA plans to group similar programs and make one manageable package (i.e., spring Chinook, steelhead, and coho programs). He said the Upper Columbia programs are NOAA's highest priority in Washington for ESA consultations but that NOAA does not yet have a complete package for the Methow subbasin; the Wells steelhead HGMP has not yet been submitted. Busack said once all HGMPs are submitted and NOAA has complete information, NOAA can complete the biological opinion in 6 months. Busack confirmed that NOAA supports the Okanogan steelhead program(s) being covered under both the Wells Steelhead HGMP (Douglas PUD) and the Okanogan Steelhead HGMP (Colville Confederated Tribes (CCT)), respectively incorporating the parts of the programs that will occur under the separate management responsibilities.

VI. HETT

A. Update (Carmen Andonaegui)

Carmen Andonaegui reported that the the Hatchery Evaluation Technical Team (HETT) met on December 23, 2010, and January 11, 2011, and discussed the following items:

NTTOC Analysis:

- The EcoRisk template is due to be completed at the next HETT meeting so it can be used to drive the model runs and be used by the expert panel members in their evaluations.
- The HETT discussed how to calculate Maximum Daily Encounter Rates so as to include space and time. The HETT decided to use intrinsic potential as described by

the NMFS Northwest Fisheries Science Center (NWFSC) Technical Review Team (TRT) to calculate carrying capacity. Tracy Hillman, BioAnalysts, will calculate carrying capacity by reach using intrinsic potential as described by the TRT, for the Entiat, Methow, and Okanogan subbasins for steelhead, spring Chinook, sockeye, summer Chinook, and coho. He has completed this calculation for spring Chinook in the Wenatchee subbasin.

- Model runs will begin by the date of the next HETT meeting.
- Todd Pearsons re-submitted the EcoRisk manuscript on January 12.

Control Group Analysis:

- Tracy Hillman described the Chiwawa spring Chinook stock-recruitment analysis and explained the results. He reviewed the data sources and methods used in the analysis. The HETT discussed how and if recruit and spawner data should be adjusted for carrying capacity. Hillman will draft a white paper describing the comparison analysis for use as an appendix to the PUDs' 5-year M&E reports.

The next HETT meeting will be on February 8.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees meetings will occur as follows: February 16, March 16, and April 20, all in Wenatchee. Mike Schiewe said the Hatchery Committees' meetings will begin alternating between Chelan and Douglas PUDs with March 16 being the first date for the Committees to meet at Douglas PUD offices. Greg Mackey will look into Douglas PUD hosting the HETT meetings on alternating dates as well. Meeting locations will be highlighted on the agendas.

List of Attachments

Attachment A – List of Attendees
Attachment B – 2009-2010 Sockeye Presentation
Attachment C – 2010_01_12 Tumwater Fishway Improvements list
Attachment D – WDFW Summer Chinook Radio Tracking Study, 2010-2014
Attachment E – 2011_01_14 WDFW – M&E Activities Update for HCP-HC

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller* (in the afternoon only)	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack (phone)	NOAA
Kirk Truscott*	CCT
Todd Pearsons	Grant PUD
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Andrew Murdoch+	WDFW
Casey Baldwin+	WDFW
Tom Scribner*	Yakama Nation
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees member or alternate

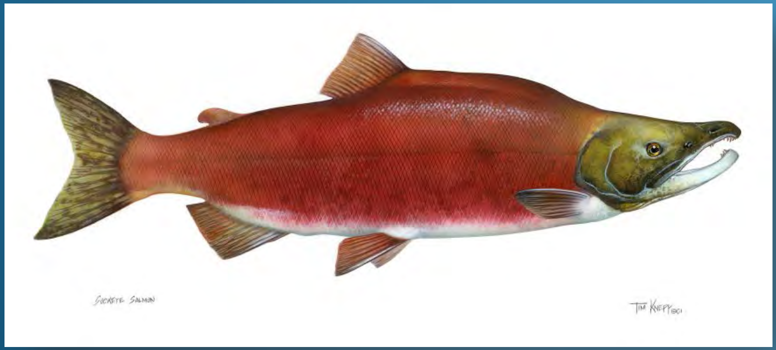
+ Joined at 1pm for WDFW study proposal

Attachment B

Adult Sockeye Escapement in the Upper Wenatchee Basin

2009 & 2010 Preliminary Results

Prepared by J. Murauskas



Introduction

- Chelan PUD proposed to utilize PIT technology to monitor adult sockeye during the spawning migration into the upper Wenatchee Basin.

- Study goal: provide accurate estimation of escapement into the Little Wenatchee and White rivers.

Methods

- PIT tags releases in 2009 & 2010
  - Tumwater Dam – WDFW
  - Bonneville Dam – CRITFC
- Detection efficiency
  - Combined probability of being missed
  - For example, 70% on two arrays would be 91%
- Escapement estimation

Methods

- Escapement

$$Escapement = \left(\frac{\left(\frac{Obs_{LWN}}{Eff_{LWN}} + \frac{Obs_{WTL}}{Eff_{WTL}} \right)}{PITs_{TUM}} \right) \times Counts_{TUM}$$

- Basically, apply conversion ratio of PIT-tagged fish (adjusted for detection efficiency) to population enumerated over Tumwater Dam.

Methods

- Assumptions
  - "Closed population"
  - No tag loss
  - All individuals have same probability of detection
  - Recapture events are proportional to the population
- Considerations
  - Array efficiency
  - Tagging effects
  - Recreational harvest

Attachment B

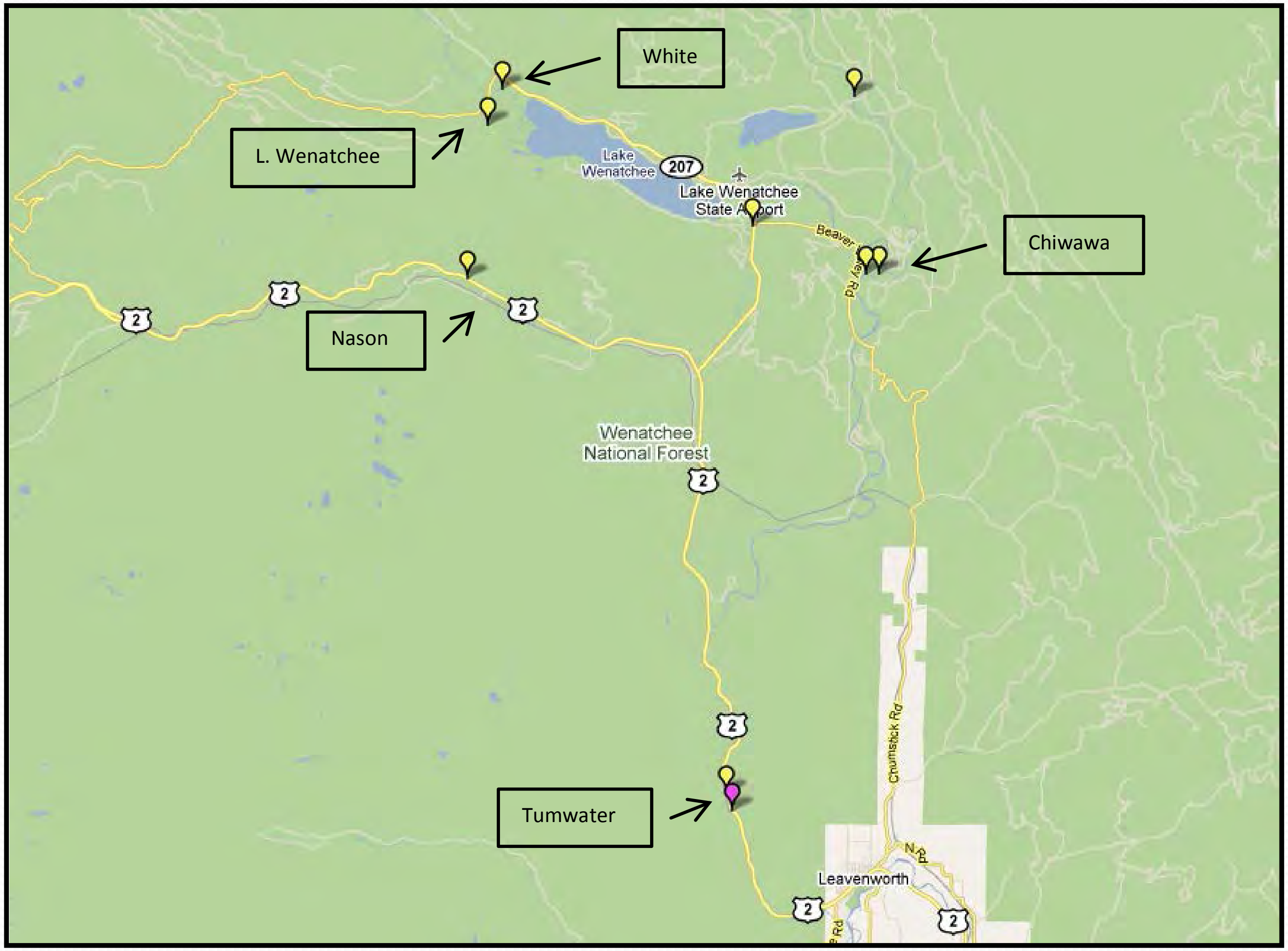


Figure 1. Map of study area, including the Tumwater Dam (purple) and in-stream detection arrays (yellow).

Results

- Tagging efforts
  - TUM: 998 and 1,054 adults
  - BON: 838 and 910 adults
    - Total of 87 and 110 subsequently detected at Tumwater
    - Travel time ~ 29 d

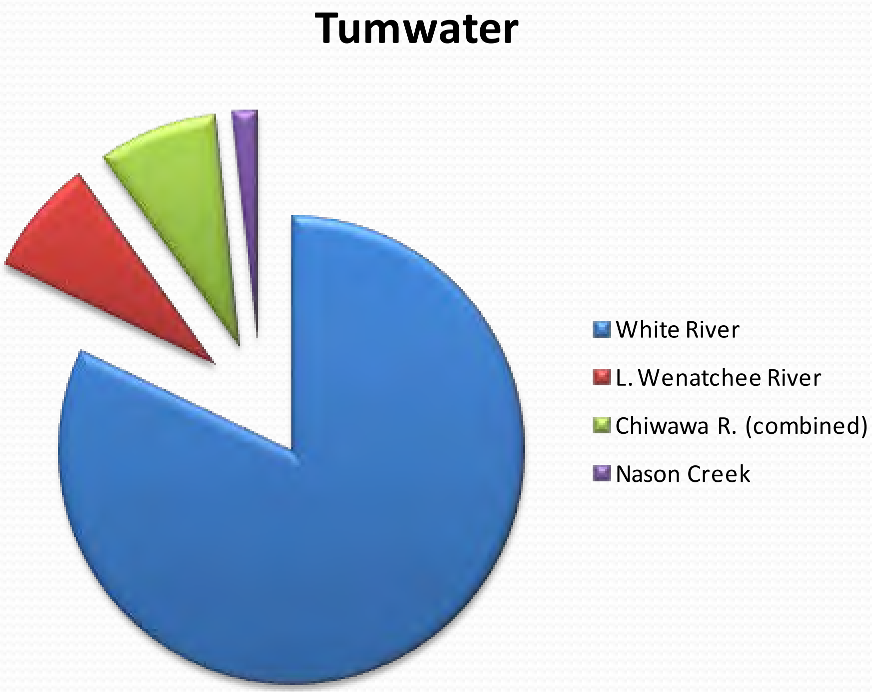
Attachment B

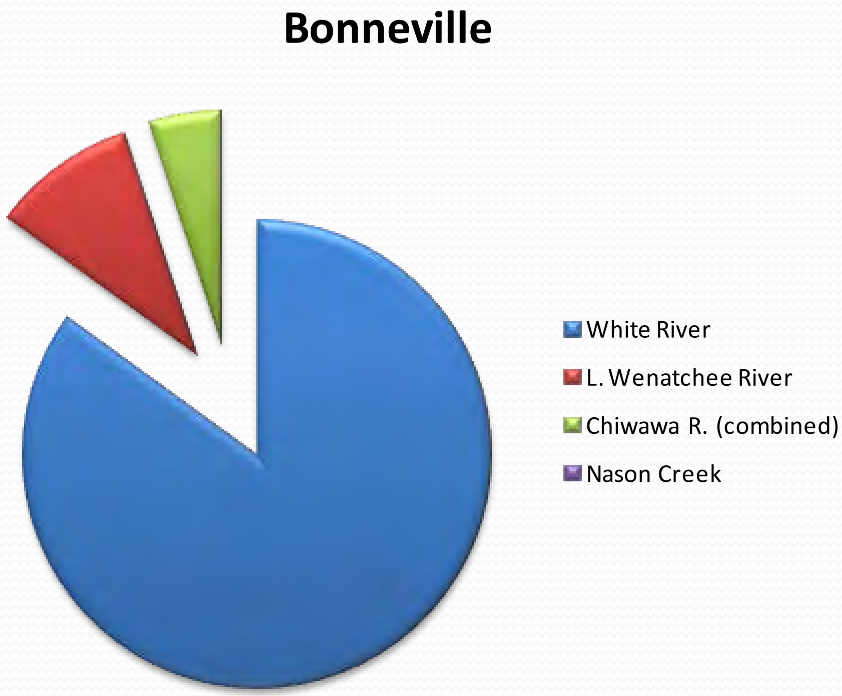
Results

Year	Release site	Tumwater	Lower Chiwawa	Upper Chiwawa	Lower Nason	Little Wenatchee	Lower White
2009	BONAFF	87	2	0	0	4	34
	TUMFBY	3	33	2	7	34	347
2010	BONAFF	110	0	0	0	6	41
	TUMFBY	2	2	1	1	61	530
Combined		*202*	*37*	*3*	*8*	*105*	***952***

Attachment B

Results (2009)





Proportion of detections by location

Results

Table 2. Detection sequences used to determine probability of detection on the Little Wenatchee River PIT arrays, 2009-2010.

Year	Hit-Hit (Array 1: Array 2)	Hit-Miss (Array 1: Array 2)	Miss-Hit (Array 1: Array 2)	Grand Total	P_1	P_2	Overall
2009	15	21	2	38	0.447	0.947	0.971
2010	46	21	-	67	0.687	1.000	1.000
Grand Total	*61*	*42*	*2*	*105*	*0.600*	*0.981*	*0.992*

Table 3. Detection sequences used to determine probability of detection on the White River PIT arrays, 2009-2010.

Year	Hit-Hit (Array 1: Array 2)	Hit-Miss (Array 1: Array 2)	Miss-Hit (Array 1: Array 2)	Grand Total	P_1	P_2	Overall
2009	-	381	-	381	-	-	-
2010	136	339	96	571	0.406	0.832	0.900
Grand Total	136	720	96	952	-	-	-

Results

Year	Tumwater count	Rec. harvest	Little Wenatchee	White River	Combined	Escapement
2009	16,034	2,229	576	13,876	14,452	0.901
2010	35,821	4,129	2,062	19,542	21,604	0.603
Total	*51,855*	*6,358*	*2,638*	*33,418*	*36,056*	*0.695*

Curiosities

- Impact of recreational fishery and drought
- Creel survey
  - Harvest of ~15% of population in 2009
  - Results indicate 77% fewer marked fish than released
- Tagging effects
  - Behavior of Bonneville and Tumwater fish
- Ratio of White to L. Wenatchee R. returns
  - 8:1 (Spawn); 13:1 (PIT-based)

Conclusions

- Great benefit of second array in White R.
- Substantial underestimation with current methods
- Great potential to provide reliable escapement estimates for adult sockeye

Attachment B

Questions?

Attachment C

TUMWATER FACILITY IMPROVEMENTS WORKING LIST

Table 1: Items to be addressed via Central Mainatenance Work Requests

No.	Short Description	Status[1]	Desired Completion[2]	Priority
~~1~~	~~Plywood Sheeting (over trap chamber)~~	WR submitted	4/15/2010	1
~~2~~	~~Panel Pad for Denil Entrance~~	WR submitted	4/15/2010	1
~~3~~	~~UPS for Transreceiver~~	WR in process	4/15/2010	1

Table 2: Items to be addressed in Facility Improvements Study prepared by CCPUD

No.	Short Description	Status[1]	Desired Completion[2]	Priority[3]
~~1~~	~~Movable Picket Barrier/Crowder~~	study	TBD	A3
2a	Add 3rd sorting gate on steep pass	study	TBD	B
2b	Reconfigure counting/work platforms in steep pass area		TBD	B
~~2c~~	~~Improve steep pass area access (safety)~~		TBD	A2
3a	Additional Holding/Recovery Tanks	study	TBD	B
3b	Sorting Tubes (by facility)		TBD	B
~~4a~~	~~Reconfigure fish sampling area~~	study	TBD	B
~~4b~~	~~Replace/Improve cabinets, equipment, components, ect.~~		TBD	B
~~5~~	~~Roofing Improvements (safety)~~	study	TBD	A4
~~6~~	~~High Flow Recovery/Release Tank~~	study	TBD	A1
~~7~~	~~Pull-out for Crane Set-up (safety)~~	study	TBD	A5

[1]WR = Work Request

[2]Completion is dependent on resource availability and budget approvals.

[3]A = short term improvements funded by CCPUD

[3]B = long term improvements funding TBD

Attachment D

Science Division
Conservation Biology Unit
Wenatchee Field Office
3515 State Hwy 97A
Wenatchee, WA 98801
(Ph) 509-664-3148
(FAX) 509-662-6606

MEMORANDUM

TO: Mike Tonseth, HCP hatchery committee
DATE: 1/13/2011
FROM: Casey Baldwin
SUBJECT: background material for discussion on 19 Jan 2011.

Study Title: Determine the population structure, movement patterns, and pre-spawn mortality for natural origin summer/fall Chinook above Wells Dam.

BACKGROUND

The following statement of work is for a research project that intends to answer several critical uncertainties identified during the 2009 Summer Chinook Summit and the Collaborative RM&E process facilitated by the Columbia Basin Fish and Wildlife Authority (CBFWA) that sought to develop a collaborative anadromous monitoring strategy. The Summer Chinook Summit was an ad-hoc effort by fish co-managers and the goal of the meetings was to “develop and refine options for management actions as appropriate to ensure conservation objectives, artificial production objectives and harvest management objectives are well linked to protect and perpetuate this valuable natural resource” (Peven et al. 2010). One of the key uncertainties identified in the Summer Chinook Summit was regarding the population structure for the spawning aggregates upstream of Wells Dam. A series of uncertainties grew from this fundamental information need and were included in the RM&E collaborative process led by CBFWA, NOAA Fisheries, and BPA to highlight monitoring and research priorities for FCRPS BiOp and non-BiOp projects. The list of uncertainties from these processes formed the basis for the objectives outlined in this Statement of Work. Completion of this project would fill a “High Priority” data gap (non-BiOp RPA) for summer/Fall Chinook in the Upper Columbia providing important Viable Salmonid Population (VSP) parameters including population structure, spatial distribution and life history diversity and genetic diversity. Additionally, this project will help to validate the redd survey abundance estimates that are ongoing in the Okanogan and Methow Tributaries and to locate and enumerate redds in the mainstem Columbia River.

A radio tracking study of summer/fall Chinook was conducted in 2005 by the CCT and WDFW in order to evaluate movement patterns and answer several questions in preparation for the building and operation of the Chief Joseph Dam hatchery facility. The 2005 study (Ashbrook et al. 2008) laid the foundation for the methods and strategy to address the objectives in this statement of work, essentially serving as a pilot study. The methods will be similar but the questions are slightly different and we will include several additional components to our study.

PRIMARY OBJECTIVES:

1) Identify likely spawning areas in the Mainstem Columbia River above Wells Dam.
2) Determine the proportion of adult summer Chinook whose final destination is the Columbia River.
3) Evaluate movement and roaming of adult summer Chinook between tributaries and the Columbia River above Wells Dam.
4) Determine pre-spawn mortality of summer Chinook within the Methow, Okanogan/Similkameen, and Columbia River above Wells Dam.
5) Document the presence/absence of summer Chinook redds in portions of the Columbia River. If present, evaluate the feasibility of quantifying the abundance of redds.
6) Determine the genetic characteristics of summer Chinook whose final location is in the Columbia River above Wells Dam and the Chelan River.

SECONDARY OBJECTIVES:

1) Evaluate migration timing related to water temperature for the Similkameen and Upper Okanogan spawning areas.
2) Evaluate run timing versus spawn timing to verify and build upon the results from Ashbrook et al. (2008)
3) Use prespawn mortality results to validate redd survey methodology for enumeration of adults on the spawning grounds.

TASKS AND METHODS

Task 1. Radio track 250 adult natural origin summer Chinook from Wells Dam each year.

Summary: Completion of this task will provide information to fulfill the Primary Objectives 1-4 and Secondary Objectives 1-2. Adult summer/fall Chinook will receive a radio tag at Wells Dam and be tracked by boat and truck, as well as at fixed stations throughout their known range upstream of Wells Dam and in the Columbia River between Wenatchee and Wells Dam. Fixed stations will be used to determine the timing of entry into the Okanogan, Similkameen, and Methow Rivers. Mobile tracking will be conducted each week to collect more refined spatial data on location and activity as well as to recover lost tags or carcasses.

Methods:

Fish Capture: Chinook will be captured in the West ladder of Wells Dam using the broodstock collection facilities already in place. Recent changes to Wells Dam have rendered the East ladder ineffective as a fish collection location and so our efforts will focus on the west ladder. Protocols will follow those outlined in Ashbrook et al. (2008) with modifications based on current operations of the trap. Only natural origin fish (adipose fin present) will be tagged, and scale samples will be taken and later analyzed by the WDFW scale laboratory in Olympia. Fish determined to be of hatchery origin will be excluded from the analysis.

Tag Description: Radio tags with activity sensors will be used. Exact details regarding manufacturer, type, and specifications will be determined at a later date. Tracking technology changes at a rapid rate, so we want to be flexible enough to take advantage of advancements between now and the onset of the study. Additionally, we need to determine the type and extent of fixed and mobile receiver equipment that can be borrowed, which could affect the kind of tag we would chose. At a minimum, we will need tags that have several kilometers of range and allow for detection of mortalities.

Tagging Techniques: Fish will be implanted gastrically with a radio tag, using a PVC pipe as a trochar. A rubber band will be placed around the tag to roughen the surface and discourage regurgitation (Keefer et al. 2004). After recovery from anesthesia, fish will be transported by truck to the Starr boat launch (4.4 km upstream of Wells Dam) for release. During transport fish will be supplied with continuous oxygen.

Mobile Surveys: Truck and boat surveys will be conducted each week to provide detailed spatial resolution regarding locations and routes in the tributaries and the mainstem in between Wells Dam and Chief Joseph Dam. The Methow River will be surveyed from a truck each week up to 5 km past the confluence with the Chewuch River and 5 km up the Chewuch River.

Aerial surveys may be conducted if blind spots exist from truck and boat surveys. Cost share opportunities may exist with ongoing aerial spawning ground surveys in the Okanogan/Similkameen.

Fixed Surveys: Fixed stations will be deployed at the same locations as were used during the previous study (Ashbrook et al. 2008), except that only 1 station will be set up in the tailrace of Chief Joseph Dam[1]. These will include the tailrace of Chief Joseph Dam, along the Columbia River between the Okanogan River and the Highway 17 bridge, lower Okanogan, lower Similkameen, and lower Methow River. Additionally, a fixed station will be installed downstream of Wells Dam to evaluate fallback.

---

[1] The previous study included an objective of fine scale movement in the vicinity of Chief Joseph Dam for identifying broodstock collection sites and they set up 3 fixed locations in the vicinity. This level of detail is not germane to our objectives so we will only use one fixed location in this area.

Task 2. Conduct underwater video surveys of likely spawning areas in the mainstem Columbia River upstream of Wells Dam to local spawning summer Chinook, redds, and carcasses.

Summary: Completion of this task will fulfill Primary Objective #5. We will contract with an agency/organization (USFWS, PNNL, other) that has been implementing underwater video techniques for Chinook spawning in the Snake River or other large rivers. We will use radio tracking to identify likely spawning locations based on fish movement and activity patterns, combined with local knowledge of potential locations based on depth, flow, gravel, and historic spawning areas (pre-inundation). Underwater video techniques will be employed during peak spawning (mid-late October through early November) and enumeration of total or density of redds will be attempted.

Methods: Detailed methods will be developed in consultation with potential subcontractors for this task. We assume that methods will be similar to those employed by the USFWS on the Snake River.

Task 3. Determine the genetic structure of summer Chinook that do not enter a tributary upstream of Wells Dam as well as the spawning aggregate in the Chelan River.

Summary: Completion of this task will provide information to fulfill the Primary Objective 6 and will be carried out in close coordination with genetic evaluations ongoing as part of the Mid-Columbia Public Utility District summer Chinook Mitigation. These ongoing studies are already evaluating the genetic structure of the tributary populations. Efforts within this task will not duplicate other genetics work, but will compliment those efforts.

Tissue samples will be taken from all tagged summer Chinook. Once the terminal destination is determined for each fish, those fish with a terminal location in the mainstem Columbia River will be analyzed for genetic structure following WDFW protocols and in conjunction with ongoing studies of tributary populations. Additionally, up to 100 samples will be analyzed from the Chelan River spawning aggregate. The Chelan River is the only confirmed spawning area in the Upper Columbia outside of the major tributaries (Wenatchee, Methow, Okanogan) and it is not currently analyzed for genetic structure.

Timeline, milestones, and deliverables for WDFW summer Chinook radio tracking study, 2010-2014

Timeline			
Year	Month(s)	Milestone	Deliverable(s)
2010	Mar-June	Early project concepts, develop objectives, methodology and equipment logistics	Statement of Work; Draft Study Plan

Attachment D

2010	July-Sept	Interagency coordination, development of equipment/personnel sharing agreements	executable contract;
2010	Oct-Dec	Interagency coordination, development of equipment/personnel sharing agreements, hire a biologist.	MOAs for equipment if needed; 2nd Draft Study Plan
2011	Jan-May	Field work logistics, preparations, equipment purchases, hire a technician, deploy receivers, ,	Final Detailed Study Plan
2011	June-Nov	Tag fish at Wells Dam, track throughout mainstem, Methow, and Okanogan.	
2011	Oct-Nov	Implement pilot study for underwater video of redds in Columbia River	
2011-2012	Nov 2011-Jan 2012	Compile data for first year of study, summarize activities and results.	Annual report of 2011 implementation, data collection, preliminary results.
2012	Jan-May	Field work logistics, preparations, equipment purchases, , hire a technician, deploy receivers.	
2012	June-Nov	Tag fish at Wells Dam, track throughout mainstem, Methow, and Okanogan.	
2012	Oct-Nov	Implement study for underwater video of redds in Columbia River	
2012-2013	Nov 2012-Jan 2013	Compile data for second year of study, summarize activities and results.	Annual report of 2012 implementation, data collection, preliminary results.
2013	Jan-June	Combine data for both years of the study, prepare final report.	Final Report
2013-2014	July-June	Prepare scientific manuscripts	Peer reviewed journal articles

Attachment E

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
FISH PROGRAM -SCIENCE DIVISION
SUPPLEMENTATION RESEARCH TEAM

3515 Chelan Hwy, Wenatchee, WA 98801
Voice (509) 664-3148 FAX (509) 662-6606

January 13, 2011

To: HCP Hatchery Committee Members

From: Andrew Murdoch

Subject: Status and Update of Activities funded under BPA or NOAA

In May 2010, the HCP HC was presented with an extensive list of activities that were generated to fill data gaps identified as part of the CBFWA Collaborative Regional M & E Workshop. The following is a brief status report on those activities as well as the relative reproductive success studies that were already ongoing. Should the HCP HC desire **any** further information or simply want to discuss the projects or results, we would be more than happy to provide more details at your convenience.

BPA Upper Columbia VSP Project (WDFW and CCT)

1. Refinement of the variance calculation in estimating smolt abundance

   WDFW statistician is currently working on the task. We hope to have some results this spring.

2. Estimate the proportion of natural and hatchery steelhead on the spawning grounds

   Various agencies have already installed many arrays throughout the upper Columbia. PIT tag arrays installed under this project are in bold.

Table 1. Permanent PIT tag antenna arrays that have been or will be installed in selected tributaries.

Wenatchee Basin		Entiat Basin		Methow Basin		Okanogan Basin	
Location	Year	Location	Year	Location	Year	Location	Year
Peshastin (CPUD)	2007	Lower (CPUD)	2007	Lower (1 - NOAA)	2009	Omak (CCT)	2010
Chiwawa (2 - ISEMP)	2008	Mad (ISEMP)	2007	Twisp (NOAA)	2008	**Lower**	**2011**
Nason (2 - ISEMP)	2008	Middle (ISEMP)	2008	**Lower (2)**	**2010**	**Salmon**	**2011**
Little Wen. (CPUD)	2009	Upper 1 (ISEMP)	2010	Beaver (USGS)	2009	**Similk.**	**2011**
White (GPUD)	2009	Upper 2 (ISEMP)	2010	Libby (USGS)	2004	**Ninemile**	**2011**
Lower Wen. (ISEMP)	2010	Upper 3 (ISEMP)	2011	Gold (USGS)	2004		
Chumstick	**2010**			S. Gold (USGS)	2004		
Upper Wen. (ISEMP)	2011			Mid. Met. (USGS)	2009		
Chiwaukum	**2011**			Upp. Met. (USGS)	2009		
Icicle	**2012**			Chewuch (USGS)	2010		
Mission	**2012**			Wolf (USGS)	2008		
				Lost	**2012**		
				Early Winters	**2012**		
				Upper Methow	**2013**		
				Upper Chewuch	**2013**		

3. Estimate the abundance and distribution of steelhead spawning not covered in the current sampling scheme.

   Many of the permanent PIT tag arrays in Table 1 also support this task. However, because current surveys do not include ALL possible spawning habitat, we intend to install several temporary antennas only for the spawning period (March – May) to determine if steelhead are utilizing areas currently thought not to be used by steelhead (Table 2).

   Table 2. Locations of temporary PIT tag antenna arrays will be installed in selected tributaries (2011 – 2013).

Wenatchee Basin	Entiat Basin	Methow Basin	Okanogan Basin
Mission Creek	Roaring Creek	Twisp River	Salmon
Nason Creek	Mad River	Little Bridge Creek	Tunk
Chiwawa River	Tillicum Creek	Lake Creek	Shuttleworth
Tronson Creek		Lake Creek	Tonasket
Peshastin Creek		Wolf Creek	Loup loup
		Beaver Creek	Bonaparte
		Lost River	Wildhorse
		Early Winters	Wanacut

4. Develop analytical tools to automate and standardize the analysis of PIT tag data from stream arrays

   I have had several discussions with contractors regarding this task and will be contracting with one or more next month. Some work has already been completed by ISEMP in the Salmon River.

5. Assessment and Refinement of Spring Chinook and Steelhead Spawning Grounds Surveys to include an Estimate of Observer Efficiency

   First year for steelhead was completed this spring in the Wenatchee and for spring Chinook in the Methow. We plan to conduct similar work in the Wenatchee this fall and Methow steelhead the spring of 2012. Both initial studies went very well and will meet to discuss the results and plans for this year’s effort with researchers from ISEMP and USFS Rock y Mountain Research Station in February.

6. Upper Columbia steelhead radio telemetry study

   Not scheduled to begin until 2014 to coincide with the end of a similar study in the Yakima Basin.

7. Steelhead Stock Assessment in the Upper Columbia ESU at Priest Rapids Dam

   Conducted as normal, no problems encountered.

Attachment E

NOAA Upper Wenatchee Smolt Trap Relocation Project

We encountered considerable delays in obtaining permits from the USFS. We are tentatively planning on relocating the trap this fall. Relocation should resolve any potential issues associated with the lake and reduce logistical issues for personnel operating both the Chiwawa and Wenatchee traps.

NOAA Summer Chinook Radio Telemetry Study

Casey Baldwin is the lead on this project and will be hiring a biologist this spring with plans to conduct the first year of tagging this year.

DCPUD/BPA Twisp Steelhead Relative Reproductive Success Study

We hired a lead biologist (Brandon Chasco) for the project in September. Study is ongoing as planned.

CCPUD/NOAA Wenatchee Steelhead Relative Reproductive Success Study

To date we have genotyped 1625 potential parents from the 2008 broodyear and 726 of their age-1 offspring. All individuals have been typed at14-15 microsatellite loci. We are in the process of conducting parentage analyses using these data, and initial results appear very promising. The 2009 parent have been DNA extracted and progeny have been collected; these samples will be genotyped in the coming months.

CCPUD/BPA Wenatchee Spring Chinook Relative Reproductive Success Study

We received a good review from the ISRP for the final three years of field work. Genotyping the 2009 spawners is nearly complete. Early results suggest similar results regardless of life stage (i.e., smolts or adults). An earlier manuscript sent to the HCP HC a couple years ago was finally published in CJFAS.

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	March 16, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of February 16, 2011 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, February 16, 2011, from 9:30 am to 4:45 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Carmen Andonaegui will set up a conference call line for Monday, March 7, from 9:00 am to 11:00 am, for approval of the Wells Steelhead Hatchery and Genetics Management Plan (HGMP) (Item II-A) and for a discussion of Chelan PUD's recommended change in steelhead production (Item III-C).
- Greg Mackey will revise the HGMP (Item II-A).
- The Hatchery Committees will provide comments on the draft Wells steelhead HGMP Statement of Agreement (SOA) to Greg Mackey by February 23. Mackey will email a revised SOA to Carmen Andonaegui by February 24, for distribution to the Committees (Item II-B).
- With review by Mike Tonseth, Carmen Andonaegui will produce a table showing implementation timelines for Wells 2013 recalculation (Item II-C).
- Douglas PUD will distribute a draft SOA for their recalculation method prior to the April Hatchery Committees' meeting (Item II-C).
- Joe Miller will provide a proposal on methods for recalculating smolt production levels for each Chelan PUD hatchery program by March 3 (Item III-A).
- Mike Schiewe will brief the Coordinating Committees on the discussion in the Hatchery Committees regarding passage delay issues at Tumwater Dam (TWD) (Item III-B).

- Andrew Murdoch and Josh Murauskas will discuss the analysis of data related to passage at TWD and provide recommendations for future operating protocols at the facility (Item III-B).
- Mike Tonseth will develop an operating protocol for the TWD facility prior to the next meeting, capturing the discussion today, and review the protocols with Joe Miller (Item III-B).
- Steve Lewis will update the Rocky Reach fish forum about discussion in the Hatchery Committees on lamprey passage at TWD (Item III-B).

DECISION SUMMARY

- The Hatchery Committees approved the collection of 75 wild-origin summer/fall Chinook juveniles from the Upper Columbia evolutionary significant unit (ESU) for a research effort by the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) Northwest Fisheries Science Center aimed at differentiating wild and hatchery populations (Item IV-A).

REVIEW ITEMS

- There are no documents under review at this time.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda; there were no additions. The January 19, 2011, Hatchery Committees meeting minutes were reviewed and approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

No comments were received on the draft Chelan 2011 Rocky Reach and Rock Island Hatchery Action Plan. Comments were due January 28, 2011. The plan was finalized and will be posted on the ftp site.

No comments were received on the draft 2009 Douglas PUD Monitoring and Evaluation (M&E) Report. Comments were due February 7. Greg Mackey will finalize the report and forward to Andonaegui for distribution to the Hatchery Committees.

II. Douglas PUD

A. Review Draft Wells Steelhead HGMP (Greg Mackey)

Comments were due on the draft Wells Steelhead HGMP by Wednesday, February 9; only the Yakama Nation provided written comments. Greg Mackey said he spoke with Mike Tonseth and Bill Gale regarding WDFW and U.S. Fish and Wildlife Service (USFWS) comments, and received a voicemail from Jeff Korth with comments. Mackey summarized the comments, indicating a Douglas PUD response to each one. Mackey indicated that, in general, all editorial comments were accepted, and provided detailed responses to the substantive comments. Mackey explained how adaptive management language was integrated into the draft. He said he added a description of the relationship of Hatchery Committees members to regional coordination, especially as it relates to US v OR. Mackey said he also added a description of the relationship between the Wells steelhead program and the Winthrop National Fish Hatchery (NFH) steelhead program. With regard to regional coordination, Mike Schiewe reminded the Committees' members that all signatories to the HCPs agreed that the HCP Committees had decision authority regarding HCP programs and activities, and that when Committees' representatives with outside obligations come to Hatchery Committees' meetings, it was their responsibility to consider their other obligations and responsibilities. The Committees agreed that section 3.2.2 of the draft HGMP was the appropriate location for describing the relationship between US v OR and the HCP.

Bill Gale indicated his remaining concerns regarding the draft HGMP were the uncertainty that the Winthrop NFH would be at full production of steelhead in 2013, and the proposed release of safety-net fish from the Methow Hatchery acclimation pond. He was concerned that the Methow release would complicate collecting broodstock at Winthrop NFH. Gale agreed to discuss these concerns with Mackey. Schiewe asked Committees' members if they would approve the draft HGMP with the revisions discussed today. Keely Murdoch and Mike Tonseth said they would approve the draft HGMP as revised. Kirk Truscott said he would like more information included on Okanogan Basin steelhead production as it relates to Grant PUD's program. Shane Bickford stated that language in the draft HGMP described the 100,000 steelhead to be produced for Grant PUD and the Okanogan steelhead program, and that the HGMP refers to the Okanogan Steelhead HGMP for additional information regarding that program. He recommended keeping references in the draft HGMP to the Okanogan steelhead program brief so that the Wells Steelhead HGMP would not dictate the

Okanogan steelhead program. Truscott said he would support the draft HGMP as written. Schiewe suggested scheduling a conference call to finalize changes to the draft HGMP and to approve the draft HGMP for submission to NOAA. Gale said he needed additional time to consider his concerns.

Mackey agreed to revise the HGMP consistent with today's discussion. Schiewe said that a vote by conference call will be held for approval of the draft HGMP on March 7.

B. Preview of the Draft Wells Steelhead HGMP SOA (Greg Mackey)

Greg Mackey reviewed the draft SOA that was distributed by email the day before the meeting, February 15. He asked Committees' members for recommended edits. As revised, the SOA will be up for approval at the conference call on March 7. Kirk Truscott asked Mackey to make sure that language in the last two paragraphs of the Background section is consistent with language in the draft HGMP concerning smolt release locations. Mike Schiewe asked that comments be sent to Mackey by February 23. Mackey will send the revised SOA to Carmen Andonaegui for distribution to the Committees by February 24.

C. Douglas PUD NNI Re-Calculation Proposal (Greg Mackey)

Greg Mackey said Douglas PUD's No Net Impact (NNI) hatchery program recalculation proposal specifies that the Biological Assessment and Management Plan (BAMP) method will be used to recalculate production beginning in 2013 (Attachment B). Steelhead, spring Chinook, and summer/fall Chinook NNI production will be adjusted accordingly; NNI is achieved for coho through funding the Yakama Nation for the coho reintroduction program, and for sockeye though funding of the Fish-Water Management Tool. Mackey presented the BAMP smolt production calculation and presented assumptions and rules related to applying the BAMP method for recalculating production beyond 2013. Craig Busack asked if recalculation would be based on five consecutive years of data, and if the BAMP method takes into consideration fluctuations in ocean conditions. Mackey confirmed that the BAMP method uses five consecutive years of SARs, and explained that the BAMP calculation adjusts for fluctuations in out-of-basin conditions.

Mackey asked that Hatchery Committees' members review the Douglas recalculation proposal (Attachment C) to familiarize themselves with how the BAMP method works. The proposal was distributed January 19. Mackey then presented examples of recalculation for each species, indicating that the proposal includes the data used in the recalculations. He explained that the Okanogan and Methow summer/fall Chinook smolt production was calculated separately, and then summed. Overall, Mackey said the smolt production numbers are likely high because SARs are usually underestimated, resulting in greater smolt estimates under the BAMP method. Kirk Truscott asked if the summer/fall Chinook adult returns were based on Wells Dam counts. Shane Bickford responded that the returns were based on tributary escapement calculated using a fish per redd approach.

Mike Schiewe asked for clarification regarding timelines for implementation of the new programs, including timing of broodstock collection and first releases. The Committees agreed that implementation of the new release levels would occur in 2014; therefore, 2013 would be the last year of existing release levels. Carmen Andonaegui and Mike Tonseth agreed to develop a table summarizing the timing of broodstock collection for the different plan species. The Wells recalculation method proposal will be up for approval at the March Committees meeting. A draft SOA will be distributed prior to the March meeting.

D. Egg Planting Video (Greg Mackey)

Greg Mackey shared with the Committees a video of a method used for planting Atlantic salmon eggs in rivers in the Northeast United States (http://www.wlbz2.com/video/default.aspx?bctid=777394094001). He said this method has been shown to be similar or more successful than fry planting.

III. Chelan PUD

A. Recalculation of Hatchery Production Post-2013 (Joe Miller)

Joe Miller summarized the five methods that Chelan PUD was considering for calculating smolt production: egg-to-smolt; redds; SARs; smolt traps; and carrying capacity (Attachment D). Miller said that the draft recalculation report distributed February 15 by email (Attachment E) describes each method in more detail. Miller explained that Chelan PUD believed it was important to use data from their Hatchery M&E Program in recalculating release levels beyond 2013. He said that these data were the most recent, and had been collected at great expense. Miller stated that high production numbers do not necessarily equate to best program outcomes, and referred to the tables in the draft recalculation report. The tables provide smolt production estimates for the Mid-Columbia hatchery programs based on the various smolt production calculation methods. He said that Appendix A of the report provides SARs and spawn escapement estimates for each hatchery program, including references for data used. Miller noted that available data varied among programs, and one method may be preferable over another method depending on the species. He said the report only includes smolt production calculations for programs for which Chelan PUD has production obligations.

In anticipation of finalizing the recalculation by October 2011, Miller suggested that Committees' members consider those circumstances where Chelan PUD agreed to an initial hatchery compensation of up to, and often greater than, 14 percent. The specific question Miller posed was whether it is appropriate to use the SARs resulting from overproduction when recalculating new smolt production levels. He said it was important that production be biologically-based and that Chelan PUD consider habitat carrying capacity. Keely Murdoch said that using the M&E data may not always be appropriate, as these data were not intended for use in recalculation of smolt production levels. She suggested the time series of data may be too short. Miller agreed to developed proposed method(s) for recalculating smolt production levels for each Chelan PUD hatchery program by March 3. Carmen Andonaegui will distribute to the Committees for review.

B. Tumwater Passage Issues (Joe Miller and Andrew Murdoch)

Joe Miller presented a Chelan PUD evaluation of fish passage conditions at TWD. A report and a PowerPoint presentation were prepared and distributed to the Hatchery Committees last week (Attachments F and G). Based on their analyses, Chelan PUD has several concerns including passage delays and whether these delays affect current or future Endangered Species Act (ESA) coverage.

Miller said that analyses of 2010 passive integrated transponder (PIT)-tag data on spring Chinook and sockey demonstrate significant delays in adult passage at TWD. Jeff Korth stated that the significance of the delay may vary among the different species affected. Joe Miller said there appears to be both pre- and post-trapping delays. He said the effects of the post-trapping delays are mostly unknown, but that the effects of the pre-trapping delays include serial ascents and fallback within the ladder over a period of days to weeks, and the disappearance of a significant number of these fish before detection at the TWD fishtrap. Miller suggested several possible indirect post-trapping effects including stress, increased disease susceptibility, and pre-spawn mortality. Miller provided information on current ESA coverage for operations at the Tumwater facility (permit 1196, permit 1347, and the 2008 Rocky Reach 2008 USFWS Biological Opinion). Miller indicated Chelan PUD intends to seek future ESA coverage for operations at the Tumwater facility only for hatchery programs. He indicated that the Washington Department of Fish and Wildlife (WDFW), NOAA, or the Bonneville Power Administration (BPA) will need to obtain ESA coverage for the spring Chinook reproductive success study, as well as any other non-HCP research that requires trapping at TWD. Miller reminded the Committees that the Chiwawa spring Chinook HGMP that was submitted to NMFS last year specifies that hatchery program activities be permitted separately from the spring Chinook reproductive success study.

To address passage delay at TWD, Miller suggested implementing a trapping schedule of 3 days on and 4 days off. This schedule is consistent with their current permit, and allows Chelan PUD to move forward with ESA consultation on the new HGMP. Miller acknowledged that this schedule may not accommodate all the M&E tasks. Mike Schiewe noted that the Coordinating Committees are the HCP Committees that normally deal with fish passage issues. He indicated that he will brief the Coordinating Committees on the issue of delayed passage at TWD at their next meeting.

Keely Murdoch asked about facility modifications at TWD that had been proposed by the Yakama Nation. She said the modifications were intended to facilitate better fish passage. Murdoch said she would like to see the modifications completed and tested prior to deciding on changing operations at the facility based on delay issues. Craig Busack said there are serious issues related to delays at the fishway, but also noted that the reproductive success study is also very important. He said he thinks the 3 days on and 4 days off schedule could compromise the reproductive success study, and asked for ideas that might meet both hatchery and study needs.

Andrew Murdoch (WDFW) presented additional analyses and interpretation of PIT-tag data related to passage delays of spring Chinook at TWD (Attachment H), including comments on Chelan PUD's analysis of TWD delays (Attachment F), and possible pre-spawn mortality. He acknowledged that operating the TWD trap for broodstock collection requires only limited operation; however, operating the trap for the spring Chinook reproductive success study requires extending trap operation time and duration. The trap is run to capture 100 percent of the returning spring Chinook. Murdoch provided graphs with spring Chinook and sockeye passage timing in the fish ladder, illustrating the overlap in timing. These data indicate that once sockeye arrive at the ladder, spring Chinook passage through the ladder almost stops. As spring Chinook passage slows, the trapping of 100 percent of run requires extended operation, forcing continuation of trapping operations through and after the sockeye migration season. Murdoch indicated that spring Chinook trapping could be stopped on July 15 without compromising the reproductive success study. Mike Tonseth said that by July 15, approximately 25 percent of the sockeye run has passed TWD. Murdoch said that the Tumwater Working Group recommended ways to reduce denile down time, including three-person crews, pulling additional pickets from the V trap to facilitate entrance into the trap, weekly monitoring of PIT-tag fish passage, and pulling the trap completely when the "sockeye effect" is detected.

Murdoch said he thought Chelan PUD's analysis was reliable but that there were a couple of assumptions that needed to be tested, both related to PIT-tag detections: 1) no prespawn mortality occurs between TWD and spawning grounds; and 2) there is equal probability of PIT-tag detection at all flows. He also reported that there was a problem with double tagging in 2010, when previously PIT-tagged fish went undetected and were double-tagged. Consequently, many of the double-tagged fish were not detected at the arrays (77 percent non-detects). He said if you removed these double-tagged fish from the analyses, there appears to be much less delay of spring Chinook at TWD. Murdoch stated he had not yet discussed his analysis with Josh Murauskas. Murdoch further explained:

- Assumption 1 – Murdoch said his analysis showed there was high variation in how much time a fish spent in the mainstem Wenatchee River prior to passing TWD, with the later-arriving fish spending less time before passing TWD . Murdoch said the relationship between pre-spawn mortality and delay at Tumwater may not be as clear as previously thought prior to this analysis. Joe Miller stated that the focus of Chelan PUD's analysis was on fish movement upstream of TWD and the lack of subsequent detections in the tributaries.
- Assumption 2 – Murdoch reported that most detections occurred at lower flows and that flow does appear to affect detection probabilities. The PIT-tag detection array at the mouth of the Chiwawa River and at the Chiwawa Weir allowed comparison of fish detections at the Chiwawa River PIT-tag array to fish detected upstream at the Chiwawa Weir. Sixty percent of fish collected at the weir were not detected at the Chiwawa River PIT-tag array. Overall, for fish released above TWD, 83 percent of

PIT-tagged fish were accounted for in 2010. The analysis does not account for prespawn mortality or PIT-tag array efficiency, and indicates there is not a problem with spring Chinook survival upstream of TWD.

- Based on his analyses, Murdoch concluded the following: trapping activities result in some fish passage delays at TWD; spring Chinook passage is negatively affected by sockeye and potentially other species in the fish ladder; the denile trap is not ideal for passing sockeye; modified operation protocols and facility improvements may increase spring Chinook passage and eliminate sockeye issues; and delay does not appear to have an effect on survival of spring Chinook upstream of TWD.
- Murdoch defined pre-spawn mortality as the difference between run escapement estimates and spawning escapement estimates. He emphasized that there is often substantial uncertainty associated with both estimates. In summary, Murdoch recommended a cautious use of carcass data as an estimate of prespawn mortality. He said when used, carcass data should be considered a conservative estimate of prespawn mortality. Ideally, carcass surveys should encompass the entire spawning season and cover all spawning areas; analysis and interpretation should consider the relationship between the probability of carcass recovery in non-spawning areas (before recovery) as well as in spawning areas.
- Murdoch concluded his presentation by briefly summarizing recent monitoring at TWD. Prior to 2004, spring Chinook and summer Chinook runs were differentiated visually; beginning in 2004, Chinook were differentiated genetically. He said that spawning escapement estimates are based on redd counts, for which there is no measure of precision. Murdoch said according to his analysis, estimated pre-spawning survival of female spring Chinook is 54 percent. Although there is more certainty in estimating female survival than male survival, overall estimated survival of spring Chinook (male and female) was 56 percent. Murdoch said that pre-spawn mortality of spring Chinook in the Wenatchee subbasin is high, but within the expected range; additionally, it appears that pre-spawning mortality is density dependent. He said increasing survival above TWD (i.e., reducing pre-spawning mortality) may be more important than improving passage efficiency at TWD.

Bill Gale summarized recent USFWS information on bull trout passage at TWD. He said Mark Nelson and R.D. Nelle (USFWS) collected data in 2009 and 2010 on bull trout passage in the Wenatchee subbasin using radio telemetry. Based on those data, bull trout passage time at TWD ranged from 1.8 to 20 days. In previous research conducted from 2001 to 2004, passage at TWD took 0.1 to 3.15 days. Gale said that bull trout pass TWD at the same time as sockeye. Jeff Korth noted that sockeye runs were up in 2009 and 2010 compared to 2001 to 2004. Gale also said that USFWS plans to produce a report on lamprey distribution in the Wenatchee subbasin in the next 6 months. He said recent surveys have documented juvenile lamprey below TWD but not above, leading to concerns that lamprey passage at TWD is problematic. Gale said he thinks modifications and recommendations for HCP Plan species will address bull trout passage needs but not lamprey passage. Mike Schiewe noted that lamprey are not an HCP Plan species, but are the responsibility of the Rocky Reach Fish Forum. Steve Lewis indicated he would update the Rocky Reach fish forum about discussion in the Hatchery Committees on lamprey passage at TWD.

Schiewe recommended that Murdoch and Josh Murauskas review their analyses of passage at TWD together. Kirk Truscott expressed concern that 17 percent of the fish detected in weir 15 in the fish ladder were not detected at weir 18, indicating a fish ladder passage issue not addressed by Murdoch's analysis. Schiewe said he will alert the HCP Coordinating Committee of today's discussion, and that perhaps Murdoch and Murauskas could present their analyses to the Coordinating Committee in the future.

Tonseth provided the Committees with an update on developing a protocol for trapping operations at the TWD fishway facility. He said the protocol will capture all of the varied activities that depend on trapping fish at TWD. Tonseth indicated that WDFW had already been discussing opportunities to move broodstock collection to other locations to alleviate bottlenecks at Tumwater, such as collecting Chiwawa program broodstock at the Chiwawa weir and collecting sockeye and some of the steelhead and summer Chinook broodstock at Dryden Dam. Tonseth said relocating activities that delay passage at TWD when peak passage for multiple species occurs simultaneously should be beneficial.

Craig Busack said he would like to see measures in place this year to address passage delays at TWD. Tonseth said he will develop operation protocols for the TWD facility prior to the next meeting. The protocols will capture today's discussions, and include halting trapping of spring Chinook by July 15 and finishing modifications to allow the denil to continue running while fish are worked up. Miller said before the TWD facility is started up this year, Chelan PUD will need formal confirmation from NMFS and USFWS that they have ESA coverage for operations proposed in 2011. Tonseth said he will work with Joe Miller in developing the TWD operating protocols. Murdoch said that steelhead trapping is scheduled to begin next week; trapping is an unmanned operation where the trap is checked at regular intervals with the time between trap checks decreasing as more steelhead appear in the trap. Miller said trapping can start at TWD when he and Tonseth agree on a protocol that will be forwarded to NMFS and USFWS for concurrence.

C. Transition to NNI Production Levels for Steelhead and Spring Chinook (Joe Miller)

Joe Miller introduced a draft SOA requesting approval to adjust steelhead production in 2011 to levels consistent with juvenile steelhead passage survival estimates for Rocky Reach and Rock Island. This would allow all production to be moved from the Turtle Rock hatchery facility to the Chiwawa facility, where the fish could be acclimated and volitionally released, rather than drop planted. It is expected that this would greatly reduce straying.

The SOA also requested approval for reallocating Methow spring Chinook production, after 2013, to the Wenatchee subbasin (Attachment I). With regard to relocating spring Chinook production, Miller explained that production of Methow spring Chinook after 2013 was expected to drop to about 90,000 smolts (based on the reduction from 14 percent to 7 percent, and possibly lower when adjusted for survival estimates). Because of the low return rate of Methow spring Chinook, the relocation of production to the Chiwawa program (with a high return rate) would increase the overall number of spring Chinook returning to the Upper Columbia. Because of the higher return rate of Chiwawa spring Chinook, fewer wild fish would be required for broodstock.

With regard to the steelhead proposal, Mike Tonseth said if a change in production is contemplated, the decision needs to be made soon because they have already met 60 percent of the egg collection goal, and would need to readjust the schedule. Mike Schiewe asked if there was support for the overall proposal (both program changes). Kirk Truscott said he supported adjustment of steelhead production for 2011, but that the rationale for the spring Chinook proposal is not as clear to him. However, Truscott agreed that releasing 90,000 fewer spring Chinook into the Methow subbasin will not measurably affect whether there will be enough MetComp adults returning for broodstock. Craig Busack said the removal of 90,000 spring Chinook from the Methow Basin and reallocating these to the Wenatchee subbasin may result in less hatchery risk, but might result in an uncertain risk to recovery.

Tonseth said that under the HCPs, the Committees have leeway to change the production levels. However, WDFW would need to coordinate any change with *US v OR* parties, and would need to do so by mid-March if a change in production levels for 2013 is supported.

Schiewe asked if the Committees were comfortable approving the change for 2011 broodyear collection for steelhead. Bill Gale said would like to review the proposal further. Tonseth said the change in 2011 broodstock collection would likely be a point of discussion at the March 4 Joint Fisheries Party (JFP) meeting. He suggested separating the steelhead proposal from the spring Chinook proposal and considering approval of the steelhead change during the already scheduled March 7 Hatchery Committees' conference call. The Committees agreed to add the steelhead proposal to the agenda; it will be the second agenda item after the vote to approve the Wells Steelhead HGMP. Carmen Andonaegui will set up a conference call for March 7, from 9:00 am to 11:00 am.

IV. WDFW

A. Request from NMFS NWFSC for Wild UC Summer/Fall Chinook Sub-Yearlings for 2010 Study

Mike Tonseth said that the NMFS Northwest Fisheries Science Center staff requested 75 wild summer/fall Chinook juveniles from the Upper Columbia ESU for research differentiating wild and hatchery fish (Attachment I). There were no comments. The request was approved.

V. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees meetings will occur as follows: March 16 (Douglas PUD office), April 20 (Chelan PUD office), and May 18 (Douglas PUD office), all in Wenatchee.

List of Attachments

Attachment A – List of Attendees
Attachment B –Wells HCP 2013 NNI Recalculation Power Point presentation
Attachment C – Douglas PUD Wells HCP Recalculation Proposal
Attachment D – Chelan PUD HCP 2013 Recalculations Power Point Presentation
Attachment E – Chelan PUD Draft HCP 2013 Recalculations (ME-Based) Report
Attachment F – Delays of UCR spring Chinook at Tumwater Dam

Attachment G – Tumwater Dam Passage Power Point presentation

Attachment H – WDFW Tumwater Dam PIT-Tag Passage Analysis

Attachment I – NMFS NWFSC Request for UC wild such fall chinook

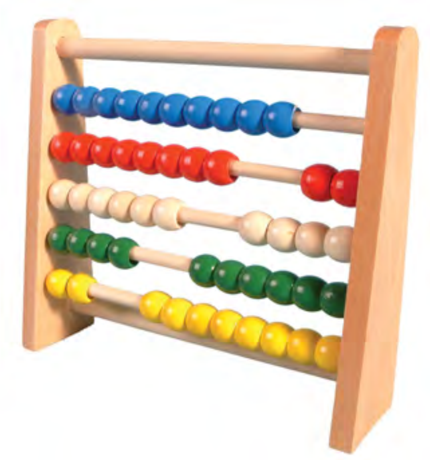
Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Shane Bickford	Douglas PUD
Andrew Gingerich	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack* (phone)	NOAA
Kirk Truscott*	CCT
Todd Pearsons	Grant PUD
Bill Gale*	USFWS
Steve Lewis (joined after lunch)	USFWS
Andrew Murdoch (joined after lunch)	WDFW
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B

Wells HCP Recalculation



NNI for the Wells Project

Douglas PUD
February 16, 2011

Attachment B

Background

- NNI hatchery compensation to be adjusted in 2013
- Wells HCP specifies using the “BAMP” method
- Recalculation for steelhead, spring Chinook, summer/fall Chinook
- Coho NNI achieved by payment to the YN for reintroduction program.
- Sockeye NNI achieved through the Fish-Water Management Tool.

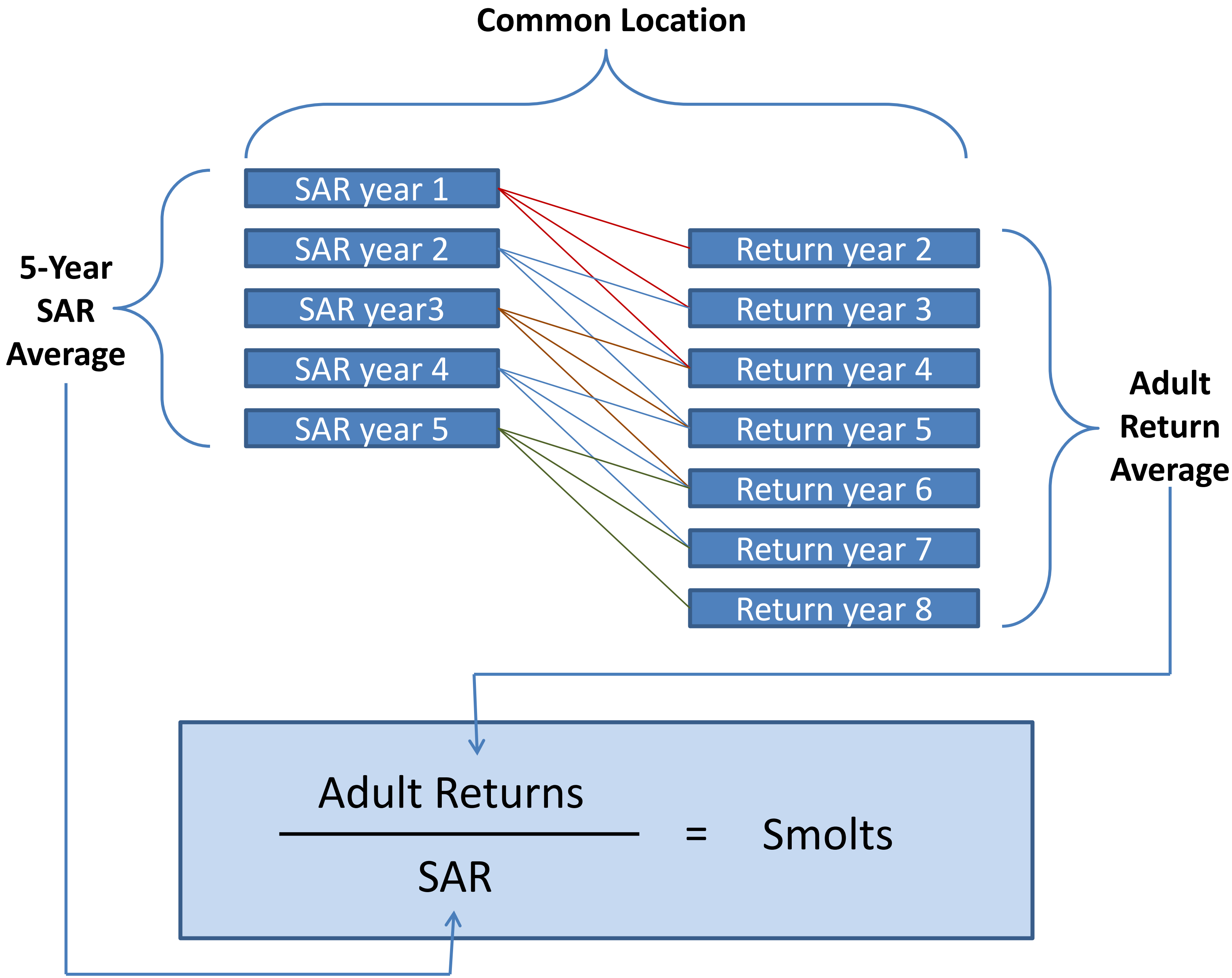
Attachment B

Returns/SARs
BAMP

Returns	**÷**	**Returns/Smolt**	**=**	**Smolts**

1. SAR and Adult Returns must match in time and space
   - Geographic location of the SAR = geographic location of the adult returns
   - SAR and adult returns must align temporally
   - We used additional years of adult returns to more fully represent the cohorts.
2. Used data from the M&E programs
3. BAMP should be calculated for each individual population (where possible) and then summed
4. The formula is self-leveling
   - SAR and adult returns tend to offset
5. Source of error is most likely under-estimate in the SAR component, resulting in an over-estimate of smolts.
6. Estimates all hatchery and wild smolts, combined
7. Assumes hatchery SAR applies to wild fish

Attachment B



Steelhead

- SAR (Wells Dam): 1999-2003 (Appendix B, 2009 DPUD M&E)
- Adult Returns (Wells Dam): 2001-2007 (Appendix A1, 2009 DPUD M&E)

$$\frac{10{,}015 \text{ returns}}{0.012994 \text{ SAR}} = 770{,}718 \text{ smolts}$$

Spring Chinook

- SAR (Methow Basin): 1999-2003 (Appendix B, 2009 DPUD M&E)
- Adult Returns (Methow Basin): 2002-2008 (Table 1-10, Methow Spring Chinook HGMP draft)

$$\frac{\text{1,504 returns}}{\text{0.00146 SAR}} = \text{1,030,646 smolts}$$

Attachment B

Summer/Fall Chinook

- SARs (Methow and Okanogan Basins): 1999-2003 (Tables 7.27; 8.21, 2009 Chelan PUD M&E)
- Adult Returns (Methow and Okanogan Basins): 2002-2008 (Tables 7.14; 8.8, 2009 Chelan PUD M&E)

Methow

$$\frac{2{,}765 \text{ returns}}{0.00190 \text{ SAR}} = 1{,}453{,}658 \text{ smolts}$$

Okanogan

$$\frac{7{,}554 \text{ returns}}{0.00922 \text{ SAR}} = 819{,}159 \text{ smolts}$$

Total Above Wells

2,272,817 smolts

Attachment C

PROPOSAL FOR RECALCULATION METHODOLOGY OF WELLS HCP NNI POPULATION DYNAMICS

Wells HCP Hatchery Committee

January 18, 2010

Douglas County Public Utility District

1.0 INTRODUCTION

The Wells HCP (2002) requires No Net Impact (NNI) hatchery compensation to be adjusted based upon the results of survival studies, and to account for population dynamics changes in the average adult returns, adult-to-smolt survival rate, and smolt-to-adult survival rate from hatchery facilities. NNI is to be adjusted in 2013, and every ten years thereafter, based on changes in population dynamics. The Wells HCP specifies, but does not require, using methodologies described in the Biological Assessment and Management Plan (BAMP, 1998) to adjust NNI for population dynamics. We propose to use the methodologies described in the BAMP, modified as described in this proposal, to adjust the Wells HCP NNI hatchery compensation for population dynamics, as described in section 8.4.5 of the Wells HCP.

2.0 BACKGROUND

Douglas County PUD produces summer steelhead, spring Chinook salmon, and summer/fall Chinook salmon as NNI hatchery compensation for unavoidable losses at the Wells Project (Table 2.1). Sockeye and coho salmon are covered for NNI by other means, and are not considered in this proposal. Sockeye salmon are covered for NNI through funding the Water Use Management Tool and coho salmon NNI is covered through a payment to the Yakama Nation to fund their coho reintroduction program. The NNI production numbers are based on an estimated number of smolts for each species that pass through the Wells Project annually, and a rate of unavoidable loss of some of these smolts at the project. This rate was established to be 3.8% in the HCP based on survival studies, and was adjusted to 3.7% based on an additional year of survival study performed in 2010 (HCP Coordinating Committee, 2010).

Table 2.1. Current NNI production targets for the Wells Project (2002-2012)

Species	NNI Smolts @ 3.8%	NNI Smolts @ 3.7%
Summer steelhead	48,858	47,751
Spring Chinook	61,071	59,464
Summer/fall Chinook	108,570	105,714

The number of smolts that pass through the project must be estimated for "population dynamics" adjustment of NNI production for 2013. The new estimates of the number of smolts passing through the project will be used in conjunction with the most updated rate of unavoidable loss to establish the new NNI production.

3.0 METHODS

The BAMP method uses an average of adult returns and an average smolt-to-adult survival rate (SAR) to estimate the average number of smolts that must have passed through the project in order to achieve the average of the adult returns (Figure 3.1).

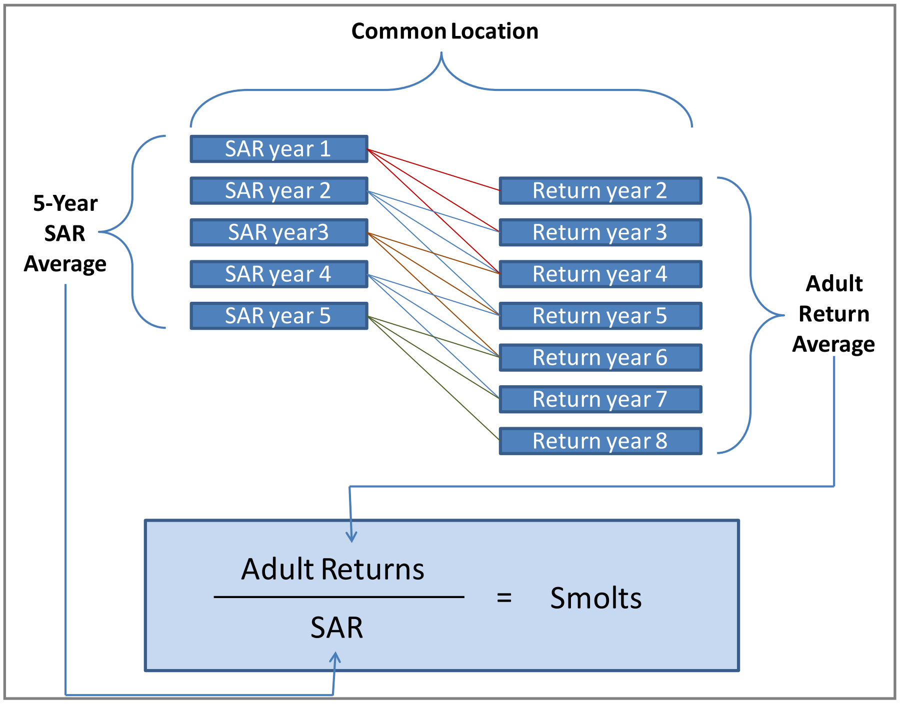


Figure 3.1. Schematic of data inputs for the BAMP smolt estimation calculation.

The BAMP describes the calculation as follows: The number of smolts passing through a project is estimated by obtaining the quotient of the rolling 5-year average of adult returns to a project divided by the rolling 5-year average of smolt-to-adult returns. We modified the BAMP calculation to account for a number of issues that were not addressed in the BAMP (1998) document (see Figure 3.1).

- The BAMP specifies using adult returns to a project (i.e., dam), but does not specify the location of the SAR estimates. We found that SARs have been calculated in varying geographic locations depending on the type of data collection that is possible or appropriate for a population. It is imperative that the SARs and the adult returns used in the BAMP calculation come from the same geographic dataset, and represent the same adult return data. Geographically mismatched SARs and adult returns (e.g. a SAR derived from coded-wire tag recoveries in a tributary and adult return counts from a dam) will result in errors. Calculations performed with such datasets are not defensible on a technical basis.
- The BAMP specifies using five years of adult returns and five years of SARs. However, this results in an adult return dataset that does not fully represent the returning cohorts used to generate the SARs. We chose to use additional adult return years to more fully account for the adult cohorts that contributed to the SARs used in the calculation.
- The BAMP does not describe how to temporally register the adult returns and SARs. We chose to use adult return years that aligned with the expected return years of the cohorts used to generate the SARs.

- Where multiple sets of SARs and adult returns are available, a BAMP calculation should be performed for each dataset separately, and the results summed to obtain an estimate of total smolt production. This helps avoid applying SARs inappropriately across populations.

The BAMP calculation assumes that 1) SARs for hatchery fish are the same as for wild fish, and 2) data from the recent past will predict future conditions in the next ten years. The BAMP relies on data that are widely and routinely collected, and repeatable across years. The most likely source of significant error is underestimation of the SAR. However, the BAMP is robust to the geographic location of SAR and adult return data. This is because both terms in the BAMP calculation are a function of the adult return number. As long as this number is used in both the SAR calculations and as the numerator in the BAMP calculation, the smolt estimate will be correct. Therefore, the most important attribute of the data is that they are the most reliable geographically synchronized data, and do not necessarily need to be collected at a dam.

We chose what we believe to be the most rigorously collected and audited data sets available that included both adult returns and SARs. Please see source documents for methods of data collection and quantitative analysis. Examples of the methodology including smolt estimates for NNI, specifics of data sources and species-specific considerations are presented below.

4.0 RESULTS

4.1 Steelhead

The steelhead analysis represents all steelhead populations upstream of Wells Dam by virtue of data collection at the dam. Both adult returns and SARs are estimated through data collection at Wells Dam.

Table 4.1. Data sources for the summer steelhead BAMP calculation.

Datum	Geographic Location	Years	Source
Adult returns	Wells Dam	2001-2007	2009 Draft DPUD M&E Report, Appendix A
SAR	Wells Dam	1999-2003	2009 Draft DPUD M&E Report, Appendix B

Table 4.2. Data used in the summer steelhead BAMP calculation.

Year	SAR %	Adult Returns
1999	2.061	--
2000	0.268	--
2001	2.072	6,629
2002	0.788	18,875
2003	1.308	9,776
2004	--	10,408
2005	--	9,732
2006	--	7,618
2007	--	7,065
average	1.2994	10,015

BAMP estimate for summer steelhead:

$$\frac{10{,}015\ adult\ returns}{1.2994\%\ SAR} = 770{,}718\ smolts$$

4.2 Spring Chinook

The only extant population of spring Chinook upstream of Wells Dam is in the Methow Basin (Good et al. 2005). Although spring Chinook may occur in the Okanogan Basin, their numbers are negligible. In addition, appropriate spring Chinook data are not available for the Okanogan. Therefore, we used only the Methow population data for the NNI calculations.

Table 4.3. Data sources for the spring Chinook BAMP calculation.

Datum	Geographic Location	Years	Source
Adult returns	Methow Basin	2002-2008	2009 Draft DPUD M&E Report, Appendix A
SAR	Methow Basin	1999-2003	2010 Draft Methow Spring Chinook HGMP, Table 1.10

The SARs were calculated for the entire Methow Basin from data in Appendix A of the 2009 DPUD M&E Report draft.

Table 4.4. Data used in the spring Chinook BAMP calculation.

Year	SAR %	Adult Returns
1999	0.083	--
2000	0.300	--
2001	0.126	--
2002	0.175	2,637
2003	0.047	1,138
2004	--	1,497
2005	--	1,376
2006	--	1,748
2007	--	1,079
2008	--	1,058
average	0.146	1,504

BAMP estimate for spring Chinook:

$$\frac{1{,}504\ adult\ returns}{0.146\%\ SAR} = 1{,}030{,}646\ smolts$$

4.3 Summer/Fall Chinook

We calculated separate BAMP estimates for the Okanogan and Methow Basins because the two populations had separate adult return and SAR data. We then summed these to arrive at the total summer Chinook smolt production upstream of Wells Dam. These two populations comprise all known populations of summer/fall Chinook upstream of Wells Dam.

Table 4.5. Data sources for the summer/fall Chinook BAMP calculation.

Datum	Geographic Location	Years	Source
Adult returns	Methow Basin Okanogan Basin	2002-2008	2009 CPUD M&E Report, Tables 7.14 and 8.8
SAR	Methow Basin Okanogan Basin	1999-2003	2009 CPUD M&E Report, Tables 7.27 and 8.21

Table 4.6. Data used in the Okanogan summer/fall Chinook BAMP calculation.

Year	SAR%	Adult Returns
1999	0.455	--
2000	1.276	--
2001	1.611	--
2002	0.775	13,857
2003	0.494	3,420
2004	--	6,721
2005	--	8,889
2006	--	8,601
2007	--	4,417
2008	--	6,975
average	0.922	7,554

BAMP estimate for Okanogan summer/fall Chinook:

$$\frac{7{,}554\ adult\ returns}{0.9222\%\ SAR} = 819{,}159\ smolts$$

Table 4.7. Data used in the Methow summer/fall Chinook BAMP calculation.

Year	SAR %	Adult Returns
1999	0.008	--
2000	0.228	--
2001	0.377	--
2002	0.283	4,630
2003	0.055	3,930
2004	--	2,189
2005	--	2,561
2006	--	2,733
2007	--	1,364
2008	--	1,947
average	0.190	2,765

BAMP estimate for Methow summer/fall Chinook:

$$\frac{2{,}765\ adult\ returns}{0.190\%\ SAR} = 1{,}453{,}658\ smolts$$

BAMP estimate total for summer/fall Chinook:

$$819{,}159\ Okanogan\ smolts + 1{,}453{,}658\ Methow\ smolts = 2{,}272{,}817\ smolts$$

5.0 SUMMARY

The calculations presented above provide liberal estimates of the number of smolts that pass through the Wells Project. It is unlikely that these are underestimates of the true number of smolts because SARs are generally underestimated, and are unlikely to be overestimated, resulting in BAMP smolt estimates that are higher than if the true SARs were known. Table 5.1 presents a summary of the BAMP smolt estimates for the Wells Project and the resulting NNI smolt production under the new 3.7% unavoidable passage loss.

Table 5.1. Summary of BAMP smolt estimates for the Wells Project and NNI smolt production at 3.7% unavoidable passage loss.

Species	BAMP smolt estimate	NNI smolt production
Steelhead	770,718	28,517
Spring Chinook	1,030,646	38,134
Summer/Fall Chinook	2,272,817	84,094

The NNI smolt production numbers (Table 5.1) demonstrate the BAMP calculation method. The final smolt estimates will incorporate the most up-to-date data available at the time of recalculation. However, these estimates should be similar to the final estimates because most of the data used to obtain these estimates will be included in the final estimates.

6.0 REFERENCES

Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Programs. 1998.

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Snow, C., C. Frady, A. Repp, A. Murdoch, M. Small, and C. Dean. 2010. Draft Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2009. *Prepared for* Douglas County Public Utility District and Wells Habitat Conservation Plan Hatchery Committee. *By* Washington Department of Fish and Wildlife, Twisp, WA. 233 p.

Attachment D

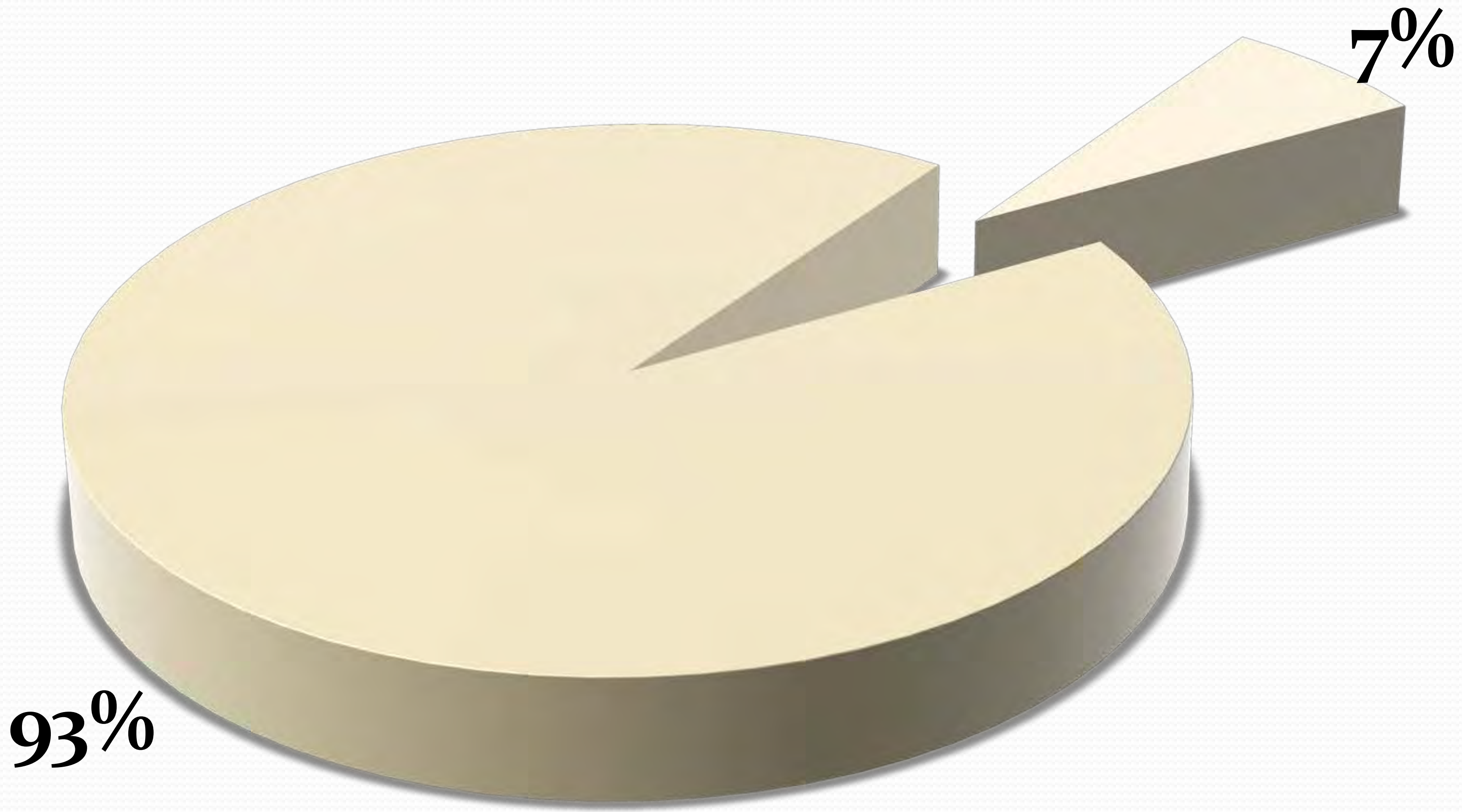
How do you estimate the number of smolts produced in a watershed?

Josh Murauskas

HCP Hatchery Committee

February 16th, 2011

Introduction



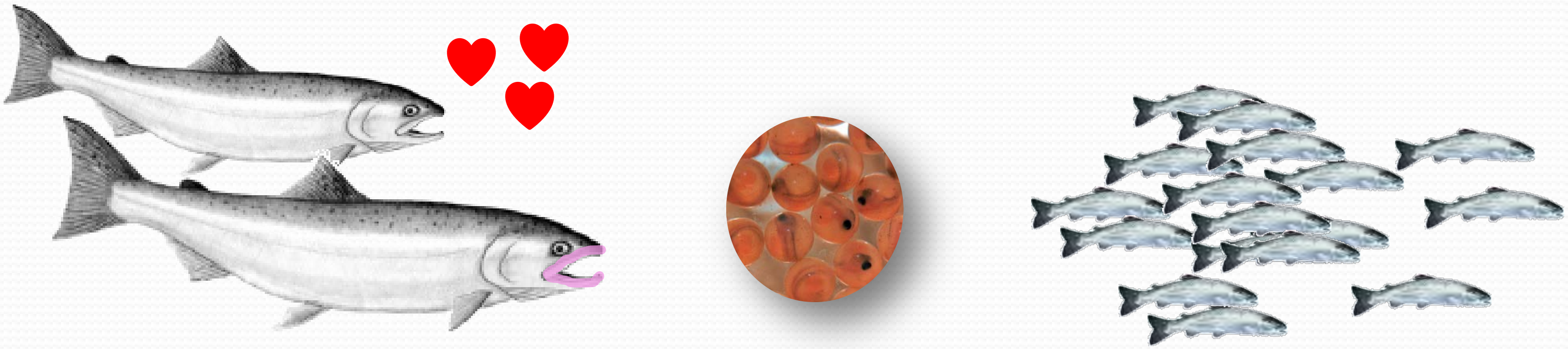
Methods

- “Egg:Smolt”
- “Redds”
- “SARs”
- “Smolt Trap”
- “Carrying Capacity”

Egg:Smolt

Spawning escapement × percent females

× fecundity × egg:smolt survival



Redds

- Number of redds × emigrants per redd

SARs, smolt trap, and capacity

- **SARs**
  - Average spawning escapement ÷ average SARs
- **Smolts trap**
  - Smolts captured ÷ efficiency
- **Carrying capacity**
  - Biological modeling based on observed data

Take-home message

- Use best available data series
- Value in M&E programs
- High estimates do not lead to best outcomes
  - Poor-performing programs lead to more brood requirements and smolt production resulting in less "bang for the buck" (Scribner 2011).

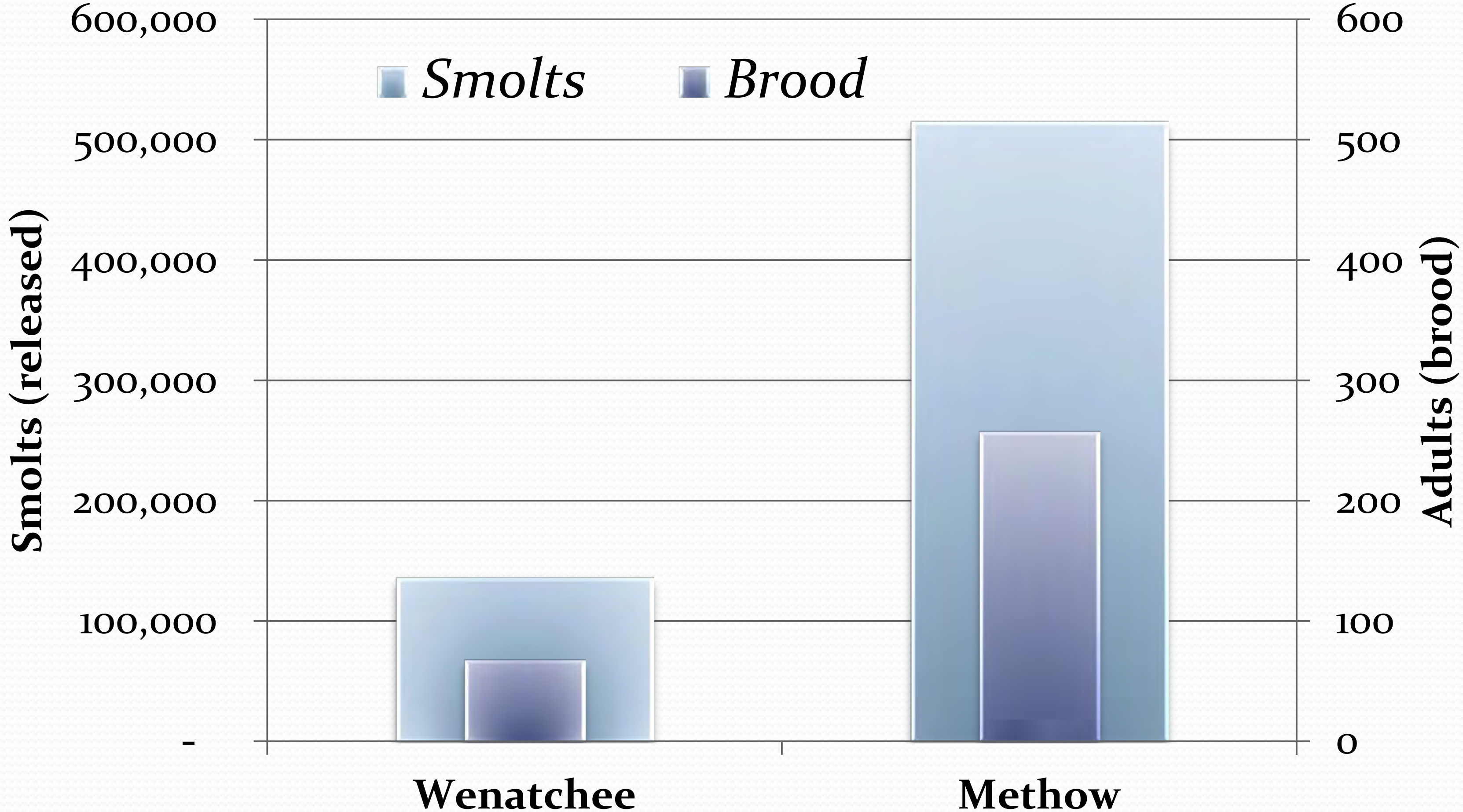
Example: Spring Chinook

System	*Biological*	*SARs*	*NNI (Bio)*	*NNI (SAR)*
Wenatchee	350,000	125,000	24,500	8,750
Entiat	50,000	150,000	7,000	21,000
Methow	100,000	650,000	14,000	91,000
Sum	***500,000***	***925,000***	***45,500***	***120,750***

Example: Spring Chinook

System	*Prod. (Bio)*	*Prod. (SARs)*	*Adults (Bio)*	*Adults (SARs)*
Wenatchee	24,500	8,750	180	64
Entiat	7,000	21,000	14	41
Methow	14,000	91,000	27	177
Sum	***45,500***	***120,750***	***220***	***281***

Fish required for 1,000 adults



Attachment E

USE OF HATCHERY MONITORING AND EVALUATION RESULTS TO ESTIMATE SMOLT PRODUCTION IN MID-COLUMBIA RIVER BASIN TRIBUTARIES

ROCK ISLAND AND ROCKY REACH HCP HATCHERY COMMITTEES

FEBRUARY 2011

INTRODUCTION

The Rock Island and Rocky Reach projects each have an Anadromous Fish Agreement and Habitat Conservation Plan (HCP) related to their Federal Energy Regulatory Commission licenses, No. 943 and No. 2145, respectively. Chelan County Public Utilities District (Chelan PUD) is responsible for funding hatchery supplementation activities associated with the HCPs. Section 8 – Hatchery Compensation Plan – within each HCP includes the following language regarding calculation of hatchery levels (8.4.2) and periodic adjustments to production [excerpted from the Rock Island HCP, beginning on Page 22):

> **8.4.2 Calculation of Hatchery Levels**. The District shall provide the funding and capacity required of the District to meet the 7% hatchery compensation level necessary to achieve NNI for all Plan Species. As set forth below, the initial estimated hatchery production capacities for Plan Species needed to compensate for Unavoidable Project Mortality are based on average adult returns of Plan Species for a baseline period, a 7% compensation requirement, and baseline adult to smolt survival rates for existing mid-Columbia River hatcheries. Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs. However, should adult survival rates fall below 98% but the Combined Adult and Juvenile survival rates is maintained above 91%, additional hatchery compensation for adult losses, toward a maximum contribution of 7% hatchery compensation, would be utilized to provide compensation for Unavoidable Project Mortality. The rationale for determining the initial capacity requirement is supported by Supporting Document C, "Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program". The Parties recognize that Supporting Document C is a supporting document and does not by itself, create contractual obligations.
>
> **8.4.3 Periodic Adjustment of District Hatchery Levels**. Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species and for changes in the adult-to-smolt survival rate, and for changes to smolt-to adult survival rate from the hatchery production facilities, considering methodologies described in the BAMP. The Hatchery Committee will be responsible for determining program adjustments considering the methodology described in BAMP and providing recommended implementation plans to the District. The District will be responsible for funding the implementation plan.

Chelan PUD funds an extensive monitoring and evaluation program (M&E) associated with the required hatchery production. That is, assessments must be conducted to ensure the two general objectives of the hatchery program – supplementation and harvest augmentation – are performing properly (Hillman et al. 2009). In some cases, the information provided by M&E efforts span multiple decades and therefore provide the most robust time series available to make population-wide inferences regarding productivity in the portion of the Columbia River Basin affected by the Rock Island and Rocky Reach hydroelectric projects. These data are presented below in a manner which is intended to provide baseline discussions within the Hatchery Committee regarding smolt production and estimation of the total number of downstream migrants that encounter each hydroelectric facility.

WENATCHEE RIVER SPRING CHINOOK

Spawning escapement of Wenatchee River spring Chinook (WRSPC) has ranged from 82 to 4,872 adults between 1989 and 2009, including fish in the Chiwawa River, Nason Creek, Little Wenatchee River, White River, Wenatchee River, Icicle Creek, and Peshastin Creek. Average spawning escapement for 2001-2009 was 2,117 adult WRSPC (Table 5.22, Hillman et al. 2009). These escapements correspond to the brood years in which complete coded wire SARs are available, i.e., 1998-2003).

Average fecundity for both wild and hatchery fish for return years between 1989 and 2009 was 4,758 eggs. An average of 52.5% females have been observed in wild and hatchery WRSPC collected for broodstock during this period. The average egg to smolt survival (based on smolt trap data and fecundity) for the entire Wenatchee Basin is 3.85% for all available brood years (i.e., 2000-2007 Table 9 in Appendix B of Hillman et al. 2009).

The five most recent complete years of CWT based SARs include 1998, and 2000-03 (Hillman et al. 2009, no hatchery releases during 1999), additionally, the incomplete SARs for BY 2005-06 were derived from DART using PIT detections at Rock Island. Overall the average SAR was 0.00693 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSPC that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$2{,}117 \times 0.525 \times 4{,}758 \times 0.0385 = \mathbf{203{,}594}\ \boldsymbol{smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$\left.{Average\ adult\ escapement}\middle/{Average\ SARs}\right. = Total\ smolts$$

Using the data above, the result would be as follows:

$$\left.{2{,}117}\middle/{0.0069}\right. = \mathbf{305{,}210}\ \boldsymbol{smolts}$$

3) Smolt trap data and calculations by WDFW (Appendix B of Hillman et al. 2009) demonstrate an average of **132,440 *emigrants*** per year for the Wenatchee Basin.

These overall results provide a range of M&E based estimates (Table 1) within the maximum habitat capacity calculated by Hillman (2010) and reported by UCRBRC (2001; based on Chapman's effective drainage area calculation using 221 smolts/sq. mi): **339,968** and **312,052**, respectively.

Table 1. WRSPC smolt production based on M&E data.

Smolt calculation method	Total WRSPC smolt production
1) Egg-smolt survival	203,594
2) SAR-based	305,210
3) Smolt trap	132,440

WENATCHEE RIVER STEELHEAD

Wenatchee River steelhead (WRST) spawning escapement has averaged 926 between 2001-2009, and includes the Chiwawa River, Nason Creek, Little Wenatchee River, White River, Wenatchee River, Icicle Creek, and Peshastin Creek.

Average fecundity for both wild and hatchery fish between 1998 and 2009 was 5,809 eggs. During this period, 51.2% of the spawners have been female. The total number of juvenile steelhead emigrating past the lower Wenatchee smolt trap was reported to be 27,373 during the 2009 migration.

The average egg to smolt survival (based on smolt trap data and fecundity) for the entire Wenatchee Basin is 1.89% for all available brood years (i.e., 2001-2005; Table 10 in Appendix B of Hillman et al. 2009). See Ward and Slaney 1993; Kostow 2004; McCubbing and Ladell 2006 for comparsion.

The five most recent complete years of CWT based SARs include 1999-03 (Hillman et al. 2009) additionally, the incomplete SARs for BY 2005-06 were derived from DART using PIT detections at Priest Rapids (consistent with stock assessment and elastomer based SAR calculations). Overall the average SAR was 0.014 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSPC that are produced in the basin using three methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for steelhead. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg\!:\!Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$926 \times 0.512 \times 5{,}809 \times 0.019 = \mathbf{52,328\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{926}/_{0.0139} = \mathbf{66,279\ smolts}$$

3) Smolt trap data and calculations by WDFW (Appendix B of Hillman et al. 2009) demonstrate an average of **37,556 smolts** per year for the Wenatchee Basin.

These overall results provide a range of M&E based estimates (Table 2) within the maximum habitat capacity reported by the UCRBRC (2001); **114,372**, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

Table 2. WRST smolt production smolt production based on M&E data.

Smolt calculation method	Total WRST smolt production
1) Egg-smolt survival	52,328
2) SAR-based	66,279
3) Smolt trap	37,556

WENATCHEE RIVER SUMMER CHINOOK

Spawning escapement of Wenatchee River summer Chinook (WRSUC) has ranged from 3,984 to 17,792 adults between 1989 and 2009, including fish in the Wenatchee River and Icicle Creek. Average spawning escapement for 2002-2008 was 9,759 adult WRSUC. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003).

Average fecundity for both wild and hatchery fish between 1989 and 2009 was 5,181 (± 79 SE) eggs. During this period, 48.05% of wild and hatchery spawners have been female

The five most recent years of CWT SAR data include 1999 to 2003 with an average of 0.00622 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$9{,}759 \times 0.4805 \times 5{,}181 \times 0.040 = \mathbf{971{,}790}\ \boldsymbol{smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{9{,}759}/_{0.00622} = \mathbf{1{,}567{,}986}\ \boldsymbol{smolts}$$

Table 3. WRSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total WRSUC smolt production
1) Egg-smolt survival	971,790
2) SAR-based	1,567,986

WENATCHEE RIVER SOCKEYE

Spawning escapement of Wenatchee River sockeye (WRSCK) has ranged from 1,025 to 29,103 adults between 1989 and 2009, including fish in the Little Wenatchee River and White River. Average escapement for 2003-2010 was 13,851 adult WRSCK. These escapements correspond to the brood years in which complete SARs are available (i.e., 2000-2003 and 2005-06)

Average fecundity for both wild and hatchery fish between brood years 1989-2008 was 2,637 eggs. During this period 48.10% of the hatchery and wild spawners were female. have been observed in wild and hatchery WRSCK collected for broodstock during this period. Freshwater productivity was determined between 1995 and 2008. The average egg to smolt survival of WRSCK was documented at 9.1%.

The five most recent complete years of CWT based SARs include brood years 2000-03 (Hillman et al. 2009). Estimates for brood years 2005-06 were derived from DART using PIT detections at Rock Island. Overall the average SAR was 0.0123 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSCK that are produced in the basin using three methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$13{,}851 \times 0.4810 \times 2{,}637 \times 0.091 = \mathbf{1,598,740\ \boldsymbol{smolts}}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{13{,}851}/_{0.0123} = \mathbf{1,124,701\ \boldsymbol{smolts}}$$

3) Application of the average smolt trap estimates. Across all years data are available (1997-2009), an average of **1,718,958 (± 513,876 SE) wild smolts** have emigrated from Lake Wenatchee.

These overall results are surprisingly consistent with each other. The wide swings in adult abundance and smolt production are typical of "natural" sockeye populations where abundance is primarily controlled by ocean productivity. (Table 4).

Table 4. WRSCK smolt production based on M&E data.

Smolt calculation method	Total WRSCK smolt production
1) Egg-smolt survival	1,598,740
2) SAR-based	1,124,701
3) Smolt trap	1,718,958

OKANOGAN RIVER SUMMER CHINOOK

Spawning escapement of Okanogan River summer Chinook (OKSUC) has ranged from 473 to 13,857 adults between 1989 and 2009, including fish in the Okanogan River and Similkameen River. Average spawning escapement for 2002-2008 was 7,554 spawners. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003).

Using data from the Methow summer Chinook program, average fecundity for both wild and hatchery fish between 1989 and 2009 was 4,979 (± 66 SE) eggs. An average of 44.40% females have been observed in wild and hatchery MRSPC collected for broodstock during this period.

The five most recent years of CWT SAR data include 1999 to 2003 with an average of 0.00922 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of OKSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios and average fecundity observed in the Wenatchee River summer Chinook, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$7{,}554 \times 0.4440 \times 4{,}979 \times 0.040 = \mathbf{667{,}978\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$Average\ adult\ escapement / Average\ SARs = Total\ smolts$$

Using the data above, the result would be as follows:

$$7{,}554 / 0.00922 = \mathbf{819{,}159\ smolts}$$

These results demonstrate two M&E based approaches for calculating smolt abundance (Table 5).

Table 5. OKSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total OKSUC smolt production
1) Egg-smolt survival	667,978
2) SAR-based	819,159

METHOW RIVER SUMMER CHINOOK

Spawning escapement of Methow River summer Chinook (MRSUC) has ranged from 460 to 4,630 adults between 1989 and 2009. Average spawner escapement for 2002-2008 was 2,765 adult MRSUC. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003)

Average fecundity for both wild and hatchery fish between 1989 and 2009 was 4,979 (± 66 SE) eggs. An average of 44.40% females have been observed in wild and hatchery MRSPC collected for broodstock during this period.

The five most recent years of CWT SAR data include 1999-2003 with an average of 0.0019 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$2{,}765 \times 0.4440 \times 4{,}979 \times 0.040 = \mathbf{244{,}500\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$Average\ adult\ escapement \big/ Average\ SARs = Total\ smolts$$

Using the data above, the result would be as follows:

$$2{,}765 \big/ 0.0019 = \mathbf{1{,}453{,}658\ smolts}$$

These results demonstrate two M&E based approaches for calculating smolt abundance.

Table 6. MRSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total MRSUC smolt production
1) Egg-smolt survival	244,500
2) SAR-based	1,453,658

METHOW RIVER SPRING CHINOOK

From the period of 2002-2008, the average Methow River spring Chinook (MRSPC) spawning escapement was 1,505 (± 234 SE) with an average of 622 redds. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003; snow et al. 2010).

In 2009, the sex ratio of adults collected at Wells was 4.39 to 1.00 male to female ratio (i.e., 19% females), and 84.3% mostly unclipped hatchery-origin fish. Fecundity for MRSPC is 4,200, based on broodstock protocols. Estimated emigrant-per-redd and egg-to-emigrant survival for MRSPC has been determined for both the Methow and Twisp rivers between 2002 and 2008. Egg-to-emigrant survival during this period has averaged 4.3% for the Twisp River and 1.1% for the Methow River. Emigrants per redd has averaged 172 for the Twisp River and 44 for the Methow River. Since the Twisp River has roughly 10 times the production of the Methow River, the weighted averages for MRSPC egg-to-emigrant survival and emigrants per redd is 4.0% and 161 emigrants, respectively. The total number of MRSPC emigrants estimated through smolt-trapping efforts in 2009 totaled 5,163 (± 4,317, 95% CI). Estimated fall MRSPC emigrants totaled 7,139 (± 1,482, 95% CI) from the Twisp River trap and 2,948 (±

535, 95% CI) from the Methow River trap in 2009. The combined production of MRSPC totaled 15,250 juvenile fish. The five most recent years of CWT SAR data include 1999-2003 with an average of 0.00146 during this period.

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of MRSPC that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1{,}505 \times 0.1855 \times 4{,}200 \times 0.040 = \mathbf{46{,}901}\ \boldsymbol{smolts}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$622 \times 161 = \mathbf{100{,}142}\ \boldsymbol{emigrants}$$

3) Application of the SAR data to average adult escapement to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{1{,}505}/_{0.00146} = \mathbf{1{,}029{,}216}\ \boldsymbol{smolts}$$

4) Application of the most recent smolt trap estimates collected from spring and fall emigrants captured in the Methow and Twisp rivers during 2009. These values indicate that **15,250 juvenile emigrants** are produced in the system on an annual basis.

These results demonstrate a potential disconnect between hatchery production levels and the biological reality of carrying capacity. The SAR based calculation of smolt numbers is an order of magnitude greater than the apparent natural productivity and is close to three times the *highest* carrying capacity of 375,921 smolts reported by the UCRBRC (2001; based on Chapman's effective drainage area calculation with 221 smolts/sq.mile).

Table 7. MRSPC smolt production based on M&E data.

Smolt calculation method	Total MRSPC smolt production
1) Egg-smolt survival	46,901
2) Redd counts	100,142
3) SAR-based	1,029,216
4) Smolt trap	15,250

METHOW RIVER STEELHEAD

Estimated maximum spawning escapement of Methow River steelhead (MRST) in 2009 was 4,484 adults, comprised of 83.9% hatchery-origin fish. Average maximum spawning escapement between 2002 and 2008 was 4,698 adult MRSPC (Snow et al. 2010). These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003). The number of redds observed between 2002 and 2009 at the Twisp and Methow combined has averaged of 1,501 redds (including the upper and lower Methow River, and the Twisp and Chewuch rivers; Snow et al. 2010).

The proportion of female steelhead observed at Wells Dam has been reported at 56.58%. Based on the broodstocking protocol the average fecundity for MRST is 5,400. Estimated emigrant-per-redd and egg-to-emigrant survival for MRST has been determined for both the Methow and Twisp rivers between 2003 and 2008. Egg-to-emigrant survival during this period has averaged 0.4% for the Methow and Twisp rivers combined (survival was not statistically different between basins and therefore pooled). Emigrants per redd has averaged 10 for both systems combined. The total number of MRST emigrants estimated through smolt-trapping efforts in 2009 totaled 31,301 (± 34,328, 95% CI).

The five most recent years of CWT SAR data include 1999-2003 with an average of 0.0130 during this period.

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of MRST that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg\colon Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$4{,}698 \times 0.5658 \times 5{,}400 \times 0.004 = \mathbf{57{,}415\ \mathit{smolts}}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1{,}501 \times\ 10 = \mathbf{15{,}010\ \mathit{emigrants}}$$

3) Application of the SAR data to average adult escapement to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$ {}^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$ {}^{4{,}698}/_{0.0130} = \mathbf{361{,}562\ \mathit{smolts}}$$

4) Application of the most recent smolt trap estimates collected from spring and fall emigrants captured in the Methow River Basin during 2009. These values provide an estimate of **31,301 smolts**.

These results highlight a wide range of smolt enumeration techniques that are within or greatly exceed the potential carrying capacity of the system (Table 8). The *highest* potential carrying capacity for MRST, reported by the UCRBRC (2001) was **137,781** smolts, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

Table 8. MRST smolt production based on M&E data.

Smolt calculation method	Total MRST smolt production
1) Egg-smolt survival	57,415
2) Redd counts	15,010
3) SAR-based	361,562
4) Smolt trap	31,301

OKANOGAN RIVER STEELHEAD

Okanogan steelhead have relatively few data to derive smolt abundance estimates. The average total spawning escapement between 2005 and 2009, was 1391, of which an average of 178 were natural origin (OBMEP 2009). During the period of 2007-2009 the average number of redds observed in the Okanogan, south of the Canadian border, was 626, which expands to 808 total for the entire watershed (total spawner counts divided by spawner/redd value observed in the U.S. for the period of 2007-09). Average fecundity for Okanogan steelhead is assumed to be the same as MRST (5,526 eggs), and the proportion of females is assumed to be 56.58%, based on spawners collected at Wells. Surrogate values of egg-to-emigrant survival (0.4%) and emigrants per redd (10) are based on data collected for MRST. The abundance of natural origin and hatchery origin Okanogan steelhead smolts were 7,533 and 91,892, respectively in 2007 (OBMEP 2007).

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1391 \times 0.5658 \times 5{,}526 \times 0.004 = \mathbf{17{,}396\ \boldsymbol{smolts}}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$808 \times 10 = \mathbf{8,080\ \mathit{emigrants}}$$

3) Application of the most recent smolt trap estimate collected from the Okanogan indicates that **7,533 wild smolts** were produced in the system in 2007.

Table 9. Okanogan smolt production based on M&E data.

Smolt calculation method	Total MRST smolt production
1) Egg-smolt survival	17,396
2)Redd counts	8,080
3) Smolt trap	7,533

ENTIAT RIVER STEELHEAD AND CHINOOK

Spawning escapement in the Entiat River was most recently reported to include 276 spring Chinook (115 redds) and 250 summer Chinook (104 redds; Hamstreet 2010). Steelhead escapement was not reported, though Johnsen et al. (2010) reported 200 redds from four reaches were documented in 2009, bringing the reported 2006-2009 average to 149 steelhead redds. Wild juvenile salmon captured in the lower Entiat River rotary screw trap included 3,422 sub-yearling spring Chinook, 1,532 yearling spring Chinook, 9,758 summer Chinook, and 1,645 steelhead. Trap efficiency averaged 16.37% for spring Chinook, and 13.82% for steelhead (Johnsen et al. 2010). The following table will be used to estimate production in the Entiat River using methodologies reported for other species above.

Table 10. Entiat River adult and juvenile M&E statistics reported by Hamstreet (2010) and Johnsen et al. (2010).

Species	Escapement	Redds	Smolts	Trap efficiency	Total smolts
Steelhead	-	200	1,645	13.82%	11,903
Spring Chinook	276	115	4,954	16.37%	30,263
Summer Chinook	250	104	9,758	16.37%	59,609

The maximum potential carrying capacity for Entiat spring Chinook, reported by the UCRBRC (2001) was **65,195 smolts**, based on Chapman's effective drainage area calculation (221 smolts/sq.mile). The maximum potential carrying capacity for Entiat steelhead, reported by the UCRBRC (2001) was **23,895** smolts, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

CONCLUSION

M&E data collected through PUD-funded hatchery programs provide considerable information that may be used to estimate production in the associated tributaries. These results should be utilized by biologists to ensure reasonable population estimates are used to inform management decisions. Table 11 provides a summary of each stock measured through PUD-funded M&E programs and how varying calculations result in population estimates.

Table 11. Summary of estimated smolt production in the mid-Columbia River Basin based on PUD-funded M&E programs, by stock and calculation method.

		Calculation method				
Basin/Stock	Applicability	Egg-smolt	Redds	SARs [1] *(Initial prod.)*	Smolt trap	Carrying capacity
Wenatchee SPC	RI (6.25%)	203,594		305,210	132,240	312,052 to 339,968
Wenatchee ST	RI (3.25%)	52,328	-	66,279	37,556	114,372
Wenatchee SUC	RI (6.25%)	971,790	-	1,567,986	-	TBD
Wenatchee SCK	RI (6.73%)	1,598,740	-	1,124,701	1,718,958	NA
Okanogan SUC	RI (6.25%)	667,978	-	819,159	-	TBD
Methow SUC	RI (6.25%)	244,500	-	1,453,658	-	TBD
Methow SPC	RI (6.25%)	46,901	100,142	1,029,216	15,250	375,921
Methow ST	RI (3.25%)	57,415	15,010	361,562	31,301	137,781
Okanogan ST	RI (3.25%)	17,396	8,080		7,533	TBD
Entiat ST	RI (3.25%)	NA	NA	NA	11,903	23,895
Entiat SPC	RI (6.25%)	51,912 [2]	51,290 [2]	NA	30,263	65,195
Entiat SUC	RI (6.25%)	24,895	NA	40,323 [3]	59,609	NA

[1] Initial production is subtracted from SAR-based estimates except for Wenatchee steelhead where a negative number results.
[2] Using fecundity, sex ratio, and freshwater productivity data from Wenatchee Spring Chinook.
[3] Based on Wenatchee River SARs (0.00622).

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APPENDIX A-SAR & Adult Returns Tables

WENATCHEE SPRING CHINOOK

Year	SAR	Spawn Escapement
1998	0.01562	
1999	No Program	
2000	0.00781	
2001	0.00488	4872
2002	0.00487	2334
2003	0.00349	785
2004		1759
2005*	0.0046	1491
2006*	0.0073	1048
2007		2059
2008		2383
2009		2323
Average	0.0069366	2117
Adult Returns/SAR		305,210

DATA: CCPUD M&E 2009
DATA:*2005-06 PIT-DART_RIA(incomplete)

WENATCHEE STEELHEAD

Year	SAR	Spawn Escapement
1998		
1999	0.0165	
2000	0.0022	
2001	0.0336	389
2002	0.0065	1348
2003	0.0027	755
2004		877
2005*		1835
2006*	0.0101	810
2007	0.0263	308
2008		804
2009		1211
Average	0.013978	926
Adult Returns/SAR		66,279

DATA: CCPUD M&E 2009 Table 3.18 and 3.16 (fish/redd x total redds)
DATA: *2005-06 SAR- DART PIT _PRA (incomplete)

Attachment E

WENATCHEE SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00252	
2000	0.01528	
2001	0.00399	
2002	0.00531	12464
2003	0.00402	9695
2004		8093
2005		9184
2006		17792
2007		4590
2008		6496
2009		
Average	0.0062	9759.142857

Adult Returns/SAR 1,567,986

DATA: CCPUD M&E 2009

WENATCHEE SOCKEYE

Year	SAR	Spawn Escapement
1999		
2000	0.0157	
2001	0.0002	
2002	0.0014	
2003		4855
2004		27556
2005	0.01407	14011
2006	0.03021	6208
2007		1870
2008		20248
2009		14452
2010		21604
Average	0.012315	13851

Adult Returns/SAR 1,124,701

DATA: CCPUD M&E 2009

DATA: DART PIT_RIA

Attachment E

OKANOGAN SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00455	
2000	0.01276	
2001	0.01611	
2002	0.00775	13857
2003	0.00494	3420
2004		6721
2005		8889
2006		8601
2007		4417
2008		6975
2009		
Average	0.0092	7554

Adult Returns/SAR 819,159

DATA: CCPUD M&E 2009

METHOW SPRING CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00083	
2000	0.003	
2001	0.00126	
2002	0.00175	2637
2003	0.00047	1138
2004		1497
2005		1376
2006		1748
2007		1079
2008		1058
2009		
Average	0.0015	1505

Adult Returns/SAR 1,029,216

DATA: DCPUD M&E 2009

Attachment E

METHOW SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00008	
2000	0.00228	
2001	0.00377	
2002	0.00283	4630
2003	0.00055	3930
2004		2189
2005		2561
2006		2733
2007		1364
2008		1947
2009		
Average	0.0019	2765

Adult Returns/SAR 1,453,658

DATA: CCPUD M&E 2009

METHOW STEELHEAD

Year	SAR	Spawn Escapement
1998		
1999	0.02061	
2000	0.00268	
2001	0.02072	
2002	0.00788	3345
2003	0.01308	10239
2004		4489
2005		4710
2006		4017
2007		2839
2008		3248
2009		
Average	0.0130	4698

Adult Returns/SAR 361,562

DATA: DCPUD M&E 2009

APPENDIX B-Excess production for application to programs with initial program levels.

	Okanogan Summer Chinook	Wenatchee Spring Chinook	Wenatchee Steelhead	Methow Spring Chinook	Wenatchee Summer Chinook	Methow Summer Chinook
Average production (2005-2010)	543,562	503,268	209,145	178,292	766,676	382,969
Calculated 7%NNI	216,554	298,000	81,275	90,000	324,831	-
Initial Production Excess	327,008	205,268	127,870	88,292	441,845	278,993

PASSAGE DELAYS AND TAKE OF ADULT SPRING CHINOOK AT TUMWATER DAM OBSERVED UNDER 100% TRAPPING OPERATIONS, 2004-2010

Prepared by
Joshua Murauskas
Chelan PUD Natural Resources Department
February 7, 2011

Overview

Tumwater Dam (Tumwater) is a remnant diversion dam located on the Wenatchee River four miles west of Leavenworth owned by Chelan County PUD (Chelan). The facility includes accommodations for fish passage and enumeration, along with trapping infrastructure for brood collection and research (Figure 1). The Washington Department of Fish and Wildlife (WDFW) are currently the primary operators of Tumwater, with the Confederated Tribes of the Yakama Nation (Yakama) also conducting activities related to coho salmon restoration.

Since 2004, the operations at Tumwater have precluded normal use of the ladder for spring- and summer-run salmon and instead diverted 100% of upstream migrants through a 15”-wide denil and into a trapping facility to support ongoing relative reproductive success studies for spring Chinook and steelhead. The high trapping rate is necessary to create a “complete” parental genotype baseline for subsequent assignments of progeny to their parents and related estimates of fitness. Under this scenario, the fishway exit gate (SG-34) is closed and the trapping chamber gate (SG-35) is opened 100% of the time (Figure 1). The denil (aka, steep pass) is only operated when staff are present in the trapping area for research and/or brood collection. When no staff are present (e.g., overnight), upstream fish passage is not permitted at Tumwater.

During these trapping operations, the entire anadromous run-at-large (up to 45,000 fish in recent years) are diverted from the ladder’s fishway exit and into the trapping facility. The average proportion of salmon species encountered at Tumwater include sockeye (65%), Chinook (26%), steelhead (5%), jack Chinook (3%), and coho salmon (1%; DART 2010). The purpose of the analyses herein is to quantify delays and take associated with these trapping activities.

Methods

Interrogation summaries of PIT-tagged fish were obtained through PTAGIS (2010). Data were filtered to select for hatchery- and wild-origin spring-run Chinook released at Chiwawa Ponds (CHIP) and the Chiwawa Trap (CHIWAT), respectively, between 2007 and 2009. Observation sites were filtered to include the lower and upper Chiwawa River, the Little Wenatchee River, lower and upper Nason Creek, the White River, and Priest Rapids, Rock Island, and Tumwater dams. The resulting records where filtered again to exclude fish with travel times less than 365 days (i.e., mini-jacks), and tabulated by tag identity and associated detections.

Delay was described as the difference between the first and last observation times at a particular observation site for each fish and reported in hours and minutes. Delays were calculated at each dam, and a histogram was constructed for delays at Tumwater. Further analyses were conducted to determine whether delays at Tumwater had an influence on detection of a Chinook in a tributary. A logistic regression was performed with delay as the dependent *x* variable, and observation in an upstream spawning tributary (yes or no) as the categorical *y* response variable. A Whole Model Test (analogous to ANOVA for a continuous response model) was performed on results to evaluate how well the model fits the data. The observed significance probability *P* represents the probability of getting, by chance alone, a Chi-square value greater than the one computed by the model. Models are judged significant when $P \leq 0.05$. Lastly, a contingency table was developed to partition arrival to a spawning tributary by last monitor name at Tumwater; that is, the upstream (Weir 18) or downstream (Weir 15) detection site within the adult fishway. These results were also used to calculate detection efficiency on the upstream array in the Tumwater fishway and determine the proportion of the run that was effectively blocked under trapping operations.

Results

The PTAGIS data query resulted in 735 detections of 214 individual adult Chinook. Median delay at Tumwater (143:35, n = 178) were significantly greater than those observed at Rock Island (00:31, n = 188) and Priest Rapids (00:06, n = 206; Wilcoxon Rank Sums $P < 0.0001$). Delays at Tumwater ranged from 0:00 to 1044:47 (~ 44 days), with 47% of all fish observed taking longer than one week (168:00) to pass the project (Figure 2).

The logistic fit indicated that delay had a significant negative effect on the probability of a fish being detected in a spawning tributary. Chinook with delays at or near one hour or less had an approximately 75% chance of being detected in a spawning tributary, where as this probability decreased to 50% at roughly 336 hours, to 25% at roughly 672 hours, and approached 0% when delays exceeded 1008 hours (Figure 3). The Whole Model Test indicated that delay is a statistically significant indicator of whether a fish is detected in a spawning tributary ($P < 0.0001$). The probability of detection in spawning tributaries varies throughout the season, though lower flows observed later in the summer produce higher probabilities of detections, thus biasing results towards delayed fish.

A contingency analysis of tributary observation (Yes or No) by last observation at Tumwater (upstream, Weir 18 or downstream, Weir 15) indicated that fish last detected at the downstream array in the Tumwater fishway had a significantly lower probability of reaching a spawning tributary ($P < 0.0001$). Since 94% of fish last detected at Weir 15 are not detected in spawning tributaries, and the probability of last being detected at Weir 15 is significantly increased with delay ($P < 0.0001$), this analysis provides another indicator of the negative effect of delays caused by trapping.

Based on the observed data presented in Table 1, 18.5% of PIT-tagged spring Chinook that encountered Tumwater were unable to ascend the trapping denil and complete upstream passage. That is, 33 of 178 total fish were last detected at the downstream array within the fishway, and the high detection efficiency of Weir 18 (103 of 105 fish, or 98.1%) does not significantly change the observed values. This data indicate that the observed escapement of 5,101 spring Chinook in 2010 reported by WDFW (Table 2) represented only 81.5% of the total number of fish that encountered Tumwater. This suggests that a total of 1,158 adult spring Chinook were unable to ascend the trapping denil and upstream passage was blocked for these individuals. This “take” – defined as killing, harming, wounding, etc. – only represents the proportion of those individuals physically blocked at the trapping denil and does not account for any effects manifested in fish that successfully ascended the trap but were significantly delayed.

Additional information on spring Chinook survival in the Wenatchee River Basin is available from WDFW (Murdoch 2011). Table 2 represents total survival for each year between 2000 and 2010, with additional columns added to denote trapping scenarios at Tumwater. Although the small sample size for each operation precludes robust statistical analyses, total survival under 100% trapping has averaged 44.5% (± 5.5% SE) between 2007 and 2010, a 33% reduction from the 66.0% (± 5.7% SE) survival observed prior to 100% trapping periods first initiated in 2004. Other factors, such as run size, may confound these observations, though a linear relationship between run size and survival is not statistically significant (*P* = 0.167). Further, average run sizes are nearly identical between 2000-2003 and 2004-2005, with 2001 representing the largest run and 4th highest survival.

Conclusions

Based on the above analyses, the following conclusions are presented:

1. Delays at Tumwater under 100% trapping operations are significantly longer (e.g., up to 143,000% greater) than those observed at other projects by the same group of fish.

2. The increasing duration of delays at Tumwater significantly decreases the probability of a fish subsequently being detected in a spawning tributary.

3. The increasing duration of delays at Tumwater significantly increases the probability of a fish being last detected at the downstream array within the adult fishway, located at Weir 15.

4. Over 94% of fish last detected at the downstream array within the Tumwater adult fishway will not be subsequently detected in a spawning tributary.

5. Nearly one of every five (18.5%) adult spring Chinook that reach Tumwater Dam are unable to ascend the trapping denil and complete upstream passage.

6. Survival of adult spring Chinook is not significantly related to run size in the Wenatchee River Basin.

7. Average observed survival rates of spring Chinook are 32.6% lower under 100% trapping operations compared to those observed prior to 2004 when trapping was performed on an as-needed basis.

Given these data, and the known effects of handling (i.e., migratory delay, fallback, and mortality; Bernard et al. 1999; Boggs et al. 2004; Bromaghin et al. 2007), current trapping and research activities at Tumwater are having a negative impact on ESA-listed spring run Chinook salmon in the Wenatchee River Basin and should be reconsidered immediately. A conservative estimate of take exceeded 1,000 adult fish in 2010.

References

Bernard, D.R., J.J. Hasbrouck, and S.J. Fleischman. 1999. Handling-induced delay and downstream movement of adult chinook salmon in rivers. Fisheries Research 44(1):37-46.

Boggs, C.T., M.L. Keefer, C.A. Peery, and T.C. Bjornn. 2004. Fallback, reascension, and adjusted fishway escapement estimates for adult Chinook salmon and steelhead at Columbia and Snake river dams. Transactions of the American Fisheries Society 133:932-949.

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Attachment F

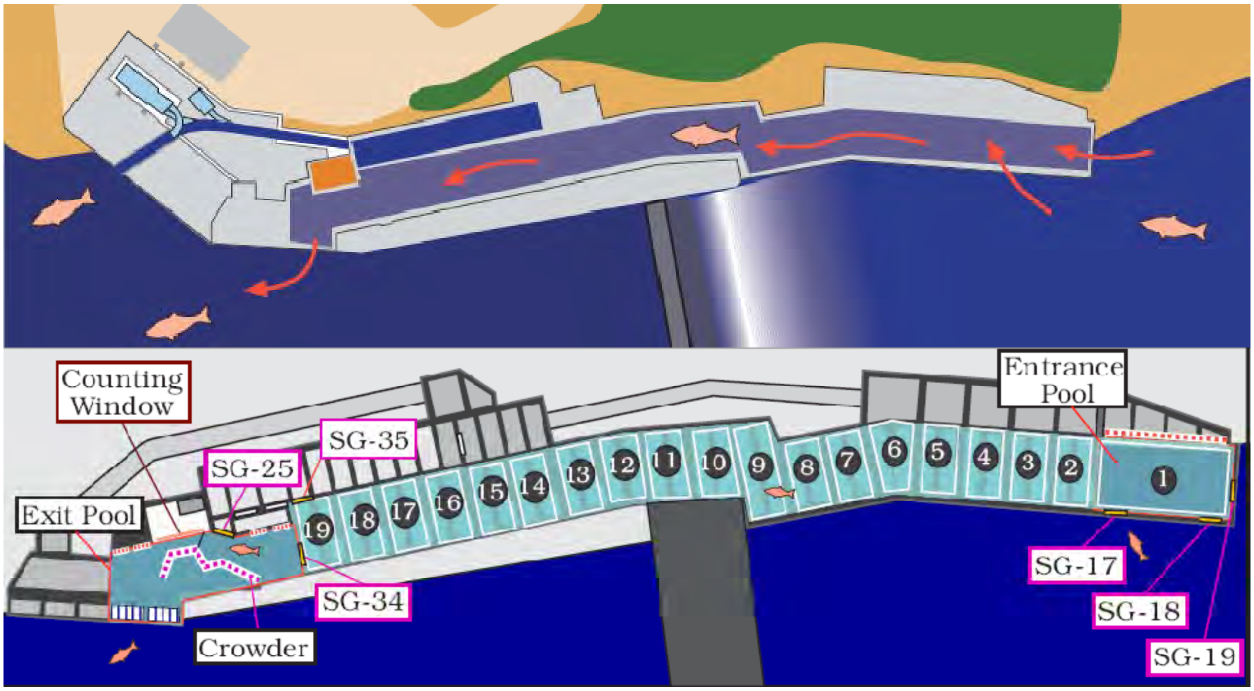


Figure 1. General overview of Tumwater Dam (top), and specific pool and gate configuration. Fishway PIT-arrays are located at Weir 15 (downstream) and Weir 18 (upstream). The fishway was designed to have SG-34 open and SG-35 closed for normal passage, and the opposite configuration for trapping activities.

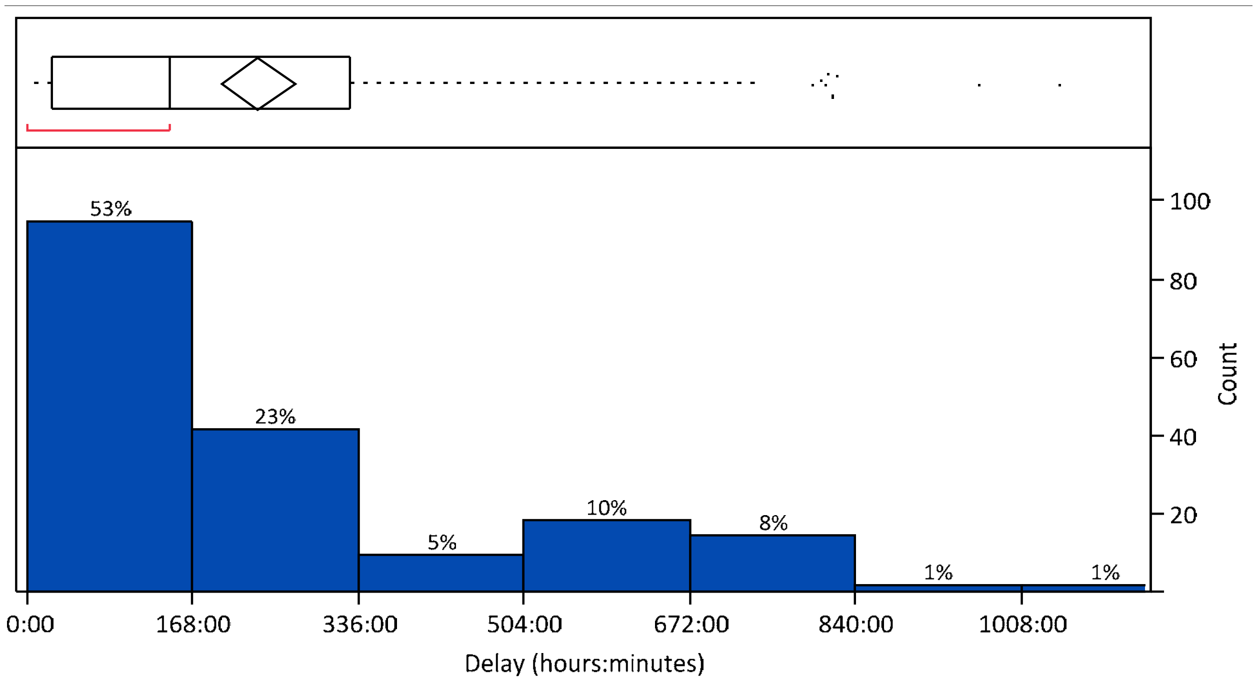


Figure 2. Distribution of spring Chinook delays (in week increments) observed at Tumwater Dam, 2008-2010, including count axis, percentage of the totals atop histograms, and box plot with shortest half (red), mean diamond, and outliers.

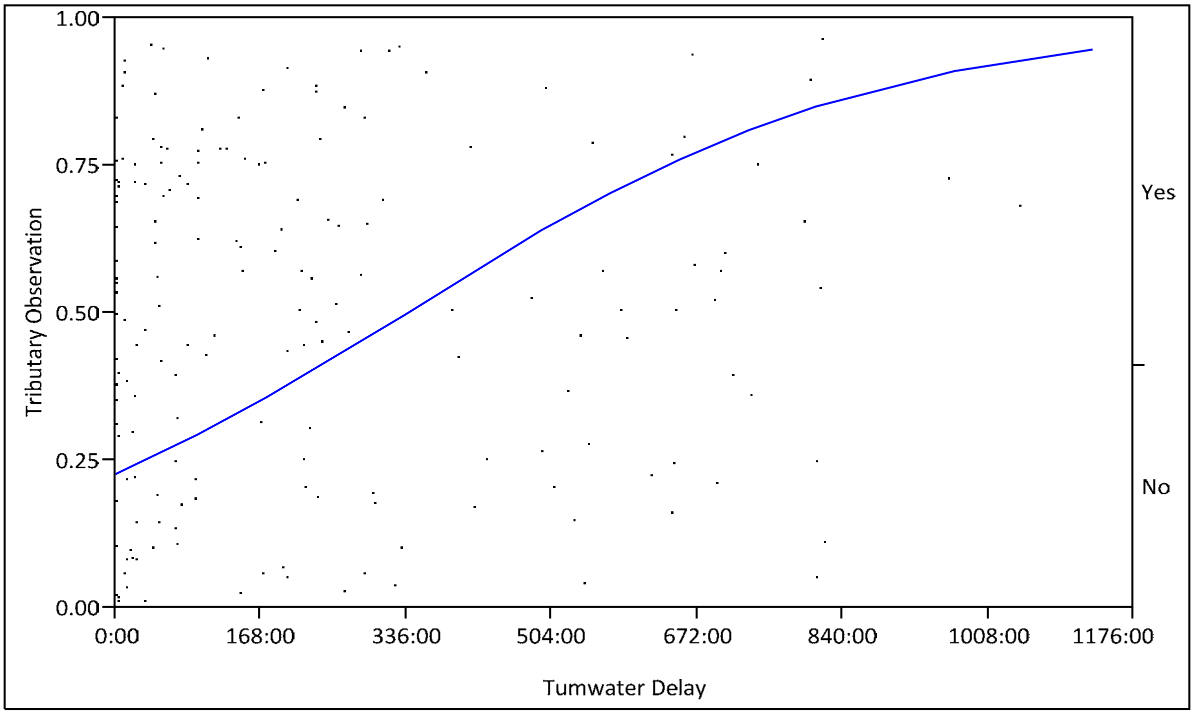


Figure 3. Logistic fit of tributary observation by Tumwater delay. Fit line represents the increasing probability of *Tributary Observation = No* as delay increases. Whole Model Test resulted in a $P < 0.0001$. Delay (hours:minutes) are divided in one-week increments.

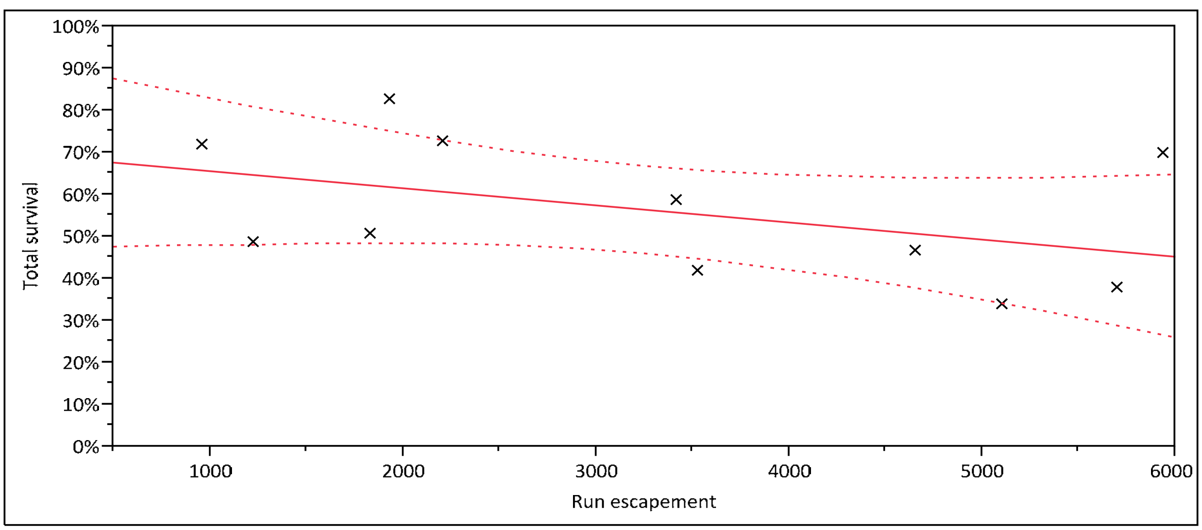


Figure 4. Total survival by spring Chinook run escapement in the Wenatchee River Basin, 2000-2010. Linear relationship is not significant ($P = 0.167$).

Table 1. Contingency table of tributary observations by last observation in the Tumwater Fishway.

Last Tumwater observation	Tributary observation *Yes*	*No*	Total
Weir 15	2	33	35
Weir 18	103	40	143
Total	**105**	**73**	**178**

Table 2. Estimated survival (female and total) of spring Chinook from Tumwater Dam to spawning for the upper Wenatchee Basin (provided by A. Murdoch, WDFW, in January 31, 2011 memorandum; trap operations column added, personal communication, N. Dietrich, WDFW).

Year	Run escape.	Females	Redds	Spawning escape.	Female survival	Total survival	100% trapping	Average survival
2000	960	356	282	688	0.79	0.72	As needed	66.0% ± 5.7% SE
2001	5,935	3,709	1,788	4,130	0.48	0.70	As needed	
2002	2,202	1,074	787	1,613	0.73	0.73	As needed	
2003	1,223	503	248	603	0.49	0.49	As needed	
2004	1,931	721	491	1,608	0.68	0.83	~4 mos.	58.7% ± 12.4% SE
2005	3,529	1,968	818	1,472	0.42	0.42	~4 mos.	
2006	1,825	1,037	528	940	0.51	0.51	~4 mos.	
2007	3,414	717	438	2,006	0.61	0.59	~10 mos.	44.5% ± 5.5% SE
2008	5,693	3,393	1,274	2,140	0.38	0.38	~10 mos.	
2009	4,652	1,427	686	2,195	0.48	0.47	~10 mos.	
2010	5,101	2,370	807	1,737	0.34	0.34	~10 mos.	

Attachment G

Chelan PUD   February 17 <u>FINAL</u> , HCP Hatchery Committee

TUMWATER PASSAGE

The issues

- We have a delay problem
- Current ESA coverage
- Future ESA coverage

Significant Delays

- Spring Chinook –ESA listed "Endangered"
- Sockeye –Regional fisheries, downstream harvest
- Bull Trout –ESA listed "Threatened"
- 2010 PIT Tag analyses by Chelan, CRITFC, and USFWS
- No disagreement here (?)

Effect of Delays?

- Pre-trapping
  - Serial *ascent-and-fallback* within ladder over days and weeks.
  - Significant numbers disappear before reaching trap

- Post-trapping
  - Physiological stress?
  - Disease susceptibility?
  - Pre-spawn mortality?
  - Depends on view of data-subjective

Indirect evidence of post-trapping effects

- The first fish arriving at Tumwater have the smallest delay…
  - "For both sexes, run time had a smaller but still significant effect on fitness, with earlier returning fish favored (Ford et al. 2009)"
- Documented high levels of pre-spawn mortality…
  - "(M)any of the adults sampled at Tumwater Dam in fact produced no progeny, because pre-spawn mortality in this population has been estimated to be as high as 50% (Murdoch et al. 2008)."
- Are these related to trapping?

Current ESA Coverage

- Permit 1196
  - Intentional Take: Adult and jack endangered UCR spring chinook salmon (both natural and hatchery origin) that return to the Chiwawa River weir and potentially at a future weir on Nason Creek, and Tumwater Dam each year may be captured, anesthetized, handled (enumerated, measured, sampled for tissues and/or scales), passive integrated transponder (PIT) tagged, and released for the investigation of reproductive success and general program monitoring of naturally spawning hatchery and naturally produced spring chinook salmon in the Wenatchee River.
  - The Permit Holders must ensure that all ESA-listed species are handled carefully. <u>Should NMFS determine that a procedure provided for under this permit is no longer acceptable, the Permit Holders must immediately cease such activity until an acceptable substitute procedure is identified and approved by NMFS</u>.

Permit 1196 continued

- In trapping operations directed at the collection of broodstock, the Permit Holders shall apply measures that minimize the risk of harm to listed salmon and spring chinook salmon. These measures include, but are not limited to: limitations on the duration (hourly, daily, weekly) of trapping in mainstem river areas to minimize capture and handling effects on listed fish; limits on trap holding duration of listed fish prior to release; application of procedures to allow safe holding, and careful handling and release of listed fish; and allowance for free passage of listed fish migrating through trapping sites in mainstem and tributary river locations when those sites are not being actively operated.

- The Permit Holders are responsible for the actions of any individual operating under the authority of this permit. Such actions include capturing, handling, releasing, tagging, transporting, maintaining, and caring for any ESA-listed species authorized to be taken by this permit.

Current ESA coverage

- Permit 1347
  - The Permit Holders shall limit operation of Tumwater Dam trap for the collection of sockeye salmon broodstock to no more that three days per week, beginning after the sockeye migration peak at Rock Island Dam, but no earlier that July 15.

- Rocky Reach 2008 USFWS Biological Opinion
  - The Biop allows Chelan **1 lethal take** for trapping operations at Tumwater and Dryden.
  - "As previously described, the broodstock collection facilities are operated approximately 42% (<u>4 days a week and 24 hours a day) of the time adult and juvenile/sub-adult bull trout are in the mainstem Wenatchee River…"</u>

Current ESA coverage

- Rocky Reach 2008 USFWS Biological Opinion

- "Tumwater and Dryden Dam Broodstock Collection Facilities - a total of 123 adults and 116 juvenile/sub-adults are expected to be harassed at Tumwater and Dryden Dams (combined total); 15 of the adults are expected to be alternate year spawners and may be impacted to a greater degree while using the FMO habitat and trying to migrate back and forth. One adult and 12 juvenile/sub-adults may be killed."

Future ESA coverage

- Separate permits for hatchery operations and the spring Chinook RRS

2009 Wenatchee Sp. Chinook HGMP p 32:

1. “The first permit should encompass Chelan PUD hatchery program obligations arising out of its HCPs and currently implemented by WDFW as its agent. Chelan PUD and WDFW should be designated as co-permit holders”
2. “A third permit should be issued to WDFW encompassing the relative reproductive success study detailed in Section 12 of this HGMP.”

Future ESA Coverage

- Obtaining a hatchery operations permit will require a solution for Tumwater
- Chelan supports implementing a conservative trapping schedule now
- Chelan supports WDFW + NOAA + BPA obtaining separate ESA coverage for any aspect of the RRS that requires additional trapping at Tumwater
- Chelan believes that the continuation of current activities could result in a level of take occurring that could exceed future authorized levels and therefore cannot continue (*clarified 2/17/2011*).

Chelan's Proposal

- Trapping 3 days on with 4 days off (16 hours/day) for future operations and adaptive flexibility for HC to modify with additional data

Why?

- Consistent with other facilities and existing permits (1347)
- More flexibility than no operations at Tumwater
- Timing-we need a hatchery operations permit and will not be able to move forward without a plan that NOAA can evaluate
- Other options may work, but we need to start somewhere.

Next steps

1. Come to some agreement on a trapping plan for submittal to NOAA
2. WDFW or NOAA or BPA needs to obtain separate ESA coverage for the spring Chinook RRS—This project operates outside of the HCP authority and decision-making process.

References

- Ford M, Williamson K, Murdoch A, Maitland T, (2009) Monitoring the reproductive success of naturally spawning hatchery and natural spring Chinook salmon in the Wenatchee River

  BPA Project No. 2003-039-00, Contract No. 41346 and 41826 Performance Period March 1, 2008-February 29, 2009
- Murdoch A, Pearsons T, Maitland T, Ford M, Williamson K (2008) Monitoring the reproductive success of naturally spawning hatchery and natural spring Chinook salmon in the Wenatchee River. BPA Project No. 2003-039-00. Bonneville Power Administration, Portland, Oregon. http://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P106770. Department of Energy, Bonneville Power Administration.

Attachment H

Tumwater Dam

Agenda

- Spring Chinook Passage at Tumwater
- CCPUD Analysis
- Pre-spawn Mortality

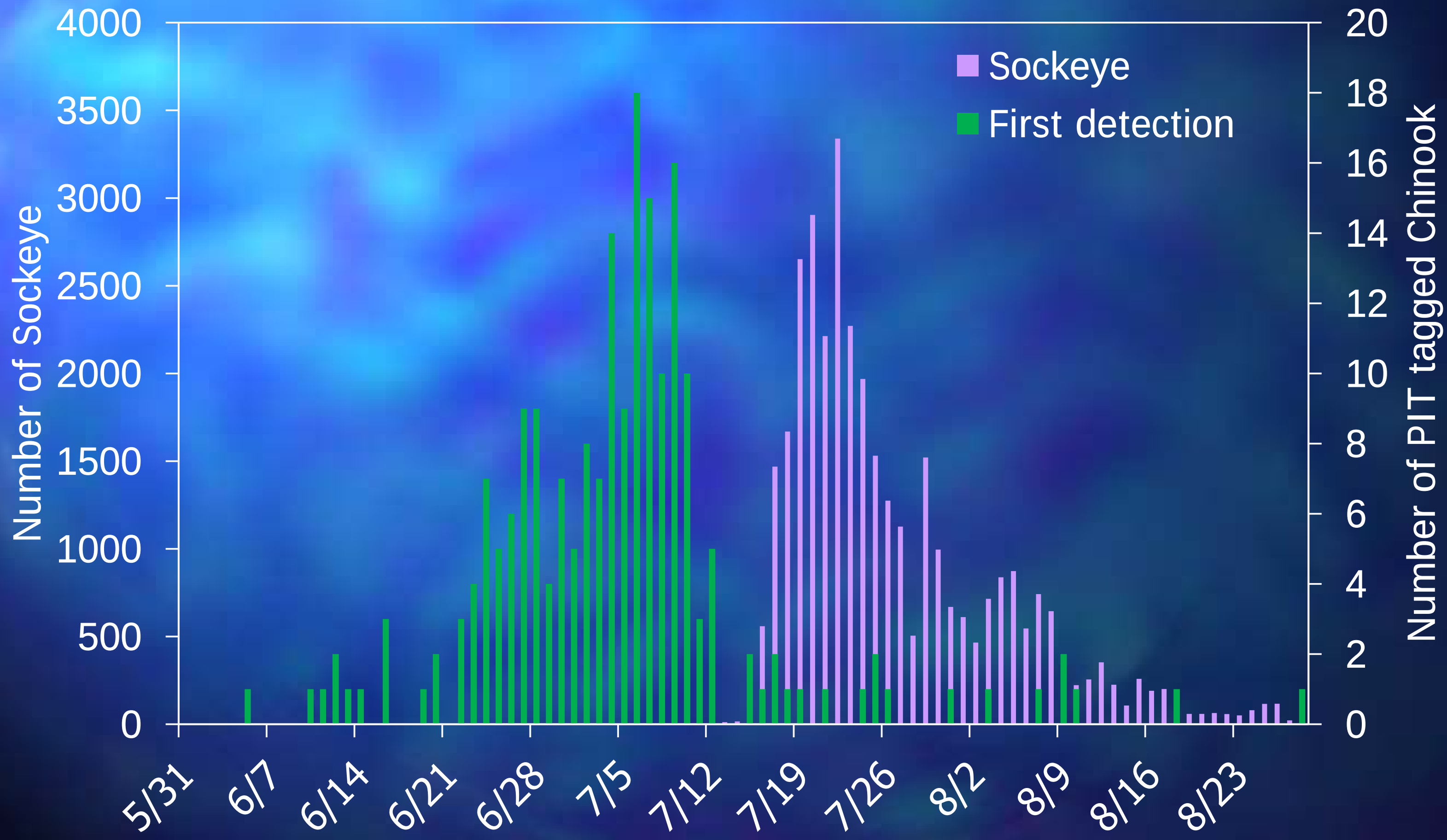
Attachment H

Tumwater Operations

- Broodstock
  - 1989 to 2003
  - July 15 to November 15
  - 3 d/week; 6-12 h/day
- Reproductive Success study
  - 2004 to 2010
  - ~100% of spring Chinook run

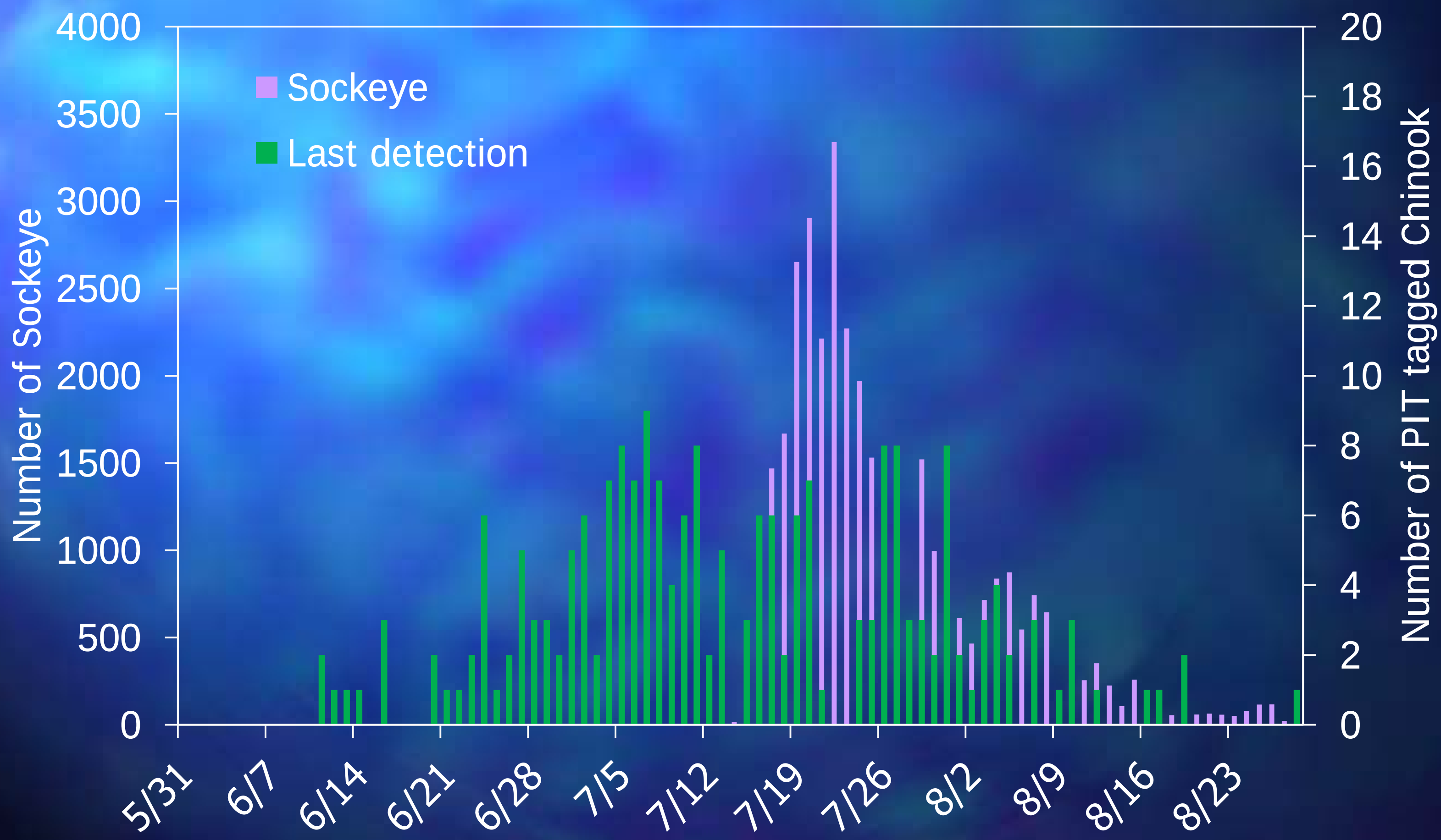
Attachment H

Spring Chinook detections at Weir 15



Attachment H

Spring Chinook detections at Weir 18



Attachment H

Tumwater Passage and Sockeye Arrival

Year	Sockeye Arrival		Number of spring Chinook (%)		Passage time (d)	
			Enter	Exit	Median	Mean
2009	July 7	Before	67 (92)	44 (60)	1	3
		After	3 (8)	29 (40)	13	16
2010	July 15	Before	187 (90)	112 (54)	1	3
		After	20 (10)	95 (46)	15	17

Recommendations for Tumwater Operations during RRS

- Tumwater Working Group has developed improvements to reduce denile down time
- Reprogram funding to increase staff at Tumwater during spring Chinook trapping in order to implement TWG improvements.
  - 3-two persons crew to 3-three person crew
- Pull additional pickets from V trap to facilitate entrance into the trap
- Monitor PIT tag fish passage weekly
- Pull trap completely when the “sockeye effect” has been detected

CCPUD Analysis

- Excellent summary of passage problem at Tumwater Dam
- Logistical regression based on passage delay and PIT tag detection at an array
- Good approach to answer the question and analysis appears to be set up correctly
- Fish delayed more than 12 h had a significantly lower probability of being detected at a tributary array

WDFW concerns

- Representative sample size
- Assumption 1
  - All spring Chinook migrate into a spawning tributary before any natural prespawn mortality occurs.
- Assumption 2
  - All PIT tagged fish have an equal probability of detection in all spawning areas.

Sample Size

- 178 Previously PIT tagged fish

Year	Tumwater			PIT tagged		Proportion PIT tagged		
	Total	Adults	Jack	Jack	Adult	Jack	Adult	Total
2008	5590	4971	619	15	0	0.024	0.000	0.003
2009	4787	3038	1749	16	34	0.009	0.011	0.010
2010	5141	4813	328	12	101	0.037	0.021	0.022
Total	15571	12822	2696	43	135	0.016	0.011	0.011

Gender Composition

Gender	Age	Number	%
Female	4	39	22
	5	7	4
Male	3	34	19
	4	48	27
	5	2	1
Unknown	3	9	5
	4	35	20
	5	4	2

- 27% (N=48) had no gender assigned.
- Double tagged fish would create detection problem at an array.
- 2004 – 2009 fish were double tagged to increase detections on spawning grounds.
- 2010 fish were not purposely double tagged, but previously PIT tagged fish were still missed (i.e., no gender for 30 fish in 2010).

Attachment H

CCPUD Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	9	26	35
% of total	5%	15%	20%
Delay YES	64	79	143
% of total	36%	44%	80%
Column totals	73	105	178
Percent of total	**41%**	59%	
Chi-square (df=1)	4.21	p= .0401	
V-square (df=1)	4.19	p= .0407	
Yates corrected Chi-square	3.46	**p= .0627**	

Female Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	5	11	16
% of total	11%	24%	35%
Delay YES	10	20	30
% of total	22%	43%	65%
Column totals	15	31	46
Percent of total	**33%**	67%	
Chi-square (df=1)	.02	p= .8858	
V-square (df=1)	.02	p= .8871	
Yates corrected Chi-square	.03	**p= .8520**	

Male Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	2	14	16
% of total	2%	17%	19%
Delay YES	19	49	68
% of total	22%	58%	81%
Column totals	21	63	84
Percent of total	**25%**	75%	
Chi-square (df=1)	1.65	p= .1994	
V-square (df=1)	1.63	p= .2021	
Yates corrected Chi-square	.93	**p= .3358**	

Adult Male Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	2	11	13
% of total	4%	22%	26%
Delay YES	10	27	37
% of total	20%	54%	74%
Column totals	12	38	50
Percent of total	**24%**	76%	
Chi-square (df=1)	.71	p= .3978	
V-square (df=1)	.70	p= .4026	
Yates corrected Chi-square	.22	**p= .6398**	

Attachment H

Unknown Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	2	1	3
% of total	4%	2%	6%
Delay YES	35	10	45
% of total	73%	21%	94%
Column totals	37	11	48
Percent of total	**77%**	23%	
Chi-square (df=1)	.20	p= .6575	
V-square (df=1)	.19	p= .6609	
Yates corrected Chi-square	.07	**p= .7902**	

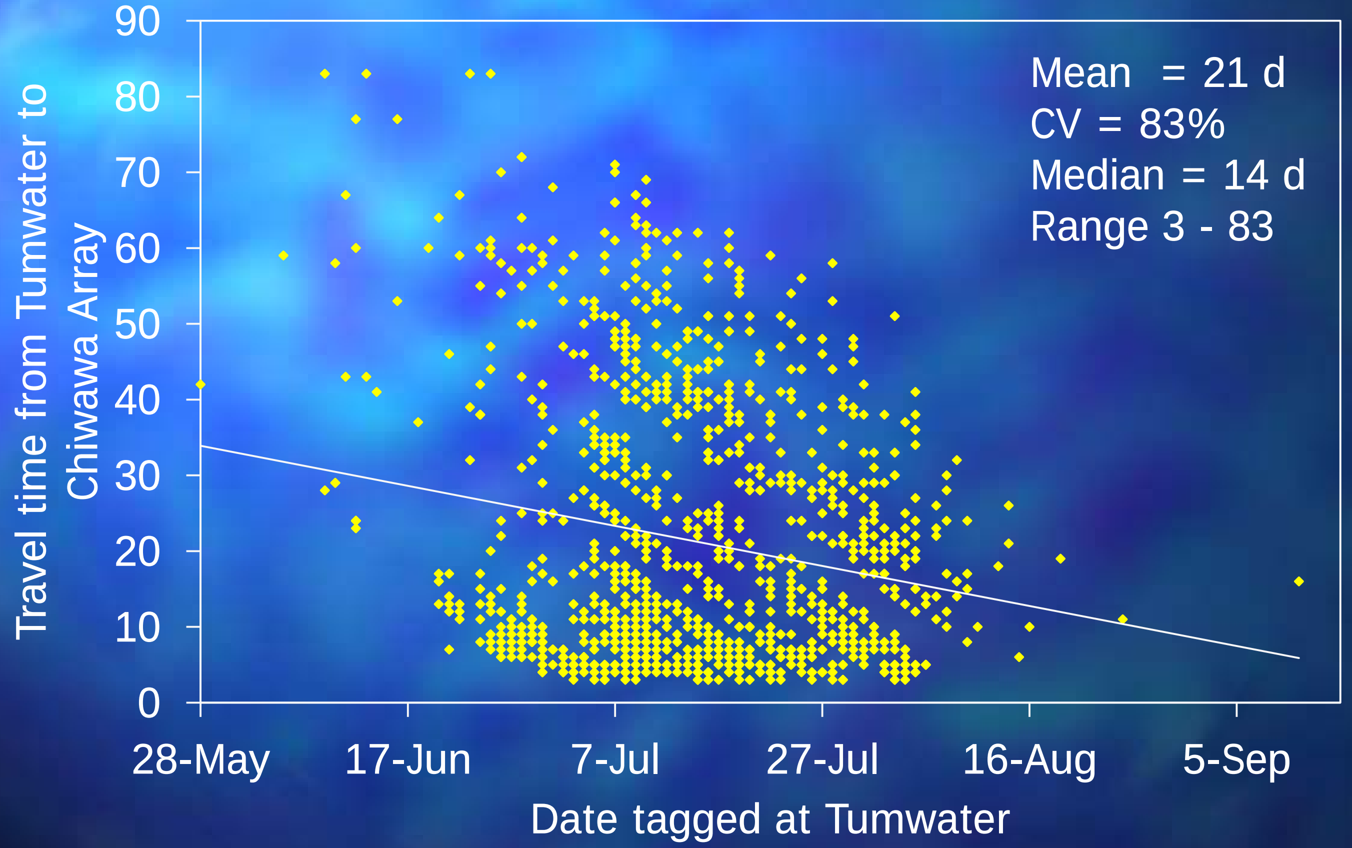
Attachment H

No Fish of Unknown Gender Chi-square analysis

	Tributary NO	Tributary YES	Row – Totals
Delay NO	7	25	32
% of total	5%	19%	25%
Delay YES	29	69	98
% of total	22%	53%	75%
Column totals	36	94	130
Percent of total	**28%**	72%	
Chi-square (df=1)	.72	p= .3970	
V-square (df=1)	.71	p= .3988	
Yates corrected Chi-square	.38	**p= .5356**	

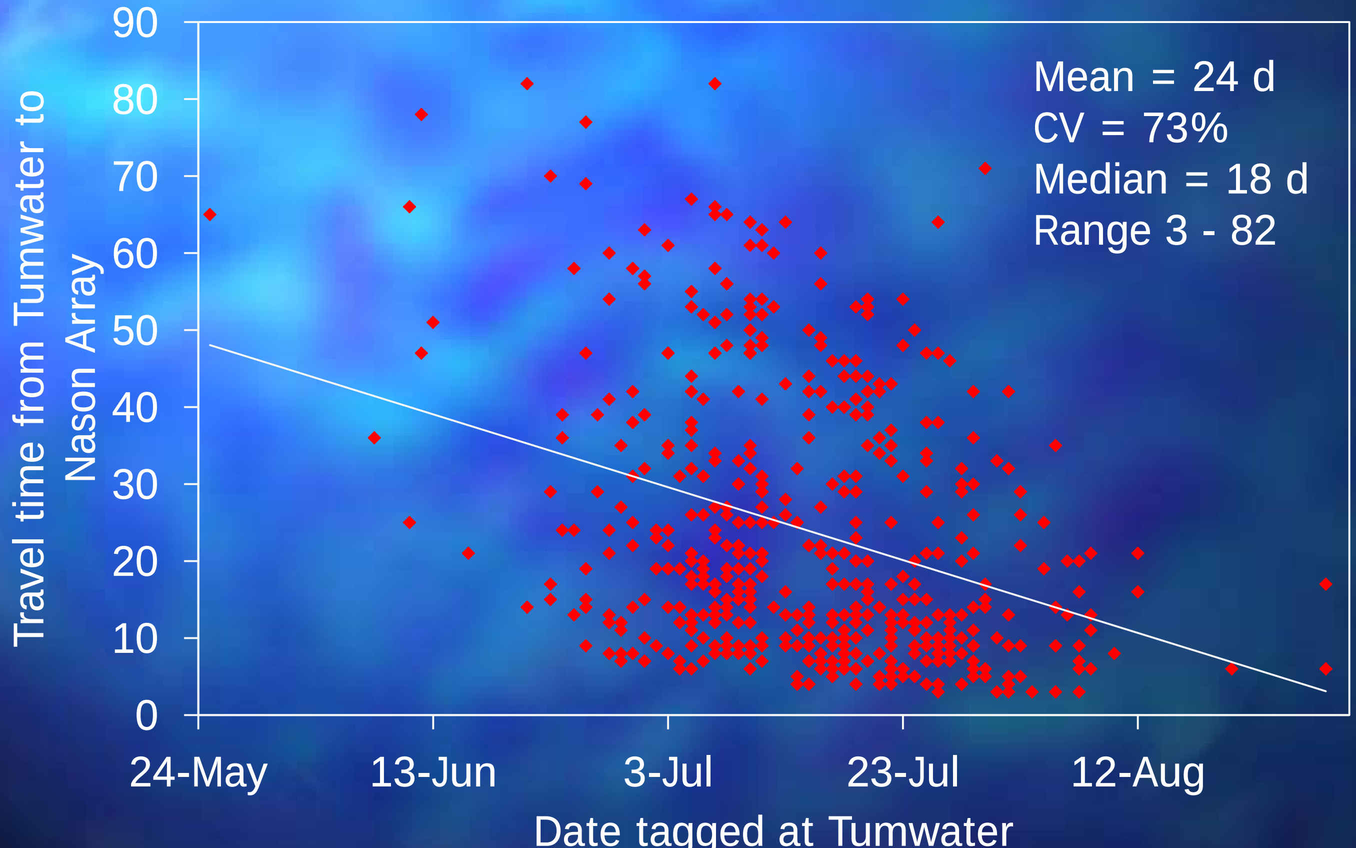
Attachment H

Assumption 1 (No mortality)



Attachment H

Assumption 1 (No mortality)



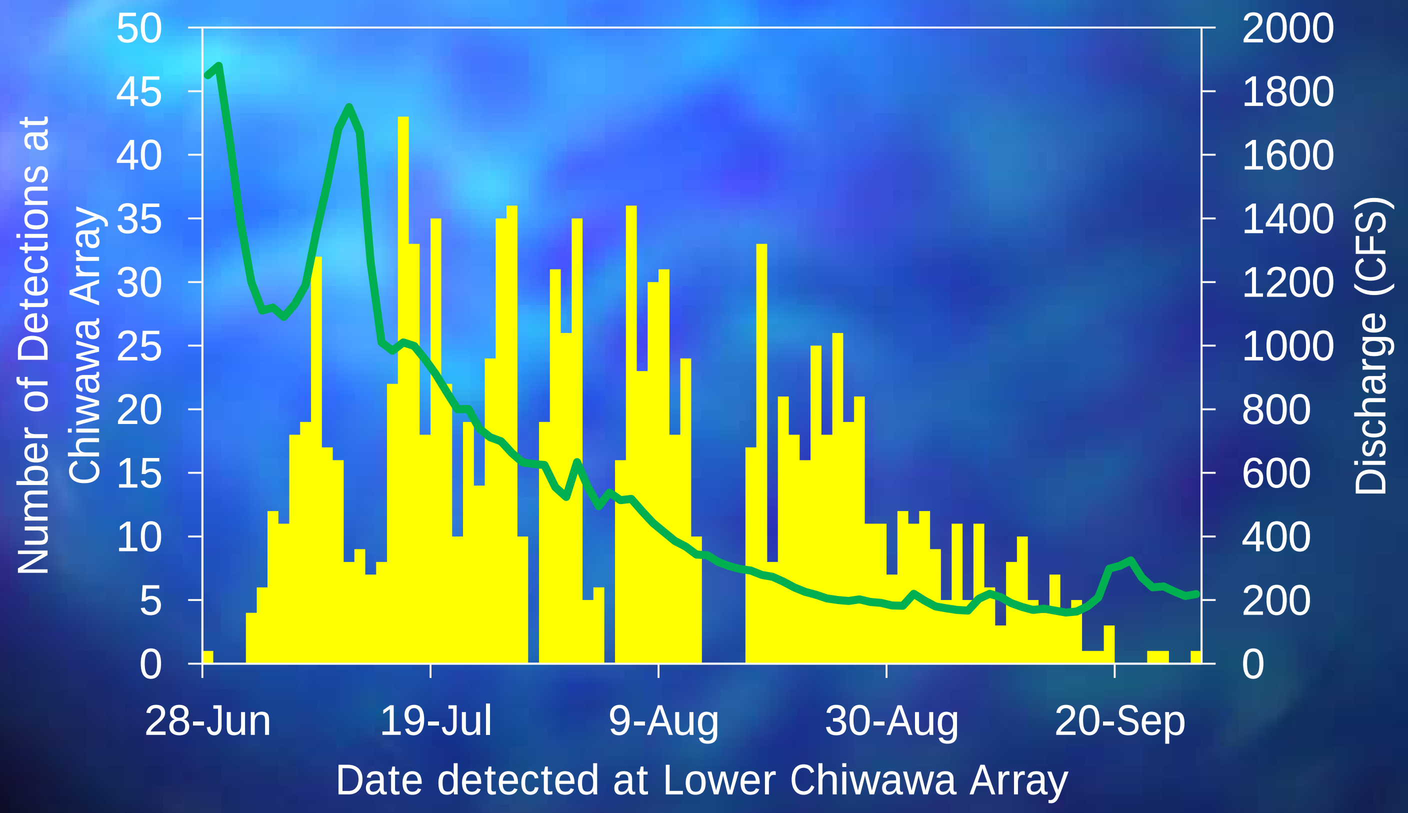
PIT tag Arrays (Equal probability)

- 69% Chiwawa hatchery
- 31% Chiwawa wild

Potential Recovery Streams	Date of Operation
Chiwawa	2008
Nason	2008
Little Wenatchee	2009
White River	2009
Upper Wenatchee	2011
Chiwaukum	2011
Peshastin	2008
Icicle	2012

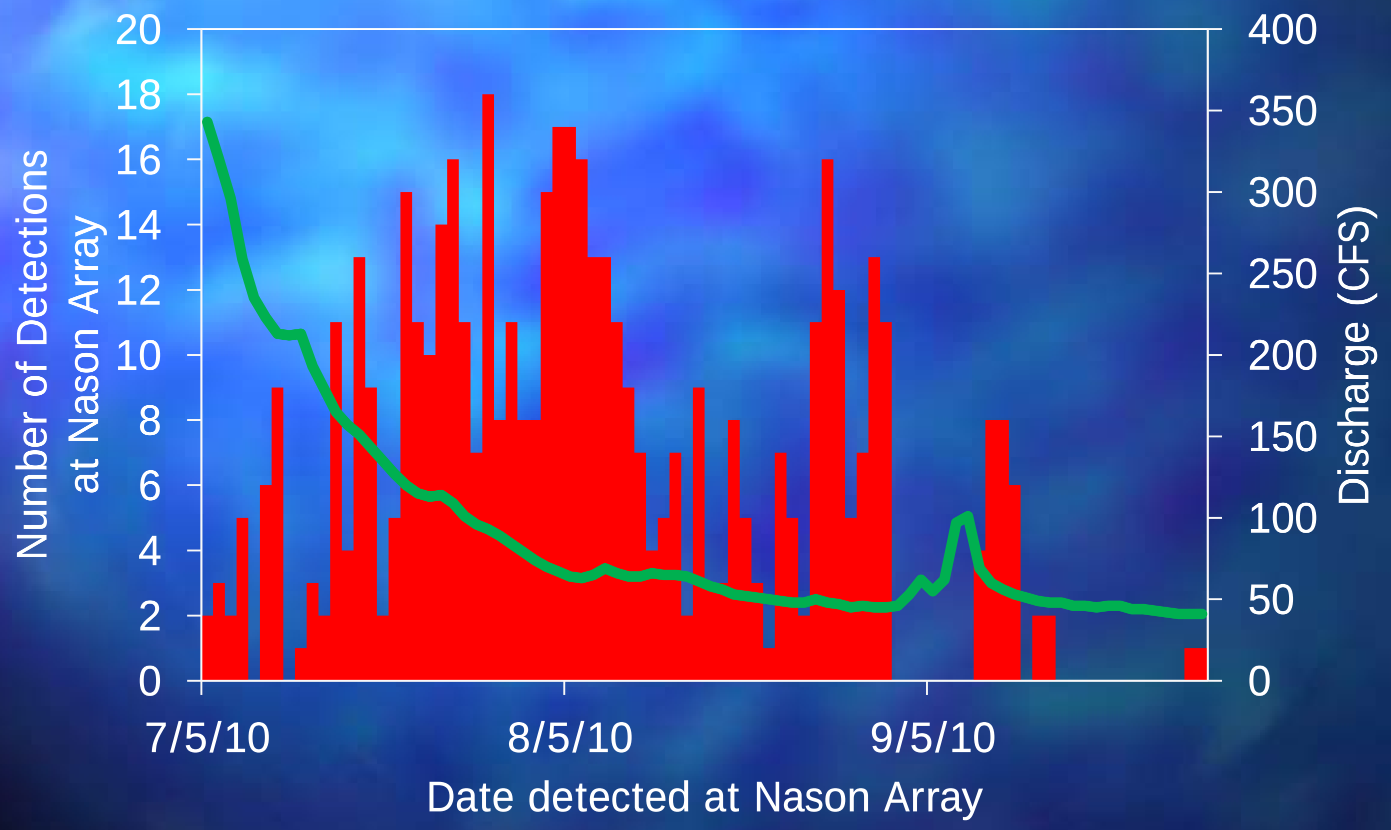
Attachment H

Assumption 2 (Equal probability)



Attachment H

Assumption 2 (Equal probability)



Assumption 2 (Equal probability)

- 88 fish collected at Chiwawa Weir in 2010
  - 80 fish had PIT tags
  - 8 fish lost PIT tags (9% loss rate)
- 60% of the Chiwawa broodstock were not detected at the lower array (tag collision, high discharge, high noise)
- 67% males and 52% females not detected

	Detected			Not detected	
Gender	Male	Female		Male	Female
N	14	18		28	20

2010 Run Reconstruction

Group	Number
PIT tagged fish upstream of Tumwater Dam	5141
Adjusted for tag loss (F =5.2%; M = 10.1%; J = 13.0%)	4730
Fish below array locations (127 adjusted for prespawn mortality)	384
Broodstock not detected	48
Number of detections at tributary arrays	3269
Number of live fish detections on the spawning grounds	93
Number of carcasses	114
Proportion of PIT tagged fish accounted for in 2010	0.83

- Analysis does not account for prespawn mortality prior to entering a tributary.
- Analysis does not account for PIT array efficiency.

Conclusions

- Trapping any fish delays passage
- Sockeye and potentially other species in the ladder may delay passage of spring Chinook
  - Species effect
  - Abundance effect
- Sockeye don't like the denile trap
  - Abundance effect
  - Facility effect
  - Reports of similar effect at Wells Dam
- Modified operation protocol and facility improvements should increase spring Chinook passage and eliminate sockeye issues
- Revised analysis found no survival impacts to spring Chinook

Attachment H

PRE-SPAWN SURVIVAL

What is prespawn mortality?

- Difference between run escapement estimates and spawning escapement estimates (migration, holding, spawning)
  - Accuracy of run escapement
    - Fallback
    - Misidentification of race
  - Mortality
    - Natural
    - Trapping/sampling effects
  - Accuracy of spawner escapement estimates
    - Inaccurate redd counts
    - Inaccurate fish per redd value

Past studies

Species	Mortality (%)	Reference	Note
Snake River spring	46 – 56	Bjornn 1990	SR dams to spawning grounds
Deschutes spring	34 – 75	Lindsay et al. 1989	Females passed upstream to redds. Same methods as Wenatchee.
Columbia River spring	1 – 22	Neitzel et al. 2004	Mortality due to head burns only. Mortality increases with number of dams.
Fraser sockeye	24	Cooke et al. 2006	Natural in river mortality to tributary due to high physiological stress indicators.
Alaska sockeye	23 – 44	Quinn et al. 2007	Based on carcasses only. Good examples of density dependence and similar to what is observed in the Wenatchee.
Willamette spring	20 – 40	Schreck et al. 1994	Mortality only for migration and holding not on the spawning grounds.
Willamette spring	50 -70	Mann et al. 2010	Dam to spawning grounds. Results suggest strong environment x pathogens interactions

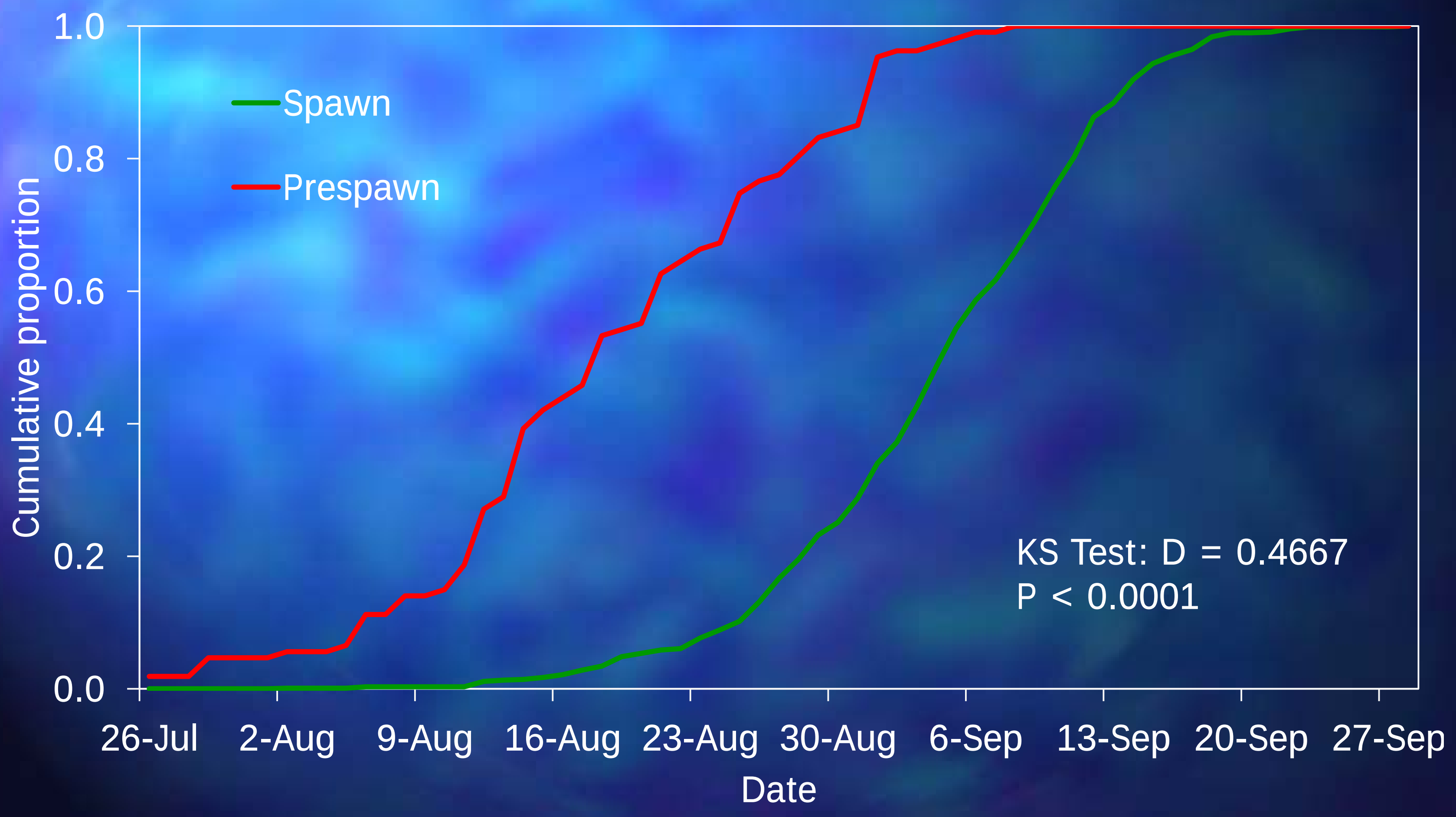
Prespawn Mortality Carcass data

Year	N	Hatchery	Wild	Total
2010	242	0.148	0.061	0.124
2009	220	0.083	0.016	0.064
2008	531	0.135	0.027	0.121
2007	189	0.036	0.000	0.026
2006	311	0.082	0.022	0.064
2005	551	0.125	0.109	0.125
2004	198	0.077	0.048	0.066
2003	103	0.267	0.082	0.136
2002	353	0.051	0.044	0.048
2001	1048	0.148	0.058	0.121
2000	117	0.049	0.026	0.033

- Mean carcass data = 8.4%
- Hatchery 10.9% and Wild 4.5%, but data must be weighted for the spawning population, adjusted for difference in spatial distribution and sampling bias. Does not mean that hatchery fish die at higher rates.

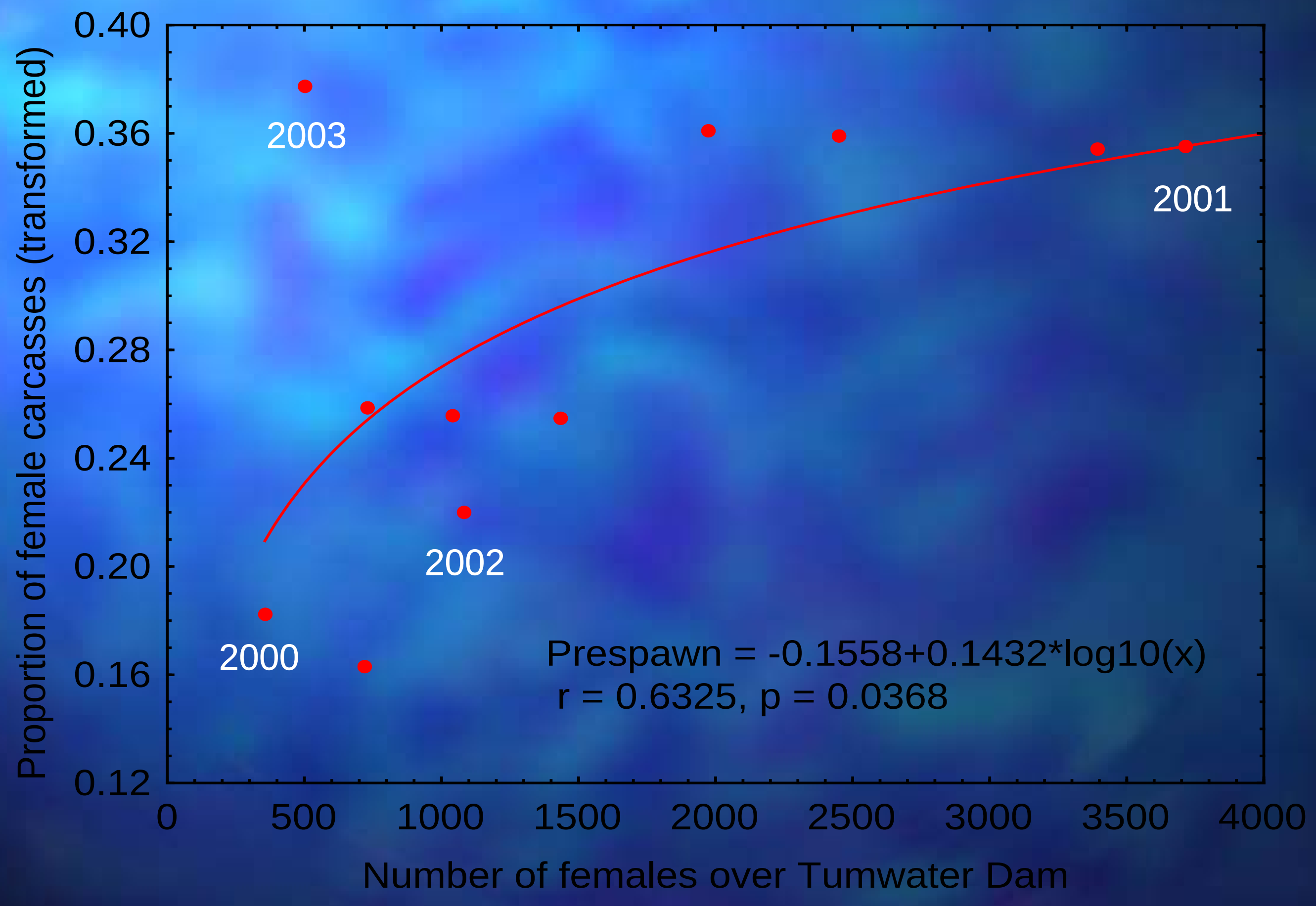
Attachment H

Temporal Distribution of Female Carcasses in Chiwawa River 2004-2010



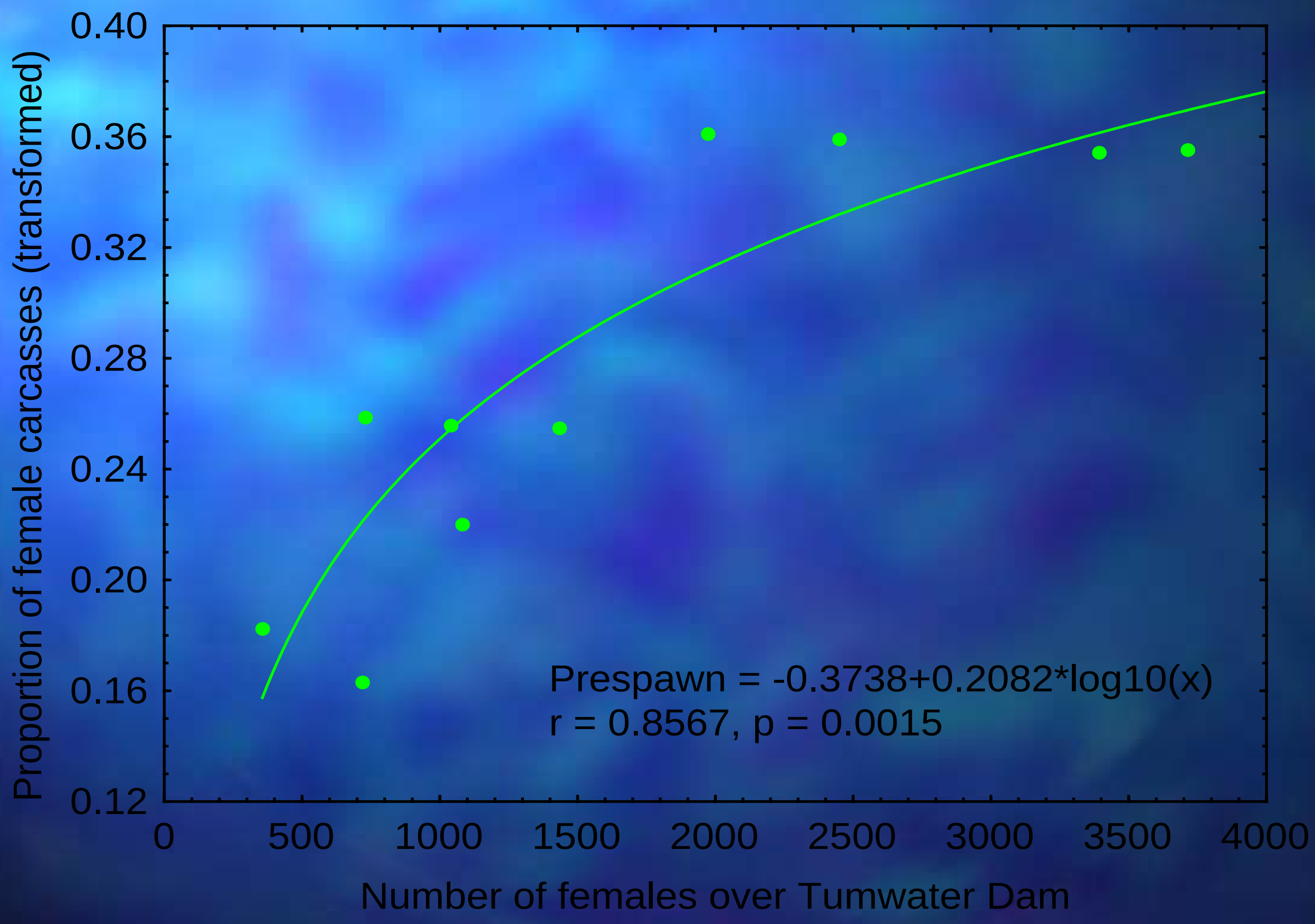
Attachment H

Relationship between female abundance and prespawn carcasses



Attachment H

Relationship between female abundance and prespawn carcasses (No 2003)



Carcass Data Summary

- Prespawn carcasses have a clear significant temporal pattern different from the spawning population
- Prespawn mortality based on carcasses should be viewed as a minimum (i.e., spawning period only)
- Data can be used in relative comparisons across years as long as effort is consistent
- Proper use of carcass data to estimate prespawn mortality would be problematic
  - Require weekly surveys from June through September including Wenatchee River from Tumwater to spawning tributaries
  - Understand relationship between carcass recovery probability in non spawning areas (before spawning) and spawning areas.

Run escapement at Tumwater

- 2000 – 2003
  - Visual differentiation between spring and summer Chinook based on body coloration and morphology (mostly from video tapes)
- 2004 – 2010
  - Same method except all fish are examined visually as they pass out of the denile
  - Spring Chinook are confirmed genetically (~100% accurate)

Spawning Escapement

- Redd based method (Murdoch et al. 2010)
- Total redd counts
- Multiplied by fish per redd value
  - 1981 – 1999 Modified Meekin (1966) using 2.2 adult per redd adjusted for proportion of jacks in the run
  - 2000 – 2003 Sex ratio of the populations based on broodstock and fish trapped but not collected (representative sample?)
  - 2004 – 2010 Based on the number of male and females passed upstream. Sex ratios were corrected for bias, but now are determined using ultrasound
- Assumes one redd per female (Murdoch et al. 2009) and male only spawn with one female.
- No measure of precision for redd counts yet!

Prespawn survival

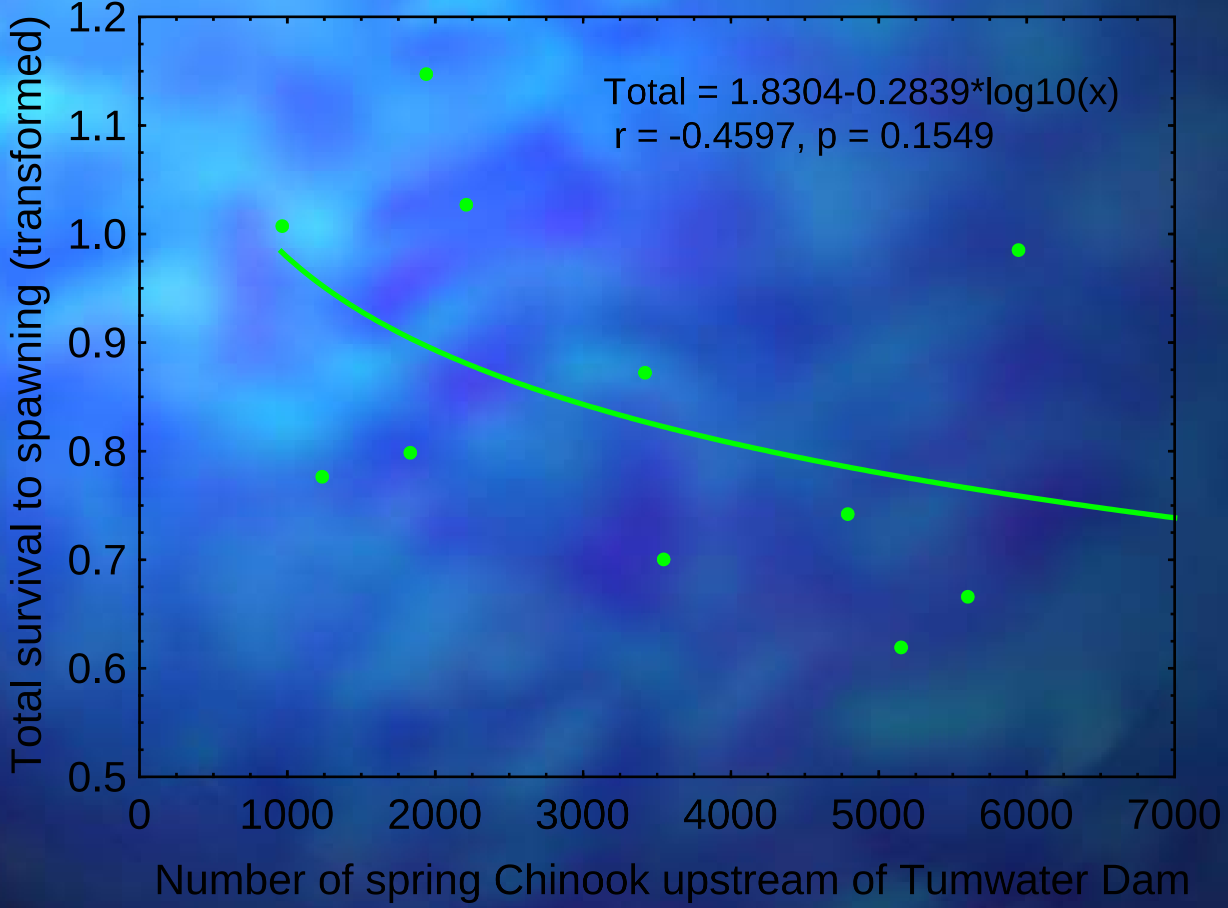
- Spawning escapement/run escapement
- Factors influencing survival
  - Natural mortality, but may have environmental covariates
  - Abundance (density dependence)
    - Not a common life history stage examined in the literature or calculated for many populations
  - Disease
  - Water Temperature
  - Stress (including that attributed to sampling)

Survival Data

Year	Total	Females	Redds	Esc.	Female survival	Total survival
2000	960	356	282	688	0.79	0.72
2001	5935	3709	1788	4130	0.48	0.70
2002	2202	1074	787	1613	0.73	0.73
2003	1223	503	248	603	0.49	0.49
2004	1931	721	491	1608	0.68	0.83
2005	3529	1968	818	1472	0.42	0.42
2006	1825	1037	528	940	0.51	0.51
2007	3414	717	438	2006	0.61	0.59
2008	5590	3356	1274	2140	0.38	0.38
2009	4787	1496	686	2195	0.46	0.46
2010	5141	2404	807	1737	0.34	0.34
Mean					0.54	0.56

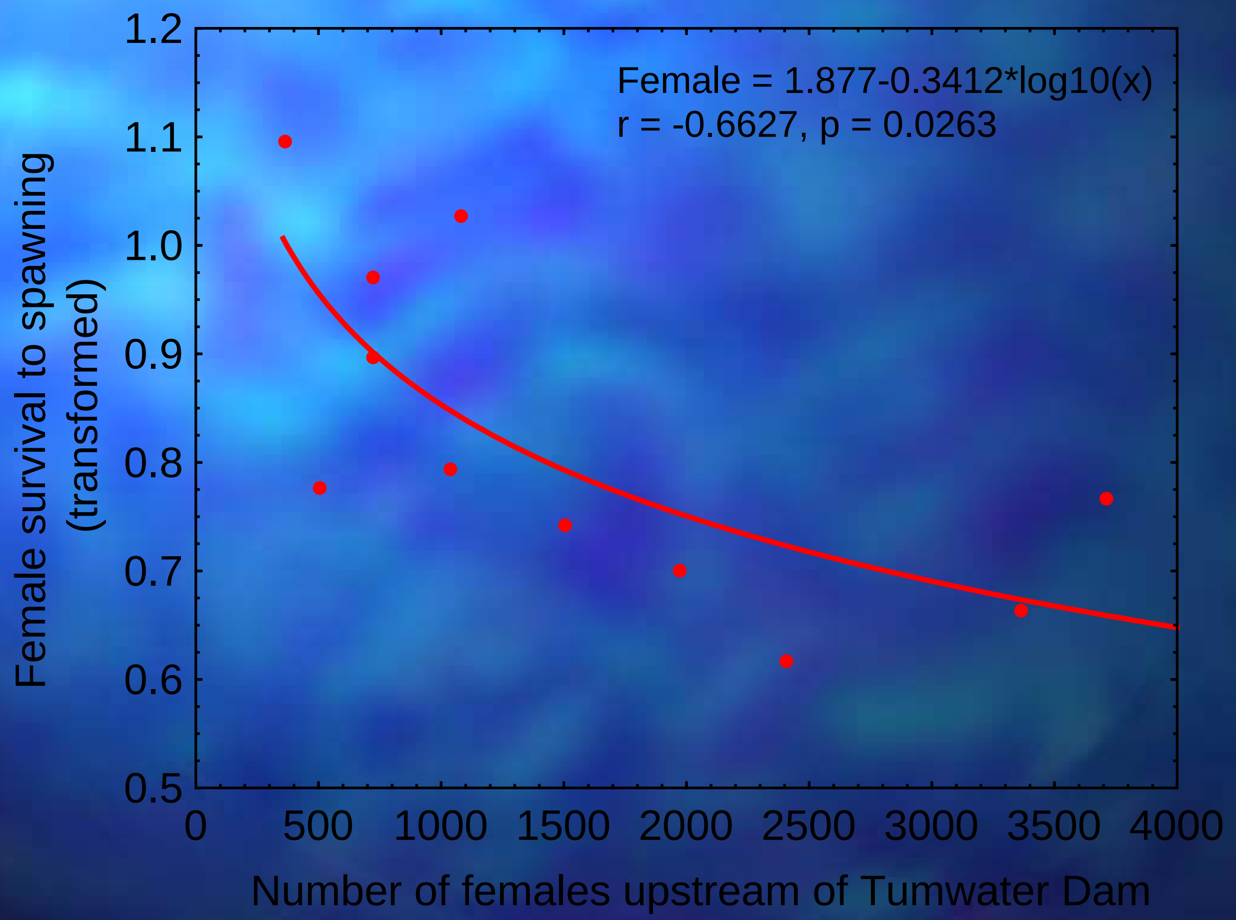
Attachment H

Relationship between Run and Spawning Escapement



Attachment H

Relationship between Female Run Escapement and Survival



Prespawn Survival Summary

- Density dependent relationships are present (i.e., % prespawn carcasses, prespawn mortality metric)
- Prespawn mortality in the Wenatchee Basin is high, but the range is common in other spring Chinook populations.
- Data suggests to maximize wild fish survival to spawning; allow only the required number of hatchery fish upstream of Tumwater Dam.

Attachment I

February 9th 2011

To whom it may concern,

Understanding the early life history of Chinook salmon (*Oncorhynchus tshawytscha)* originating in the Columbia River (CR) has received considerable research effort. Although many aspects of their outmigration in the CR are now better understood, difficulty associated with differentiating wild and hatchery populations has limited researcher's ability to understand the factors that relate to survival of Chinook salmon. This may be particularly true for some stocks originating in the CR where large numbers of hatchery individuals carry no artificial tag. The first goal of my research proposal is to create a baseline to distinguish hatchery and wild individuals in various stages of their marine migration. Otolith microstructure near the natal region will be used as a tool to characterize the divergence between the stochastic rearing environment experienced by wild individuals and the stable rearing environment experienced by hatchery individuals.

I am requesting 75 wild origin individuals from the Upper Columbia Summer / Fall evolutionary significant unit in 2011. I am hoping for primarily sub yearling individuals and the only necessity for this work is that they be at least 30 mm in fork length. The goal and application of this baseline is to determine the origin of non-marked individuals captured off the coasts of Oregon and Washington during an ongoing National Ocean and Atmospheric Association, Bonneville Power Administration funded project studying survival of juvenile salmonids off the coasts of Oregon and Washington. I appreciate you consideration of my request and please feel free to contact me if you have any other questions.

Sincerely,

Andrew Claiborne
PSMFC
NWFSC
Andrew.claiborne@noaa.gov
(541) 867 0148

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	March 16, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of March 7, 2011 HCP Hatchery Committees conference call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met via conference call on Monday, March 7, 2011, from 9:00 am to 10:30 am. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Greg Mackey will revise the draft Statement of Agreement (SOA) and draft Hatchery and Genetics Management Plan (HGMP) and provide a redline final draft HGMP to the Hatchery Committees by close of business March 8 (Item II-A).
- Hatchery Committees' members will provide final comments on the revised HGMP to Douglas PUD by close of business March 14 (Item II-A).
- Joe Miller will provide the Hatchery Committees with a revised SOA and analysis regarding the Chelan PUD's proposed changes in Methow spring Chinook production levels and relocating production to the Chiwawa facility (Item III-A).

DECISION SUMMARY

- The Hatchery Committees approved the draft SOA for the Wells Steelhead HGMP, with revisions and subject to a final review of the HGMP by close of business March 14 (Item II-A).
- The Hatchery Committees agreed to postpone the vote on the Chelan PUD SOA for changes in Wenatchee steelhead production levels until the March 16 Hatchery Committees meeting (Item III-A).

I. Welcome

Mike Schiewe opened the call by stating that the purpose of the meeting was to discuss and vote on approval of Douglas PUD's draft Wells Steelhead HGMP SOA (Attachment B), and

Chelan PUD's request for adjustment of Chelan PUD's Wenatchee steelhead production levels and moving the release to the Chiwawa facility in the Wenatchee Basin (Attachment C).

II. Douglas PUD

A. SOA for the Draft Wells Steelhead HGMP (Greg Mackey)

Greg Mackey introduced the topic by summarizing recent changes to the draft Wells Steelhead HGMP. He incorporated all edits from the Committees that were discussed in the last Committees' meeting, and made a few minor editorial changes in the SOA. He indicated that he talked with Kirk Truscott and Bill Gale this morning regarding additional edits to the draft SOA and HGMP.

Based on his conversation with Truscott, Mackey will insert the text, "act as a safety-net," into the sentence describing the 300,000 smolt segregated component of the program in the Statement section of the draft SOA to make it consistent with the draft HGMP. Mackey also will replace "enhancement" with "safety-net" in the second-to-last sentence and replace the word "segregated" with "safety-net" elsewhere in the SOA.

Regarding his conversation with Bill Gale prior to this morning's meeting, Mackey said Gale expressed concern with acclimating 100,000 smolts at the Methow Hatchery for only a couple of weeks in the spring before volitional release. In response, Mackey said Douglas PUD developed an adaptive management approach and timeline for evaluating the effect of the abbreviated Methow Hatchery acclimation and release on homing fidelity. Briefly, steelhead released between 2012 and 2013 will be marked and homing fidelity and strays rates will be analyzed.

The Committees will review the assessment data in 2015 to determine whether the short-term acclimation at the Methow Hatchery is acceptable. If the Committees determine that it is not, Douglas PUD will either overwinter the steelhead at the Methow Hatchery or explore alternate release sites in the lower Methow Basin. These might include Carlton Pond or possibly in a tributary in the lower Methow, such as Beaver Creek. Mackey said by 2015, one- and two-year ocean adults would have returned, and these fish would be used as the basis for making any changes to the acclimation strategy beginning in 2016. Mackey said a third possible alternative to overwintering at the Methow Hatchery or at alternate, available lower Methow River sites, is to shift the lower Methow Basin steelhead component out of the Methow Basin and release the fish into the Columbia River. Mackey said the decision would be made by the Committee. Craig Busack recommended keeping this alternative in the HGMP to avoid the potential to have to reinitiate consultation if implemented. Mike Schiewe suggested adding a statement in the HGMP to the effect that the Committee would consider measures in addition to release from the lower Methow, including moving fish out of the basin, to reduce straying. Mackey agreed to make this change to the draft HGMP. Gale and Keely Murdoch asked that language be added to the HGMP to say overwintering at the Methow Hatchery would be considered if space becomes available.

Schiewe asked the Committee members if there were any other concerns or issues with the draft HGMP that had not already been considered. Truscott asked that Mackey review the SOA, the HGMP, and the one-page document to confirm that all three documents are consistent. Schiewe asked for a vote on approval of the SOA, subject to the changes made today. The Committees approved the SOA, subject to today's revisions, and with the opportunity to review the final version prior to submittal to the National Oceanic and Atmospheric Administration (NOAA). Mackey agreed to make the final changes in red-line format and send to Carmen Andonaegui for distribution to the Committees by close of business March 8. Schiewe said that any issues related to the final draft HGMP must be raised by Committees' members no later than close of business March 14; otherwise, it will be considered final and approved.

III. Chelan PUD

A. SOA for Adjustment of Chelan PUD Steelhead Production Levels and Transfer of Acclimation to the Wenatchee Basin (Joe Miller)

Joe Miller reported that he received a proposed change to the Wenatchee steelhead SOA from Mike Tonseth (on behalf of the Joint Fisheries Parties [JFP]). The alternate proposal was to produce 247,300 smolts for 2011 and 2012 rather than the 206,849 smolts proposed in Chelan PUD's SOA. Miller said that Chelan PUD has no objections to the alternate proposal (Attachment D); with the caveat that if there is an issue with high ELISA fish, the 247,300 steelhead production would have to be proportionately reduced.

Keely Murdoch said that although the Yakama Nation will likely approve the Washington State Department of Fish and Wildlife (WDFW) alternate proposal, and are supportive of an early, interim reduction, she wanted to defer voting on the SOA until later this week after Chelan PUD and Yakama Nation have a chance to meet. Mike Tonseth said a delay until the Committees' regularly-scheduled meeting on March 16 would not be problematic with regard to broodstock collection scheduling. Miller said he will also request a vote for approval of the spring Chinook SOA, which was originally separated from the steelhead SOA so the steelhead SOA could move forward. He said he would like both to be considered for approval on March 16. Gale said it may be advantageous in *US v OR* to link steelhead and spring Chinook; however, he needs to understand how Chelan's proposed changes to the Methow spring Chinook program might impact the Winthop National Fish Hatchery (NFH) spring Chinook production program and Methow spring Chinook in its entirety. Miller said Chelan PUD will provide the Committees with additional analysis regarding the potential effect of Chelan PUD's proposed changes in Methow spring Chinook production levels and potential effects of the proposed relocation of Methow spring Chinook production to the Chiwawa facility. The Committees agreed to postpone the vote on the SOA until March 16.

Schiewe encouraged all Committees' members with additional questions on Chelan PUD's proposed changes to the steelhead program or the Methow spring Chinook program to alert Chelan PUD in advance of the meeting so there can be a productive discussion. Schiewe said the two SOAs will be separately considered for approval. Busack asked how the proposed changes in production levels might affect what is included in the Methow spring Chinook HGMP, and specifically, how it might affect the number of adults expected to return to the Basin. Gale said Methow Hatchery is now focused on an integrated program. The Winthrop NFH program would also function as a safety-net program for the Methow Hatchery program; however, Gale said in order to provide a safety-net function, there needs to be certainty that the conservation program would be returning enough adults for broodstock to support the program. Gale said this is why Methow Basin spring Chinook production as a whole needs to be considered when deciding whether to relocate all of the Chelan PUD Methow spring Chinook production out-of-basin.

Kirk Truscott stated that initial Chelan PUD Methow spring Chinook production is 288,000 with a recalculated production level of 90,000. The 90,000 smolt production level is for the expected post-2013 production. He said Chelan PUD's proposal only asks for consideration of what impact moving 90,000 spring Chinook smolts out of the Methow Basin will have on the remaining spring Chinook production programs. For example, if the proposed relocation action is approved, will this affect the number of returning adults such that the remaining conservation programs cannot be supported? Josh Murauskas said a 90,000-smolt release is estimated to be equivalent to about 100 returning adults. Miller said he will provide an analysis of potential impacts to Methow spring Chinook programs after the Chelan PUD discussion with the Yakama Nation. He said he will distribute an amended steelhead SOA based on today's discussions.

List of Attachments

Attachment A – List of Attendees
Attachment B – Draft Wells Steelhead HGMP SOA
Attachment C – Chelan PUD Methow Steelhead SOA
Attachment D – WDFW Methow Steelhead Alternate Proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Shane Bickford	Douglas PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack*	NOAA
Kirk Truscott*	CCT
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B

Wells HCP Hatchery Committee
Statement of Agreement
Wells Hatchery Steelhead Hatchery Genetics Management Plan
March 9, 2011

Statement

The Wells HCP Hatchery Committee approves the Hatchery Genetic Management Plan (HGMP) for the Wells Hatchery Summer Steelhead Program, dated March 7, 2011.

The HGMP for the Wells steelhead program includes three components: 1) an integrated hatchery component for the Twisp River to satisfy the No Net Impact (NNI) requirements of the Wells HCP (current production for NNI is 47,571 smolts), 2) a 300,000 smolt component intended to act as a safety-net and support steelhead harvest without negatively affecting the three proposed integrated steelhead programs upstream of Wells Dam (Twisp, Winthrop and Colville), and 3) up to 100,000 smolts for Grant PUD.

Background

The Wells HCP requires Douglas PUD to produce hatchery steelhead toward achieving the NNI goal of the HCP. Steelhead passage survival at Wells has been measured to average 96.3% during four years of survival study (1998, 1999, 2000 and 2010). The new NNI release goal of 47,571 steelhead smolts is mitigation for the unavoidable loss of 3.7% of the juvenile steelhead migrating through the Wells Project.

The Wells HCP also requires Douglas PUD to produce 300,000 steelhead smolts to satisfy fixed hatchery production requirements in the Wells Project license. Currently, all 300,000 of these smolts are released into the Methow and Okanogan rivers.

Grant PUD is required to produce up to 100,000 steelhead smolts toward achievement of current NNI goals for the Priest Rapids Hydroelectric Project. Douglas PUD will rear up to 100,000 steelhead smolts on behalf of Grant PUD under a hatchery sharing agreement.

Smolt release levels in this HGMP will initially transition from the current release levels, and then remain constant thereafter. In 2011 and 2012, Wells Hatchery steelhead releases will be sized to ensure a Methow Basin total release of 350,000 smolts, including Winthrop NFH releases. This will include the 47,571 Twisp integrated release, and a lower Methow release sized to meet the 350,000 Methow Basin smolt target. The remaining up to 200,000 smolts produced at Wells Hatchery will be released directly from Wells Hatchery downstream of Wells Dam. Up to 100,000 of these fish may be released in the Okanogan Basin at the request of the Colville Confederated Tribes.

Beginning with the 2013 release year, 150,000 Wells Hatchery steelhead smolts will be released annually in the Methow Basin. This will include the 47,571-smolt Twisp integrated release, and approximately 100,000 safety-net smolts released in the lower Methow (Methow Hatchery). Assessment of the Lower Methow component will begin in 2012, with a management decision in 2015 regarding acclimation strategy and/or release location. The remaining up to 200,000 safety-net smolts will be released from Wells Hatchery downstream of Wells Dam. At the request of the Colville Confederated Tribes, up to 100,000 of the Wells Hatchery safety-net fish may be released in the Okanogan Basin, or up to 200,000 may be released from acclimation facilities with adult extraction capabilities in the Columbia River upstream of the Okanogan River confluence, provided these facilities are developed by others.

Attachment C

Implementation of Juvenile Project Survival Estimates for Steelhead Hatchery Compensation

FINAL STATEMENT OF AGREEMENT

Modified March 7, 2011. For Decision at March 16, 2011 HCP HC meeting.

Chelan PUD is requesting approval from the Rock Island and Rocky Reach Habitat Conservation Plans' (HCPs) Hatchery Committees to implement the following actions:

1) Chelan PUD will produce 247,300 steelhead smolts (Table 1) for the RI and RR HCPs (collectively) for broodyears 2011-12. These numbers reflect available within-basin hatchery capacity (at Chiwawa) and the application of Juvenile Project Survival Estimates to hatchery compensation levels (i.e., HCPs Section 8.4.2: *HCP Juvenile Project Survival Estimates, when available will be used to adjust hatchery based compensation plans*; Table 2).
2) Future compensation levels, determined by HCP Hatchery Committees' recalculation (i.e., release years 2014-2023), will be applied to subsequent brood years.

TABLE 1: Calculation of hatchery production at Chiwawa for 2011-12 broodyears

Broodyear	Steelhead Reared
2011	247,300
2012*	247,300

*In the event that the high ELISA pond is needed for spring Chinook, production would be reduced by 28,500.

Steelhead-Background

Chelan PUD has successfully completed survival studies necessary to adjust hatchery compensation to reflect estimated Juvenile Project Survival at Rocky Reach and Rock Island projects. At the same time, Chelan PUD has the capacity to rear and acclimate 100% of the "adjusted" program levels in the Wenatchee Basin and eliminate the use of Turtle Rock. The transition of the program to the Wenatchee Basin should greatly reduce stray rates, improving both the fidelity of the Wenatchee program and enhancing fishing opportunities within the basin. The simultaneous adjustment of program levels and in-basin acclimation also eliminates some of the current management and Section 10 permitting issues associated with the production of Endangered Species Act (ESA) listed fish (i.e., straying and adult management).

- Chelan PUD has achieved Juvenile Survival Phase III standards for Rocky Reach and Rock Island projects (Table 2).
- Not including Inundation Production (165,000 smolts), Chelan's current Initial Production levels (235,000 smolts) would be 562% greater than actual NNI (41,849 smolts) as determined by the Juvenile Project Survival estimates.
- The total NNI and HCP production obligation could be acclimated in the Wenatchee basin at Chiwawa, thus avoiding the continued use of Turtle Rock.
- Hatchery steelhead acclimated at Turtle Rock (mainstem Columbia River surface water) stray at a high rate (around 80%)
- Moving the entire steelhead program to Chiwawa would likely increase, and potentially double, the number of adults returning to the Wenatchee --even if the program is smaller (e.g., 1,000 adult returns at 80% stray rate convert 200 fish to the Wenatchee; 500 adult returns with a 20% stray rate convert 400 fish to the Wenatchee).
- The reduction in strays and increase in returns to the Wenatchee would improve program performance both in terms of ESA compliance and fishing opportunities.

TABLE 1: Application of Juvenile Project Survival Estimates to current hatchery compensation levels

Project	Current Initial Production Levels (for passage loss)	CC Approved Phase III Survival Estimate	NNI Hatchery Production Compensation	Calculated 7% Production Levels (from HCPs)	Application of Survival Estimates to Calculated 7% Production
Rock Island	200,000	96.75%	3.25%	51,275	**23,806**
Rocky Reach	35,000	95.79%	4.21%	30,000	**18,043**
				Total	**41,849**

Attachment D

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE

FISH PROGRAM – FISH MANAGMENT
WENATCHEE RESEARCH OFFICE

3515 Chelan HWY, Wenatchee, WA 98801
Voice (509) 663-9678 FAX (509) 662-6606

4 March 2011

To: Joe Miller, CPUD HCP Hatchery Committee/Joint Fisheries Parties

From: Mike Tonseth

RE: Proposed Alternate Interim Reduction Plan for the Wenatchee Steelhead Program (alternate proposal to the CPUD draft SOA up for decision on 3/7/11).

After meeting with the Joint Fisheries Parties (JFP – represented at yesterday's meeting by USFWS, YN, NOAA, and WDFW), WDFW recommends modification of the Chelan PUD (CPUD) proposal for an interim reduction of the Wenatchee steelhead program to the 7% level (estimated at 206,849 fish) prior to the NNI recalculation in 2013, to an overwinter capacity based level of 247,300 fish.

Presently the CPUD recommendation is for a reduction from the current 400,000 to 206,849 (165,000 inundation and 41,849 NNI). As stated in the original proposal, Chelan PUD has successfully completed survival studies necessary to adjust hatchery compensation to reflect estimated juvenile project survival at Rock Island and Rocky Reach projects. The results of those studies have been summarily approved by the Coordinating Committee.

From the JFP's perspective, what has yet to be resolved by the HC is the calculation method in determining the number of naturally produced smolts emigrating past the Rocky Reach and Rock Island projects (an exercise which is presently being conducted within the HCP Hatchery Committee (HC) with a commitment to finish those calculations no later than October 2011). While there is understanding in how the calculated 7% production was derived in the proposal, it is inconsistent and is widely dissimilar to the draft recalculation methods presented to the HC by CPUD at the February 16 2011 HC meeting.

Additionally the development of an alternate reduction proposal is a byproduct of the lateness of the request. Spawning of the 2011 brood began over two months ago and is approximately 2/3 complete (for wild fish). To offset the potential effects of selecting only the early spawned wild fish for retention, moving to capacity will accommodate progeny from the entire NOR brood collection without having to select against a portion of the spawn component.

The alternate proposal is to reduce the Wenatchee summer steelhead program to the overwinter capacity that will be available at the Chiwawa Ponds acclimation facility beginning in the fall of 2011 for the 2011 brood (2012 release)and for the 2012 brood (2013 release). The capacity will include 23,600 in the round ponds in the reuse facility, 28,500 in the spring Chinook high ELISA pond presently under construction (there are no high ELISA progeny in the 2011 brood), and 195,200 fish in the large rearing pond. The total potential overwinter capacity for the steelhead program is 247,300 fish at six fish per pound.

The basis of this recommendation is to 1) reduce the high stray rate observed in this program by providing a reduction in the Wenatchee steelhead program to a level sufficient to achieve 100% overwinter acclimation of the 2011 and 2012 brood year productions (pre 2013 NNI recalculation implementation), 2) allow for full use of the wild broodstock presently on hand (about 2/3 spawned) to prevent any effects elimination of the late spawn element may have on population and genetic structure of the hatchery component, and 3) provide time for the HCP-HC time to develop the recalculation method for determining an agreed upon number of smolts emigrating past the Rock Island and Rocky Reach projects.

It is anticipated, as Chelan indicated, that the stray rate could be significantly reduced by an order of magnitude (5x-7x). Which while it would reduce the number of hatchery fish residing in the mainstem Columbia, it will increase the number of hatchery fish in the Wenatchee basin, providing for better control of pHOS through implementation of recreational harvest strategies and adult management at Tumwater Dam. Decreased straying of Wenatchee steelhead to populations above Rocky Reach Dam will also lead to a decrease in pHOS for those tributaries affected. For a production level of 247,300 steelhead, and assuming an SAR of 0.0123, the number of adults expected would be 3,042. Assuming stray rates do not exceed 15% the expected strays at the 5%, 10%, and 15% level, would be approximately 456, 304, and 152 fish respectively. For comparison if the same 247,300 fish program were to remain at Turtle Rock for acclimation with a spring transfer, under current stray rates (70%-80%) the number of strays would vary between 2,129 and 2,434 fish.

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	April 25, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of March 16, 2011, HCP Hatchery Committees Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Douglas PUD Headquarters Building in East Wenatchee, Washington, on Wednesday, March 16, 2011, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Josh Murauskas will provide Carmen Andonaegui with a final Methow spring Chinook Statement of Agreement (SOA) for distribution to the Hatchery Committees 10 days prior to the March 29 conference call (Item II-A).
- Carmen Andonaegui will set up a conference call line for March 29 at 9:30 am to vote on Chelan PUD's revised Methow spring Chinook SOA (Item II-A).
- Mike Tonseth, Greg Mackey, and Keely Murdoch will develop a plan for co-acclimation of Chinook and steelhead in the Twisp Pond in 2011 (Item III-B).
- Mike Tonseth will review and confirm summer Chinook broodstock needs (Item III-C).
- By March 31, Mike Tonseth will provide the Hatchery Committees with the draft 2011 Broodstock Collection Protocols for review (Item IV-A).
- Keely Murdoch will provide Mike Tonseth with coho broodstock collection protocols as soon as possible (Item IV-A).
- Mike Tonseth will make changes to the draft Hatchery Production Management Plan as agreed to at today's meeting and send the revised draft to Carmen Andonaegui for distribution to the Hatchery Committees for comments (Item IV-B).
- Bill Gale will forward Steve Lewis' email regarding Washington Department of Fish and Wildlife's (WDFW) Section 6 permit coverage for operations at Tumwater Dam (TWD) to Carmen Andonaegui for distribution to the Hatchery Committees (Item IV-C).

- Hatchery Committees' comments on the draft TWD Operations Plan are due to Mike Tonseth by April 6 (Item IV-C).
- Mike Tonseth will provide a revised draft TWD Operations Plan to the Hatchery Committees by April 15 for consideration at the next meeting (Item IV-C).
- Craig Busack will provide monthly updates on the progress of Mid-Columbia Hatchery and Genetics Management Plans (HGMPs) at future Committees meetings (Item V-A).
- The Hatchery Committees will be prepared to discuss factors affecting smolt-to-adult return (SAR) rates for Mid-Columbia hatchery programs at the next meeting. Carmen Andonaegui will compile the information for use by the Committees (Item V-B).

DECISION SUMMARY

- The Hatchery Committees approved the Chelan PUD Wenatchee Steelhead SOA (Item II-B).
- The Hatchery Committees approved the Wells Steelhead HGMP. (Note: the draft HGMP was approved during a March 7 Hatchery Committees conference call with the condition that comments would be accepted until March 14. No additional comments were received; therefore, the approval is final.)

REVIEW ITEMS

- Draft 2011 Broodstock Collection Protocols – comments due by the next Hatchery Committees meeting to Mike Tonseth
- Draft Hatchery Production Management Plan – comments due prior to next Hatchery Committees meeting to Mike Tonseth
- Draft Tumwater Dam Operations Plan – comments due by April 6 to Mike Tonseth

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. Josh Murauskas requested that Chelan PUD's Wenatchee steelhead program modifications SOA be added to the agenda as a decision item. He also requested that Chelan PUD's TWD agenda item be held for discussion as part of WDFW's TWD agenda item. Bill Gale requested discussion of 2011 broodstock collection at Wells Dam for the Entiat NFH be added to the agenda. Keely Murdoch requested an HGMP consultation and permitting update from National Marine Fisheries Service (NMFS), and a discussion of SAR rates at Upper Columbia hatcheries be added to the agenda.

Both the February 16, 2011, Hatchery Committees meeting minutes and the March 7, 2011, Committees conference call minutes were reviewed and approved with minor revision. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Chelan PUD

A. Methow Spring Chinook SOA (Josh Murauskas)

Josh Murauskas provided an update on the draft Methow Spring Chinook SOA requesting reallocation of Methow spring Chinook production from Methow Hatchery to the Wenatchee Basin and the Chiwawa Ponds Facility. He said that based on a meeting with the Yakama Nation, Chelan PUD has added a provision agreeing to a minimum production level of 200,000 Chiwawa spring Chinook salmon smolts in the future, unless directed otherwise by the Hatchery Committees or by NMFS as a condition of their Endangered Species Act (ESA) hatchery permit.

Kirk Truscott said the Colville Confederated Tribes (CCT) were concerned about the potential effect that moving Chelan PUD's spring Chinook production out of the Methow subbasin could have on Methow broodstock availability for their programs at Chief Joseph Hatchery. Specifically, Truscott said the CCT's Okanogan spring Chinook reintroduction program will require enough broodstock for a 200,000 egg-take from the Methow Basin. Truscott said that in reviewing target smolt release numbers for Methow spring Chinook programs, an adult return to the Winthrop NFH with an average SAR of 0.0015 would return about 600 adults. However, there are no data available to estimate how many of the 600 adults would return to the Winthrop NFH outfall and hence be available for collection as broodstock. The Committees discussed possible alternatives for adult collection, including Wells Dam. However, the fish are not externally marked and cannot be distinguished at Wells. Greg Mackey noted that Douglas PUD would be concerned if the proposed changes caused additional risk, complications, or cost to the Douglas program(s). Truscott said the CCT cannot support the SOA without knowing its effect on broodstock availability. Bill Gale noted similar concerns regarding adequate broodstock for Winthrop NFH programs. Murauskas agreed that it is also in Chelan PUD's interest to make sure enough broodstock are available given their funding of the CCT Chief Joseph spring Chinook program. Truscott and

Murauskas agreed to further evaluate the potential effect on broodstock availability as a result of moving Chelan PUD's spring Chinook program out of the Methow subbasin. Mike Tonseth noted that with an increase in natural juvenile production, there could be an associated decrease in broodstock needs. Truscott said moving the Chelan PUD spring Chinook program out of the Methow subbasin may also affect Upper Columbia River spring Chinook recovery.

The Committees agreed to a conference call on March 29 at 9:30 am to further consider and vote on the Chelan PUD spring Chinook SOA, as revised based on today's discussion. Murauskas will provide Carmen Andonaegui with a final Methow spring Chinook SOA for distribution to the Hatchery Committees 10 days prior to the March 29 conference call. In the meantime, Chelan PUD, CCT, and the USFWS agreed to further evaluate the potential effects of Chelan PUD's proposed change to the Methow program on broodstock collection and recovery. Carmen Andonaegui will set up a conference call line for March 29 at 9:30 am.

Mike Tonseth said the 2011 Broodstock Collection Protocols are due April 15 and if the SOA is approved, the change in broodstock collection would be incorporated.

B. Wenatchee Steelhead SOA (Josh Murauskas)

Josh Murauskas said WDFW requested a change to the Wenatchee Steelhead SOA to allow for maximum smolt production at the Chiwawa Facility. The change is reflected in the March 7, 2011, version of the SOA up for approval today. Mike Schiewe asked for questions from the Committees. There were no questions and the SOA was approved.

C. 2013 NNI Recalculation SOA (Josh Murauskas)

Josh Murauskas said the draft NNI Recalculation SOA was distributed by email along with a paper explaining the 2013 recalculation methods (Attachment B). He summarized the approach and recommended program sizes using a PowerPoint presentation (Attachment C). He said Chelan PUD is proposing to use monitoring and evaluation (M&E) data to estimate smolt production where data is available. They propose using similar techniques to the Biological Assessment and Management Plan (BAMP) method if M&E data is not available, but only when smolt estimates using the BAMP method do not exceed the estimated carrying capacity. Murauskas referred to the estimated carrying capacities in the

Quantitative Analytical Report (QAR). He said the QAR carrying capacity estimates are consistent with estimates based on M&E data in the case of Wenatchee River Basin spring Chinook.

Murauskas summarized Chelan PUD's analyses by showing comparisons of smolt production estimates for spring Chinook and steelhead programs using the BAMP method, carrying capacity, and M&E data. He indicated that carrying capacity based on M&E data were Chelan PUD's preferred basis for estimating spring Chinook and steelhead smolt production, but that SARs and adult escapement provided the only estimates for summer/fall Chinook smolt production given the available data. Bill Gale noted that the summer/fall Chinook smolt production estimates assume no mainstem spawning. The Hatchery Committees discussed adjusting summer/fall Chinook estimates to include mainstem spawning production and a means to estimate mainstem production. The Committees also discussed the extent to which smolt production estimates lead to mitigating for mitigation production.

Keely Murdoch asked why dam counts are not used rather than spawning escapement numbers in the BAMP calculations, given that adult mortality occurs between the dam counts and the spawning ground counts. Murauskas said they used the SARs generated from M&E data and reported in the M&E reports. The Committees discussed what goes into calculating SARs and the reliability or application of SARs. Murauskas said Chelan PUD's 2013 recalculation methods paper provides SARs for all Mid- and Upper-Columbia hatchery programs, and that the proposed smolt production estimates are included in the draft 2013 recalculation SOA. Mike Tonseth asked if the smolt production estimates from Chelan and Douglas PUDs will be reconciled if they are not consistent as a result of using different recalculation methods. As an example, he provided production estimates from the BAMP for Methow spring Chinook compared to carrying capacity estimates generated from M&E data (1,029,216 and 375,921, respectively). Tonseth asked that if estimated smolt numbers arriving at a projects differed as a result of using differing recalculation methods (e.g. BAMP vs QAR) for the same population, and SOAs were subsequently approved for the differing methods used by each of the PUD's, that the logic behind doing so be clearly detailed. Murauskas finished his presentation by reviewing the hatchery compensation calculations for both Rock Island and Rocky Reach dams for HCP species. He said it would be up to the Hatchery Committees to decide how production would be allocated.

Mike Schiewe asked for questions from the Committees. Tonseth said spring Chinook production levels for the Chiwawa program are easily met with the 200,000 minimum production requirement in the SOA, if it is approved. Schiewe said that although there is no request for a vote on Chelan PUD's recalculation method at this time, the Committees do need to agree to a recalculation method no later than October 2011. Tonseth reiterated that if Chelan PUD's carrying capacity-based smolt production estimates are accepted, rather than the BAMP method estimate proposed by Douglas PUD, the reasoning needs to be explained.

Schiewe said the PUDs have provided their recalculation proposals as requested by the Committees and asked what action the Committees would like to take. Murauskas said Chelan PUD will ask for a vote to approve their proposed recalculation method at the next Committees' meeting.

III. Douglas PUD

A. Douglas Recalculation Methodology (Greg Mackey)

Greg Mackey said Douglas PUD was prepared to request a vote on their SOA for recalculation of hatchery NNI production, but that given earlier discussion today on Chelan PUD's recalculation proposal, he recognizes there may be still questions. Keely Murdoch said she is more comfortable with Douglas PUD's proposal to use the BAMP method rather than Chelan PUD's recalculation proposal. Bill Gale said Douglas PUD's approach to recalculating is more simple and that it might be helpful to consider their proposal before considering Chelan PUD's proposal. Mike Tonseth said he is inclined to wait on voting on Douglas PUD's proposal to allow additional discussion about how to reconcile the two PUDs' approaches to recalculation, or whether to accept two independent recalculation methods for a single population. He said if the Committees approve two different methods for a single population, the rational for doing so needs to be clearly documented.

Murdoch suggested the need for a Joint Fisheries Parties (JFP) meeting to consider options. The Committees discussed how hatchery program production is incorporated into PUD production estimates. Mackey said the BAMP method includes hatchery fish in the production estimates while carrying capacity estimates use only natural production. Mackey said an alternate approach to the BAMP would be be to simply use the known number of hatchery fish to be released, then add the estimated number of natural-origin smolts produced using either population estimates, or perhaps carrying capacity. He said this is what the BAMP method attempts to do, but this alternate approach would more simply and directly obtain NNI numbers. Bill Gale said the Chelan and Douglas PUDs should mitigate for the losses at their dams of hatchery fish intended to mitigate for Grand Coulee Dam impacts. Gale said the JFP will be prepared to discuss a JFP recalculation recommendation at the next Committees meeting. He said a proposal will be distributed prior to the next meeting to inform the discussion on approval of the PUDs' recalculation proposals.

B. Twisp Weir and Twisp and Chewuch Acclimation Ponds (Greg Mackey)

Greg Mackey reported that Douglas PUD was not able install the traps at the Twisp Weir last week because of road conditions, but they will try again tomorrow. If they are not able to install the traps tomorrow, they will install as soon as road conditions allow. Mackey also reported that Douglas PUD will begin filling the Twisp and Methow acclimation ponds on Monday, with plans to move fish in on Tuesday. Keely Murdoch asked if steelhead were going to be acclimated in the Twisp Pond this year. Mackey said Douglas PUD did not have approval of the Wells steelhead HGMP in time to allow changes in infrastructure at the pond that are needed to support two-species acclimation. Mike Tonseth proposed acclimating steelhead and Chinook together with no divider in the Twisp Ponds in 2011. He said this would allow for assessment of in-pond performance of steelhead and Chinook acclimated together using HxW steelhead prior to acclimating the WxW steelhead in 2012. Tonseth, Mackey, and Murdoch agreed to meet to discuss moving forward with co-acclimation, along with an observation approach to evaluating interactions when Chinook and steelhead are acclimated in the same pond.

C. Wells Broodstock Collection for the Entiat Summer Chinook Program (Bill Gale)

Bill Gale said the USFWS is moving forward on their Entiat NFH summer/fall Chinook program, transitioning from rearing 200,000 to rearing 400,000. Gale said the USFWS plans to continue collecting broodstock at Wells Dam until adults begin returning to the Entiat NFH. He said they had difficulties transporting adults from Wells Dam to the Entiat NFH last year, and with the expected doubling of production, proposed collecting and transferring green eggs and milt (rather than adults) in 2011.

Mackey said Douglas PUD is prepared to approve a plan similar to the SOA between DPUD and USFWS from 2010, but would like to know what extra costs or water might be involved in holding adults through spawning and obtaining green eggs and milt. Mackey and Gale will discuss additional costs and water needs associated with the change. Gale said that to accomodate the increase in production at the Entiat NFH, 240 hatchery adults will be needed. He said USFWS would provide staff and formalin for the entire spawning effort.

Mike Tonseth said WDFW had not yet received all of the summer Chinook broodstock collection requests for 2011. He said last year about 1,200 adult summer Chinook adults from Douglas PUD at Wells Dam were requested to meet Douglas PUD, Chelan PUD, Yakama Nation, and USFWS requests, and that the combined request will increase this year by at least 120 adults. Tonseth wanted to make sure the Wells facility would be able to accommodate all of the summer/fall Chinook broodstock needs including the request for 240 adults from the USFWS. Gale said he needed to know if the USFWS needs to be prepared to do an adult transfer this year. Tonseth said the change in broodstock collection would need to be included in the 2011 broodstock protocols. Gale and Mackey agreed to develop an agreement outside the Committees.

IV. WDFW

A. 2011 Broodstock Protocols (Mike Tonseth)

Mike Tonseth reported that he is still waiting on broodstock requests from the Yakama Nation and USFWS, as discussed earlier today. He will distribute a draft by the end of March for review by the Hatchery Committees. He would like comments on the draft and discussion at the next Committees meeting so that a near-final draft can be submitted to NMFS by mid-April 2011. Tonseth, Kirk Truscott, and Alene Underwood discussed coordinating equipment needs related to broodstock collection activities to maximize efficiencies. Tonseth will set up a pre-trapping coordination meeting with the appropriate parties. Because there is not yet resolution on the direction of the Methow spring Chinook program, Tonseth said he will draft the broodstock protocols to identify both potential broodstock collection scenarios: for juvenile release in either the Methow or Wenatchee basins. Keely Murdoch agreed to provide Tonseth with the coho broodstock collection protocols as soon as possible.

B. Draft Hatchery Production Management Plan (Mike Tonseth)

Mike Tonseth emailed a draft Hatchery Production Management Plan to the Hatchery Committes on March 8. He said that in the spring of 2010, there was a discussion of how to manage hatchery program overages. This discussion led to an support by the Committees to develop a Hatchery Production Management Plan. Some of the elements of the plan include using ultrasound to identify gravid females, and a method to better estimate egg take. In 2010, preliminary implementation of many features of the plan was very successful in minimizing hatchery overproduction and therefore will be repeated in 2011. Tonseth said the plan provided actions for staying within target production objectives and includes recommended actions if production objectives are not being met. Tonseth requested comments from the Committees on the draft plan.

Greg Mackey suggested language be added to the plan to indicate it can also be used to avoid under-production. He also suggested using prediction intervals to check how well model projections predict parameters in the plan. Tonseth said the plan is set up for broodstock collection over the migration period as allowed by the permit and as detailed in the broodstock collection protocols. He said the document provides a general approach to managing production but that it is up to program managers to manage individual program broodstock collection to ensure they are capturing the necessary demographics. Mackey suggested language be added to the plan to indicate that culling can be used for a variety of diseases and not be restricted to Bacterial Kidney Disease (BKD). Tonseth will make the changes to the draft plan and distribute it to the Committees for comments. The Hatchery Production Management Plan will be on the agenda for approval at the April meeting.

C. Tumwater Dam Operations Plan (Mike Tonseth)

Mike Tonseth said the draft TWD Operations Plan, distributed by email earlier this week, is available for comments and discussion. Josh Murauskas said Chelan PUD has completed their analysis of passage delays at TWD and suggested WDFW seek ESA permit coverage for their trapping operations at TWD. Mike Schiewe said WDFW's TWD Operations Plan would be the basis for an ESA permit application. Tonseth said WDFW recognizes there is a delay during fish passage at TWD, but that they do not know the ultimate effect(s) of the delay on ESA-listed fish populations. He said WDFW will describe the facility operation needed for trapping operations unique to WDFW programs so that NMFS can determine if additional actions are required. Murauskas asked if TWD operations have coverage for bull trout. Bill Gale said Steve Lewis of USFWS sent an email to Joe Miller and Tonseth regarding bull trout coverage under ESA. He read the email to the Hatchery Committees, in which Lewis said as long as Chelan PUD is working on addressing passage delays and does not exceed the allowed incidental take at TWD as stipulated in the Rocky Reach Section 7 Incidental Take permit, they are covered under ESA. Gale will forward Lewis' email to

Carmen Andonaegui for distribution to the Committees. Murauskas said Chelan PUD may request that Lewis participate in the conference call on March 29 to clarify WDFW's coverage under the existing ESA Section 6 permit for TWD operations related to bull trout.

Tonseth provided the Committees with an overview of the content and organization of the draft TWD Plan, saying it is divided into two sections. He said one section describes processing of fish during broodstock collection. The other section covers activities at TWD that are in addition to broodstock collection efforts. Tonseth said the TWD Operations Plan describes WDFW's plans to move collection of broodstock from TWD to the Dryden Weir or to the Chiwawa Weir to the extent the existing collection permit allows. .

Tonseth said the draft TWD Plan specifies the use of three-person crews and recommends that the steep pass not be closed at any time during fish passage season. If appropriate-sized crews cannot be maintained, the steep pass will be set to bypass. Tonseth said the Committees will need to decide what are acceptable passage delays and, if delays are observed, when to implement bypass operations. By July 15, or when sockeye numbers start to increase as determined by observations at Dryden Dam, reproductive study activities will stop and the fish facility will go to bypass-only. Tonseth said he anticipates that spring Chinook reproductive success study activities can be halted by July 15, based on past spring Chinook run data at TWD.

Committees' members comments on the draft TWD Operations Plan are due to Tonseth by April 6. Tonseth will provide a new draft TWD Operations Plan by April 15 for consideration at the next meeting. Tonseth said an operations plan is needed at TWD for the period from June 15 until the trap operation terminates in the fall.

V. NMFS

A. HGMP Permitting Process Update *(Craig Busack)*

Keely Murdoch asked Craig Busack to provide an update on timelines and on the status of processing HGMPs. He said timelines have not changed since his update at the last Hatchery Committees meeting in February. Busack said NMFS completed a Biological Opinion last week on three Umatilla hatchery programs, and that this will be helpful in preparing other Biological Opinions on hatchery programs. He had no update on the status of the Wenatchee subbasin hatchery program consultations. Busack said he does not think there is risk to hatchery program operators as long as program consultations are in progress. Busack said NMFS will not be issuing compliance letters in 2011 for ESA coverage. Busack said he will plan on providing monthly updates on the progress of Mid- and Upper-Columbia HGMPs at future Committees' meetings.

B. Smolt-to-Adult Return Rates (Keely Murdoch)

Keely Murdoch suggested that the Hatchery Committees undertake a review of selected HCP hatchery programs to better understand why, for example, SARs for Methow programs are substantially lower than those for the Wenatchee. The Committees discussed several Upper- and Mid-Columbia hatchery programs, their different SARs, and what factors may be contributing to the differences. Mike Schiewe suggested comparing programs side-by-side to highlight program differences. Bill Gale suggested using information on programs and SARs provided in the Methow and Chiwawa spring Chinook HGMPs. Mike Tonseth said that the Chiwawa M&E report includes information on SARs. Committees members agreed to further discuss a path forward for this evaluation. Schiewe suggested that a good starting point might be for Committees members to begin providing Andonaegui with a list of parameters that merit comparison. Andonaegui could compile and organize the list as a basis for further discussion.

VI. HETT Update

A. Update (Carmen Andonaegui)

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on March 8, 2011, and discussed the Non-Target Taxa of Concern (NTTOC) analysis and the control group analysis, as detailed below.

NTTOC Analysis:

- A master file has been created that contains all the compiled information collected for use in the NTTOC risk analysis.
- Greg Mackey has created an Access database for NTTOC data.
- Tracy Hillman will have carrying capacities calculated for wild and natural salmonid production for Upper Columbia Region subbasins and the mainstem Columbia River within the Upper Columbia Region by the next HETT meeting. As soon as carrying capacity estimates are completed, Greg Mackey will calculate Maximum Daily Encounter rates and risk assessment model runs can begin for the Wenatchee and

Methow subbasins. Grant PUD will conduct model runs for all species except coho, which will be conducted by Keely Murdoch.
- Cutthroat and lamprey risk assessment will be conducted using a qualitative process to provide input for the 5-year HCP M&E report.

Control Group Analysis:
- Tracy Hillman has completed running power analyses on Wenatchee spring Chinook data as part of the reference stream analysis, and is nearing completion of the Methow spring Chinook reference stream analysis. He will begin the analysis on summer Chinook soon.

The next HETT meeting will be on April 12.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees meetings are April 20 (Chelan PUD office), May 18 (Douglas PUD office), and June 15 (Chelan PUD office), all in Wenatchee.

List of Attachments

Attachment A – List of Attendees
Attachment B – Draft Chelan PUD NNI Recalculations (M&E-based)
Attachment C – Chelan PUD 2013 Recalculations PowerPoint presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Alene Underwood	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack* (phone)	NOAA
Kirk Truscott*	CCT
Todd Pearsons	Grant PUD
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B

USE OF HATCHERY MONITORING AND EVALUATION RESULTS TO ESTIMATE SMOLT PRODUCTION IN MID-COLUMBIA RIVER BASIN TRIBUTARIES

ROCK ISLAND AND ROCKY REACH HCP HATCHERY COMMITTEES
FEBRUARY 2011

INTRODUCTION

The Rock Island and Rocky Reach projects each have an Anadromous Fish Agreement and Habitat Conservation Plan (HCP) related to their Federal Energy Regulatory Commission licenses, No. 943 and No. 2145, respectively. Chelan County Public Utilities District (Chelan PUD) is responsible for funding hatchery supplementation activities associated with the HCPs. Section 8 – Hatchery Compensation Plan – within each HCP includes the following language regarding calculation of hatchery levels (8.4.2) and periodic adjustments to production [excerpted from the Rock Island HCP, beginning on Page 22):

> **8.4.2 Calculation of Hatchery Levels**. The District shall provide the funding and capacity required of the District to meet the 7% hatchery compensation level necessary to achieve NNI for all Plan Species. As set forth below, the initial estimated hatchery production capacities for Plan Species needed to compensate for Unavoidable Project Mortality are based on average adult returns of Plan Species for a baseline period, a 7% compensation requirement, and baseline adult to smolt survival rates for existing mid-Columbia River hatcheries. Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs. However, should adult survival rates fall below 98% but the Combined Adult and Juvenile survival rates is maintained above 91%, additional hatchery compensation for adult losses, toward a maximum contribution of 7% hatchery compensation, would be utilized to provide compensation for Unavoidable Project Mortality. The rationale for determining the initial capacity requirement is supported by Supporting Document C, "Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program". The Parties recognize that Supporting Document C is a supporting document and does not by itself, create contractual obligations.
>
> **8.4.3 Periodic Adjustment of District Hatchery Levels**. Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species and for changes in the adult-to-smolt survival rate, and for changes to smolt-to adult survival rate from the hatchery production facilities, considering methodologies described in the BAMP. The Hatchery Committee will be responsible for determining program adjustments considering the methodology described in BAMP and providing recommended implementation plans to the District. The District will be responsible for funding the implementation plan.

Chelan PUD funds an extensive monitoring and evaluation program (M&E) associated with the required hatchery production. That is, assessments must be conducted to ensure the two general objectives of the hatchery program – supplementation and harvest augmentation – are performing properly (Hillman et al. 2009). In some cases, the information provided by M&E efforts span multiple decades and therefore provide the most robust time series available to make population-wide inferences regarding productivity in the portion of the Columbia River Basin affected by the Rock Island and Rocky Reach hydroelectric projects. These data are presented below in a manner which is intended to provide baseline discussions within the Hatchery Committee regarding smolt production and estimation of the total number of downstream migrants that encounter each hydroelectric facility.

WENATCHEE RIVER SPRING CHINOOK

Spawning escapement of Wenatchee River spring Chinook (WRSPC) has ranged from 82 to 4,872 adults between 1989 and 2009, including fish in the Chiwawa River, Nason Creek, Little Wenatchee River, White River, Wenatchee River, Icicle Creek, and Peshastin Creek. Average spawning escapement for 2001-2009 was 2,117 adult WRSPC (Table 5.22, Hillman et al. 2009). These escapements correspond to the brood years in which complete coded wire SARs are available, i.e., 1998-2003).

Average fecundity for both wild and hatchery fish for return years between 1989 and 2009 was 4,758 eggs. An average of 52.5% females have been observed in wild and hatchery WRSPC collected for broodstock during this period. The average egg to smolt survival (based on smolt trap data and fecundity) for the entire Wenatchee Basin is 3.85% for all available brood years (i.e., 2000-2007 Table 9 in Appendix B of Hillman et al. 2009).

The five most recent complete years of CWT based SARs include 1998, and 2000-03 (Hillman et al. 2009, no hatchery releases during 1999), additionally, the incomplete SARs for BY 2005-06 were derived from DART using PIT detections at Rock Island. Overall the average SAR was 0.00693 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSPC that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$2{,}117 \times 0.525 \times 4{,}758 \times 0.0385 = \boldsymbol{203{,}594\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$Average\ adult\ escapement / Average\ SARs = Total\ smolts$$

Using the data above, the result would be as follows:

$$2{,}117 / 0.0069 = \boldsymbol{305{,}210\ smolts}$$

3) Smolt trap data and calculations by WDFW (Appendix B of Hillman et al. 2009) demonstrate an average of **132,440 *emigrants*** per year for the Wenatchee Basin.

These overall results provide a range of M&E based estimates (Table 1) within the maximum habitat capacity calculated by Hillman (2010) and reported by UCRBRC (2001; based on Chapman's effective drainage area calculation using 221 smolts/sq. mi): **339,968** and **312,052**, respectively.

Table 1. WRSPC smolt production based on M&E data.

Smolt calculation method	Total WRSPC smolt production
1) Egg-smolt survival	203,594
2) SAR-based	305,210
3) Smolt trap	132,440

WENATCHEE RIVER STEELHEAD

Wenatchee River steelhead (WRST) spawning escapement has averaged 926 between 2001-2009, and includes the Chiwawa River, Nason Creek, Little Wenatchee River, White River, Wenatchee River, Icicle Creek, and Peshastin Creek.

Average fecundity for both wild and hatchery fish between 1998 and 2009 was 5,809 eggs. During this period, 51.2% of the spawners have been female. The total number of juvenile steelhead emigrating past the lower Wenatchee smolt trap was reported to be 27,373 during the 2009 migration.

The average egg to smolt survival (based on smolt trap data and fecundity) for the entire Wenatchee Basin is 1.89% for all available brood years (i.e., 2001-2005; Table 10 in Appendix B of Hillman et al. 2009). See Ward and Slaney 1993; Kostow 2004; McCubbing and Ladell 2006 for comparsion.

The five most recent complete years of CWT based SARs include 1999-03 (Hillman et al. 2009) additionally, the incomplete SARs for BY 2005-06 were derived from DART using PIT detections at Priest Rapids (consistent with stock assessment and elastomer based SAR calculations). Overall the average SAR was 0.014 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSPC that are produced in the basin using three methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for steelhead. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$926 \times 0.512 \times 5{,}809 \times 0.019 = \mathbf{52,328\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$\left. Average\ adult\ escapement \middle/ Average\ SARs \right. = Total\ smolts$$

Using the data above, the result would be as follows:

$$\left. 926 \middle/ 0.0139 \right. = \mathbf{66,279\ smolts}$$

3) Smolt trap data and calculations by WDFW (Appendix B of Hillman et al. 2009) demonstrate an average of **37,556 smolts** per year for the Wenatchee Basin.

These overall results provide a range of M&E based estimates (Table 2) within the maximum habitat capacity reported by the UCRBRC (2001); **114,372**, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

Table 2. WRST smolt production smolt production based on M&E data.

Smolt calculation method	Total WRST smolt production
1) Egg-smolt survival	52,328
2) SAR-based	66,279
3) Smolt trap	37,556

WENATCHEE RIVER SUMMER CHINOOK

Spawning escapement of Wenatchee River summer Chinook (WRSUC) has ranged from 3,984 to 17,792 adults between 1989 and 2009, including fish in the Wenatchee River and Icicle Creek. Average spawning escapement for 2002-2008 was 9,759 adult WRSUC. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003).

Average fecundity for both wild and hatchery fish between 1989 and 2009 was 5,181 (± 79 SE) eggs. During this period, 48.05% of wild and hatchery spawners have been female

The five most recent years of CWT SAR data include 1999 to 2003 with an average of 0.00622 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$9{,}759 \times 0.4805 \times 5{,}181 \times 0.040 = \mathbf{971{,}790\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{9{,}759}/_{0.00622} = \mathbf{1{,}567{,}986\ smolts}$$

Table 3. WRSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total WRSUC smolt production
1) Egg-smolt survival	971,790
2) SAR-based	1,567,986

WENATCHEE RIVER SOCKEYE

Spawning escapement of Wenatchee River sockeye (WRSCK) has ranged from 1,025 to 29,103 adults between 1989 and 2009, including fish in the Little Wenatchee River and White River. Average escapement for 2003-2010 was 13,851 adult WRSCK. These escapements correspond to the brood years in which complete SARs are available (i.e., 2000-2003 and 2005-06)

Average fecundity for both wild and hatchery fish between brood years 1989-2008 was 2,637 eggs. During this period 48.10% of the hatchery and wild spawners were female. have been observed in wild and hatchery WRSCK collected for broodstock during this period. Freshwater productivity was determined between 1995 and 2008. The average egg to smolt survival of WRSCK was documented at 9.1%.

The five most recent complete years of CWT based SARs include brood years 2000-03 (Hillman et al. 2009). Estimates for brood years 2005-06 were derived from DART using PIT detections at Rock Island. Overall the average SAR was 0.0123 during this period (see Appendix A).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSCK that are produced in the basin using three methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg\!:\!Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$13{,}851 \times 0.4810 \times 2{,}637 \times 0.091 = \mathbf{1,598,740\ \mathit{smolts}}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{13{,}851}/_{0.0123} = \mathbf{1,124,701\ \mathit{smolts}}$$

3) Application of the average smolt trap estimates. Across all years data are available (1997-2009), an average of **1,718,958 (± 513,876 SE) wild smolts** have emigrated from Lake Wenatchee.

These overall results are surprisingly consistent with each other. The wide swings in adult abundance and smolt production are typical of "natural" sockeye populations where abundance is primarily controlled by ocean productivity. (Table 4).

Table 4. WRSCK smolt production based on M&E data.

Smolt calculation method	Total WRSCK smolt production
1) Egg-smolt survival	1,598,740
2) SAR-based	1,124,701
3) Smolt trap	1,718,958

OKANOGAN RIVER SUMMER CHINOOK

Spawning escapement of Okanogan River summer Chinook (OKSUC) has ranged from 473 to 13,857 adults between 1989 and 2009, including fish in the Okanogan River and Similkameen River. Average spawning escapement for 2002-2008 was 7,554 spawners. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003).

Using data from the Methow summer Chinook program, average fecundity for both wild and hatchery fish between 1989 and 2009 was 4,979 (± 66 SE) eggs. An average of 44.40% females have been observed in wild and hatchery MRSPC collected for broodstock during this period.

The five most recent years of CWT SAR data include 1999 to 2003 with an average of 0.00922 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of OKSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios and average fecundity observed in the Wenatchee River summer Chinook, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$7{,}554 \times 0.4440 \times 4{,}979 \times 0.040 = \mathbf{667{,}978\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$\text{Average adult escapement} / \text{Average SARs} = \text{Total smolts}$$

Using the data above, the result would be as follows:

$$7{,}554 / 0.00922 = \mathbf{819,159\ smolts}$$

These results demonstrate two M&E based approaches for calculating smolt abundance (Table 5).

Table 5. OKSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total OKSUC smolt production
1) Egg-smolt survival	667,978
2) SAR-based	819,159

METHOW RIVER SUMMER CHINOOK

Spawning escapement of Methow River summer Chinook (MRSUC) has ranged from 460 to 4,630 adults between 1989 and 2009. Average spawner escapement for 2002-2008 was 2,765 adult MRSUC. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003)

Average fecundity for both wild and hatchery fish between 1989 and 2009 was 4,979 (± 66 SE) eggs. An average of 44.40% females have been observed in wild and hatchery MRSPC collected for broodstock during this period.

The five most recent years of CWT SAR data include 1999-2003 with an average of 0.0019 during this period (Hillman et al. 2009).

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of WRSUC that are produced in the basin using two methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$\text{Escapement} \times \text{Percent females} \times \text{Fecundity} \times \text{Egg:Smolt} = \text{Total smolts}$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$2{,}765 \times 0.4440 \times 4{,}979 \times 0.040 = \mathbf{244{,}500\ smolts}$$

2) Application of the most recent (i.e., 5-year period) SAR data to average adult escapement over the same period to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{2{,}765}/_{0.0019} = \mathbf{1{,}453{,}658\ smolts}$$

These results demonstrate two M&E based approaches for calculating smolt abundance.

Table 6. MRSUC smolt production smolt production based on M&E data.

Smolt calculation method	Total MRSUC smolt production
1) Egg-smolt survival	244,500
2) SAR-based	1,453,658

METHOW RIVER SPRING CHINOOK

From the period of 2002-2008, the average Methow River spring Chinook (MRSPC) spawning escapement was 1,505 (± 234 SE) with an average of 622 redds. These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003; snow et al. 2010).

In 2009, the sex ratio of adults collected at Wells was 4.39 to 1.00 male to female ratio (i.e., 19% females), and 84.3% mostly unclipped hatchery-origin fish. Fecundity for MRSPC is 4,200, based on broodstock protocols. Estimated emigrant-per-redd and egg-to-emigrant survival for MRSPC has been determined for both the Methow and Twisp rivers between 2002 and 2008. Egg-to-emigrant survival during this period has averaged 4.3% for the Twisp River and 1.1% for the Methow River. Emigrants per redd has averaged 172 for the Twisp River and 44 for the Methow River. Since the Twisp River has roughly 10 times the production of the Methow River, the weighted averages for MRSPC egg-to-emigrant survival and emigrants per redd is 4.0% and 161 emigrants, respectively. The total number of MRSPC emigrants estimated through smolt-trapping efforts in 2009 totaled 5,163 (± 4,317, 95% CI). Estimated fall MRSPC emigrants totaled 7,139 (± 1,482, 95% CI) from the Twisp River trap and 2,948 (±

535, 95% CI) from the Methow River trap in 2009. The combined production of MRSPC totaled 15,250 juvenile fish. The five most recent years of CWT SAR data include 1999-2003 with an average of 0.00146 during this period.

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of MRSPC that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1{,}505 \times 0.1855 \times 4{,}200 \times 0.040 = \mathbf{46{,}901}\ \boldsymbol{smolts}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$622 \times 161 = \mathbf{100{,}142}\ \boldsymbol{emigrants}$$

3) Application of the SAR data to average adult escapement to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$${}^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$${}^{1{,}505}/_{0.00146} = \mathbf{1{,}029{,}216}\ \boldsymbol{smolts}$$

4) Application of the most recent smolt trap estimates collected from spring and fall emigrants captured in the Methow and Twisp rivers during 2009. These values indicate that **15,250 juvenile emigrants** are produced in the system on an annual basis.

These results demonstrate a potential disconnect between hatchery production levels and the biological reality of carrying capacity. The SAR based calculation of smolt numbers is an order of magnitude greater than the apparent natural productivity and is close to three times the *highest* carrying capacity of 375,921 smolts reported by the UCRBRC (2001; based on Chapman's effective drainage area calculation with 221 smolts/sq.mile).

Table 7. MRSPC smolt production based on M&E data.

Smolt calculation method	Total MRSPC smolt production
1) Egg-smolt survival	46,901
2) Redd counts	100,142
3) SAR-based	1,029,216
4) Smolt trap	15,250

METHOW RIVER STEELHEAD

Estimated maximum spawning escapement of Methow River steelhead (MRST) in 2009 was 4,484 adults, comprised of 83.9% hatchery-origin fish. Average maximum spawning escapement between 2002 and 2008 was 4,698 adult MRSPC (Snow et al. 2010). These escapements correspond to the brood years in which complete coded wire SARs are available (i.e., 1999-2003). The number of redds observed between 2002 and 2009 at the Twisp and Methow combined has averaged of 1,501 redds (including the upper and lower Methow River, and the Twisp and Chewuch rivers; Snow et al. 2010).

The proportion of female steelhead observed at Wells Dam has been reported at 56.58%. Based on the broodstocking protocol the average fecundity for MRST is 5,400. Estimated emigrant-per-redd and egg-to-emigrant survival for MRST has been determined for both the Methow and Twisp rivers between 2003 and 2008. Egg-to-emigrant survival during this period has averaged 0.4% for the Methow and Twisp rivers combined (survival was not statistically different between basins and therefore pooled). Emigrants per redd has averaged 10 for both systems combined. The total number of MRST emigrants estimated through smolt-trapping efforts in 2009 totaled 31,301 (± 34,328, 95% CI).

The five most recent years of CWT SAR data include 1999-2003 with an average of 0.0130 during this period.

The extensive data collected, with components summarized above, over the past 20 years can be used to estimate the total number of MRST that are produced in the basin using four methods:

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg\colon Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$4{,}698 \times 0.5658 \times 5{,}400 \times 0.004 = \mathbf{57{,}415\ \boldsymbol{smolts}}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1{,}501 \times 10 = \mathbf{15{,}010\ \boldsymbol{emigrants}}$$

3) Application of the SAR data to average adult escapement to estimate the number of smolts required to produce the observed number of adults (e.g., BAMP methods). The following equation could be used:

$$^{Average\ adult\ escapement}/_{Average\ SARs} = Total\ smolts$$

Using the data above, the result would be as follows:

$$^{4{,}698}/_{0.0130} = \mathbf{361{,}562\ \boldsymbol{smolts}}$$

4) Application of the most recent smolt trap estimates collected from spring and fall emigrants captured in the Methow River Basin during 2009. These values provide an estimate of **31,301 smolts**.

These results highlight a wide range of smolt enumeration techniques that are within or greatly exceed the potential carrying capacity of the system (Table 8). The *highest* potential carrying capacity for MRST, reported by the UCRBRC (2001) was **137,781** smolts, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

Table 8. MRST smolt production based on M&E data.

Smolt calculation method	Total MRST smolt production
1) Egg-smolt survival	57,415
2) Redd counts	15,010
3) SAR-based	361,562
4) Smolt trap	31,301

OKANOGAN RIVER STEELHEAD

Okanogan steelhead have relatively few data to derive smolt abundance estimates. The average total spawning escapement between 2005 and 2009, was 1391, of which an average of 178 were natural origin (OBMEP 2009). During the period of 2007-2009 the average number of redds observed in the Okanogan, south of the Canadian border, was 626, which expands to 808 total for the entire watershed (total spawner counts divided by spawner/redd value observed in the U.S. for the period of 2007-09). Average fecundity for Okanogan steelhead is assumed to be the same as MRST (5,526 eggs), and the proportion of females is assumed to be 56.58%, based on spawners collected at Wells. Surrogate values of egg-to-emigrant survival (0.4%) and emigrants per redd (10) are based on data collected for MRST. The abundance of natural origin and hatchery origin Okanogan steelhead smolts were 7,533 and 91,892, respectively in 2007 (OBMEP 2007).

1) Application of average adult escapement, observed sex ratios, average fecundity, and freshwater productivity. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$1391 \times 0.5658 \times 5{,}526 \times 0.004 = \mathbf{17,396\ \mathit{smolts}}$$

2) Application of freshwater productivity to average redd counts. The following equation could be used:

$$Average\ redds \times {}^{Emigrants}/_{redd} = Total\ emigrants$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$808 \times 10 = \mathbf{8,080}\ \boldsymbol{emigrants}$$

3) Application of the most recent smolt trap estimate collected from the Okanogan indicates that **7,533 wild smolts** were produced in the system in 2007.

Table 9. Okanogan smolt production based on M&E data.

Smolt calculation method	Total MRST smolt production
1) Egg-smolt survival	17,396
2)Redd counts	8,080
3) Smolt trap	7,533

ENTIAT RIVER SRING and SUMMER CHINOOK

The 10 year average (2001-10) spring Chinook and summer Chinook spawning escapements in the Entiat River are are 322 spring Chinook (134 redds) and 412 summer Chinook (171.5 redds; using 2.4 fish/red for spring and summer Chinook, Hamstreet 2011).

1) ***Spring Chinook***-Application of average adult escapement, observed sex ratios (59% female, Hamstreet 2011), average fecundity reported for the Wenatchee (i.e., 4,758), and egg-to-smolt ratios reported for Wenatchee spring Chinook (i.e., 0.0385). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$322 \times 0.59 \times 4758 \times 0.0385 = \mathbf{34,801}\ \boldsymbol{smolts}$$

2) ***Summer Chinook***-Application of average adult escapement, observed sex ratios (68% female, Hamstreet 2011), average fecundity reported for the Wenatchee (i.e., 5,181), and egg-to-smolt ratios reported for summer/fall Chinook (e.g., Chapman and Chandler 2001). The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

$$412 \times 0.68 \times 5{,}181 \times 0.040 = \mathbf{58{,}060}\ \boldsymbol{smolts}$$

3) Application of the most recent smolt trap estimates (i.e., 2009) collected from the Entiat indicate that **53,743 spring Chinook** and **73,179 summer Chinook** emigrated from the Entiat in 2009 (Johnsen et al. 2010).

Species	Emigrants	Cumulative derived trap efficiency	Total Emigrants
Spring Chinook	11,578	21.5%	**53,743**
Summer Chinook	15,765	21.5%[1]	**73,179**

4) Carrying Capacity: The maximum potential carrying capacity for **Entiat spring Chinook**, reported by the UCRBRC (2001) was **65,195 smolts**, based on Chapman's effective drainage area calculation (221 smolts/sq.mile).

ENTIAT RIVER STEELHEAD

For the Entiat River, the average number of steelhead redds observed between 2007-09 was 160.7 (Johnsen et al. 2010). Using productivity and life history data from the Wenatchee it is possible to estimate the productivity for the Entiat during the 2007-09 period: Assumptions from Wenatchee: percent female = 51.2%, fecundity = 5,809 eggs, egg-to-smolt survival = 0.019, and fish/redd for the Wenatchee 2.08.

1) Application of average adult escapement (avg. redds [160.7] X fish/redd [2.08] = escapement [334]), observed sex ratios, average fecundity, and egg-to-smolt ratios reported for steelhead. The following equation could be used:

$$Escapement \times Percent\ females \times Fecundity \times Egg{:}Smolt = Total\ smolts$$

where average values are used for each component in the equation. Using the data above, the result would be as follows:

[1] Assumed to be the same as spring Chinook. Data derived from upper and lower smolt traps reported in Johnsen 2010.

$$334 \times 0.512 \times 5{,}809 \times 0.019 = \mathbf{18{,}889}\ \boldsymbol{smolts}$$

2) Application of the most recent smolt trap estimates (i.e., 2009) collected from the Entiat indicate that **23,153 wild steelhead** emigrated from the Entiat in 2009 (Johnsen et al. 2010).

Species	Emigrants	Cumulative derived trap efficiency	Total Emigrants
Steelhead	2,698	12.8%	**23,153**

3) Carrying Capacity: The maximum potential carrying capacity for Entiat steelhead, reported by the UCRBRC (2001) was **23,895** smolts, based on Chapman's effective drainage area calculation (81 smolts/sq.mile).

CONCLUSION

M&E data collected through PUD-funded hatchery programs provide considerable information that may be used to estimate production in the associated tributaries. These results should be utilized by biologists to ensure reasonable population estimates are used to inform management decisions. Table 10 provides a summary of each stock measured through PUD-funded M&E programs and how varying calculations result in population estimates.

Table 10. Summary of estimated smolt production in the mid-Columbia River Basin based on PUD-funded M&E programs, by stock and calculation method.

		Calculation method				
Basin/Stock	Applicability	Egg-smolt	Redds	SARs *(BAMP)*	Smolt trap	Carrying capacity
Wenatchee SPC	RI (6.25%)	203,594		305,210	132,240	312,052 to 339,968
Wenatchee ST	RI (3.25%)	52,328	-	66,279	37,556	114,372
Wenatchee SUC	RI (6.25%)	971,790	-	1,567,986	-	TBD
Wenatchee SCK	RI (6.73%)	1,598,740	-	1,124,701	1,718,958	NA
Okanogan SUC	RI (6.25%) RR (7.0%)	667,978	-	819,159	-	TBD
Methow SUC	RI (6.25%) RR (7.0%)	244,500	-	1,453,658	-	TBD
Methow SPC	RI (6.25%) RR (7.0%)	46,901	100,142	1,029,216	15,250	375,921
Methow ST	RI (3.25%) RR(4.21%)	57,415	15,010	361,562	31,301	137,781
Okanogan ST	RI (3.25%) RR(4.21%)	17,396	8,080		7,533	TBD
Entiat ST	RI (3.25%) RR (4.21%)	18,889	NA	NA	23,153	23,895
Entiat SPC	RI (6.25%) RR (7.0%)	34,801	NA	NA	53,743	65,195
Entiat SUC	RI (6.25%) RR (7.0%)	58,060	NA	NA	73,179	NA

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APPENDIX A-SAR & Adult Returns Tables

WENATCHEE SPRING CHINOOK

Year	SAR	Spawn Escapement
1998	0.01562	
1999	No Program	
2000	0.00781	
2001	0.00488	4872
2002	0.00487	2334
2003	0.00349	785
2004		1759
2005*	0.0046	1491
2006*	0.0073	1048
2007		2059
2008		2383
2009		2323
Average	0.0069366	2117

Adult Returns/SAR 305,210

DATA: CCPUD M&E 2009

DATA:*2005-06 PIT-DART_RIA(incomplete)

WENATCHEE STEELHEAD

Year	SAR	Spawn Escapement
1998		
1999	0.0165	
2000	0.0022	
2001	0.0336	389
2002	0.0065	1348
2003	0.0027	755
2004		877
2005*		1835
2006*	0.0101	810
2007	0.0263	308
2008		804
2009		1211
Average	0.013978	926

Adult Returns/SAR 66,279

DATA: CCPUD M&E 2009 Table 3.18 and 3.16 (fish/redd x total redds)

DATA: *2005-06 SAR- DART PIT _PRA (incomplete)

Attachment B

WENATCHEE SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00252	
2000	0.01528	
2001	0.00399	
2002	0.00531	12464
2003	0.00402	9695
2004		8093
2005		9184
2006		17792
2007		4590
2008		6496
2009		
Average	0.0062	9759.142857
Adult Returns/SAR		1,567,986

DATA: CCPUD M&E 2009

WENATCHEE SOCKEYE

Year	SAR	Spawn Escapement
1999		
2000	0.0157	
2001	0.0002	
2002	0.0014	
2003		4855
2004		27556
2005	0.01407	14011
2006	0.03021	6208
2007		1870
2008		20248
2009		14452
2010		21604
Average	0.012315	13851
Adult Returns/SAR		1,124,701

DATA: CCPUD M&E 2009

DATA: DART PIT_RIA

Attachment B

OKANOGAN SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00455	
2000	0.01276	
2001	0.01611	
2002	0.00775	13857
2003	0.00494	3420
2004		6721
2005		8889
2006		8601
2007		4417
2008		6975
2009		
Average	0.0092	7554

Adult Returns/SAR	819,159

DATA: CCPUD M&E 2009

METHOW SPRING CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00083	
2000	0.003	
2001	0.00126	
2002	0.00175	2637
2003	0.00047	1138
2004		1497
2005		1376
2006		1748
2007		1079
2008		1058
2009		
Average	0.0015	1505

Adult Returns/SAR	1,029,216

DATA: DCPUD M&E 2009

Attachment B

METHOW SUMMER CHINOOK

Year	SAR	Spawn Escapement
1998		
1999	0.00008	
2000	0.00228	
2001	0.00377	
2002	0.00283	4630
2003	0.00055	3930
2004		2189
2005		2561
2006		2733
2007		1364
2008		1947
2009		
Average	0.0019	2765

Adult Returns/SAR 1,453,658

DATA: CCPUD M&E 2009

METHOW STEELHEAD

Year	SAR	Spawn Escapement
1998		
1999	0.02061	
2000	0.00268	
2001	0.02072	
2002	0.00788	3345
2003	0.01308	10239
2004		4489
2005		4710
2006		4017
2007		2839
2008		3248
2009		
Average	0.0130	4698

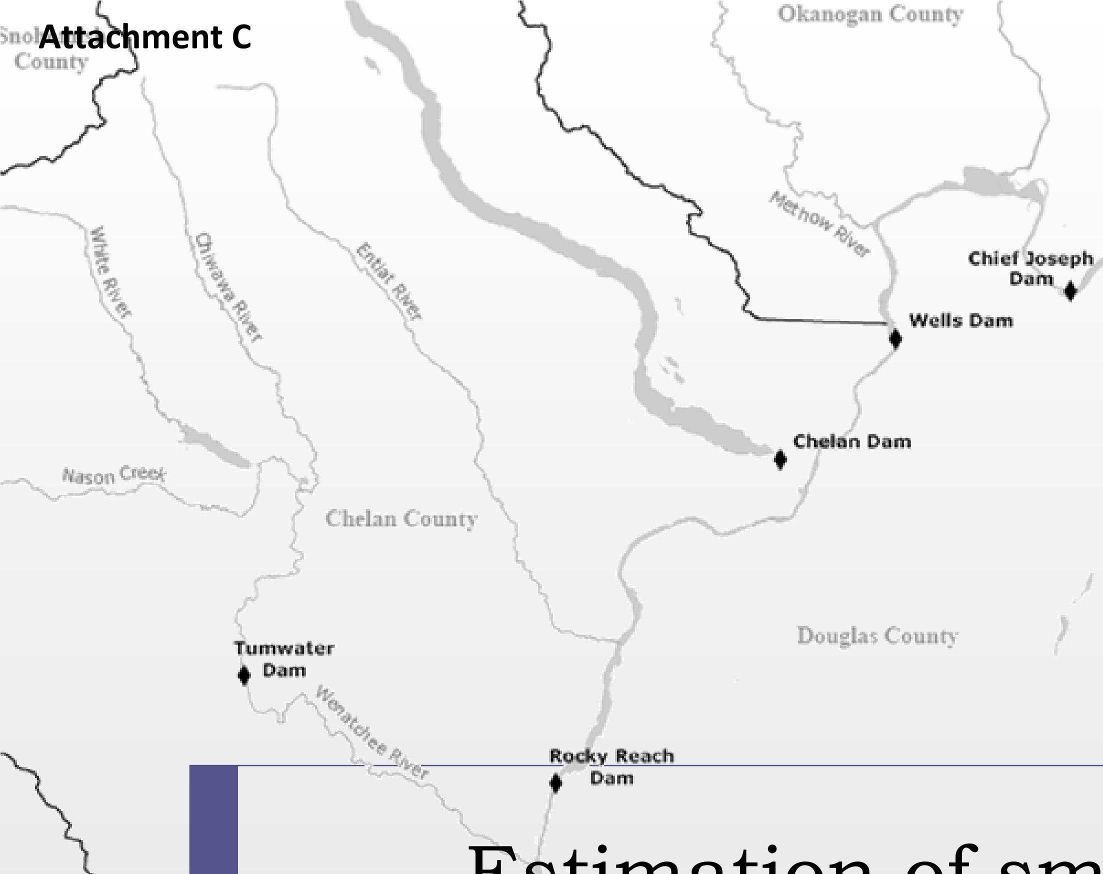
Adult Returns/SAR 361,562

DATA: DCPUD M&E 2009

APPENDIX B-Excess production for application to programs with initial program levels.

	Okanogan Summer Chinook	Wenatchee Spring Chinook	Wenatchee Steelhead	Methow Spring Chinook	Wenatchee Summer Chinook	Methow Summer Chinook
Average production (2005-2010)	543,562	503,268	209,145	178,292	766,676	382,969
Calculated 7%NNI	216,554	298,000	81,275	90,000	324,831	-
Initial Production Excess	327,008	205,268	127,870	88,292	441,845	278,993

Attachment C

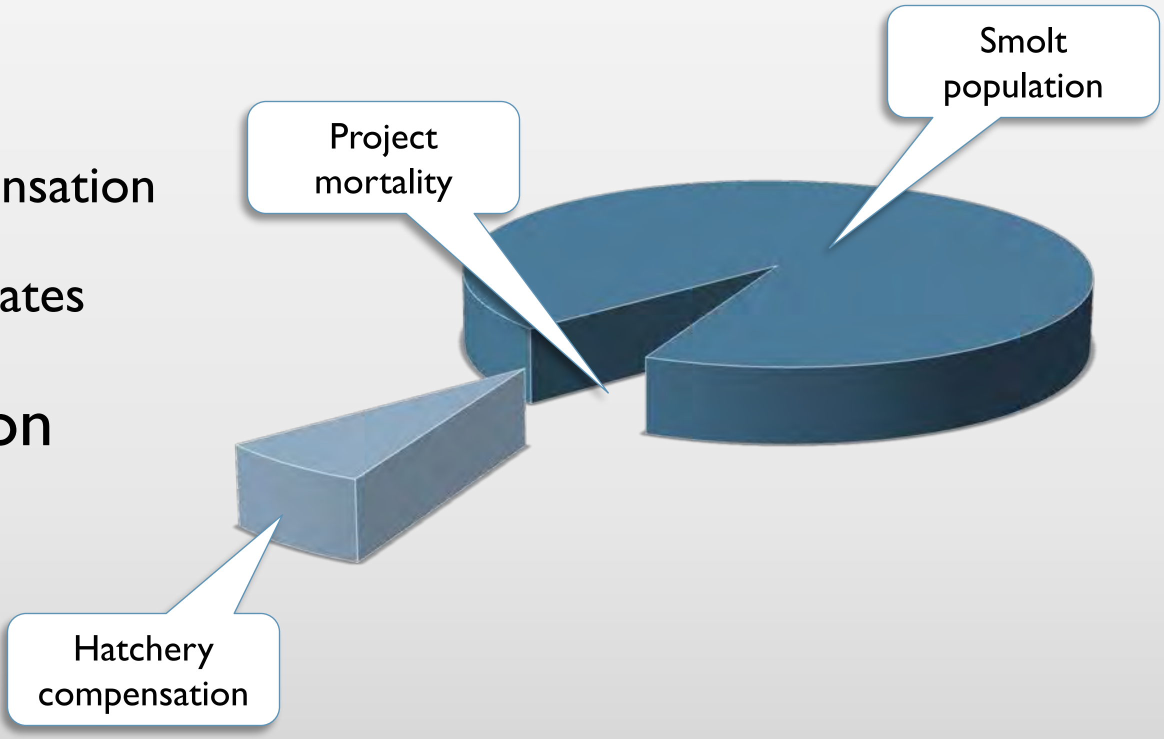


Estimation of smolt populations above Rock Island and Rocky Reach

Joshua Murauskas
Natural Resources Department

Introduction

- Habitat and Conservation Plans (HCPs)
  - "No Net Impact" (NNI)
    - Survival studies
    - Hatchery compensation
    - Population estimates
- 2013 Recalculation



Chelan PUD Efforts

- *Use of hatchery monitoring and evaluation results to estimate smolt production in mid-Columbia River Basin tributaries*
  - Synopsis of data availability and potential applications to estimate smolt populations
    - Escapement
    - Sex ratios
    - Fecundity
    - Redd counts
    - Survival data
    - Smolt estimates
    - Productivity
    - Habitat availability

Scientific recommendations

- Use of best available data consistent with regional management objectives
- Proposed guidelines:
  - Use BAMP-based equation, unless
    - *Results exceed carrying capacity*
    - *Appropriate data unavailable*
  - If BAMP or Carrying Capacity unavailable
    - *Use highest alternative population estimate*

Attachment C

Upper Columbia River Steelhead and Spring Chinook Salmon Population Structure and Biological Requirements

Final report, March 2001

Prepared By:

Upper Columbia River Steelhead and Spring Chinook Salmon Biological Requirements Committee [1]

Michael Ford
National Marine Fisheries Service, Northwest Fisheries Science Center

Phaedra Budy, U.S. Fish and Wildlife Service
Craig Busack, Washington Dept. of Fish and Wildlife
Don Chapman, Bioanalysts, Inc.
Tom Cooney, National Marine Fisheries Service
Tim Fisher, Beak Consultants, Inc.
Jim Geiselman, Bonneville Power Administration
Tracy Hillman, Bioanalysts, Inc.
Joe Lukas, Grant County Public Utility District
Chuck Peven, Chelan County Public Utility District
Chris Toole, National Marine Fisheries Service
Earl Weber, Columbia River Inter-Tribal Fish Commission
Paul Wilson, Columbia Basin Fish and Wildlife Authority

Spring Chinook

Table 3.1 - Estimates of habitat capacity for spring chinook salmon

	Wenatchee	Entiat	Methow
Smolt Capacity [1]			
Chapman estimates based on effective drainage area (221 smolts/sq. mi.)	312052	65195	375921
Chapman estimates corrected for Mullan HQI accuracy (.84)	262144	54764	315774
Adult equivalents for Chapman estimates based on 1.3% smolt-adult survival.	3408-4057	712-848	4105-4887
Adult equivalents for Chapman estimates based on 4% egg-smolt survival, 4100 eggs/female and 1:1 sex ratio	3197-3806	668-795	3851-4584
Parr Density [2]			
Fisher estimates (19.17/100m^2)	1060101	122688	835812
Smolt equivalents for Fisher estimates (14.7-40% overwinter survival)	155835-424040	18035-49075	122864-334325
Adult equivalents for Fisher estimates (1.3% smolt-adult survival)	2026-5512	234-638	1597-4346
Adult equivalents for Fisher estimates based on 4% egg-smolt survival, 4100 eggs/female and 1:1 sex ratio	1900-5171	220-598	1498-4077
Mullan-Chapman estimates (basin-specific densities)	1045170	64000	436000
Smolt equivalents for Mullan-Chapman estimates (14.7-40% overwinter survival)	153640-418068	9408-25600	64092-174400
Adult equivalents for Mullan-Chapman estimates (1.3% smolt-adult survival)	1997-5434	122-333	833-2267
Adult equivalents for Mullan-Chapman estimates based on 4% egg-smolt survival, 4100 eggs/female and 1:1 sex ratio	1874-5098	115-312	782-2127
Schaller et al. (1999) estimates [3]	4808	496	1379

Notes:

[1] Don Chapman suggested an approach based on effective drainage area, defined as the area upstream from the lower limit of rearing by stream annulus salmon and steelhead, basically the area above water where the daily maxima reaches 22°C. Chapman calculates the Wenatchee, Entiat and Methow basins have 1412, 295, and 1701 mi^2 of effective drainage, respectively. He then calculated the yield of smolts per square mile of effective drainage for the Snake basin during the mid-60's, a period considered to be full seeding, arriving at 222 spring chinook smolts/mi^2. The correction of 0.84 results from a comparison of a similar analysis of steelhead smolts, which resulted in 81 smolts/mi^2, for a total of 275965 smolts for the three basins combined. Chapman assumed that the habitat quality index (HQI) total of Mullan et al. (1992) (Appendix H,Table 8) of 231898 was more accurate. The HQI total was 84% of the effective drainage total. Chapman assumed that the same correction could be applied to spring chinook smolt capacities based on effective drainage area. The value of 1.3% smolt-adult survival is a mean of values in Mullan et al.(1992). The values of of 4% egg to smolt survival and 4100 eggs/female came from Chiwawa River monitoring data (Tracy Hillman, personal communication).

[2] Parr density- Tim Fisher and Don Chapman both suggested approaches based on parr densities. Fisher used a value of 19.17 parr/100m^2, an average from IDFG Snake basin habitat monitoring reports for 1984-1995, and applied this value to all three basins. Fisher also used an overwinter survival value of 14.7%, a mean from Snake River streams (Paulsen and Fisher 1999). The Mullan-Chapman values came from Chapman's summary of density data in Mullan et al. (1992), and thus were basin specific: 18.9 parr/100m^2 for the Wenatchee, and 10.0 parr/100m^2 for the other two basins. All calculations above assumed the same rearing areas:

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- Wenatchee
  - *312,052 smolts*
- Entiat
  - *65,195 smolts*
- Methow
  - *375,921 smolts*

Steelhead

- Wenatchee
  - *114,372 smolts*
- Entiat
  - *23,895 smolts*
- Methow
  - *137,781 smolts*

Table 4.1 - Steelhead habitat capacity

	Wenatchee	Entiat	Methow
Estimates based on spawners[1]			
Mullan et al. (1992) Ricker Curve MSY estimates	2,275	417	2,212
Mullan et al. (1992) Beverton-Holt MSY estimates	3,307	606	3,213
Estimates of smolt capacity[2]			
Mullan et al. (1992) HQI smolt production	49,146-107,601	9,003-19,711	47,769-104,586
Adult equivalents for Mullan et al. estimates (3.0% smolt-adult survival)	1,474-3,288	270-591	1,433-3,137
Adult equivalents for Mullen et al. estimates assuming 66 smolts/spawner	744-1,630	136-299	723-1,585
Chapman smolt capacity estimates based on effective drainage area (81 smolts/sq. mi.)	114,372	23,895	137,781
Adult equivalents for Chapman estimates (3.0% smolt-adult survival)	3,431	717	4,133
Adult equivalents for Chapman estimates assuming 66 smolts/spawner	1,733	362	2,088
GAFM estimates (in Mullan et al. 1992)	100,000	22,300	58,552
GAFM2 estimates (WDFW unpub.)	62,167	12,739	35,113
Adult equivalents for GAFM estimates	3,000	669	1,757

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Results: Spring Chinook = 746,326

	Egg-Smolt	BAMP	Smolt Trap	Carrying Capacity
Wenatchee	203,594	305,210	132,240	339,968
Entiat	34,801	.	53,743	65,195
Methow	46,901	1,029,216	15,250	375,921
Okanogan	.	.	.	.
Total	285,296	1,334,426	201,233	781,084

Results: Steelhead = 245,351

	Egg-Smolt	BAMP	Smolt Trap	Carrying Capacity
Wenatchee	52,328	66,279	37,556	114,372
Entiat	18,889	.	23,153	23,895
Methow	57,415	.	31,301	137,781
Okanogan	17,396	.	7,533	.
Total	146,028	66,279	99,543	276,048

Attachment C

Results: Summer Chinook = 3,913,982

	Egg-Smolt	BAMP	Smolt Trap	Carrying Capacity
Wenatchee	971,790	1,567,986	.	.
Entiat	58,060	.	73,179	.
Methow	244,500	1,453,658	.	.
Okanogan	667,978	819,159	.	.
Total	1,942,328	3,840,803	73,179	.

Attachment C

Results: Sockeye= 1,124,701

	Egg-Smolt	BAMP	Smolt Trap	Carrying Capacity
Wenatchee	1,598,740	1,124,701	1,718,958	.
Entiat				
Methow				
Okanogan				
Total	1,598,740	1,124,701	1,718,958	

Attachment C

Rock Island Hatchery Compensation

Species	Upstream population	Hatchery Comp.	NNI	Inundation	Total
Spring Chinook	746,326	6.25%	46,645	0	46,645
Summer Chinook	3,913,982	6.25%	244,624	0	244,624
Steelhead	245,351	3.25%	7,974	0	7,974
Sockeye	1,124,701	6.73%	75,692	0	75,692

Rocky Reach Hatchery Compensation

Species	Upstream population	Hatchery Comp.	NNI	Inundation	Total
Spring Chinook	441,116	7.00%	30,878	0	30,878
Summer Chinook	2,345,996	7.00%	164,220	400,000	564,220
Steelhead	179,072	4.21%	7,539	165,000	172,539
Sockeye		6.41%	Skaha	0	Skaha

Attachment C

Combined Hatchery Compensation

Species	Rock Island	Rocky Reach	Inundation	Total
Spring Chinook	46,645	30,878	0	**77,523**
Summer Chinook	244,624	164,220	400,000	**808,844**
Steelhead	7,974	7,539	165,000	**180,513**
Sockeye	75,692	Skaha	0	**75,692**

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	April 25, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of the March 29, 2011, HCP Hatchery Committees' conference call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met by conference call on Tuesday, March 29, 2011, from 9:30 am to 11:00 am. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Chelan PUD, Colville Confederated Tribes (CCT), and the U.S. Fish and Wildlife (USFWS) will meet at 1:00 pm today to discuss how the Statement of Agreement (SOA) for Methow spring Chinook might affect the transfer for Winthrop spring Chinook to the Okanogan Basin (Item II-A).
- Joe Miller will send out a revised SOA this afternoon (Item II-A).
- Hatchery Committees' members will vote on the revised SOA by email, providing their vote no later than 5:00 pm, Thursday, March 31, 2011 (Item II-A).

DECISION SUMMARY

- The Hatchery Committees agreed to vote by email on the revised SOA by 5:00 pm, March 31, 2011 (Item II-A).

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe opened the call by stating that the purpose of the meeting was to consider Chelan PUD's proposal to move the Methow spring Chinook program to the Wenatchee Basin and increase the production of the program to a level greater than what would be required after 2013 No Net Impact (NNI) recalculation.

II. Chelan PUD

A. Methow Spring Chinook SOA (Joe Miller)

Joe Miller summarized the rationale behind Chelan PUD's Methow spring Chinook SOA (Attachment B). The benefits include higher smolt-to-adult return (SAR) rates for Chiwawa spring Chinook compared to Methow spring Chinook; more effective means of managing adults in the Wenatchee Basin than in the Methow Basin; the Hatchery Scientific Review Group (HSRG) determination that the removal of adult spring Chinook hatchery fish from the Methow Basin would result in improved performance of natural fish production; and the agreement would provide higher production levels in the Wenatchee than would be required by the NNI recalculation.

Tom Scribner said he supports the SOA but said there is a concern within the *US v OR* Production Advisory Council (PAC) about what the Methow Basin production programs would look like after potential PUD hatchery program changes, especially as it relates to fish conservation goals.

Bill Gale said he is largely in support of the proposal but that he shares Scribner's concern about how PUD hatchery program changes may move through the *US v OR* process. Gale said he is concerned that the change proposed in the SOA will affect other HCP programs and programs outside the HCP, for example, the planned transfer of some Methow spring Chinook production to the Okanogan Basin. He would like language added to the SOA that would provide a mechanism to address problems caused to other production programs as a result of transferring Chelan PUD's spring Chinook production to the Wenatchee Basin. Mike Schiewe asked Gale if he was ready to vote on the SOA if that language was incorporated today. Gale said he was not prepared to vote. Schiewe reminded the Committees that the purpose of this call was to vote on the proposed SOA, and that the HCP is very clear that the signatories have acknowledged their authority to make decisions and that the HCP Hatchery Committee was a decision body.

Kirk Truscott said the CCT generally support the SOA; however, they remain concerned that the SOA leaves open the possibility that the planned transfer of Methow spring Chinook to the Okanogan Basin could be subject to change by parties who are not signatories of the HCPs.

Mike Tonseth said Washington Department of Fish and Wildlife (WDFW) is generally in support of the SOA. He said WDFW is concerned about being able to implement the SOA prior to support for the program change within *US v OR*. Schiewe reminded the Committees that decisions in the HCP forum are not contingent on agreement occurring in another forum, and that this is addressed in the HCP, which is a contract. He said that if all HCP signatories approve the SOA, the PUDs will be within their rights to implement the program.

Craig Busack said he is generally in support of the SOA, but that he has a concern regarding the effect of changes proposed to other production programs in the Methow Basin. He asked about the comfort level among Hatchery Committees' members with the production levels as discussed at the last Joint Fisheries Party (JFP) meeting.

Greg Mackey said that estimated SAR rates for Methow spring Chinook were calculated using spawner escapement numbers, as estimated in the Douglas M&E report, and that Chiwawa SAR rates were estimated based on all coded-wire tag recoveries, as described in the Monitoring and Evaluation (M&E) conceptual framework. He said the Methow Basin and Chiwawa River SARs are not directly comparable in that they are estimated from different information. Mackey said the Methow Basin SARs are probably lower than Wenatchee Basin SARs, but the difference is not as great as presented in the SOA. Miller said Chelan PUD's proposal was based not only on SARs, but also on the ability to implement the program. He reminded the Committees that the HSRG concluded that natural production in the Methow Basin would potentially improve with a reduction in hatchery fish.

Tonseth said that to make rigorous comparisons of SARs between the Methow Basin and the Wenatchee Basin would require additional analysis. He suggested that if the SARs for the Methow Basin were higher than currently reported, then some of the concerns regarding broodstock might be reduced. Miller said the big incentive in the SOA is the production of 200,000 spring Chinook for the Wenatchee Basin, which is considerably more than the alternative that would be about 20,000 to 30,000 smolts after the recalculation. Busack said it did not sound like there was concern within the Committees over production levels that would complicate approval of the SOA.

Schiewe asked if Committees members were ready to vote on the SOA or if they had language to add to the SOA before the vote. Gale and Busack said they would like some acknowledgement in the SOA that the transfer of Chelan PUD's Methow Basin production to the Wenatchee Basin would trigger a Hatchery Committees' evaluation of the effect of the transfer on all Methow Basin hatchery programs' goals and production levels. Gale said that the effect of the Chelan PUD proposal would cut overall Methow spring Chinook production by half. Gale suggested the following text: "This SOA will require a comprehensive review by the Hatchery Committees of all spring Chinook programs in the Methow Basin." Shane Bickford asked whether acceptance of the SOA would lead to a reopening of the draft Methow spring Chinook Hatchery and Genetics Management Plan (HGMP) submitted to National Marine Fisheries Service (NMFS) last year. Bickford said that the HGMP already contemplated a reduction in the size of the program, and accommodated such change through the use of sliding scales. Busack agreed that this action would not require reopening the HGMP.

Schiewe said the Committees always have the option to consider program changes under the adaptive management section of the HCPs, asking if the additional language in the SOA is even necessary. Bickford said he did not think it was necessary and said Douglas PUD supports Chelan PUD's proposed program change. Schiewe asked if others are OK with not adding the additional language. Tonseth and Busack agreed that additional language was not necessary, but Gale reiterated his support for formalizing the requirement of a basin-wide review. Tom Kahler reiterated that the HGMP was written anticipating a reduction in production with NNI recalculation of all PUD programs, so he does not think the proposed change in reduction would require a reopening.

Tonseth suggested that added text specify that the Hatchery Committees' review of Methow Basin hatchery programs' goals and production levels be completed within a year of the Committees' approval of the SOA. Truscott said he wanted to further discuss with Chelan PUD the potential for the proposed transfer of Methow spring Chinook production to interfere with the agreed-to transfer of Methow Basin fish to the Okanogan program. Gale asked to participate in that discussion; they agreed to meet today at 1:00 pm. Truscott said he would like to delay the vote until after this afternoon's discussion.

Schiewe summarized that the following language would be added to the SOA based on today's discussions: "Approval of the SOA will require the Hatchery Committees to review and evaluate goals and production levels for all Methow Basin hatchery programs within 1 year of approval." Chelan PUD, CCT, and USFWS will meet at 1:00 pm today to discuss how the SOA might affect the transfer of Methow spring Chinook to the Okanogan Basin. Miller will send out the revised SOA this afternoon and all agreed to a vote on the revised SOA by email. Committees' members agreed to provide their vote on the revised SOA to Schiewe by email no later than 5:00 pm, Thursday, March 31.

List of Attachments

Attachment A – List of Attendees
Attachment B – Chelan PUD Methow spring Chinook SOA

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Shane Bickford	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack*	NOAA
Kirk Truscott*	CCT
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Tom Scribner*	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B

Chelan PUD-Transition to NNI production levels for Methow spring Chinook in 2011 and Reallocation of Spring Chinook Hatchery Production to Chiwawa

For Decision at the March 29, 2011, Hatchery Committee Conference Call

Statement of Agreement

Chelan PUD is requesting approval from the Rock Island and Rocky Reach Habitat Conservation Plans' (HCPs) Hatchery Committees to implement the following actions:

1) Implementing 7% No-Net-Impact (NNI) production level for 2011 Methow Spring Chinook program (i.e., 90,000 smolts, Table A) and future transition of Chelan's spring Chinook obligation from the Methow Basin to the Chiwawa program following recalculation (i.e., beginning with the 2012 broodyear for release in 2014; Table A).

2) In exchange for the implementation of the proposed adjustments in 2011 (i.e., item 1 above), Chelan PUD is proposing to adopt a recalculated 200,000 spring Chinook smolt production level at Chiwawa Hatchery for the 2012 broodyear (releases in 2014) and thereafter. The intent of this agreement is to maintain a minimum 200,000 smolt program at Chiwawa indefinitely, unless, through adaptive management, ESA concerns, or under permit requirements, the Hatchery Committee decides to alter or reallocate production targets (Table A). The 200,000 smolt program at Chiwawa would represent Chelan's aggregate Rocky Reach and Rock island NNI spring Chinook mitigation for the Methow, Entiat, and Wenatchee Rivers.

3) Chelan will produce 298,000 spring Chinook at Chiwawa for the 2011 broodyear (i.e., 2013 release year; Table A).

4) Chelan will contribute to the future production of spring Chinook in the Okanogan Basin in accordance with previous agreements (i.e., this SOA incorporates the December 12, 2007 SOA regarding Chief Joseph Hatchery). As a component of the future CJH Funding Agreement between Colville Confederated Tribes and Chelan PUD, Chelan PUD may fund implementation of the CJH by directly funding measures necessary for the production and procurement of CJH spring Chinook broodstock in the Methow River.

5) The HCP will evaluate program linkages between spring Chinook hatchery goals and production levels within the Methow Basin within one year of approval of this SOA.

Attachment B

TABLE A: Proposed spring Chinook production levels for 2011 and thereafter

	Unadjusted current production levels	Proposed production levels (BY 2011)	Proposed recalculated production levels (BY 2012)
Methow Program	288,000	90,000	0
Chiwawa Program	298,000	298,000	200,000

Attachment B

Background

The Chiwawa spring Chinook program has had higher performance than the Methow Hatchery (460% higher SAR). A higher performing program makes more efficient use of listed broodstock and may translate into more fish for harvest (Appendix A: Figure 1). Based on this, Chelan PUD is offering a long-term commitment to produce 200,000 spring Chinook at Chiwawa in exchange for (1) reducing the 2011 Methow production levels to reflect 7% NNI for the 2011 brood year (i.e., 288,000 to 90,000), and (2) discontinuing the use of Methow entirely in brood year 2012 and thereafter. The 200,000 smolt program at Chiwawa would represent Chelan's aggregate Rocky Reach and Rock island NNI spring Chinook mitigation for the Methow, Entiat, and Wenatchee Rivers.

<u>This production reallocation will provide over 4x the number of returning adults than the current potential maximum recalculated levels that utilize Methow Hatchery</u> (Appendix A: Figure 1 and Tables 1-3). Specifically, the maximum recalculated levels (i.e., SAR or carrying capacity based recalculation methods) would require the production of approximately 20,000 smolts at Chiwawa and about 132,000 at Methow (Appendix A: Table 3[1]). Unfortunately, because of low SARs at Methow, the number of returning adults produced from these smolts would be relatively small compared to the proposed 200,000 produced at Chiwawa, Appendix A: Figures 1 and 2).

KEY INFORMATION:

- Chiwawa SAR is 460% higher than Methow SAR (Chiwawa SAR = 0.0069; Methow SAR = 0.0015)
- At current program levels, the Methow program is broodstock limited (based on assessments by USFWS[i] and Douglas PUD M&E report[ii]). Chief Joseph hatchery may also be using MetComp spring Chinook broodstock in the future.
- In the absence of the current proposal, the maximum recalculated hatchery production level for <u>Chiwawa could be less than 22,000 smolts for the next 10 years.</u>
- In the absence of the current proposal, there is no other recalculation scenario that will produce 200,000 spring Chinook smolts (at Methow or Chiwawa or combinations thereof).
- The proposal for 200,000 smolts at Chiwawa is within the current production level proposed for the Wenatchee Spring Chinook HGMP and could be considered in the current section 10 permit application.

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[1] The SAR production level for Entiat cannot be calculated, but using the highest alternative approach, it appears that up to 8,353 smolts would be required for production at either Methow or Chiwawa.

Attachment B

Appendix A. Spring Chinook population estimates, mitigation, and production by the Chelan PUD Hatchery Program, post-recalculation (2014-2023).

Table 1. Estimated spring Chinook smolt production in the mid-Columbia River Basin, by calculation method and tributary.

Basin	Egg-Smolt	Redds	SAR-Based	Smolt-Trap	Carrying Capacity
Wenatchee	203,594	NA	305,210	132,440	339,968
Entiat	51,912	51,290	NA	30,263	65,195
Methow	46,901	100,142	1,029,216	15,250	375,921
Sum	302,407	151,432	1,334,426	177,953	781,084

Table 2. Chelan PUD spring Chinook smolt NNI mitigation requirements, by calculation method and tributary.

Basin	Egg-Smolt	Redds	SAR-Based	Smolt-Trap	Carrying Capacity
Wenatchee	12,725	NA	19,076	8,278	21,248
Entiat	6,651	6,572	NA	3,877	8,353
Methow	6,009	12,831	131,868	1,954	48,165
Sum	25,385	19,402	150,944	14,109	77,766
Rock Island NNI	*6.25%*				
Rocky Reach NNI	*7.00%*				
Combined NNI	*12.81%*				

Table 3. Chelan PUD post-2013 spring Chinook artificial smolt and adult production, by recalculation method and hatchery.

	Juvenile Releases			Estimated Returning Adults		
Hatchery	SAR-Based	Carrying Capacity	Proposed	SAR-Based	Carrying Capacity	Proposed
Chiwawa	19,076	21,248	200,000	132	147	1,386
Methow	131,868	56,518	0	193	83	0
Sum	150,944	77,766	200,000	325	230	1,386
Methow SAR	*0.00146*					
Chiwawa SAR	*0.00693*					

Attachment B

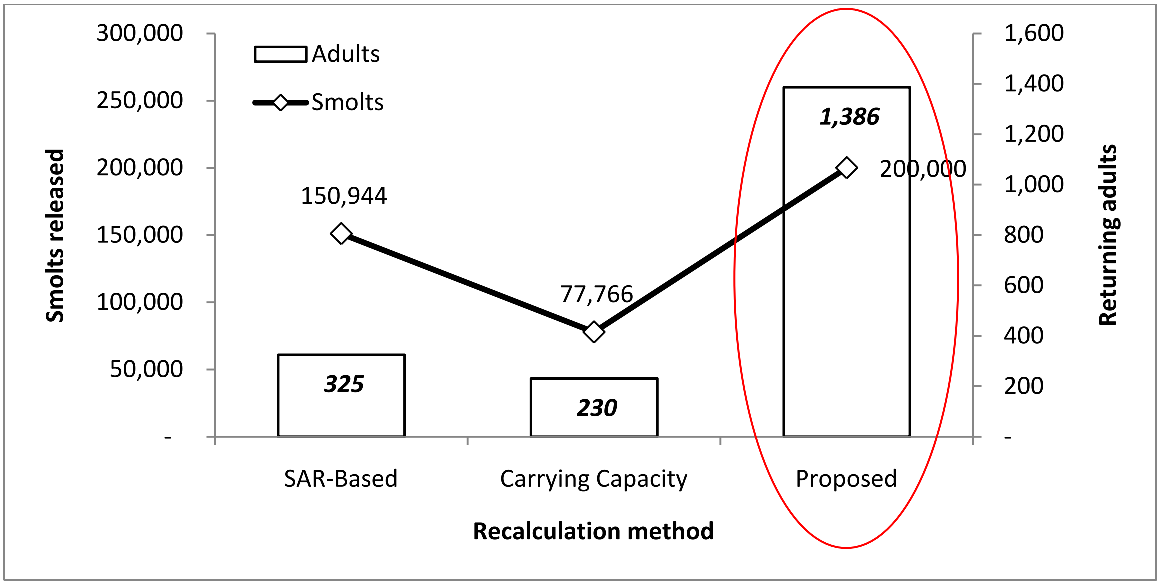

Figure 1. Total spring Chinook smolts and estimated returning adults from the Chelan PUD Hatchery Programs by recalculation method, 2014-2023. <u>Chelan's proposed method of 200,000 smolts at Chiwawa provides over 4X the number of returning adults as the highest alternative recalculation methods involving Methow Hatchery</u>.

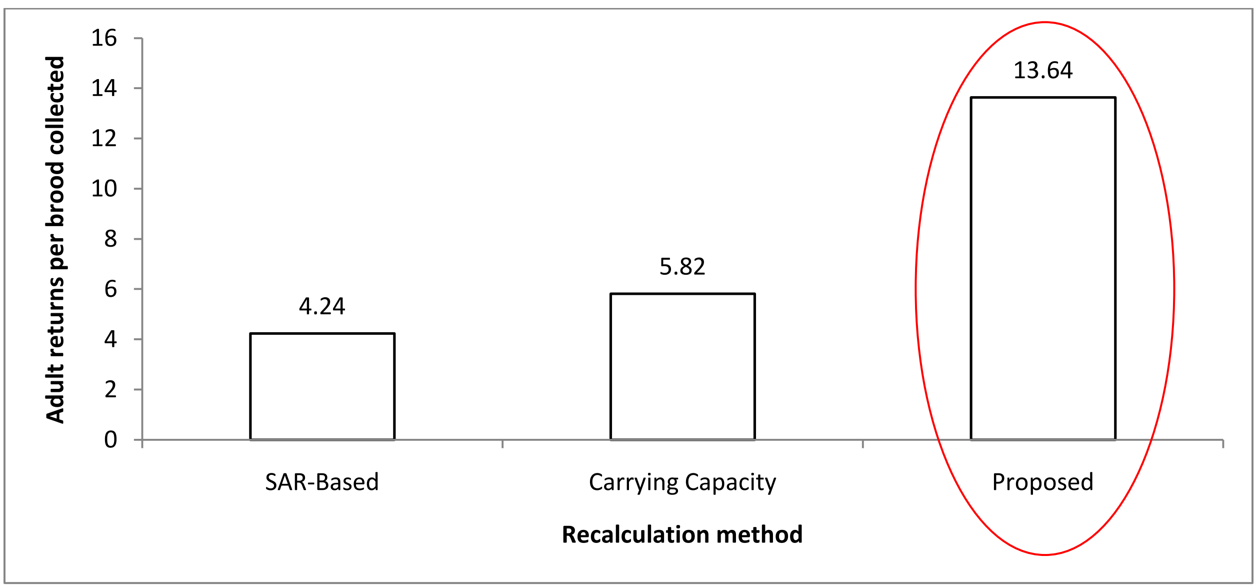

Figure 2. Estimated number of returning adults per brood adult collected in the Chelan PUD Hatchery Programs by recalculation method, 2014-2023. Estimates based on a constant fecundity of 4,800 eggs, 1:1 sex ratio, and 82% egg to smolt survival. <u>Because of the disparity in SARs, Chiwawa creates adult returns more efficiently (per unit of broodstock) than Methow Hatchery.</u>

Attachment B

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[i] "A critical limitation to achieving conservation goals has been difficulty with trapping wild adults for broodstock, particularly in the mainstem Methow River." (p.107, USFWS Columbia Basin Hatchery Review Team, Leavenworth NFH Complex Assessments and Recommendations Report – April 2007)

[ii] "Spring Chinook releases were at least 10% below program production goals, primarily because of inadequate broodstock collection due to low overall abundance of returning adult fish. Recent broodstock protocols have included mainstem collection sites (i.e., Wells Dam) in addition to tributary locations to maximize broodstock collection opportunities. However, limitations to trapping duration (i.e., only 3 d per week) and the necessity of using DNA analysis to determine stock origin limits the ability of Wells Dam trapping to complete numeric objectives. Analysis of tissue samples currently allows managers to separate collected natural origin fish into Twisp or non-Twisp groups. Wild spring Chinook salmon identified as non-Twisp origin are incorporated into the Methow Composite stock, but this broad genetic grouping likely includes stray fish from other river basins, further decreasing the utility of trapping at Wells Dam. Managers should continue to investigate tributary collection methods and locations for the Methow Composite stock to maintain genetic integrity, represent run timing of local stocks, and assist with meeting numeric collection targets." (p.18, Monitoring and Evaluation of Wells and Methow Hatchery Programs in 2009; Chapter 1: 2007 Brood Spring and Summer Chinook Salmon and 2008 Brood Summer Steelhead Reared at Methow and Wells Hatchery Facilities)

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	May 18, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of April 20, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Douglas Public Utility District (PUD) Headquarters Building in East Wenatchee, Washington, on Wednesday, April 20, 2011, from 9:30 am to 4:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Kirk Truscott will review Okanogan River Coded Wire Tag (CWT) spawner survey data to determine the origin of summer/fall Chinook spawning in the vicinity of Bonaparte Pond; this information will be considered by the Hatchery Committees in deciding whether to support continued use of the pond for acclimation in 2011 (Item III-B).
- Mike Tonseth will revise the Tumwater Dam (TWD) Operation Protocols as discussed in today's meeting, for distribution to the Hatchery Committees prior to the May meeting (Item IV-C).
- Josh Murauskas will schedule a meeting of interested Hatchery Committees members to discuss methods for estimating natural-origin production for use in No Net Impact (NNI) recalculation (Item V-A).
- Bill Gale will provide information to Carmen Andonaegui on a planned meeting arranged by the Bureau of Reclamation (BOR) and the U.S. Fish and Wildlife Service (USFWS) on a proposal to construct a weir on the upper Methow River; Andonaegui will distribute this information to the Hatchery Committees (Item V-B).
- Greg Mackey will report back to the Hatchery Committees on Douglas PUD's plans for marking steelhead in 2011 (Item V-C).
- Todd Pearsons will check with the Priest Rapids Coordinating Committee's Hatchery Subcommittee (PRCC HSC) to determine if they are interested in

moving the planned June 16 meeting to the week of June 23 to avoid conflict with the Yakima Klickitat Fisheries Project program review (Item VIII-A).

SOA DECISION SUMMARY

- There were no Statement of Agreement (SOA) decision items at today's meeting.

AGREEMENTS

- The Hatchery Committees agreed to the Chelan PUD proposal to continue rearing up to 400k summer/fall Chinook at the Ringold Hatchery for transfer and acclimation at the Chelan Falls Facility (Item II-A).
- The Hatchery Committees agreed to defer a decision on whether to discontinue summer Chinook acclimation at Bonaparte Pond until their next meeting (Item II-B).
- The Hatchery Committees agreed to Chelan PUD's proposal to continue to use passive integrated transponder (PIT)-tag detections to enumerate Wenatchee Basin sockeye, but also to continue to conduct spawning ground surveys and carcass recoveries in the Little Wenatchee River (Item II-C).
- The Hatchery Committees approved by email on April 12, 2011, a request from Sandy Downing, National Marine Fisheries Service (NMFS), for 4,000 excess Wells yearling summer Chinook (Item IV-B).

REVIEW ITEMS

- There are no review items at this time.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. Tom Scribner asked for time for the Joint Fisheries Parties (JFP) to caucus prior to the NNI agenda item discussion. Douglas PUD asked that their agenda item on the 2013 NNI Recalculation be changed from a decision to a discussion item, and that an update on Twisp Pond acclimation be added to the agenda. Chelan PUD asked that both the 2013 NNI Recalculation SOA and the Chelan Spring Chinook SOA decision items be removed from the agenda, and requested the Yakama Nation provide an update on acclimation at Rohlfing Pond. Mike Tonseth asked that the agenda item for discussion of the second draft of the TWD Operations Plan be changed to a discussion of the comments received on the first draft of the TWD Operations Plan. The USFWS asked that two discussion items be added to the agenda: steelhead marking in the Methow Basin; and notice of a meeting to set goals and objectives for locating a new, BOR-funded weir on the upper Methow River. Tonseth said Bob Rogers, Washington Department of Fish and Wildlife (WDFW), will attend today's Hatchery Committees meeting to participate in the discussion on the use of Bonaparte for acclimation of summer/fall Chinook. Craig Busack agreed to provide an update on the status of NMFS's review of the Hatchery and Genetics Management Plans (HGMPs) for the Upper Columbia hatchery programs.

Both the March 16, 2011 Committees meeting minutes and the March 29, 2011 Committees conference call minutes were reviewed; the March 16 minutes were approved as written and the March 29 minutes were approved with revisions. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Douglas PUD

A. Twisp Acclimation Update (Greg Mackey)

Greg Mackey reported that Douglas PUD has implemented a trial of mixed-species acclimation at Twisp Pond this spring, with approximately 60,000 to 70,000 spring Chinook and 32,000 to 34,000 steelhead. He said that Charlie Snow, WDFW, reported the two species appeared to be doing well and no notable levels of mortality have been observed. Mackey said an end-point condition check will be conducted. He said the ratio of steelhead to Chinook in the acclimation pond is intended to reflect HGMP production program ratios. The balance of steelhead juveniles allocated to the Twisp River will be drop-planted into the Twisp River.

III. Chelan PUD

A. 2011 Path Forward for the Ringold Hatchery (Joe Miller)

Joe Miller said Chelan PUD plans to continue initial rearing of summer/fall Chinook for the Chelan Falls yearling program at Ringold Hatchery as agreed to in 2009 and using the same Integrated Hatchery Operations Team (IHOT) rearing densities. The Ringold fish will be transferred to the new Chelan Falls acclimation facility, to be completed in fall 2011 (Attachment B). The Hatchery Committees agreed with the planned 2011 actions.

B. Discontinuation of Bonaparte Acclimation (Joe Miller)

Joe Miller reported that Chelan PUD is recommending discontinuing the use of Bonaparte Pond for rearing and acclimation of summer/fall Chinook (Attachment C). He said that because of continuing problems with fish health at Bonaparte Pond, continued use of the pond poses a risk to Chelan PUD's ability to meet their mitigation targets. He said Bonaparte Pond production would return to the Similkameen Facility. Kirk Truscott agreed that continued use of the pond for rearing and acclimation of 200,000 summer Chinook at Bonaparte Pond would require aggressive disease treatment. However, he noted that moving all Okanogan summer Chinook hatchery production to the Simikameen Facility would also pose a risk of possible catastrophic loss of the entire program if something goes wrong at the Similkameen Facility.

Truscott said one goal of acclimating summer/fall Chinook at Bonaparte Pond was to redistribute summer Chinook spawning in the Okanogan Basin. He said that in the last two years, summer/fall Chinook were observed spawning in the Okanogan River in the vicinity of Bonaparte Pond; however, it has not been established whether the spawners were from the Bonaparte Pond releases. Truscott agreed that keeping 200,000 summer Chinook at Bonaparte Pond has not been very beneficial to Okanogan production, given the disease and early icing issues. He suggested a reduced number of juveniles for acclimation with continuation of an aggressive treatment program. The Hatchery Committees discussed that the role of Bonaparte Pond in reshaping spawning distribution in the Okanogan River will be greatly diminished when planned summer/fall Chinook production from Chief Joseph Hatchery begins.

Bob Rogers noted that in 2007 the number of juveniles placed in Bonaparte Pond for acclimation was increased from 100,000 to 200,000. He said 100,000 should be the maximum number of juveniles placed in Bonaparte Pond for acclimation given the water quality limitations. Rogers suggested that limiting the pond capacity to 100,000 juveniles and aggressive treatment with Chloramine T would possibly be a solution.

The Hatchery Committees agreed to defer a decision on the continued use of Bonaparte Pond until next month so that Truscott and other interested Committees members could compile CWT data on the spawners observed in the vicinity of Bonaparte Pond in order to determine if they were returnees from Bonaparte Pond releases.

C. Wenatchee Sockeye Escapement Using Mark-Recapture Methodology (Josh Murauskas)

Josh Murauskas said that Chelan PUD's 2009-2010 Wenatchee sockeye escapement estimates based on PIT-tag detections had been previously reported to the Committees. He said Chelan PUD is proposing to continue PIT-tagging sockeye in 2011 for use in enumerating adult escapement and to continue carcass recovery of CWTs for use in determining adult origin and spawner composition. Murauskas said that with the double PIT-tag arrays at the entrance to the White River, he estimated that only 250 PIT-tagged adults would be needed to estimate adult sockeye escapement at a +/- 7 percent confidence interval (CI). The minimum number of tags required (i.e., 250) was presented to illustrate the power of the mark-recpature approach. Additional tags will be available if needed.

Mike Tonseth said he recommends Chelan PUD continue redd counts and spawning ground surveys in the Little Wenatchee River to ground-truth PIT-tag adult escapement estimates. Kirk Truscott said that given that the Little Wenatchee River has such relatively low spawner abundance, clear water conditions, and little redd superimposition, it offers reliable conditions for estimating spawning abundance based on redd counts. Joe Miller agreed to continuing full spawning ground surveys in the Little Wenatchee River as a component of the caracass surveys. The Hatchery Committees agreed to Chelan PUD's proposal.

D. Rolfing Pond Update (Mike Tonseth)

Mike Tonseth reported that a high water event pushed fish out of Rohlfing Pond earlier this month. Keely Murdoch said there was no estimate of how many fish remain in the pond. The Yakama Nation became aware of the unintentional release when they were advised that juvenile steelhead were being captured in downstream smolt traps.

IV. WDFW

A. 2011 Broodstock Protocols (Mike Tonseth)

Mike Tonseth reviewed the draft 2011 Hatchery Broodstock Collection Protocols (Protocols), emphasizing where changes had been made to the previous year's protocols. He said he had received comments from only Douglas PUD and that these focused on making sure the individual protocols aligned with draft HGMPs. Tonseth noted that he included text to cover both of the two possible alternatives for Entiat summer Chinook broodstock collection protocols being discussed by the USFWS and Douglas PUD. Tonseth will revise and finalize the Protocols as discussed in today's meeting, and send them to Carmen Andonaegui for distribution to the Hatchery Committees prior to the next meeting.

B. Draft Hatchery Production Management Plan (Mike Tonseth)

Mike Tonseth reported that he received comments from Douglas PUD on the draft Hatchery Production Management Plan (Plan) recommending deletion of the first paragraph of the draft and providing some minor grammatical edits. He said if the Hatchery Committees are satisfied with the draft, he will send it to WDFW in Olympia for their review. Tonseth said that assuming Olympia's approval, he will ask for the Committees' approval of the Plan at next month's meeting.

Steve Hays asked if there was a category in the Plan that allows for the use of excess production fish for research purposes. Tonseth said this is accounted for in the Plan.

C. Comments on 1st draft Tumwater Dam Operations Plan (Mike Tonseth)

Mike Tonseth reviewed the USFWS comments from Steve Lewis on the first draft of the TWD Operations Plan. Bill Gale clarified several USFWS comments, saying that the USFWS agrees that there is no passage delay at Dryden Dam, and hence there is no need for an operations plan at Dryden Dam similar to TWD. Gale further clarified that bull trout tend to pass TWD at a given flow regime following peak discharge. Gale also clarified that the USFWS recommendation on staffing the facility applied to the migration season for all salmonid fish species passing TWD, not just for bull trout.

Josh Murauskas presented Chelan PUD's comments on the Operations Plan as submitted to Tonseth, remarking that the Operations Plan should include real-time monitoring for use in evaluating whether the proposed protocols are having the desired effect. Tonseth agreed that real-time monitoring should be implemented, and agreed to draft a protocol for including in a monitoring plan. However, Tonseth said he did not agree with applying the 98 percent passage rate at TWD because there was too much uncertainty in estimating adult inter-dam survival into the Wenatchee. For example, he said last year there was a difference of 16 percent in adult passage numbers between the Rocky Reach and Rock Island interdam count and adults counted passing TWD. Joe Miller said Chelan PUD would be satisfied with real-time monitoring and operations to evaluate and manage adult passage at TWD. The Hatchery Committes discussed how adult passage at TWD might be measured. Keely Murdoch said it would be more helpful to focus on operational improvements at TWD and narrow down where adult passage delays might be occurring. Kirk Truscott agreed that rather than focusing on measuring passage survival, the focus should be on passage efficiency between pools 15 and 18 where the PIT-tag detectors are located in the fish ladder.

Tonseth summarized that the majority of the Yakama Nation's comments focused on monitoring the effect of operational improvements on adult passage time. Murdoch said she thinks the delay problems at TWD are related to fishway operations. She said that planned modifications should improve operation efficiency and that the effects of the modifications need to be monitored to evaluate whether they decrease passage delays. Murdoch said the real-time monitoring will help identify where the problems are occurring. Miller said the Operations Plan needs to be final by June 1, 2011. Tonseth said he will develop a monitoring plan for implementation in 2012 and beyond, and also a plan for using real-time monitoring in 2011 to identify and evaluate adult passage delay problems. He agreed to revise the Plan as discussed in today's meeting, for distribution to the Committees prior to the May meeting.

V. Yakama Nation

A. Joint Fisheries Parties 2013 NNI Recalculation Proposal *(Keely Murdoch)*

Keely Murdoch presented a proposal for the 2013 NNI recalculation developed by the JFP (Attachments D). She provided background on previous discussions and restated the definition of NNI from the HCP. She said nowhere in any of the documents that she reviewed is hatchery compensation tied to carrying capacity.

Murdoch emphasized that the HCP states that the Biological Assessment and Management Plan (BAMP) shall be considered when recalculating NNI, and reviewed the BAMP calculation. She summarized the information that was originally available for calculating smolt production for NNI and described how NNI was to be adjusted during recalculation (Attachment E). She said the objective is to measure run-of-river fish survival, saying the BAMP method is a back-calcuation based on total number of smolts passing each project as a function of adult returns.

Murdoch said Chelan PUD's proposal to use a carrying capacity-based method was inconsistent with the HCP; the BAMP method mitigates for all unavoidable mortality and is consistent with the HCP. Murdoch said the BAMP method for calculating NNI should only be modified as long as it did not change the intent of the HCP. As an example, she used spring Chinook adult returns for Rock Island Dam (RI) from 2003 to 2008, and cumulative smolt-to-adult return (SAR) rates from Upper Columbia spring Chinook programs from 1999 to 2003. Using these data sets, spring Chinook NNI mitigation for RI is estimated to be about 332,000 juveniles, which she said is close to what previous discussions on NNI recalculation estimated.

Tom Scribner said that the Yakama Nation thinks the BAMP method is a good alternative for recalculating NNI. He said he would like to hear a discussion on why it is not a reliable method that could be modified and used for recalculation in 2013. Murdoch said the JFP proposal is for discussion and is not a final proposal. She then asked for discussion.

Steve Hays said that the BAMP was not intended to be a back-calculation method; rather, it was based on an assumption that 7 percent of the total number of smolts that arrived at a dam are lost as a result of hydropower projects' operations. Assuming no loss of smolts between dams, the number of juveniles it would take to make up the estimated 7 percent loss is NNI. He said SARs were never intended to be combined with Federal hatcheries, but to be estimated for individual PUD hatcheries. The goal was to improve the performance of hatcheries in the HCP context and through adaptive managment, and that PUD hatchery performance would be used in calculating future hatchery compensation levels. These hatchery-specific SARs could then used to determine how many adults were needed to meet juvenile production needs. He emphasized that the BAMP method is an adult-to-adult-based calculation and was never intended as a back-calculation. Hays said one of the original concerns of calculating NNI was that the basin populations not be swamped with hatchery fish; the goal of NNI was to make up for production lost as a result of the dams and to compensate for production that pre-dated dam construction. Scribner said there are other mitigation goals than mitigating for lost production, such as lost harvest opportunity. Murdoch noted that the HCP describes a two-step process: first, mitigation is determined and then a plan for implementation is developed. Josh Murauskas said that the missing piece in estimating annual smolt production is the natural-origin component. He said that hatchery production is known. Murauskas said using a back calculation to estimate numbers of hatchery migrants was unnecessary, as the number released was a matter of record. He said using the hatchery release numbers is a much simpler and accurate measure of actual "hatchery smolts" in the system. Secondly, Murauskas said part of the recalculation discussion is whether to mitigate for mitigation fish.

Joe Miller provided the Hatchery Committees a handout of statements from the HCP regarding the BAMP and text from the BAMP regarding productivity (Attachment F). Murdoch said it is confusing as to what is meant in the HCP and what is meant in the BAMP regarding the terms "adult-to-smolt" versus "adult/smolt"; she said she knows "adult/smolt" is the definition of SAR. Hays said that "adult-to-smolt" is intended to be a way to evaluate adult returns as they relate to natural production. Miller said SAR rates just need to be taken into consideration when calculating NNI and that how to do this needs to be discussed. Schiewe said the JFP is advocating using the BAMP method to accomplish this, while the PUDs are recommending other methods. Miller quoted the the HCP, noting that the original 7 percent number is expected to change based upon the completion of survival studies: " Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs." He emphasized the intent of the HCP is to provide mitigation to help build natural production. Scribner reminded him that harvest is also a goal, as are rebuilding natural populations of non-Endangered Species Act (ESA)-listed species. Bill Gale said the Committees need to decide what the mitigation obligation should be first, and then consider implementation and the effects of implementation on natural reproduction. Scribner asked if one of Chelan PUD's concerns was to not have to mitigate for another PUD's mitigation production. Miller explained that hatchery compensation should replace fish lost as a result of hydroelectric project mortality (i.e., 7 percent as adjusted by survival studies) but not cause a compounding of production that exceeds project mortality levels and the original number of fish that encounter the projects. The Committees discussed how many fish each Project needs to mitigate for and whether this should be based on incoming smolts at an upstream dam (such as Wells Dam) and keeping that number of smolts whole as they move through additional projects, or based on how many smolts arrive at each of the dams downstream.

Miller and Murdoch discussed the issue of carrying capacity as it relates to NNI and recalculation and as it is described in the BAMP. Miller noted that the BAMP explicitly identifies carrying capacity as an important consideration for determining production levels. As an example, the BAMP indicates that for steelhead, where hatchery production was determined to exceed carrying capacity, production should not be increased. Scribner said carrying capacity should only be considered in the implementation phase. Miller said it could be considered in both the calculation and the implementation phases. Gale said that if the BAMP method is used and then it is determined that the resulting mitigation number exceeds carrying capacity, then the NNI calculation should be reviewed to determine if the information used in the equation was accurate. Murdoch said the data set used to estimate SARs should be the starting point for reviewing the accuracy of NNI calculations and a starting point for discussion of NNI recalculations.

Hays reiterated that the goal of NNI is to mitigate for production losses consistent with recovery and to mitigate for harvest opportunities impacted by dam operations. Miller said CWT-derived SARs significantly underestimate actual SARs for recent years; CWT-based estimates are not instantaneous like dam counts and are subject to continuous revision over time. Murdoch said annual monitoring and evaluation (M&E) reports should include an evaluation of the data sets used for deriving escapement estimates. Craig Busack asked why hatchery SARs are being used. Members of the Committees said it was because there are no SARs for natural-orgin fish; however, Murdoch said that by the next recalculation period, there may be natural production SARs available. Busack said the BAMP method for estimating smolt mortality appears to be a very poor way to calculate mitigation production for natural production, given how poor hatchery survival is compared to wild fish survival. Hays clarified that the BAMP calculation was intended to determine how many fish would be needed to make up for production from adults return losses (adult-to-adult), to avoid trying to determine how many natural and hatchery smolts arrive at a dam. He said the best way to approach this is to determine how many adults are needed for production.

Miller presented the PUDs' Principles of Adjustment for Hatchery Compensation (Principles) (Attachment G). He said the Principles are in response to the JFP's request for a common approach by the PUDs to NNI recalculation. He said the the PUDs reviewed M&E data to identify the number of hatchery- and natural-origin smolts in the Upper Columbia basins and then revisited the BAMP method. Miller said the goal of finding the best way to estimate smolt numbers is consistent with the HCP.

Greg Mackey indicated that the goal stated in the Principles is taken directly from the HCP. He said the objectives for accomplishing recalculation (the number of smolts produced and an estimate of NNI to compensate for mortality) should be mutually agreeable to all Parties. Mackey said hatchery smolt numbers do not need to be estimated because it is known how many hatchery smolts are released. For naturally produced smolts, the PUDs' proposal lists three methods, starting with the most direct method of using smolt trap data. He said where smolt trap data are not robust enough, spawner survey data could be used to estimate natural smolt production using egg-to-smolt survival. If no other data are available, Mackey said the PUDs proposed to use spawning escapement/SAR for an estimate of naturally-produced smolts, separating out hatchery smolts by some agreed-upon method. Todd Pearsons said the intent of the Principles was to come up with the most direct, consistent approach to estimating smolt numbers. Mackey said the PUDs wanted to clearly describe the method for recalculations so it would be possible to repeat the method in 2023.

Scribner asked the PUDs to respond specifically to the JFP proposal. He said the current hatchery M&E plan focused more on monitoring for trends and on the effects of hatchery production on natural production. He said that he would like a response from the PUDs as to how the M&E results relate to determining mitigation production needs. Murdoch said it is important to leave a very clear record of how 2013 recalculation is performed and the logic behind decisions on methods. The Hatchery Committees discussed calculating both hatchery and natural production and how to approach identifying an agreed-upon method; all the Committees' members agreed with using hatchery production release numbers (i.e. the program number of hatchery smolts) for calculating the number of hatchery smolts arriving at dams. Schiewe said that what remains is for the Committees to agree on a method for estimating natural smolt production. When estimating smolt production, the PUDs' proposal uses an estimate of smolt production measured at the tributary outlet rather than at the dams, as done in the BAMP method. Mackey said that as long as the same dateset is used to estimate adult returns—as in the BAMP equation of adult returns/SARs—this method would work for the PUDs. He said that using SARs based on tributary recoveries and using smolt passage estimated at dams does not align for use in the calculation. Mackey said that when hatchery adults are not marked to allow for differentiation between hatchery- and natural-origin, run composition estimates would be used for each subbasin.

Ultimately, Murauskas suggested using adult returns and run composition (i.e., hatchery- versus natural-orgin) at the projects to estimate the numbers of hatchery smolts required to compensate for the natural origin adults that would have returned if it were not for the unavoidable dam-passage mortality of juveniles. Members of the Hatchery Committees agreed to convene a working group of interested members to work through an example recalculation for spring Chinook using Murauskas's suggested approach for estimating the natural smolt portion of NNI; Murauskas agreed to arrange and schedule the meeting. For the next Committees' meeting, Committees' members will be prepared to review sample spring Chinook hatchery production numbers, and address which hatchery programs require mitigation.

B. Proposal to Construct a Weir on the Upper Methow River (Bill Gale)

Bill Gale said he attended a recent meeting in the Methow Basin, arranged by the BOR, concerning a proposal to construct a weir on the upper Methow River. Gale said the weir is being proposed primarily to benefit the Winthrop Hatchery programs but will be available for other hatchery programs use. He said he would like to get the PUDs involved in discussions. Gale said a BOR process is being used to evaluate the proposal, with the next meeting tentatively scheduled for June 14, 2011. The purpose of the meeting will be to identify goals and objectives for the construction of a weir; the meeting will be facilitated. After establishing goals and objectives, the USFWS will move into more extensive planning. Gale said he will email information on the planned meetings and process to Carmen Andonaegui for distribution to the Hatchery Committees. He asked that contact information for other potentially interested parties be sent to him.

C. Hatchery Steelhead Mass Marking (Bill Gale)

Bill Gale reported that during USFWS steelhead broodstock collection for Winthrop NFH this year, they encountered a large number of presumed wild, adipose-present steelhead. The steelhead turned out to be hatchery fish, based on the results of scale analysis. Gale asked if it was possible for Douglas PUD to CWT all Wells hatchery steelhead released without an adipose clip (ad-clip). He said this would eliminate the need for the USFWS to do costly scale analysis and collect non-target fish for broodstock. Kirk Truscott said that some adipose-present hatchery steelhead returning to the Winthrop Hatchery could be Wenatchee hatchery program strays. He said the JFP has identified the need for a marking scheme for hatchery steelhead in the Upper Columbia, where marking options are limited because of the many fisheries. Mike Tonseth said a blank tag could be used rather than a CWT, which would be less expensive. He said there is no need to place a CWT in a fish that is not ad-clipped. Greg Mackey said he will report back to the Hatchery Committees on Douglas PUD's plans for marking steelhead in 2011. Tonseth said that about 100,000 to 150,000 Douglas PUD hatchery steelhead are not ad-clipped, but that they are suppose to be elastomer-tagged. A discussion on an Upper Columbia hatchery steelhead marking scheme will be on the next month's Committees' meeting agenda.

VI. NMFS

A. HGMP Update *(Craig Busack)*

Craig Busack reported that NMFS has begun evaluating the draft USFWS Entiat summer Chinook HGMP. He said NMFS will finalize the Winthrop steelhead program letter today regarding the draft Winthrop Steelhead HGMP. Busack said NMFS received the draft Wells Steelhead HGMP but have not yet begun the review. He said review of the Wenatchee HGMPs has been delayed by work on the Snake River consultations and by a need to respond to a 60-day Notice of Intent to legally challenge the Sandy River hatchery program.

VII. HETT Update

A. Update (Carmen Andonaegui)

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on April 12, 2011, and discussed the following items:

Non-target Taxa of Concern (NTTOC) Risk Assessment:

- The HETT will deliver to the Hatchery Committees a draft 5-year report on risks to NTTOC by September and a final report by the end of 2011. The report will describe the process used to evaluate the risk, but the Dephi review will not likely be completed in time to include in the 5-year report.

Control Group Analysis:

- Tracy Hillman is preparing a report describing the reference stream analytical methods.

The next HETT meeting is scheduled for May 10, 2011.

VIII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are May 18 (Douglas PUD office, East Wenatchee), June 15 (Chelan PUD office, Wenatchee), and July 20 (Douglas PUD office, East

Wenatchee). Mike Schiewe asked if the June 2011 meeting could be moved from June 15 to June 22. Todd Pearsons will check with the PRCC HSC to see if that meeting could also be changed to the following week to avoid conflict with the Yakima Klickitat Fisheries Project program review. He will report to the Committees at the May meeting and a decision will be made at that time.

Schiewe asked if the PUDs are on schedule to have their annual reports ready in time for use in the 5-year report. Greg Mackey said the Douglas PUD has received a draft report and is reviewing it now; Joe Miller said Chelan PUD is on track to deliver their annual M&E report on schedule in June.

List of Attachments

Attachment A – List of Attendees
Attachment B – 2011 Path Forward for Ringold Hatchery
Attachment C – Bonaparte Pond 2011 Recommendation
Attachment D – JFP 2013 NNI Recalculation Proposal
Attachment E – Spring Chinook BAMP calculations
Attachment F – Rock Island and Rocky Reach HCP and BAMP Language
Attachment G – Principles for Adjustment of Hatchery Production

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Steve Hays	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack* (phone)	NOAA
Kirk Truscott*	CCT
Todd Pearsons	Grant PUD
Bill Gale*	USFWS
Bob Rogers	WDFW
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation
Tom Scribner*	Yakama Nation

* Denotes Hatchery Committees member or alternate

Attachment B

2011 Path Forward for Ringold Hatchery

Submitted by Chelan PUD for discussion at April 20th, 2011, HCP HC meeting

Basic Plan

- Continue implementation of the October 21, 2009, Statement of Agreement "*Regarding Summer Chinook Rearing at Ringold Hatchery and Eastbank Re-use Facility*" for Broodyear 2010.
- Continue early-rearing 400,000 Wells stock Summer Chinook at Ringold using the IHOT density of 0.20 or less (repeat 2010 effort)
- Following rearing at Ringold, acclimate summer Chinook at Chelan Falls.

Background

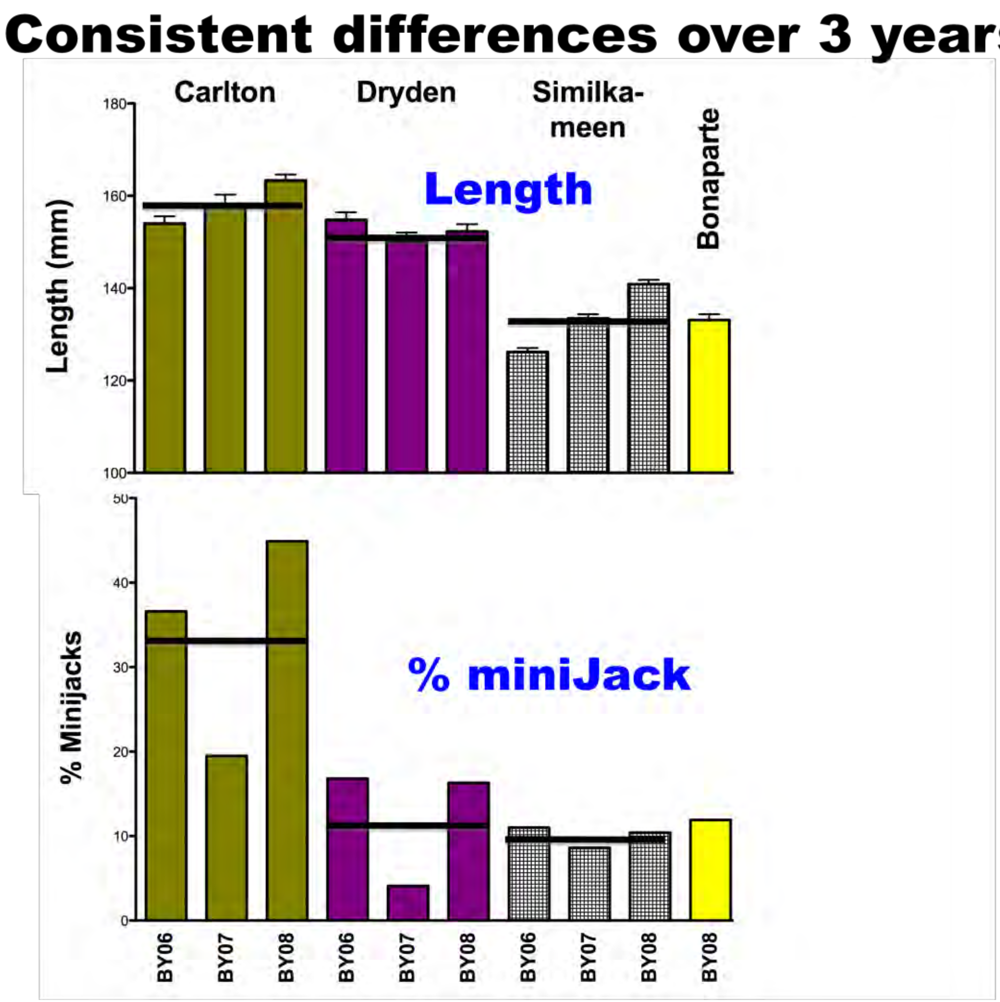
In 2010, Chelan PUD reared approximately 400,000 Wells-stock summer Chinook at Ringold Hatchery, at the IHOT Density Index (i.e., not to exceed 0.20). A pilot study in 2009 provided some indication that IHOT rearing densities were not reducing the survival of hatchery reared smolts either within the hatchery or during downstream migrations (Table 1). An analysis of precocity rates by Brian Beckman, Don Larsen and Deb Harstad (National Oceanic and Atmospheric Administration's [NOAA's] Northwest Fisheries Science Center), indicated that precocity rates of the Ringold fish (acclimated at Bonaparte) were similar or lower than other summer Chinook early-reared at Eastbank (Figure 1; HCP HC presentation 11/17/2010). The results for 2009 supported the continued use of Ringold on the basis of (1) equivalent or better survival rates for Ringold reared fish at IHOT densities, and (2) no apparent physiological detriment related to the use of Ringold.

Table 1. Cormack/Jolly-Seber estimates for "High density-IHOT" and "Low density-HCP" groups of summer Chinook released from Bonaparte Pond in 2010 (BY 2008).

Population	*Survival probabilities*			*Capture probabilities*		Final Product (lambda)
	Rel-RRH	**RRH-MCN**	**Rel-MCN**	**RRH**	**MCN**	
IHOT High density	0.566 (0.0227)	0.791 (0.1150)	**0.448 (0.0631)**	0.518 (0.0220)	0.134 (0.0203)	0.140 (0.0210)
HCP Low density	0.636 (0.0275)	0.660 (0.0819)	**0.420 (0.0493)**	0.450 (0.0210)	0.161 (0.0206)	0.180 (0.0228)

Attachment B

Figure 1. Precocity rates for BY 2008 summer Chinook early reared at Ringold hatchery ("Bonaparte" acclimation) versus other summer Chinook programs early reared at Eastbank hatchery (Figure provided by Don Larsen, NWFSC).



2009 Broodyear Summary for Ringold

At the end of May, 2010, after initial transfer from Eastbank, 401,816 juvenile summer Chinook were present at Ringold. During the period in which fish were reared at Ringold (i.e., between May and the end of September) 2,058 mortalities occurred (0.62% mortality rate). Subtracting the loss due to mortality, and a post-tagging counting adjustment of -10,946 individuals, from the total number reared at Ringold yielded a total of 388,812 at the end of September (i.e., 401,816-[2058+10,946] = 388,812). The fish reared at Ringold were subsequently transferred to Chelan Falls and Turtle Rock acclimation facilities.

The growth of fish at Ringold was monitored over the summer and prior to transport to acclimation locales. Tables 2 & 3 depict size information at Ringold and Eastbank for the same stock of fish (i.e., Wells stock).

Table 2. Descriptive statistics of fish length (mm) during the last week of August 2010; N = sample size, SD = standard deviation, CV = coefficient of variation, and FPP = fish per pound.

		Fork Length (mm)		
Group	N	Mean	SD	CV
Ringold-Raceway 11	5,045	85.4	10.6	12.4
Ringold-Raceway 12	4,945	88.8	9.9	11.2
Eastbank-Raceway 1	100	75.4	5.5	7.2

Table 3. Descriptive statistics of fish length (mm) during September 2010, prior to acclimation at Turtle Rock and Chelan Falls; N = sample size, SD = standard deviation, CV = coefficient of variation, and FPP = fish per pound.

Group	N	Fork Length (mm)			Condition factor
		Mean	SD	CV	
Eastbank – 1	100	98.4	11.3	11.5	1.09
Eastbank – 2	100	98.5	11.3	11.4	1.12
Ringold – 1	175	104.6	9.8	9.4	1.14
Ringold – 2	106	105.7	8.1	7.6	1.12
Ringold – 6	100	117.5	12.4	10.5	1.16
Ringold – 13	140	107.2	12.2	11.4	1.09
Ringold – 14	152	102.2	12.8	12.6	1.16

Attachment C

Bonaparte Recommendation

Submitted by Chelan PUD

In 2008, the Rock island Hatchery Committee approved the use of Bonaparte Pond to rear and acclimate a portion of Chelan PUD's Similkameen summer Chinook program.[1] Under the 2008 Statement of Agreement, the continued use of the facility requires annual approval: "*Use of and production level for this pond for Similkameen Program production in subsequent years will require approval of the Rock Island Hatchery Committee."*

The main purpose of acclimating summer Chinook at Bonaparte was to redistribute adult spawners from the Similkameen downstream to the Okanogan River. Unfortunately, the program has had a number of significant mortality events (Table 1) that have reduced the potential for success. The root cause of mortality is unknown, but the design of the pond (i.e., for irrigation purposes) may not be allowing water to circulate in a manner that is conducive to maintaining fish health.

In 2011, and beyond, Chelan is proposing to discontinue rearing and acclimating summer Chinook at Bonaparte Pond and instead use the Similkameen Facility for the entire program. The discontinuation of Bonaparte is supported by the following:

- Mortality has been consistently higher in Bonaparte pond when compared to the Similkameen facility.
- In 2010-2011, a significant mortality event eliminated 46,580 juveniles despite aggressive treatments with Chloramine-T.
- The continued application of large quantities of therapeutic chemicals required for treating chronically ill fish is potentially risky from a water quality perspective.
- The problem causing the recent mortality event at Bonaparte has not been identified and is therefore unlikely to be "fixed"
- Chelan has NNI hatchery obligations that are jeopardized by the high mortality observed in Bonaparte
- Reductions in summer Chinook production at Similkameen and the development of two new acclimation ponds by the CCT are likely to reduce the long term desirability of Bonaparte as an acclimation facility.
- The opportunity to reshape the spawning distribution of summer Chinook in the Okanogan (using Bonaparte) is limited by the small number of smolts that can be acclimated in Bonaparte pond and the potential loss of smolts prior to release.
- The opportunity to redistribute spawning populations using small releases from Bonaparte will be dwarfed by the production from Chief Joseph Hatchery.

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[1] Statement of Agreement For Use of Bonaparte Pond For Rearing up to 100,000 Summer Chinook From The Similkameen Program in the 2008 – 2009 Rearing Season

Attachment C

Table 1. Survival data for ponding-to-release at Bonaparte.

Brood year	Bonaparte	Similkameen	Notes
2004	98%	98%	
2005	0%	94%	100% loss at Bonaparte
2006	-	94%	No Bonaparte program
2007	96%	97%	
2008	87%	90%	
2009*	77%	99%	46,580 smolt loss at Bonaparte

*Within pond survival, Feb. 2011

Attachment D

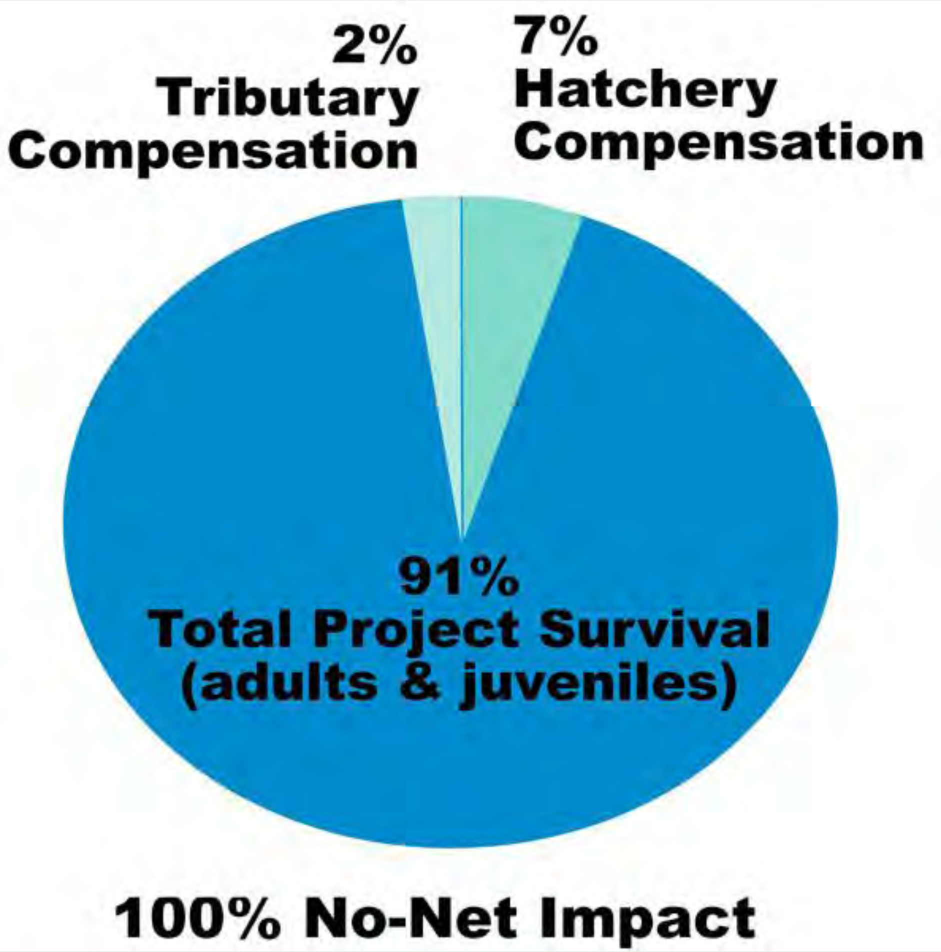
2013 Recalculation

NNI Hatchery Compensation

For the CPUD and DCPUD HCP Agreements

Attachment D

100% No Net Impact



Attachment D

100% No Net Impact for each Plan Species affected by the Projects.

- 91% Combined Adult and Juvenile Project Survival achieved by project improvement measures implemented within the geographic area of the Project;
- 9% compensation for Unavoidable Project Mortality provided through hatchery and tributary programs
  - 7% compensation provided through hatchery programs
  - 2% compensation provided through tributary programs

What does the pie represent?

- All fish (Plan species) passing through each project
  - Includes hatchery and wild production
- “by project by species” – BAMP 1998 page 10
- 100% No Net Impact (“NNI”) for the duration of the Agreement.
  - “which means that the projects will be virtually invisible to the species migrating past the Projects” – CCPUD and DCPUD 2002
  - Original BAMP NNI calculations included mitigation fish (Winthrop NFH, Entiat NFH, Leavenworth NFH).

Initial NNI mitigation BAMP

- Initial Mitigation

$$\left(\frac{Baseline\ Returns}{Mean\ SAR}\right) \times NNI\ Component\ = Hatchery\ Production$$

- Spring Chinook baseline returns by project (1973-1982)
  - Hatchery and naturally produced
- SARs – mean for mid-Columbia spring Chinook programs (1980-1990)

Adjusted NNI Mitigation BAMP

- Replace '*Baseline Returns*' with a five year running average of adult counts "by project and by species"

$$A_{ys} = \frac{A_y + A_{y-1} + A_{y-2} + A_{y-3} + A_{y-4}}{5}$$

- Replace baseline SARs with a five year running average of SARs

$$SAR_{ys} = \frac{SAR_y + SAR_{y-1} + SAR_{y-2} + SAR_{y-3} + SAR_{y-4}}{5}$$

Adjusted NNI Mitigation Continued

- NNI Component is adjusted based on the results of survival studies at each project
- The objective of the survival studies is to measure survival of “run-of-river” fish.
- NNI mitigation is for all smolts (or “run of river” fish) subject to “unavoidable project mortality” at the rates measured in survival studies.

BAMP Formula and NNI

- Is a back calculation of the **total smolts** passing each project from their adult returns
- HCP NNI is mitigation for all "unavoidable project mortality" as measured at each project.

Other methods considered by the HCP HC

- CPUD’s carrying capacity method
  - inconsistent with the intent of the mitigation because it does not mitigate for all “unavoidable project mortality”
- CPUD’s and DCPUD’s spawning escapement method
  - inconsistent with the intent of the mitigation because it does not mitigate for all “unavoidable project mortality

Attachment D

BAMP Recalculation

- Mitigates for all “unavoidable project mortality”
- Is consistent with the HCP agreement.
- Can be modified as long as modifications do not change the intent of the mitigation or violate the Agreements.

Example Calculation

- Spring Chinook @ Rock Island Dam

$$NNI\ hatchery\ mitigation = \left(\frac{12{,}216}{0.0023}\right)\ x\ 6.25\% = 331{,}957$$

- Adult counts from FPC
  - return years 2003-2008
- Cumulative SAR from UC spring Chinook programs
  - Brood years 1999-2003
  - Leavenworth NFH, Chiwawa, Methow, Twisp, Chewuch, and Winthrop NFH

Attachment E

5-Year Combined Spring Chinook SARS

Table 1. Smolts released by brood-year (CWT).

Brood year	LNFH Smolts Released	Chiwawa Smolts Released	Twisp Smolts Released	Chewuch Smolts Released	Methow Smolts Released	Winthrop Smolts Released	**Combined UC smolts Released**	**Combined Methow Smolts Released**
1999	1630089	No Prog	67408		180775	175869	**2054141**	**424052**
2000	1554362	46726	74717		266392	201604	**2143801**	**542713**
2001	1288893	374129	51652	261284	130787	461678	**2568423**	**905401**
2002	1422100	145074	20541	254238	181235	578307	**2601495**	**1034321**
2003	1476046	216702	50627	127614	48831	550214	**2470034**	**777286**

Table 2. Adult Returns based on CWT recovery (Columbia Basin) by brood year.

Brood year	LNFH Adult Returns	Chiwawa Adult Returns	Twisp Adult Returns	Chewuch Adult Returns	Methow Adult Returns	Winthrop Adult Returns	**Combined UC Adult Returns**	**Combined Methow Adult Returns**
1999	2743	No Prog	61		145	100	**3049**	**306**
2000	5088	365	173		852	617	**7095**	**1642**
2001	4323	1827	44	738	508	541	**7981**	**1831**
2002	3297	706	120	699	599	691	**6112**	**2109**
2003	2093	756	49	61	57	397	**3413**	**564**

Table 3. Combined SARS

Brood year	**Combined UC SAR (Adults/Smolts)**	**Combined Methow SAR (Adults/Smolts)**
1999	0.001484319	0.000722
2000	0.003309542	0.003025
2001	0.003107354	0.002022
2002	0.002349418	0.002039
2003	0.001381762	0.000726
Mean SAR	**0.002326479**	**0.001707**

Attachment E

Spring Chinook Counts by Project

Table 4. Adult counts by project (jacks included)

Return Year	Priest Rapids/Wanapum Dam[a]	Rock Island Dam	Rocky Reach Dam	Wells Dam
2003	18792	17634	4666	4702
2004	14541	11876	5099	4793
2005	14663	12412	4985	4996
2006	8614	10126	5650	4376
2007	7734	7638	3344	2793
2008	14,584	13609	4436	3134
Mean Return	**13,155**	**12,216**	**4,697**	**4,132**

[a] The BAMP instructs the HCP HC to use Wanapum Dam counts. Wanapum Dam adult counting was not operational until 2006. Priest Rapids counts were used for return years prior to 2006.

Back-calculation of Smolts by Project

Table 5. Back-calculation of smolts by project (mean adult returns / SAR)

Priest Rapids/Wanapum[a]	Rock Island Dam[a]	Rocky Reach Dam	Wells Dam
5,654,624	5,250,781	2,751,416	2,420,816

Spring Chinook Mortality Rates by Project

Table 6. Spring Chinook Mortality Rates by Project (approved by coordinating committee)

Priest Rapids/Wanapum	Rock Island Dam	Rocky Reach Dam	Wells Dam
13.41%	6.25%	7.00%	3.70%

Adjusted NNI Mitigation by project

Table 7. Adjusted NNI mitigation by project as calculated by the formulas on pages 7-10 of the BAMP.

Priest Rapids/Wanapum	Rock Island Dam	Rocky Reach Dam	Wells Dam
758,285	328,174	195,599	89,570

Attachment E

Adjusted NNI Mitigation by PUD

Table 8. Adjusted spring Chinook mitigation by PUD as calculated by the formulas on pages 7-10 of the BAMP.

Project	Chelan PUD	Douglas PUD	Grant PUD
Priest Rapids/Wanapum			758,285
Rock Island	328,174		
Rocky Reach	195,599		
Wells		89,570	
Total	523,773	89,570	758,245

Attachment F

Rock Island and Rocky Reach HCP and BAMP Language

Submitted by Chelan PUD for discussion at the 4/20/2011 HCP HC meeting

What do the HCPs say?

What are the primary objectives of the Hatchery Compensation Plan?

- **SECTION 8.1.2** *The District shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI.*

Are the HCPs explicit about the relationship between the HCPs and the BAMP?

- **SECTION 8.4.2**: *The rationale for determining the initial capacity requirement is supported by Supporting Document C, "Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program". The Parties recognize that Supporting Document C is a supporting document and does not by itself, create contractual obligations.*

- **SECTION 12.5: Integrated Agreement**. *All previous communications between the Parties, either verbal or written, with reference to the subject matter of this Agreement are superseded by the terms and provisions of this Agreement, and once executed, this Agreement and its examples, figures, tables and appendices shall constitute the entire agreement between the Parties, provided, that titles to sections and sub-sections thereof are for the assistance of the reader and are not part of the Agreement.*

Do the HCPs identify the parameters that should be considered for adjustments to hatchery production levels?

- **SECTION 8.4.3 Periodic Adjustment of District Hatchery Levels.** *Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species and for changes in the adult-to-smolt survival rate, and for changes to smolt-to adult survival rate from the hatchery production facilities, considering methodologies described in the BAMP.*

What is Unavoidable Project Mortality?

- **SECTION 13.30** *"Unavoidable Project Mortality" refers to the assumed 9% mortality caused by the Project to Plan Species that is compensated through the tributary and hatchery programs.*

Attachment F

What is NNI?

- **INTRODUCTION** *NNI consists of two components: (1) 91% Combined Adult and Juvenile Project Survival achieved by project improvement measures implemented within the geographic area of the Project, (2) 9% compensation for Unavoidable Project Mortality provided through hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs.*

- **SECTION 8.4.2 Calculation of Hatchery Levels**. *The District shall provide the funding and capacity required of the District to meet the 7% hatchery compensation level necessary to achieve NNI for all Plan Species. As set forth below, the initial estimated hatchery production capacities for Plan Species needed to compensate for Unavoidable Project Mortality are based on average adult returns of Plan Species for a baseline period, a 7% compensation requirement, and baseline adult to smolt survival rates for existing mid-Columbia River hatcheries. Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs.*

"Considering methodologies described in the BAMP"

What is the overall goal of the BAMP?

- **1.1: Goal Statement.** One biological goal of the Mid-Columbia Mainstem Conservation Plan (MCMCP) is to achieve No Net Impact (NNI) to the productivity of anadromous salmonids originating in the Mid-Columbia Region due to the operation of the mid-Columbia River hydropower dams

What are the objectives of the BAMP?

- **1.2: First Objective: Rebuild Natural Populations** The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), mandates the conservation of threatened and endangered species in their natural habitats to a level at which they can sustain themselves without further legal protection.

- **1.3: Second Objective: No Net Impact** As discussed in Section 1.1, one objective of the Mid-Columbia Hatchery Program is to numerically compensate for salmonid mortalities at the five mid-Columbia River dams.

Does the BAMP recommend hatchery production levels that are independent of the status of natural populations?

- **1.3: Second Objective: No Net Impact…** No Net Impact for all Plan Species will be done in a phased approach, and done in a manner that ensures a high likelihood for meeting the first objective: rebuilding natural populations. The Mid-Columbia Hatchery Coordinating Committee will assess the status of the populations to be affected by all steps taken to achieve NNI, and may defer additional hatchery production if they believe the risk to the natural populations is high.

Does the BAMP anticipate adjustments to production based on actual project survival and hatchery performance?

- **1.3.1: Interim production objectives …**Conceivably, continual modifications to the existing facilities will increase the survival of smolts released from the Mid-Columbia hatcheries. This potential improved performance will adjust the production objective downward. Ultimately, production objectives will be adjusted to meet NNI, according to actual survival rates through the mainstem hydroelectric projects.

Does the BAMP recommend producing hatchery fish in excess of carrying capacity?

- **1.6.4: Hatchery production ceiling** *When hatchery-reared salmon and steelhead smolts intermingle with listed salmon and steelhead smolts in the Columbia River migration corridor, there are potential density-dependent adverse effects. These effects include disease transmission, predation, and competition for food and space. In order to address the question of ecological carrying capacity of the Columbia River migration corridor and of the estuarine and marine ecosystems, and to minimize overall density-dependent effects of hatchery production on listed species, NMFS has recommended that an annual production ceiling be established.*

Should the Monitoring and Evaluation program data be considered when examining production capacity?

- **1.8.1: Assessment and control of effects**
- *(1)Density dependent effects: A fundamental assumption in identifying those populations which could be supplemented is whether the sources of the population's decline are from factors within, or outside the basin of origin (Cuenco et al.1993).*
    - *Current production capacity estimates must be based on present conditions and may be lower than historical levels.*
    - *If these capacities are reasonably accurate, they can serve as a starting point for the development of hatchery production strategies* (In reference to Table 1 below). *Information gained from ongoing hatchery evaluations under the Mid-Columbia Hatchery Program will assist the Mid-Columbia Hatchery Coordinating Committee in further refining these estimates of production capacity, and the resulting hatchery production objectives*.

- *Given the estimated seeding levels, the HWG believes that additional hatchery supplementation will increase production of chinook salmon and sockeye salmon, if framed within a context that reduces interference with natural life history patterns. Supplementation of steelhead should not increase in Phase A of the Mid-Columbia Hatchery Program. Rather, artificial propagation of steelhead should remain at current levels and concentrate on increasing local adaptation and natural productivity.*

Miscellaneous SAR information.

Table 1: Changes in CWT-based SARs as reported from the 2007 M&E report to those reported in the 2010 draft M&E report. The most recent, comparable brood years (2000 & 2001) exhibit relatively large increases.

	Percent Difference					
Broodyear	WEN SUM	MET SUM	OK SUM	TR SUM	WEN SOCK	CHIW SPR
1995	3%	8%	1%	5%	22%	NA
1996	3%	4%	0%	7%	2%	0%
1997	2%	2%	2%	3%	10%	-1%
1998	2%	0%	1%	5%	-33%	2%
1999	1%	0%	2%	4%	29%	NA
2000	15%	18%	12%	70%	38%	1%
2001	45%	50%	54%	64%	NA	11%
2010 vs 2007 change for combined AVG 2000-2001 BY	21%	36%	32%	66%	38%	4%

Attachment F

Table 2. Minimum and maximum differences in reported comparable SAR values by M&E reporting years for Chelan PUD NNI Hatcheries by stock and reporting years (brood years 2000-2003). Values greater than 10% are highlighted.

	Difference: 2007 and 2008		Difference: 2008 and 2009		Difference: 2009 and 2010	
Stock	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Methow Summer	**14.8%**	**30.4%**	-0.4%	**33.6%**	-0.5%	8.3%
Okanogan Summer	**11.1%**	**34.5%**	-2.8%	0.9%	0.0%	**18.1%**
Turtle Rock Subs	-4.0%	**68.1%**	-7.1%	**69.2%**	0.0%	2.6%
Turtle Rock Yearlings	**39.4%**	**40.7%**	-0.7%	5.3%	0.0%	2.4%
Wenatchee Spring	0.5%	**10.0%**	0.0%	4.5%	0.0%	0.9%
Wenatchee Summer	**12.3%**	**29.1%**	1.2%	**29.6%**	0.0%	**15.0%**

Attachment G

Principles of Adjustment for Hatchery Compensation

DRAFT Statement of Agreement

HCP Hatchery Committees
April 20th, 2011

The Rock Island, Rocky Reach and Wells HCPs Hatchery Committees agree that the following goal, objectives, and measures will be used to adjust hatchery compensation for the PUDs' NNI hatchery programs. This approach will be consistent among Chelan, Douglas and Grant PUDs; however, any decision regarding Grant PUD's production will occur in the Priest Rapids Coordinating Committee.

Goal

Adjust hatchery compensation based upon the results of survival studies and adjust hatchery compensation to account for changes in the average adult returns of Plan Species and for changes in the adult-to-smolt survival rate and for changes to the smolt-to-adult survival rate for the hatchery production facilities.

Objectives

1. Establish an agreed upon mechanism to account for the number of natural-origin smolts and hatchery-origin smolts not produced to mitigate for impacts of PUD dams entering each of the five PUD hydroelectric projects.
2. Determine the level of hatchery compensation by multiplying the number of smolts entering a project times the unavoidable mortality measured at each project.

Methods

The methods of determining the number of smolts are presented in the order in which they will be applied in the adjustment of hatchery compensation.

1. Annual releases of smolts will be used to determine the number of hatchery smolts.
2. Screw trap population estimates of natural-origin smolts.
3. If less than 5 years of smolt trap data are available, natural-origin smolt populations will be estimated from spawner survey data using egg-to-smolt survival.
4. If all other methods described above cannot be used due to a lack of available data, then use the "spawning escapement/SAR" method to estimate naturally produced smolts.

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	June 16, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui, Steve Lewis		
Re:	Final Minutes of May 18, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Douglas PUD Headquarters Building in East Wenatchee, Washington, on Wednesday, May 18, 2011, from 9:30 am to 2:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Joe Miller will provide Chelan PUD's hatchery production summary handout to Carmen Andonaegui for distribution to the Hatchery Committees (Item III-A).
- Mike Tonseth and Keely Murdoch will provide to the Hatchery Committees for review, a plan for notification and reporting of issues associated with acclimation at Rohlfing Pond (Item III-C).
- Steve Lewis will prepare an email confirming U.S. Fish and Wildlife Service (USFWS) approval of the Tumwater Dam (TWD) Operations Plan for distribution by Carmen Andonaegui to the Hatchery Committees (Item III-E).
- Mike Tonseth will provide a table of current and proposed interim external marking schemes for Methow basin steelhead to Carmen Andonaegui for distribution to the Hatchery Committees (Item IV-A).
- Tom Kahler will email a .pdf of a published study on the effects of multiple fin-clips on steelhead survival to Carmen Andonaegui for distribution to the Hatchery Committees (Item IV-A).
- Keely Murdoch will review with Yakama Nation staff the use of vent-clips as an interim measure for externally marking steelhead in the Methow basin. She will document the YN concurrence or objection to its interim use for Methow steelhead to Carmen Andonaegui for distribution to the Hatchery Committees by June 1, 2011 (Item IV-A).

SOA DECISION SUMMARY

- There were no Statements of Agreement (SOAs) decision items at today's meeting.

AGREEMENTS

- Lacking Hatchery Committees consensus on the continued use of Bonaparte Pond for acclimation of summer/fall Chinook, the request by the Colville Confederated Tribes (CCT) to rear and acclimate 100,000 yearling smolts in 2011 was not approved.

REVIEW ITEMS

- There are no review items at this time.

Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. A HCP hatchery production update was added to the agenda by Joe Miller along with a discussion on Rohlfing Pond. Josh Murauskas added to the agenda an update on steelhead acclimation at the Chiwawa Facility. Greg Mackey said that Douglas PUD's discussion on external marking for steelhead could be combined with Mike Tonseth's agenda items. Tonseth added to the agenda a notification to the Committees on a proposal for an evaluation of electro anesthesia for 2011.

The April 20, 2011, Committees' meeting minutes were reviewed and approved with revisions. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

All Parties

A. 2013 NNI Recalculation Discussion (All Parties)

Mike Schiewe summarized the progress to date on identifying a method for recalculating No Net Impact (NNI). He said a subgroup of the Hatchery Committees had met yesterday as agreed to at the last Committees' meeting to further the technical discussion. He said the subgroup made good progress and that an alternative method for recalculation was proposed by Keely Murdoch and Bill Gale. As the pros and cons of the recalculation methods were discussed, Schiewe said several issues arose. One issue was a need to better identify the transition date between spring Chinook and summer/fall Chinook adult returns. The PUDs agreed to review recent adult return data to determine if a different date than that used by the Fish Passage Center was more appropriate. Another issue identified by the working group was the release of unmarked fish from some hatchery programs, and the potential for their numbers to artificially inflate the count of natural origin fish. A third issue briefly discussed was the apparent differing opinions regarding which hatchery programs required mitigation, and particularly the issue of whether a PUD should be required to mitigate for the loss of mitigation fish. Schiewe suggested that this latter issue is not strictly technical in nature and may require policy-level input. Working group members agreed to develop revised hatchery program targets (all species, all programs) using the two alternative methods under consideration for review and discussion on June 7, at 1pm, at the Douglas PUD meeting room. Mike Tonseth emphasized that all parties need to work with the same numbers in order to compare and contrast different estimates.

On the issue of mitigating for mitigation, Murdoch said that the Yakama Nation supports providing PUD mitigation for all salmon and steelhead, whether hatchery or wild. Murdoch said Chelan PUD should provide mitigation for mortalities of Wells mitigation fish at Rocky Reach and Rock Island projects, but was uncertain if they should have to mitigate for mortality caused to their own mitigation fish at their own projects, the determination of which may depend upon the methods used for the recalculation. For example, Murdoch suggested that the adult-based NNI recalculation method introduced by Gale would address the concern of the PUDs that they not have to mitigate for mitigation fish. The Committees discussed the importance of resolving this issue in order to stay on track to complete the recalculation by October 2011.

Joe Miller said the PUDs do not support mitigating for mitigation production, but agreed that it was worth reviewing at the next meeting the results of recalculating NNI using the adult-based method. Greg Mackey said he was working on an analysis that would help determine whether “mitigation for mitigation” made a meaningful difference in the final numbers; he said that this would be available for the June meeting. Tonseth pointed out that if this issue is elevated to the Coordinating Committees, then the process could take a long time and put at risk making the October deadline. He said he thinks this issue can best be resolved by the Hatchery Committees in a timely manner. Todd Pearsons said the Priest Rapids Coordinating Committees (PRCC), not the PRCC Hatchery Subcommittee, needs to approve the NNI recalculation method. He said the PRCC will need to be briefed on the agreed-upon recalculation method with enough time remaining to obtain approval by the October deadline if the Committees want Grant PUD to adopt a recalculation method consistent with the one approved by the HCP Committees. Tonseth reiterated the importance of using the same dataset for the recalculation, no matter which method is chosen. Schiewe suggested that an August 2011 deadline be set for reaching consensus on this issue. Tonseth said after reaching agreement on recalculation, the Committees still need to develop an implementation plan. The Committees agreed to continue to work to resolve all issues.

Chelan PUD

A. Chelan PUD production update (Joe Miller)

Joe Miller distributed a summary of revised hatchery production levels that were estimated based on recently completed survival studies (Attachment B). He said the update is intended only as a notification of base production levels based on survival study results. Miller said Chelan PUD is not asking for adjustments to production now, but that the adjustments will be implemented with the 2014 releases. Miller said the base production levels could change for spring Chinook because survival tesing is currently in progress at Rocky Reach Dam. Miller said there will be no changes to the PUD's commitment for sockeye production levels related to the Okanogan River/Penticton hatchery SOA. He will email a copy of the summary handed out at today's meeting to Carmen Andonaegui for distribution to the Hatchery Committees.

Tom Kahler asked if Grant PUD had adjusted production levels based on their survival study results for the Priest Rapids Project. Todd Pearsons said that Grant PUD had not made any adjustments, and agreed to forward their most recent data to Andonaegui for distribution to the Committees. Mike Tonseth asked what would happen if agreement on production levels for the NNI recalculations cannot be reached through the Hatchery Committees or the Coordinating Committees prior to broodstock collection activities for the 2014 releases. Miller responded that the production levels based on survival study results are the default production levels until consensus on recalculation can be reached.

B. Discontinuation of Bonaparte Pond Acclimation (Joe Miller)

Joe Miller said that since last meeting's discussion, he had not seen any additional data supporting the continued use of Bondaparte Pond to rear and acclimation summer/fall Chinook salmon. He said acclimation using Bonaparte Pond poses a risk to Chelan PUD's mitigation obligation, and will be discontinued. Kirk Truscott said he had looked at some of the summer Chinook spawning ground survey data for the Okanogan River system. He said that the smolt-to-adult survival rate (SAR) was just under 1.2 percent for summer Chinook acclimated in Bonaparte Pond, and that coded-wire-tag (CWT) data indicate that there was a greater affinity for summer Chinook acclimated at Bonaparte Pond to spawn in the Okanogan River. Truscott said that although survival for summer Chinook in Bonaparte Pond is only 75 percent, the benefit gained from the redistribution of spawners into the Okanogan River from the Similkameen improves overall productivity of Okanogan River summer Chinook program fish. Truscott said he would like to see Chelan PUD reduce the number of fish acclimated at Bonaparte Pond to 100,000 to improve in-pond survival and to continue acclimation at the site. He said transport loading rates could also be reviewed to see if a reduction in transport densities could improve survival in Bonaparte Pond, and that an aggressive treatment for bacterial gill disease early in the acclimation period could result in a marked improvement in survival throughout the rearing period. Mike Tonseth said he would like to review the redd data by river mile to see if there is superimposition by the Bonaparte Pond spawners on the 50 percent of the Similkameen Facility-acclimated summer Chinook known to spawn in the Okanogan River. Tonseth said that although Bob Rogers, Washington Department of Fish and Wildlife (WDFW), did not have a strong opinion regarding continued use of Bonaparte Pond, Rogers did say that, if continued, 100,000 juveniles should be the maximum held. Tonseth said he supports continuing acclimation at Bonaparte Pond at the 100,000 juvenile level. Keely Murdoch said she supported a reduction in numbers and continued acclimation at Bonaparte Pond.

Miller reiterated that Chelan PUD is opposed to continuing to use Bonaparte Pond as an acclimation site. He said the mortality is too high and the number of spawners from returning adults is too low to have a significant contribution to Okanogan River summer Chinook production.

Mike Schiewe said that HCP rules require unanimous agreement by all signatories for approval of a proposal, such as the continued rearing of summer/fall Chinook at Bonaparte Pond; hence, the proposal to continue the use of Bonaparte Pond in 2011 was not approved. Tonseth said that any reversal of this decision would need to be reached by August 1, when juveniles would have to be marked. Truscott said he plans to continute to review data on the effect of acclimation at Bonaparte Pond on overall Okanogan River hatchery program success.

C. Rohlfing Pond Acclimation (Joe Miller)

Joe Miller said he was would like a notification and reporting process developed for acclimation activities at Rohlfing Pond; he noted this spring's escape of juvenile fish from that site during high flow conditions. Keely Murdoch said Rohlfing Pond has been used for acclimation of coho since 2003 and that this year was the first high flow event resulting in the escape of some juveniles from the site. She said the site generally has consistent flows during the acclimation period and that flows this spring were unusual. Miller said he needs a description of how acclimation of steelhead at Rohlfing Pond fits into the Chelan PUD's Wenatchee steelhead program prior to continuing acclimation at the site. He would like the plan to be approved with a SOA by the Hatchery Committees. He said that although the current Wenatchee steelhead production goal is 400,000 smolts, with the upcoming changes in production, acclimating 20,000 steelhead in Rohlfing Pond will represent a significant proportion of Chelan PUD's steelhead production obligation. Miller said Rohlfing Pond was conceived as a pilot project and that it is time to describe how continued acclimation at the site fits into Chelan PUD's program. Murdoch said the Yakama Nation currently has plans to expand Rohlfing Pond and increase acclimation capacity at the site, but is still working through the Environmental Impact Statement (EIS) process for their coho program. Mike Tonseth said he and Murdoch will develop a notification and reporting plan for the Committees to review.

Tonseth said there is a need to evaluate the role of all current Wenatchee basin acclimation sites, including Rohlfing Pond and Blackbird Pond, as well as the role of remote acclimation sites as a general concept,now that all Wenatchee steelhead program fish are being acclimated within the Wenatchee basin. As an example, Tonseth noted the need to better monitor survival-to-release at Blackbird Pond, referring to problems with the passive integrated transponder tag (PIT tag) detection system at the pond outlet this year.

D. Steelhead Acclimation at the Chiwawa Facility (Josh Murauskas)

Josh Murauskas reported that an additional PIT tag detector was installed at the Chiwawa Facility that allows an overflow weir to be opened on both acclimation tanks at the same time. He said that on May 15, rapid volitional movement of steelhead out of the acclimation tanks was recorded and that the smolts were in good condition. Murauskas said all smolts should have migrated from the acclimation tanks by the end of this week, May 22, 2011.

E. Tumwater Dam Passage (Joe Miller and Mike Tonseth)

Mike Tonseth summarized plans to minimize passage delays at TWD. Joe Miller said the TWD Operations Plan was developed jointly by WDFW and Chelan PUD staff, and that it had been submitted to National Marine Fisheries Service (NMFS) and the USFWS for a check on consistency with current Incidental Take Statements. Miller discussed the real-time monitoring element, which will allow for in-season adjustment of trapping operations based on median delay times as monitored with PIT tag arrays in the fish ladder. When passage delays of 48 hours are observed, trapping activities will be curtailed until median delays drop below 24 hours. Miller said the real-time monitoring and in-season adjustments would be implemented in concert with changes to staffing and facility improvements. Tonseth said the version of the Operations Plan submitted to the federal agencies has real-time monitoring scheduled to be implemented throughout entire fish migration season. The extended monitoring will allow for evaluation of passage timing, both with and without on-going trapping activities. Additionally, the Operations Plan includes relocating some broodstock collection efforts, like sockeye, to the Dryden Dam fish collection facility. He said this does not preclude some sockeye, summer Chinook, or steelhead broodstock collection activities at TWD, if needed.

Tonseth said that an enhanced trapping operations would be implemented beginning June 1, 2011. From June 15 to July 15, 2011, the trap would be actively staffed 24 hours per day, 7 days per week, with a two- or three-person crew. From July 16 to August 31, 2011, trapping activities at TWD would be limited to 3 days per week, 16 hours per day. From September 1 until mid-December 2011, the trap would return to a 24 hour per day, 7 day per week operation, with staffed or unstaffed active trapping for steelhead and coho developed based on passage rates. As described in the TWD Operations Plan, the adult ladder will remain open during periods of operation when staff are not present 24 hours per day 7 days per week. When unstaffed, the adult trap will be checked at least every 24 hours, or more often depending on fish passage numbers.

Responding to a question, Josh Murauskas said the 24-hour passage delay criteria was based on radio-telemetry data collected at TWD in the 1990s where median passage time at

Tumwater for both Chinook and sockeye was at or below approximately 24 hours. He said prior to initiation of trapping activities at TWD, passage time was not monitored. Steve Lewis asked why moving sockeye broodstock collection down to the Dryden Dam Facility would not transfer the passage delay problem down to that facility. Tonseth explained how the Dryden Dam Facility operates, and emphasized that there never has been a passage problem at the facility.

Miller said NMFS has signaled by email their approval of the Operations Plan, but that Chelan PUD has not yet received a formal notice of approval. He said Chelan PUD expects that some of the TWD passage issues will be addressed through the Biological Opinion issued for Chelan PUD's hatchery programs. Lewis said the USFWS sees the TWD Operations Plan as a "good step" and would like to see how the first year of operations at TWD goes under the new plan. He recommended that Chelan PUD rely on the Biological Opinion issued during relicensing to address passage activities at TWD rather than rely on the ESA Section 6 Permit held by WDFW. Miller asked Lewis for formal documentation from the USFWS stating their position on the TWD Operations Plan. Lewis agreed to send an email stating USFWS approval of the Operations Plan to Carmen Andonaegui for distribution to the Committees.

Douglas PUD

A. External Marking for Steelhead (Greg Mackey)

Greg Mackey introduced this agenda item, saying that as discussed at last month's Hatchery Committees' meeting, Bill Gale had indicated that the USFWS had found unmarked, adipose fin-present (ad-present) steelhead during broodstock collection this year. He asked Douglas PUD to consider marking alternatives for steelhead. Mackey said Charlie Snow, WDFW, had also said that encountering unmarked adult steelhead at the Twisp Weir during broodstock collection was problematic. As a result, Douglas PUD has been working with WDFW to develop an external marking scheme for steelhead; Mike Tonseth presented a proposed interim steelhead marking plan. Tonseth said he has long recognized the need for a new Upper Columbia steelhead marking scheme to support hatchery program Monitoring and Evaluation (M&E) objectives. At the September 15, 2010 meeting, the Hatchery Committees agreed to discontine use of elastomer tags as an external marking technique. As a result, an alternate marking plan was identified as needing to be developed for Upper Columbia River (UCR) steelheadincluding the Methow basin, to meet the current Section 10 permit requirements which require all hatchery-produced steelhead to be externally marked.

Tonseth said under the interim marking plan, 100,000 upper Methow basin steelhead will not be ad-clipped. Of the 100,000 ad-present steelhead, 50,000 will receive a CWT; the other 50,000 will be vent-clipped. The balance of Wells steelhead program juveniles will be ad-clipped, consistent with the current marking scheme. He said currently, the Twisp River steelhead are ad-present with an elastomer tag. The Twisp River steelhead will subsequently be ad-present with CWT. Mike Schiewe asked Tonseth to create a table listing current and proposed marking schemes. Tonseth will produce the table and send it to Carmen Andonaegui for distribution to the Committees.

Tonseth said the Joint Fisheries Parties (JFPs) need to have an in-depth discussion on external marking schemes. He said the Hatchery Genetic Management Plan (HGMP) requires 100 percent external marking of steelhead, and that a final marking scheme is needed by August or September, when juvenile steelhead marking will occur. Mackey said Douglas PUD's budget will be approved soon and if a more expensive marking strategy is approved, funding will be problematic.

Keely Murdoch expressed concern on behalf of the YN for the use of ventral fin clipping as an external mark. Tom Kahler said there is a published paper reporting high survival of steelhead with multiple fin-clips; he agreed to forward a .pdf of the paper to Carmen Andonaegui for distribution to the Committees. Tonseth said he will email JFP representatives asking for their availablity to discuss external marking schemes for steelhead. Mackey said right now he is only looking for a one-year solution to marking and is not suggesting the use of vent-clips beyond that time. Tonseth said approving the marking of 100,000 ad-present steelhead will prevent harvest in lower Columbia River fisheries while allowing steelhead to be identifiable to meet adult management needs in the Upper Columbia. Murdoch said she is not prepared to support the marking proposal at this time. Murdoch said she will discuss the issue of vent-clips as an interim measure with Yakama Nation staff and provide her response by email to Carmen Andonaegui by June 1. Schiewe said the interim steelhead external marking scheme will require approval by the full Hatchery Committees.

WDFW

A. Electroanesthesia Study Proposal (Mike Tonseth)

Mike Tonseth said WDFW is proposing a study this year to evaluate the effects of electroanesthesia on gamete development and fertilization rates in adult summer Chinook. Adults from the Turtle Rock summer Chinook program will be used. Tonseth said a discussion of the proposal (Attachment C), which was distributed this morning by email, will be on the agenda for next month's meeting. He said the use of adult Turtle Rock summer Chinook for the study will not interfere with meeting Chelan PUD's broodstock collection objectives. The Hatchery Committees agreed that a formal SOA would not be needed for the study proposal to go forward, and wanted the opportunity to the review the proposal before further discussion at the June meeting.

B. Hatchery Production Management Plan Update (Mike Tonseth)

Tonseth said the draft Hatchery Production Management Plan it is still in Olympia and under review. He said there have been significant revisions suggested by fish program management staff, and the document will be provided to the Hatchery Committees again for a second review.

HETT Update

A. Update (Carmen Andonaegui)

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) did not meet in May but continued to work on HETT tasks, completing the following activities:

Non-target Taxa of Concern (NTTOC) Risk Assessment:

- Tracy Hillman completed his estimates of steelhead natural production carrying capacity for the HETT using several diffent methods to allow for comparison. His preference was for the Intrinsic Potential method using Mullan data.
- Greg Mackey calculated Maximum Daily Encounter (MDE) rates using the carrying capacity production numbers. The MDE rates came out low, in Mackey's opinion, mostly due to the small natural smolt production compared to the production potential.
- The HETT's next regularly scheduled meeting is June 14. Carrying capacity estimates and MDE rate calculations will be discussed at the June meeting in an attempt to get acceptance of MDE rates so that model runs can be initiated. The goal is make sure the model simulations perform as expected, providing reasonable results so the Expert Panel review can begin.

Control Group Analysis:

- Hillman has almost completed the analyses of White, Nason, and Chiwawa spring Chinook. He has a few more trend analyses to do on productivity to complete the spring Chinook. He is waiting on some new summer Chinook reference data so he can run a revised analysis for this species.
- Hilman indicated he hopes to have a draft paper describing the reference stream analytical methods in June.
- Todd Pearsons' Ecological Risk Assessment manuscript was accepted for publication in the Environmental Biology of Fishes.

The next HETT meeting is scheduled for June 14, 2011.

HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are June 15 (Chelan PUD office), July 20 (Douglas PUD office), and August 17 (Chelan PUD office). Mike Schiewe said he will not be present at the June 15 meeting; Ben Floyd, Anchor QEA, will attend the meeting in Schiewe's absence, to assist Carmen Andonaegui in facilitating the meeting.

A subgroup of the Hatchery Committees will meet on June 7, 2011, at 1:00 pm, at the Douglas PUD meeting room to continue work on 2013 NNI recalculation.

Schiewe said Bill Gale has confirmed that the meeting to discuss a proposal to construct a weir in the upper Methow River has been set for June 14, 2011. Gale told Schiewe that he had sent out an email to the PUDs, WDFW, tribes, and others stakeholder asking for their participation in the meeting and providing details.

List of Attachments

Attachment A – List of Attendees
Attachment B – Chelan PUD Hatchery Production Update
Attachment C – WDFW Electroanesthesia Study Proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Kirk Truscott*	CCT
Steve Lewis†	USFWS
Todd Pearsons	Grant PUD
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees member or alternate

† Joined after lunch

Attachment B

Chelan PUD Production Update 5-18-2011

This document reflects Chelan PUD's HCP production levels as adjusted by recently completed survival studies. Section 8.4.2 of the Rock Island and Rocky Reach HCPs states: "Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs." Table 1 indicates the adjusted production levels for Rocky Reach and Rock Island based upon HCP approved Juvenile Project Survival estimates. Table 2 indicates adjusted compensation levels HCP approved Juvenile Project Survival estimates. The values in these tables reflect the default production targets for 2014 releases except where adjusted by Section 8.4.3 Periodic Adjustment of Hatchery Levels (i.e., recalculation).

Table 1. Adjusted production levels for Rocky Reach and Rock Island based upon HCP approved Juvenile Project Survival estimates.

Project	Species	Calculated 7% production levels from HCP (RR HCP, Table 2; RI HCP, Table 1)	Calculated 7% adjusted by approved project survival **	Inundation (not subject to recalculation)	Total adjusted production
Rocky Reach					
	Spring Chinook	90,000	90,000	-	90,000
	Steelhead	30,000	18,043	165,000	183,043
	Summer Chinook	200,000	200,000	400,000	600,000
	Sockeye	300,000	274,714		274,714
Rock Island					
	Spring Chinook	298,853	266,833	-	266,833
	Steelhead	51,275	23,806	-	23,806
	Summer Chinook	541,385	483,379	-	483,379
	Sockeye	571,040	549,014	-	549,014
**Example (RI spring Chinook): (298,853/7%) x 6.25% = 266,833					

Table 2. Adjusted compensation levels based on Juvenile Project Survival Estimates where (1-Survival %) = Compensation %.

Species	RR %	RI %
Spring Chinook Yearling	7.00%	6.25%
Summer Chinook Yearling	7.00%	6.25%
Sockeye	6.41%	6.73%
Steelhead	4.21%	3.25%

Table 3. Aggregate production for Rocky Reach and Rock Island.

Total Production for RR+RI		
	Spring Chinook	356,833
	Steelhead	206,849
	Summer Chinook	1,083,379
	Sockeye	823,728

Attachment C

The use of electronarcosis as an alternate method in anesthetizing summer Chinook salmon and the effect on gamete maturation and egg fertilization.

Study Proposal Submitted to

Rock Island Habitat Conservation Plan
Hatchery Committee

By

Travis Maitland
Todd Miller

May 2011

Washington Department of Fish and Wildlife
Hatchery-Wild Interaction Unit
Science Division, Fish Program
Wenatchee, WA

Introduction

We propose to conduct a study evaluating the effects of Electroanesthesia (EA) using adult summer Chinook *Oncorhyncus tshawytscha* and subsequent eyed eggs included as part of the Turtle Rock Yearling Chinook program. With the results of this study, we hope to demonstrate that EA is a safe, feasible option for anesthetizing adult Chinook salmon during routine broodstock collection, spawning, and biological sampling activities. Furthermore, EA provides a financial and management benefit during broodstock collection. The prototype unit cost is around $500.00 and has been proven to work efficiently. The unit expense is a fraction of the cost associated with using MS-222 or carbon dioxide ($CO2$). Besides the associated cost, $CO2$ can be unpredictable at varying water temperatures, slow acting (inefficient), and appears to exert excess stress on the fish. Furthermore, MS-222 requires a withdrawal period of 21 days before consumption can be permitted. EA has no withdrawal period and fish can be consumed immediately.

Methods

An equal number of adult male (N = 92) and female (N = 92) summer Chinook (~ <u>Half of Turtle Rock Yearling Program Collection Goal</u>; N = 373) will be randomly collected from the "volunteer" trap at the Wells Hatchery Complex. At collection each fish will be placed in a watered vessel and subject to EA immobilization using a DC continuous current regulated power supply (BK Precision Model 1667). Based on historic egg data, this sample size should provide a power of 0.78 to detect a 5% difference in egg mortality between groups. While immobilized, each fish will be externally marked and PIT tagged to ensure tracking of individuals throughout holding and spawning. Water temperature, water conductivity, voltage readings and duration of immobilization (min) will also be monitored and recorded. Treatment and control group fish will be randomly assigned to one of four cross (fertilization) groups during gamete collection (Table 1). Live and dead eggs from each cross group will be enumerated at the eyed stage via standard hatchery methods and an eyed egg survival proportion will be calculated. Appropriate statistical tests (i.e. ANOVA) will then be applied to the survival proportions to determine if differences in survival to the eyed egg stage exist.

Discussion

The goal of this study is to determine if the use of EA as an alternate method of anesthetizing adult Chinook salmon has any negative effects on the maturation and viability of gametes as it relates to egg fertilization, eyed egg survival and if possible, fry/juvenile stage survivals. In a previous study evaluating the use of EA on adult spring Chinook, Zydlewski et al., found no significant differences in fecundity, and progeny survivals at the eyed egg and fry stages between females that were immobilized by tricaine methanesulfonate (MS-222) and those that were immobilized using EA. Similarly, we conducted a feasibility study of EA equipment on a small group (6 Females and 6 Males) of adult summer Chinook in 2010 just prior to gamete collection at Wells Hatchery. The results of the test showed no significant difference ($P=0.82$) in survivals to the eyed egg stage between EA fish and those handled and spawned without anesthesia. In both these studies fish were immobilized immediately prior to gamete collection. Under this proposal, we intend to immobilize fish soon after collection in order to capture potential negative effects throughout gamete maturation and subsequent gamete viability.

Attachment C

Table 1. Proposed treatment and control group crosses (requires 184 summer Chinook are EA'd)

Cross Type	Approximate number of fish per group
Female (EA) x Male (EA)	46 x 46 (92)
Female (EA) x Male	46 x 46 (92)
Female x Male (EA)	46 x 46 (92)
Female x Male = (Control)	46 x 46 (92)

References

Zydlewski, G. B., W. Gale, and J. Holmes., J. Johnson, T. Brigham, and W. Thorson. 2008. Use of Electroshock for Euthanizing and Immobilizing Adult spring Chinook Salmon in a Hatchery. North American Journal of Aquaculture 70:415-424.

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	July 20, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of June 15, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD Headquarters Building second floor conference room in Wenatchee, Washington, on Wednesday, June 15, 2011, from 9:30 am to 12:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Travis Maitland will provide the revised electro anesthesia (EA) study proposal to Carmen Andonaegui for distribution to the Hatchery Committees (Item II-A).
- Mike Tonseth will revise the table on current and proposed Wells steelhead interim marking schemes and provide the updated table to Carmen Andonaegui for distribution to the Hatchery Committees (Item III-A).
- Josh Murauskas will provide Carmen Andonaegui electronic copies of the handouts he provided at today's meeting on recent steelhead releases from Chelan PUD acclimation facilities, for distribution to the Hatchery Committees (Item IV-A).
- Josh Murauskas will email Carmen Andonaegui the May 27, 2011, email from U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to Joe Miller, Chelan PUD, commenting on and providing concurrence with the Tumwater Dam (TWD) Operations Plan, for distribution to the Hatchery Committees (Item IV-B).
- Josh Murauskas will copy Carmen Andonaegui on future emails from Chelan PUD to NMFS providing bi-monthly reports on TWD operations, for distribution to the Hatchery Committees (Item IV-B).
- Josh Murauskas will report back to the Hatchery Committees on adult fishway flow operations at TWD fishway, indicating whether fishway flows are varied year-to-year or within season (Item IV-B).

- Craig Busack will request that NMFS staff provide an update to the Hatchery Committees on the status of Section 10(j) regarding the experimental Okanogan spring Chinook population (Item V-A).

SOA DECISION SUMMARY

- The Hatchery Committees approved the Statement of Agreement (SOA) for the 2011 collection of Summer Chinook broodstock for the Entiat National Fish Hatchery (NFH).

AGREEMENTS

- The Hatchery Committees agreed to a 1-year implementation of the 2011 Wells steelhead interim marking plan (Item III-A).
- The Hatchery Committees approved implementation of the EA study as amended to include an evaluation for post-EA hemorrhaging in anesthetized adults (Item III-A).

REVIEW ITEMS

- There are no review items at this time.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Carmen Andonaegui welcomed the Hatchery Committees and introduced Ben Floyd. She explained that in Mike Schiewe's absence she would be chairing the meeting with Floyd's assistance. Schiewe will return to chair the July Committees' meeting.

Andonaegui reviewed the agenda. Three agenda items were added:

- Tom Kahler: Entiat 2011 Broodstock SOA
- Josh Murauskas: Chelan/Grant PUDs Hatchery Sharing Agreement
- Keely Murdoch: Multi-species Acclimation Update

The May 18, 2011 Committees' draft meeting minutes were reviewed. Several editorial changes were discussed and approved. The description on page 6 regarding recent juveniles' "unscheduled releases" and "unplanned early release" from the Rohlfing acclimation pond due to a high flow event was revised to indicate the releases were "escapes." On page 7, the text was revised to clarify staffing arrangements at the TWD adult trap facility. Text was also revised to clarify that the adult ladder will either be kept open when staff are not present or checked at least every 24 hours, if not more frequently, when staff are not present and the trap is operating from June through mid-December. The Committees approved the meeting minutes as revised. Andonaegui will finalize the minutes and distribute them to the Committees.

II. WDFW

A. Electroanesthesia Study Proposal (Mike Tonseth and Travis Maitland)

Mike Tonseth reported that he had not received any comments on the EA proposal. The Hatchery Committees discussed the following:

- What is the control group? The non-anesthetized group is the control. The study will not be evaluating the effects of different anesthesia types on summer Chinook.
- Has a power analysis been performed for the study as designed? The sample size should provide a power of 0.78 to detect a 5 percent difference in egg mortality between groups. The sample size is not large enough to increase the power of detection.
- Are they looking at hemorrhaging in tissues as a result of the use of EA? In a previous EA trial, adult hemorrhaging was looked for but not observed. Washington Department of Fish and Wildlife (WDFW) will add this as a study element.

The Committees approved the EA study proposal, with the inclusion of an evaluation of hemorrhaging in adults. Travis Maitland will send the revised EA study proposal, to include evaluating hemorrhaging, to Carmen Andonaegui for distribution to the Committees.

III. Douglas PUD

A. Wells Steelhead Interim Marking Plan (Tom Kahler)

Carmen Andonaegui explained that the interim marking plan proposal was introduced at the last Hatchery Committees' meeting, at which time the Committees' members expressed their support of the plan for 1-year, with Keely Murdoch requesting additional time for review. Murdoch followed up with a June 1, 2011 email to the Committees stating the Yakama Nation's conditional concurrence with WDFW's Wells steelhead interim marking plan, on the condition it be implemented for only 1-year. Bill Gale also indicated his support for implementation of the interim marking plan for 1-year, saying he was not present at the last Committees' meeting to give his support at that time. A table describing the current and proposed (2012) interim marking scheme for juvenile steelhead produced at the Wells Fish Hatchery for Douglas and Grant PUDs (Attachment B) was developed by Mike Tonseth and distributed to the Committees on June 13, 2011. Tonseth will add release locations, fish origin, and other clarifying information to the table, and provide the updated table to Carmen Andonaegui for distribution to the Committees.

The Committees discussed the benefits, concerns, and uncertainty associated with vent-clipped fish. The Committees discussed the need to develop a comprehensive marking plan for steelhead in the upper Columbia within the next year while the interim plan is in effect.

With Murdoch's June 1, 2011 notice of approval, the Wells steelhead interim marking plan was approved for 1 year.

B. *2013 NNI Recalculation Discussion (Tom Kahler/Josh Murauskas)*

Carmen Andonaegui summarized the discussions of the June 7, 2011 Hatchery Committees' working group on 2013 No Net Impact (NNI) recalculation. She shared three points:

1. The PUDs agreed to compile a database to include up to ten years of adult returns and the most recent five years of smolt-to-adult returns (SARs).
2. Chelan PUD agreed to prepare a statement outlining their position on which hatchery programs they propose to include in the recalculation of their hatchery mitigation obligations and to provide the statement to the Hatchery Committees no later than July 6, 2011, for discussion at the July 20, 2011 Committees' meeting.
3. The next Committees' workgroup meeting on 2013 NNI recalculation is scheduled for June 30, 2011, at the Leavenworth NFH. The June meeting will focus on technical details of the recalculation, like adult dam counts and SARs.

C. Entiat 2011 Broodstock SOA (Tom Kahler)

Tom Kahler said the SOA (Attachment C) is for the collection of additional hatchery-origin summer Chinook for broodstock to support the Entiat NFH summer Chinook program. An agreement between Douglas PUD and the USFWS contains details on the arrangement to collect the broodstock at Wells Dam. The agreement is contingent on approval by the Hatchery Committees that the collection of additional summer Chinook will not interfere with HCP obligations. Bill Gale requested that Douglas PUD consider developing a multi-year SOA for future Entiat NFH program summer Chinook broodstock collection needs rather than have to revisit the request annually. Kahler agreed to explore the option internally to develop a multi-year agreement between the USFWS and Douglas PUD for the collection of summer Chinook broodstock for the Entiat NFH program. The Committees approved the SOA.

IV. Chelan PUD

A. Chiwawa, Blackbird Pond, and Turtle Rock Steelhead Releases Update (Josh Murauskas)

Josh Murauskas provided handouts showing preliminary information on the 2011 juvenile Wenatchee steelhead releases. He said travel times were very good, recognizing there are issues with last detections at Blackbird Pond. Murauskas said these data are preliminary and that additional data will be provided at the July 2010 Hatchery Committees' meeting. He will provide Carmen Andonaegui electronic copies of the handouts for distribution to the Hatchery Committees. Bill Gale said he would like to have a discussion with Chelan PUD on how to improve passive integrated transponder tag (PIT-tag) detection at Blackbird Pond. Josh Murauskas said that further discussion with the Committees was needed on target release sizes into Blackbird Pond in future years.

Mike Tonseth recommended a future discussion by the Committees' on steelhead remote acclimation sites and on establishing an overarching approach to acclimation for the Wenatchee, Methow, and Okanagon PUDs' hatchery steelhead programs.

B. Tumwater Dam Update (Josh Murauskas)

Josh Murauskas distributed copies of an email from NMFS and the USFWS stating their approvals of the TWD Operations Plan. Craig Busack stated that the NMFS email expresses his agency's conditional approval, noting that the contributing factors to adult fish passage delays at TWD need to be resolved. He said NMFS is concerned by the lack of consensus regarding causes and effects of the delays. Busack said he would like to see agreement within the Hatchery Committees regarding which data set(s) should be used in evaluating the cause and effect of the delays, and consensus on data interpretation. The Committees discussed existing PIT-tag data limitations in evaluating passage delays and discussed the results of past radio-telemetry studies, recognizing that these data were not comparable ins some cases. Both NMFS and the USFWS have requested bi-monthly reports from Chelan PUD regarding operations at TWD. The Committees asked that these reports also be provided to them. Murauskas will copy the reports to Carmen Andonaegui for distribution to the Committees as they arrive.

Bill Gale said Pacific lamprey passage at TWD is also of concern and that the USFWS is evaluating lamprey passage at TWD.

Murauskas advised the Committees that the headgates had to be put in place in the fishway on June 8, 2011, and were in place until the morning of June 14, 2011. When flows exceed 10,000 cubic feet per second (cfs) at TWD, Murauskas explained that the headgates must be installed to protect the structural and operational integrity of the facility, although this prevents adult fish passage. He said that with the removal of the headgates on the morning of June 14, 2011, the fishway is now fully operational. Murauskas agreed to notify the Committees of any future fishway closures due to the installation of headgates as a result of flows exceeding 10,000 cfs at TWD.

In response to a question by Kirk Truscott, Murauskas will report back to the Committees on adult fishway flow operations at TWD fishway, indicating whether fishway flows are varied year-to-year or within season.

C. 2011 Hatchery Sharing Agreement (Josh Murauskas)

Josh Murauskas reported that the Chelan PUD Commission had approved the 2011 Hatchery Sharing Agreement with Grant PUD. The Hatchery Committees approved by Statement of Agreement on November 17, 2010, the 2010 Hatchery Sharing Agreement with Grant PUD, agreeing that the 2010 Hatchery Sharing Agreement would not impact HCP production. The Hatchery Sharing Agreement covers the sharing of hatchery space for the Grant PUD hatchery program fish at Chelan PUD's Eastbank Hatchery Complex.

V. NMFS

A. HGMP Update (Craig Busack)

Craig Busack provided an update on the status of Hatchery and Genetic Management Plans (HGMPs) submitted to NMFS. He said that processing of the Upper Columbia HGMPs is stalled due to staffing limitations, the Sandy River lawsuit, and workload priorities, including refocusing on the lower Snake River fall Chinook HGMP. NMFS is drafting their comments on the USFWS Icicle Creek spring Chinook HGMP, but have not yet started reviewing any other Wenatchee hatchery program HGMPs or the Wells steelhead HGMP. Busack said there is a draft biological opinion on the Entiat spring Chinook HGMP that is still undergoing internal review.

In response to Hatchery Committees members' questions on the status of the Endangered Species Act (ESA) Section 10(j) process for introducing ESA-listed species into areas where they have been extirpated, as with the Okanogan spring Chinook population, Busack said he will request that the NMFS staff person handling these requests provide an update to the Committees on the status of these requests.

VI. HETT Update

A. Update (Carmen Andonaegui)

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on June 14, 2011, and completed the following activities:

Non-Target Taxa of Concern (NTTOC) Risk Assessment:

- The risk assessment manuscript has been accepted by *Environmental Biology of Fishes* for publication.
- The HETT expects to have completed all data entry within the next couple of weeks and to have completed model runs by their next meeting on July 12, 2011. A Grant PUD staff person will be available to conduct the first model runs, which will also serve as a proof of these data. At the next HETT meeting, any data problems will be discussed along with model outputs, including any anomalies.
- During the March 2011 meeting, the HETT decided that cutthroat trout and Pacific lamprey would need to be evaluated differently from the salmon and steelhead due to the lack of population and distribution information. The 5-year M&E reports will

only refer to the need to conduct a more detailed risk assessment for cutthroat, saying the assessment is "under development" and citing the ecological risks manuscript.

- Todd Pearsons is working on a memo describing the risk to lamprey from hatchery programs. The memo will provide a narrative, qualitative assessment of risk and be included as an attachment to the 5-year M&E report.

Control Group Analysis:

- Tracy Hillman has completed the spring Chinook power analysis for the control streams analysis. He expects to wrap up the summer Chinook analysis by the next HETT meeting on July 12, 2011.
- Hillman will have the draft report on the methodology used for the control stream analysis to the HETT by the end of June 2011.

The next HETT meeting is scheduled for July 12, 2011. The draft 5-year M&E report is due to Douglas PUD by the end of August; the draft to Chelan PUD in September.

VII. Yakama Nation

A. Multi-Species Acclimation Update (Keely Murdoch)

Keely Murdoch reported that Cory Kamphaus, Yakama Nation, has completed an analysis on the escape of some steelhead juveniles from Rohlfing Pond during this spring's high-flow event. Approximately 2,400 juveniles are estimated to have escaped, representing approximately 12 percent of the total number of steelhead juveniles placed in the pond at the start of acclimation in 2011. These values may change slightly as additional PIT-tag data become available.

Murdoch said the early results of co-mingling steelhead and yearling Chinook during acclimation at the Twisp acclimation pond was promising. The Hatchery Committees confirmed that they are in support of implementing a second year of co-mingled acclimation using juvenile steelhead and yearling Chinook. The Committees discussed elements to consider for 2012 co-mingled acclimation at the Twisp acclimation pond, including species proportions, densities, and the effects of temperature on species interactions. The number of steelhead that can be acclimated at the Twisp acclimation pond will depend on the number of Twisp-origin Chinook that will be acclimated.

Murdoch said Kamphaus will present the results of the Yakama Nation's 2011 expanded multi-species acclimation program to the Committees at the July 2011 meeting. She stated that the Yakama Nation's interest is in acclimating steelhead juveniles in the upper Methow River. Tom Kahler reminded the Committees that in the draft Wells steelhead HGMP they selected the Methow Hatchery as the release location for the 100,000 "lower Methow" steelhead specifically because adult returns could be collected at that facility. The Committees discussed the challenges that acclimating steelhead in the upper Methow River might present for the management of returning adults. Tom Kahler stated that data from monitoring and evaluation efforts to date do not indicate any difference in the spawning distribution of hatchery and natural-origin steelhead in the upper Methow, and thus reveal no need to extend the distribution of the hatchery spawners by expanding acclimation to the upper basin. Murdoch replied that regardless of data on spawning distribution, the Yakama Nation remained concerned that the habitat in the upper Methow may not be fully seeded. Committees' members stated it would be helpful to better understand the current steelhead spawning distribution in the upper Methow River, the extent of available spawning habitat and its level of seeding, the role stream temperatures play on steelhead spawning distribution in the Methow River, and how expanding steelhead acclimation into the upper Methow River might affect natural productivity. Bill Gale cautioned the Committees on making changes to the Wells steelhead hatchery program prior to HGMP approval by NMFS. Tom Kahler reiterated Douglas' concern about the potential effect on the Wells steelhead program of expanding steelhead acclimation into the upper Methow subbasin without adequate adult management capabilities.

VIII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are July 20 (Douglas PUD office, East Wenatchee), August 17 (Chelan PUD Headquarters, Wenatchee), and September 21(Douglas PUD office, East Wenatchee).

List of Attachments

Attachment A – List of Attendees

Attachment B – Interim Marking Scheme for Wells Juvenile Steelhead

Attachment C – SOA for the Collection of Additional Summer Chinook Broodstock for the Entiat NFH Summer Chinook Program

Attachment A
List of Attendees

Name	Organization
Carmen Andonaegui	Anchor QEA, LLC
Ben Floyd	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation
Bill Gale*	USFWS
Craig Busack*	NMFS
Travis Maitland	WDFW

* Denotes Hatchery Committees member or alternate

Attachment B

Table 1. Current and proposed interim (to be released in 2012) marking scheme for juvenile steelhead produced at Wells Fish Hatchery for Douglas and Grant PUD.

				CWT Only			
	Ad+CWT	Ad-clip only	Vent clip	Snout	Adipose fin	Elastomer	Total
Douglas PUD							
Current	150,000	100,000				100,000	350,000
Proposed (2012)		250,000	50,000	50,000			350,000
Grant PUD/CCT							
Current	80,000				20,000		100,000

Attachment C

Final 6-09-2011

Wells HCP Hatchery Committee
Statement of Agreement
Regarding Collection of Adult Broodstock for Entiat National Fish Hatchery (USFWS)
15 June 2011

Statement

The Wells HCP Hatchery Committee approves the collection of additional hatchery-origin summer Chinook (up to 124 pair) during broodstock collection efforts at the Wells Hatchery volunteer ladder trap for the 2011 brood year. These additional brood will be transferred to the US Fish and Wildlife Service's (USFWS) Entiat NFH to support their new summer Chinook program. This collection is already described in the Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols. The USFWS agrees to provide staff required for these collection efforts. Currently, this includes one person to sort fish and two people to transfer fish to a transport truck. Should staffing needs increase in the future, USFWS will supply the required additional staff. Transportation of adults from Wells Hatchery to the Entiat NFH will be accomplished by Washington Department of Fish and Wildlife using Wells Hatchery trucks. The USFWS will provide fuel for the transportation and if requested will assist Wells Hatchery staff with spawning summer Chinook at the Wells Fish Hatchery. Spawning and adult holding activities will occur at Entiat NFH and are the responsibility of US Fish and Wildlife Service. This agreement is in effect for only one year.

Background

The USFWS, in conjunction with other parties (Yakama Nation, Confederated Colville Tribes, NOAA, WDFW, BOR) is implementing a new summer Chinook hatchery production program at Entiat NFH. The long-term goal of this program is to provide fish for tribal, commercial, and sport harvest, and to meet tribal trust responsibilities as mitigation for Grand Coulee Dam. A Hatchery and Genetics Management Plan (HGMP) for this program was submitted to NOAA in July of 2009. This HGMP has also been distributed to all of the relevant co-managers.

In 2011 the USFWS anticipates moving to full program at the Entiat NFH with a yearly release goal of 350-400K yearling summer Chinook smolts released into the Entiat River. The USFWS uses volunteer summer Chinook returns at Wells Hatchery as broodstock for the Entiat program. Broodstock collection efforts entailed transfer of eggs in the first year of partial production (BY 2009), and transfer of adults in BY 2010 (and all subsequent years until sufficient returns to Entiat NFH). Full production will require the collection of up to 300 hatchery-origin summer Chinook adults (enough to provide up to 400K eggs). As the progeny of the initial Wells Hatchery collections return as adults (to Entiat NFH), they will be used as broodstock and the number of adults needed from Wells Hatchery will be reduced. It is anticipated that by brood year 2016 the Entiat NFH program will utilize volunteers to that facility for 100% of broodstock needs. Funding for this new program will be the responsibility of the USFWS and BOR.

Broodstock collection will occur concurrent with planned WDFW efforts as detailed in the 2011 Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols developed in conjunction with the HCP-Hatchery Committee.

ANCHOR QEA
720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	September 20, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of July 20, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Douglas PUD Headquarters Building in East Wenatchee, Washington, on Wednesday, July 20, 2011, from 9:30 am to 3:30 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Josh Murauskas will provide Carmen Andonaegui with a summary of variations in seasonal and year-to-year operations (including fishway flow conditions) at Tumwater Dam (TWD) for distribution to the Hatchery Committees (Item I).
- Josh Murauskas will email Carmen Andonaegui a copy of the PowerPoint presentation on NNI recalculation from today's Hatchery Committees' meeting (Item II-A).
- Tom Scribner will email Carmen Andonaegui a description of the Yakama Nation's draft hatchery implementation proposal for distribution to the Hatchery Committees (Item II-A).
- Josh Murauskas will email a revised version of the No Net Impact (NNI) recalculation database to Carmen Andonaegui by July 27, 2011, for distribution to the Hatchery Committees (Item II-B).
- The Hatchery Committees will review the revised 2013 hatchery NNI recalculation database and be prepared to confirm at the next Committees' meeting on August 17, 2011, that the information in the database represents the information to be used for 2013 hatchery NNI recalculation (Item II-B).
- Tom Kahler will email Carmen Andonaegui a revised version of the 2013 Hatchery NNI Recalculation Methodology Statement of Agreement (SOA) for distribution to the Hatchery Committees (Item II-C).

- Chelan PUD and Douglas PUD will prepare a table of estimates of hatchery production based on inclusion or exclusion of selected mitigation and inundation hatchery programs for initial discussion at the August 9, 2011, Hatchery Recalculation Subgroup meeting (Item III-A).
- Josh Murauskas will email Carmen Andonaegui a copy of Chelan PUD's PowerPoint presentation on hatchery compensation for hatchery production for distribution to the Hatchery Committees (Item III-A).
- Carmen Andonaegui will distribute to the Hatchery Committees by email Bill Bosch's PowerPoint presentation on the benefits of hatchery supplementation (Item V-A).
- Craig Busack will provide to Washington Department of Fish and Wildlife (WDFW), Chelan PUD, and Douglas PUD by email a list of questions to answer for preparation of an addendum to their respective hatchery program Hatchery and Genetic Management Plans (HGMPs) (Item VI-A).
- Craig Busack will provide an email to the Hatchery Committees on the status of the Endangered Species Act (ESA) Section 10(j) process related to the U.S. Fish and Wildlife Service's (USFWS's) request to release spring Chinook into the Okanogan River (Item VI-B).

SOA DECISION SUMMARY

- The Hatchery Committees approved the 2013 NNI Hatchery Recalculation Methodology SOA (Item II-C).

AGREEMENTS

- There were no agreements at today's Hatchery Committees' meeting.

REVIEW ITEMS

- Comments on the draft Hatchery Production Management Plan are due to Mike Tonseth by Friday, August 5, 2011.
- The Douglas PUD Draft 2010 monitoring and evaluation (M&E) of Wells and Methow Hatchery Programs in 2010 report is out for 60-day review. Comments are due to Greg Mackey by September 12, 2011.
- Comments on Chelan PUD's draft 2010 Rocky Reach and Rock Island Annual M&E report are due September 2, 2011, to Josh Murauskas.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. No items were added to the agenda; the following items were deleted from the agenda:

- Tom Scribner said he was deleting the Yakama Nation agenda items 3 and 4. He said the Yakama Nation will present both agenda items at the August 2011 Committees meeting.

The June 15, 2011, Hatchery Committees draft meeting minutes were reviewed and approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees. Josh Murauskas will provide Carmen Andonaegui with a summary of variations in seasonal and year-to-year operations (including fishway flow conditions) at Tumwater Dam (TWD) for distribution to the Hatchery Committees. This was an Action Item from the last Committees' meeting on June 15, 2011.

II. Douglas PUD/Chelan PUD

A. Progress Toward 2013 NNI Recalculation (Greg Mackey/Josh Murauskas)

Mike Schiewe provided a brief background of Hatchery Committees' efforts towards recalculating NNI hatchery production targets. He said that the Hatchery Committees have been working on recalculation for several months, including three meetings of a Committees' subgroup to discuss the technical aspects of recalculation. Schiewe said the Committees have worked towards an agreed-upon recalculation method and discussed which hatchery programs should be subject to the 2013 recalculation. He said the Committees' deadline for agreeing to an approach to 2013 NNI recalculation is October 2011, to be followed immediately by the development of an implementation plan, ultimately to be incorporated into the new broodstock collection protocols for 2012.

Josh Murauskas gave a presentation to the Committees summarizing Chelan and Douglas PUDs' perspective on NNI recalculation (Attachment B). Murauskas will email the presentation to Carmen Andonaegui for distribution to the Committees. Murauskas said that the concept of NNI is that the number of hatchery smolts released by the PUDs equals the number of smolts necessary to match the number of smolts from the tributaries and Grand

Coulee Fish Maintenance Project (GCFMP) that would have been in-river prior to the construction and operation of the PUD projects. He described the Biological Assessment and Management Plan (BAMP) process for calculating NNI as a process to ensure that the same number of adults return to the upper Columbia, absent project-related mortality, as returned previous to construction of the PUD projects.

Murauskas said the PUDs see several problems with using the BAMP calculation alone, most importantly that the calculation includes fish that are not subject to NNI recalculation: survival study fish, initital production, the PUD's own NNI hatchery production, and the PUD's own inundation production. He pointed out that Chelan PUD alone has released a minimum of 10 million smolts above NNI over the term of the HCP to date and those returning adults therefore do not represent NNI. Murauskas provided a comparison of recalculated smolt production estimates for Chinook and steelhead using the BAMP calculation, the application of BAMP methods to natural-origin fish and application of Unavoidable Project Mortality to Grand Coulee hatchery releases, and several calculations of hatchery smolt production based on M&E data (Attachment C). Murauskas said that the PUDs' preferred recalculation method is the BAMP/Hatchery Releases method, pointing out the differences in levels of production between the BAMP and the BAMP/Hatchery Releases methods, and saying without excluding NNI hatchery releases in the recalculation, there would be a substantial increase in production with the BAMP method for all species. He further pointed out how subjecting production to facilities with low SARs further inflates production. Murauskas said that in the BAMP/Hatchery Releases method, target hatchery releases are used to represent hatchery smolts in the equation and that the number of wild fish produced are calculated using the BAMP method. He said that the NNI Recalculation Methods SOA up for approval today asks for agreement on two things: 1) that the number of hatchery smolts needed to replace a shortage of returning wild adults is calculated based on adult return counts, SARs, and project survival rates; and 2) that hatchery release targets are used to represent the number of hatchery smolts in-river for recalculation. He said that the SOA does not address the question of which hatchery programs are subject to mitigation, which hatchery programs' production will be used for each mitigation component, or any details associated with implementation.

Greg Mackey emphasized that the PUDs are seeking a technically-defensible approach for deriving target HCP hatchery production levels, but that this does not preclude the opportunity to modify programs based on implementation concerns. Todd Pearsons stated that the reason for Grant PUD's involvement in the HCP Parties development of an NNI recalculation method is to have a consistent approach to recalculation among the PUDs as requested by the Joint Fisheries Parties (JFP) and the HCP Hatchery Committees. He said that the SOA for approval today was a negotiated approach among the PUDs and HCP Hatchery Committees' members regarding how best to address recalculation.

Bill Gale said that the question he is most concerned with is not which recalculation method is used so much as which hatchery programs should be included in the recalculation, and he has concerns approving a recalculation method without knowing which hatchery programs will be included. Tom Kahler said that regardless of which hatchery programs are used to recalculate production, the items up for agreement as captured in the SOA (hatchery release numbers equal hatchery smolts in-river and adult replacement numbers are based on adult counts, SARS, and project survival) would not affect which hatcheries are included. Steve Hays reminded the Committees that the BAMP was originally devised to ensure that the PUDs' hatchery programs would not flood the available habitat with hatchery fish and also to develop a supplementation program that would accommodate anticipated increases in natural production. He said that negotiated production targets set initial production level above and beyond what was indicted by the BAMP calculation in some cases, resulting in elevated returns of adult hatchery fish to the dams (which is one of the factors used in the BAMP calculation), subsequently resulting in elevated hatchery production targets.

Mike Tonseth said that, conceptually, the PUDs' preferred method takes into account how additional production may have inflated current adult returns. He agreed with Gales's concern regarding the need to know which hatcheries will be included in the recalculation. Kahler said that a sensitivity analysis could be conducted on the estimates derived using different hatchery programs.

Kirk Truscott said that he has concerns similar to those of Gale and Tonseth but agreed that a technical basis for recalculation is needed; he acknowledged the problem with the summer Chinook production estimates derived using the BAMP. Steve Hays said using adult return counts resulting from inflated hatchery production will equal higher returns and then higher production estimates, and so on. This is why the PUDs are proposing to not use some hatchery production in some recalculations. Hays pointed out that high adult hatchery returns also negatively influence the proportion of hatchery-origin spawners (pHOS).

Craig Busack said he likes the proposal and that it is a logical and simple way to come up with recommended hatchery production targets. He said that he shares Committees members' concerns about the potential effects of policy and negotiated effects on the production targets, but that the important thing is to show the technical basis for deriving the estimates and then to provide an explanation for any deviations from the calculated values.

Tom Scribner indicated he had developed a draft hatchery implementation proposal to present to the Committees. Scribner said that he met with the some of the JFP parties earlier in the day regarding the proposal; however, he emphasized that the proposal was not a JFP proposal. Scribner said the Yakama Nation's concern is regarding spring Chinook production levels. Steve Parker said that the JFP is working to balance a technical approach with a practical outcome. He said there is merit to separating the technical elements from the policy elements, but that the Yakama Nation feels they need some predictability regarding what the outcomes of NNI recalculation might be.

Scribner said that the Yakama Nation wants to maintain the existing spring Chinook hatchery supplementation program targets at the following levels: White River = 150,000; Nason = 250,000; Chiwawa = 298,000; Methow Hatchery = 400,000; Winthrop Hatchery = 400,000; Okanogan = 200,000; the latter assuming the ESA section 10(j) application is approved. Summer/fall Chinook production targets would be set at levels consistent with the capacity of existing facilities, including Grant PUD's planned facility capacity at Carlton Pond, the Dryden Facility, and the Chief Joseph Hatchery. Scribner said the JFP would not pursue further hatchery infrastructure creation for summer chinook by the PUDs. He said that if the Yakama Nation proposal were to be approved by the Committees, there would be no need to determine which hatchery program production would be included and which would be excluded in recalculation, nor would there be a need for new facilities for summer Chinook except to make Carlton and Dryden capable of overwintering production. Scribner agreed to email Carmen Andonaegui a description of the Yakama Nation's hatchery implementation proposal for distribution to the Committees. Scribner indicated that the

Yakama Nation would consider acceptance of the PUD recalculation proposals in exchange for assurance on spring Chinook production.

Schiewe reminded the Committees that the Yakama Nation proposal is an implementation plan separate from the request for approval of the recalculation method SOA. Mackey said that the PUDs would need to further discuss the Yakama Nation proposal internally, as did the JFP representatives at the table. Truscott said that the 200,000 Chief Joseph hatchery spring Chinook production level is included in the 900,000 spring Chinook production target to be cost-shared by Grant and Douglas PUDs.

B. 2013 NNI Recalculation Database (Greg Mackey/Josh Murauskas)

Mike Schiewe said that the recalculation database compiled by Josh Murauskas and distributed by email to the Hatchery Committees has been the subject of multiple discussions by the Hatchery Committees' subgroup. He said that Murauskas had provided a paper describing the sources of these recalculation data (Attachment D). Murauskas said that a couple more changes need to be made to the final version of the database emailed on July 11, 2011, to the Committees. He said that Keely Murdoch noticed an anomaly in the adult counts between the Priest Rapids data and the Rock Island adult counts that needs to be corrected; Greg Mackey noted that he needs to add Wells Hatchery summer Chinook SARs to the database. Murauskas asked for review of the database by Committees' members to make sure that there are no other missing or incorrect data. He said he will be sending a revised version of the database no later than July 27, 2011, to Carmen Andonaegui for distribution to the Committees. The Committees' subgroup will discuss any issues with the database at their next meeting on August 9, 2011. Murauskas said that at the next Hatchery Committees meeting on August 17, 2011, the Committees should be prepared to agree that the database includes all data needed to recalculate NNI production.

C. NNI Recalculation Methodology SOA (Greg Mackey/Josh Murauskas)

Greg Mackey said that the PUDs would like to proceed with a vote by the Hatchery Committees on the 2013 Hatchery Recalculation Methodology SOA (Attachment E). Josh Muruaskas said the SOA asks for agreement by the Committees that the number of hatchery smolts released equals the number of hatchery-origin smolts in-river for the purpose of recalculating NNI compensation. Steve Parker said that, with regard to being asked to approve the SOA, the Yakama Nation has no assurances yet that the PUDs will accept the

Yakama Nation proposal or which hatcheries will be included in recalculating hatchery production numbers. Kahler said that the concept that the number of hatchery fish released equals the number of hatchery fish produced was provisionally agreed to by the Committees in April 2011, and thus is not a new issue. Bill Gale said his concern is that he is being asked to agree to a NNI recalculation method that will result in a reduction in production of all HCP Plan species, knowing that a further reduction in hatchery production could occur depending on which hatchery program might be excluded from the recalculation. Kahler emphasized that agreeing that hatchery fish released equals hatchery fish in-river is independent of the question of which hatchery programs are used in recalculation. The hatchery programs that the Hatchery Committees agree on will be the ones used in the calculation.

The Committees' members discussed possible edits to the SOA that would highlight the point that approval of the SOA did not address the question of which hatchery programs would be included in the recalculation, and that that question was a separate decision. Mike Tonseth suggested language be inserted in the SOA stating that the approved recalculation method does not define which hatchery programs will be used in the calculation. Schiewe reminded the members that the HCP requires that the Committees approve a method of recalculation, and then subsequently, an implementation plan. Gale said that the last sentence of the third paragraph in the SOA should be deleted ("The relative performance … between programs"). The Committees agreed to delete the sentence.

Kirk Truscott said that it was his understanding that if this SOA is approved, providing agreement on the recalculation method, but then the HCP Parties are unable to agree on which hatchery program to include or exclude from recalculation, this would mean that hatchery NNI targets could not be recalculated. Tonseth agreed that this was the case. Steve Hays said that the goal is not to calculate the number of hatchery fish produced but to estimate how many hatchery fish are needed to achieve NNI. The Committees' members discussed how using the BAMP method alone may inflate the PUDs' NNI compensation obligation. Murauskas said that the SOA identifies how to calculate NNI production no matter which hatchery programs are subsequently included in the recalculation.

Schiewe proceeded to ask each Committees' member individually if they approved the SOA as amended. Each member voted to approve the SOA.

Gale asked what the next steps were for finalizing the recalculation. He suggested a sensitivity analysis on the possible outcomes using the PUDs' preferred alterntive with different hatchery programs included and excluded. Mackey agreed that the PUDs would perform the sensitivity analysis and pointed out the language in the SOA that refers to the next steps after approval of the SOA.

In summary, the edits to the SOA approved by the Committees were to: delete the last sentence of the third paragraph in the SOA ("The relative performance … between programs"); and add the words "agreed to by the HC" to the first sentence of the third paragraph ("Compensation for hatchery-origin smolts will be based upon the 2014-2023 projected annual release targets for those hatchery programs '<u>agreed to by the HC</u>' that are subject to NNI (i.e., subject hatcheries)."). Tom Kahler will email Carmen Andonaegui a revised final version of the approved 2013 NNI Recalculation Methodology SOA for distribution to the Hatchery Committees, including a copy to Todd Pearsons.

III. Chelan PUD

A. Hatchery Compensation for Hatchery Programs (Josh Murauskas/Joe Miller)

Josh Murauskas provided a paper describing Chelan PUD's understanding of which hatchery mitigation programs are subject to recalculation (Attachment F). He said that Chelan PUD agreed that impacts to Grand Coulee mitigation programs should be part of recalculation. Murauskas said that project mortality losses to Chief Joseph production would be compensated by the PUDs through funding arrangements between the PUDs and the Colville Confederated Tribes (CCT). He said Chelan PUD's hatchery production for NNI should not be included when recalculating Chelan PUD NNI production. Committees' members generally agreed with the above interpretations, but did not vote or agree to formally accept them.

Regarding Chelan PUD's obligation relative to mitigation for inundation production, Kirk Truscott said that inundation smolts produced for release above the Rocky Reach and Rock Island projects and subsequently killed at the projects represent a loss of 7 percent at each project for which compensation is needed to achieve NNI. Reading from the Rocky Reach HCP (Table 2, footnote 1, pg. 49 and referenced in section 8.4.4 of the Rocky Reach HCP), Murauskas said that inundation fish are not subject to recalculation and are above the level needed to compensate for unavoidable mortality. Steve Hays said that the inundation mitigation levels are an overcompensation for lost spawning habitat. He said that a more concise approach to estimating the impact of lost spawning habitat inundated would be to count the number of returning adults and then develop a reasonable mitigation option. Todd Pearsons said that because Grant PUD only mitigates for inundation for Hanford Reach fall Chinook and hatchery releases occur below the Priest Rapids Project, there is no loss associated with their inundation hatchery releases.

Truscott said that a sensitivity analysis would help understand how much mitigation production is at stake. Bill Gale said that if Douglas PUD releases a certain number of fish upstream of PUD projects and then those fish are killed at PUD projects downstream, the downstream PUDs should have to compensate. Hays said that if the goal is to achieve a certain adult return rate, the smolt-to-adult rates (SARs) incorporate smolt project mortality. The SAR is the sum total of all losses from release point to return. Schiewe said that the next step is a sensitivity analysis, creating a table of hatchery production estimates, minus the agreed-to hatchery exclusions and assuming Grand Coulee mitigation is included, and then adding in the other hatchery program productions sequentially to determine each one's affect on final production estimates. He said that the subgroup could do this exercise, leaving the decisions on which programs to include or exclude to the full Committees. Tonseth provided results from a quick estimate of mitigation obligations for impacts to upstream inundation fish. He suggested that if the premise is that inundation for summer Chinook above Rocky Reach is subject to recalculation, for example, and that the adult return target were 300 pairs, expanded out, the mitigation would only be about 20,000 hatchery smolts given a 7 percent loss at Rocky Reach. For steelhead, also assuming 300 adult pairs, Chelan PUD is already grossly overproducing hatchery fish for a 300-pair adult return. Tonseth said Douglas PUD produces 300,000 hatchery fish for release as mitigation for inundation. There was discussion about how the Wells inundation mitigation obligation was originally the production of rainbow trout for a lost whitefish fishery. The Commmittees agreed that a description of the basis for the Douglas PUD steelhead mitigation program would be helpful in understanding whether mitigation should be required for Wells Project inundation fish.

Schiewe said that questions as to which hatchery programs are included or excluded in recalculation should be addressed on a project-specific basis, and the Committees agreed. He reiterated the need for the PUDs to prepare a table of estimates of hatchery production based on inclusion or exclusion of selected mitigation and inundation hatchery programs, for initial discussion at the next subgroup meeting. Josh Murauskas will email a copy of Chelan PUD's PowerPoint presentation on hatchery compensation to Carmen Andonaegui for distribution to the Committees.

B. 2010 Chelan PUD M&E Report (Josh Murauskas)

Mike Schiewe reported that the Hatchery Committees were notified by email on June 2, 2011, that Chelan PUD's draft Rocky Reach and Rock Island 2010 Annual M&E report was posted to the Anchor QEA ftp site. However, notice was not clearly provided in the email that the posting of the report triggered the start of the 60-day review period that would end on August 2, 2011. Schiewe asked if the Committees could complete comments by this date. Bill Gale asked that the comment period be extended to September to allow additional time for comment given the current workload. Mike Tonseth said that he would like to verify that extending the comment period to September would not be in conflict with any National Marine Fisheries Service (NMFS) ESA permit requirements for Chelan PUD hatchery programs. The Committees discussed permit requirement timing briefly and decided that a September 2, 2011, comment due date would be acceptable. These comments are due to Josh Murauskas. The M&E Report will be up for approval at the September 21, 2011, Committees' meeting.

IV. WDFW

A. Draft Hatchery Production Management Plan (Mike Tonseth)

Mike Tonseth said that the first draft Hatchery Production Management Plan (Plan) was distributed to the Hatchery Committees in March 2011 for comments. The Plan was subsequently revised based on Committees' comments and discussion, and in April 2011, it was sent to WDFW in Olympia for internal review and comments. Tonseth said that he incorporated the comments he received from Olympia, and the revised draft was distributed to the Committees on July 18, 2011, for final review. He said that the draft had not substantially changed, but that he removed any reference to Regulatory Codes of Washington (RCWs) in order to maintain maximum flexibility within the Plan when managing for surplus fish. Committees' comments on the July 18, 2011, draft Plan are due to Tonseth by Friday, August 5, 2011. The Plan will be up for approval at the next Committees' meeting on August 17, 2011. Upon approval, the Plan will be included as an appendix to the annually-prepared broodstock management plans.

V. Yakama Nation

A. The Flip Side of the Risk Monologue: the Unheralded Benefits of Hatchery Supplementation (Bill Bosch)

Bill Bosch provided a PowerPoint presentation on benefits of hatchery supplementation (e.g., mitigation for dams and habitat degradation, failure of stocks to replace themselves), and how such supplementation can contribute to maintaining sustainable salmon and steelhead populations. Carmen Andonaegui will distribute Bill Bosch's presentation to the Hatchery Committees.

B. MKIV Tagging Systems – An Alternative to Vent Clipping (Tom Scribner)

Tom Scribner said that, over the next year, the JFP needs to consider alternative methods for marking steelhead, and that the Yakama Nation is not supportive of fin clipping. He said that he wanted to use this agenda item to highlight the fact that issues regarding external tagging need to be worked out. Scribner said that there are alternatives to fin clipping that some might not be aware of and that there are external marking alternatives that were not available in the past. He said that WDFW needs to start developing a comprehensive steelhead marking strategy and that the different obligations among fisheries programs need to be reviewed to make sure marking plans are in place to meet management needs. Scribner said that discussion will start as soon as the JFPs can agree to a meeting date and that an agreed to marking strategy is needed by the end of June 2012. Bill Gale said that in *U.S. v Oregon*, steelhead marking is a "To Be Determined" issue. Mike Schiewe asked if Douglas PUD should be involved with this process, for development of the marking strategy for Methow steelhead. Mike Tonseth said that the M&E needs have to be considered in the overall steelhead marking strategy and that the JFP is working on the Upper Columbia portion of the strategy. He said that the marking strategy will be brought to the Hatchery Committees. Greg Mackey said that the Wells steelhead HGMP has a marking plan, but it is recognized that it needs to be integrated with a broader steelhead marking strategy.

VI. NMFS

A. HGMP Update (Craig Busack)

Craig Busack reported that NMFS is currently focusing on the review of the coho HGMP and on the Leavenworth Hatchery spring Chinook consultation. He was not certain whether the spring Chinook consultation for the Wenatchee stocks included only the Leavenworth spring Chinook stock or Wenatchee spring Chinook as a whole. Busack said that NMFS review of the Entiat HGMP was going well.

Busack said that NMFS is asking that permit applicants develop an addendum for any HGMP that includes activities associated with TWD trap operations. Bill Gale asked if NMFS wants an addendum for the Leavenworth spring Chinook program because Leavenworth spring Chinook strays are trapped at TWD. Busack said that he was thinking more about the Nason Creek, White River, and Chiwawa programs. He said that NMFS wants a consensus interpretation of past problems associated with TWD operations. Mike Schiewe recommended that NMFS provide a formal request to permit holders asking for the document; Busack said the document would become an appendix to the HGMP. Tonseth said he would like a formal set of questions from NMFS identifying what information is required in the addendum. Busack agreed to provide a list of questions to permit holders by email. Busack said that if any changes need to be made to the previously submitted adult management plan section of the HGMPs (for consistency with this new addendum), then those changes should be made as well. He said that the goal is have consistency between TWD operations and the adult management plans of the HGMPs.

Busack said that the addendum will be included with the HGMP and subject to the 30-day public comment period. He said that he would like to see resolution of any differences in opinion regarding how delay is calculated. Josh Murauskas said that with the operational and structural changes that have been implemented this year at TWD, fish are moving faster past the dam. He said that once this year's adult migration is finished, they will have a much better idea of how TWD is operating relative to delaying adult fish passage.

B. ESA Section 10(j) Okanogan Spring Chinook Request (Craig Busack)

Craig Busack said that he had spoken with the NMFS staff person processing the Okanogan spring Chinook 10(j) request from USFWS. The application was published on July 19, 2011, in the federal register for a 60-day review, and the National Environmental Policy Act (NEPA) process should be starting soon. Busack was uncertain as to how long the 10(j) process would take and whether it would be completed in time for transferring the 200,000 spring Chinook juveniles to the Okanogan River in late October 2011. Bill Gale said that USFWS needs to know that they have approval to move forward under the 10(j) process by late September 2011 in order to be able to plan the October 2011 release. Tom Scribner asked about the possibility of using a categorical exclusion for this planting of spring Chinook in the Okanogan River. Busack said he would provide further information on the timing of the process to the Hatchery Committees by email. Gale asked that the expected final completion date of the 10(j) process be included in the email correspondence.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are August 17 (Chelan PUD, Wenatchee), September 21 (Douglas PUD, East Wenatchee), and October 19 (Chelan PUD, Wenatchee).

List of Attachments

Attachment A – List of Attendees
Attachment B – PUD Recalculation Discussion presentation
Attachment C – Comparison of Recalculation Estimates Using Different Methods
Attachment D – Notes on Mid-Columbia PUD Recalculation Data
Attachment E – 2013 Hatchery Recalculation Methodology SOA
Attachment F – Chelan PUD Hatchery Compensation for Other Hatchery Programs

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Steve Hays	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Tom Scribner*	Yakama Nation
Steve Parker	Yakama Nation
Bill Bosch	Yakama Nation
Bill Gale*	USFWS
Craig Busack*	NMFS

* Denotes Hatchery Committees member or alternate

Attachment B

Hatchery Recalculation Discussion

HCP Hatchery Committee

June 20th, 2011

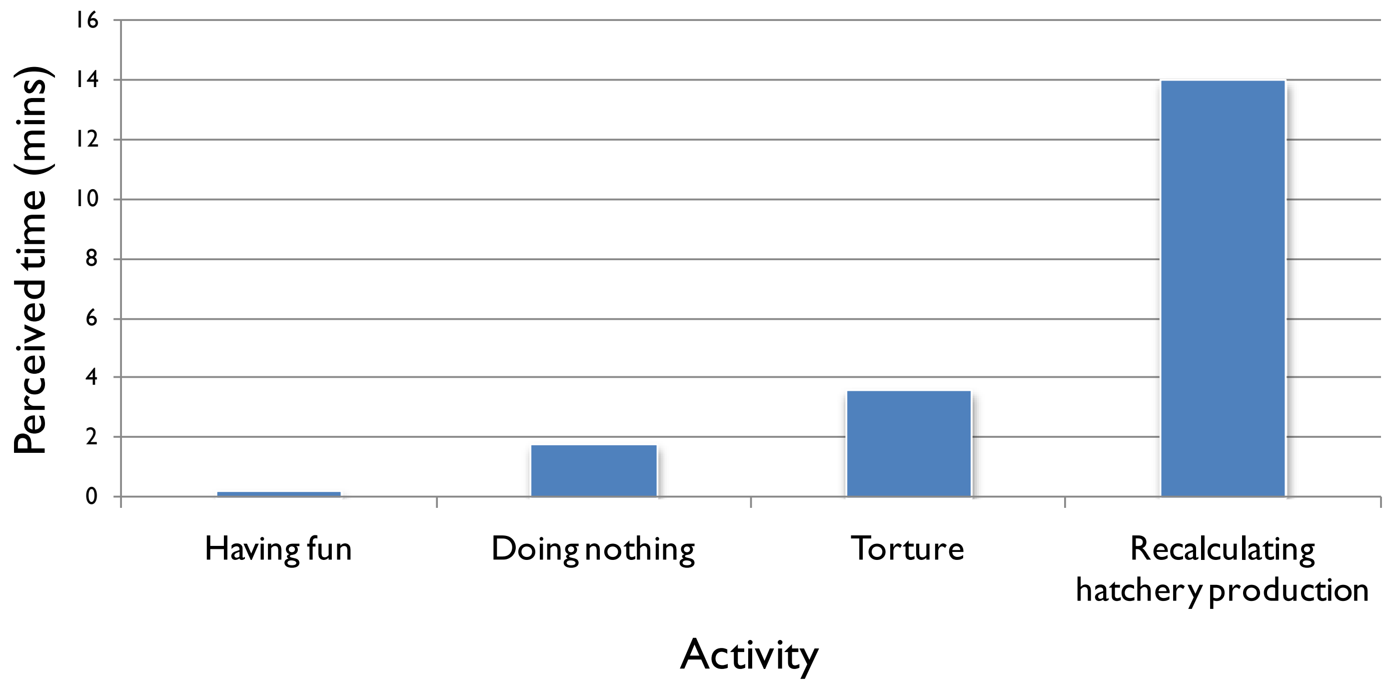
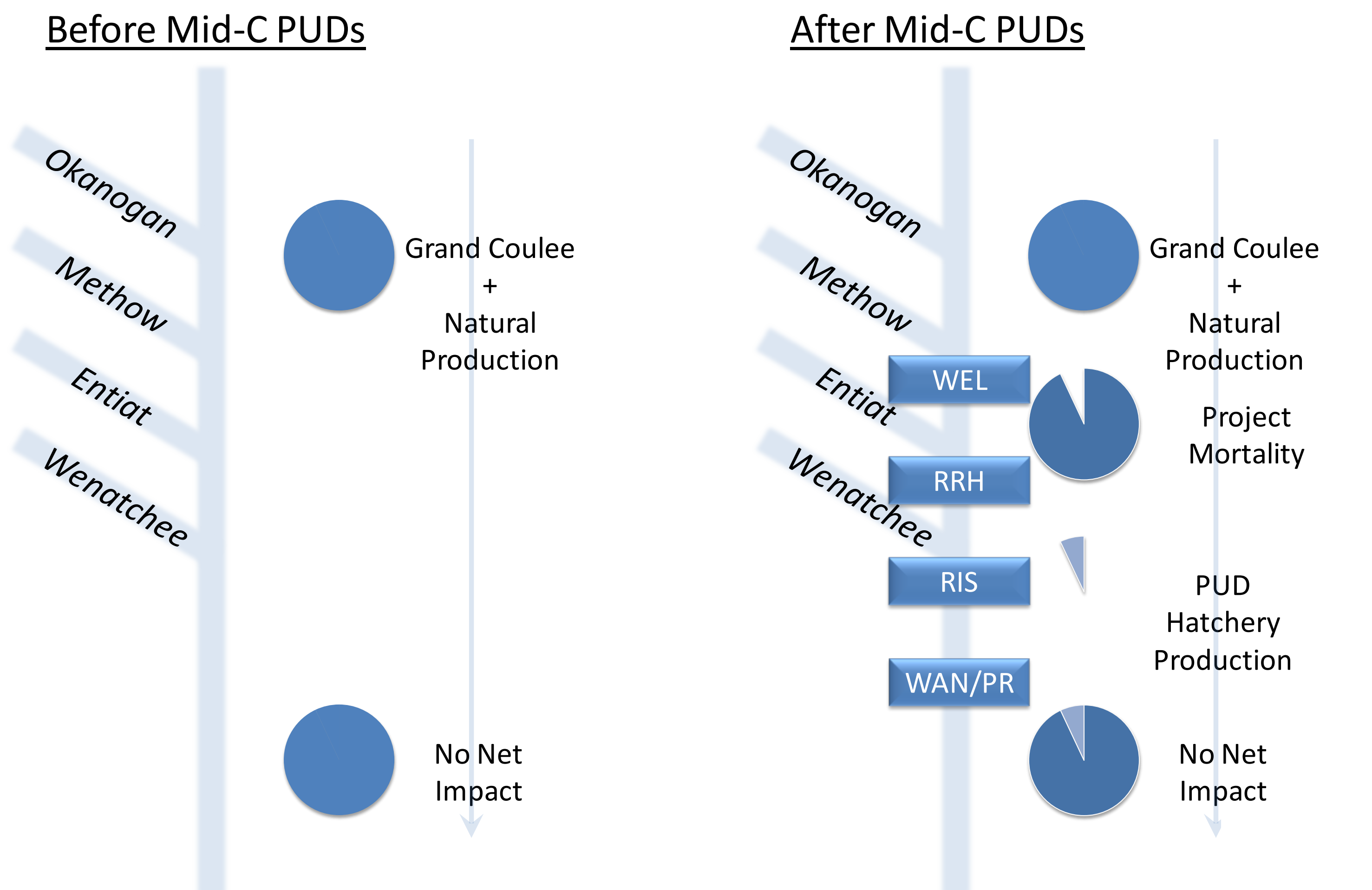


Figure 1. Perception of one minute, by activity.

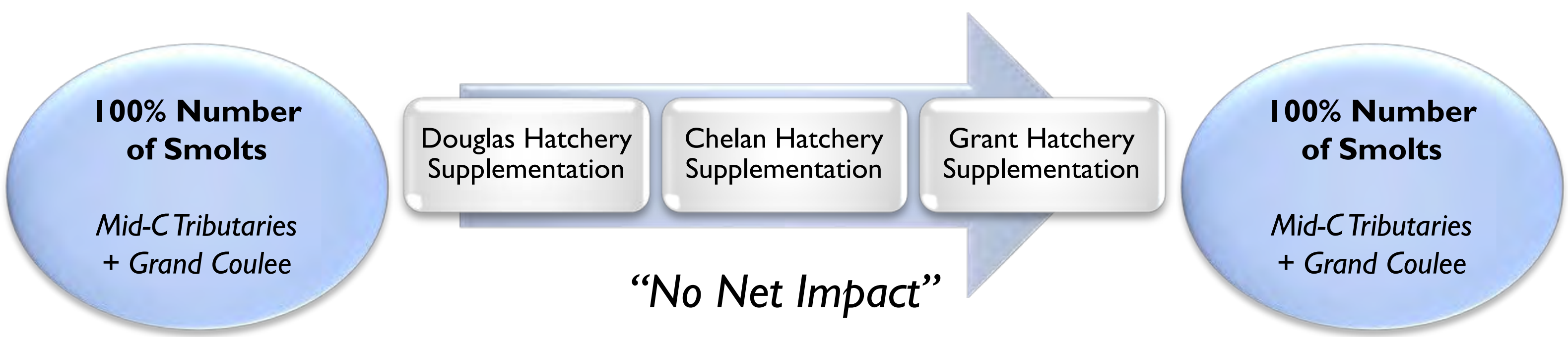
Attachment B

What is NNI?



"Basis" for NNI

- Natural-origin production
- Non-NNI production
  - GCFMP = Compensation by production
  - Chief Joseph = Compensation by funding



Arithmetic

- Before PUDs
  - *Wild + GCFMP* **=** *Original output*
- After PUDs, before mitigation
  - *Wild + GCFMP – (PUDs)* **<** *Original output*
- After PUDs, with mitigation
  - *Wild + GCFMP – (PUDs + NNI)* **=** *Original output*
- After PUDs, with NNI for NNI
  - *Wild + GCFMP – (PUDs + (NNI × NNI))* **>** *Original output*

What is "Recalculation"

- HCPs, section 8.4.3
- Essentially:
  - More juveniles = more losses
  - Better performance = fewer losses
  - Consider the BAMP

What is the "BAMP"

- Biological Assessment and Management Plan (1998)

- "Plug Numbers"
  - *Returns ÷ SAR × NNI = Hatchery production*

Why BAMP works (wild fish)

- Natural-origin population assumed to be short, commensurate with unavoidable project mortality

- Number of hatchery smolts required to provide adults to meet NNI for wild-origin fish simple arithmetic based on extensive M&E data

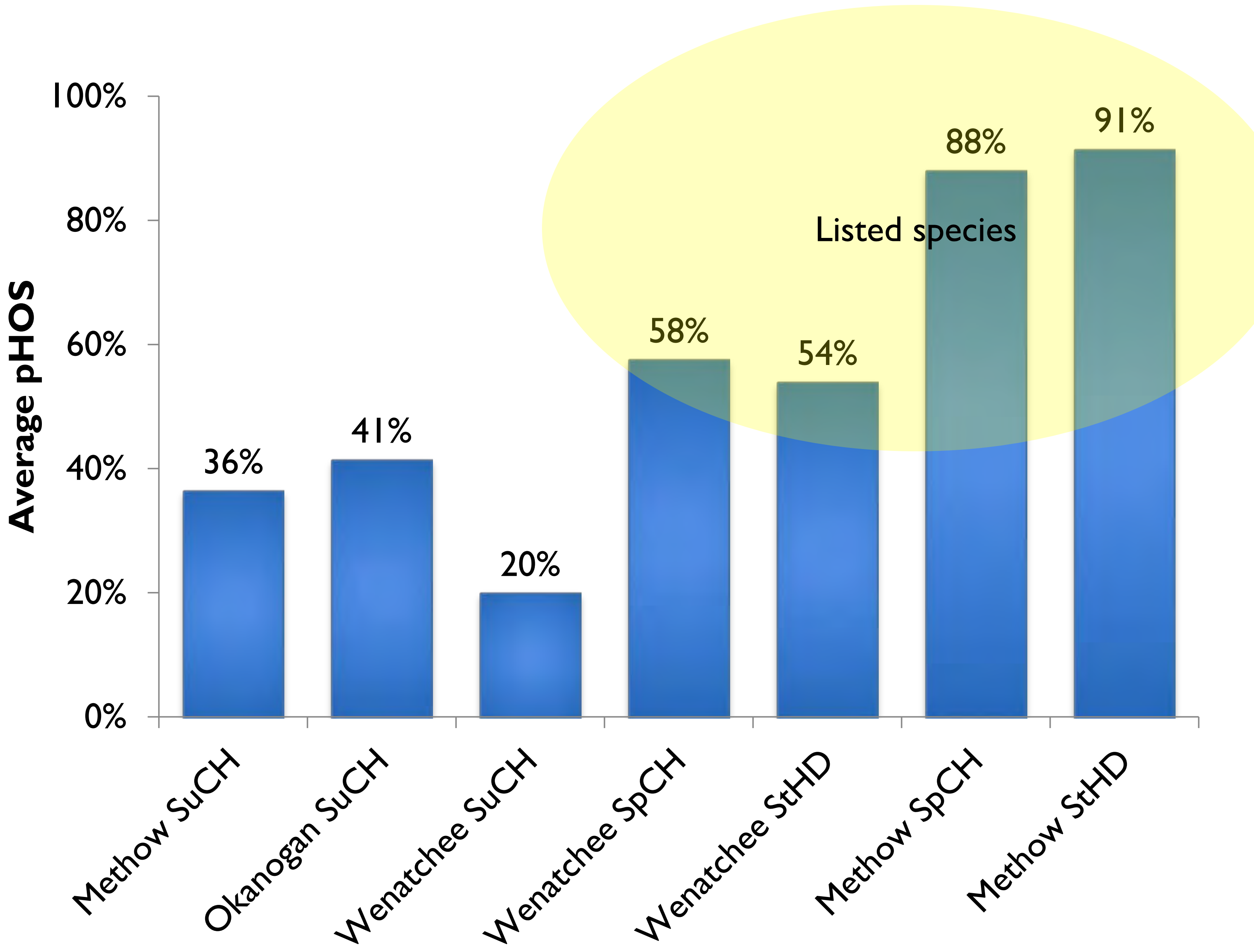
Why BAMP fails (hatchery fish)

- Several reasons, but most importantly… inclusion of fish not subject to NNI

  - *Initial production*
  - *Inundation*
  - *PUD mitigation*
  - *Survival study returns*
  - *Over-production*
  - *Strays*

At least
•2 million spring Chinook
•2 million steelhead
•6 million summer Chinook
released by CPUD above NNI over first decade of HCP

Attachment B

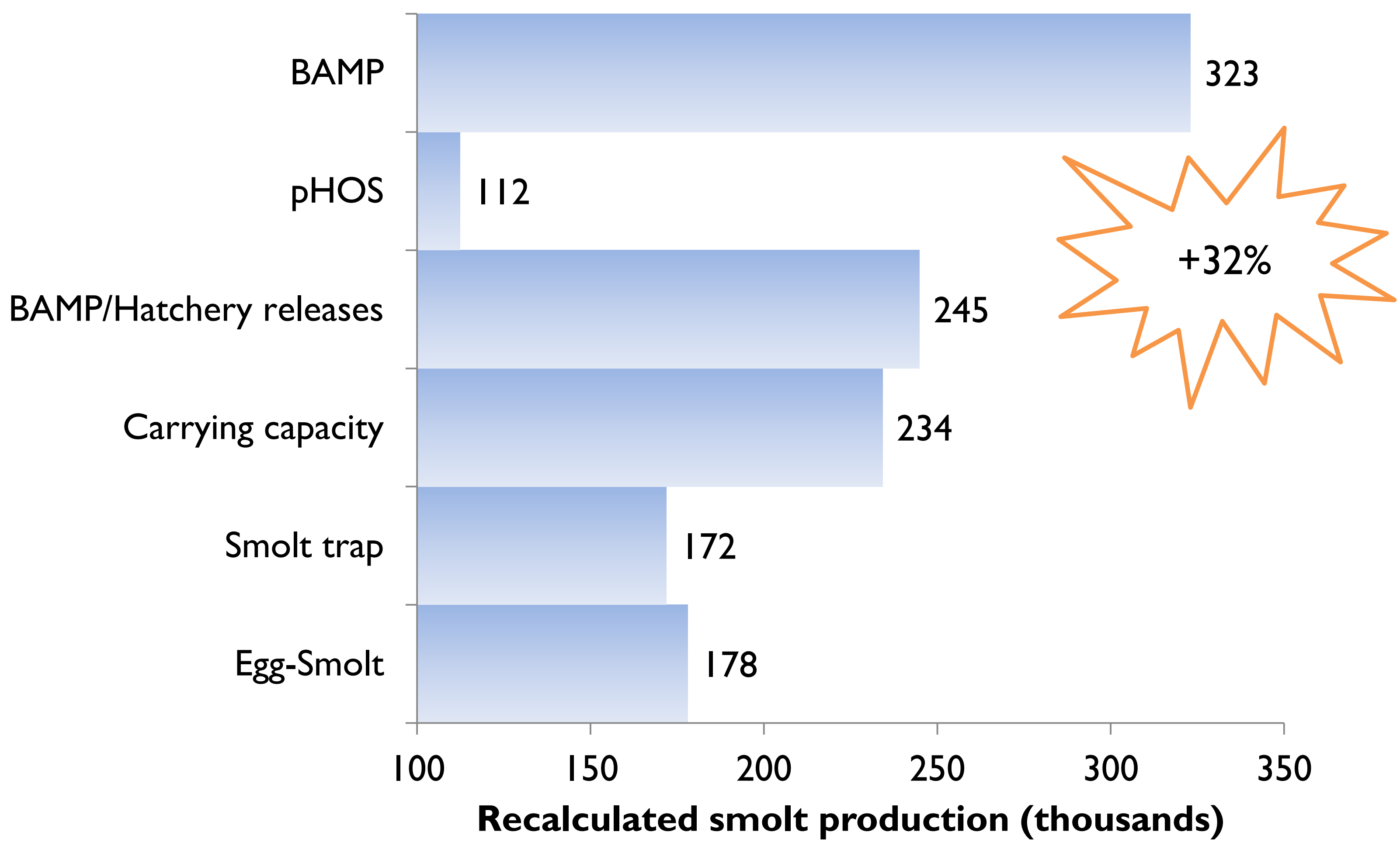


What about using the BAMP with all adult returns?

And how does this method stack up against other recalculation methods based on M&E data?

Attachment B

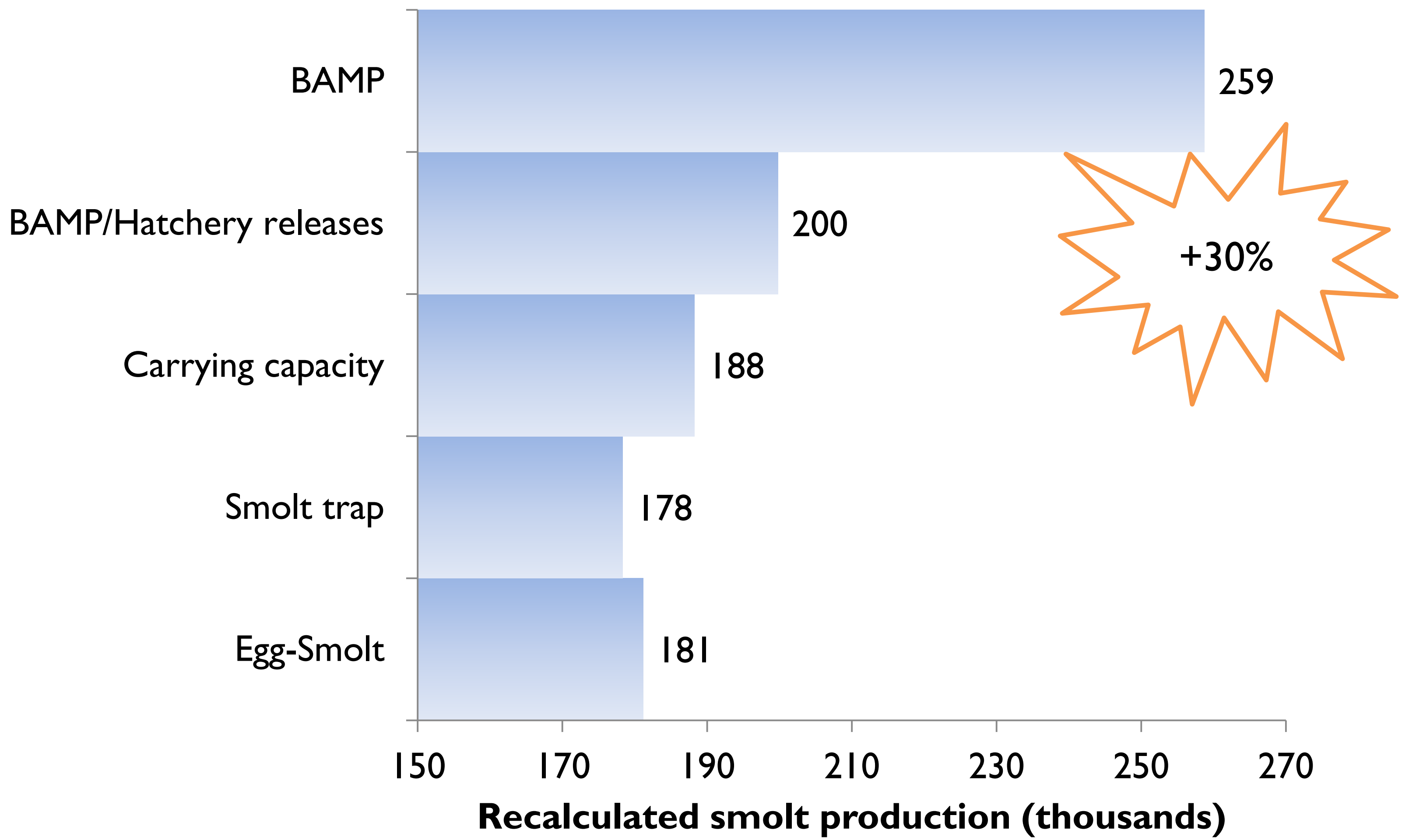
Spring Chinook



Based on Chelan PUD mitigation

Attachment B

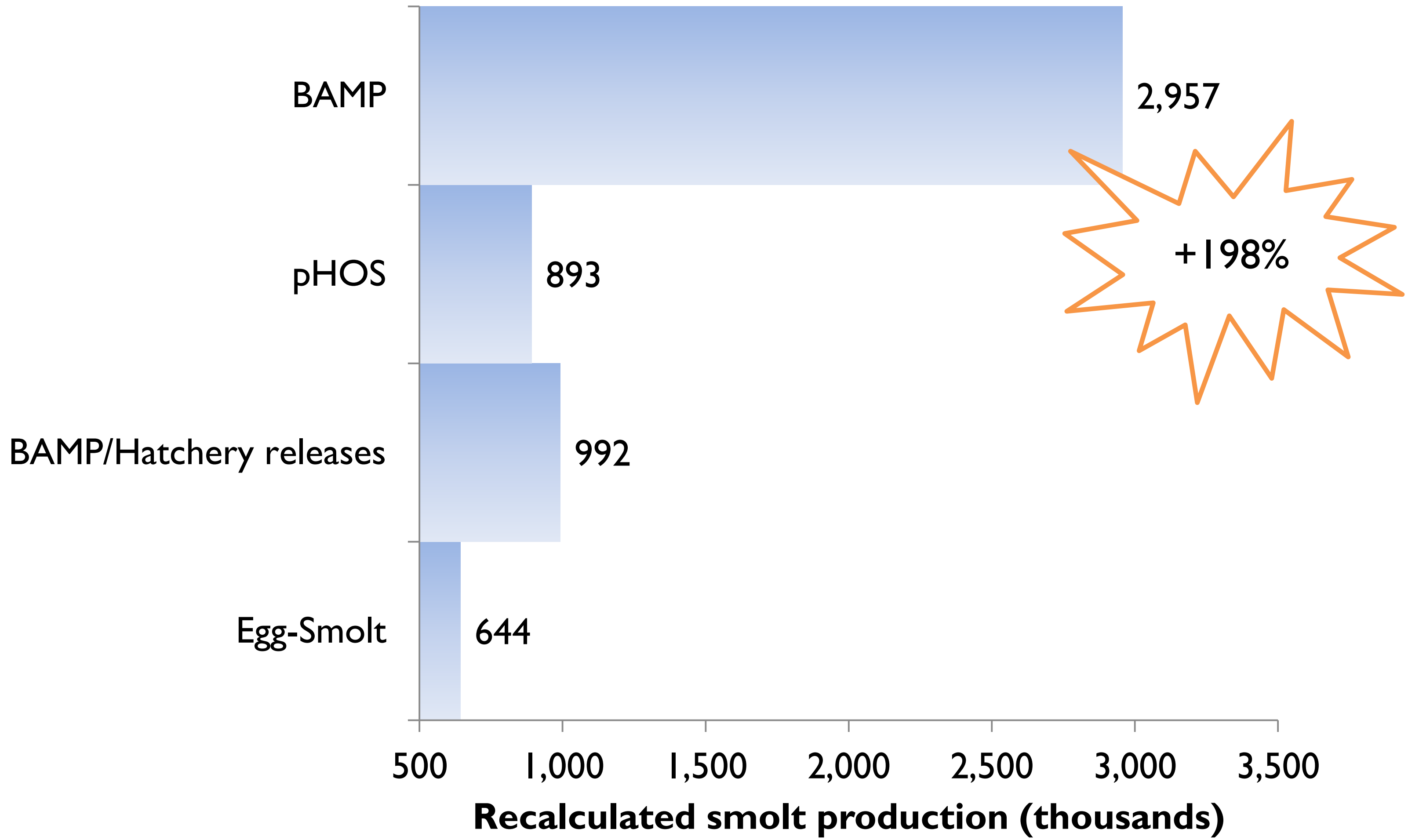
Steelhead



Based on Chelan PUD mitigation

Attachment B

Summer Chinook



Based on Chelan PUD mitigation

What exactly are the PUDs proposing?

July 20th SOA

PUD proposal

- BAMP application for wild fish:
  - <u>Identify adults owed</u>
    - $\text{Returns}_{\mathit{Observed}} \div$ Juvenile survival $= \text{Returns}_{\mathit{Expected}}$
    - $\text{Returns}_{\mathit{Expected}} - \text{Returns}_{\mathit{Observed}} =$ Adults owed
  - <u>Identify smolts required</u>
    - Adults owed ÷ Hatchery SAR = Smolts owed

PUD proposal

- Target hatchery releases represent hatchery smolts in calculations
  - Example (WNFH spring Chinook)
    - 600,000 smolts × 7% NNI = 42,000 smolts owed
- Generous approach since targets are rarely met
- Forward thinking since programs change

What about today's SOA?

- Two items to agree on:
  - 1) Determine shortage of wild adults and replace with hatchery adults via returns, SARs, and project survival (i.e., BAMP)
  - 2) Utilize known hatchery release target numbers to represent hatchery smolts in river for recalculation efforts

What today's SOA excludes

- July 20th SOA does <u>NOT</u> include:
  - Which hatcheries are subject to mitigation
  - Which hatcheries will be used for each mitigation component
  - What measures will be used during implementation

Take home message

- Wild = BAMP
- Hatchery = Hatchery
- Hatcheries to include separate from technical discussions (i.e., policy)
- Science should drive outcome, not vice-versa
- PUDs may be willing to negotiate spring Chinook production numbers

Attachment C

Chelan PUD Estimated Recalculation Comparisons

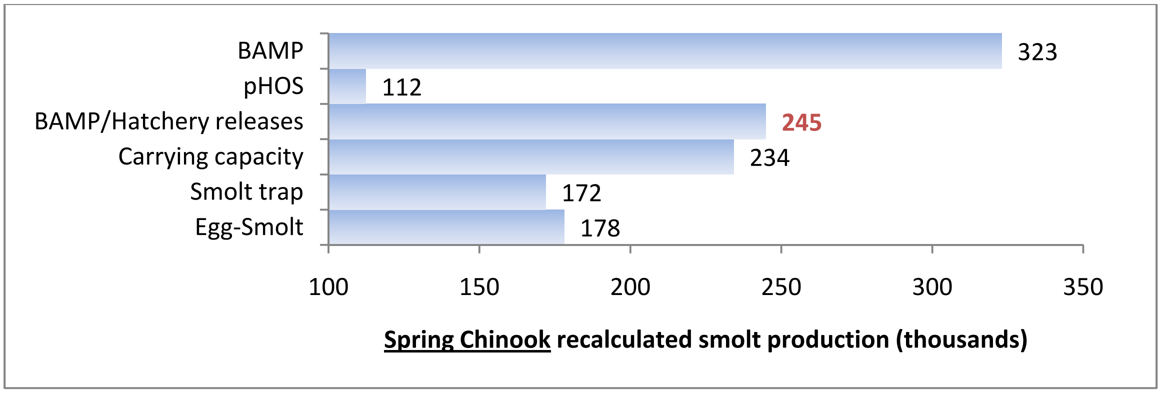


Figure 1. Chelan PUD's recalculated hatchery production for 2014-2023 spring Chinook releases, by method. Note that BAMP/Hatchery releases method are based on in-kind mitigation of LNFH releases.

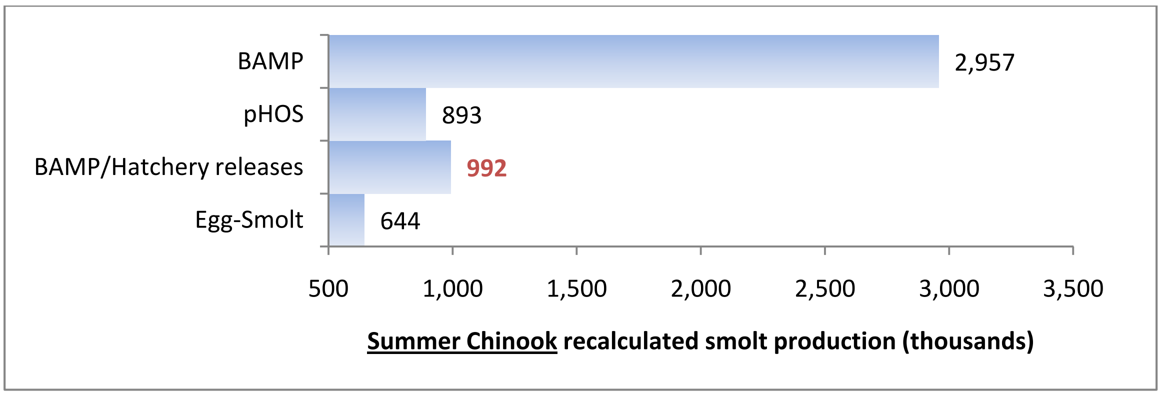


Figure 2. Chelan PUD's recalculated hatchery production for 2014-2023 summer Chinook releases, by method. Note that BAMP method uses a Carlton SAR for Rocky Reach to highlight the variation in production requirements depending on facility selection. Application of a Turtle Rock SAR at Rocky Reach would result in $1,316 \times 10^3$ total smolts for Chelan PUD.

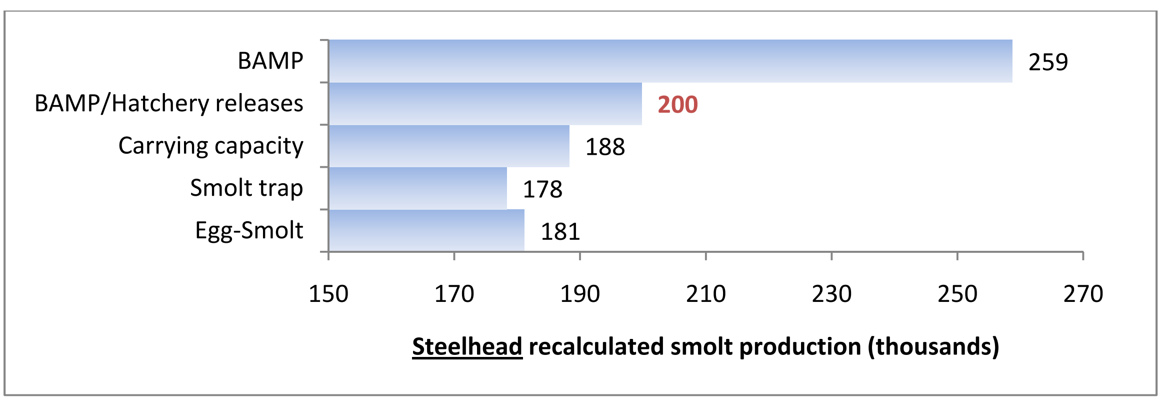


Figure 3. Chelan PUD's recalculated hatchery production for 2014-2023 steelhead releases, by method.

Notes on Mid-Columbia PUD Recalculation Data

July 11th, 2011

Unavoidable Project Mortality

1. Survival and resulting compensation levels are determined through the HCP Coordinating Committee(s) and hatchery production levels, except for inundation, are subject to adjustments upon completion of survival studies. For example, the Rock Island HCP states: "*Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs*" (pg. 22).
2. Methow-Okanogan, Entiat, and Wenatchee combined survival probabilities are based on the product of survival at each project that fish produced in these basins would experience during the downstream migration.

Adult Returns

1. **Wells**
    a. Spring Chinook counts reflect the best run estimates at Wells Dam (data provided by Charles Frady, WDFW). WDFW adjusts the returns for broodstock removal (broodstock removed at Wells Dam/Hatchery are included in the return), fallback, and double counts. Spring Chinook and summer Chinook counts were separated using video records at Wells Dam. Biologists used body morphology, color, and spotting patterns to discern spring verses summer Chinook, where spring Chinook tend to be more slender, darker in color, and have fewer spots, and summer Chinook tend to be more stout, bright, and more heavily spotted. Origin of spring Chinook (natural or hatchery) was determined through marks and tags and scale reading of fish collected for broodstock at Wells Dam, which occurs throughout the run (Charles Frady, personal communication).

    b. Steelhead counts reflect the best run estimates at Wells Dam (2010 draft Douglas M&E Report, Chapter 4, Appendix A). Total count at Wells Dam includes passage from 15 June (run year) to 14 June (spawn year) for brood years 2003 to present; total Wells Dam count for previous years includes the total reported for the run year (prior to spawn). Ladder counts are based on DCPUD raw data for brood years 2000-2010. For brood years 2007-2009, proportion of hatchery and wild fish at Wells Dam was estimated through run-at-large sampling; in previous years, proportions were calculated from broodstock trapping records. Estimated double counts and fallback were based on expanded PIT tag interrogation data. Fish origin was determined through marks and tags, and by scale reading.

    c. Summer Chinook counts are based on the fish counts at Wells Dam, with fish removed as broodstock at Wells Dam and hatchery accounted for. The total summer Chinook counts were obtained by subtracting the annual number of spring Chinook (see Spring Chinook section, above) from the total annual

Chinook count (spring and summer combined). Douglas PUD maintains adipose clipped and un-clipped Chinook data. The annual ratio of clipped to unclipped provided an estimate of hatchery versus natural origin fish. This ratio was applied to the summer Chinook returns to obtain the natural- and hatchery-origin returns.

2. **Rock Island and Rocky Reach**
   a. Clipped and unclipped adult enumeration data are only available beginning in 2002.
   b. The calendar division between spring- and summer-run Chinook salmon is June 7th at Rock Island, and June 12th at Rocky Reach. These dates are different from those used on DART and FPC, but more accurately reflect the run distribution at Rock Island and Rocky Reach. These dates are the last day of each year that adult returns will be assigned to the spring-run of Chinook for recalculation purposes.
   c. Summer Chinook counts are determined by clipped (hatchery-origin) and unclipped (natural-origin) observations. Unclipped hatchery-origin fish, including a small number of adults released as sub-yearlings from Turtle Rock Island and a potentially significant number (i.e., thousands) of adults released as sub-yearlings from Priest Rapids Hatchery, are included in the natural-origin totals.
   d. Spring Chinook and steelhead counts are determined by clipped (hatchery-origin) and unclipped (natural-origin) observations, adjusted for unclipped hatchery adults identified in stock assessment at Wells and Priest Rapids, respectively.
   e. Sockeye counts are determined by clipped (hatchery-origin) and unclipped (wild-origin) observations. The difference between enumeration totals at Rock Island and Rocky Reach are assumed to represent the Wenatchee River totals. Tumwater counts may be used in future recalculations and are more representative of spawning escapement of Wenatchee River sockeye; however, clipped and unclipped enumeration would be required at Tumwater.
3. **Priest Rapids**
   a. Spring, summer, and fall Chinook counts between 2007 and 2010 were used because 2007 was the first year that fish were characterized as clipped or unclipped. A cumulative nadir using Chinook count data (adults and jacks) between 2007-2010 was used to split run timing of Chinook salmon into spring, summer, and fall races.
   b. Steelhead counts between 2001-2010 were used at Priest Rapids Dam because estimates of origin were available during this time period. Steelhead was identified to origin based on scale patterns.
   c. Wild spring Chinook salmon were estimated as unclipped fish at Priest Rapids Dam minus unclipped hatchery fish at Wells adjusted by conversion rates between Priest Rapids Dam and Wells Dam.
   d. Summer and fall Chinook salmon adults are expressed as clipped or unclipped. There are varying degrees of unclipped hatchery fish in the unclipped fish category. As such the unclipped fish counts are overestimates of wild fish abundance.

SARs

1. **Wells**
    a. Steelhead SAR (2010 draft Douglas M&E Report, Chapter 1, Appendix B): The total number of adult hatchery fish by brood year originating from Wells Hatchery releases is calculated by applying mark rate and age data collected during run sampling or spawning of adult fish to the total passage of steelhead at Wells Dam on an annual basis as listed on the Fish Passage Center or CR DART websites. The number of juvenile steelhead released was divided by the sum of returning adult fish from that brood to derive the SAR ratio. Wild fish and known stray fish were excluded. Hatchery steelhead typically return as 1-salt or 2-salt fish, so the SAR would be calculated as:

    Juveniles released / 1-salt returns (year X) + 2-salt returns (year Y)

    Some steelhead from other programs were released upstream of Wells Dam release fish with an identical mark as Wells Hatchery fish (i.e., Winthrop NFH; ad-clip), and SAR calculations include these fish. Steelhead programs releasing fish upstream of Wells Dam with a unique hatchery mark (i.e., Colville Tribe; peduncle CWT) were excluded from SAR calculations.

    a. Spring Chinook SAR (2010 draft Douglas M&E Report, Chapter 1, Appendix B): The SAR for each brood of spring Chinook released from Methow Hatchery was calculated for each release site (typically Methow, Twisp, and Chewuch releases) using coded wire tag data available from the RMIS database (www.rmpc.org). The number of adult fish for each release site was determined by summing the number of fish in the RMIS database for each specific tagcode, then expanding that number by the tagcode-specific mark rate determined prior to release through routine QC sampling at the hatchery. Because Methow Hatchery fish are not adipose fin-clipped, they cannot be retained in selective fisheries that target adipose fin-clipped fish. However, some mortality occurs on fish released in selective fisheries, and the number of returning adults from the RMIS database was then expanded to account for fishery-related mortality using the exploitation rate of a surrogate stock (e.g., Leavenworth NFH, or Chiwawa Hatchery). For example: If 20% of the adult return an adipose fin-clipped surrogate stock of spring Chinook is harvested in selective fisheries, and the mortality rate for released fish is estimated at 10%, we would assume that 20% of the returning adult Methow Hatchery spring Chinook from the same brood year were also captured in the fishery, and we would increase the estimated adult return of MH fish by the hooking mortality rate associated with that fishery:

MH adult fish in RMIS + (MH adult fish in RMIS x surrogate stock harvest rate x hooking mortality rate.

SAR proportion was calculated as the number of juvenile fish released for that tagcode divided by the expanded adult returns. We typically included only anadromous lineage fish (i.e., exclude captive brood progeny) in these calculations so that comparisons across years are similar.

The SARs presented here are an amalgamation of the Twisp, Chewuch, and Methow release groups and associated CWT recoveries to represent an SAR for Methow Hatchery releases as a whole.

Recalculation data notes

Attachment E

Rock Island, Rocky Reach, and Wells HCP Hatchery Committees

Final Statement of Agreement (SOA)

Regarding the 2013 No Net Impact (NNI) Recalculation Methodology

Statement

The Rock Island, Rocky Reach, and Wells HCP Hatchery Committees approve the following methodology for the population dynamics "adjustment of hatchery compensation" scheduled to occur in 2013 as described by the Rock Island, Rocky Reach, and Wells HCPs.

Under this methodology, total hatchery compensation will reflect unavoidable project mortality to (1) hatchery-origin smolts and (2) natural-origin smolts where:

<u>Compensation for hatchery-origin smolts</u> will be based upon the 2014-2023 projected annual release targets for those hatchery programs agreed to by the Hatchery Committees that are subject to NNI (i.e., subject hatcheries). Compensation will be determined by multiplying the annual release targets of the subject hatcheries by the unavoidable project mortality for each hydro project.

<u>Compensation for natural-origin smolts</u> at each Project will be determined using the Biological Assessment and Management Plan (BAMP) methodology, where average returns of natural-origin adults to each project will be divided by the respective juvenile project survival rates to represent the number of adults that would have returned to each project absent unavoidable mortality. The difference between this result and the average observed returns will represent the number of adult equivalents required to meet NNI. As the final step, adult equivalents will be converted to hatchery smolt production numbers by dividing the number of adult equivalents by average hatchery-specific smolt-to-adult returns (SARs).

Background

The Rock Island, Rocky Reach, and Wells HCPs require periodic adjustment of NNI hatchery compensation rates to account for population dynamics, unavoidable project losses, and hatchery performance. Initial hatchery production levels expire in 2013, with the recalculated production levels applying to smolt release years 2014 - 2023.

This SOA covers only the overarching methodology of calculating NNI hatchery compensation levels as a necessary prerequisite to a subsequent SOA documenting the selection of data to be used for recalculation, which populations and hatchery programs are subject to NNI, and ultimately what levels of NNI hatchery compensation are required to meet NNI during smolt release years 2014 - 2023. Under the methods proposed herein, natural-origin and hatchery-origin fish contribute to the "populations" that are subject to NNI and receive hatchery compensation.

Attachment E

For hatchery-origin smolts, the population size is not derived but instead relies simply on the projected annual program hatchery release numbers for 2014-2023, for those hatchery programs subject to NNI. The use of projected hatchery release numbers as the hatchery population reflects the contemporary management/conservation objectives and production levels for the subject hatcheries.

For natural-origin fish the "population" is the average number of natural-origin adults passing the individual HCP Projects. Achieving hatchery compensation for the natural-origin population follows the BAMP:

$$\text{average adult returns}/\text{average SAR} = \text{smolts}$$

where average adult returns will be the number of additional natural-origin adult returns expected in the absence of a project, and SAR is the average SAR of the hatchery facility that will provide the mitigation.

Attachment F

Hatchery Compensation for Other Hatchery Programs

Submitted by Chelan PUD to the Rock Island and Rocky Reach Hatchery Committees

July 7, 2011

This document describes Chelan PUD's understanding of its mitigation responsibilities with respect to other hatchery programs. The purpose is to identify the specific hatchery production groups that would be subject to mitigation and therefore be included in Chelan PUD's periodic adjustment of hatchery compensation. Collectively, this information represents Chelan PUD's hatchery policy on the issue of compensating for other hatchery programs.

Chief Joseph Production

Based on previous Hatchery Committee (HC) agreements and language from the HCPs, Chelan will compensate for unavoidable project mortality losses from the new Chief Joseph Hatchery production through funding a proportion of the operations and maintenance of Chief Joseph Hatchery. For spring Chinook, the HCP HC has already approved a Statement of Agreement where Chelan would fund a 7% cost reimbursement (14% total for both Rocky Reach and Rock Island projects) for Chief Joseph Hatchery (approved December 12, 2007) to meet our hatchery compensation for Okanogan Basin spring Chinook. Section 8.4.3 (b) of the HCP explicitly identified "*operation and maintenance funding in the amount equivalent to 7% project passage loss*" as an option to meet the Chelan's hatchery compensation requirement for Okanogan Basin Spring Chinook and the HC agreed to the approach. More recently, the Wells HC approved an SOA with the same funding approach for mitigating unavoidable project losses for Chief Joseph summer and spring Chinook collectively (approved November 15, 2010). It is Chelan's understanding that our existing commitment to fund Chief Joseph spring Chinook and current negotiations for summer Chinook production will represent the entirety of our hatchery compensation related to releases from the Chief Joseph Hatchery (similar to our funding commitment for Coho with the Yakama Nation). For this reason, Chelan is not including smolt releases from Chief Joseph Hatchery in our calculations for the periodic adjustment of hatchery compensation as this would represent a "double counting" of the mitigation obligation.

Grand Coulee Mitigation Production

Chelan anticipates including hatchery releases from the federally-funded Grand Coulee mitigation programs (i.e., Leavenworth, Entiat, and Winthrop National Fish Hatcheries) in the periodic adjustment of hatchery production levels. Chelan suggests that where out-of-basin stocks are released by the Federal programs (i.e., Leavenworth Carson stock), in-kind replacement should be prioritized. That is, Carson-stock smolts should not be replaced with ESA listed stock of a local origin. For out of basin stocks that require mitigation, Chelan recommends directly funding the Federal programs at the level of unavoidable project mortality (i.e., similar to Chief Joseph) or considering the creation of a segregated release program that can utilize Carson stock. Where the Federal programs use within-basin stocks or the HC agrees to replace Carson stock with ESA listed local stocks, the relative performance of the selected hatchery (i.e., Federal SAR ÷ PUD SAR) should be used to derive the smolt release number, commensurate with estimated unavoidable project mortality (as approved by the HCP Coordinating Committee). The use of relative hatchery performance ensures that an equivalent number of adults are produced to the number lost as a result of unavoidable project mortality, consistent with objectives of the Grand Coulee mitigation programs.

NNI Production

Where NNI production replaces losses due to unavoidable project mortality, it represents the totality of Chelan's hatchery compensation and should not be counted a second time. The basic premise is that NNI compensation is provided to mitigate for losses that occurred because of the project, but the NNI mitigation itself is not part of the basis for calculating NNI (e.g., taxing a tax). As an example, if 100 fish enter the project and 7% are lost due to unavoidable project mortality, Chelan's NNI responsibility is to replace those 7 fish. Therefore, the Chelan does not believe it is responsible for mitigating for 7% of 107 fish if the 7 NNI hatchery produced fish are added above the project. This arithmetic may be different on a project-by-project basis and vary with release locations, but the central premise is that hatchery mitigation will fill the void caused by unavoidable project mortality. Chelan is working with the other PUDs to ensure that collectively we can meet the "100-in-100-out" goal for hatchery releases subject to NNI (i.e., Leavenworth, Entiat, and Winthrop National Fish hatchery releases) by calculating any shortfall that may occur by the time fish reach Priest Rapids and producing a residual number of smolts to make up the balance. For NNI production associated with natural-production, all downstream project mortality is accounted for in the hatchery SAR which is used to backfill adult equivalents. Therefore, smolts produced to replace natural-origin fish should not be counted a second time in any mitigation framework because the hatchery SAR already incorporates all downstream PUD and Federal project effects.

All Inundation Production

The RI and RR HCPs state that inundation production compensates for original inundation by the project and is not subject to recalculation: "*These amounts are not subject to recalculation, and are provided <u>in addition</u> to the levels necessary to compensate for unavoidable project mortality*" (RI HCP, pg. 47; RR HCP, pg. 49). Inundation production is explicitly not part of unavoidable project mortality and is excluded from the periodic adjustment of hatchery production (RI and RR HCPs Section 8.4.3): "*Hatchery production levels, <u>except for original inundation mitigation</u>, shall be adjusted in 2013…*" The Well's HCP provides the same language regarding inundation: "*Hatchery production commitments, <u>except for original inundation compensation</u>, shall be adjusted based upon the results of survival studies…*" (Wells HCP Section 8.4.4). Also: "*Hatchery production commitments, <u>except for original inundation mitigation</u> , shall be adjusted in 2013 and every 10 years thereafter to achieve and maintain NNI...*"(Wells HCP Section 8.4.5).

The recalculation of NNI numbers to mitigate for inundation production is tantamount to recalculating inundation production, which is counter to all of the HCPs. Inundation production was tied to specific geographic areas and mitigation for this production would presumably either (a) move to a hatchery outside of the geographic area or (b) require increasing production at the inundation facility. The first option would be inconsistent with the purpose of the inundation production, and the second option would essentially increase a number that was intended to be fixed. Recognizing that the entire hydropower system was in place prior to the selection of *fixed* inundation levels further suggests that adjustments for project mortality were not anticipated (hence the exclusion of survival-based adjustments). Based on contractual language within the HCPs, and the fact that fixed numbers were chosen after all of the downstream Columbia River projects were already in existence, Chelan PUD is not including inundation production in any calculation of NNI hatchery compensation. Chelan remains committed to producing its full inundation obligation.

Initial Production

The HCPs state that initial production represents levels "*greater than that required to compensate for 7% unavoidable project mortality*," and "*will be produced from the effective date of the agreement through 2013*" (Rock Island HCP, pg. 47). For the 2014 release year and beyond, Chelan PUD is not including initial production in any calculation of hatchery compensation.

Table 1. Summary of hatchery compensation for other hatchery programs.

Mitigation	Recalculated?	Notes
Chief Joseph Production	No	Fixed funding arrangement between PUDs and Colville
Grand Coulee Mitigation	Yes	In-kind compensation or exchange for production elsewhere
NNI Production	No*	Own mitigation not subject to mitigation. Grand Coulee NFHs releases would be maintained at 100% of release number through the PUD projects by production of a residual number fish when necessary.
All Inundation	No	Excluded by HCPs
Initial Production	No	Excluded by HCPs

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	September 21, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of August 17, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at the Chelan PUD Headquarters Building in Wenatchee, Washington, on Wednesday, August 17, 2011, from 9:30 am to 2:45 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Carmen Andonaegui will distribute the 2010 Parental-Based Tagging (PBT) Study Feasibility Report to the Hatchery Committees (Item II-A).
- Chelan PUD will provide the draft 2012 Chelan PUD Monitoring and Evaluation (M&E) Work Plan to Carmen Andonaegui by August 24, 2011, for distribution to the Hatchery Committees for a 30-day review (Item III-A).
- Chelan PUD, Washington Department of Fish and Wildlife (WDFW), and the Yakama Nation will prepare a plan for acclimation of Wenatchee steelhead production in 2012 for Hatchery Committees review and approval before the September 21, 2011, Committees meeting (Item III-B).
- Hatchery Committees' members will discuss with their respective management staff the strategy of moving forward with development of 2013 to 2023 No Net Impact (NNI) hatchery program implementation plans based on a range of recalculated NNI program sizes (Item IV-A).
- Joint Fisheries Parties (JFP) members will discuss with their respective management staff their preferences for species and release locations they would like considered during development of NNI hatchery program implementation plans (Item IV-A).
- Carmen Andonaegui will set up a conference call for Tuesday, August 30, 2011, at 1 pm, to seek concurrence for moving forward with development of NNI hatchery program implementation plans (Item IV-A).
- Carmen Andonaegui will include a summary of the discussion on NNI Recalculation

from today's meeting, for distribution by email prior to the August 30, 2011, conference call with today's Action Items (Item IV-A).

- Joe Miller will prepare a brief summary describing the three recalculation options presented in the sensitivity analysis presented at today's meeting, along with one or more example calculations (Item IV-A).
- Cory Kamphaus will email Carmen Andonaegui a copy of the 2011 results of the Expanded Multi-species Acclimation Program for distribution to the Hatchery Committees (Item V-A).
- Greg Mackey will email Carmen Andonaegui Charlie Snow's report on comingling of steelhead and spring Chinook in 2011 at the Twisp Pond for distribution to the Hatchery Committees (Item V-B).
- Cory Kamphaus will revise the 2012 Multi-species Acclimation Program proposal and provide the revised proposal to Carmen Andonaegui for distribution to the Hatchery Committees (Item V-B).
- Joe Miller will forward to Carmen Andonaegui Craig Busack's email on items the National Marine Fisheries Service (NMFS) is requesting from Tumwater Dam (TWD) permit holders for inclusion in the TWD Addendum to draft Hatchery Genetic Management Plans (HGMPs) for Wenatchee basin hatchery program (Item VI-B).
- Craig Busack will email a notification the PUDs and WDFW as to whether an addendum will be needed for the TWD HGMP. Carmen Andonaegui will distribute the email to the Hatchery Committees (Item VI-B).

STATEMENT OF AGREEMENT DECISION SUMMARY

- There were no Statements of Agreement (SOAs) up for approval at today's meeting.

AGREEMENTS

- The Hatchery Committees agreed to the collection of four additional adult Chiwawa spring Chinook broodstock in 2011 for use in Year 3 of the egg-to-fry survival study (Item II-C).
- The Hatchery Committees approved as final the Hatchery NNI Recalculation database (Item IV-A).
- The Hatchery Committees approved the Yakama Nation's 2012 Expanded Multi-species Acclimation Program Study Pan (Item V-B).

REVIEW ITEMS

- The Douglas PUD Draft 2010 M&E of Wells and Methow Hatchery Programs in 2010 report is out for 60-day review. Comments are due to Greg Mackey by September 12, 2011.
- Comments on Chelan PUD's draft 2010 Rocky Reach and Rock Island Annual M&E report are due September 2, 2011, to Josh Murauskas.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. The following adjustments were made to the agenda:

- Keely Murdoch asked to have the Yakama Nation's presentation of the 2011 Expanded Multi-species Acclimation Program scheduled for 1:00 pm.
- Joe Miller asked to have the discussion of recalculation held late in the morning session of the meeting.

The July 20, 2011, Hatchery Committees draft meeting minutes were reviewed. They were approved subject to Tom Scribner reviewing and clarifying statements he made during the meeting, as indicated in the draft July 20, 2011. Carmen Andonaegui will finalize the minutes and distribute them to the Committees after contacting Scribner.

II. WDFW

A. Hatchery Production Management Plan for Approval (Mike Tonseth)

Mike Tonseth said WDFW was delaying the request for approval of the draft Hatchery Production Management Plan. He said incorporating the proposed Yakama Nation edits regarding resource management authority will require additional WDFW review. He said editorial comments from Tom Kahler had been incorporated.

B. 2011 Wenatchee spring Chinook PBT Activities (Mike Tonseth)

Mike Tonseth said this year's PBT testing was completed in June, with only 86 adipose fin-present (ad-present) Chinook sampled for DNA, scale collection, and passive integrated transponder tagging (PIT-tagging). Additional scales were taken to send to the Pacific Northwest Laboratory (PNL) for analysis to help determine the adult's tributary-of-origin, along with the results from DNA analysis. He said that the delayed run-timing for spring Chinook this year may have reduced collection efficiency, even though they pushed adult collection activities back two weeks. Tonseth said WDFW is discussing whether to propose conducting a third year of sampling to gather more data; however, they are concerned that a third year will not provide the additional information needed to help understand the discrepancies between the DNA results and adult returns to TWD. He said that once this year's data are all in and the analysis is complete, they will review their options for identifying broodstock, holding the option open for conducting a third year of the PBT study.

Tonseth said that in 2010, based on analysis of the DNA samples and then comparing them to adults returning to TWD, the population assignment probabilities were very low, creating a lot of uncertainty in the ability to identify tributary-of-origin for upper Wenatchee subbasin spring Chinook in Year 1 of the PBT study. Tonseth said that the Year 2 data (2011) are still being analyzed. DNA samples are at the WDFW lab and additional scale samples are at PNL for isotope analysis but have not yet been processed. Based on current data, Tonseth estimated that only about 10 percent of the adults sampled at the Priest Rapids Off-ladder Adult Fish Trap (OLAFT) may be identifiable to a tributary.

Kirk Truscott said that he has two concerns with the PBT study: the difficulty with assignment probability, and the fact that fish did not want to ascend the denil at the OLAFT. He asked about the possibility of using only the picket weir at the Priest Rapids fish ladder next year to try and determine whether this year's difficulties at the denil were an anomaly. Todd Pearsons said that the denil is constructed and operated to within specifications and if there is a problem with fish use of the denil, the specifications need to be reviewed. Keely Murdoch asked if WDFW plans to provide a report on the results of this year's PBT study activities for use in deciding whether or not to conduct a third year of study. Tonseth said the preliminary recommendation is to not conduct a third year of study. He said that ten scales per fish were collected at the OLAFT this year, to be used for differentiating between spring versus summer Chinook and hatchery versus wild Chinook. Tonseth said that in 2010, a number of Chinook sampled at the OLAFT returned to the Winthrop National Fish Hatchery (NFH) outfall. These returning fish were ad-present and untagged, but since scales were not pulled from last year's sampled fish, it was not possible to validate from whether the fish were of hatchery or wild origin. He said that he will check with Andrew Murdoch as to when a report on 2011 PBT study results might be available, but that he thinks it will likely be November 2011, which was when the 2010 report was completed. Tonseth said that he will ask if a WDFW colleague would be available to present to the Committees the results of the last two years of PBT study results.

Truscott said that natural-origin and hatchery-origin spring Chinook have been tagged in the Wenatchee subbasin for years. He suggested querying the PIT-tag Information System (PTAGIS) database and looking at how many adult spring Chinook are detected returning to the Wenatchee subbasin versus the Methow subbasin. He said that this comparison could help with understanding how much spring Chinook are straying overall and whether it was unusual that the fish determined at Priest Rapids Dam to be Wenatchee spring Chinook then returned to the Winthrop NFH. Tonseth agreed that the low assignment probabilities could be a function of straying. The Committees discussed what the objectives of the PBT were and whether the parental-based assignments were suppose to be to the population, even if the analysis of the results are being used to identify parentage. Greg Mackey said that an analysis of allele frequency can be done to identify what population the fish belongs to and that parentage can be identified to determine tributary-of-origin. Committees' members will review the 2010 PBT Feasibility Report. Carmen Andonaegui will resend the 2010 report to the Hatchery Committees by email.

C. Request for Additional Hatchery Spring Chinook Adults for Continuation of the Egg-to-Fry Survival Study (Mike Tonseth)

Mike Tonseth said WDFW is requesting the collection of four additional adult Chiwawa hatchery spring Chinook, two males and two females, for Year 3 of the Wenatchee spring Chinook egg-to-fry survival study in the Chiwawa River (Attachment B). Joe Miller said that Chelan PUD supports collection of the fish and continuation of the study. Tonseth said the results for 2009 and 2010 are in the study proposal, which Carmen Andonaegui distributed on August 15, 2011, to the Committees. Keely Murdoch asked whether the 2009 and 2010 study conditions differed from what was being proposed for 2011. Tonseth said the number of egg boxes used will be increased in 2011. Murdoch asked whether the egg boxes simulate natural conditions experienced by eggs in gravels—for example, does sediment flow freely into and through the egg boxes? Tonseth said that the egg boxes were originally designed to allow fry to escape; however, for this study, the egg boxes were modified to allow water flow to move sediments freely through the boxes, but not to allow for the release of fry. He said that all fry utilized in the study will be euthanized after they are pulled out of gravel as sack fry.

The request for additional spring Chinook broodstock was approved by all Committees' members.

III. Chelan PUD

A. Draft 2012 Chelan PUD M&E Work Plan (Joe Miller)

Joe Miller said the draft 2012 Chelan PUD M&E Work Plan will be available for review by the Hatchery Committees on approximately August 24, 2011. Miller said the 2011 Work Plan is the same as last year's Work Plan, with the exception of changes in planned activities for 2012 to reflect approved actions by the Committees. Mike Schiewe said that such documents are subject to a 60-day review according to Committees protocols, and asked if Miller and Committees' members needed the full 60 days to review, or whether a shorter review period of 30 days would be acceptable. The Commmittees agreed to a 30-day review period.

Tonseth said that this year was the last scheduled year for the PBT study and asked if a continuation of the study for 2012 would still be included in the Work Plan if a decision to continue the study was not final within the 30-day review period. Miller said that if there was a strong interest in continuing the study, a placeholder could be inserted into the Plan, but that he would like to see a decision point for the study and have the Committees agree to define success criteria.

Chelan PUD will provide the draft 2012 Chelan PUD M&E Work Plan to Carmen Andonaegui by August 24, 2011, for distribution to the Hatchery Committees for a 30-day review.

B. 2012 Steelhead Stocking/Blackbird Pond (Josh Murauskas)

Joe Miller reminded the Hatchery Committees that Chelan PUD's Wenatchee steelhead production obligation had been reduced from the original 400,000 to 247,000 smolts. He said that there is a need for direction from the Comittees as to where to acclimate and release the hatchery production and in what proportions. Miller said that he has been talking with Mike Tonseth about an acclimation and release plan, and will continue working with the fisheries managers to come up with a recommendation for Committees' review. The Committees discussed the current acclimation locations at Blackbird Pond, the Chiwawa Acclimation Facilities, and at various multi-species acclimation ponds run by the Yakama Nation. The Committees also discussed how transitioning to all wild by wild (WxW) hatchery crosses, and resulting progeny would affect acclimation options. Schiewe suggested that Chelan PUD and WDFW include the Yakama Nation in their initial discussions.

Chelan PUD, WDFW, and the Yakama Nation will prepare a Wenatchee steelhead acclimation proposal for Hatchery Committees review and approval before the September 21, 2011 Committees meeting. The proposal will be for 1-year only, so they can adapt as they change, based on on-going study results.

IV. Chelan PUD/Douglas PUD

A. Recalculation Discussion (Josh Murauskas/Joe Miller/Tom Kahler/Greg Mackey)

Mike Schiewe said a goal for today's meeting was to finalize the updated version of the recalculation database and review the PUD sensitivity analysis of how including or excluding selected hatchery programs affected the NNI program sizes. Joe Miller said he emailed the sensitivity analysis to Committees' members last night (Attachment C). Miller said Josh Murauskas was prepared to present a Power Point presentation (Attachment D) on the sensitivity analysis today.

Murauskas noted that the 2013 NNI Recalculation Methodology SOA approved by the Committees July 20, 2011, included agreement that compensation for natural-origin smolts would be determined using the Biological Assessment and Management Plan (BAMP) methodology and that compensation for hatchery-origin smolts would be based on release targets for hatchery programs. He said that the SOA did not address which hatchery programs would be subject to recalculation. Murauskas said the sensitivity analysis presented by Chelan and Douglas PUDs is intended to address the Committees' request for an analysis of the effect on mitigation production levels by including or excluding various hatchery programs. He said that he considered five components of compensation in the sensitivity analysis: natural-origin smolts; hatchery smolts; mitigation for NNI programs; mitigation for upstream inundation programs; and adult equivalents for losses to hatchery programs. Murauskas then gave examples of recalculated smolt production levels based on including or excluding the five components in the sensitivity analysis. He said that for smolts that had to pass multiple projects, the losses across all PUD projects were additive when used to calculate mitigation for NNI production.

Miller reviewed the sensitivity analysis with the Committees, focusing on the level of compensation that would be required under each of the recalculation scenarios by PUD and by species (Table 1). Table 2 displays three Options for production levels presented by PUD and by species, depending on which components for compensation were included or excluded from the recalculation. Miller explained how their sensitivity analysis includes those hatchery compensation components the PUDs thought were appropriate for use in recalculation, recognizing that some assumptions they used in the recalculation may need to be adjusted; for example, using the 60/40 split between Dryden and Similkameen, respectively.

Miller said that the Background Definitions and Assumptions section of the handout defines the different variables that are used in the calculations. Miller noted that the primary differences between the Options were components that were included and excluded. He asked Committees' members to take time to familiarize themselves with the calculations and the Options presented today. Miller noted that the Options in Table 2 presents the full range of hatchery production outcomes for recalculation. He noted that Option 3 includes migitigation for inundation fish and does not include an adjustment for smolt-to-adult returns (SARs), and as such, represented the maximum production levels.

Schiewe suggested to the Committees that one path forward might be to not take the recalculation phase further than the Table 2 ranges, and begin discussions on implementation. He reminded the Committees that NMFS input regarding the appropriateness of production levels under the Endangered Species Act (ESA) would be critical, especially if species adjustments based on what agencies want for production targets and release locations are considered.

Keely Murdoch said that she needs to understand which option most closely represents NNI, saying she does not want implementation discussions to confuse the selection of which recalculation option is most appropriate. Murdoch said that she would like the Committees to agree on which option to use prior to beginning discussions on implementation. Todd Pearson asked whether the Committees could agree on a range of mitigation production without having to first come to agreement as to whether to include inundation mitigation, for example, he asked whether the Committees can then work through the issues related to implementing production ,working with a range of possible production. Keely reiterated that implementation should not not be finalized until the Committees reached consensus on the outstanding issues. Schiewe asked if Committees' members thought they could, for example, agree on whether it was appropriate to include mitigation for inundation in recalculation. Further, he asked whether they thought evaluating the question for dispute resolution would resolve the question. Most members agreed that consensus was unlikely, and that elevating the question for dispute resolution would only delay the development of an implementation plan.

Greg Mackey said that, for implementation planning, it would be helpful if fisheries managers would identify their priorities for hatchery program production. He said that Douglas PUD was considering developing an implementation proposal considering the Yakama Nation's input at the July 20, 2011 Hatchery Committees meeting, acknowledging the Yakama Nation's desire to prioritize spring Chinook production. However, he stated that it was uncertain whether the prioritization of spring Chinook for hatchery production was universal among fisheries managers. Mackey said that there are some possible constraints on hatchery production to consider, for example, Grant PUD's Biological Opinion places limits on upper levels of production, or perhaps some species production trades would not be approved under the ESA. He said that Douglas PUD was considering producing a list of possible species production trades for Craig Busack to review for their appropriateness under the ESA.

Mike Tonseth summarized the progress on recalculation by the Committees, saying that last month's approval by the Committees of the NNI recalculation methodology SOA provided agreement on a general approach to recalculation. Further, he said that agreement today on the database and a range of recalculation outcomes based on the inclusion or exclusion of specific programs would be a reasonable starting point for developing an implementation plan. He asked if any Committees' member felt that their respective agency or tribal position was not represented in the sensitivity options and resulting range of production included in the sensitivity analysis. Tonseth said that if all Committees' members agree that their positions are represented in the Options, then the range of production is appropriate. He said that a single production level will be achieved through implementation. Committee members generally concurred with this summary.

Miller suggested that each Committees' member discuss with their management staff the Committees' preference to begin discussions on implementation using the range of production illustrated by the Options included in the sensitivity analysis, rather than go to dispute resolution over the unresolved issues related to recalculation. Fisheries management agency representatives will also discuss internally with their management staff which salmon and steelhead populations are important to their interests and provide the PUDs with some options. Carmen Andonaegui will schedule a Committees' conference call for Tuesday, August 30, 2011, from 1:00 to 3:00 pm, for seeking concurrence on proceeding to discussions on implementation of NNI recalculated hatchery production. Murdoch will find out whether Tom Scribner or Steve Parker are available for the conference call. Andonaegui will include a summary of today's discussion of recalculation in the meeting's Action Items and distribute it to the Committees prior to the conference call. Busack requested from the PUDs additional narrative detail on the sensitivity analysis Options. Miller said he will provide a brief narrative summary of what each Option represents, with mathematical examples.

Schiewe said the Committees also need to provide their concurrence on whether the July 28, 2011, version of the database is complete for use in recalculation. Kirk Truscott asked why adult returns in the database for Rock Island include brood data starting in 2002 and going through 2010, while Grant PUD's adult brood data starts with 2006. Murauskas said that Chelan PUD started differentiating between clipped and unclipped adult returns in 2002; Grant PUD started separating adult return counts into clipped and unclipped in 2006. He said that the goal is to use a 10-year average but datasets shorter than 10-years will be used when necessary; however, calculated average adult returns starting with 2006 results in a larger number than if averages had been calculated using earlier return years. If there is error in using a shorter dataset, Murauskas said that it is on the side of being more generous. He said that adult Chinook counts at Rock Island, Rocky Reach, and Wells dams combine summer and fall Chinook returns; Priest Rapids and Wanapum dams separate spring, summer, and fall Chinook runs, based on the nadir of the combined run. Murauskas said that unclipped fall Chinook counts obtained from Rock Island Dam adult counts were provided to Grant PUD for their estimation of natural-origin fall-run Chinook. The Hatchery Committees approved as final the Hatchery NNI Recalculation database

Andonaegui will distribute by email a summary of the discussion on NNI Recalculation from today's meeting, prior to the August 30, 2011, conference call.

SUMMARY OF RECALCULATION DISCUSSION

The 2013 NNI Recalculation Methodology SOA approved by the Committees on July 20, 2011, defines the method that will be used for calculating 2013 to 2023 hatchery compensation levels required to achieve NNI. The recalculation database that has been developed by the PUDs, reviewed and revised by the Hatchery Committees over the past several months, and accepted as final at the August 17, 2011, meeting are the numeric inputs for the recalculation. However, using the method and the database still requires identifying which of the current mid- and upper-Columbia hatchery programs should be subject to NNI recalculation; and to date, there has been no consensus regarding which program should be included or excluded.

Toward resolving this disagreement, the PUDs developed a sensitivity analysis spanning the full range of potential program sizes based on inclusion or exclusion of the current hatchery programs that were subject to disagreement; and presented this analysis at the August 17, 2011 Hatchery Committees' meeting. The Sensitivity Analysis, which was distributed by email August 16, 2011, defines a range of program sizes for each of the plan species, for each PUD, under three scenarios ranging from the least to most inclusive.

After considerable discussion and acknowledgement by the Hatchery Committees that: 1) the recalculation estimates are not necessarily the final sizes of programs but rather, the starting point for implementation discussions; 2) the differences between the upper and lower estimates are in many cases the basis for flexibility and management discretion in developing the implementation plan, and 3) resolving the different perspectives on which programs to include or exclude may not be possible or necessary, it was proposed that the Committees accept the ranges of programs' sizes as the starting point for development of the 2013 to 2023 NNI hatchery implementation programs. It was agreed that members would discuss this proposal with their respective management staff and further consider this proposal during the conference call on August 30, 2011, identified in the Action Items.

V. Yakama Nation

A. Results of the 2011 Expanded Multi-species Acclimation Program (Cory Kamphaus)

Cory Kamphaus provided a handout summarizing results of the 2011 Draft Expanded Multi-species Acclimation Program (Attachment E). He will email Carmen Andonaegui the handout for distribution to the Hatchery Committees. Kamphaus said that the same monitoring and evaluation performance objectives used in 2010 were used again in 2011. The performance indicators were: in-pond growth, in-pond survival, survival to McNary Dam, SARs, and spawner distribution. He reviewed the 2011 results, highlighting areas for improving the study design and areas where factors beyond the Yakama Nation control affected study results. For example, Kamphaus discussed the difficulties encountered at Rohlfing Pond with tag collision caused by the narrow pond outlet, and the limited placement of PIT-tag detection arrays. There were also disease problems encountered in juveniles in some acclimation ponds, affecting survival results, and the late onset of spring flows likely contributed to lower survivals for juveniles released based on normal-year spring flow onset dates.

Kamphaus said that the multi-species acclimation concept appears to be a good approach to acclimation but that there are still some logistical issues associated with tagging and release to work through within the multi-species acclimation program.

B. Proposal for the 2012 Expanded Multi-species Acclimation Program (Keely Murdoch/Cory Kamphaus)

Cory Kamphaus said that the 2012 Expanded Multi-species Acclimation Program proposal was distributed to the Hatchery Committees prior to last month's meeting (Attachment F). He said that the proposed 2012 study is similar to the 2011 study. The same pond loading of numbers of juvenile salmonids will be used, but the Yakama Nation would like to add two acclimation sites in the upper Methow River in 2012: Heath Pond and Goat Wall. The objective of using these new pond locations is to extend spring Chinook spawning distribution into the upper Methow River.

Table 1 in the proposal showed the proposed numbers of juveniles for acclimation and the number of juveniles to be PIT-tagged, by species and by location. The Committees discussed how the number of PIT-tag juveniles may change, depending on the ability to separate and hold the fish prior to transfer. A discussion is planned next week to look more closely at the options for PIT-tagging juveniles for the multi-species acclimation program. Kamphaus asked that the number of steelhead for PIT-tagging that go into Rohlfing Pond be decreased, if possible, to help address the tag collision problems at that site.

Kamphaus asked about any concerns with placing steelhead into acclimation sites in upper Methow River sites. He said that he understood that there may be a concern regarding complicating the on-going study on Winthrop NFH steehead. Greg Mackey said that 2012 would be the last year Douglas PUD's steelhead production would be available for stocking into the upper Methow River. He said that starting in 2013, this production would go to Methow Hatchery as safety net fish, according to the Wells Steelhead HGMP. Mackey said that according to WDFW staff, there is no room at the Wells Hatchery to tag and hold separate groups of fish due to the increase in separately held and marked groups of steelhead. Keely Murdoch said that it would be important to PIT tag any juveniles for placement into upper Methow so that survival could be estimated. Mike Tonseth said the only option would be to tag juveniles as they were loaded into distribution trucks, since there was no capacity to hold these fish separately. Kamphaus said that would be too much stress on the fish and be too difficult to transport. Tonseth recommended a meeting with Charlie Snow, Jayson Walls, and Mackey to look into flexibility for PIT-tagging steelhead for the multi-species acclimation program.

Kamphaus said he was asking for support for the 2012 proposal with Heath Pond steelhead excluded. He noted that there is a communication plan attached to the proposal covering distribution of information in the event of an unplanned release of fish from any multi-species acclimation site. Joe Miller said 20,000 juvenile steelhead is a significant portion of Chelan PUD's adjusted 247,000 juvenile production. Miller said he supports the proposal for 2012, but that there is a need to develop a long-term Wenatchee Basin steelhead acclimation strategy. Miller said he wants to continue with annual approval for continuation of the multi-species acclimation program, and that annual survival estimates for each site should be a criterion for continued use. Kirk Truscott approved the proposal, but said that he supports multi-species comingling in the ponds rather than segregated acclimation using some type of barrier. Kamphaus said that comingling or segregating is a function of whether the species can be held to a comparable size to reduce the potential of predation by one species on another while in the pond. Tonseth said the steelhead and spring Chinook comingled this past spring (2011) in the Twisp Pond (located at the Twisp weir) were of different sizes and no notable negative interaction was observed. Mackey agreed to send the brief report prepared by Snow on the Twisp Pond comingled acclimation of spring Chinook and steelhead to Carmen Andonaegui for distribution to the Committees. Tonseth approved the 2012 proposal, saying he thinks that over the long term, multi-species acclimation will be successful, but that more extensive analysis of the program is needed. He said that if the multispecies acclimation program is continued, there needs to be a more rigorous analysis of what release sizes and locations are most appropriate. For the report on the results of the 2012 study year, Tonseth said he would like to see the biological parameters for each acclimation site (i.e., flow, temperature, density); a summary of disease monitoring and reporting, given that the juveniles are PUD mitigation program fish and therefore, any differences in survivals will need to be explained; and monthly reporting on mortality, growth sampling, estimates of predation, fish health, and release time start/stop times. Tonseth said that these data need to be reported to the M&E evaluation groups for inclusion in the Chelan PUD and Douglas PUD monthly production reports. The Committees discussed the reporting procedures the PUD M&E evaluation groups are required to follow in case of a disease outbreak at a PUD hatchery. Mackey said that he will need to know how many juvenile steelhead are being requested for the muli-species acclimation program, if they are needed, and said that there are mitigation credit concerns and ESA take concerns associated with using these steelhead. Mackey asked for background information on how long each acclimation ponds has been in use, and any known problems that have been encountered. Kamphaus said that some of this information is in the original multi-species program proposal, but that he will add biological parameters and reporting details missing from the program proposal and provide a revised proposal to the Committee at some time in the future.

The Committees approved the 2012 Expanded Multi-species Acclimation Program with recommended revisions as discussed at today's meeting.

VI. NMFS

A. HGMP Update (Craig Busack)

Craig Busack reported that NMFS staff have been working on the Wenatchee hatchery program HGMPs. He said that staff were working on the effects analyses, focusing on the Leavenworth NFH program and coho programs, and are now moving on to the Chiwawa program. Busack said that bundling the HGMPs for processing was being reconsidered by NMFS.

B. Tumwater Passage Report and HGMP Addendum (Craig Busack)

Craig Busack said that after the July Hatchery Committees meeting, he sent an email to the permittees specifying that NMFS wanted an HGMP addendum on TWD operations meeting. However, because adult passage delay issues at TWD appear to have been successfully addressed by the new operating protocols, NMFS no longer will require the addendum. Josh Murauskas said that with modified TWD operations, few sockeye have been blocked and median delay for all species is on the order of only a few minutes. He said that he will provide a report summarize passage timing at TWD following the end of the 2011 fish trap operation season.

Busack said that it is not unusual during ESA consultations to ask an applicant for more information. He said that if additional information is received after a HGMP has been put out for public comment, the additional information becomes part of the public record. Busack said that the adult management plan will still be put out for public comment.

Busack asked whether broodstock collection for the PBT study raises any concerns with passage at TWD. Todd Peasons said that the issue with collection of spring Chinook broodstock at TWD will be whether enough White River spring Chinook can be collected to meet broodstock needs. Keely Murdoch said after looking at the 2011 TWD operations results, the same approach as used in 2011 could be used during the spring Chinook broodstock collection, watching for delays and stopping collection activities if delays hit a pre-established trigger. Mike Schiewe summarized for Busack the earlier discussion on the PBT study, and the possibility of not continuing a third year of study, given the lack of assignment of probabilities from the OLAFT to TWD. Tonseth said that the number of spring Chinook adults sampled at the OLAFT and correctly assigned to the Wentchee subbasin was 48 percent; the number correctly assigned to tributary was 10 percent. Busack said that he will look into PBT studies being conducted elsewhere, where they are getting 100 percent assignment, and report back to the Committees.

VII. HETT Update

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on August 9, 2011, and completed the following activities:

Non-Target Taxa of Concern (NTTOC) Analysis

Within the next few weeks, the HETT expects to be able to begin model runs for the Risk Assessment for all species except summer Chinook. They are revising some of the temperature-related calculations based on discussions at the last meeting. Josh Murauskas is working to get summer Chinook data on Wenatchee stream lengths for spawning distribution so the summer Chinook model runs can begin.

Control Group Analysis

Tracy Hillman received comments from three reviewers on the draft reference stream methods paper he distributed for review – John Clark with Alaska Department of Fish and Game, and David Bernard, an independent consultant. The comments were easily addressed. Todd Pearson also provided comments, which were discussed by the HETT. Hillman will revise and finalize the paper for inclusion as an appendix to the 5-Year M&E reports for Douglas and Chelan PUDs.

The next HETT meeting is scheduled for September 13, 2011. Hillman and Andrew Murdoch both reported that the 5-year M&E reports are on schedule.

Mike Schiewe asked when the draft M&E report will be made available to the Hatchery Committees. Miller said that Chelan PUD is reviewing the draft chapter of the M&E report on spring Chinook and are targeting a September 2011 delivery date of a draft to the Committees. Greg Mackey said that he is reviewing the Twisp subasin section of the Douglas draft M&E report and also expected to have the draft M&E report to the Committees in September. Schiewe said that he thinks a discussion at an upcoming Committes' meeting about the 5-Year M&E plan findings and how to move forward would be a good future agenda item.

VIII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are September 21, 2011 (Douglas PUD), October 19, 2011 (Chelan PUD), and November 16, 2011 (Douglas PUD).

Mike Schiewe said Chelan PUD is attempting to schedule a Director's Level meeting in October or November 2011 and is trying to identify possible dates. He said that although the Directors were the target audience, HCP Committees' members were welcome. Schiewe said that it would be mostly a Chelan PUD presentation about accomplishments leading up to the 2013 check in, including phase designations and NNI recalculation, with Douglas PUD likely participating at a lesser level. Four possible meeting dates have been identified: October 19, 2011; October 28, 2011; November 1, 2011; or November 15, 2011. The meeting will be held in Lacey, Washington, in the afternoon for approximately 2 hours. Schiewe said that November 15, 2011, is a Coordinating Committees' meeting date and that meeting date would be convenient for the Coordinating Committees' staff who might be involved in the meeting. He asked if Hatchery Committees members were willing to change the October 19, 2011, Hatchery Committees' meeting date to accommodate the Director's Level meeting. No one wanted to make that change. Schiewe said that he will provide that feedback to Chelan PUD, letting them know that the Hatchery Committees thought November 15, 2011, would be a good date.

List of Attachments

Attachment A – List of Attendees
Attachment B – Wenatchee Spring Chinook Egg-to-Fry Survival Study proposal
Attachment C – Recalculation Sensitivity Analysis Handout
Attachment D – Recalculation Sensitivity Analysis Presentation
Attachment E – Draft 2011 Expanded Multi-species Acclimation Program results
Attachment F – 2012 Expanded Multi-species Acclimation Program proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation
Cory Kamphaus	Yakama Nation
Jim Craig*	USFWS
Craig Busack*†	NMFS

Notes:

* Denotes Hatchery Committees member or alternate

†Joined by phone

Attachment B

Wenatchee Spring Chinook Salmon Egg-To-Fry Survival Study Proposal

Submitted to

Rock Island Habitat Conservation Plan
Hatchery Committee

by

Andrew Murdoch
Travis Maitland
Chris Johnson
Anthony Fritts

Washington Department of Fish and Wildlife
Hatchery-Wild Interaction Unit
Science Division, Fish Program
Wenatchee, WA

July 2011

Attachment B

Short Description of Proposal: Rigorous estimates of egg-to-fry survival across a range of habitat conditions are needed to populate life cycle models to predict the effects of improvements in freshwater habitat on salmon productivity and recovery. In the second year of the study WDFW and NOAA seek to obtain gametes from returning hatchery spring Chinook adults at Eastbank FH to place in egg boxes in two reaches in the Chiwawa River during the fall of 2011. It is intended that this study could be expanded to include additional reaches within those two tributaries or other tributaries in the Wenatchee River Basin or upper Columbia Basin (e.g., Methow spring Chinook, Wenatchee summer Chinook). The fourth year of a similar study is ongoing in the Yakima River.

Additional Detail: Funding is available through NOAA and the FCRPS BiOp to generate estimates of egg-to-fry survival, one of the major factors thought to limit freshwater production and recovery of spring Chinook salmon populations, across a range of habitat conditions. Other work on egg to fry survival has generally been focused on a low number of redds, only one or two areas/habitat types within a watershed, and/or used other methods such as egg plates which are known to maximize survival to hatching. The Whitlock-Vibert boxes that we propose to use allow movement of sediment into and out of the box and have been used in sedimentation studies. They have been shown to be a fair representation of the conditions in the redd so we believe that any habitat differences such as sedimentation and intra-gravel flow will result in an observable difference in survival that can be related to habitat.

The eggs we propose to use are from returning marked hatchery origin adults that are taken back to Eastbank Fish Hatchery as part of the Chelan County PUD spring Chinook mitigation in the Chiwawa River basin. Single matings (one female and one male) are fertilized and incubated in individual Heath incubation trays through hatching. This will provide an opportunity for controls and to monitor for variation in fertility of individual fish, as the same parental crosses will be utilized in the artificial redds. In addition, because gametes to be placed in the river sites are held for 24 hrs (due to logistics of collecting gametes and getting them placed in the artificial redds within daylight hours), we propose evaluating potential differences in fertilization rates for day of spawn and the 24 hr hold groups.

Just as the case was in 2010, three reaches are proposed in the Chiwawa River (within areas of known spawning). These reaches were chosen because the spring Chinook reproductive success study has determined that spawning success in upper and lower reaches of these rivers is different. This study may provide insight as to the cause of those differences, if the differences are habitat related. Three sites in each reach were be selected that are known spawning areas. Six artificial redds will be constructed in each site, each containing one egg pocket with 100 fertilized eggs, for a total of 5,400 eggs. Additional redds to check development rate may be constructed if time allows. Therefore, we request up to 6,500 hatchery origin eggs if available. Consultation with others such as the redd survey crew must be made to ensure this work does not affect other ongoing projects. See attached draft of the proposed methods for more details regarding the experimental design.

Proposed Action: Use up to 6,500 hatchery origin eggs from 2011 Chiwawa spring Chinook broodstock to perform egg-to-fry survival study.

Long-term Study Objectives:

1) Measure egg to fry (hatch) survival under a range of habitat conditions.
2) Compare egg to fry survival of hatchery and wild fish.
3) Develop efficient techniques for measuring egg to fry survival.
4) Understand mechanisms at site/redd that are influencing differences in survival among redds, sites, and reaches.

2011 Objectives

1) Continue the development of a sampling scheme for measuring egg to fry survival.
2) Measure egg to fry survival at a subset of habitat conditions.
3) Incorporate temperature probes for measuring DO.
4) Compare sediment intrusion between redd locations.

Field Methods

Study reaches and sites

Study reaches were likely to large and too few egg boxes in 2009 to detect differences between reaches. We propose replicating methods used in 2010 by using the same three study-reaches in the Chiwawa River for 2011. These reaches represent the upper and lower spring Chinook spawning areas in Chiwawa River. Two reaches are proposed in the lower Chiwawa River because two different channel types are utilized by spring Chinook (pool-riffle and plane-bed). Three sites for egg box placement will be selected within each of the three reaches. These sites will be selected based on both the proximity of spawning females at the time of egg box placement, and historical spawning densities. Six Whitlock-Vibert egg boxes, retrofitted with finer mesh to prevent fry from escaping, each containing 100 bank-fertilized eggs, will be placed in artificial redds at each site. The total number of egg boxes for the study proposed is 54 (3 reaches x 3 sites x 6 egg boxes) and the total number of eggs 5,400 (900 per female, 6 females, two spawning pairs from each of three weekly spawning events; Appendix A). In each of the three reaches there will be two additional egg boxes placed in the lowest site (one on week one and one on week three) as test redds to determine development at the specified pull date (based upon temperature units). In addition, to test for differences in fertilization rates between gametes spawned the day of and those held for 24 hrs, an additional 100 eggs from each cross will be held 24 hrs prior to being fertilized and incubated at Eastbank FH.

Fish collection

Adults will be collected at Tumwater Dam or Chiwawa Weir and transported to the Eastbank Fish Hatchery where eggs will be collected from hatchery origin adults. These collections will correspond with yearly brood stock collection. Eastbank FH staff spawns a proportion of the collected brood once a week over the duration of the spawning period. Because eggs will only be available one day a week and because it is unlikely that we could place all of the egg boxes in one day, box placement will occur at weekly intervals. Timing of the placement of the boxes will be consistent with the peak spawn timing in each of the two tributaries. This will likely require that egg boxes be pulled throughout the late winter and early spring of 2012. One crew will be utilized on each of the three spawning dates, each composed of three to four individuals, in order to maximize consistency in the fertilization of eggs and their placement in each site. One hundred eggs from two adult crosses (900 eggs per cross) will be stocked weekly within each site, one at each of three sites (18 egg boxes per week). Using these methods, all eggs will be placed in three spawning days (i.e., three weeks).

Gamete collection/fertilization:

After spawning at the hatchery, eggs from each hatchery females will be counted into six freezer bags and milt from each hatchery males will also be stored in six freezer bags. Gametes will be stored in freezer bags filled with tanked oxygen overnight and while being transported to the study reaches. During transportation, gametes will be kept cool by transporting on layers of burlap placed over ice in a cooler. Bags will be labeled by desired cross, and numbered for placement sequence in order to avoid confusion when placing eggs in the artificial redds. Eggs will be fertilized on the bank directly prior to their placement within the WV boxes. A bucket filled with fresh river water will hold a submerged egg box, containing substrate collected during construction of the artificial redd. A freezer bag containing one hundred eggs from the appropriate female will then be fertilized with at least two or three drops of milt from the appropriate male in an area shaded from direct sunlight. River water will then be added and the contents gentry swirled to mix the milt throughout, thus activating the eggs. The contents of each will then be placed directly into the prepared Whitlock-Vibert box. The time of gamete collection, time of spawning, water temperature at spawning, and depth of box in relation to surrounding substrate will be recorded at this time. The boxes will then be gently transferred to a pre-constructed artificial redd and carefully backfilled. The time separating gamete collection and egg placement will be as short as possible, and every effort will be made to ensure that gametes are handled in a consistent manner.

Egg box construction and substrate

All egg boxes will be mesh-lined to prevent escapement of fry. Whitlock-Vibert egg boxes will be modified by placing 1/8” mesh across those areas of the box from which fry could escape (middle and top slots). This modification was successful in preventing the escapement of fry under experimental conditions in CESRF spawning channel (WDFW, unpublished data) and showed no increase in accumulated sediment when compared to unscreened boxes. Gravel for use within each egg box will be collected at the time of redd construction and will be consistent with surrounding substrate. Fine sediments will be excluded as these are normally carried away by the current during redd construction. The top trays of the WV boxes will be removed to provide additional room for gravel.

Redd/egg pocket construction

Artificial redds will be created prior to the time of spawning so that all eggs can be deposited as soon as possible after collection. Redds will be constructed using bottomless buckets that will be placed at each redd location and substrate will be removed by shovel or hand and placed into another labeled bucket. As substrate is removed, the bottomless bucket will be pushed into the substrate until the desired depth of 30 cm is reached. Substrate removed from each redd location will be placed into a perforated labeled bucket so the substrate can be placed back into the original redd. The perforated bucket will also facilitate the "washing" of the substrate to remove fine sediment that would have been removed through the natural redd construction process. Egg boxes will be carefully placed in the substrate by hand and substrate carefully placed back in the bottomless bucket, which will then be removed. Additional substrate will be collected by raking substrate particles directly upstream of the redd. Each box will be buried 30cm deep (see DeVries 1997). Each artificial redd will be flagged, and its exact position triangulated using two reference points along the bank. Rebar markers will be used if sufficient natural markers are not present. Point locations, if not rebar, will be marked with green paint. Redd locations will also be recorded using GPS and reference photos. A PIT tag will be affixed to the inside of each WV box to assist in determining the exact location of the egg boxes. The PIT tag will also be used to track data for each respective artificial redd. Lastly, color coded strings will be affixed to each upper corner of the egg boxes so that their location and orientation can be found without disturbing the box itself during excavation.

Habitat, Substrate, and Dissolved Oxygen

Reach scale
Reach morphology and characteristics such as gradient, confinement, and channel type will be obtained from currently existing sources (e.g. GIS, mapping software, Cram et al.).

Site scale
If logistically possible, existing substrate conditions will be categorized by Wolman pebble counts (Wolman 1954) and volumetric substrate samples, using standard methodology, prior to the construction of artificial redds at each site.

Redd scale
Percent of fines will be evaluated by measuring the amount of fines that has accumulated in the WV boxes between placement and removal. Whitlock-Vibert boxes (both standard and modified with additional screening) have been shown to provide conditions of sediment accumulation similar to that of surrounding spawning gravels, and can therefore be used to provide representative results in incubation studies (Garrett and Bennett 1996). Boxes will be carefully extracted by excavating around the box and then carefully placing it into a separate plastic Ziploc bag. This will minimize the loss of fine sediments (Riser, D. Sear, and P. Roni, personal communication). Gravel and fines will then be sifted for a volumetric measure of fine sediment. Standpipes similar in design to those used by Greig et al. (2005), will be used to measure dissolved oxygen, inter-gravel flow, and temperature on a weekly basis adjacent to the artificial redds in each site (4 reaches x 3 sites = 12 standpipes), as conditions allow. Scour chains will be placed at each redd site to monitor bed load movements.

Egg to fry survival

Temperature data loggers placed within each reach will be used to measure basin temperatures. Thermal units from those data or other sources will be used to predict the approximate date egg boxes should be removed from the gravel (i.e., calculated fifty percent emergence). To aid in determining the most appropriate date, a small number of additional WV boxes may be placed within the study area and retrieved periodically as the expected target emergence date approaches.

On the determined removal date, boxes will be located via their GPS location, presence of flagging, and their triangulated position relative to bank points and/or PIT tags. A bottomless barrel will be placed over the egg pocket to protect the area from flow while the box is excavated. The gravel and other material will be carefully removed around the box, and the box then placed in a plastic bag while still submerged. The WV boxes will then be opened on site, the contents placed in a fine mesh sieve and the number of dead eggs, live eggs, and live and dead fry counted. All fine sediment accumulated within the box will be saved for subsequent classification.

2009 Results

Two tributaries of the Wenatchee River were selected for the study pilot, Nason Creek, and the Chiwawa River. Two reaches were selected in each tributary, and three study sites within each reach. At each site, hatchery origin spring Chinook eggs were bank fertilized and placed in three artificially constructed redds within modified Whitlock-Vibert egg boxes, using methods defined in Johnson et al. (2009). Egg boxes were removed shortly after reaching a target of 900 accumulated thermal units (degrees C). Pull dates ranged between February 11th and March 30th 2010 in Nason Creek sites and between March 16th and April 12th 2010 in the Chiwawa River.

Survival was similar between reaches, but variable between sites: Nason Creek lower reach: (mean, 57.0; SD, 33.8), Nason Creek upper (mean, 66.6; SD, 30.8), Chiwawa lower (mean, 71.1; SD, 11.5), and Chiwawa upper (mean, 74.7; SD, 11.7). No detectable difference in survival was found between reaches (ANOVA: $F_{2,31} = 0.45$, $P = 0.64$), or between the adult crosses used in the study (ANOVA: $F_{4,31} = 1.2$, $P = 0.34$).

Minimum detectable difference was calculated using the following formula presented by Zar (1999. p.195 eq. 10.36):

$$\delta = \sqrt{\frac{2ks^2\phi^2}{n}}$$

where:
n = group sample size
δ = minimum detectable difference
k = number of groups
s^2 = sample variance
ϕ = among groups variance

Estimated minimum detectable difference in percent survival between reaches in the pilot study was approximately 20.7; or 30.7 percent of the overall mean (67.6 percent).

No difference in the percentage of fine sediment accumulated in the boxes was detected between sites (ANOVA: $F_{3,29} = 1.8$, $P = 0.17$). However, the overall percentage of fines was quite high (mean, 17.7; SD, 9.0). There was no significant correlation between the percentage of fines upon recovery and survival ($R^2 = 0.05$, $P = 0.23$, Figure 1.), although the negative trend was similar to a small but significant trend detected in the Yakima River Basin (Figure 2).

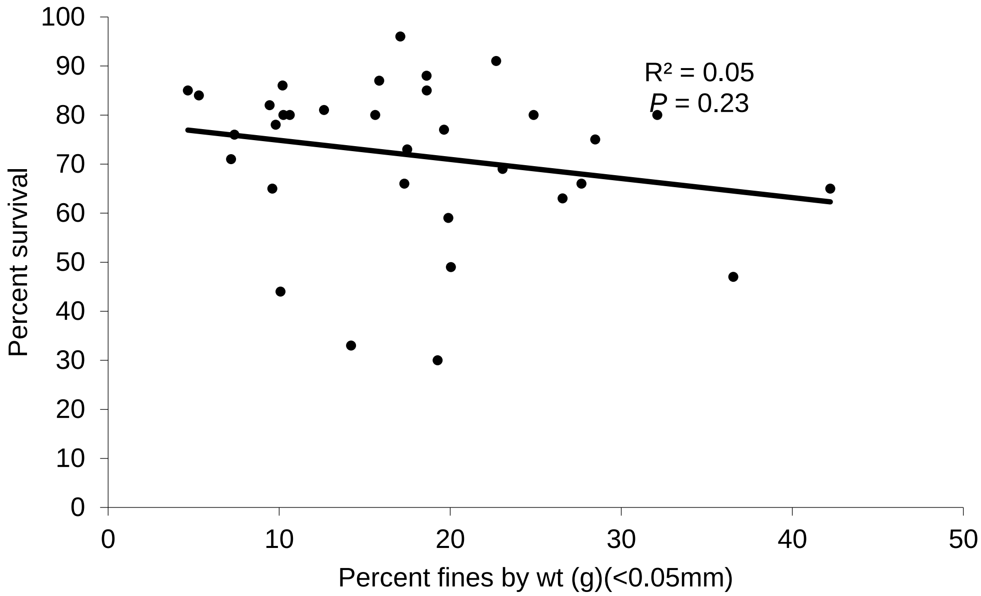


Figure 1. Negative trend in survival with increasing percentage of fine sediment in egg boxes recovered from the Wenatchee River Basin.

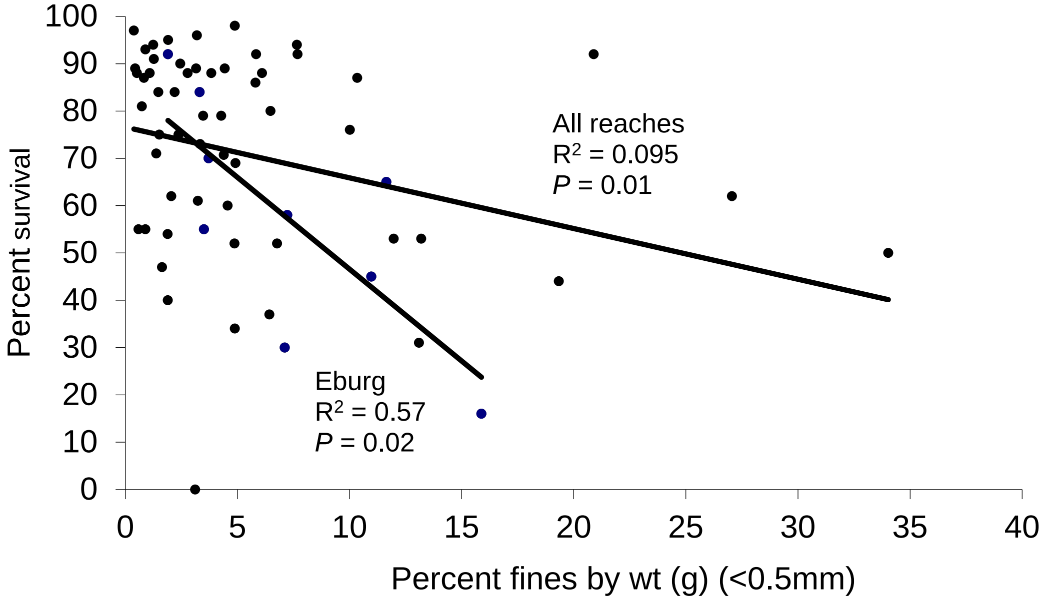


Figure 2 .Significant negative trends in survival with increasing percentage of fine sediment in egg boxes recovered from the Yakima River Basin.

In contrast to findings in the Wenatchee Basin pilot, significant differences in survival were detected in the Yakima River Basin between both reaches and adult cross. Likewise, although there was no detectable decrease in survival with increasing levels of fines in Nason Creek or the Chiwawa River, the trend is similar to that observed in the Yakima Basin where a small but significant relationship between survival and percent fines was detected with a larger sample size

We expect that by decreasing the within-reach variance may allow a more successful analysis of differential egg to fry survival and factors affecting survival in the Wenatchee River Basin. An increase of sample size within each reach, and a decrease in reach length should decrease the level of uncertainty around estimates of survival.

2010 Results

Because 2009 study reaches were likely too large and there were too few egg boxes to detect differences between reaches, we selected three reaches in the Chiwawa River in 2010 and increased the number of egg boxes per site. At each site, hatchery origin spring Chinook eggs were bank fertilized and placed in six artificially constructed redds within modified Whitlock-Vibert egg boxes, using methods defined in Johnson et al. (2009). Egg boxes were removed shortly after reaching a target of 900 accumulated thermal units (degrees C). Removal dates ranged between March 18th and April 18th 2011.

Mean survival was greatest in the upper Pool-Riffle study reach (mean, 60.9; SD, 27.5) and lowest in the Plane-Bed reach (mean, 44.1; SD, 26.7). Survival by adult cross ranged between 69.7 (SD, 11.5), and 33.5 percent (SD, 29.9). Although a positive trend in survival was observed from lower to upper reaches, we found no detectable difference in survival among the three Chiwawa River study reaches (ANOVA: $F_{2, 39} = 2.3$, $P = 0.11$; Figure 1) or among the adult crosses used in the study (ANOVA: $F_{5, 39} = 2.0$, $P = 0.10$; Figure 2).

Attachment B

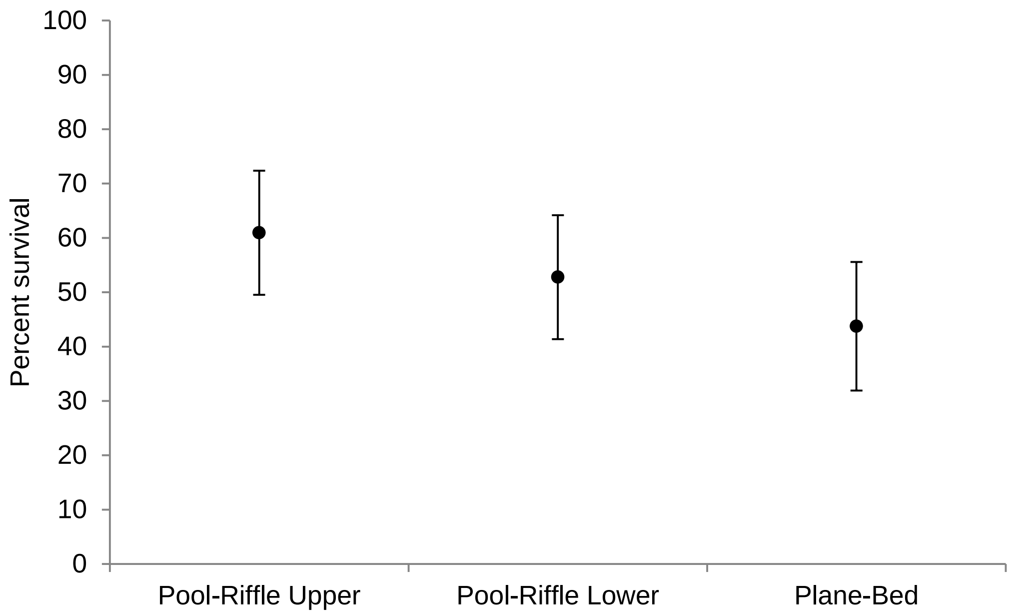


Figure 1. Estimated spring Chinook survival by study reach in the Chiwawa River 2010 (2011 emergent fry). Error bars represent ninety-five percent confidence intervals.

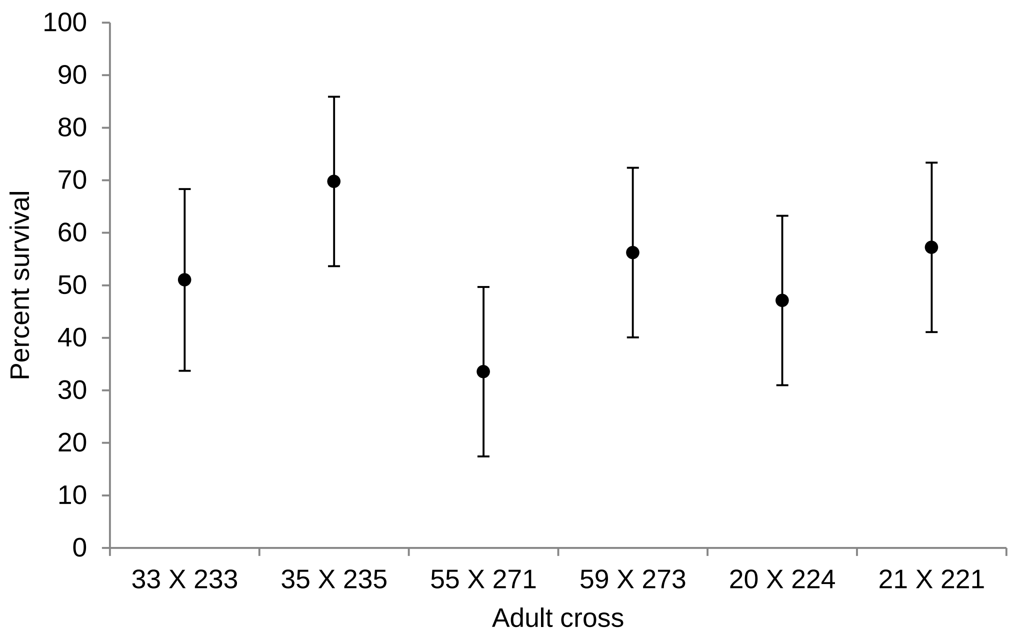


Figure 2. Estimated spring Chinook survival by adult cross in the Chiwawa River 2010 (2011 emergent fry). Error bars represent ninety-five percent confidence intervals.

No difference in the percentage of fine sediment accumulated in the boxes was detected between reaches (ANOVA: $F_{2,48} = 2.2$, $P = 0.12$).

Percent fines in recovered egg boxes averaged 12.9 percent (SD, 8.4). No significant correlation between the percentage of fines upon recovery and survival was detected ($R^2 = 0.02$, $P = 0.13$, Figure 3.), although the negative trend was similar to a small but significant trend detected in the Yakima River Basin (Figure 2).

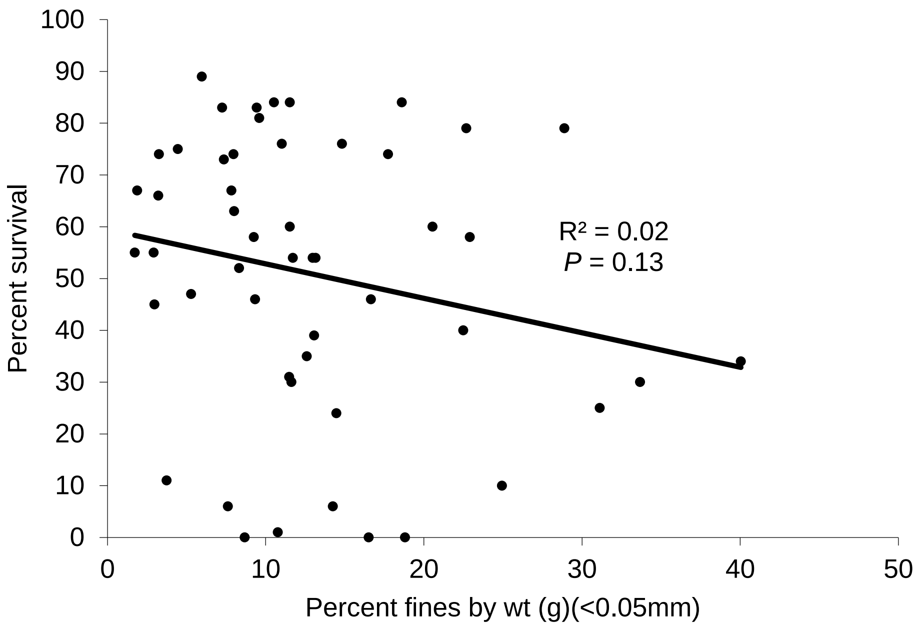


Figure 3. Negative trend in survival with increasing percentage of fine sediment in egg boxes recovered from the Wenatchee River Basin.

Although our preliminary results have shown no detectable differences among reaches, we did observe a positive trend in survival from low to high on a reach scale. These observations are consistent with what has been found relative to differences in reproductive success. For this reason, we would like to replicate field methods carried out in 2010.

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Appendix A. Experimental design for egg to fry study.

River	Reach/Channel type	Site	Redd #	Female	Male
Chiwawa	Upper/ pool-riffle	1	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		2	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		3	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
	Lower/ plane-bed	1	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		2	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		3	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
	Lower/ Pool-riffle	1	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		2	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6
		3	A	1	1
			B	2	2
			C	3	3
			D	4	4
			E	5	5
			F	6	6

Sensitivity Analysis

Table 1. Summary of factors contributing to recalculation options 1, 2 and 3.

			Components of compensation for hatchery smolts						
PUD	**Species**	***(a)*** **Natural Origin Compensation i.e., BAMP**	***(b)*** **Subject Hatchery Mortality (PRN_x x UPM_p)**	***(c)*** **SAR Credit for Adult Equivalents [(PRN_x x UPM_p) x RHP_z]**	***(d)*** **Mitigation for NNI ($MNNI_x$)**	***(e)*** **SAR credit for Adult Equivalents [($MNNI_x$) x RHP_z]**	***(f)*** **Inundation Production (IRN_i)**	***(g)*** **Mitigation for Inundation (IRN_i x UPM_p)**
Douglas	SpCH	9,326	14,800	8,475	4,996	2861	0	0
	SuCH	48,540	0	0	0	0	441,000	0
	StHD	3,352	3,700	0	1,300	0	300,000	0
Chelan	SpCH	42,001	128,000	55,710	34,541	14,938	0	0
	SuCH	522,228	53,000	0	15,812	0	400,000	56,505
	StHD	14,161	7,460	0	2,621	0	165,000	21,969
	SCKY	45,946	0	0	0	0	0	0
Grant	SpCH	89,407	214,560	102,535	53,829	26,312	0	0
	SuCH	591,409	53,640	0	16,003	0	0	112,778
	StHD	82,281	18,950	0	6,659	0	0	88,118
	FaCH	108,508	0	0	0	0	6,000,000	0
Total	SpCH	140,735	357,360	166,720	93,366	44,110	0	0
	SuCH	1,162,177	106,640	0	31,814	0	841,000	169,283
	StHD	99,793	30,110	0	10,580	0	465,000	110,087
	SCKY	45,946	0	0	0	0	0	0
	FaCH	108,508	0	0	0	0	6,000,000	0

Attachment C

Table 2. Range of recalculated values based upon options 1, 2, and 3.

	PUD	Species	**Option 1** *a+c+f*	**Option 2** *a+c+e+f*	**Option 3** *a+b+d+f+g*
Sensitivity Comparisons	Douglas	SpCH	17,801	20,663	29,123
		SuCH	489,540	489,540	489,540
		StHD	307,052	308,352	308,352
	Chelan	SpCH	97,712	112,649	204,542
		SuCH	975,228	991,039	1,047,545
		StHD	186,621	189,242	211,211
	Grant	SpCH	191,942	218,254	357,796
		SuCH	645,049	661,051	773,829
		StHD	101,231	107,890	196,007
	Total	SpCH	307,455	351,566	591,461
		SuCH	2,109,817	2,141,631	2,310,915
		StHD	594,903	605,484	715,570
Chief Joseph funding arrangement			✔	✔	✔
Inclusion of BAMP (natural-origin fish)			✔	✔	✔
Calculated NNI on GCFMP releases			✔	✔	✔
PUD SAR credit for GCFMP adult equivalents			✔	✔	
Mitigation for NNI on hatchery releases				✔	✔
Inclusion of mitigation for inundation[1]					✔

[1] Inundation levels "are not subject to recalculation, and are provided in addition to the levels necessary to compensate for Unavoidable Project Mortality" (pg. 49, Rocky Reach HCP).

Background Definitions and Assumptions

Summary of Approved Recalculation Methodology SOA:

1. Compensation for *Hatchery-origin* smolts will be based upon projected hatchery smolt releases.
2. Compensation *Natural-origin* smolts will be based upon adult returns at the individual PUD projects.

Definitions related to sensitivity analysis:

S_p: Juvenile Project Survival at project "p". Defined as: {***S** =100%-UPM*}. Therefore, if UPM = 5%, then S = 95%

UPM_p: Unavoidable Project Mortality at project "p". Defined as: {***UPM** = 100% - S*}. Therefore, if S = 95%, then UPM = 5%.

Subject Hatchery: A hatchery that produces smolts which are then subject to PUD NNI hatchery compensation. As examples, Winthrop, Entiat and Leavenworth are Subject Hatcheries.

PRN_x : Projected Release Number from Subject Hatchery "x"; The projected annual smolt release number from a Subject Hatchery. As an example, Winthrop is a "Subject Hatchery" which is projected to release 400,000 spring Chinook smolts and would be designated as $PRN_{Winthrop}$ = 400,000.

IRN_i : Inundation Release Number from Inundation Hatchery "i"; The fixed annual smolt release number from an inundation hatchery. As an example, Chelan Falls is an "Inundation Hatchery" which will release 400,000 summer Chinook smolts and would be designated as $IRN_{ChelanFalls}$=400,000. Inundation amounts are not subject to recalculation, and are provided in addition to the levels necessary to compensate for UPM.

SAR : Smolt-to-Adult Return.

RHP_z: Relative Hatchery Performance of the Subject Hatchery and PUD Hatchery "z" which is selected to produce mitigation for the Subject Hatchery. The relative performance of two or more hatcheries based on the number of expected adult returns. More specifically, (1) a BAMP analog that ensures PUD hatcheries and subject hatcheries produce an equivalent number of adults to meet NNI; and, (2) an incorporation of PUD hatchery SARs into hatchery compensation calculations. Defined as:

$$\mathbf{RHP}_{\boldsymbol{z}} = \mathrm{SAR}_{\text{subject hatchery}} \div \mathrm{SAR}_{\text{PUD Hatchery z}}$$

Attachment C

MNNI$_x$: Mitigation for NNI hatchery compensation related to Subject Hatchery "x": The number of smolts needed, above NNI production, to ensure that 100% of PRN$_x$ smolts are accounted for at Priest Rapids Dam. Defined as:

$$\mathbf{MNNI} = [\mathrm{PRN}_x \div (\mathrm{S}_{\mathrm{Wells}} \ \mathrm{x}\ \mathrm{S}_{\mathrm{RR}} \ \mathrm{x}\ \mathrm{S}_{\mathrm{RI}} \ \mathrm{x}\ \mathrm{S}_{\mathrm{WANPRD}})] - [\mathrm{PRN}_x (\mathrm{UPM}_{\mathrm{Wells}} + \mathrm{UPM}_{\mathrm{RR}} + \mathrm{UPM}_{\mathrm{RI}} + \mathrm{UPM}_{\mathrm{WANPRD}} + 1)]$$

ONR$_p$: <u>O</u>bserved Average <u>N</u>atural Origin <u>R</u>eturns at project "p". The arithmetic mean of adult returns to a specific project, calculated from up to 10 years of the most recent adult return data.

CH: Compensation for Hatchery Origin Smolts

CN: Compensation for Natural Origin Smolts

Attachment C

I. Compensation options for Hatchery-Origin Smolts

Generalized Option 1 (Hatchery Component)

Compensation for Hatchery Origin Smolts from Hatchery "p" at Project "x" using PUD Hatchery "z" =

$$\left[\left(\boldsymbol{PRN_x} \times \boldsymbol{UPM_p}\right)\right] \times \boldsymbol{RHP_z} = \boldsymbol{CH_{option\ 1}}$$

Generalized Option 2 (Hatchery Component)

Compensation for Hatchery Origin Smolts from Hatchery "p" at Project "x" using PUD Hatchery "z" =

$$\left[\left(\boldsymbol{PRN_x} \times \boldsymbol{UPM_p}\right) + \left(\boldsymbol{MNNI_x}\right)\right] \times \boldsymbol{RHP_z} = \boldsymbol{CH_{option\ 2}}$$

Generalized Option 3 (Hatchery Component)

Compensation for Hatchery Origin Smolts from Hatcheries "p"& "i" at Project "x" =

$$\left[\left(\boldsymbol{PRN_x} \times \boldsymbol{UPM_p}\right) + \left(\boldsymbol{MNNI_x}\right) + \left(\boldsymbol{IRN_i} \times \boldsymbol{UPM_p}\right)\right] = \boldsymbol{CH_{option\ 3}}$$

Primary Differences:

- Option 1 does not ensure preservation of smolt or adult equivalents from Subject hatchery (PRN_x).
- Options 1&2 use RHP to ensure equivalent number of adults are produced from PUD and Subject Hatcheries, consistent with methods described by the BAMP and HCP.
- Option 3 applies UPM to fixed inundation production (IRN).
- Option 3 does not credit PUD hatchery performance (SAR) for mitigation of hatchery-origin smolts.

II. Compensation for Natural-Origin Smolts

Agreed Method

Step 1: Calculate the average number of adults that would have returned to a project absent UPM.

$$\boldsymbol{ONR_p/S_p \;=\; Premortality\ Return\ Estimate_p}$$

Step 2: Calculate the difference between the premortality estimate and observed returns to determine the number of adult equivalents required to meet NNI.

$$\boldsymbol{Premortality\ Return\ Estimate_p - ONR_p \;= Adult\ Equivalents_p}$$

Step 3: Convert adult equivalents to hatchery smolt production numbers by dividing adult equivalents by average hatchery specific SAR. Therefore, Compensation for Natural Origin Smolts at project "P" using PUD Hatchery "Z" =

$$\boldsymbol{\frac{Adult\ Equivalents_p}{SAR_z} = CN}$$

For the purposes of this analysis it was assumed that hatchery compensation for natural origin fish would be distributed in accordance with (1) the relative proportion of adult spawners in tributaries with PUD hatcheries or (2) based upon the previous allocation of hatchery production agreed to in the HCPs.

III. Total Hatchery Compensation

Option 1:

$$\boldsymbol{CN + CH_{option\ 1} + IRN_i = Total\ Compensation}$$

Option 2:

$$\boldsymbol{CN + CH_{option\ 2} + IRN_i = Total\ Compensation}$$

Option 3:

$$\boldsymbol{CN + CH_{option\ 3} + IRN_i = Total\ Compensation}$$

Attachment D

Hatchery Recalculation 2014-2013

SENSITIVITY ANALYSIS

J. MURAUSKAS
CHELAN COUNTY PUD
AUGUST 17TH, 2011

Attachment D

Overview

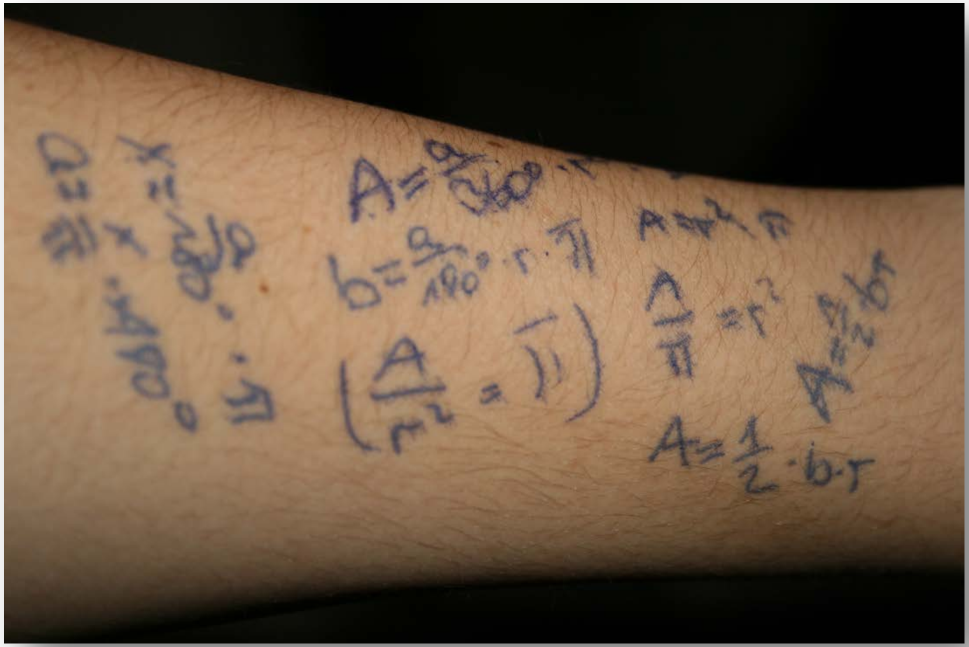
- HCP-HC agreed to recalculation SOA stating:
  - Natural fish will be mitigated through BAMP methodologies
  - Hatchery fish will be mitigated based on annual release targets
- Hatcheries included in recalculation not yet decided
- JFP requested a sensitivity analysis on how inclusion of various programs influence outcomes

Sensitivity components

- Natural-origin smolts (i.e., BAMP-based)
- Losses to subject hatchery smolts
- Mitigation for NNI
- Inundation and mitigation for upstream inundation
- Adult equivalents for losses to hatchery programs

Attachment D

How does the math work?



Attachment D

Natural-origin smolts

- Example: natural-origin summer Chinook at RIS
  - 43,990 returns ÷ 93.75% survival = 46,923 expected adults
  - 46,923 – 43,990 = 2,932.7 adults short of NNI
  - 60/40 split between DRYP and SMILP per RIS HCP
    - 2,932.7 × 60% = 1,759.6 adults at DRYP (0.632% SAR)
    - 2,932.7 × 40% = 1,173.1 adults at SMILP (1.227% SAR)
  - DRYP = 1,759.6 ÷ 0.632% ≈ 278,000 smolts owed
  - SMILP = 1,173.1 ÷ 1.227% ≈ 96,000 smolts owed

Hatchery-origin smolts

- Example: summer Chinook at ENFH
  - Annual release = 400,000 smolts
  - RRH mortality = 7.00%
  - 400,000 × 7.00% ≈ 28,000 smolts owed

Attachment D

Mitigation for NNI

- Example: NNI for WNFH
  - Annual release of 400,000
  - WEL, RRH, RIS, & WAN/PRD loss = 0.27298
  - 400,000 × 0.27298 = 109,192 smolts
  - 109,192 ÷ (1 – 0.27298) = 150,191 smolts (+40,999 smolts)
  - 400,000 + 150,191 = 550,191
  - 550,191 × (1 – 0.27298) = 400,000 smolts

Attachment D

Inundation

- Inundation:
  - “*not subject to recalculation, and are provided in addition to the levels necessary to compensate for Unavoidable Project Mortality*” (pg. 49, Rocky Reach HCP).
- For discussion purposes, upstream inundation multiplied by mortality would equal losses incurred to inundation. However, HCPs indicate that inundation is not subject to recalculation.

Attachment D

Adult equivalents (BAMP)

- Example: mitigation for losses to LNFH at RIS
  - 1.2 M × 6.25% = 75,000 smolts lost
  - Mitigation for NNI = 16,648 additional smolts
  - 91,648 in-kind smolts owed
  - BAMP: adults ÷ SAR = smolts *OR* smolts × SAR = adults
  - 91,648 smolts × 0.241% = 221 adults short of NNI
  - 221 adults ÷ Chiwawa SAR 0.540% ≈ 41,000 smolts owed

Attachment D

Sensitivity comparisons

PUD	Species	Option 1	Option 2	Option 3
Douglas	SpCH	17,801	20,663	29,123
	SuCH	489,540	489,540	489,540
	StHD	307,052	308,352	308,352
Chelan	SpCH	97,712	112,649	204,542
	SuCH	975,228	991,039	1,047,545
	StHD	186,621	189,242	211,211
Grant	SpCH	191,942	218,254	357,796
	SuCH	645,049	661,051	773,829
	StHD	101,231	107,890	196,007
Total	SpCH	307,455	351,566	591,461
	SuCH	2,109,817	2,141,631	2,310,915
	StHD	594,903	605,484	715,570
Inclusion of BAMP (natural-origin fish)		✔	✔	✔
Calculated NNI on GCFMP releases		✔	✔	✔
Adult equivalent replacement of losses to GCFMP releases		✔	✔	
Mitigation for NNI on hatchery releases			✔	✔
Inclusion of mitigation for inundation				✔

Attachment E

July 29, 2010

Expanded Multispecies Acclimation in the Methow and Wenatchee
2011-DRAFT RESULTS

The overarching mission of this project is to improve the efficacy of current supplementation efforts by providing additional acclimation sites with the purpose of improving homing fidelity, adult spawner distribution, and potentially survival rates. This goal has been parsed out into two primary objectives; 1) to evaluate acclimation of multiple species in a shared semi-natural environment, and 2) provide additional single species acclimation sites to meet current management goals in the Methow and Wenatchee subbasins.

Monitoring and Evaluation

As described within the objectives of the project, M&E will be implemented to: (1) test acclimation of two species co-mingled in semi-natural acclimation sites, and (2) demonstrate increased spawner distribution and survival of returning adults as a result of expanded acclimation. Success of expanded acclimation and multi-species acclimation strategies using semi-natural and natural acclimation sites will be determined based on the following performance indicators for each of the sites listed in Table 1: **In-pond growth, in-pond survival, survival to McNary Dam**, SARs, and spawner distribution. The following results will focus on the relevant performance indicators related to juvenile acclimation on out-migration success.

In-Pond Growth

The objective was to estimate in-pond growth, evaluated by arrival size-to-volitional release, of spring Chinook, coho, and/or steelhead at the projects sites (listed below). The metric used for determining in-pond growth was based on repetitive growth sampling during the entire acclimation period and would be calculated as follows:

$$S_{\text{in-pond growth}} = \text{Smolts}_{\text{emigratio}\mathbf{n}} - \text{juveniles}_{\textbf{on-site arrival}}$$

Where $S_{\text{in-pond growth}}$ was the estimated rate of in-pond growth; $\text{Smolts}_{\textbf{emigration}}$ was the average size of smolts prior to emigration; and $\text{juveniles}_{\textbf{on-site arrival}}$ was the average size of juveniles upon arrival at the acclimation site. The rationale behind evaluating weekly in-pond growth may provide a diagnostic of potential negative interactions in multi-species ponds when compared with single-species sites. The following site evaluations were conducted:

1. Semi-natural multispecies (MS) vs. semi-natural single species (SS)

    a. Coho- 2011 (MS) Rohlfing's Pond (RFP) vs. 2011 (SS) Butcher Creek (BCP) and Coulter Creek (CLP) sites

   b. Coho- 2011 (MS) Winthrop NFH Backchannel (WINTBC) vs. 2011 (SS) Lower Twisp Pond (LTP)

   c. Steelhead- 2011 RFP vs. 2011 Blackbird Island and/or Chiwawa Acc. Site

2. Semi-natural multispecies (MS)-between years; same site

   a. Coho- 2011 RFP vs. 2010 RFP

   b. Coho- 2011 WINT BC vs 2010 WINT BC

   c. Spring Chinook- 2011 WINT BC vs 2010 WINT BC

3. Semi-natural MS vs. conventional SS

   a. Spring Chinook- 2011 WINT BC vs. 2011 Winthrop NFH on-station (WINT)

4. Semi-natural SS vs. conventional SS

   a. Spring Chinook- 2011 Methow FH (MET) vs. 2011 Biddle Pond (BDP)

Semi-natural multispecies (MS) vs. semi-natural single species (SS)

A positive growth rate was documented for coho at Rohlfing's Pond and Winthrop NFH back channel reared fish, although the Rohlfing's site, as in 2010, does not provide growth rates as they relate to multiple species rearing within one acclimation site. A segregated acclimation was established, due to the discrepancy in size between species, at the time of transfer (9.0 FPP for ST and 22.00 FPP for CO), which essentially lent this site to function as a single species, semi natural acclimation pond. Figure 1 demonstrates positive growth rates for coho at Rohlfing's Pond; as compared to other semi-natural, single same species rearing environments. The steelhead data was not available at the time of analysis and will be available for the final results. Winthrop NFH back channel provided a clearly definable positive trend in growth rates as compared to other same single species, semi-natural acclimation site (Figure 2). While growth rates were different between the group comparisons, many factors may have contributed to this disparity (e.g.- parental crosses, water temperatures, duration of acclimation, daily feeding requirements, densities, etc.).

Attachment E

July 29, 2010

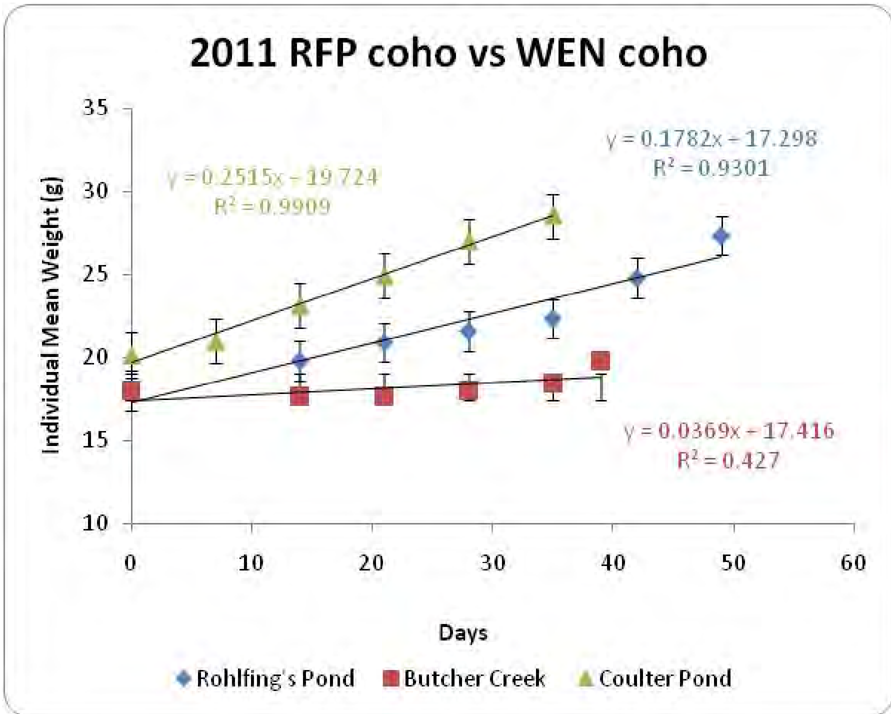


Figure 1. Coho growth comparisons between Rohlfing's Pond and other upper WEN basin coho acclimation sites, 2011.

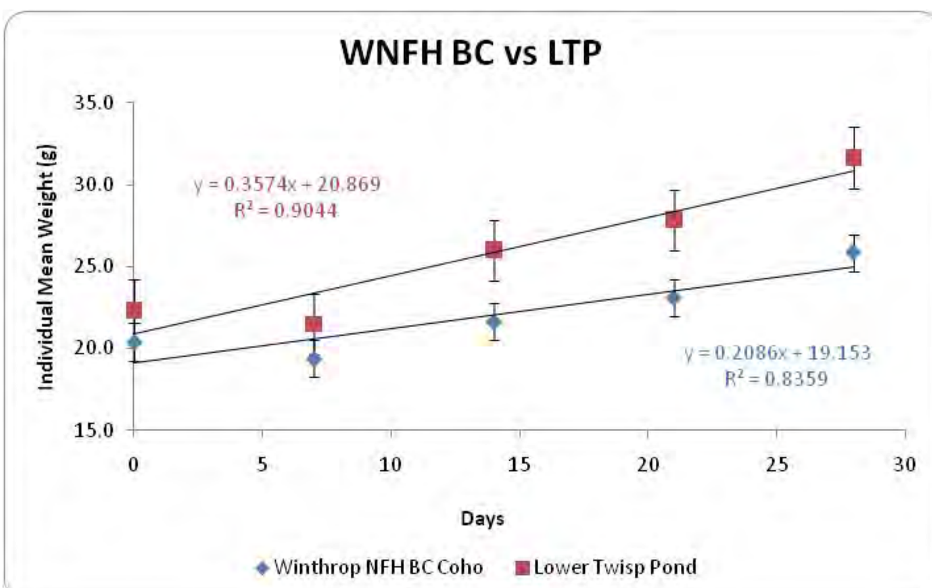


Figure 2. Coho growth comparisons between Winthrop NFH back channel and Lower Twisp Pond, 2011.

July 29, 2010

Semi-natural multispecies (MS)-between years; same site

When comparing same species within semi-natural, multispecies sites, results were mixed. For coho and steelhead at Rohlfing's pond, growth rates trended positively and were comparable between years (Figure 3 and 4). Again, this site basically functioned as a single species site with the separation of the two stocks die to the size discrepancy as time of transfer. For Winthrop NFH back channel coho and spring Chinook (Figures 5 and 6), as compared to 2010 data, a decreased growth rate was observed for both. While this may demonstrate that potential negative interactions could have been occurring within the site, other factors may have contributed to the unexpected performance identified within this site. An unusually cool spring delayed normal feeding practices well into April during the 2011 acclimation season. Shortly after the transfer to the back channel, spring Chinook were observed having a moderate outbreak of a *Saprolegnia* fungus which initiated an early release for this site, although fish were forced out prematurely shortly thereafter so that maintenance could occur at the Foghorn irrigation diversion. Back channel spring Chinook growth sampling was inconsistent throughout acclimation (r^2= .08) and may have been attributed to the methods employed by YN staff as well as the high standard deviation observed within these samples (pre-release SD= 21.9).

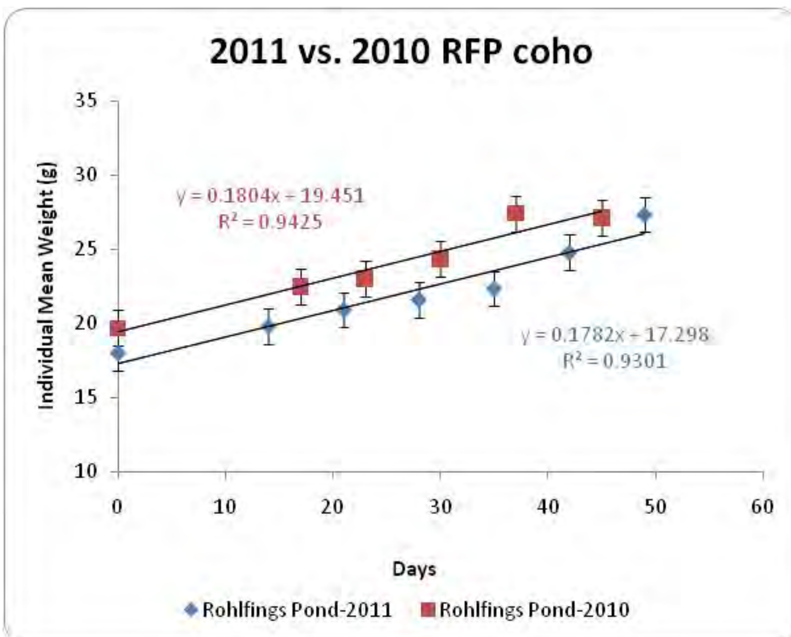


Figure 3. Coho growth comparisons between Rohlfing's Pond in 2011 and 2010.

Attachment E

July 29, 2010

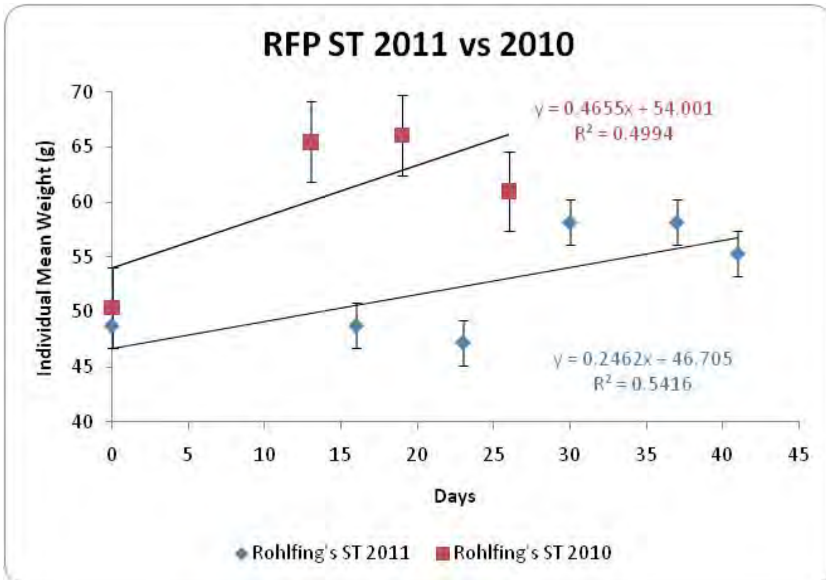


Figure 4. Steelhead growth comparisons between Rohlfing's Pond in 2011 and 2010.

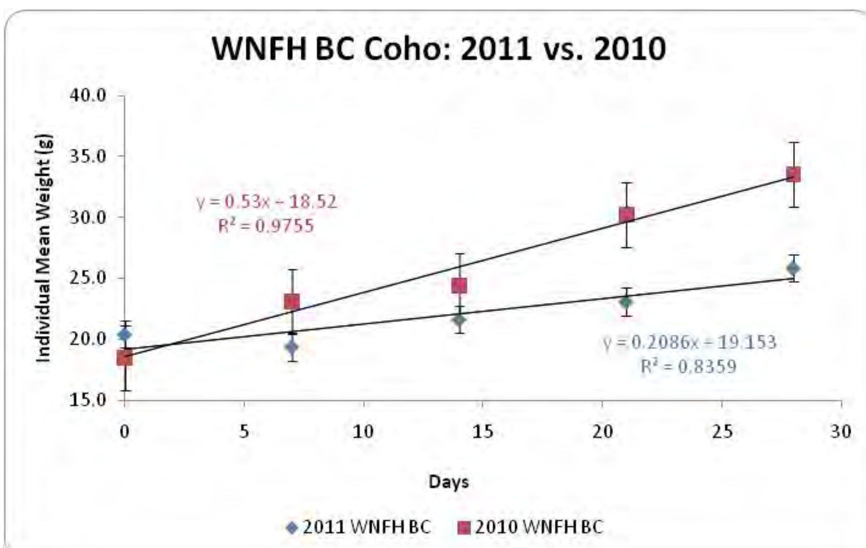


Figure 5. Coho growth comparisons between Winthrop NFH back channel in 2011 and 2010.

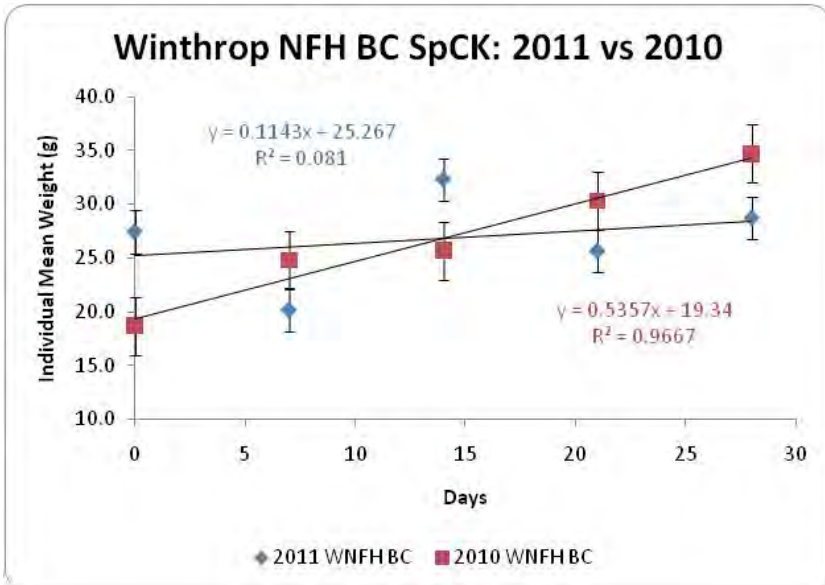


Figure 6. Spring Chinook growth comparisons between Winthrop NFH back channel in 2011 and 2010.

Semi-natural MS vs. conventional SS

For same species comparisons between semi-natural multispecies and conventional single species, spring Chinook reared at Winthrop NFH in the back channel and on-station were analyzed (Figure 7). While a positive trend line was determined, it was minimal and may have been attributed to some of the factors mentioned in the previous section.

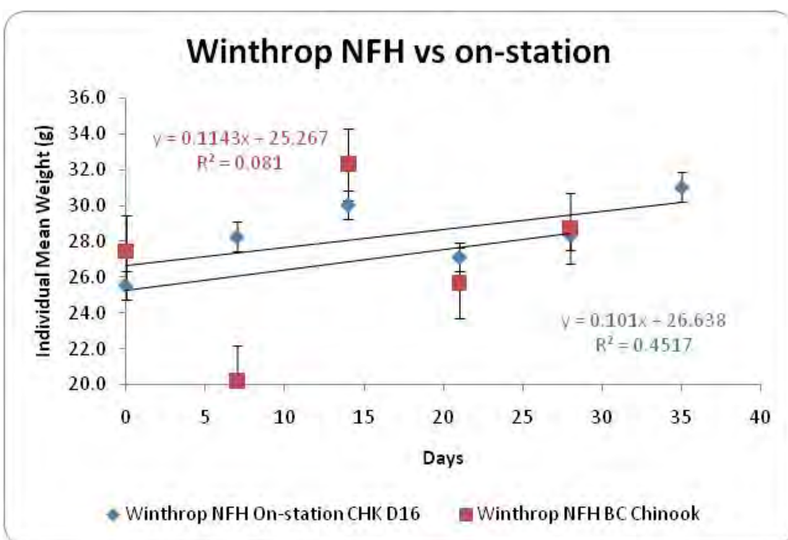


Figure 7. Spring Chinook growth comparison between Winthrop NFH back channel and on-station groups, 2011.

Attachment E

July 29, 2010

Semi-natural SS vs. conventional SS

For the single species comparison between different rearing environments, YN analyzed spring Chinook at Biddle Pond and Methow FH. Again, r^2 values were unusually low and determined to be an artifact of high variability among the acclimated groups. Also, the cool springtime temperatures did hamper feeding regimes at the Biddle site that likely lent to the lower rate of growth that expected (Figure 8).

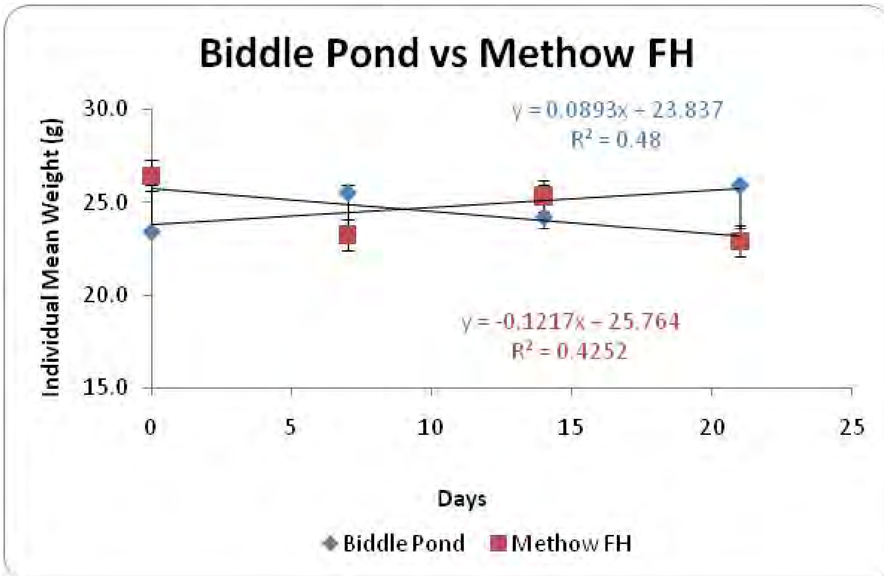


Figure 8. Growth comparison for spring Chinook at Biddle Pond and Methow FH in 2011.

In-Pond Survival

The objective was to estimate in-pond survival, determined from fish arrival at the site to volitional release, for coho, spring Chinook, and steelhead being acclimated at the various locations. In-pond survival rate estimates for juveniles were based on PIT tag detections and calculated as follows:

$$S_{ip} = \frac{(D_{outlet} / E_{detection})}{\text{PIT total}}$$

Where S_{ip} = in-pond survival; D_{outlet} = unique detections at the pond outlet; $E_{detection}$ = estimated PIT-tag detection efficiency at the outlet; and PIT_{total} = the total number of

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PIT-tagged fish released into the pond. If residual steelhead were observed, the in-pond survival estimate was adjusted to account for this residualism and calculated as follows:

$$S_{ip} = \frac{(D_{outlet} / E_{detection})}{PIT_{total} - R_{residualism}}$$

The rate of residualism was calculated using the following formula:

$$S_{residualism} = \frac{fish_{remaining\ in\ pond}}{Juveniles_{exiting\ the\ pond+remaining\ in\ the\ pond}}$$

Where $S_{residualism}$ is the estimated rate of residualized fish; $fish_{remaining\ in\ pond}$ is the estimated number of fish remaining in the pond after access to the stream has been precluded following seven consecutive days of zero detection at the outlet PIT tag detectors; $Juveniles_{exiting\ the\ poind+remaining\ in\ the\ pond}$ is the number of juveniles detected exiting the pond plus the number of juveniles estimated to have remained in the pond.

The rationale behind in-pond survival estimates is to assess potential negative interactions in sites with multiple species, devise predator control strategies, and to evaluate the effectiveness of natural acclimation relative to conventional smolt release programs.

At Rohlfing's Pond, detection efficiencies were lower than expected even though YN added a 3rd antenna in series for the RFP site. Steelhead, when compared to the coho, had considerably lower detection efficiency (Table 1). Overall large numbers of PIT tag likely compromised the system as a whole during peak outmigration resulting in tag collisions. Approximately 50% of the steelhead were tagged as compared to only an estimated 7% for the coho population. To alleviate some of this tag collision and try to obtain a better estimate of in-pond survival, additional arrays could be placed in series or determining if the number of tagged steelhead is needed to evaluate all of the proposed metrics within this study plan as well as the overall PUD comprehensive Monitoring and Evaluation Plan. In-pond survival between the two species in Rohlfing's Pond was comparable and would have been presumably more closely similar to what was observed for coho if efficiencies were comparable.

After all actively migrating individuals were observed, a total of 18 steelhead were identified still residing in the pond. This identification was conducted through repeat snorkel surveys at the site. The steelhead juveniles were allowed to remain in the pond until connectivity between the outlet and Nason Creek dissipated. Although dissolved oxygen and temperature measurements were adequate and inflow was still entering the pond, YN implementing a fish rescue plan to remove the remaining individuals and place them into Nason Creek. The rate of residualism for the 2011 steelhead acclimated at Rohlfing's Pond was 0.09%.

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In-pond survival for spring Chinook at Biddle Pond and Methow FH were calculated and summarized in Table 1. Detection efficiencies were fair and both sites and provided comparable in-pond survival estimates for both sites.

Winthrop NFH on-station and back channel groups were subjected to an overall poor but variable detection efficiency during the 2011 outmigration (range from 20.1% - 68.9%). With the Spring Creek array acting as the only detection system for both the on-station and back-channel releases, tag collision rates were presumably high with the nature of the release strategies that occurred. On-station releases were forced while back channel releases began volitionally but were ultimately forced to allow for a maintenance project to occur within the Foghorn irrigation ditch. Staff observations were that a large number of these juveniles were residing in Spring Creek for several weeks. For 2012, efficiencies should be more reliable with the implementation of volitional releases from Winthrop NFH.

Table 1. PIT tag release summary for all sites during acclimation, 2011.

Acclimation Site	Outlet Detections	Total Downstream Detections	Detection Efficiency	In-pond Survival
Rohlfing's Pond – Coho	4,672	1,099	85.3%	96.2%
Rohlfing's Pond - Steelhead	5,348	2,565	60.9%	92.8%
Winthrop NFH back channel-Spring Chinook	3,113	1,918	48.7%	92.3%
Winthrop NFH back channel- Coho	2,908	2,505	45.5%	91.6%
Winthrop NFH- Coho	1,394	3,216	20.1%	99.2%
Winthrop NFH- Spring Chinook	2,717	1,494	68.9%	98.7%
Biddle Pond- Spring Chinook	6,204	2,902	78.7%	98.6%
Methow FH-spring Chinook	5,903	2,726	73.6%	99.1%

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Release-to-McNary Survival

The objective was to estimate smolt survival of spring Chinook, steelhead, and coho being acclimated at this project's sites from the point of release downstream. The survival was estimated based on PIT tag detections.

$$S_{\textbf{suvival to Mcnary}} = \frac{\text{smolts}_{\textbf{McNary}}}{\text{smolts}_{\textbf{emigrated}}}$$

Where $S_{\text{survival to McNary}}$ was the estimated rate of survival to McNary Dam; $\text{smolts}_{\textbf{emigrated}}$ was the estimated number of PIT tagged smolts emigrating from a given acclimation site; and $\text{smolts}_{\textbf{McNary}}$ was the estimated number of smolts passing McNary Dam.

Release to McNary survival estimates are provide below. Survivals were comparable for steelhead and coho at Rohlfing's Pond and between spring Chinook reared at Biddle Pond and Methow FH. Winthrop NFH on-station releases fared better for the spring Chinook while Winthrop NFH back channel releases fared better for coho. A possible rationale for the lower than expected survivals for the respective groups within the two acclimation sites may have been that the on-station coho were fighting an infection of BCWD right up until release while, as mentioned previously, the spring Chinook in the back channel were showing symptoms of a fungus that is one of the causative agents for tail rot.

Additional comparisons between species that were a part of the multispecies acclimation sites as compared to single species sites will be evaluated and reported in the final document.

Table 2. Release-to-McNary juvenile survival estimates for release in the Methow and Wenatchee basin, 2011.

Acclimation Site	**Release-to-McNary Survival**	**Standard Error**
Rohlfing's Pond – Coho	34.3%	3.3%
Rohlfing's Pond - Steelhead	34.8%	3.0%
Winthrop NFH back channel-Spring Chinook	21.9%	6.3%
Winthrop NFH back channel- Coho	47.1%	6.9%
Winthrop NFH- Coho	32.6%	7.3%

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Winthrop NFH- Spring Chinook	54.0%	5.3%
Biddle Pond- Spring Chinook	41.4%	3.9%
Methow FH-spring Chinook	48.0%	3.9%

Discussion Draft

Expanded and Multi-Species Acclimation in the Wenatchee & Methow Subbasins

Project Summary

The Yakama Nation's expanded and multispecies acclimation project was created to fulfill a need for acclimated hatchery releases for both ESA listed steelhead and spring Chinook in the upper Columbia. Within in the Wenatchee, that need has been partially met with steelhead rearing occurring short-term at a central location followed by out-planting juveniles to specific tributaries, which would still not allow for the necessary acclimation on tributary specific waters. Steelhead in the Methow basin would continue to be transported from out-of-basin facilities (Wells FH) and truck planted at target locations during juvenile smoltification, again, severely limiting imprint time on specific water sources. While most spring Chinook releases will receive some acclimation, they are typically released from one single point release, often not within suitable spawning habitat where hatchery spawner contribution did not overlap with the naturally produced fish that they are intended to supplement.

The overarching mission of this project is to improve the efficacy of current supplementation efforts by providing additional acclimation sites with the purpose of improving homing fidelity, adult spawner distribution, and potentially survival rates. This goal has been parsed out into two primary objectives; 1) to evaluate acclimation of multiple species in a shared semi-natural environment, and 2) provide additional single species acclimation sites to meet current management goals in the Methow and Wenatchee subbasins. Since project implementation in 2010, these objectives have been further refined for the project as we move forward with planning for 2012 and are listed below:

1. *Short term objectives*

    a. Evaluate the feasibility of comingling two species within a single acclimation pond. Determine species compatibility based on traits such as run timing, juvenile size, susceptibility to pathogens, and inherent behavioral differences (i.e., establishing territories and/or displaying dominant/aggressive behavior).

    b. Determine species-specific benefits to rearing in a semi-natural environment (e.g., residualism rates for steelhead, comparative growth rates between species if a multiple-use site or growth rates of a similar species but acclimated in two different environments, emigration survival, and post-release residence time)

    c. Minimize straying between watersheds by acclimating on intended surface waters.

2. *Long term objectives*

   a. Through implementation of YN semi-natural acclimation practices (volitional release, time of release, effective condition prior to release, etc.), minimize the hatchery-wild interactions that could alter the survival of naturally produced individuals and impair recovery efforts for those populations.

   b. Maximize the use of limited rearing capacity and inform the future direction of acclimation in the Upper Columbia.

   c. Take advantage of the semi-natural rearing strategy that employs many of the features of “landscape hatcheries” (Williams et. al., 2003) to include natural water temperature regimes that dictate growth rates and degree of smoltification prior to release, system flexibility to allow for responsiveness to the basic principle of adaptive management, and decentralizing releases towards multiple, small scale releases.

   d. With the intent of distributing hatchery origin adults more broadly throughout the watersheds, Proportionate Natural Influence (PNI) values within stream systems will be more uniform. While this project does not manage the natural influence ratios and viability criteria values, providing additional adult management options could lead to a higher probability of success.

Both multi-species and single-species acclimation sites would be operated using existing Chelan County Public Utility District (CCPUD) steelhead hatchery program fish, existing Douglas County PUD (DCPUD)/Grant County PUD (GCPUD) spring Chinook hatchery program fish, and fish from the YN Mid-Columbia Coho Restoration Project. In consultation with the HCP Hatchery Committee and PRCC Hatchery sub-committee, the YN would manage all aspects of design, development, and implementation of the expanded acclimation program. Proposed implementation for 2012 is outlined in Table 1 and will include the following:

1. Three semi-natural multi-species acclimation sites: Rohlfing Pond, adjacent to upper Nason Creek in the Wenatchee subbasin for steelhead and coho, Heath Ponds, located in the upper Methow, and the Winthrop NFH back-channel in the Methow subbasin for spring Chinook and coho. Growth management should be emphasized for all species prior to co-mingling to decrease any potential effects of negative size dependant interactions and allow for adequate spring growth to occur.
2. Two single-species acclimation sites for spring Chinook salmon; all in the Methow subbasin. Biddle Pond, a semi-natural site adjacent to Wolf Creek and used for spring Chinook acclimation over the past two seasons, and Goat Wall, a natural side channel located within the upper Methow. Spring Chinook are available and have been allocated for both locations through marking plans coordinated between YN and WDFW.

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Project sites in the both subbasins will be stocked as early as possible in the spring to maximize the acclimation time on local water (typically mid-April) but may require flexibility by co-managers to work through potential logistical constraints (e.g. inclement weather conditions, site access).

The proposed multi-species sites are located within the mid to upper reaches of spawning habitat for the species being acclimated (spring Chinook, steelhead, and coho) within both the upper Methow River and Nason Creek (Figures 1,2, and 3). The proposed single-species sites are located within the middle to upper reaches of known spawning habitat (Wolf Creek and the Methow River) for spring Chinook. It is anticipated that the returning adults from the proposed sites will spawn in the stream reaches where acclimated.

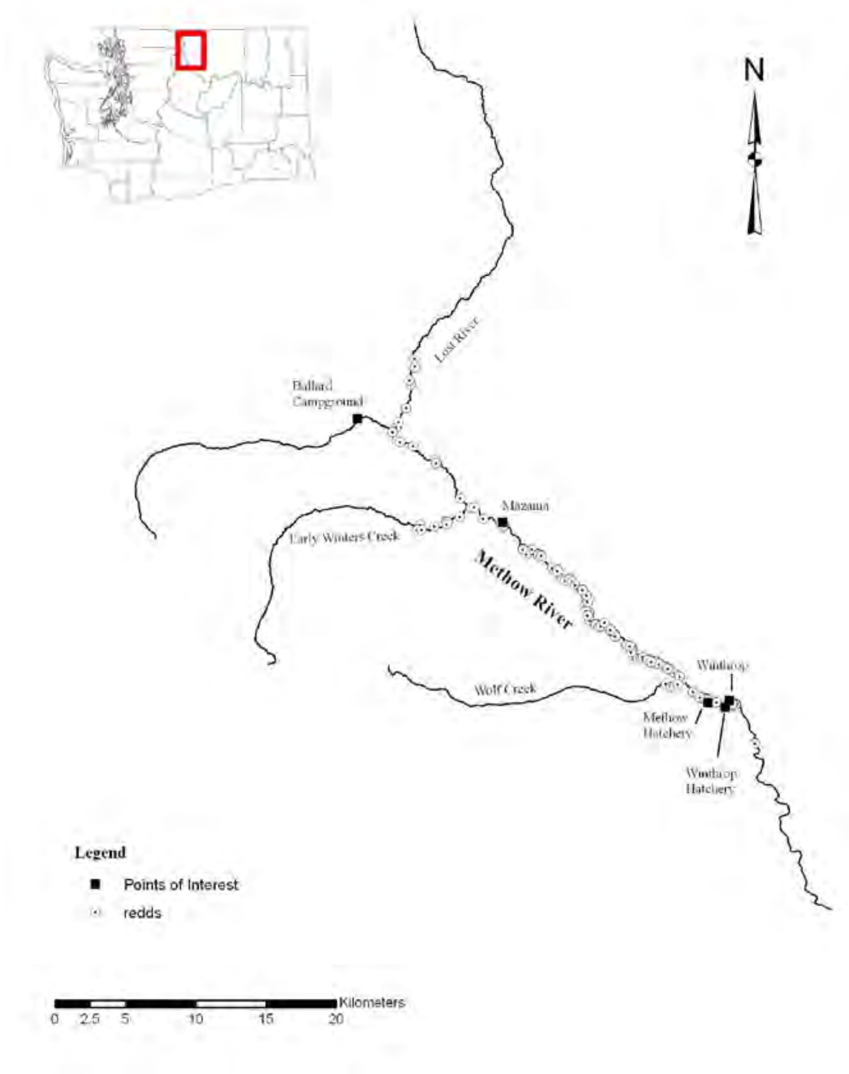

Figure 1. Spatial distribution of spring Chinook redds in the Upper Methow watershed based on GPS waypoints collected during 2009 surveys (Snow et al. 2010).

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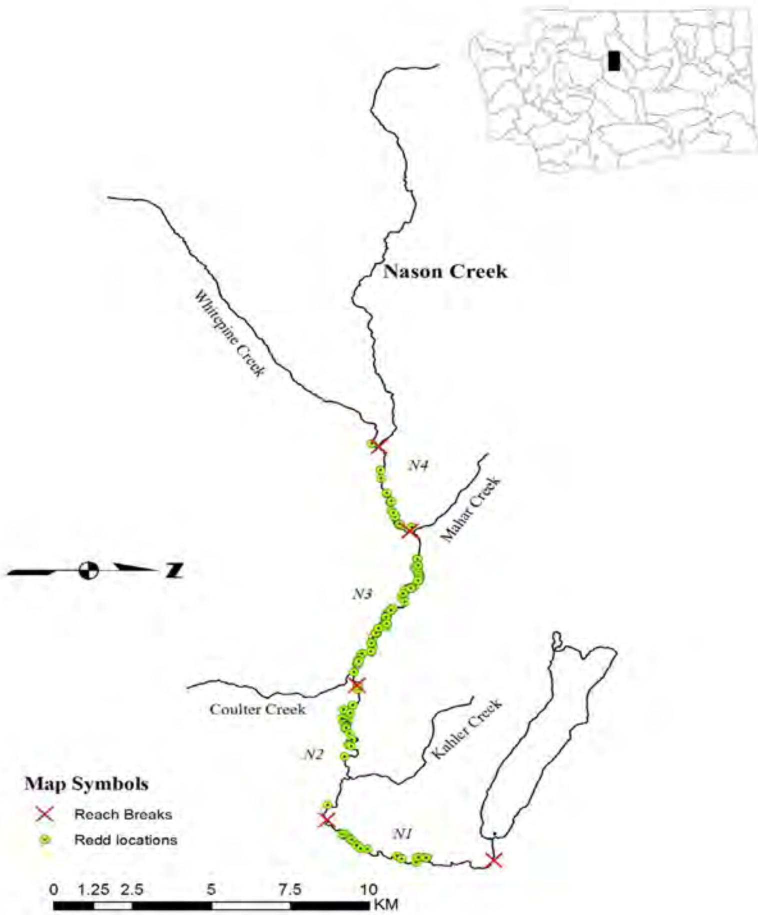

Figure 2. Steelhead spawner distribution in the Nason Creek Basin in 2009 (Hillman et al. 2010)

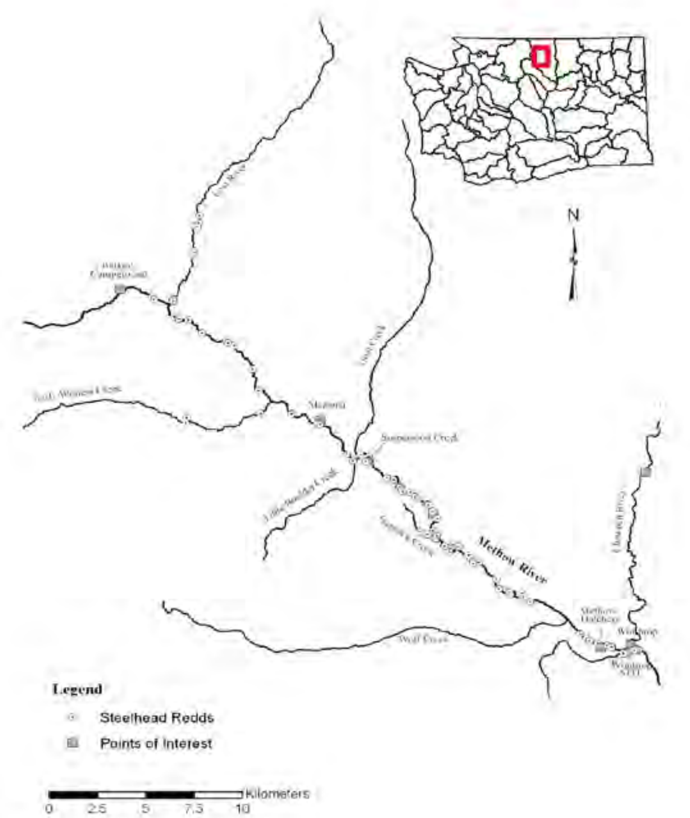

Figure 3. Spatial distribution of summer steelhead redds in the upper Methow River drainage based on GPS waypoints collected during 2009 surveys (Snow et al. 2010). **Does not include redd expansion.**

Release strategies will be similar to the approach currently used in the Mid-Columbia Coho Restoration Project. A portion of all fish placed in the acclimation ponds will be PIT tagged to provide a survival index for release-to-McNary and calculate in-pond survival estimates. Steelhead will be tagged at sufficient numbers to support a SAR estimate with a 90% CI that is within 20% of the true value PIT tag detection systems will be used to monitor volitional releases. For spring Chinook, SARs will be calculated using unique CWT codes.

- Rohlfing Pond (Nason Creek RKM 22.5) would be stocked in 2012 with 20,000-25,000 juvenile steelhead and 80,000-90,000 coho. Rohlfing Pond is located on an unnamed seasonal creek that connects to the lower end of Mahar Creek before reaching Nason Creek at RKM 22.5, and has been in use for coho acclimation since 2002. Approximately 10,000 of the juvenile steelhead as well as 6,000 coho will be PIT tagged. All coho will receive CWTs while steelhead will be provided a unique external mark to discern the Rohlfing's group from the Nason Creek truck planted fish. Mark coordination for steelhead would occur in late summer with WDFW. Modifications to the 2011 net design will allow for a higher level of security against unforeseen environmental conditions. Water source consists of a seasonal stream providing 100% surface water to the site.

- Winthrop NFH back channel (Methow RKM 80.6), a multispecies site would be stocked with approximately 50,000 spring Chinook (Winthrop NFH production) and 50,000 coho in 2012. An estimated 6,000 spring Chinook as well as 6,000 coho would be PIT tagged prior to acclimation. All coho and spring Chinook will have received CWTs. This location is supported by 100% Spring Creek surface water that derives from the foghorn irrigation diversion.

- Heath Ponds (Methow RKM 90.2), a proposed multispecies-species acclimation site located in the upper reaches of the Methow River, would be stocked beginning in 2012 with approximately 60,000 juvenile spring Chinook and 50,000 HxW steelhead currently located at Wells Dam. An estimated 6,000 spring Chinook and 10,000 steelhead would be PIT tagged (Table 1). Chinook would be 100% CWTed while currently marking plans for steelhead to be released in the upper Methow basin are under review and await decision from the HCP committees. Modifications needed for this site would be minimal and include containment nets. Water source would be a mix of groundwater (natural springs within the Heath complex) and Methow River surface water.

- Biddle Pond (Wolf Creek RKM 1.9), a single-species acclimation site adjacent to Wolf Creek would be stocked in 2012 with 60,000 spring Chinook. Between 6,000-10,000 spring Chinook would be PIT tagged and 100% CWT'ed (Table 1).

- Goat Wall Pond (Methow RKM 112.0), a single-species acclimation site on the Methow River would be stocked with 30,000 spring Chinook. Between 6,000-10,000 spring Chinook will be PIT tagged and have been 100% CWT'ed (Table 1). Modifications needed for this site would be minimal and include containment nets at the pond outlet. Water sources for this site would include a small tributary (Gate Creek) as well as Methow River.

Juvenile fish will be transported from rearing facilities to acclimation sites in early spring as soon as the ponds are ice free. Acclimation duration will range from 4-10 weeks depending upon location, weather conditions, and the degree of smoltification. Release dates typically occur the first week of May. After three years of short-term (mid-March to release) multi-species acclimation at Rohlfing Pond, the YN will evaluate acclimation success in terms of established monitoring and evaluation metrics (see "***Monitoring and Evaluation***"); 2012 would mark the 3rd year for this site. If the determination is made that short-term, multi-species acclimation can be improved upon through longer acclimation or is not producing favorable results; overwinter acclimation may be proposed for testing at this site.

Attachment F

Table 1. Expanded acclimation sites proposed for 2012 implementation in the Wenatchee and Methow subbasins.

Acclimation Site	Subbasin	Species	Number of Juveniles	Number of Juveniles Marked (i.e.- CWT's, EL, etc.)	Number of Juveniles PIT tagged
Multi-species					
Winthrop NFH back Channel	Methow	Spring Chinook (Winthrop NFH production)	50,000	100% CWT'ed	6,000
		Coho (Mid-Columbia Coho Restoration project)	50,000	100% CWT'ed	6,000
Rohlfing Pond	Wenatchee	Coho (Mid-Columbia Coho Restoration project)	80,000 – 90,000	100% CWT'ed	6,000
		Wenatchee steelhead WxW	20,000-25,000	TBD	10,000
Heath Pond	Methow	Spring Chinook (Methow FH; Methow Composite Stock)	60,000	100% CWT'ed	6,000
		Methow HxW steelhead	50,000	TBD	10,000
Single-species					
Biddle Pond	Methow	Spring Chinook (Methow FH; Methow Composite Stock)	60,000	100% CWT'ed	6,000
Goat Wall Pond	Methow	Spring Chinook (Methow FH Methow Composite Stock)	30,000	100% CWT'ed	6,000

Monitoring and Evaluation

As described within the objectives of the project, M&E will be implemented to: (1) test acclimation of two species co-mingled in semi-natural acclimation sites, and (2) demonstrate increased spawner distribution and survival of returning adults as a result of expanded acclimation. Success of expanded acclimation and a multi-species acclimation strategies using semi-natural and natural acclimation sites will be determined based on the following performance indicators for each of the sites listed in Table 1: In-pond growth, in-pond survival, survival to McNary Dam, SARs, and spawner distribution (Tables 2 and 3) are detailed below:

In-Pond Growth

Objective: To estimate in-pond growth (arrival at site-to-volitional release) of spring Chinook, coho, and steelhead acclimated at Project sites.

Metric: An in-pond growth estimate, from arrival at the acclimation site to release, will be based on weekly sampling of growth and will be calculated as follows:

$$S_{\text{in-pond growth}} = \text{Smolts}_{\text{emigration}} - \text{juveniles}_{\textbf{on-site arrival}}$$

Where $S_{\text{in-pond growth}}$ is the estimated rate of in-pond growth; $\text{Smolts}_{\textbf{emigration}}$ is the average size of smolts prior to emigration; and $\text{juveniles}_{\textbf{on-site arrival}}$ is the average size of juveniles upon arrival at the acclimation site.

Rationale: In-pond growth may be diagnostic of negative species interactions in multi-species acclimation ponds when compared with growth in single-species acclimation ponds. This information will be used to adaptively manage semi-natural pond acclimation strategies to produce healthy smolts, thereby maximizing survival.

Method: Juveniles will be sampled weekly to measure growth. Air and water temperatures will be recorded daily. While interactions between species may affect growth rates, so might environmental factors. For example, overall growth in a given acclimation period may be related to an unusually cold spring with temperatures directly affecting conversion rates of feed to biomass.

Evaluation:

1. Compare in-pond growth of coho acclimated at the semi-natural, multi-species sites (Rohlfing Pond and Winthrop NFH back-channel) to in-pond growth for coho acclimated within the same year at semi-natural and natural single-species sites (Coulter Pond and/or Butcher Pond in the Wenatchee and Lower Twisp Pond in the Methow) and in previous years at semi-natural and natural single-species acclimation sites (Rohlfing Pond, Coulter Pond, Butcher Pond, Winthrop NFH back-channel, and Lower Twisp Ponds).

2. Compare in-pond growth for spring Chinook acclimated in a multi-species acclimation pond to in-pond growth for spring Chinook acclimated in conventional acclimation environments.
3. Compare in-pond growth for steelhead acclimated in a semi-natural multi-species acclimation pond (Rohlfing's Pond and Heath Ponds), to steelhead acclimated in a semi-natural, single-species pond (Blackbird Pond) and in hatchery environments (Chiwawa Recirculation Evaluation [Chiwawa Fish Hatchery], Eastbank Fish Hatchery, Wells FH).

In-Pond Survival

Objective: To estimate in-pond survival (from arrival at the site to volitional release) of juvenile spring Chinook, coho, and steelhead acclimated at Project sites.

Metric 1: In-pond survival rate estimates for juveniles at all acclimation sites will be based on PIT-tag detections as described below and will be calculated as follows:

$$S_{ip} = \frac{(D_{outlet} / E_{detection})}{\text{PIT total}}$$

Where S_{ip} = in-pond survival; D_{outlet} = unique detections at the pond outlet; $E_{detection}$ = estimated PIT-tag detection efficiency at the outlet; and PIT_{total} = the total number of PIT-tagged fish released into the pond.

Rationale: In-pond survival estimates will be used to assess potential negative species interactions, predator control strategies and to evaluate the effectiveness of natural acclimation relative to conventional smolt release.

Method: Up to 10,000 of each species within a pond will be PIT-tagged prior to being transported to the acclimation site (Table 1). All PIT-tagging will follow protocols described in the PIT-tag Marking Procedures Manual (CBFWA 1999). PIT-tag detection antenna will be installed to detect fish volitionally emigrating from the acclimation sites.

Metric 2: If residual steelhead are observed, the in-pond survival rate estimate will be adjusted to account for residualization as described below and will be calculated as follows:

$$S_{ip} = \frac{(D_{outlet} / E_{detection})}{PIT_{total} - R_{residualism}}$$

Where S_{ip} = in-pond survival rate; D_{outlet} = unique detections at the pond outlet; $E_{detection}$ = estimated PIT-tag detection efficiency at the outlet; PIT_{total} = the total number of PIT-tagged fish released into the pond; and $R_{residualism}$ = the number of juveniles residualized. Residualism will be calculated as described in the section "***Residualism***".

Rationale: In-pond survival rate estimates will be used to evaluate the success of acclimation and predator control strategies, allowing researchers to maximize survival through adaptive management. To get accurate estimates of in-pond survival rates, residualized juveniles must be deducted from PIT_{total} so they are not counted as mortalities.

Method: 10,000 juvenile steelhead will be PIT-tagged prior to being placed in the multispecies acclimation location. All PIT-tagging will follow protocols described in the PIT-tag Marking Procedures Manual (CBFWA 1999). PIT-tag detection antenna will be installed to detect fish volitionally emigrating from the acclimation sites.

Pit-tag Detection

Acclimation ponds will be equipped with PIT-tag detectors so in-pond survival estimates can be measured with the use of PIT-tagged fish. A portion of juveniles will be tagged at each acclimation site to provide for estimates of in-pond survival, release-to-McNary Dam survival, and SARs. Since 2008, PIT-tag antenna arrays have been in operation at both Rohlfing Pond in Nason Creek and Winthrop NFH back-channel in Spring Creek. A PIT tag detection system will be installed at Biddle Pond, Heath Pond, and Goat Wall Pond prior to their use as acclimation sites. Additional arrays will be made available through ongoing installation efforts by USGS, USFWS, and WDFW so that YN may increase sample sizes for survival estimates.

The efficiency of the PIT-tag arrays installed at the outlets will be estimated with the following formula:

$$E_{detection} = \frac{\text{\# unique outlet detections that were also detected downstream}}{\text{Total number of unique detections at downstream interrogation sites}}$$

By querying the PIT Tag Information System (PTAGIS) database for downstream PIT-tag detections for fish released from a given acclimation pond, the efficiency of antennas can be estimated by determining the proportion of the fish detected downstream that were also detected exiting the pond.

Predation Assessment

In conjunction with the Mid-Columbia Coho Restoration Program (Kamphaus et al. 2009), during 2008 predation, M&E results indicated estimated predator consumption varied between acclimation ponds. Pond shape, pond size, numbers of coho, geographic location, riparian area, and aquatic vegetation all affected the predator abundance and predation mortality. Primary predators observed in 2008 during predator control efforts were the North American river otter (*Lutra canadensis*) and the common merganser (*Mergus merganser*). In addition to these key predators, mink, belted kingfishers, great blue herons, and hooded mergansers have all been documented throughout the Wenatchee and Methow subbasins and were observed in small numbers at some of the coho acclimation sites. Mallards and other “dabbler” types of ducks have recently also been identified as opportunistic, piscivorous predators if ideal conditions are present (Kamphaus et al. 2009). Since 2006, estimated predation numbers at the coho acclimation sites have decreased, in part due to the extended hazing efforts conducted by YN personnel during the coho acclimation period. During the period of acclimation, staff will be stationed at the acclimation sites from dawn until dusk, 7 days per week. Hazing tactics are particularly effective against sight-feeding avian predators such as mergansers and mallards during 2008 coho acclimation. Once hazing pressure was applied however, mammalian feeders, primarily North American river otter, tended to shift toward nocturnal feeding. This behavior limited the effectiveness of hazing efforts by YN personnel. Although hazing efforts were very beneficial, predation still occurred at these locations.

Rationale: During acclimation, unaccounted loss for all juvenile salmonid species maybe a result of predation. If uncontrolled, predation can have a significant impact on survival during acclimation, not only directly but also indirectly through elevated and repeated stress. Unusually high densities of fish can create an optimal situation for predation while consistent stress events can delay coho stimuli for flight response through this prolonged predation exposure. Predation mortality estimates will be used to evaluate the success of predator control strategies at acclimation sites, allowing researchers to maximize survival during acclimation through adaptive management. The predator assessment model will not be used to determine in-pond survival, rather will serve as an index of much predation is occurring, the efficacy of hazing techniques as well as when and where increased predator hazing is required. The predation model may also inform us approximately how much of the in-pond mortality (PIT tag estimate) is the result of predation.

Method: As standard practice, moribund and deceased juvenile salmonids will be recovered from each site location daily until the end of release to determine known mortality during the acclimation period. Daily documentation of predator abundance will be used to estimate predation mortality at all acclimation sites using the following equation:

$$E_c = C_t * FPP * N_i * C_d$$

Where E_c= estimated consumption for an individual predator; C_t= consumption total per day (kg) for an individual predator; FPP= fish per pound; N_i= number of same species predators observed during time interval i; and C_d= duration of same species predators observed.

Evaluation:

1. Compare in-pond survival of coho acclimated at the semi-natural multi-species sites (Rohlfing Pond and Winthrop NFH back channel) to in-pond survival for coho acclimated within the same year at semi-natural and natural single-species sites

(Coulter Pond, Butcher Pond, and Lower Twisp Ponds) and in previous years at semi-natural and natural single-species acclimation sites (Rohlfing Pond, Coulter Pond, Butcher Pond, Lower Twisp Ponds, and Winthrop NFH back channel).

2. Compare in-pond survival for spring Chinook acclimated in a multi-species acclimation pond to in-pond survival for spring Chinook acclimated in conventional acclimation environments.
3. Compare in-pond survival for steelhead acclimated in Rohlfing Pond and Heath Ponds, semi-natural multi-species acclimation ponds, to in-pond survival for steelhead acclimated in a semi-natural, single-species pond (Blackbird Pond) and in hatchery environments (Chiwawa Recirculation Evaluation [Chiwawa Fish Hatchery], Eastbank Fish Hatchery, and Wells FH, if applicable).

Release to McNary Dam survival

Objective: To estimate smolt survival of spring Chinook, coho, and steelhead acclimated at Project sites from the point of release to a downstream point.

Metric: A survival-to-McNary Dam estimate will be based on PIT tag detection (Neeley 2007) and will be calculated as follows:

$$S_{\textbf{suvival to Mcnary}} = \frac{\text{smolts}_{\textbf{McNary}}}{\text{smolts}_{\textbf{emigrated}}}$$

Where $S_{\text{survival to McNary}}$ is the estimated rate of survival to McNary Dam; $\text{smolts}_{\textbf{emigrated}}$ is the estimated number of PIT tagged smolts emigrating from a given acclimation site; and $\text{smolts}_{\textbf{McNary}}$ is the estimated number of smolts passing McNary Dam.

Rationale: Estimates of smolt survival-to-McNary Dam will be used to adaptively manage semi-natural pond acclimation strategies to produce healthy smolts, thereby maximizing survival.

Method: A portion of the juvenile spring Chinook, steelhead, and coho will be PIT-tagged prior to being placed in the acclimation ponds (Table 1) to support an estimate with a 90% CI that is within 20% of the true value (range: 6,000-10,000 PIT tags). All PIT-tagging will follow protocols described in the PIT-tag Marking Procedures Manual (CBFWA 1999). PIT-tag detection antenna arrays will be installed to detect fish volitionally emigrating from the multi-species acclimation sites. Survival-to-McNary Dam will be calculated based on PIT-tag detections at McNary Dam.

Evaluation:

1. Compare survival-to-McNary Dam of coho acclimated at the semi-natural multi-species sites (Rohlfing Pond and Winthrop NFH back channel) to survival-to-McNary Dam for coho acclimated within the same year at semi-natural and natural

single-species sites (Coulter Pond, Butcher Pond, and Lower Twisp Ponds) and in previous years at semi-natural and natural single-species acclimation sites (Rohlfing Pond, Coulter Pond, Butcher Pond, Twisp Ponds, and Winthrop NFH back channel).

2. Compare survival-to-McNary Dam for spring Chinook acclimated in a multi-species acclimation pond to survival-to-McNary Dam for spring Chinook acclimated in conventional acclimation environments.
3. Compare survival-to-McNary Dam for steelhead acclimated in Rohlfing Pond and Heath Ponds, semi-natural multi-species acclimation ponds, to survival-to-McNary Dam for steelhead acclimated in a semi-natural, single-species pond (Blackbird Pond) and in hatchery environments (Chiwawa Recirculation Evaluation [Chiwawa Fish Hatchery], Eastbank Fish Hatchery, and Wells FH).

Residualism

Objective: To estimate numbers of residualized juvenile steelhead for Rohlfings Pond and Heath Ponds.

Metric: Residualism will be calculated as follows:

$$S_{\text{residualism}} = \frac{\text{fish}_{\text{remaining in pond}}}{\text{Juveniles}_{\text{exiting the pond+remaining in the pond}}}$$

Where $S_{\text{residualism}}$ is the estimated rate of residualized fish; $\text{fish}_{\text{remaining in pond}}$ is the estimated number of fish remaining in the pond after access to the stream has been precluded following seven consecutive days of zero detection at the outlet PIT tag detectors; $\text{Juveniles}_{\text{exiting the poind+remaining in the pond}}$ is the number of juveniles detected exiting the pond plus the number of juveniles estimated to have remained in the pond.

Rationale: Estimating residualism rates of steelhead in Rohlfing Pond and Heath Ponds is needed to accurately calculate in-pond survival estimates for the project steelhead acclimated in these two sites. The in-pond survival estimate will be adjusted to account for residualization as described in the previous section "***In-pond Survival";*** Metric #2. In observations of hatchery steelhead that fail to migrate, negative interactions with wild salmonids are observed, largely as a function of the greater size and more aggressive behavior of hatchery fish. Monitoring residualism rates in fish acclimated in a multi-species, semi-natural environments will be beneficial in assessing the extent to which multi-species acclimation in semi-natural environments might contribute to greater residualism.

Methods: 10,000 juvenile steelhead will be PIT-tagged prior to being placed in the acclimation pond. All PIT-tagging will follow protocols described in the PIT-tag Marking Procedures Manual (CBFWA 1999). PIT-tag detection antenna arrays will be installed to detect fish volitionally emigrating from the multi-species acclimation site. To avoid release of non-migrating individuals, access to the stream will be precluded following seven consecutive days of zero detection at the outlet PIT tag detectors. YN staff will then snorkel the pond using multiple counters to develop an estimate of residualized steelhead. If too many fish are present to effectively be counted using underwater observation techniques then a mark/recapture survey will be implemented to determine the number of steelhead residualized in the pond. Using hook and line sampling and some form of marking to be determined, an estimate of residualized steelhead will be calculated. Residualized steelhead will be kept in the pond overwinter. A minimum flow requirement for inlet flows will be determined and flows into the pond will be monitored. If inlet flow drops below minimum targets, a fish rescue will be implemented.

Evaluation:

1. Residualism will be calculated and recorded for steelhead acclimated at Rohlfing Pond and Heath Pond. No comparisons on residualism for conventionally-reared and released steelhead because in hatchery fish are all either forced-released from hatchery acclimation ponds or are truck-planted and residualism is unknown.

Smolt-to-Adult (SAR) returns

Objective: To demonstrate increased smolt-to-adult survival for fish acclimated at expanded acclimation sites.

Metric: An estimate of SARs will be calculated for fish acclimated at expanded acclimation sites based on survival from acclimation sites to spawning grounds as an adult. SARs will be calculated as follows:

$$S_{\text{smolt-adult}} = \text{Adults and Jacks}_{\textbf{broodyear X}} / \text{Smolts}_{\textbf{broodyear X}}$$

Where $S_{\text{smolt-adult}}$ is the estimated smolt-to-adult survival rates; Adults and Jacks $_{\textbf{broodyear}\ \boldsymbol{X}}$ is the number of adults to return from broodyear *X* ; Smolts $_{\textbf{broodyear}\ \boldsymbol{X}}$ is the population of emigrating smolts.

Rationale: SARs will be used to demonstrate the extent to which the expanded acclimation sites are contributing to adult returns. Knowledge of how SAR indices (growth rates, smolt size, and acclimation length) correlated with rearing and environmental conditions (single species natural and semi-natural acclimation environments, multi-species natural and semi-natural acclimation environments, and conventional program of single-species, single release, hatchery rearing/acclimation, or truck plants) will allow researchers to adaptively manage the acclimation effort to maximize survival.

Methods: Prior to being placed in the acclimation ponds, sites that do not have supplemental marks for determining SARs (i.e.-CWT'ing), a portion of all juvenile fish will be PIT tagged (Table 1) to support a SAR estimate with a 90% CI that is within 20% of the true value. All PIT-tagging will follow protocols described in the PIT-tag Marking Procedures Manual (CBFWA 1999). All juvenile spring Chinook placed in Biddle Pond, Winthrop NFH back channel, and Goat Wall Pond will also be coded-wire tagged. PIT-tag detection antenna systems will be installed to detect fish volitionally emigrating from the expanded acclimation sites. SARs will be calculated based on PIT-tag detections at FCRPS dams and PIT tag detections at tributary detection arrays in operation in the Wenatchee and Methow subbasins, coupled with CWTs as applicable. The YN would implement carcass recovery surveys in Wolf Creek if additional surveys are needed, consistent with methodologies identified in the DCPUD M&E Plan, as necessary, to supplement PUD M&E Plan surveys. Under DCPUD's M&E Plan, Wolf Creek surveys are conducted by WDFW on a rotating-panel sampling design and currently surveys only extend upstream to RKM 1.9 (Biddle Pond outlet). Pre-release CWT retentions will be used to estimate the number of fish with CWTs released.

Evaluation:

2. Compare SARs of coho acclimated at the semi-natural multi-species sites (Rohlfing Pond and Winthrop NFH back channel) to SARs for coho acclimated within the same year at semi-natural and natural single-species sites (Coulter Pond, Butcher Pond, Lower Twisp Ponds) and in previous years at semi-natural and natural single-species acclimation sites (Rohlfing Pond, Coulter Pond, Butcher Pond, Winthrop NFH back channel, and Lower Twisp Pond).
3. Compare SARs for spring Chinook acclimated in a multi-species acclimation pond to SARs for spring Chinook acclimated in conventional acclimation environments.
4. Compare SARs for steelhead acclimated in Rohlfing Pond and Heath Pond, semi-natural multi-species acclimation ponds, to SARs for steelhead acclimated in a semi-natural, single-species pond (Blackbird Pond), in hatchery environments (Chiwawa Recirculation Evaluation [Chiwawa Fish Hatchery], Eastbank Fish Hatchery), Wells FH and direct plant releases (e.g.-Nason Creek and Methow/Chewuch releases).

Adult spawner distribution

Objective: To demonstrate increased distribution of steelhead and coho in the Wenatchee subbasin and spring Chinook, coho, and steelhead in the Methow subbasin acclimated at the expanded acclimation sites, both multi-species and single-species sites.

Metric: Using PIT tag detections at arrays in subbasin tributaries, coupled with CWTs, adult distribution will be monitored and recorded.

Rationale: Adult distribution will be monitored and recorded to demonstrate distribution during years when expanded acclimation is provided. Expanding acclimation of existing hatchery programs is intended to demonstrate improved adult dispersal to stream reaches targeted by acclimation.

Methods: Adult distribution will be evaluated based on the location of carcasses recovered during spawning ground surveys and on PIT tag detections at tributary detection arrays in operation in the Wenatchee and Methow subbasins (Appendix B, Figures 2 and 5). The YN will conduct spawning ground surveys in Wolf Creek as necessary and SARs will be estimated based on retrieval of CWTs. All other spawning ground surveys will be conducted under PUD M&E Plan activities (survey methods are provided in the PUD HCP M&E Plans). Project fish acclimated in expanded acclimation sites will be compared with the reference condition. The reference condition is the distribution of spring Chinook and steelhead currently expressed under conventional or established release strategies being implemented in accordance with the CCPUD and DCPUD hatchery programs in the Wenatchee and Methow subbasins, respectively.

Evaluation:

1. Compare adult distribution of coho in years with multi-species acclimation at Rohlfing Pond and single-species acclimation at Coulter and Butcher ponds to adult distribution in previous years all with single-species acclimation. Compare adult distribution of coho in the Methow subbasin with acclimation at Winthrop NFH back channel and Lower Twisp Ponds to adult distribution of coho in previous years with no subbasin acclimation.
2. Compare adult distribution for spring Chinook in years with acclimation provided at Heath Pond, Biddle Pond, and Goat Wall Pond to adult distribution for spring Chinook in previous years with acclimation at the Methow FH only.
3. Compare adult distribution for steelhead for years with acclimation provided at Rohlfing Pond and Heath Ponds to adult distribution for steelhead in previous years using only truck plants in Nason Creek, acclimation at Blackbird Pond, and truck plants in Upper Methow/Chewuch.

Attachment F

Table 2. Multi-species acclimation site evaluations.

Site	Subbasin/ Stream	Performance Indicator	Treatment Species	Reference Condition	Expected VSP Contributions (as measured by HCP M&E Program)	
					Abundance/ Productivity (A and P)	**Spatial Structure/ Diversity**
Rohlfing Pond	Wenatchee/ Nason Creek	In-pond growth	WxW Steelhead 20-25K (Eastbank FH)	Single species natural ponds and hatcheries (Blackbird Island, Chiwawa Recirculation evaluation, and Eastbank FH)	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
			Coho 80K - 90K	Single species natural ponds (within year and historical)	Evaluation of the contribution of coho adult returns and distribution on VSP parameters is not a metric evaluated under this Project but is covered under the Mid-Columbia Coho Restoration Program.	
		In-pond survival	Same as for in-pond growth	Same as for in-pond growth	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.

Attachment F

Site	Subbasin/ Stream	Performance Indicator	Treatment Species	Reference Condition	Expected VSP Contributions (as measured by HCP M&E Program)	
					Abundance/ Productivity (A and P)	Spatial Structure/ Diversity
Rohlfing Pond	Wenatchee/ Nason Creek	Residualism	WxW Steelhead (Eastbank FH)	Same as for in-pond growth	Not a performance indicator but needed to accurately calculate the indicators	Not a performance indicator but needed to accurately calculate the indicators
		Release to MCN survival	Same as for in-pond growth	Same as for in-pond growth	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
		SAR				
		Adult distribution				
Heath Ponds	Upper Methow	In-pond growth	HxW Steelhead 50K (Wells FH)	Single species hatcheries (Methow FH and Wells FH)	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.

Attachment F

Site	Subbasin/ Stream	Performance Indicator	Treatment Species	Reference Condition	Expected VSP Contributions (as measured by HCP M&E Program)	
					Abundance/ Productivity (A and P)	Spatial Structure/ Diversity
Heath Ponds	Upper Methow	In-pond growth (cont)	Spring Chinook 60K	Single species, on-station acclimation at Methow FH and natural ponds	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
		In-pond survival	Same as for in-pond growth	Same as for in-pond growth	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
		Residualism	HxW Steelhead (Wells FH)	Same as for in-pond growth	Not a performance indicator but needed to accurately calculate the indicators	Not a performance indicator but needed to accurately calculate the indicators

Attachment F

<table>
<tr><th rowspan="2">Site</th><th rowspan="2">Subbasin/ Stream</th><th rowspan="2">Performance Indicator</th><th rowspan="2">Treatment Species</th><th rowspan="2">Reference Condition</th><th colspan="2">Expected VSP Contributions (as measured by HCP M&E Program)</th></tr>
<tr><th>Abundance/ Productivity (A and P)</th><th>Spatial Structure/ Diversity</th></tr>
<tr><td rowspan="3">Heath Ponds</td><td rowspan="3">Upper Methow</td><td>Release to MCN survival</td><td rowspan="3">Same as for in-pond growth</td><td rowspan="3">Same as for in-pond growth</td><td rowspan="3">Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.</td><td rowspan="3">If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.</td></tr>
<tr><td>SAR</td></tr>
<tr><td>Adult distribution</td></tr>
<tr><td>Winthrop NFH back channel</td><td>Methow River</td><td>In-pond growth</td><td>Methow stock spring Chinook 50K (Winthrop NFH)</td><td>Single species, on-station acclimation at Winthrop NFH and natural ponds</td><td>Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.</td><td>If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.</td></tr>
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Attachment F

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<tr><th rowspan="2">Site</th><th rowspan="2">Subbasin/ Stream</th><th rowspan="2">Performance Indicator</th><th rowspan="2">Treatment Species</th><th rowspan="2">Reference Condition</th><th colspan="2">Expected VSP Contributions (as measured by HCP M&E Program)</th></tr>
<tr><th>Abundance/ Productivity (A and P)</th><th>Spatial Structure/ Diversity</th></tr>
<tr><td rowspan="5">Winthrop NFH back channel</td><td rowspan="5">Methow River</td><td>In-pond growth</td><td>Coho
50K</td><td>Single species, on-station acclimation at Winthrop NFH and natural ponds</td><td colspan="2">Evaluation of the contribution of coho adult returns and distribution on VSP parameters is not a metric evaluated under this Project but is covered under the Mid-Columbia Coho Restoration Program.</td></tr>
<tr><td>In-pond survival</td><td>Same as for in-pond growth</td><td>Same as for in-pond growth</td><td rowspan="4">Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.</td><td rowspan="4">If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.</td></tr>
<tr><td>Release to MCN survival</td><td rowspan="3">Same as for in-pond</td><td rowspan="3">Same as for in-pond growth</td></tr>
<tr><td>SAR</td></tr>
<tr><td>Adult distribution</td></tr>
</table>

Table 3. Single-species acclimation site evaluations.

Site	Subbasin/ Stream	Performance Indicator	Treatment Species	Reference Condition	Expected VSP Contributions (as measured by HCP M&E Program)	
					Abundance/ Productivity	**Spatial Structure/ Diversity**
Biddle Pond	Methow/ Wolf Creek	In-pond growth and fish condition	MetComp stock Spring Chinook (Methow FH) 60K	Conventional Methow FH spring Chinook program	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
		In-pond survival	Same as for in-pond growth and fish condition	Same as for in-pond growth and fish condition		
		Release to MCN survival				
		SAR				
		Adult distribution				
Goat Wall Pond	Methow/ Upper Methow River	In-pond growth	MetComp stock Spring Chinook (Methow FH) 30K	Conventional Methow FH spring Chinook program	Adult spawners returning and distributing into appropriate and often under seeded habitats will result in increased abundance and productivity when compared to returns to conventional, large single release points where density dependent factors occur.	If adult fish return to the vicinity of dispersed acclimation ponds and colonize unused habitat, then spatial distribution and life history diversity would increase.
		In-pond survival	Same as for in-pond growth	Same as for in-pond growth		
		Release to MCN survival				
		SAR				
		Adult distribution				

The YN will evaluate in-pond growth and survival, estimate survival-to-McNary Dam and SARs, and monitor fish distribution for tagged, returning adult fish acclimated at expanded acclimation sites. The YN will also estimate in-pond residualism for steelhead at Rohlfing Pond. Overall effects of the supplementation program on the population will be evaluated entirely under the PUDs' M&E Plans (Murdoch and Peven 2007, DCPUD 2007, Pearsons and Langshaw 2009) and not partitioned to show effects separately for fish acclimated as part of this project. The YN will partition out fish acclimated at expanded acclimation sites and provide SAR estimates for project fish. Adult distribution will be recorded for fish acclimated at the expanded acclimation sites based on PIT tag detections at tributary and mainstem detection arrays in operation in the Wenatchee and Methow subbasins as well as CWT recoveries form carcass surveys conducted by WDFW as part of the PUD's M&E Plan. If additional spawning ground surveys are necessary in Wolf Creek or other areas not targeted through current M&E efforts, the YN would coordinate with WDFW and conduct additional surveys using appropriate protocols. Adult distribution will be used to evaluate any changes to hatchery spawner distribution as a result of this project (Figures 1-3).

The expanded, multi-species acclimation project would be closely integrated with on-going M&E projects associated with mitigation hatchery programs funded by the mid-Columbia PUDs. There are eight objectives in the PUD M&E Plans that are relevant to the goals of this acclimation project:

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.
2. Determine if run timing, spawn timing, and spawner distribution of both the natural and hatchery components of the target population are similar.
3. Determine if genetic diversity, population structure, and effective population size have changed in natural spawning population as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.
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 Hatchery Replacement Rate (HRR) expected value based on survival rates listed in the Biological Assessment and Management Plan (BAMP; NMFS et al. 1998).
5. Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.
6. Determine if hatchery fish were released at the programmed size and number.

7. Determine if the proportion of hatchery fish on the spawning ground affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.
8. Determine if harvest opportunities have been provided using hatchery returning adults where appropriate.

Where applicable, information from the PUDs' M&E programs will be incorporated with in-pond survival to determine the future direction of this project (i.e., whether to pursue multi-species acclimation or continue to implement only single-species natural acclimation). The first 3-year check-in scheduled under the expanded acclimation project will occur in 2013. The process to evaluate results and determine project success and benefits and a path forward for Wenatchee and Methow hatchery program production will be made in consultation with the HCP Hatchery Committees and the PRCC Hatchery Sub-Committee.

Communication Plan

In conjunction with implementation of the Expanded and Multispecies Acclimation Plan, a communication plan would be developed to update and inform other stakeholders involved within the project as to current and unexpected events that may occur during the acclimation period. In an event that there is a deviation from the outlined plan, below is a prescription of the communication that would occur:

1. Incident or observations identified by field staff to be relayed to the biologist directly overseeing the project (Cory Kamphaus, YN) within 24 hours of the event first occurring. Field staff will effectively try and remedy the situation if possible, but at a minimum, continue to monitor the situation (i.e. - disease outbreak, D.O.'s dropping, etc.) until additional measures are taken.

2. YN project biologist would then contact representatives from the various entities (e.g.- Chelan PUD, Grant PUD, Douglas PUD, WDFW) to inform them of the current issues and the severity of the event.

3. YN project biologist will provide a memo documenting the nature of the event, how it was remedied or being monitored, plan of action if conditions continue and are unable to be modified, to YN's HCP representatives (Tom Scribner and Keely Murdoch) for distribution to the various committee members involved.

4. Committee feedback on additional direction outside of what has been decided by YN would then take place if further action is required.

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720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	September 21, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of the August 30, 2011, HCP Hatchery Committees' Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met by conference call on Tuesday, August 30, 2011, from 1:00 pm to 2:00 pm. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Douglas, Chelan, and Grant PUDs will develop a draft No Net Impact (NNI) Hatchery Implementation Plan and provide it to Carmen Andonaegui for distribution to the Committees by September 14, 2011, for consideration at the September 21, 2011, Committees' meeting (Item II-B).

DECISION SUMMARY

- The Hatchery Committees agreed to move forward with development of a 2013 to 2023 NNI Hatchery Implementation Plan (Item II-A).

I. Welcome

Mike Schiewe opened the call by saying that there were two goals for today's conference call: 1) to seek concurrence on moving forward with development of 2013 to 2023 hatchery implementation plans, based on the range of NNI compensation estimates presented at the August 17, 2011, Hatchery Committees' meeting; and 2) to begin discussion of agency and tribal priorities for production of plan species and their release locations. The latter will be considered by Hatchery Committees' members during development of the implementation plans. Schiewe said that the ranges of production levels were bounded by the high and low estimates calculated by the PUDs in the sensitivity analysis, and the estimates varied depending on which hatchery programs were included or excluded from the recalculation, and whether a smolt-to-adult return (SAR) credit was used for adult equivalents. He said that final program sizes will be defined in the Hatchery Implementation Plans, and that working from a range of program sizes allowed for flexibility in meeting program goals.

II. All Parties

A. Moving forward on development of the NNI Recalculation Implementation Plan

Craig Busack said that the use of the phrase "which programs are in and which are out" during discussions was confusing, given that the discussion is really about which mitigation elements are under consideration and subject to recalculation, and how SARs are included or not included in the recalculation. He asked for clarification. The PUDs confirmed that including Grand Coulee mitigation fish in recalculation was agreeable. What is in dispute are which losses of NNI mitigation fish at downstream projects are subject to mitigation, and whether mitigating for inundation losses are included in recalculation. Regarding credit for SARs for mitigation fish, Mike Schiewe said that one estimation option (Option 3) considered having all hatchery programs to require mitigation and excludes the SAR credit, thus creating a program alternative of maximum size. Busack said that he is comfortable with moving forward to develop an implementation plan with a range of production levels. He said that when evaluating recalculated hatchery program effects, he will consider National Marine Fisheries Service (NMFS) tribal trust responsibility and NMFS responsibilities under the Endangered Species Act (ESA). Busack said he will be looking to maximize ESA benefits while avoiding impacts to the tribal trust during implementation of the mid-Columbia HCPs. He said that implementation of the HCPs cannot have a negative impact on ESA-listed species. Schiewe said that the Commitees anticipate that NMFS would provide such leadership on avoiding or minimizing impacts to ESA-listed species impacts during implementation plan development.

Busack said that he supports employing a SAR credit in the recalculation, saying this is an incentive to build better hatcheries. He said that he is still considering the pros and cons of mitigating for NNI fish and requiring mitigation for inundation. Mike Tonseth said he feels the Committees' time is best served moving forward with developing an implementation plan. Kirk Truscott said that he is fine moving onto development of an implementation plan with the range of production levels from the sensitivity analysis. Tom Scribner said he would like to move forward with implementation planning, which was the point of his earlier proposal to the Committees at the July 20, 2011, meeting. Bill Gale said he supported moving on to implementation planning but that he was still concerned about not being able to come to agreement on recalculated hatchery production levels. He said that not having this agreement will make the next recalculation in 2023 more difficult. Gale said it is important that there is a clear record showing how the range of options and this decision point resulted from Committees' discussions. Josh Murauskas and Greg Mackey said that they support moving on to developing an implementation plan. The Committees reached consensus on moving forward to develop an implementation plan.

Mike Tonseth asked about Grant PUD's level of participation in the development of an implementation plan. He said that implementation will involve all three PUD hatchery programs. Tom Dresser said Grant PUD supported moving the process forward. He said that the HCP Coodinating Committees' process is the same process as is being followed by the Priest Rapids Coordinating Committee (PRCC), and that the PRCC Hatchery Subcommittee will recommend to the PRCC that they move forward in developing an implementation plan.

Gale asked Murauskas to explain the SAR credit concept. Murauskas said that the sensitivity analysis produced a range of hatchery production levels under recalculation. He said that the SAR credit allows adjustment of the number of smolts released from one hatchery to create the same number of adult equivalents as smolts released from another hatchery, which is identical to how hatchery performance is applied to calculations for natural origin fish and in the BAMP. Gale questioned the appropriateness of using a SAR adjustment, saying SARs may not be equivalent currency because some runs are subject to more harvest pressure than others. Gale indicated that he had concerns about the CWT calculated SARs for the USFWS hatchery programs because he felt they underestimated the true SARs. Schiewe reminded the Committees that the maximum production level in the range of production levels excludes the SAR credit. Gale said the SAR credit lowers overall mitigation production and is scientifically unsound if applied to USFWS programs where the SARs were not comparable. He was especially critical of the application of a SAR credit for spring Chinook. Mike Tonseth asked Gale why USFWS programs were different from other programs that have CWT based SARs and are subject to harvest. He said, for example, that the terminal harvest on Leavenworth spring Chinook results in lower SARs as compared to programs not subject to the terminal harvestand that the comparison between SARs in this case is confounded by unaccounted tribal and sport harvest in Icicle Creek and is nota function a differnce in hatchery effectiveness. Murauskas said that it is exactly this type of difference of opinion or different interpretation of data that makes the use of a range attractive, by avoiding elevating these types of difficult-to-resolve issues like SAR credits or mitigation for mitigation for dispute resolution. Joe Miller offered to discuss further with Gale any data used in the sensitivity analysis, or additional data or new approaches Gale may consider. The Committees agreed to move forward with development of an implementation plan.

B. NNI Recalculation Priorities – Species, Programs, Release Locations

Mike Schiewe said that a second goal of today's conference call was to begin the discussion on program species priorities and release locations. Schiewe said that the proposal presented by Tom Scribner at the July 20, 2011, Hatchery Committees meeting identified spring Chinook as the Yakama Nation's species preference and provided proposed program production levels for spring chinook. He said that the PUDs are requesting species and release location preferences from Committees' members for use in planning for hatchery operations.

Mike Tonseth said that the Washington Department of Fish and Wildlife's (WDFW's) primary interest in the implementation plan is the development of marking strategies to allow fisheries managers to meet monitoring and evaluation (M&E) needs and to manage surplus adults. He said he had some concern over what some spring Chinook programs might look like after implementation, and feels the preliminary findings of the 5-year M&E review will be important to inform the Hatchery Committees on the latest information regarding the programs. Tonseth requested a presentation by the Hatchery Evaluation Technical Team (HETT) to the Hatchery Committees on the M&E data analysis at the October 19, 2011 meeting to help guide the Committees thoughts on implementation.

Kirk Truscott noted that spring Chinook abundance in the Methow subbasin plays a key role in how the reintroduction of spring Chinook into the Okanogan River subbasin will play out. He said that summer Chinook abundance is an important priority, because of the harvest implications. Bill Gale said he is concerned about the potential impact of recalculated hatchery production levels on recovery. He said that he would like to see changes in program implementation that would benefit recovery. Gale said that the U.S. Fish and Wildlife Service (USFWS) has an interest in spring Chinook and steelhead because of ESA issues. He said USFWS also has an interest in summer Chinook, but to a lesser extent. His top priority for implementation is recovery of ESA-listed species and conservation. Craig

Busack said ESA-listed spring Chinook and steelhead are the focus of NMFS, as would be other anadromous fish species if they became listed. He said that he shares Gale's concern about the effect of hatchery program sizes on recovery. Regarding fish marking, Busack said an effective marking strategy is necessary to reduce the impact of over-production on recovery.

Joe Miller said that Chelan PUD was interested in making progress on development of an implementation plan. He said that the HCP is an ESA vehicle to get an implementation plan for their hatchery programs, but that the PUD wants harvest and other considerations built into the plan, and input will be helpful. Greg Mackey said that Douglas PUD wants their hatchery programs to be successful because they are a key component of the Wells HCP.

Schiewe said that the first step beyond this discussion of preferences is for a draft implementation plan to be developed, to which all the Committees' members can respond. Josh Murauskas said that the PUDs have had discussions about implementation planning and could provide a draft for the Committees to consider. Mackey agreed. Tom Dresser said that, working with Douglas and Chelan PUDs, Grant PUD will provide sections for the draft implementation plan that are Grant PUD's responsibility. Gale, Scribner, Tonseth, Busack, and Truscott supported the PUDs development of a first draft of the implementation plan for consideration at the September 21, 2011, Committees' meeting. The PUDs will email a draft NNI Hatchery Implementation Plan to Carmen Andonaegui for distribution to the Committees by September 14, 2011.

Mackey asked Busack if he was aware of any hatchery program elements that would not be supported by NMFS because of a potential negative effect on recovery of ESA-listed species. Busack said it would depend on a program element's potential impacts on recovery, and would need to be evaluated on a species-by-species basis. Schiewe summarized that the path forward was for the PUDs to develop a first-cut draft 2013-2023 implementation plan, given the range of production levels identified, for discussion at the next Committees' meeting.

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Tom Dresser	Grant PUD
Shane Bickford	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack*	NOAA
Kirk Truscott*	CCT
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Tom Scribner*	Yakama Nation

* Denotes Hatchery Committees' member or alternate

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	October 21, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of September 21, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, September 21, 2011, from 9:30 am to 2:00 pm. Attendees are listed in Attachment A to these Meeting Minutes.

ACTION ITEM SUMMARY

- Mike Tonseth will email Keely Murdoch the biological parameters he requested be included in the 2012 multi-species acclimation plan (Item I).
- Josh Murauskas will forward (to Carmen Andonaegui) Steve Hays' email describing Chelan PUD's request for the collection of 2,500 additional summer Chinook eyed-eggs for a Chelan River eyed-egg survival study (Item II-C).
- Chelan PUD will provide to the Hatchery Committees prior to the October 19, 2011, Hatchery Committees meeting a Chelan River eyed-egg survival study proposal for approval at the October 19, 2011, meeting (Item II-C).
- Kirk Truscott will provide a write-up for the Hatchery Committees describing the agreements between the PUDs and the Colville Confederated Tribes (CCT) for production at Chief Joseph Hatchery (Item III-A).
- Douglas, Chelan, and Grant PUDs will revise the draft Hatchery Implementation Plan proposal to include footnotes describing the rationales and assumptions that went into developing the proposed production levels and send it to Carmen Andonaegui for distribution to the Hatchery Committees by September 28, 2011 (Item III-A).
- Douglas, Chelan, and Grant PUDs will seek to provide the draft 5-Year Hatchery Monitoring and Evaluation (M&E) Report to include at a minimum the completed Chinook M&E results, to the Hatchery Committees by October 11, 2011, for discussion at the October 19, 2011, Committees meeting (Item III-A).

- Mike Tonseth will provide Keely Murdoch confirmation that the Washington Department of Fish and Wildlife (WDFW) is operating the Tumwater Dam (TWD) fish trap 5 days per week, 8 hours per day, and will notify Murdoch when their trapping efforts change (Item IV-A).

STATEMENT OF AGREEMENT DECISION SUMMARY

- There were no Statements of Agreement (SOAs) for approval at today's meeting.

AGREEMENTS

- There were no agreements at today's meeting.

REVIEW ITEMS

- The Draft 2012 Chelan PUD M&E Work Plan is out for a 30-day review. Comments are due September 23, 2011, to Chelan PUD.

REPORTS FINALIZED

- Greg Mackey will finalize Douglas PUD's *Draft 2010 M&E of Wells and Methow Hatchery Programs in 2010* and email it to Carmen Andonaegui for distribution to the Hatchery Committees.
- Josh Murauskas will finalize Chelan PUD's *Draft 2010 Rocky Reach and Rock Island Annual M&E Report* and email it to Carmen Andonaegui for distribution to the Hatchery Committees.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. The following items were added to the agenda:

- Keely Murdoch: coho broodstock collection
- Greg Mackey: update on Charlie Snow's report on multi-species acclimation at Twisp Pond
- Bill Gale: update on the early release of spring Chinook from the Winthrop National Fish Hatchery (NFH).

The Hatchery Committees' August 23, 2011, draft meeting minutes and August 30, 2011, draft conference call minutes were reviewed. Mike Tonseth agreed to send an email to Keely Murdoch listing the biological parameters he requested be included in the 2012 multi-species acclimation plan. The August 23, 2011, draft meeting minutes and the August 30, 2011, draft conference call minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Chelan PUD

A. Update on SARs from 2009 Summer Chinook Re-use Releases (Josh Murauskas)

Josh Murauskas said that Carmen Andonaegui emailed a memo to the Hatchery Committees (on September 20, 2011) that summarizes preliminary smolt-to-adult returns (SARs) for a 2009 release of summer Chinook smolts from water re-use rearing vessels (re-use releases), and travel times and survivals for 2009-2011 smolt releases (Attachment B). Murauskas reported that almost three-quarters of the re-use releases returned as two-salts (three-salt fish are not yet returning). Furthermore, about twice as many 2009 raceway-reared fish returned as minijacks and jacks as compared to the re-use releases, and re-use releases had higher SARs. Murauskas reported the results of the analysis of travel times for smolts released in 2009 through 2011 (calculated using PitPro, software developed by Columbia Basin Research, Seattle, WA), saying that re-use releases showed significantly faster travel times to McNary compared to raceway releases in both 2009 and 2011. Summarizing analysis of survival to McNary Dam for smolts released from 2009 through 2011, Murauskas said that 2009 re-use releases survived at significantly higher rates compared to raceway releases. The 2010 and 2011 raceway releases survived at slightly different rates than re-use releases, but the differences were not statistically significant either year (0.579 vs. 0.631, and 0.700 vs. 0.673, respectively). Murauskas said the objective of the study is to achieve similar or better survival for fish reared under re-use conditions compared to fish reared in conventional raceways.

Murauskas said that there were some differences among the three years of study; however, the results showed similar trends. For example, he said, smolts were released at different sizes, and in 2011, smolts were released from Dryden rather than from the Chelan River. He noted that fish size within years was controlled between raceway and re-use releases, as were fish rearing densities. Craig Busack asked about the availability of peer-reviewed studies comparing raceway fish to fish reared under re-use conditions. Murauskas said that most studies he is aware of focus on evaluations of water re-use in commercial aquaculture settings.

Murauskas said that hatchery practices, such as the size of fish at release, are known to affect hatchery fish performance, including the proportions of mini-jack and jack returns; he suggested that changes in hatchery rearing practices are one way to improve hatchery fish returns. Busack suggested that the use of the term "re-use" for the test fish might be misleading because the differences in performance are more likely due to rearing vessel shape and flow patterns alone.

Murauskas said that data for the Chiwawa steelhead reared in the water re-use systems are still being analyzed, but that the 2011 smolts volitionally emigrated very quickly with substantially faster travel time to McNary Dam than travel times for fish reared in raceways. He said he will be able to provide more results soon.

B. *Phase III SOA for Chinook at Rocky Reach (Josh Murauskas)*

Josh Murauskas reported that Phase III survival standards for yearling Chinook salmon at the Rocky Reach Project have been met and approved by the Coordinating Committees. He said that the first-order goal of the HCP is to achieve a combined juvenile and adult survival standard of 91percent or higher. Murauskas said that the mean adult survival from 2009 to 2011 was 0.999, and that in combination with estimated yearling Chinook survival (0.9237), the combined survival at Rocky Reach was 0.9228, exceeding the target of 91 percent. The Phase III Chinook standard achieved SOA was approved by the Rocky Reach Coordinating Committee during an August 30, 2011, conference call.

C. *Chelan River Egg-to-fry Survival Study (Josh Murauskas)*

Josh Murauskas said that Chelan PUD is requesting an additional 2,500 eyed summer Chinook eggs for an egg-to-fry survival study. The request was from Steve Hays, Chelan PUD, who could not be at today's meeting, and Murauskas had limited information on the study. Mike Tonseth requested a formal proposal, which he suggested need be no more than a brief explanation of the objectives and methods. Murauskas said that he would forward Hays' email to Carmen Andonaegui, as it provides a limited description of the study as presented today. Tonseth said that additional broodstock would not need to be collected to meet the request for 2,500 additional eggs. Prior to the October 19, 2011, Hatchery Committees' meeting, Murauskas will provide the Committees with a study proposal for the egg-to-fry survival study for approval at the October 19, 2011, meeting.

III. Chelan PUD/Douglas PUD/Grant PUD

A. Recalculation Discussion (Josh Murauskas/Greg Mackey/Todd Pearsons)

Mike Schiewe said that on September 14, 2011, Douglas, Chelan, and Grant PUDs provided by email to the Hatchery Committees for consideration an initial draft Hatchery Implementation Plan proposal (Proposal) (Attachment C). Josh Murauskas said the proposal includes total proposed numbers by species and basin, but does not address how many fish would go to which facility. He said that the main trade-off in production numbers was between spring Chinook and steelhead. The PUDs are proposing the maximum calculated production values for spring Chinook (Table 1). Table 2 in the proposal shows minimum and maximum calculated summer Chinook production levels, partitioned by subyearlings and yearlings. He said the proposed summer Chinook production levels were closer to maximum calculated values because the PUDs are already committed to summer Chinook hatchery production for the new Chief Joseph Hatchery through an agreement with the CCT, and these were not subject to recalculation. Murauskas said that, in all cases, the minimum level was the same as Option 1 in the hatchery recalculation sensitivity analysis prepared by the PUDs and distributed for the August 17, 2011, Committees' meeting, and that the maximum level was the same as Option 3 in the sensitivity analysis. The proposed levels, however, present Chief Joseph Hatchery numbers ("Okanogan" value) as per PUD agreements and the inundation programs are presented as separate line items for clarity

The Committees asked for clarification and explanation of how different production values were calculated in light of the CCT/PUD Chief Joseph Hatchery Agreement, recalculation, and any other constraints that were not subject to the sensitivity analysis. The Committees requested that the PUDs provide more detail in the tables, using footnotes to document how the numbers were derived. The PUDs agreed to revise the draft proposal to include descriptions of the rationales and assumptions that went into developing the proposed production levels, and to send it to Carmen Andonaegui for distribution to the Committees by September 28, 2011. Schiewe asked Kirk Truscott to provide a brief write-up for the

Committees describing the agreements between the CCT and the PUDs for planned production at the Chief Joseph Hatchery.

Joe Miller reminded the Committees that the Washington State Department of Ecology (Ecology) was working on a Wenatchee Basin Total Maximum Daily Load (TMDL), and that the TMDL will likely constrain future hatchery production at the Dryden site through limits on waste loading to the Wenatchee River.

Murauskas said that the PUDs were looking for feedback on the draft proposal, which should be viewed as a first iteration. He said that input on release locations was also needed. Regarding proposed production of steelhead, Murauskas said that the proposed minimum value was a trade-off for proposing maximum production levels for spring Chinook. Bill Gale requested that a footnote be added to the proposal indicating flexibility between releases into the Okanogan and Methow rivers for Columbia River inundation mitigation steelhead, subject to Committees' approval. Greg Mackey said the Douglas PUD steelhead Hatchery Genetic Management Plan (HGMP) does not include a release into the Methow Basin of the Columbia River inundation fish as an option. He said that Douglas PUD plans to follow the current HGMP, although he recognized that this could change after National Marine Fisheries Service (NMFS) review of the draft HGMP. Mackey said the 8,000 steelhead proposed for the Twisp River is the recalculated production level for No Net Impact (NNI) (pre-recalculation value was 48,000) and is consistent with the draft HGMP. Mackey and Kahler clarified that instead of the current 348,000, the proposed total number of Douglas PUD steelhead for release into the Methow Basin is 108,000, including the 8,000 NNI fish in the Twisp and 100,000 safety-net fish released from the Methow Hatchery. These 100,000 safety-net fish are a component of Douglas' 300,000 inundation compensation fish, the remainder of which (200,000) will be released to the Columbia River from Wells Hatchery. The 108,000 Methow Basin total does not include steelhead released from the Winthrop NFH conservation program.

Table 4 in the proposal shows the proposed sockeye production, which was based on the Biological Assessment and Management Plan (BAMP) calculation using wild returns. Murauskas said that the Skaha Reintroduction Agreement and the Fish Water Management Tool drive Okanagan sockeye production levels substantially. He said that there is no inundation compensation required for sockeye and so it was not included in the sensitivity analysis.

Todd Pearsons said that Table 5 shows proposed fall Chinook production levels of 5 million fish for inundation compensation, with no proposed fry production, and 325,543 smolts to meet NNI (which is the recalculated value for the 1 million fry production required in the Grant PUD Settlement Agreement). He said that the new smolt production level reflects an assumed fry-to-subyearling conversion of 200,000 smolts. Pearsons said Grant PUD believes the rate should be lower, but is proposing 200,000 as a reasonable alternative as more of a middle range of conversion rates proposed by different entities. The value is not based on a calculation, and he said the capacity exisits to support this level of production with the restructured Priest Rapids Hatchery. Mike Tonseth commented that relative to the smolt-to-fry conversion, there is the question of whether this is legally allowed. Pearsons said that the conversion rate would need to be vetted within Grant PUD if the Committees agreed to the conversion. Tonseth noted that for fall Chinook, all mitigation fish are released below PUD projects and so are not subject to mitigation of mortalities. Schiewe said that the next step will be for the Committees to consider facility capacities once production levels have been agreed to, with spring Chinook being the most complex.

The Committees discussed when and how the presentation of the draft 5-Year M&E Plan should be presented to the Committees. Miller said that Chelan PUD's 5-Year M&E Plan drafted to date only includes the analysis of spring Chinook M&E data, and has not yet been reviewed by the PUDs, who contracted for the work. Tom Kahler said that the M&E data collected by its contractors are proprietary based on their contract with WDFW, and thus a release of that data prior to the acceptance of the analyses by Douglas PUD violates the contract. Bill Gale suggested that a meeting could be scheduled separate from the Committees' October meeting for presentation of the draft 5-Year M&E Plan. Tonseth said that WDFW staff could not provide the presentation much before the next Committees' meeting on October 19, 2011, which would not leave much time for the Joint Fisheries Parties (JFP) to consider the results prior to the next Committees' meeting. Miller said Chelan PUD would need to have an internal discussion about disseminating draft and not-yet-internally-reviewed analysis.

Gale said he wants production targets to be consistent with Endangered Species Act (ESA) recovery and that M&E results may affect where the fish are distributed. Schiewe said that production levels and locations need to be agreed to soon, so that they may be used in the development of the 2012 broodstock collection plan. Mackey said that the draft Douglas PUD 5-Year M&E Plan is due to the Committees for review by September 30, 2011, but that only spring Chinook had been completed and that steelhead may lag behind a bit. The PUDs will seek to provide the draft 5-Year M&E Plan, to include at a minimum the completed Chinook M&E results, to the Hatchery Committees by October 11, 2011, for discussion at the October 19, 2011, Committees' meeting. Tracy Hillman, BioAnalysts, and Andrew Murdoch, WDFW, authors of the Chelan PUD and Douglas PUD 5-Year M&E Reports, respectively, will provide a presentation of the 5-Year M&E analysis results at the October 19, 2011, meeting, provided that the analysis is sufficiently complete and had received the necessary PUD review and release.

Miller proposed deciding now whether the maximum production levels proposed for spring Chinook were acceptable without waiting for the final 5-Year M&E analysis results. He said that a default production level for spring Chinook was what was most important to the PUDs. Tonseth said the minimum and maximum values in the proposal are those identified in the PUDs' sensitivity analysis, which the Committees had already agreed to during the August 30, 2011, conference call. The Committees agreed to strike the word "maximum" from the third column header in the proposal for spring Chinook. The Committees discussed approving maximum spring Chinook production levels for 2014 through 2023. Keely Murdoch, Gale, and Craig Busack said they needed more time to discuss the proposed production levels internally and amongst the JFP.

IV. Yakama Nation

A. Coho Broodstock Collection (Keely Murdoch)

Keely Murdoch said that the Yakama Nation was having difficulties meeting their broodstock collection goals with the right bank fishway at Dryden Dam inoperable since the beginning of September 2011. She said that typically the right bank fishway is the route used by the majority of adult coho migrants, and it is where the Yakama Nation has been most successful at capturing coho broodstock. Murdoch said that, in the past, trapping at TWD had also been important in meeting their coho broodstock collection goals, because the adult trap was operated 7 days per week by either the Yakama Nation, WDFW, or Chelan PUD. However, she said that the Yakama Nation's permit only allows them to trap 3 days per week, 16 hours per day at TWD, and this may not be adequate to meet their collection goal with the limited Dryden Dam trapping. Mike Tonseth said that WDFW was operating the trap currently 8 hours per day, 5 days per week for steelhead adult management, targeting the 8 hours per day of operation for the highest steelhead passage times per day. He said that WDFW will go to a 24-hour-per-day, unmanned operation when they can meet the criteria which allows for those operating conditions. Tonseth said that he will provide Murdoch confirmation that WDFW is operating the TWD fish trap 5 days per week, 8 hours per day, and will provide Murdoch notice when their trapping efforts change.

Greg Mackey said that Douglas PUD had written a letter to the Yakama Nation last year saying they could trap coho at the Methow Hatchery, and Douglas PUD is willing to provide access again this year.

V. Douglas PUD

A. Multi-species Acclimation Update (Greg Mackey)

Greg Mackey said that Charlie Snow's (WDFW) report on the results of multi-species acclimation at the Twisp Pond was distributed to the Hatchery Committees by Carmen Andonaegui (emailed September 13, 2011). He said that no concerns were identified during the co-mingled acclimation of steelhead and spring Chinook for 26 days. He also said that Chinook showed positive growth and healthy fin condition. Steelhead showed a decrease in size and a decline in fin condition, but these results were likely an artifact of the sampling (difficult to obtain representative samples of steelhead) and not indicative of interspecies interactions. Mackey said that no eye problems were observed. Spring Chinook mortalities occurred shortly after introduction into the pond and tapered off towards the time when the steelhead were introduced into the pond. Mackey said that steelhead mortalities followed a similar path. There was no indication that co-acclimaiton resulted in increased mortalities for either species once co-mingled in the pond. He said that with volitional release, about 80 percent of the fish emigrated the evening after the gates were opened, with virtually all of the fish exiting within 3 days. Fish that did not volitionally emigrate were forced out of the pond.

VI. USFWS

A. Update on an Early Release of Spring Chinook (Bill Gale)

Bill Gale said that the U.S. Fish and Wildlife Service (USFWS) will be releasing about 70,000 spring Chinook from the Winthrop NFH into the Methow River in early October to make space at the hatchery for steelhead. He said that the spring Chinook are uniquely coded wire tagged (CWT) and are from the 2010 brood year. Gale said that normally these fish would have been released in 2012.

VII. NMFS

A. HGMP Update (Craig Busack)

Craig Busack reported that the Entiat summer Chinook draft biological opinion was completed and being reviewed internally, that drafting of the Mid-Columbia coho draft biological opinion was in process, that the draft Leavenworth spring Chinook biological opinion was almost complete, and that the Chiwawa spring Chinook biological opinion was behind schedule. He said that Chelan PUD had offered to provide staff to help with processing of the National Environmental Policy Act (NEPA) review and drafting of the biological opinions, and that NMFS is considering this option. Busack said that NMFS also recently received a 60-day notice on the Elwha hatchery programs, which will take staff away from work on the Mid-Columbia PUD HGMPs.

Busack said that an initial step was for NMFS to complete a review of the Wenatchee basin adult management plan, but that this was more complicated than originally envisioned. He said that NMFS had planned to do separate consultations on the PUDs' hatchery programs, with the Chiwawa spring Chinook program as one consultation and Grant PUD's Nason and White River spring Chinook programs as another. Busack said that NMFS had planned to bundle the Chiwawa program with summer Chinook in one biological opinion, which would have included the Adult Management Plan, but that WDFW and Chelan PUD are not in agreement on the Adult Management Plan. He said that the way WDFW and Chelan PUD want to split out the Adult Management Plan would complicate the consultation. Mike Tonseth said that WDFW was scheduling a meeting with Chelan PUD and Rob Jones, NMFS, to discuss the issue.

Busack said that he did not generally see any problems with the hatchery production numbers proposed in the PUDs' draft Hatchery Implementation Plan relative to ESA recovery of listed upper Columbia River stocks given most of the proposed production levels were reductions. He said that there has not been an analysis of the effects of hatchery program size on ESA-listed species' recovery.

VIII. HETT Update

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on September 13, 2011, and discussed the following items:

Non-Target Taxa of Concern (NTTOC) Analysis

The HETT has completed estimates for carrying capacities for sockeye, Chinook, coho, and steelhead in the upper Columbia River subbasins, where applicable, and completed a database for use in calculating NTTOC interactions. Todd Pearsons will start test risk assessment model runs and will fine-tune the inputs from the database to match model requirements. Pearsons said that he has not yet begun the test runs.

Control Group Analysis

The HETT discussed ranking criteria for choosing reference streams based on Tracy Hillman's reference stream analysis conducted for the 5-Year M&E Report. The purpose of a ranking system will be to develop an objective way to select a reference stream. Based on the day's discussion, Hillman and Andrew Murdoch, WDFW, will further develop an objective reference stream selection process using some of the variables in Hillman's reference stream analysis, such as correlation coefficients and pHOS or pNOS. The HETT plans to recommend using up to six variables in the selection process. Greg Mackey explained that the HETT realized that although Hillman's reference stream identification method helped identify reference streams using a series of criteria, it did not explain how to then select the most appropriate reference stream in a fully objective manner. The HETT will produce a white paper describing how reference streams are ranked and selected.

The HETT has developed a comprehensive list of reference streams that were considered for spring Chinook. The reference streams are listed in a white paper that Hillman wrote for the HETT describing the methodology for identifying reference streams (Aug. 15, 2007, *Investigation in the Use of Spatial Controls for Hatchery Evaluations in the Upper Columbia River Basin: Control Stream Recommendations for Spring Chinook*). The HETT has been unable to identify a reference stream for any other HCP program species given the lack of available data. Mike Schiewe said that after the 5-Year M&E Report is completed, the Hatchery Committees should discuss whether they would like to pursue identifying reference streams for steelhead and summer Chinook or whether this effort has been taken as far as possible given data limitations for these species. Mackey said the 5-Year M&E Report will include a statement about the status of identifying reference streams for steelhead and summer Chinook.

IX. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are October 19, 2011 (Chelan PUD); November 16, 2011 (Douglas PUD); and December 14, 2011 (Chelan PUD).

List of Attachments

Attachment A – List of Attendees
Attachment B – Preliminary Results of Re-use Smolt Releases
Attachment C – Draft Hatchery Implementation Plan

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Steve Hays	Chelan PUD
Greg Mackey*	Douglas PUD
Shane Bickford	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Jayson Wahls	WDFW
Keely Murdoch*	Yakama Nation
Bill Gale*	USFWS
Craig Busack*†	NMFS

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

Attachment B

Memorandum

To: HCP Hatchery Committee
From: Josh Murauskas, Chelan PUD
Re: Preliminary update on comparative performance of re-use technology
CC: Todd Pearsons, Grant PUD
Date: September 20, 2011

Chelan County Public Utility District (Chelan) began evaluating partial water re-use technology for producing summer-run Chinook salmon smolts beginning with the release of approximately 20,000 fish outfitted with passive integrated transponder (PIT) tags during the 2009 migration. This study included roughly 10,000 PIT-tagged smolts reared in both raceway (control) and circular (re-use, treatment) vessels. Comparative evaluations were continued in 2010 with a second year of releases from Chelan River, and 2011 with releases from Dryden Acclimation Ponds on the Wenatchee River (with funding from Grant PUD). Adults residing in the ocean for two years (i.e., “2-salt” fish) have returned from the 2009 smolt releases, whereas jacks (i.e., “1-salt” fish), and mini-jacks have returned from 2010 and partially from 2011. The intent of this memo is to provide some graphs representing the preliminary results of these studies, including both juvenile and adult performance.

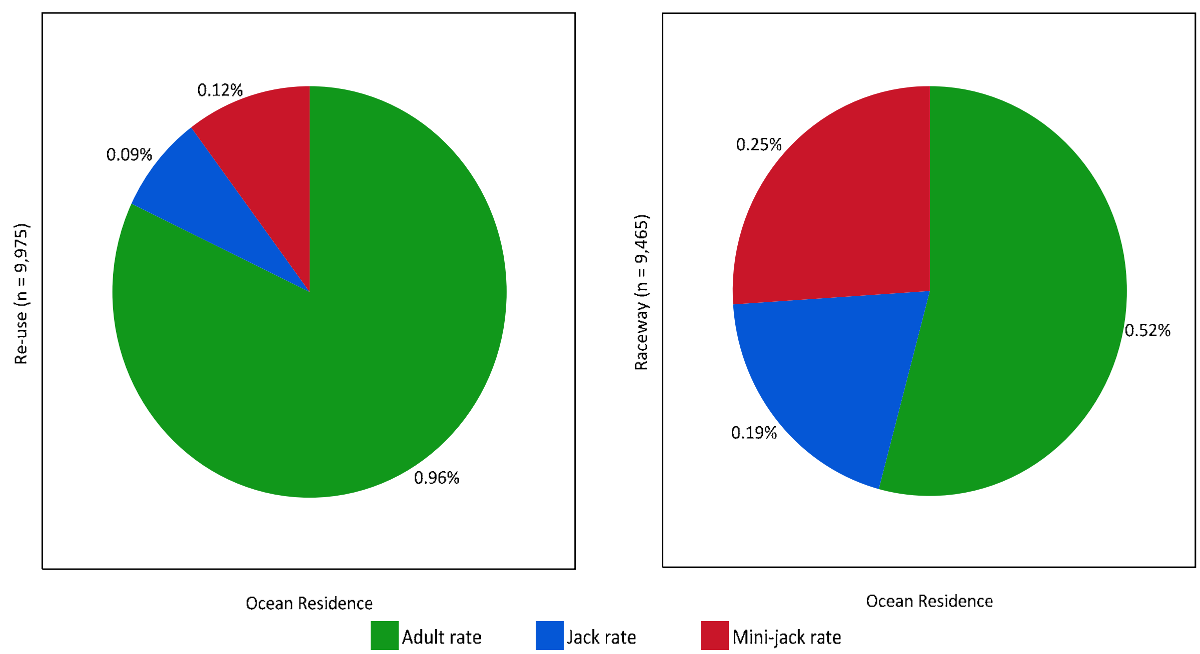


Figure 1. Composition and rate of return (to Bonneville) of summer-run Chinook salmon released in Chelan River during the 2009 migration, by rearing strategy. Total smolt-to-adult returns (jacks + adults) for is currently 1.05% for re-use (left, n = 105) and 0.71% for raceway fish (n = 67), with a significantly greater proportion of mini-jacks and jacks in the raceway group. Note that returns represent three years and are not yet complete.

Attachment B

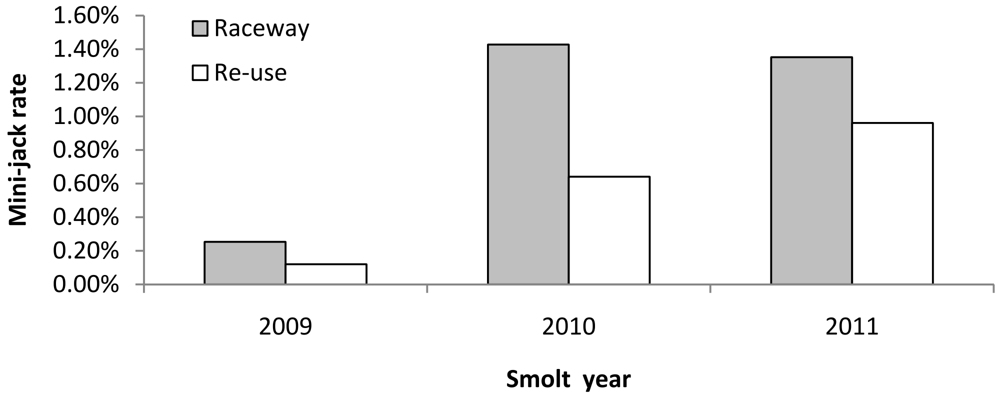


Figure 2. Mini-jack rate of summer Chinook smolts reared in raceway or re-use vessels and released into the Chelan River (2009 and 2010) or the Wenatchee River (Dryden Ponds, 2011). Note that more mini-jacks may be detected for the 2011 releases.

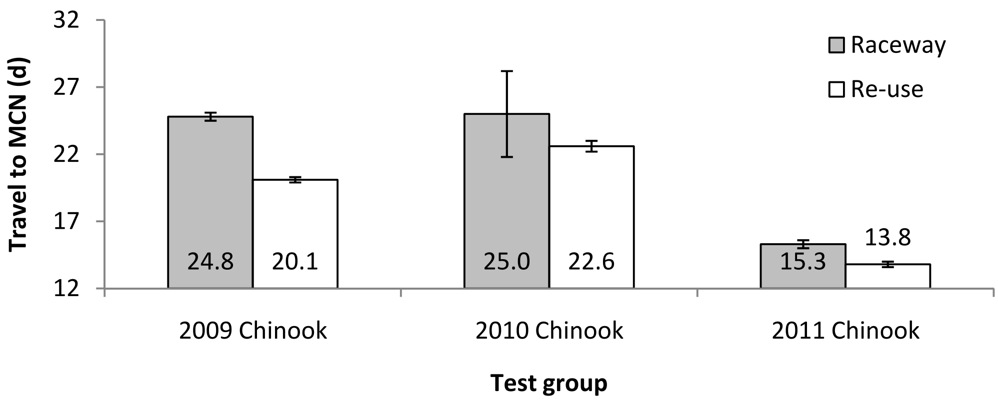


Figure 3. Mean (harmonic) travel time to McNary Dam (days, ± SE) of summer Chinook smolts released in 2009-2011, by rearing vessel.

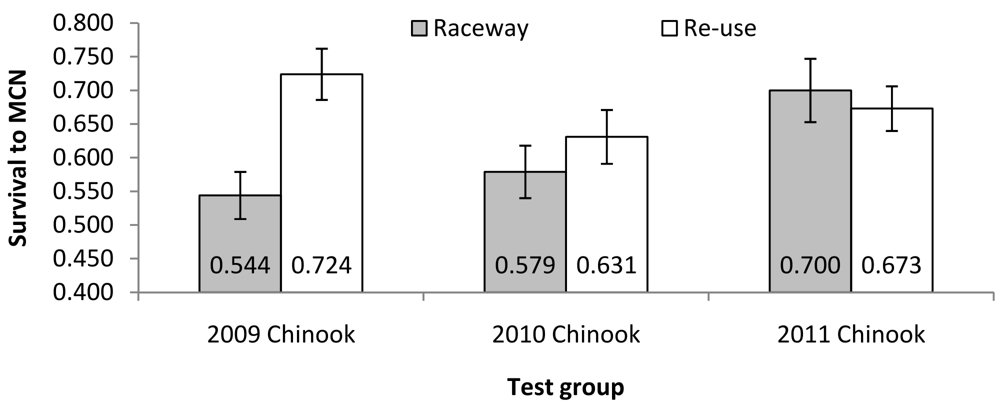


Figure 4. Probability of survival to McNary Dam (± SE) of summer Chinook smolts released in 2009-2011, by rearing vessel.

Attachment C

Implementation of PUD Hatchery Production, 2014-2023

Draft for Discussion at the September 21st, 2011 Hatchery Committee Meeting

Table 1. Proposed implementation of mid-Columbia PUD spring Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed: Maximum
Okanogan Basin[1]	259,000	259,000	259,000
Methow Basin	150,000	224,000	224,000
Wenatchee Basin	157,000	367,000	367,000
Total	**566,000**	**850,000**	**850,000**

** Additional spring Chinook production in the Wenatchee River totals 1,200,000 (Leavenworth); additional spring Chinook production in the Methow River totals 400,000 (Winthrop); additional spring Chinook production in the Okanogan River totals up to 641,000 (Chief Joseph). These targets would represent an additional 2,241,000 spring Chinook smolts in addition to the proposed 850,000 PUD-funded target releases.*

Table 2. Proposed implementation of mid-C PUD summer Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	207,000	207,000	522,000[2]
Methow R.	167,000	335,000	200,000
Chelan R.	176,000	185,000	176,000
Chelan R. Inundation	400,000	400,000	400,000
Wenatchee R.	719,000	743,000	500,000
Wells Inundation CH-0	484,000	484,000	484,000
Wells Inundation CH-1	320,000	320,000	320,000
Total[3]	**2,110,000**	**2,311,000**	**2,239,000**

** Additional summer Chinook production in the Entiat River totals 400,000 (Entiat); additional summer Chinook production in the Okanogan River totals 953,000 yearling equivalents (Chief Joseph). These targets would represent an additional 1,353,000 summer Chinook smolts in addition to the proposed 2,239,000 PUD-funded target releases.*

[1] Grant, Chelan, and Douglas PUDs have agreed to provide funding for spring Chinook production at Chief Joseph Hatchery to represent obligations in the Okanogan River Basin. Total production reflects a proportion of up to 900,000 yearling spring Chinook.

[2] Grant, Chelan, and Douglas PUDs have agreed to provide funding for summer Chinook production at Chief Joseph Hatchery.

[3] Total represents yearling equivalents. Wells Hatchery total summer Chinook inundationproduction was reported as 441,000 yearling equivalents in the sensitivity analysis.

Attachment C

Table 3. Proposed implementation of mid-C PUD steelhead programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	101,000	196,000	100,000
Methow R.	7,000	8,000	8,000
Methow R. Inundation	100,000	100,000	100,000
Columbia R. Inundation[4]	200,000	200,000	200,000
Wenatchee R.	22,000	46,000	22,000
Wenatchee R. Inundation	165,000	165,000	165,000
Total	**595,000**	**715,000**	**595,000**

** Additional steelhead production in the Methow River totals 100,000 (Winthrop). These targets would represent an additional 100,000 steelhead smolts in addition to the proposed 595,000 PUD-funded target releases.*

Table 4. Proposed implementation of mid-C PUD sockeye programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	WMT/Skaha	WMT/Skaha	WMT/Skaha[5]
Wenatchee R.	46,000	46,000	46,000
Total	**46,000**	**46,000**	**46,000**

Table 5. Proposed implementation of mid-C Grant PUD fall Chinook programs by river basin, 2014-2023.

Program	Planned	Proposed
Inundation	5,000,000	5,000,000
Fry	1,000,000	.
Smolts (NNI)	1,000,000	325,543
Smolts (fry exchange)	.	200,000

[4] A portion of these fish may be released in the Okanogan River, as per the draft Wells Steelhead HGMP.
[5] Grant, Chelan, and Douglas PUDs have met obligations for sockeye salmon in the Okanogan River Basin through funding the Water Management Tool and the Skaha Reintroduction Program.

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	November 17, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of October 19, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD Headquarters in Wenatchee, Washington, on Wednesday, October 19, 2011, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Bill Gale will send the Joint Fisheries Party's (JFP) comments and recommendations for changes to the draft PUD Implementation Plans by November 4, 2011, to Carmen Andonaegui for distribution to the Hatchery Committees (Item II-C).
- Carmen Andonaegui will schedule a conference call for November 8, 2011, from 9:00 am to 11:00 am to discuss the JFP comments and recommendations for changes to the draft PUD's Implementation Plans (Item II-C).

STATEMENT OF AGREEMENT DECISION SUMMARY

- There were no Statements of Agreement (SOAs) at this meeting.

AGREEMENTS

- The Hatchery Committees approved a request by Chelan PUD for 2,500 summer Chinook eyed-eggs for an egg-to-fry survival study in the Chelan Falls powerhouse tailrace of the Chelan River (Item IV-D).

REVIEW ITEMS

- There are no documents under review at this time.

REPORTS FINALIZED

- Josh Murauskas will finalize Chelan PUD's *Draft 2012 M&E Work Plan* and email it to Carmen Andonaegui for distribution to the Hatchery Committees.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. The Chelan PUD 5-Year Monitoring and Evaluation (M&E) results presentation was moved up to 10:00 am. The following items were added to the agenda:

- Greg Mackey will present preliminary results of the Methow spring Chinook supplementation analyses from the draft Douglas PUD 5-Year Hatchery M&E Report.
- Bill Gale asked Craig Busack to provide an update on the status of the Okanogan spring Chinook 10(j) request.

The draft September 21, 2011, Committees' meeting minutes were reviewed and approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Hatchery Recalculation/Implementation

A. *Updated Hatchery Implementation Plan, 2014 to 2023 (Greg Mackey/Josh Murauskas/Todd Pearsons)*

Mike Schiewe reported that the draft PUD Implementation Plans had been revised as discussed at the September 21, 2011, Hatchery Committees' meeting, and emailed to the Committees' members on September 28, 2011.

B. *Douglas PUD Recalculation Presentation (Greg Mackey)*

Greg Mackey said the proposed production levels he was presenting for Douglas PUD's hatchery programs (Attachment B) came from the August 16, 2011, Sensitivity Analysis and were the same as that included in the September 28, 2011, draft PUD Implementation Plan. He said that, of the range of production levels identified in the Sensitivity Analysis, Douglas PUD is proposing the highest level of production for each species, which is Option 3. Mackey noted that the proposed summer Chinook production is consistent with the Douglas PUD and the Colville Confederated Tribes (CCT) Chief Joseph Hatchery Agreement; he clarified that the No Net Impact (NNI) production levels for summer Chinook are expressed as yearling equivalents. Mackey said that spring Chinook and steelhead are the maximum production levels based on recalculation. Mackey's PowerPoint presentation (see attached) included a table that provided Douglas PUD hatchery production levels by species, location, facility, mitigation type (NNI or Inundation), and production level.

Craig Busack asked about Douglas PUD's proposed production of only 8,352 steelhead smolts for the Twisp River and how this reduction would affect the ongoing reproductive success study. Mackey said that the reproductive success study target is for a 1:1 hatchery-to-wild adult return to the Twisp River, and that Douglas PUD is aware that the recalculated value resulted in a very small program; however, the impact of the Wells Project on steelhead is very small. He said Doulgas PUD has done some investigation of potential release sizes to return an appropriate number of hatchery adults to the Twisp. Bill Gale recommended keeping the release size the same for the duration of the reproductive success study to maintain consistency. Mackey said that Douglas PUD is open to discussion about the proposed 8,352 steelhead smolt production level. He also stated that Douglas PUD has a goal of providing an SOA to the Hatchery Committees for approval in November 2011.

Tom Scribner said that the JFPs were not prepared to discuss specific production numbers or to consider an SOA on production numbers. He said that the Yakama Nation would prefer not to see an SOA from the PUDs on production levels at this time. Scribner said that the JFP needs additional time to consider in its entirety all three PUD implementation proposals before considering an SOA on only the Douglas PUD or Chelan PUD production. Shane Bickford said that the draft Implementation Plans document provides all three PUD proposed production plans for their respective programs. Mike Schiewe reminded the Hatchery Committees members that the goal was to finalize the Implementation Plans by the end of the year to allow adequate time to develop and review the 2012 Broodstock Protocols. Scribner said the JFP is sensitive to the time constraints and intends to work within that timeline. Bickford and Josh Murauskas stated that, although the Implementation Plans included all three PUDs' proposed production levels, each PUD would present a separate SOA on production levels to their respective HCP Hatchery Committee. Scribner and Mike Tonseth said that the JFP's interest in knowing each PUD's proposed production level is so they can understand the linkages between the various hatchery programs prior to agreeing to an SOA.

C. *Chelan PUD Recalculation Presentation (Josh Murauskas)*

Josh Murauskas said that Chelan PUD's proposed production levels are the same as shown on Tables 6, 7, and 8 of the draft Implementation Plans. Todd Pearsons said Grant PUD's proposed production levels are also the same as in the Implementation Plans.

Tom Scribner said that the JFP would be providing input on the draft Implementation Plans in the next couple of weeks and was not yet prepared to provide proposed alternate production levels. He then summarized some the preliminary JFP concerns. Scribner said that the JFP's objectives are to continue to be able to support implementation of the Wenatchee Spring Chinook Management Plan and Salmon and Steelhead Recovery Plan, and to meet agency and tribal management goals. He said that the Yakama Nation's proposed recalculated production levels presented at the July 20, 2011, Hatchery Committees meeting included a higher spring Chinook production in exchange for a decrease in summer Chinook production and that the JFP response to the draft PUD Implementation Plan will reflect that position. Scribner said that the JFP wants to see a production facility on Nason Creek for spring Chinook. He said the JFP was considering the viability of the Lake Wenatchee sockeye program and may want a species swap with Lake Wenatchee sockeye because that program continues to perform poorly. Scribner said the JFP wants to keep overwinter capacity at Carlton and Dryden ponds for summer Chinook, as captured in an SOA in the Priest Rapids Coordinating Committee (PRCC). He said that the JFP also wants to maintain the size of the Twisp steelhead program. Scribner said that spring Chinook and summer Chinook production levels were the most difficult species to reach consensus on among the JFP entities. He said that, within 2 weeks, he hoped the JFP would have consensus on production levels, but if there is not consensus, the JFP will describe where there is consensus and where there needs further discusson and resolution.

Josh Murauskas asked what kind of species trades that the JFP were considering for the Lake Wenatchee sockeye program. Scribner said probably steelhead but maybe Chinook. Pearsons asked if the JFP's desire for a production facility on Nason Creek was related only to having a facility there or if their interest was also in having more spring Chinook in excess of the 250,000 smolts currently proposed. Scribner responded that the JFP's concern was that the recalculated production levels not affect the integrity of the spring Chinook spawning aggregates as described in the Spring Chinook Management Plan. The Committees' members discussed how a Nason Creek facility might affect Percent Natural Influence (PNI) and discussed the pros and cons of not having a targeted spring Chinook supplementation program in Nason Creek.

Mike Schiewe said that resolving the issue of supplementation in Nason Creek would have to be worked out within the PRCC and asked if there were any more issues with Grant PUD's proposed production levels to highlight for the HCP Hatchery Committees. Scribner noted the importance of continuing coordination among the PUDs for use of the overwintering facilities at Carlton and Dryden ponds. He said before that can happen, there is a need to understand and agree to what species swaps might occur and that he understood the PUDs are not opposed to possible species swaps.

Mike Tonseth said that the JFP is committed to providing a consensus position no later than November 4, 2011, or to inform the PUDs that the JFP could not reach consensus. If the JFP could not reach consensus, those issues for which consensus could not be reached will be identified for the PUDs. Tonseth asked the PUDs to not come forward with any new positions or production levels at this time. Bill Gale agreed to provide a statement of the JFP's position on the draft Implementation Plan by November 4, 2011, to Carmen Andonaegui for distribution to the Hatchery Committees. Andonaegui will schedule a conference call for November 8, 2011, from 9:00 am to 11:00 am to discuss the JFP position.

Steve Parker recalled the history and importance of the Wenatchee spring Chinook programs as context for the recalculation of mitigation responsibilities. Parker said that the parties should remember that the spring Chinook supplementation programs have not met the program levels that were agreed to in the HCPs, and it is of considerable concern that recalculation may reduce the PUDs' production responsibility without the JFP ever having achieved the full mitigation that they signed up for. The avoided costs to the PUDs should be borne in mind as the parties develop new mitigation program goals.

III. Douglas PUD

A. Douglas PUD Draft 2012 M&E Work Plan (Greg Mackey)

Greg Mackey said that he received the 2012 Work Plan from the Washington Department of Fish and Wildlife (WDFW) yesterday, October 18, 2011, and has not yet reviewed it. He said that he would review the Work Plan, have discussions with WDFW, and send out a draft 2012 Work Plan to the Hatchery Committees for review within about 10 days. He would like to have a discussion of the draft 2012 Work Plan at the November 16, 2011, meeting and will plan on asking for approval of the Work Plan at the December 14, 2011, meeting. Mackey said that the draft 2012 Work Plan is very similar to past work plans and that he will highlight for the Committees any differences.

B. Douglas PUD 5-Year M&E results (Greg Mackey)

Greg Mackey provided a presentation of preliminary results of the Methow spring Chinook supplementation analysis from the draft Douglas PUD 5-Year M&E analysis (Attachment C). This presentation followed the in-depth presentation on the Wenatchee spring Chinook 5-Year M&E analysis by Tracy Hillman (see Section IV). He said that Andrew Murdoch, WDFW, will present more detailed analyses and results at the November 16, 2011, meeting. Mackey said that the goal of today's presentation was to show the similarity of findings from the Methow and Wenatchee spring Chinook supplementation programs' analyses. He summarized the objectives of the supplementation analysis, emphasizing Objective 1 and Objective 7, as identified in the M&E Framework document (*Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs*, 2007). He said that to evaluate whether Douglas PUD's hatchery programs met these objectives, the Twisp, Chewuch, and Methow populations were analyzed separately.

Mackey summarized that total spawner abundance did not increase for any population and that there were significant decreases in spawner abundance in the Twisp relative to three of the four reference populations and in one of three comparisons with reference populations for the Chewuch; however there were no significant differences in abundance between Methow and reference populations. He also noted that the abundance of natural-origin recruits did not increase in treatment populations relative to reference populations, and significantly decreased in two of four comparisons for the Twisp, one of three comparisons for the Chewuch, and two of five comparisons for the Methow. There were no significant differences in productivity between reference and treatment populations, although producitivty comparisons carried the least statistical power (of spawner abundance, NORs, and productivity) to detect a difference if it existed. Mackey emphasized that analytic approach used in the M&E evaluations compared how the supplemented populations (treatment populations) performed compared to unsupplemented populations (reference populations). He said that there was no apparent relationship between the proportion of hatchery spawners (pHOS; proportion of effective hatchery-origin spawners) and freshwater productivity for the Twisp and Methow populations. The Chewuch population was not analyzed because there is no smolt trap on the Chewuch River for collecting outmigrant data. In summary, Mackey said results from the Methow subbasin spring Chinook analyses were very similar to those for the Chiwawa spring Chinook.

IV. Chelan PUD

A. 5-Year M&E Results Presentation (Tracy Hillman/Andrew Murdoch)

Tracy Hillman, BioAnalysts, presented results of the spring Chinook supplementation analyses (Attachment D) from the draft Chelan PUD 5-Year Hatchery M&E Report. Hillman emphasized that, although the presentation today covered only the Chiwawa spring Chinook analyses, the analysis of all Chelan PUD hatchery programs was in progress. Josh Murauskas said that the full draft Chelan PUD 5-Year Hatchery M&E report would be available in November or December 2011. Joe Miller said he would confirm the date with Hillman.

Hillman's presentation included summaries and analyses of: in-hatchery performance; hatchery adult production; and a synthesis of information and analyses on the effects of supplementation on life history and spawning characteristics, abundance, and productivity. The results of his detailed analysis are shown in the attached PowerPoint presentation (Attachment D). To augment his presentation, Hillman provided the following summary of findings and some preliminary recommendations for consideration:

Summary:

1. Inability to collect the target number of broodstock prevented this program from meeting the target release number.
2. Size-at-release goals were not met largely because size targets were not based on stock-specific length-weight relationships.
3. Hatchery Replacement Rates (HRRs) were on average six times greater than the Natural Replacement Rates (NRRs).
4. There was no significant genetic difference between wild and hatchery Chinook.
5. There was no significant difference in migration timing or spawn timing of hatchery and wild Chinook.

6. There was a significant difference in the distribution of hatchery and wild Chinook in the Chiwawa.
7. There was a significant difference in age-at-maturity and size-at-maturity between hatchery and wild Chinook.
8. Hatchery Chinook exceeded the 5 percent and 10 percent stray rates.
9. Supplementation has not significantly increased total spawning abundance or Natural-Origin Returns (NORs) in the Chiwawa Basin.
10. Supplementation has not significantly reduced adult productivity within the Chiwawa Basin.
11. The significant negative relationship between juveniles/spawner and spawners indicates that the Chiwawa Basin has a carrying capacity that at times has been exceeded.

Possible Recommendations:

1. Reduce the size of the program.
2. To the extent possible, collect all broodstock at the Chiwawa Weir.
3. Revise the size-at-release targets based on the stock-specific length-weight relationship. Consider selecting size targets that are within 20 percent of the size of natural-origin smolts.
4. Increase PNI.
5. Examine the effects of the Chiwawa Weir on straying.

B. Recalculation Timeline (Joe Miller)

Joe Miller summarized a number of time-sensitive issues that were driving Chelan PUD's concern to complete the new hatchery implementation plans before the end of the year. He said that the Chelan PUD budget for the 2012 calendar year must be approved by the Commission by the end of 2011 and that not having agreement on hatchery production levels and an implementation plan will make it very difficult to accurately estimate hatchery facility budget needs for 2012. Miller said that agreement on production levels was also needed so that permit timelines could be met and a new permit could be issued before the current one expires. He said that, at the current rate of progress, 2012 broodstock will be collected and juveniles potentially released without a valid permit. Miller noted that Chelan PUD is vulnerable for "take" of Endangered Species Act (ESA)-listed species if operating without a valid permit. He said Chelan PUD also needs to know their hatchery production levels so they can plan for the best use of hatchery facility space for the upcoming year. Until upcoming production levels are agreed on, Chelan PUD cannot move forward with agreements for sharing the use of their hatchery facilities.

C. Update: Okanagan Nation Alliance Skaha Contract (Joe Miller)

Joe Miller said that, on October 17, 2011, Chelan PUD received final approval from their Commission to move forward with the Skaha sockeye production program. Miller said that Chelan and Grant PUDs and the Okanagan Nation Alliance (ONA) Aquatic Enterprises, a subsidiary of ONA, have agreed on a long-term contract for capital and operation expenses of about $4 million for the Chelan PUD share of the program. Miller said that the total agreed-to budget would cover the full build-out of the production facility with a capacity for 5 million fry. The agreement is for a term of up to 49 years. Mike Schiewe said the Hatchery Committees are scheduled to look at progress towards meeting sockeye production targets in 2021, which is just short of the next recalculation date. Miller said Chelan PUD is at about a 30% engineering design on the facility and moving along well.

D. Request for Eyed-eggs (Steve Hays)

Steve Hays provided background on the Chelan PUD request for 2,500 summer Chinook eyed-eggs as requested by the 2011 Hatchery Committees at the September 21, 2011, meeting (Attachment E). The eggs will be used in a survival study of summer Chinook eyed eggs-to-fry in the Chelan Falls tailrace in the Chelan River. Mike Tonseth said the eggs could be made available without interfering with any HCP summer Chinook programs. The Committees approved the request.

V. NMFS

A. HGMP Update (Craig Busack)

Craig Busack reported that he emailed Carmen Andonaegui, for distribution to the Hatchery Committees, a spreadsheet showing the status of all ESA consultations in the Columbia River Basin. He said that National Marine Fisheries Service (NMFS) had reviewed the adult management plan for the Wenatchee spring Chinook program and provided oral comments to Chelan PUD and to WDFW. Busack also noted that NMFS had talked with Chelan PUD about their offer to provide support to NMFS to work more quickly to process the Chelan PUD Hatchery and Genetic Management Plans (HGMP)s. Joe Miller said that Chelan PUD is presently working with NMFS to address some outstanding items with the HGMPs that they have submitted. Busack said the next discussion with Chelan PUD is scheduled for next Monday, October 24, 2011. Busack said that he will provide an updated consultations spreadsheet each month to the Committees. Tom Scribner asked whether NMFS was planning to consider the issue of funding during their review of the adult management sections of the HGMPs for the spring Chinook. Miller responded that Chelan PUD was still discussing the adult management plan with WDFW and that there were a couple of management responsibilities unique to fisheries managers. He said that Chelan PUD has been looking at the hatchery facilities and trying to understand how the adult management plan responsibilities would be applied and said that Chelan PUD was committed to implementing their HGMPs. Busack said that the HGMPs had all included a discussion of adult management and have a sliding scale for implementation. He said that the Biological Opinion Terms and Conditions would assume that whatever management activities were necessary to meet the Terms and Conditions would be implemented. Mike Schiewe reminded the Committees that the basis for issuing take permits for the HGMPs was that the supplementation programs enhance recovery. He said that the permits assume that all conditions will be implemented.

Greg Mackey asked for an update on review of Methow HGMPs. Busack said that he was working with Bill Gale to revise the Winthrop steelhead HGMP and will then start working on the Winthrop spring Chinook HGMP. Regarding the Douglas PUD HGMPs, Busack said that the Wells and Winthrop HGMPs will ultimately to be considered together. Mackey said that Douglas PUD had not yet received letters from NMFS stating the adequacy of either the draft Wells steelhead or the Methow spring Chinook HGMPs as submitted. He asked that if NMFS was intending to use Douglas PUD's Wells steelhead HGMP in consideration of the USFWS Winthrop steelhead HGMP, then should not NMFS provide Douglas PUD a letter of scientific adequacy before such a review? Shane Bickford said that he was recently advised that NMFS would be reviewing the Wells HGMPs swiftly. Busack said he would check in with NMFS management and confirm the order of review for the Winthrop and Wells/Methow HGMPs. Mackey asked Busack to contact him if he needed any input on either of the Douglas PUD HGMPs.

B. Okanogan Spring Chinook 10(j) Request Update (Craig Busack)

Craig Busack introduced Eric Murray, NMFS, who is drafting NMFS's response to the CCT's request to authorize reintroduction of Upper Columbia spring Chinook into the Okanogan subbasin as an experimental population under Section 10(j) of the ESA. Murray said that the CCT is proposing to introduce excess hatchery fish from Winthrop National Fish Hatchery (NFH) into the Okanogan subbasin with a limited take prohibition. He said that the request was published earlier this year (July 19, 2011) in the Federal Register and he received comments only from the U.S. Bureau of Reclamation (Reclamation) and the U.S. Fish and Wildlife Service (USFWS), both in support of the proposal. Murray said that he would be moving forward with drafting a proposed rule and that environmental review under the State Environmental Policy Act (SEPA) would have to be met. He said that a public meeting will be held in early December 2011, with a draft rule available in July 2012, with the hope of finalizing the rule by summer 2012.

VI. HETT Update

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) met on October 11, 2011, and discussed the following items:

Non-Target Taxa of Concern (NTTOC) Analysis

The risk assessment test model runs have begun. The next step in the risk assessment will be to send a letter of invitation to a list of experts asking for their participation in the assessment. The HETT anticipates sending the letters out in February 2012 along with the risk assessment manuscript describing the Delphi and modeling approaches. The manuscript will be included as an appendix to the 5-Year M&E reports. Greg Mackey said that the model runs will be divided up among HETT members based on program ownerships. He said that the plan is to complete model runs of all possible interactions, but that only a representative subset of those interactions will be sent to the Delphi panel members asking for their assessment, given the large number to review.

Control Group Analysis

The HETT is developing a model for use in identifying and ranking potential reference streams. A method for identifying reference streams was previously developed by the HETT, along with a paper describing the method (*Investigation in the Use of Spatial Controls for Hatchery Evaluations in the Upper Columbia River Basin: Control Stream Recommendations for Spring Chinook*, August 15, 2007). However, the HETT felt that the method fell short in that it did not provide a way to rank the list of viable reference streams. The model allows for ranking of the reference streams using four variables: Proportion Natural-Origin Spawners (pNOS); correlation coefficient between test and reference populations; relationship between trends; and coefficient of variance of treatment over reference. A white paper describing the reference stream ranking process is being drafted by the HETT for the Hatchery Committees.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are November 16, 2011 (Douglas PUD), December 14, 2011 (Chelan PUD), and January 18, 2012 (Douglas PUD).

The Committees talked about the November meeting agenda items to make sure enough time was reserved to allow for a full discussion of the Implementation Plans. Bill Gale offered to arrange a presentation to the Committees on the results of a 2-year evaluation of Winthrop Hatchery steelhead program. The Committees agreed to have the USFWS presentation on an agenda in early 2012.

Bill Gale reported that Reclamation hosted a Projects Alternatives and Solutions Study (PASS) meeting in Twisp, Washington, two weeks ago to consider options for managing adult steelhead in the Methow subbasin. He said that Reclamation is working on finalizing a draft report identifying the potential alternatives discussed; these included the construction of a weir at one of several different locations and managing adults without constructing a weir. Gale said that Reclamation seemed intent on taking the lead in finding a workable solution for steelhead adult management in the Methow subbasin. He said that the next step will be to finalize the report; then Reclamation and the USFWS will separately evaluate the alternatives before holding a joint meeting to attempt to reach consensus on a single approach for managing adult Methow steelhead.

List of Attachments

Attachment A – List of Attendees
Attachment B – Douglas PUD Recalculation Presentation
Attachment C – Douglas PUD 5-Year M&E Analysis Preliminary Results Presentation

Attachment D – Chelan PUD 5-Year M&E Chiwawa Spring Chinook Analysis Results Presentation

Attachment E – Chelan PUD Egg-to-Fry Chelan River Study Proposal

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Shane Bickford	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Jeff Korth	WDFW
Andrew Murdoch	WDFW
Keely Murdoch*	Yakama Nation
Tom Scribner*	Yakama Nation
Steve Parker	Yakama Nation
Bill Gale*	USFWS
Tracy Hillman	BioAnalysts
Craig Busack*†	NMFS

Notes:

* Denotes Hatchery Committees member or alternate

† Joined by phone

Attachment B

Adjustment of Douglas PUD Hatchery Compensation

HCP Hatchery Committee

October 19, 2011

Attachment B

Sensitivity Comparisons

Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1 *a+c+f*	Option 2 *a+c+e+f*	Option 3 *a+b+d+f+g*
Douglas	SpCH	17,801	20,663	29,123
	SuCH	489,540	489,540	489,540
	StHD	307,052	308,352	308,352
Chelan	SpCH	97,712	112,649	204,542
	SuCH	975,228	991,039	1,047,545
	StHD	186,621	189,242	211,211
Grant	SpCH	191,942	218,254	357,796
	SuCH	645,049	661,051	773,829
	StHD	101,231	107,890	196,007
Total	SpCH	307,455	351,566	591,461
	SuCH	2,109,817	2,141,631	2,310,915
	StHD	594,903	605,484	715,570
Chief Joseph funding arrangement		✔	✔	✔
Inclusion of BAMP (natural-origin fish)		✔	✔	✔
Calculated NNI on GCFMP releases		✔	✔	✔
PUD SAR credit for GCFMP adult equivalents		✔	✔	
Mitigation for NNI on hatchery releases			✔	✔
Inclusion of mitigation for inundation[1]				✔

Attachment B

DISTRIBUTION OF PRODUCTION BY RIVER BASIN

Table 1. Proposed implementation of mid-Columbia PUD spring Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan Basin[1]	259,000	259,000	259,000
Methow Basin[2]	150,000	224,000	224,000
Wenatchee Basin[2]	157,000	367,000	367,000
Total	**566,000**	**850,000**	**850,000**

** Additional spring Chinook production in the Wenatchee River totals 1,200,000 (Leavenworth); additional spring Chinook production in the Methow River totals 400,000 (Winthrop NFH); additional spring Chinook production in the Okanogan River totals up to 641,000 (Chief Joseph). These targets would represent an additional 2,241,000 spring Chinook smolts in addition to the proposed 850,000 PUD-funded target releases.*

Table 2. Proposed implementation of mid-Columbia PUD steelhead programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	101,000	196,000	100,000[3]
Methow R.[4]	7,000	8,000	8,000
Methow R. Inundation[5]	100,000	100,000	100,000
Columbia R. Inundation[6]	200,000	200,000	200,000
Wenatchee R.	22,000	46,000	22,000
Wenatchee R. Inundation	165,000	165,000	165,000
Total	**595,000**	**715,000**	**595,000**

** Additional steelhead production in the Methow River totals 100,000 (Winthrop NFH). These targets would represent an additional 100,000 steelhead smolts in addition to the proposed 595,000 PUD-funded target releases.*

Mitigation for NNI ...

Inclusion of mitigation for inundation

Attachment B

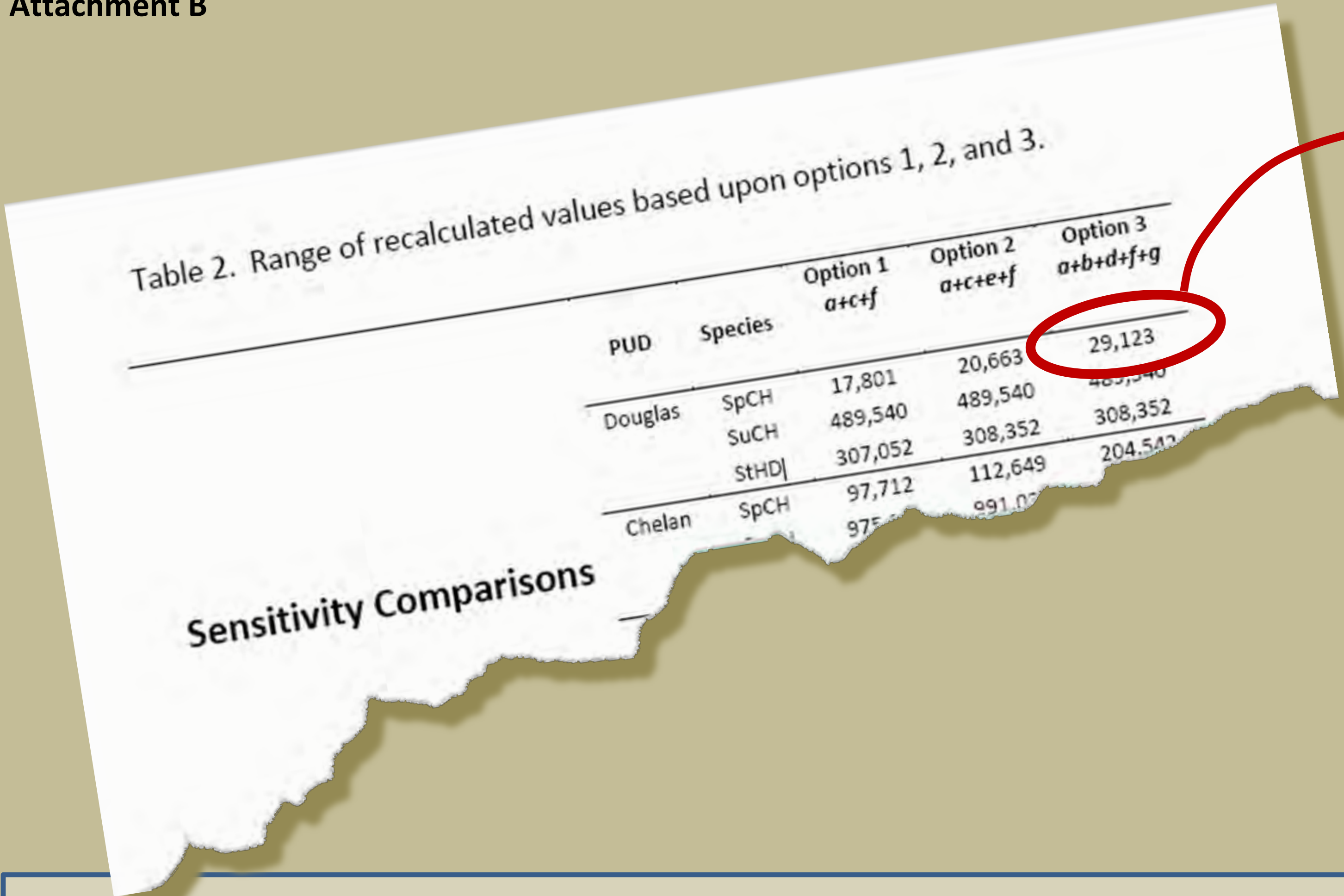


Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1 *a+c+f*	Option 2 *a+c+e+f*	Option 3 *a+b+d+f+g*
Douglas	SpCH	17,801	20,663	29,123
	SuCH	489,540	489,540	[illegible]
	StHD	307,052	308,352	308,352
Chelan	SpCH	97,712	112,649	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]

Sensitivity Comparisons

Spring Chinook NNI: 29,123
Spring Chinook CJH: 33,300

Attachment B

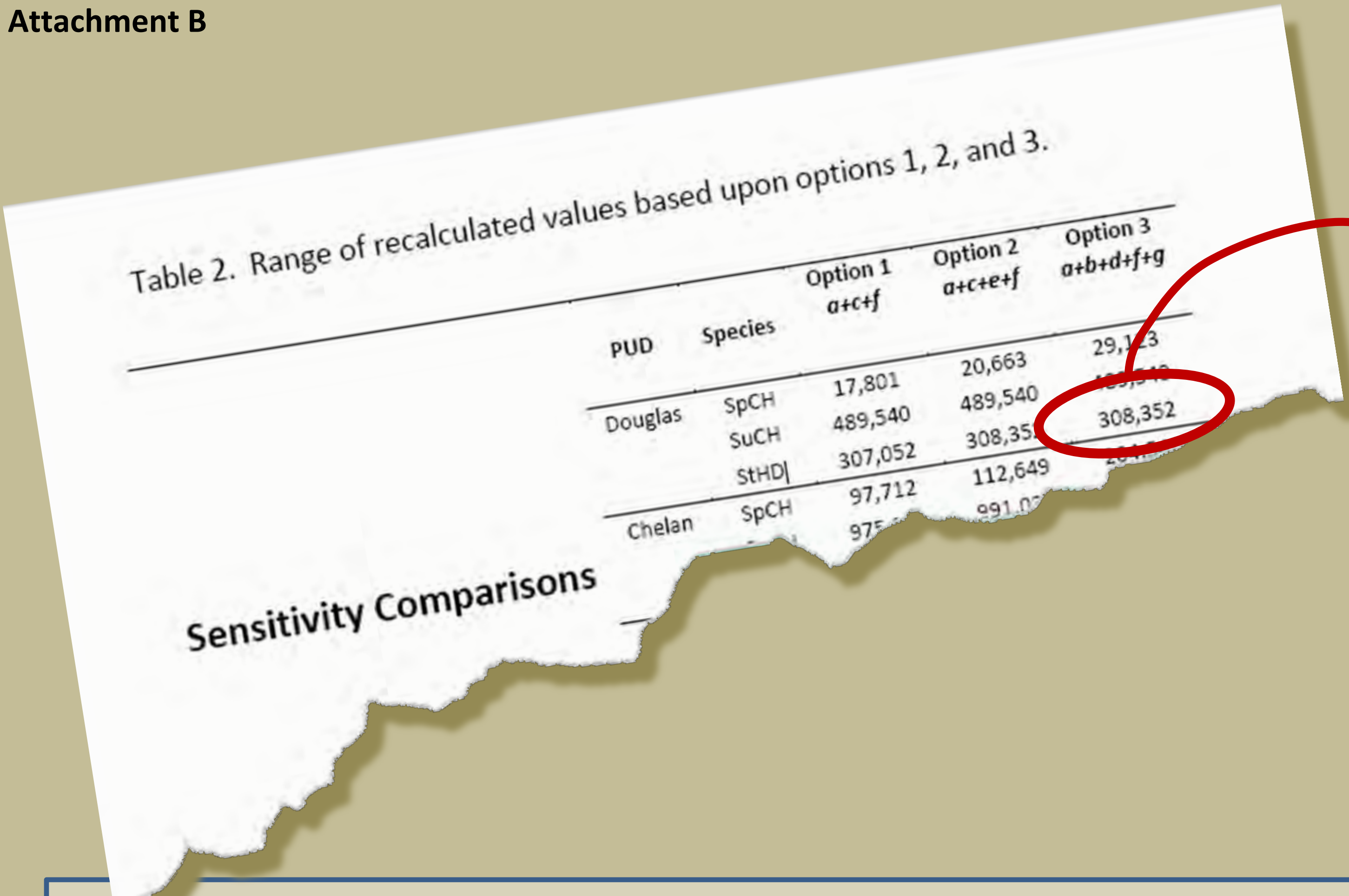


Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1 *a+c+f*	Option 2 *a+c+e+f*	Option 3 *a+b+d+f+g*
Douglas	SpCH	17,801	20,663	29,1[illegible]3
	SuCH	489,540	489,540	[illegible]
	StHD	307,052	308,35[illegible]	308,352
Chelan	SpCH	97,712	112,649	[illegible]
	[illegible]	97[illegible]	991,0[illegible]	

Sensitivity Comparisons

Steelhead NNI Twisp: 8,352

Inundation Methow: 100,000

Inundation Wells: 200,000

Attachment B

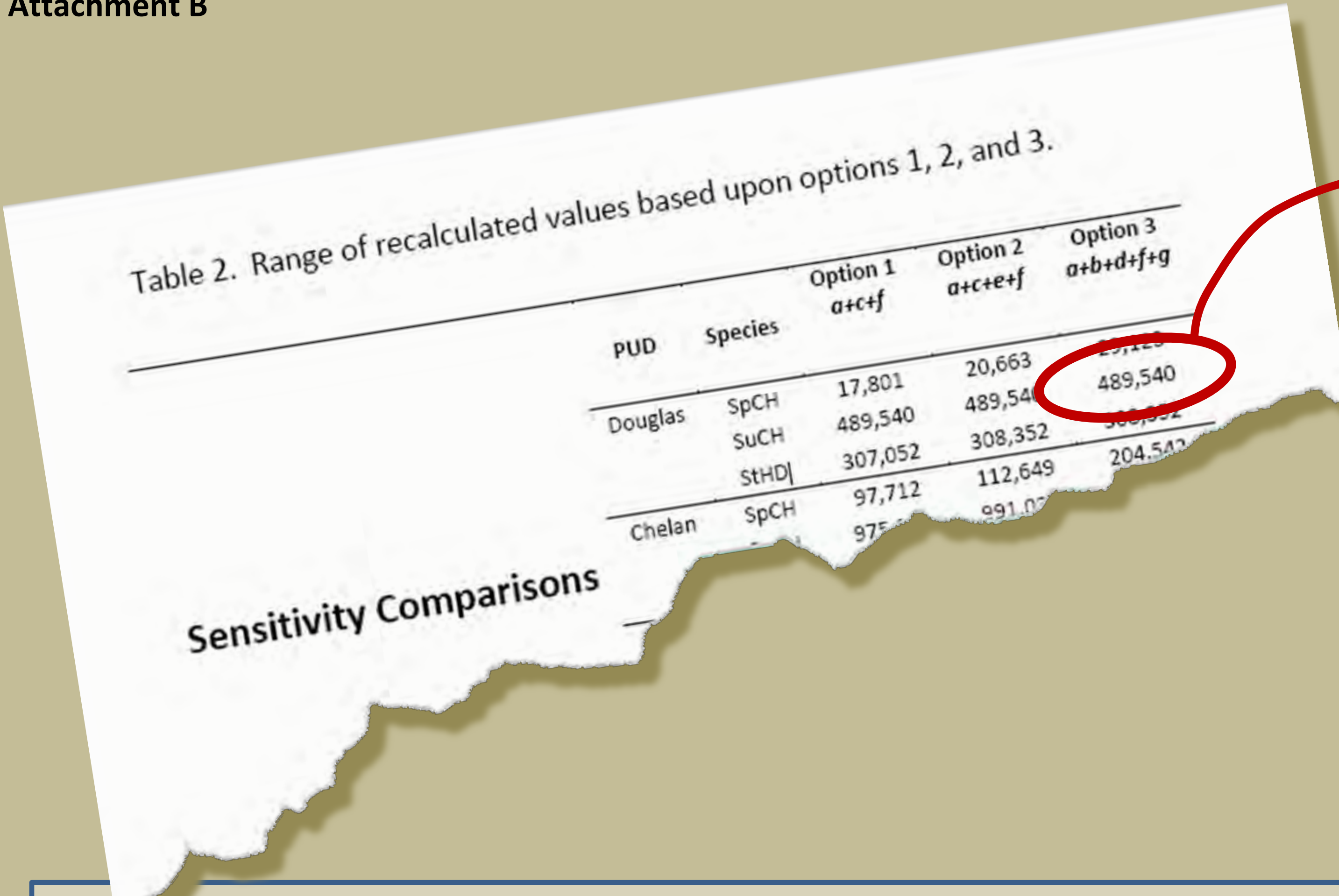


Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1 $a+c+f$	Option 2 $a+c+e+f$	Option 3 $a+b+d+f+g$
Douglas	SpCH	17,801	20,663	[illegible]
	SuCH	489,540	489,54	489,540
	StHD	307,052	308,352	[illegible]
Chelan	SpCH	97,712	112,649	204,54
		97	991,0	

Summer Chinook NNI: 48,540

Increase consistent with Chief Joseph SOA

Summer Chinook NNI: 54,575

Attachment B

Table 2. Range of recalculated values based upon options 1, 2, and 3.

PUD	Species	Option 1 *a+c+f*	Option 2 *a+c+e+f*	Option 3 *a+b+d+f+g*
Douglas	SpCH	17,801	20,663	[illegible]
	SuCH	489,540	489,54[illegible]	489,540
	StHD	307,052	308,352	[illegible]
Chelan	SpCH	97,712	112,649	204,54[illegible]
	[illegible]	97[illegible]	991,0[illegible]	[illegible]

Sensitivity Comparisons

Summer Chinook NNI:	**54,575**
Inundation yearlings:	**320,000**
Inundation subs:	**484,000**

Attachment B

Summary

- Spring Chinook and Steelhead are maximized
- Summer Chinook exceeds recalculated value
- Inundation production is unchanged

Attachment B

NNI Adjusted Hatchery Compensation

Species	River	Facility	Type	Compensation
Spring Chinook	Twisp	Methow	NNI	29,123
	Okanogan	Chief Joseph	NNI	33,300
Total				*62,423*
Steelhead	Twisp	Wells/Methow	NNI	8,352
	Methow	Wells/Methow	Inundation	100,000
	Columbia	Wells	Inundation	200,000
Total				*308,352*
Summer Chinook	Okanogan	Chief Joseph	NNI	54,575
	Columbia	Wells	Inundation 1	320,000
	Columbia	Wells	Inundation 0	484,000
Total Yearlings				*374,575*
Total Sub-Yearlings				*484,000*

Attachment C

Douglas PUD 5-Year M&E Report: Synopsis of Draft Results

HCP Hatchery Committee

October 19, 2011

Methow Basin Spring Chinook

- Objective 1: Abundance, Recruitment, and Productivity
  - Spawner Abundance (Hatchery + Natural Origin)
  - Natural Origin Recruits (NOR)
  - Productivity (Recruits per Spawner)
- Objective 7: Freshwater Productivity
  - pHOS vs. Freshwater Productivity Relationship

Spawner Abundance

Population	Finding	Comparison
Twisp	Decrease	3 of 4
	No Difference	1 of 4
Chewuch	No Difference	2 of 3
	Decrease	1 of 3
Methow	No Difference	3 of 3

Attachment C

NOR Abundance

Population	Finding	Comparison
Twisp	Decrease	2 of 4
	No Difference	2 of 4
Chewuch	No Difference	2 of 3
	Decrease	1 of 3
Methow	No Difference	3 of 5
	Decrease	2 of 5

Attachment C

Productivity

Population	Finding	Comparison
Twisp	No Difference	4 of 4
Chewuch	No Difference	3 of 3
Methow	No Difference	4 of 4

Attachment C

Proportion of Hatchery Spawners Relationship to Freshwater Productivity

Population	Finding
Twisp	No Relationship
Chewuch	NA
Methow	No Relationship

Attachment D

Evaluation of the Chiwawa Spring Chinook Program

Outline

(1) In-Hatchery Performance

(2) Hatchery Adult Production (HRR)

(3) Supplementation:

- Life History and Spawning Characteristics
- Abundance and Productivity

(4) Summary and Recommendations

Methods and Data

(1) Murdoch and Peven. 2005. Conceptual approach to monitoring and evaluating the Chelan County Public Utility District Hatchery Programs.

(2) Hays et al. 2006. Analytical framework for monitoring and evaluating PUD Hatchery Programs.

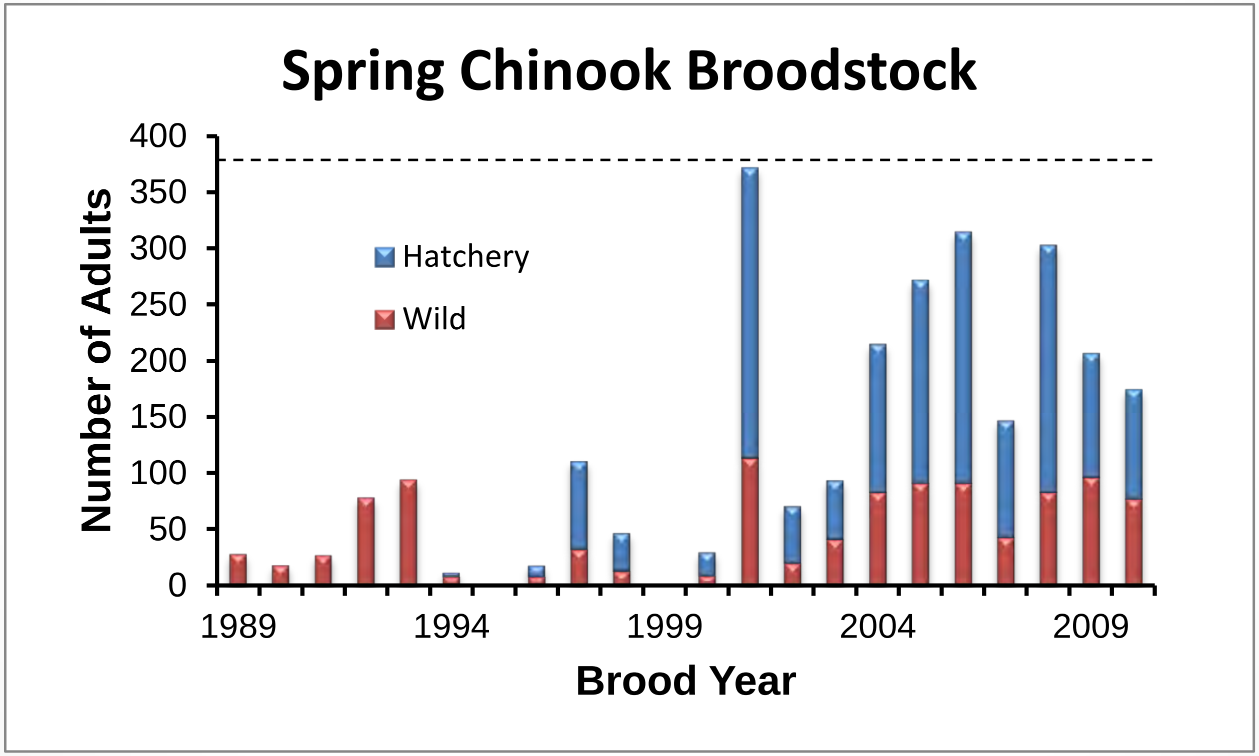
(3) Hillman et al. 2011. Monitoring and evaluation of the Chelan County PUD Hatchery Programs; 2010 Annual Report.

In-Hatchery Performance

- Broodstock Collection (Bonus)
- Unfertilized Egg to Release Survival (Bonus)
- Size at Release
- Number Released

Attachment D

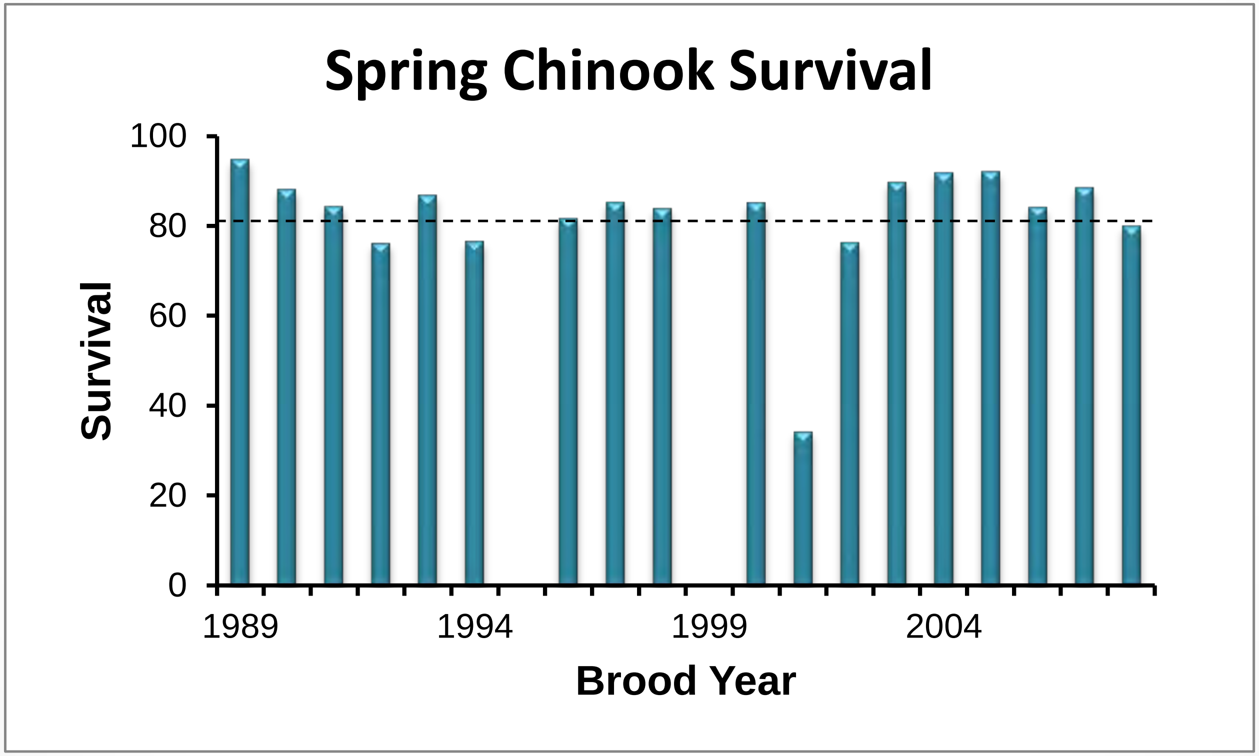
Broodstock Collection



Previous Goal = 379 adult spring Chinook; Current Goal = 170 adults

Attachment D

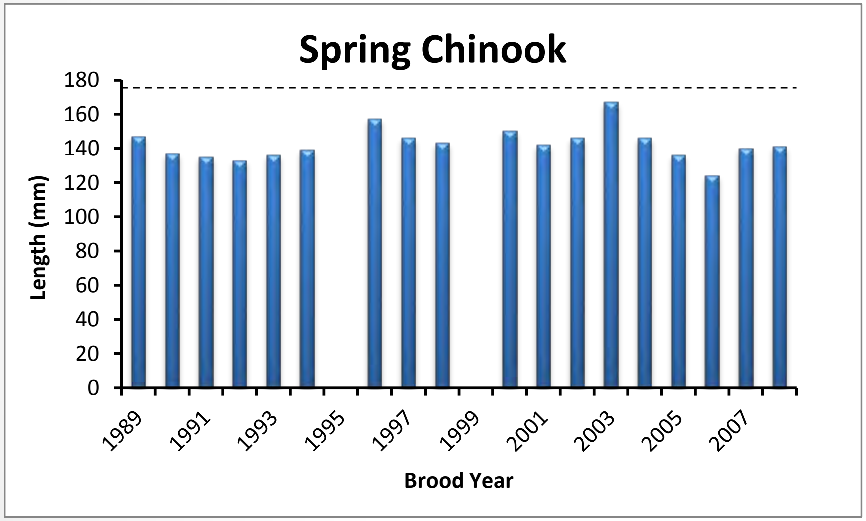
Within-Hatchery Survival

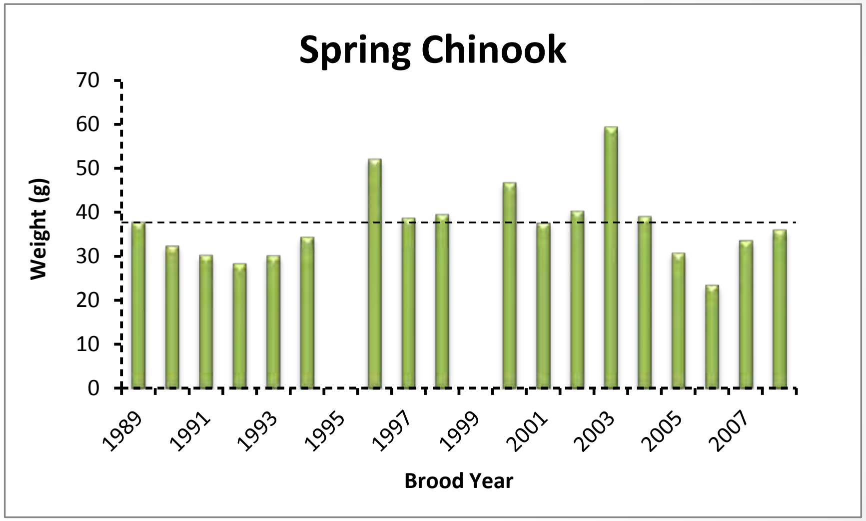


Unfertilized Egg to Release Survival Goal = 81%

Attachment D

Size at Release

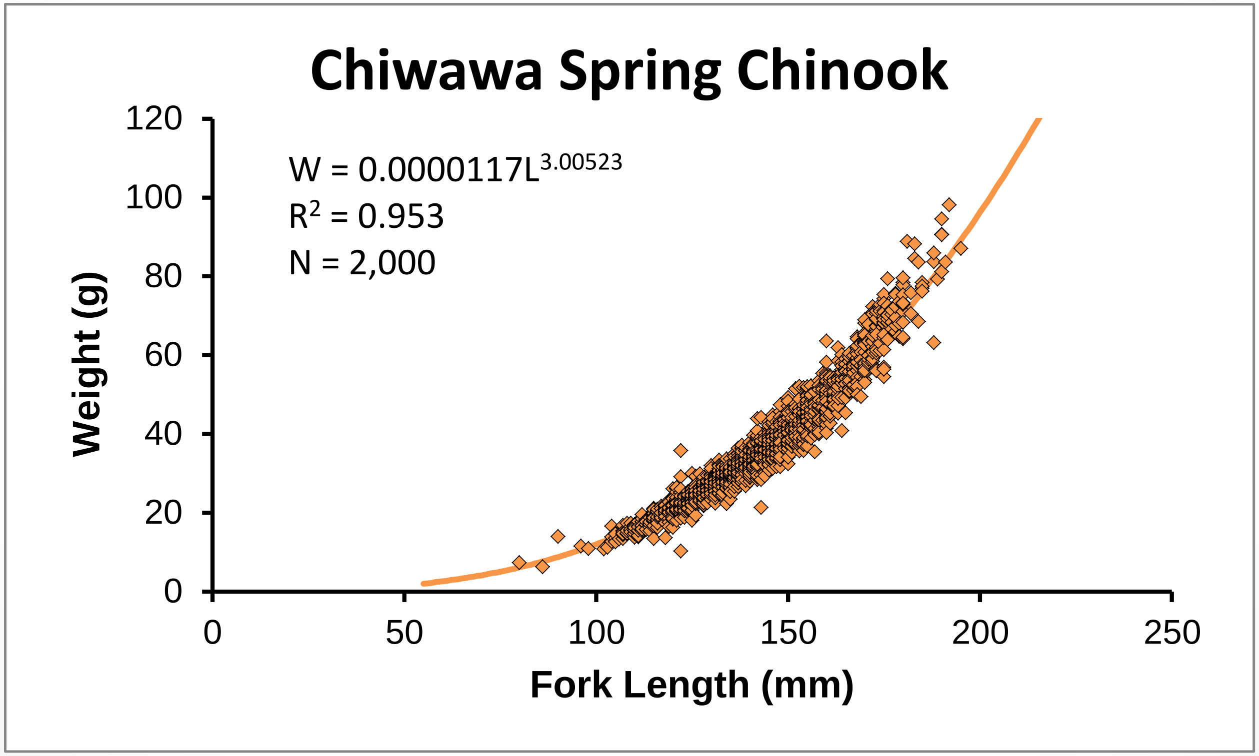




Length Goal = 176 mm; Weight Goal = 37.8 g

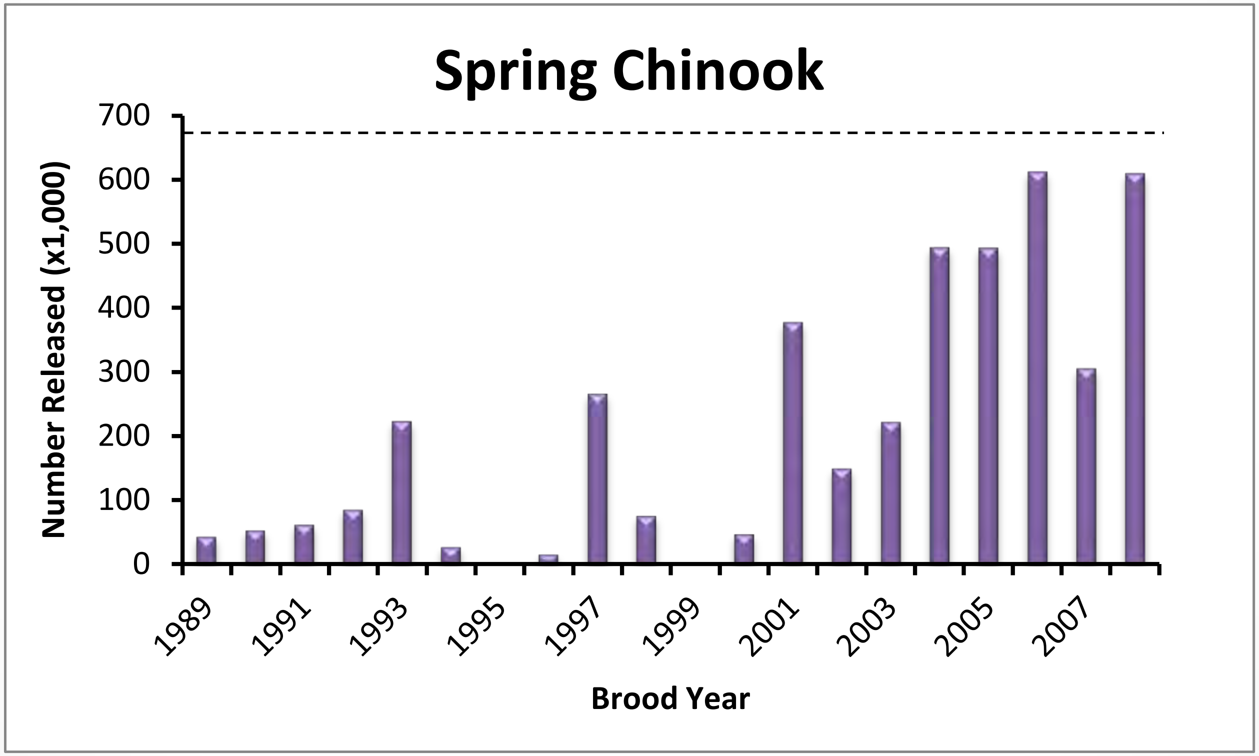
Attachment D

Length-Weight



Attachment D

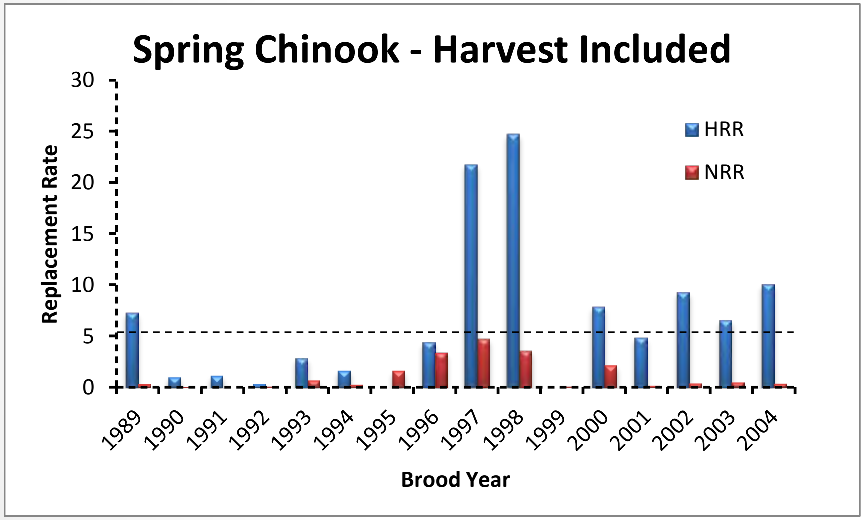
Number Released

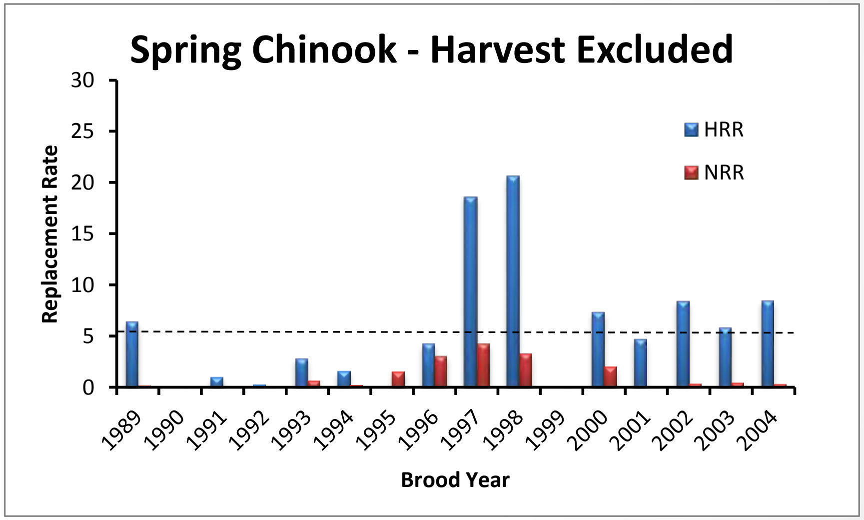


Previous Goal = 672,000 smolts; Current Goal = 298,000 smolts

Attachment D

Hatchery Adult Production





HRRs were nearly six times greater than NRRs

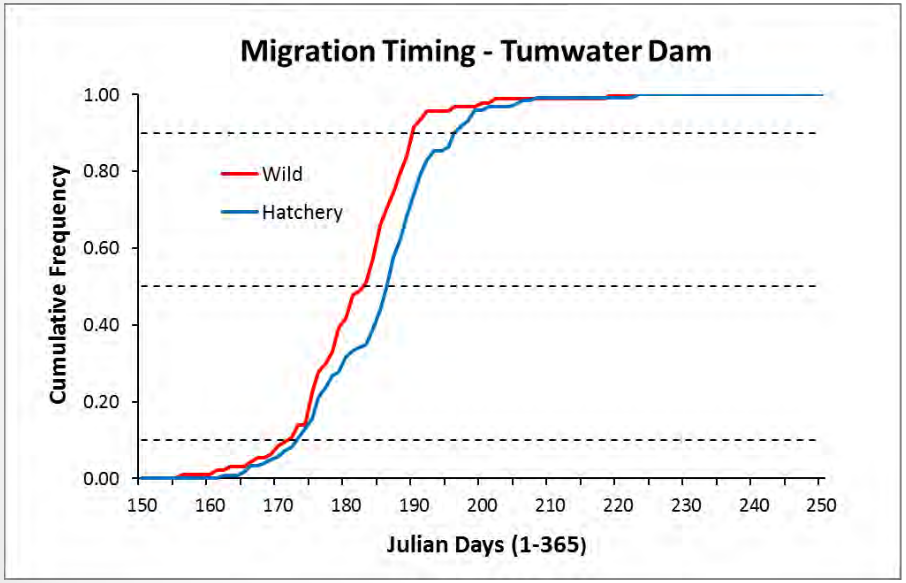
Attachment D

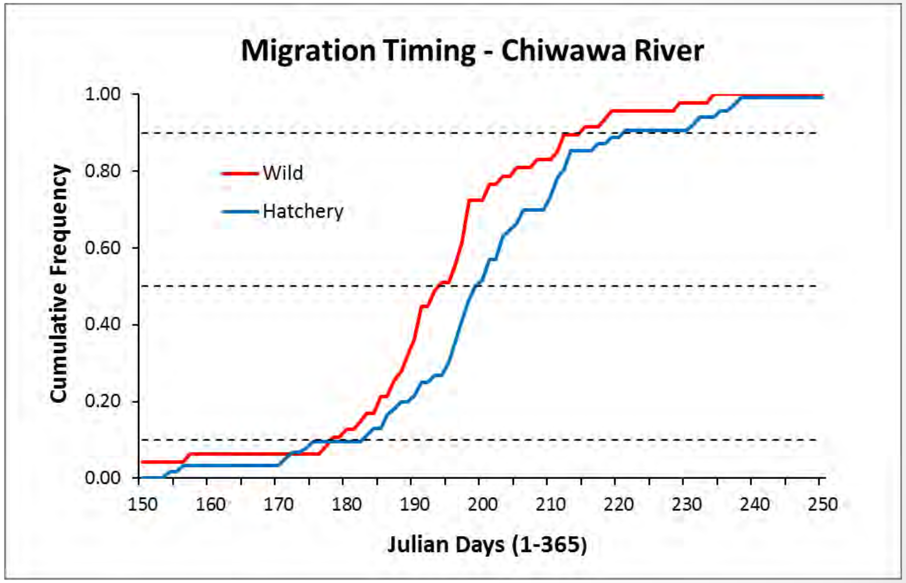
Life History and Spawning Characteristics

- **Migration Timing**
- **Spawn Timing**
- **Redd Distribution**
- **Age-at-Maturity**
- **Size-at-Maturity**
- **Stray Rates**
  - **Among Populations by Brood Year**
  - **Among Populations by Return Year**
  - **Within Population by Return Year**

Attachment D

Migration Timing

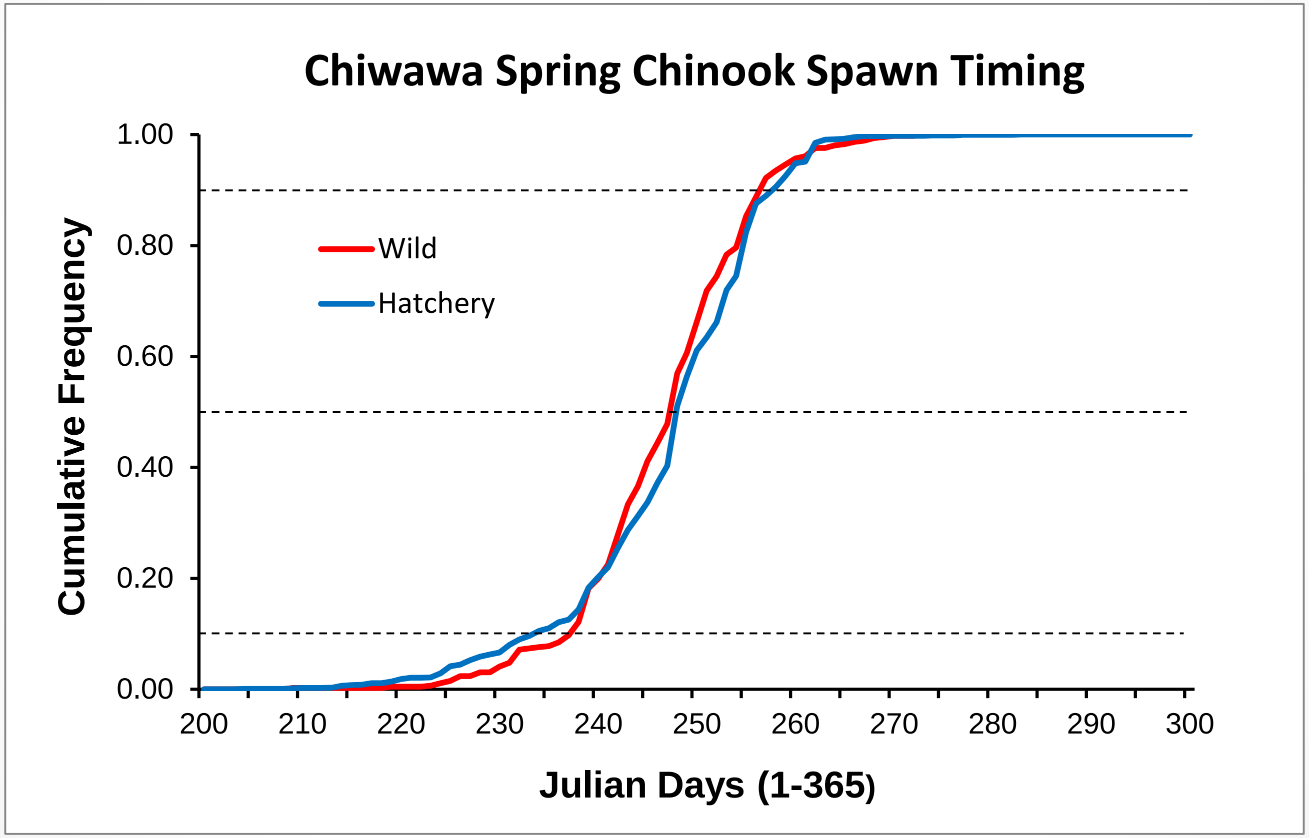




No Significant Difference Migration Timing

Attachment D

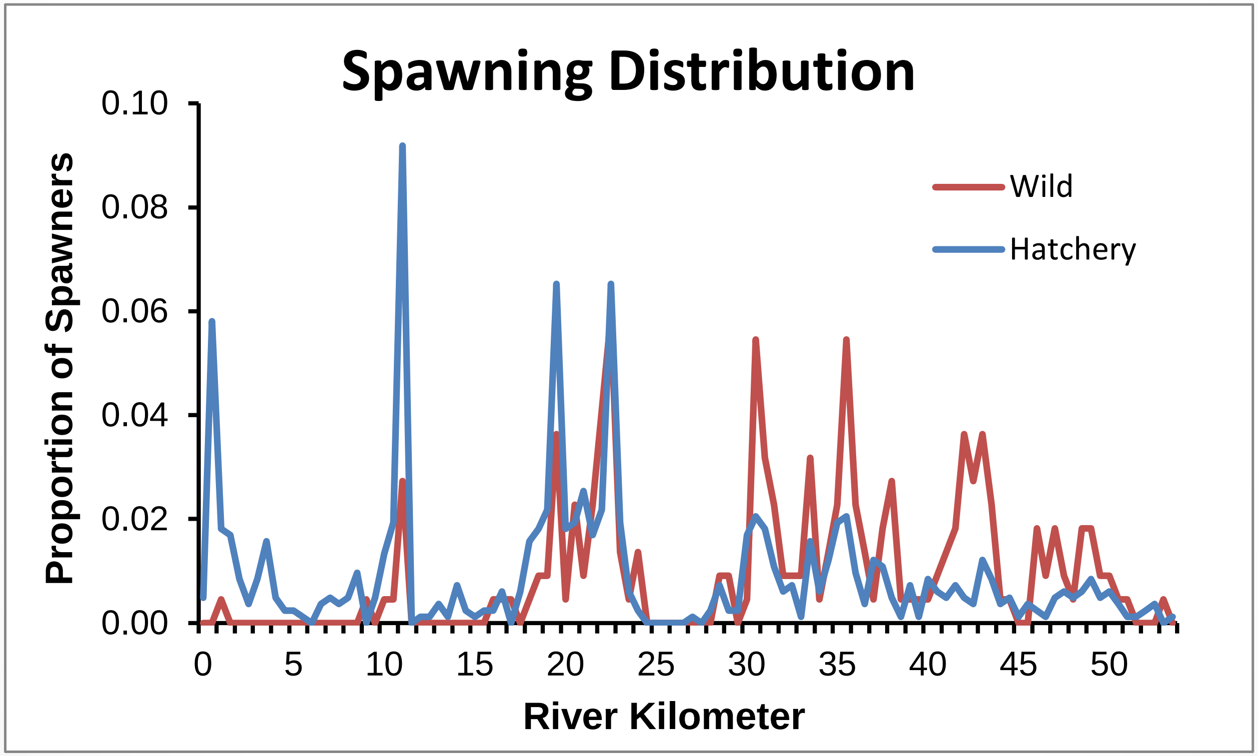
Spawn Timing



No Significant Difference in Spawn Timing

Attachment D

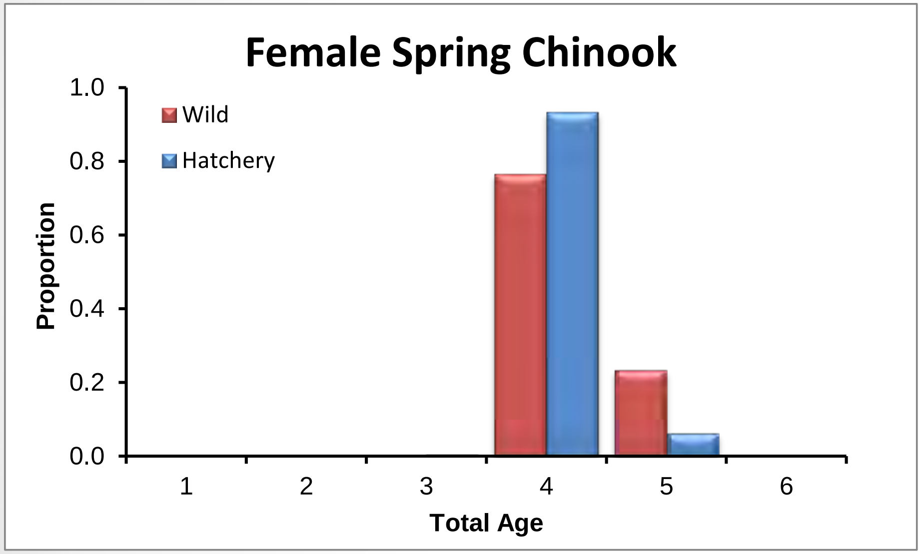
Redd Distribution

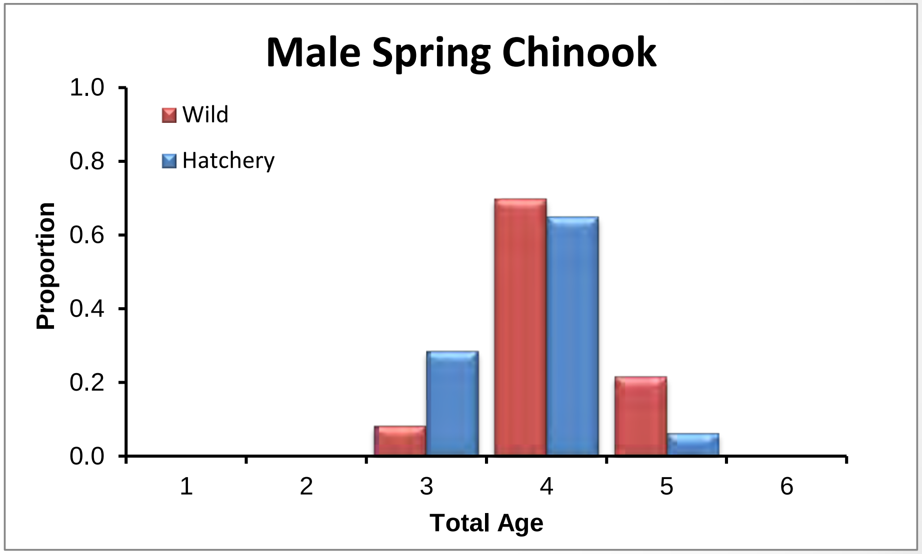


Significant Difference in Redd Distribution

Attachment D

Age at Maturity

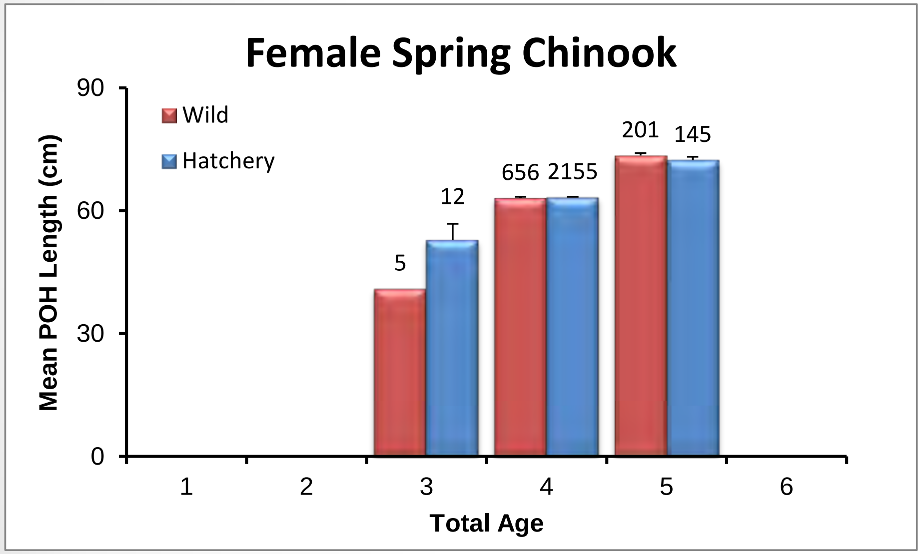


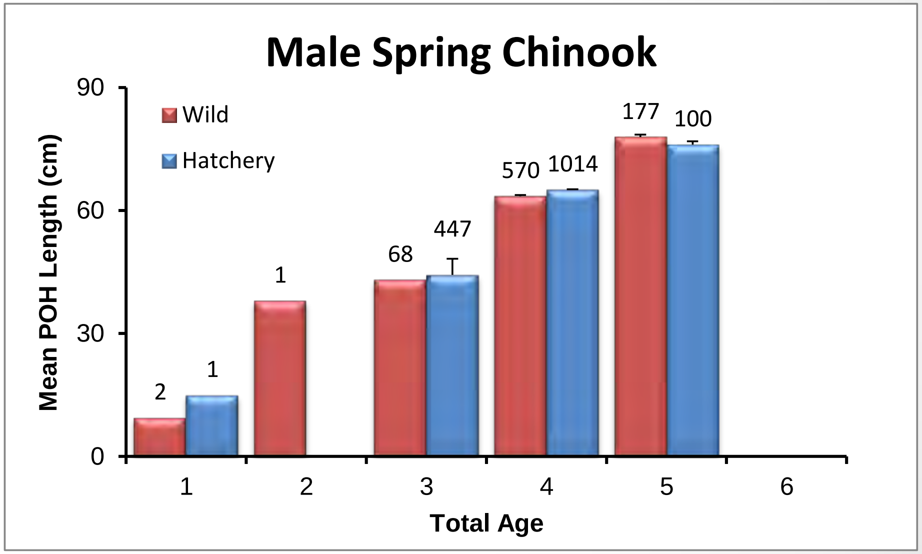


Significant Difference in Age at Maturity

Attachment D

Size at Maturity

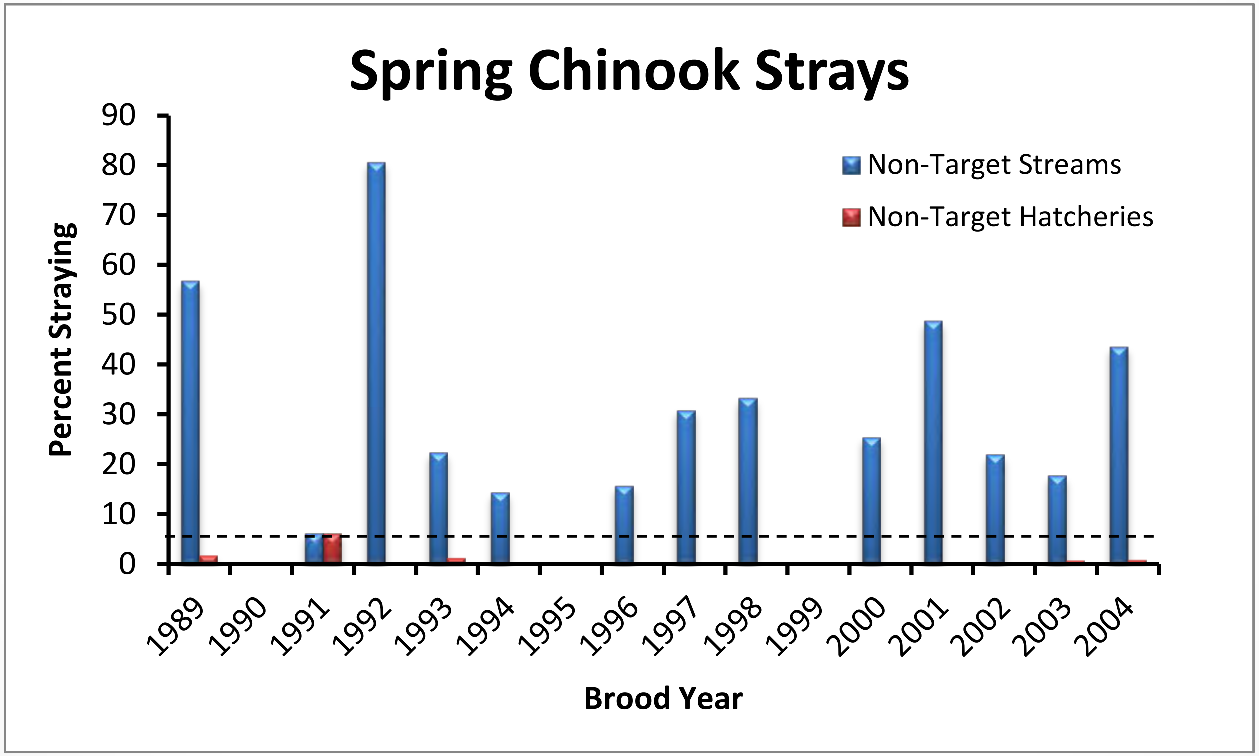




Significant Difference in Size at Maturity

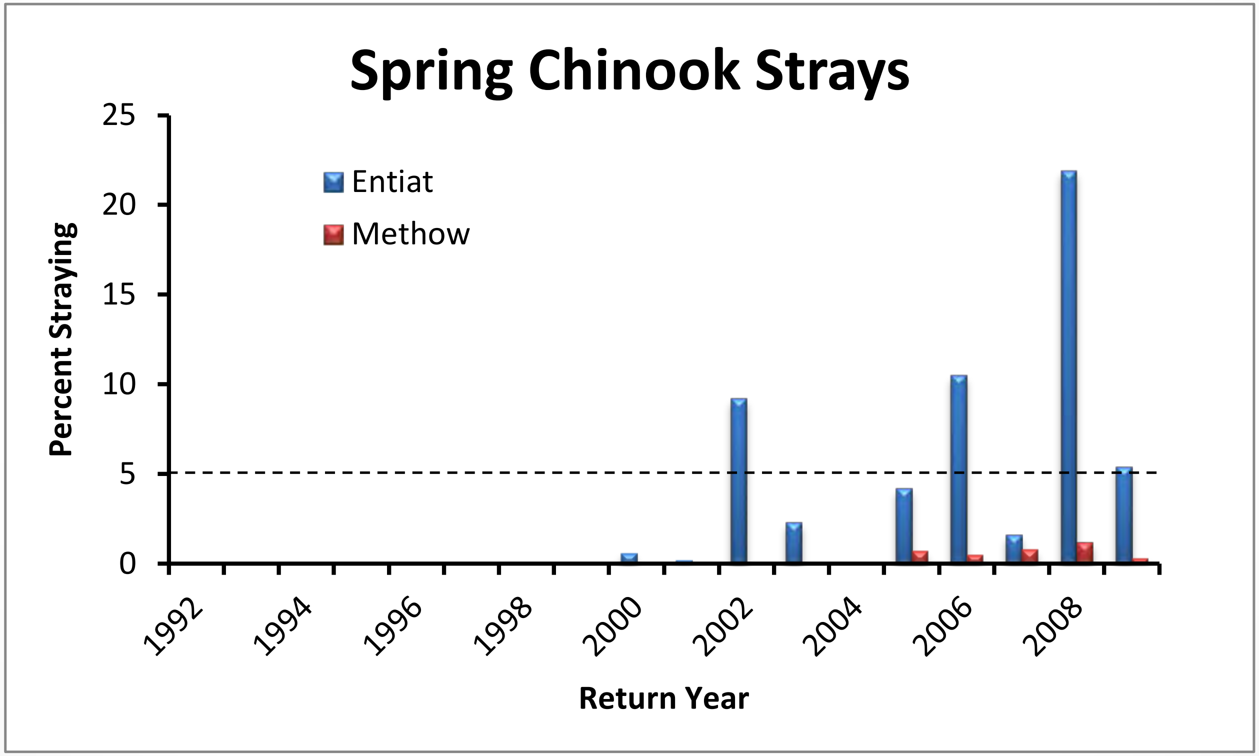
Attachment D

Stray Rates



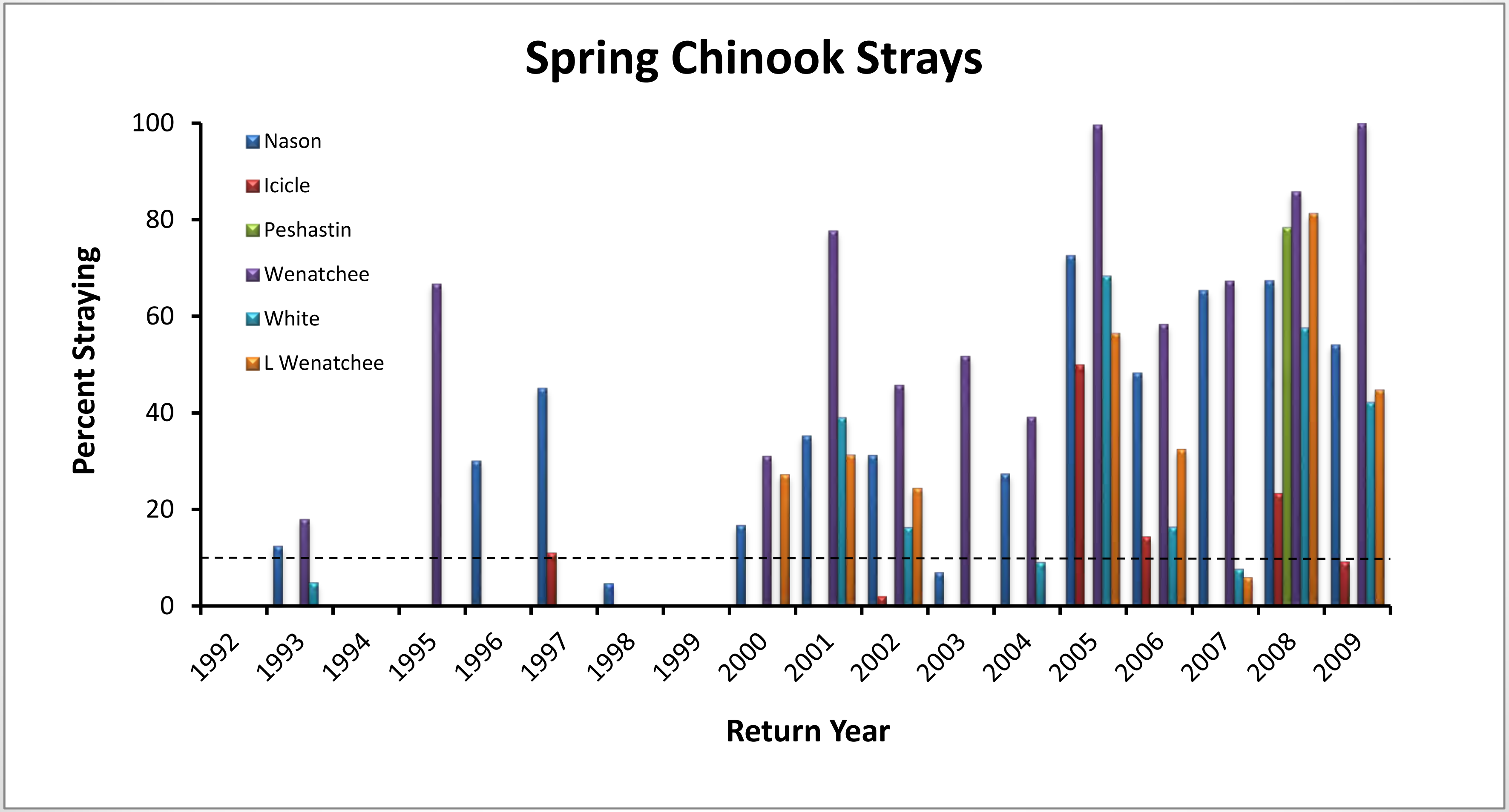
Attachment D

Stray Rates



Attachment D

Stray Rates

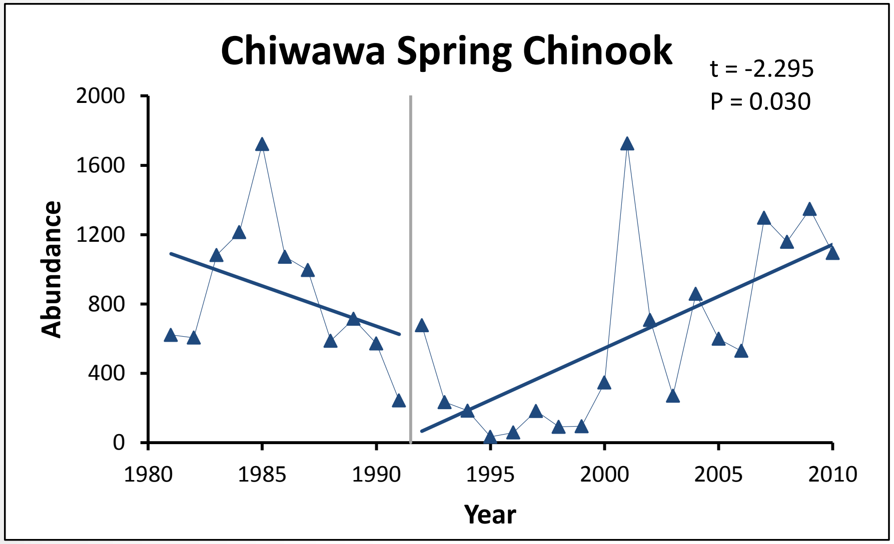


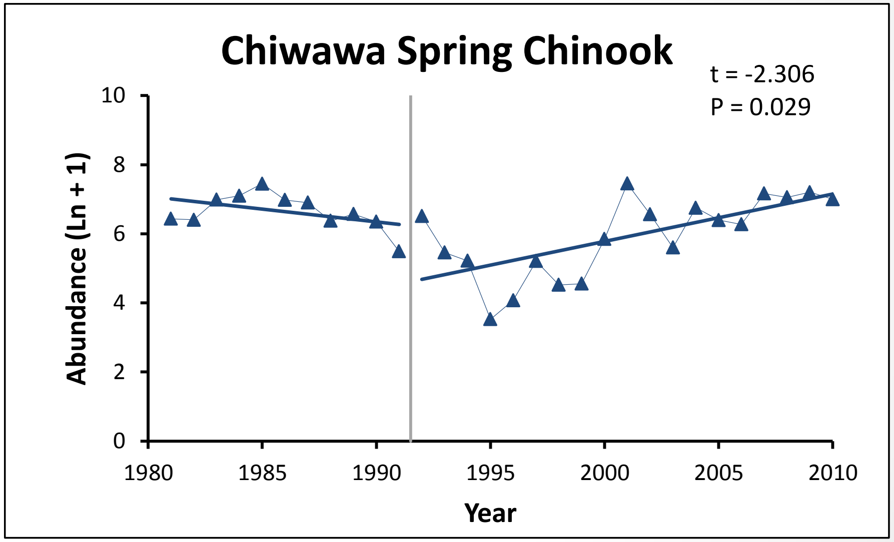
Abundance and Productivity

- Total Spawning Escapement
- Natural-Origin Recruits (NORs)
- Productivity (NRRs)
- Juvenile Productivity

Attachment D

Spawning Escapement

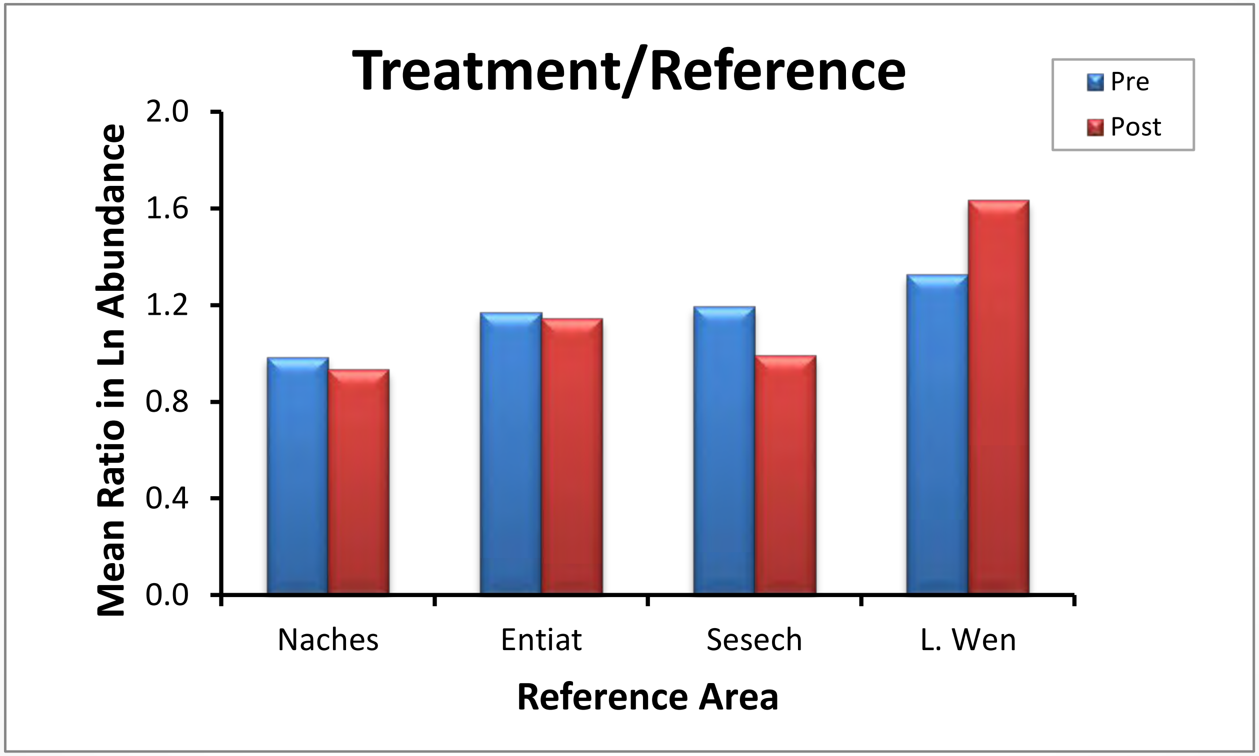




Significant Difference in Trend and Mean Abundance

Attachment D

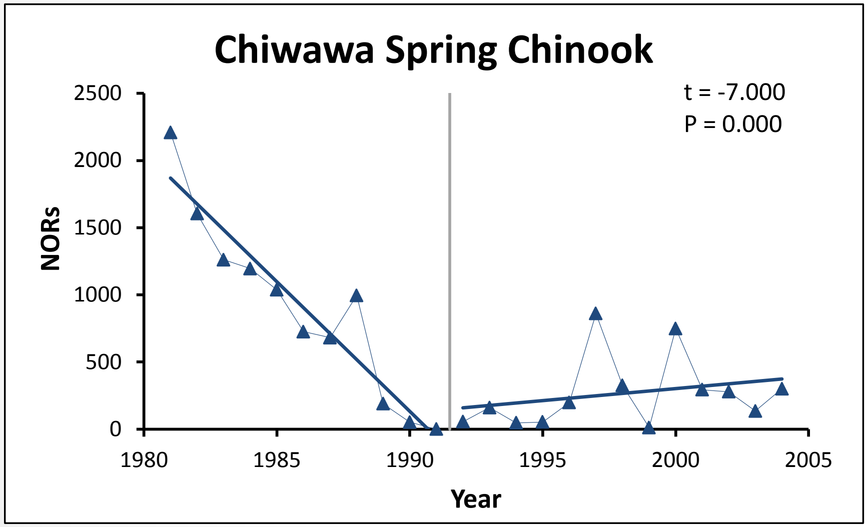
Spawning Escapement

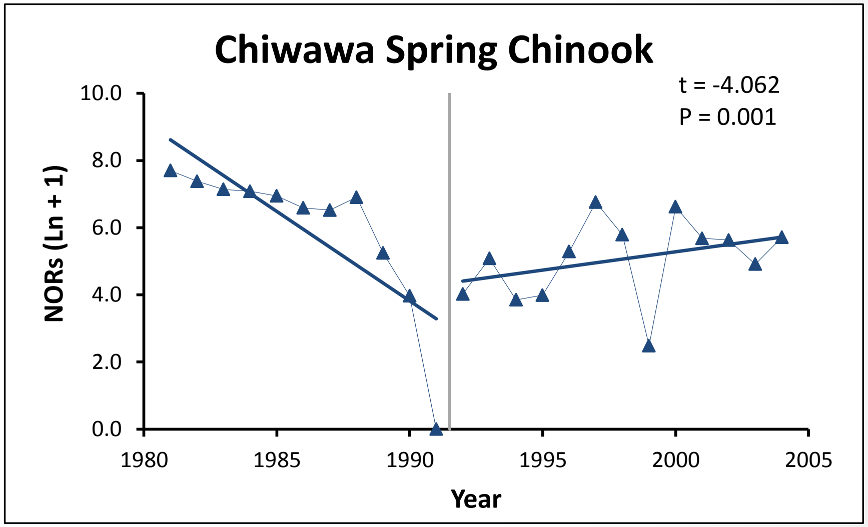


No Significant Increase in Abundance

Attachment D

NORs

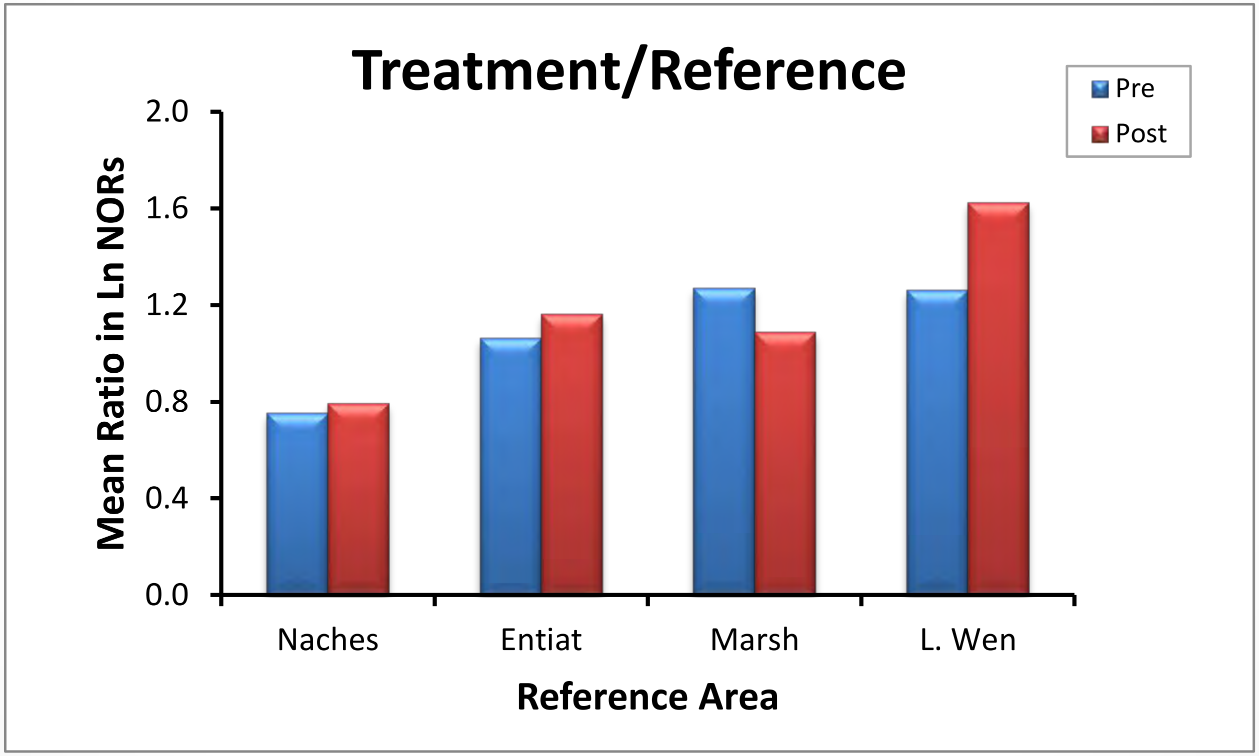




Significant Difference in Trend but not in Mean LN NORs

Attachment D

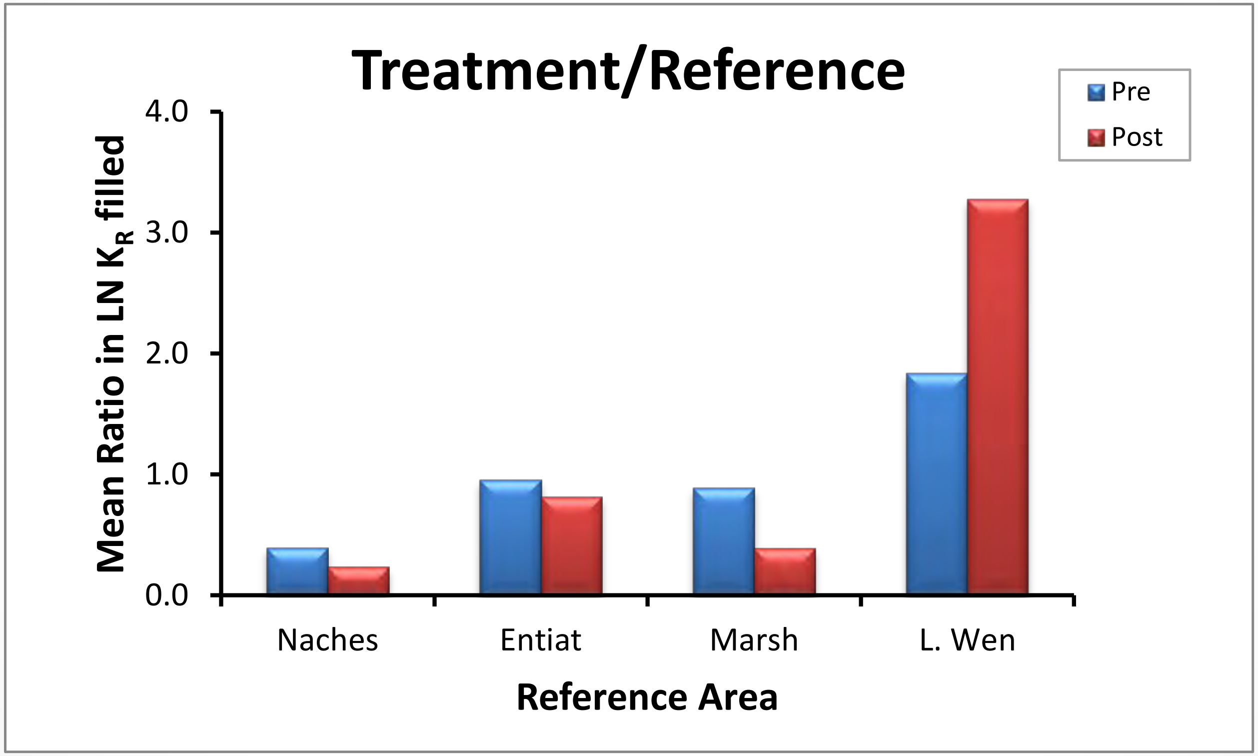
NORs



No Significant Increase in NORs

Attachment D

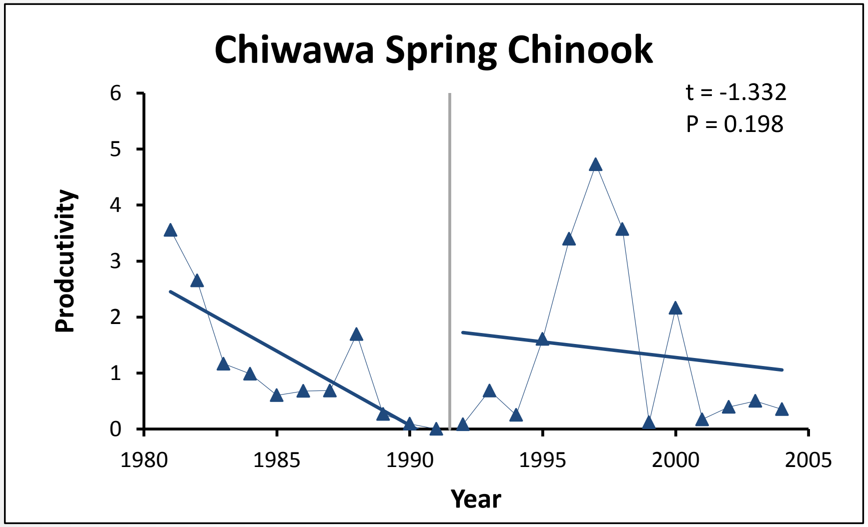
Adjusted NORs

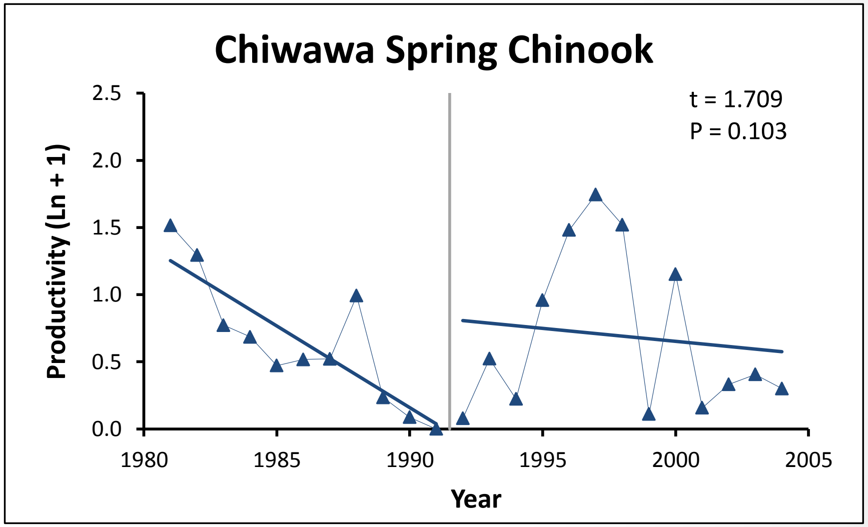


No Significant Increase in Adjusted NORs

Attachment D

Productivity (NRRs)

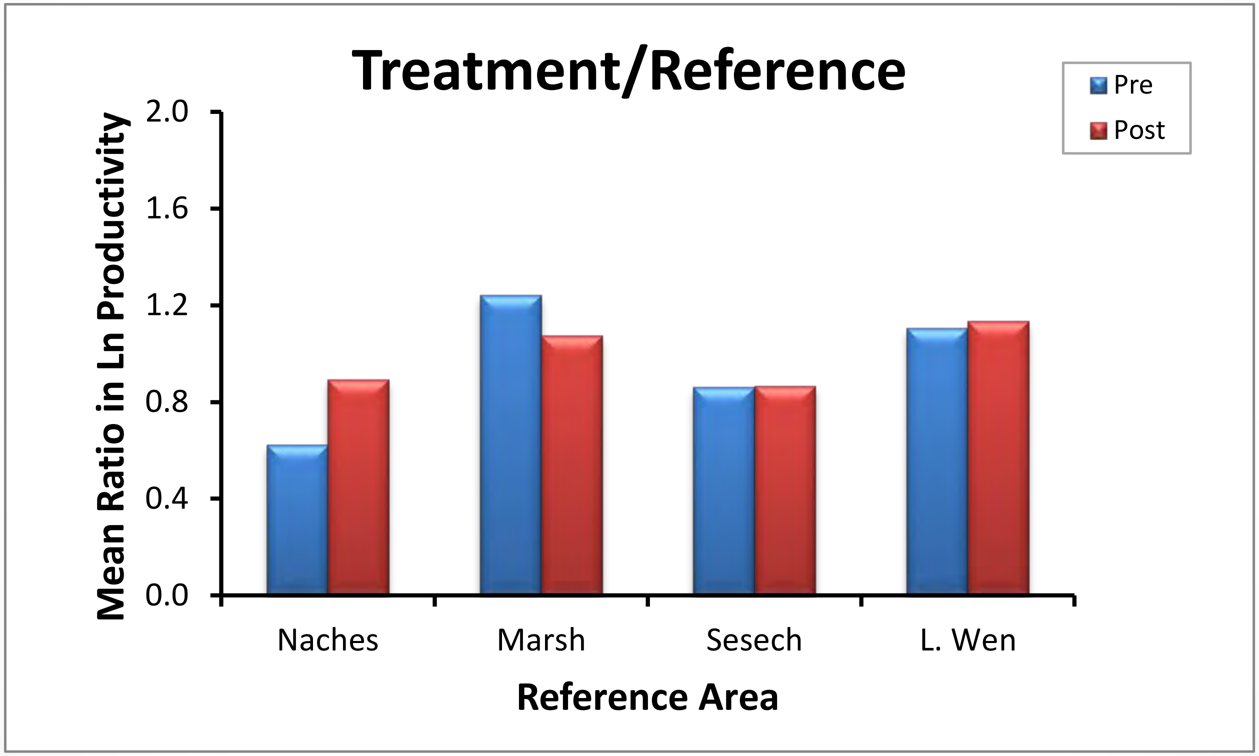




No Significant Difference in Trend or Mean NRRs

Attachment D

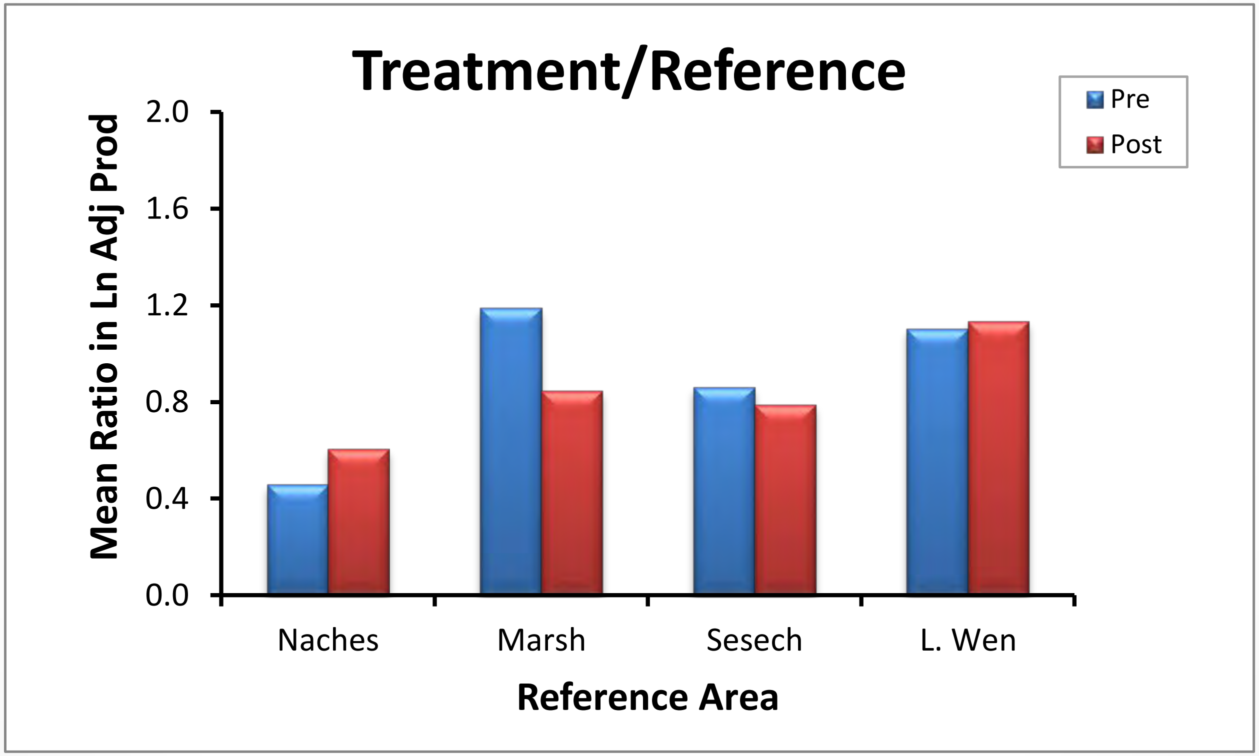
Productivity (NRRs)



No Significant Decrease in NRRs

Attachment D

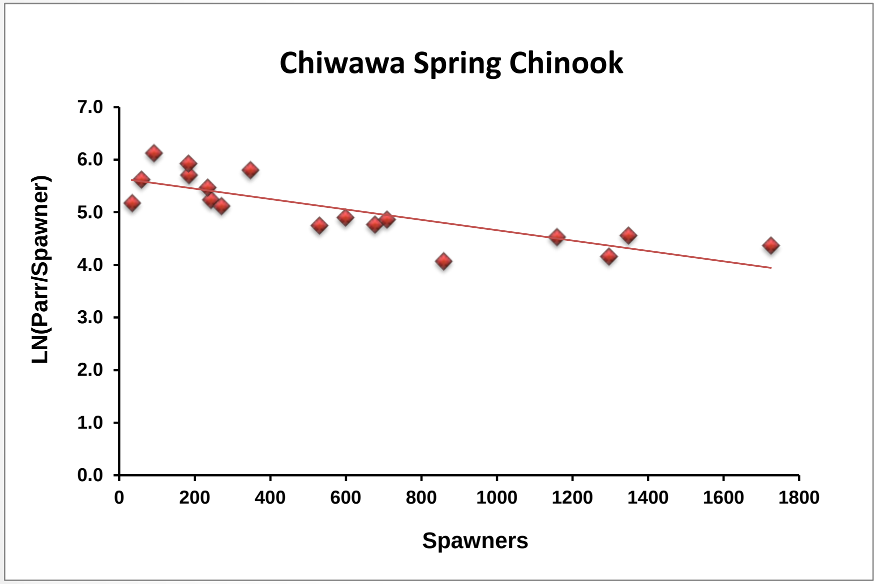
Adjusted NRRs

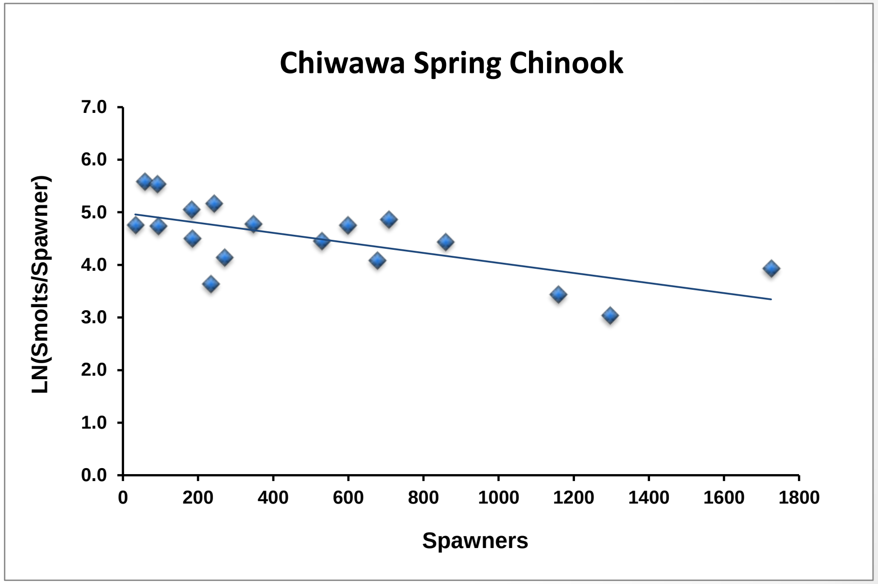


No Significant Decrease in Adjusted NRRs

Attachment D

Juvenile Productivity

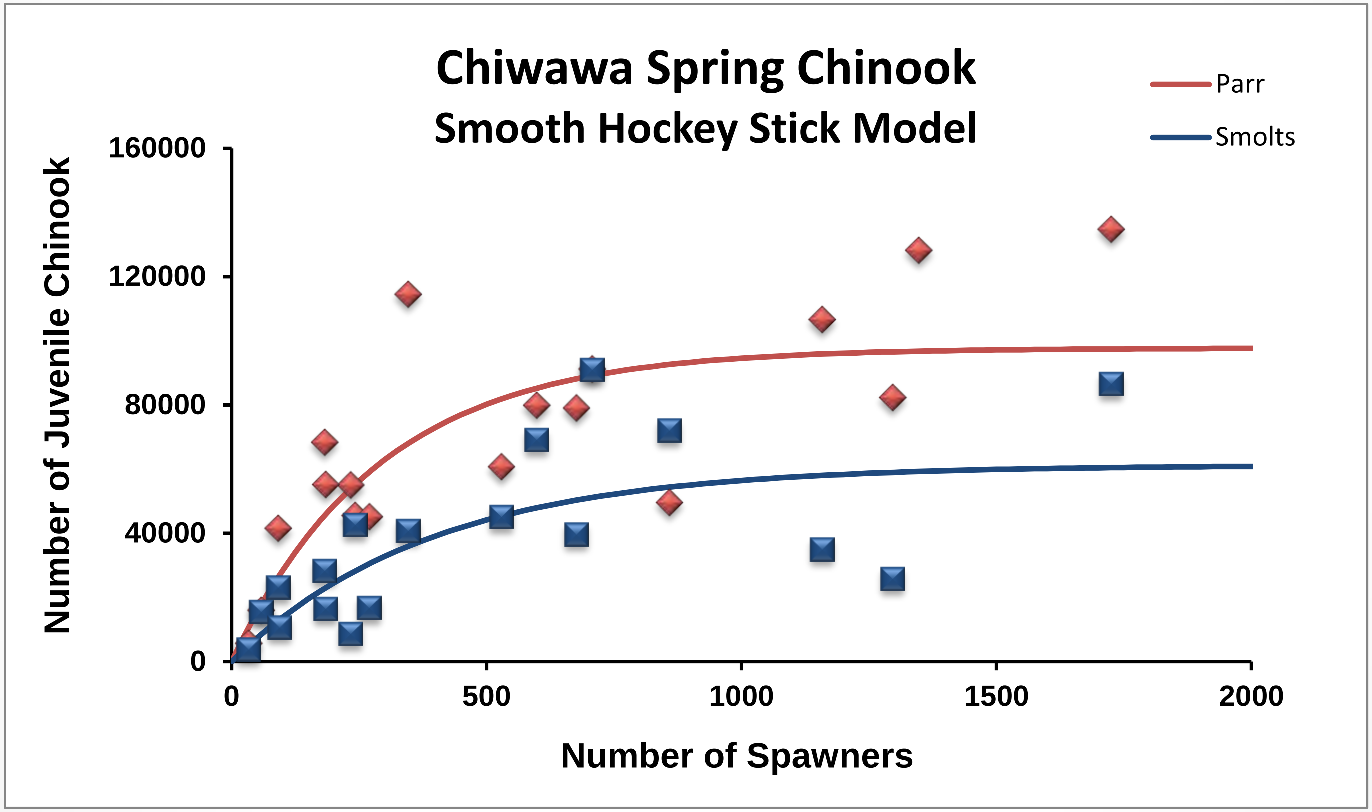




Significant Negative Relationship between Spawners and Juveniles/Spawner

Attachment D

Juvenile Productivity



Estimated Mean Carrying Capacity: 98,000 parr; 55,000 smolts

Summary

(1) Inability to collect the target number of broodstock prevented the program from meeting the target release number.

(2) Size-at-release goals were not met largely because size targets were not based on stock-specific length-weight relationships.

(3) HRRs were on average six times greater than NRRs.

(4) There was no significant genetic difference between wild and hatchery Chinook.

Summary

(5) There was no significant difference in migration timing or spawn timing of hatchery and wild Chinook.

(6) There was a significant difference in the distribution of hatchery and wild Chinook in the Chiwawa.

(7) There was a significant difference in age-at-maturity and size-at-maturity between hatchery and wild Chinook.

(8) Hatchery Chinook exceeded the 5% and 10% stray rates.

Summary

(9) Supplementation has not significantly increased total spawning abundance or NORs in the Chiwawa Basin.

(10) Supplementation has not significantly reduced adult productivity within the Chiwawa Basin.

(11) The significant negative relationship between juveniles/spawner and spawners indicates that the Chiwawa Basin has a carrying capacity that at times has been exceeded.

Possible Recommendations

(1) Reduce the size of the program.

(2) To the extent possible, collect all broodstock at the Chiwawa Weir.

(3) Revise size-at-release targets based on the stock-specific length-weight relationship. Consider selecting size targets that are within 20% of the size of natural-origin smolts.

(4) Increase PNI.

(5) Examine the effects of the Chiwawa Weir on straying.

Attachment E

Egg-Fry Survival Study
Chelan River Summer Chinook
2011-12

Purpose:

The Lake Chelan Settlement Agreement, terms of which were incorporated into the Ecology 401 Water Quality Certification and the FERC License, required the construction of additional spawning habitat in the Chelan powerhouse tailrace and lower Chelan River. Evaluation of the effectiveness of this habitat project is also required, including studies of intragravel dissolved oxygen in Chinook redds during times when the powerhouse is not operating and evaluation of egg-fry survival rates in the new spawning habitat, both tailrace and Chelan River habitat channel. If low levels of dissolved oxygen and egg-fry survival are below required levels defined in the Lake Chelan Settlement Agreement, then Chelan PUD will take corrective actions if the failure to meet required levels is an effect of project operations.

Methods:

Dissolved oxygen probes will be placed into egg pockets of redds during the first two weekends in December. Methods will follow those described in Bioanalysts, 2003 (Effects of Powerhouse Operations on Intragravel Flows and Water Quality within Chinook Redds www.chelanpud.org/relicense/study/reports/8106_1.pdf).

Egg-fry survival estimates will follow the protocols recently used in a study of egg-fry survival in the Hanford Reach of the Columbia River (Oldenberg, in preparation. Pacific Northwest National Laboratory. Study performed for Grant County Public Utility District, Hanford Reach Fall Chinook Working Group). In this study, 100 eyed-eggs (378 degree days) from Priest Rapids hatchery stock were placed in cylindrical egg tubes (CETs) along with spawning gravels typical to the Hanford Reach. The egg tubes were buried to a depth of 30cm in hand-constructed “redds” by divers at two spawning areas within the Hanford Reach. At estimated time of emergence (1000 dd) the CETs were recovered and live Chinook fry were enumerated, as were any discernable dead eggs and fry. Control CETs with eggs were incubated in a laboratory setting. Eyed-eggs were used because an attempt to use green eggs the previous year had high mortality rates from the handling effects in both control and test groups.

For this study proposal, Wells Hatchery stock summer Chinook eggs destined for the Chelan Falls Acclimation Site will be incubated to the eyed-egg stage, shocked, picked (at normal time for hatchery operations) and an allotment of 2500 eggs will be provided for the study from 10 egg trays (10 females – 250 eggs per female) that showed normal survival to the eyed-egg stage. These eggs will be mixed together and incubated in a tray until the date of CET placement in the Chelan tailrace and lower Chelan River. To the extent practicable, incubation of test eggs in the hatchery prior to placement of the CETs will manage water temperatures to match the accumulated degree days for the majority of naturally spawned Chinook eggs in the Chelan River. In 2010, the mode of spawning activity occurred between October 22 and November 3 and accumulated degree days on December 3 were in the 430 dd -330 dd, depending on date of egg deposition. Current scheduling for powerhouse outages to place the CETs in the tailrace is planned for December 3-4, but this may be adjusted if needed to match timing of spawning activity and temperature regime.

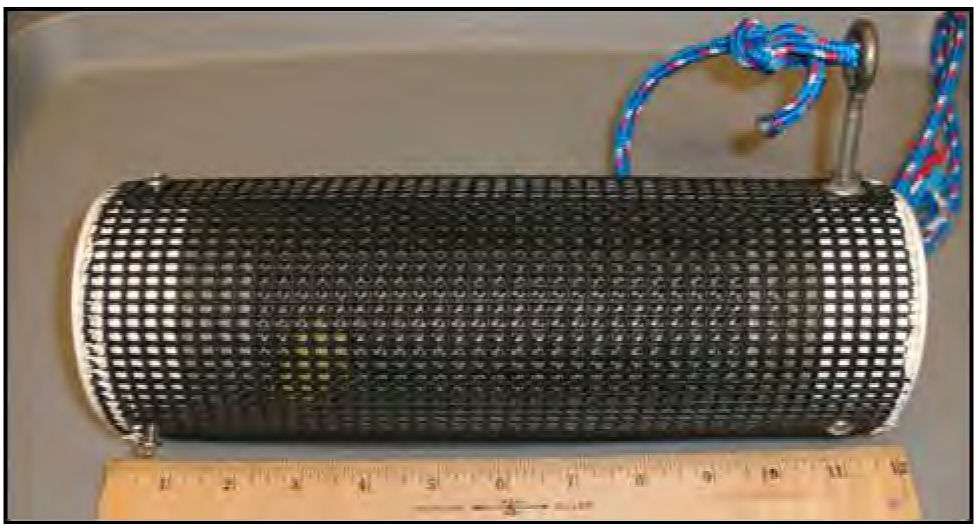
The study proposal is to deploy 5 CETs in the tailrace in the spawning habitat area that is dependent on powerhouse discharge for flowing water, 5 CETs in the tailrace in the area that receives some flow from the Chelan River habitat channel, in addition to the powerhouse discharge, 5 CETs in the spawning areas that receive both Chelan River and Columbia River flows (below the railroad bridge –

this is an egg-fry comparison site identified in the Lake Chelan Settlement Agreement), 5 CETs in the Chelan River habitat channel, and 5 CETs suspended in the tailrace water from the net pen dock structures (control). The water in the Chelan Powerhouse tailrace is expected to be near the saturation point and circulation through a suspended CET is expected to be more than adequate to maintain favorable conditions for incubating eggs and alevines.

The CETs will be recovered and live fry enumerated at estimated timing of emergence at about 1000 degree days. At some point late in the incubation period when oxygen demand is high for the alevines in the naturally spawned redds, the powerhouse flows will be interrupted for various time periods as part of the study design for intragravel dissolved oxygen. The CETs in the spawning habitat created in tailrace above and below the habitat channel discharge will be subject to this same flow alteration. The CETs in habitat below the railroad bridge may experience some reduction in intragravel flow and dissolved oxygen when the powerhouse flow is interrupted, but to a much lesser extent since Columbia River flows also influence this habitat. The CETs in the Chelan River habitat channel will not be affected by powerhouse operations.

Chelan PUD may seek to conduct additional CET studies or other egg-fry survival studies in 2012, depending on the results of this proposed study.

CYLINDRICAL EGG TUBE (CET)



Attachment E

CET PLACEMENT AREAS

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	December 14, 2011
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of the November 8, 2011, HCP Hatchery Committees' Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met by conference call on Tuesday, November 8, 2011, from 9:00 am to 10:30 am. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Carmen Andonaegui will coordinate with Josh Murauskas and Tom Kahler on scheduling a meeting room at one of the PUD office buildings for the November 17, 2011, Hatchery Committees' meeting. She will advise Todd Pearsons whether or not the Hatchery Committees will need Grant PUD's reserved meeting room for November 17, 2011, at the Cedars Inn in East Wenatchee for the meeting (Item II-A).

AGREEMENTS

- Hatchery Committees' members agreed to switch meeting dates with the Priest Rapids Coordinating Committee (PRCC) Hatchery Subcommittee (HSC). The Hatchery Committees will meet on November 17, 2011, and the HSC will meet on November 16, 2011 (Item II-A).

I. Welcome

Mike Schiewe opened the call by saying that the goal for today's conference call was to discuss the Joint Fisheries Parties (JFP) proposed amendments to the PUDs' Recalculation Implementation Plan (RIP), in advance of the discussion of the RIP at the November 17, 2011, Hatchery Committees' meeting.

II. All Parties

A. Discussion of the Draft Implementation Plans

JFP-affiliated members of the Hatchery Committees started the discussion by reviewing the consensus JFP amendments to the PUD RIP (Attachment B) for each of the HCP Plan Species. Bill Gale said that the proposed amendments reflected fisheries management parties' interests, with proposed species swaps and program changes being driven by management needs. The Committees agreed to hear the RIP proposal amendments, asking only for clarification and withholding discussion until after all proposed amendments were presented.

Keely Murdoch said that the JFP supported moving Chelan PUD production from the Methow National Fish Hatchery (NFH) to the Chiwawa Facility provided that action is linked to approval of a Grant PUD species swap to move approximately 61,000 Grant PUD summer Chinook from the Dryden Facility to spring Chinook at the Methow Hatchery to ensure that Methow spring Chinook numbers are not reduced. The JFP supports a 150,000 spring Chinook program in Nason Creek and a 75,000 spring Chinook program in the White River.

Kirk Truscott said there were no recommended changes to Grant PUD's proposal for summer Chinook. He said that the recommended JFP changes to Chelan PUD and Douglas PUD proposals identified subyearling and yearling production. For Wenatchee summer Chinook, the 167,000 smolt release difference between the PUDs' and JFPs' proposals was tied to the summer Chinook-to-spring Chinook conversions in Grant PUD's programs. Craig Busack asked if the proposed overwinter acclimation in Dryden was tied to a PRCC Statement of Agreement (SOA) for overwintering at these facilities. Todd Pearsons clarified the SOA regarding Dryden was an agreement stating that Grant PUD would assess the feasibility of overwintering summer Chinook at the Dryden facility, and that Grant PUD did not own the facility. Murdoch said that overwintering summer Chinook at Dryden is a priority for the JFP.

Gale said that there were two main changes proposed by the JFP to the PUD RIP for steelhead production. First, he said that the JFP proposed a steelhead smolt release of 48,000 in the Twisp River, shifting 40,000 juveniles from mainstem Columbia River inundation mitigation to the Twisp River to maintain the integrity of the Methow Basin conservation program. Secondly, in the Wenatchee Basin, Gale said the JFP was asking for a shift of sockeye production to Wenatchee steelhead production on a one-to-one basis to maintain the integrity of the Wenatchee steehead program. This shift would increase steelhead production in the Wenatchee from the Chelan PUD-proposed 187,000 smolts to 247,000 smolts. Gale said that this increase resulted in a higher production level than was identified as the maximum production scenario in the Sensitivity Analysis.

Mike Tonseth said that proposed amendments to the PUD RIP for sockeye was straightforward in that it only affected Chelan PUD, with all other PUDs meeting their mitigation obligation through production programs in the Okanagan Basin. Tonseth said that the JFP recognized that a 46,000 smolt production program for Wenatchee sockeye is not likely a viable program level. He said that the species trade the JFP had proposed between steelhead and sockeye raised minimum steelhead production to 247,300, which is consistent with the HCP SOA and with *U.S. v OR* agreements. Tonseth said that since sockeye mortality would continue at the Rock Island Project, the JFP expects that current sockeye Monitoring and Evaluation (M&E) activities in the Wenatchee Basin would continue and include, but not be limited to, current M&E activities and include biotic and abiotic variables, which could be identified as limiting factors to natural productivity and juvenile/adult abundance.

Regarding fall Chinook, Gale said that the JFP had recommended text to insert in the RIP to the effect that the JFP had not reached agreement on the current fry-to-smolt exchange value for fall Chinook. Pearsons said that Grant PUD will probably default to a 1 million fry production level if the JFP was not ready to discuss the issue.

Tom Kahler said that Douglas PUD understands the JFP position on and is amenable to supplementing the 8,000 No Net Impact (NNI) steelhead production level in the Twisp River in support of the ongoing relative reproductive success study, as indicated at the October 19, 2001, Committees meeting. He said that Greg Mackey had analyzed the smolt-release number necessary to provide the desired ratio of hatchery-to-wild returns to the Twisp while minimizing adult management actions, and 48,000 smolts were more than adequate to achieve the desired returns, as was a total release of approximately 30,000 smolts. Kahler also said that he believes Douglas PUD is not opposed to overwintering steelhead smolts at the Methow Hatchery as described in their HGMP, but he has not discussed internally the specifics of the JFP proposal, and first must verify with the Methow Hatchery manager that the hatchery can accommodate the overwintering request without interfering with spring Chinook production. Kahler said that Douglas PUD questions the JFP recommendation that the 40,000 steelhead come from Columbia River inundation safety-net fish. Gale said that the JFP amendment to the PUD RIP included a footnote explaining that the distribution of steelhead production between the Columbia River and the Methow Basin was dependent on the National Marine Fisheries Service (NMFS) consultation. He said that the JFP are in agreement that the additional Methow steelhead should come out of the Columbia River production group, but recognized that this may change with the NMFS consultation. Kahler said that Douglas PUD fundamentally disagrees with the JFP position. He said that Douglas PUD had always opposed the transfer of Columbia River inundation fish into the Methow Basin, but agreed to it only as a compromise to get agreement on the HGMP. Kahler said that the underlying science indicates that there are too many hatchery steelhead in the Methow Basin already and, hence, all 300,000 inundation mitigation fish should be released into the Columbia River. The Committees discussed the effects of higher numbers of hatchery steelhead released annually into the Methow Basin. The discussion included whether the potential level of hatchery steelhead in the Methow Basin would help with or exacerbate adult management, and how it would hamper meeting proportion of hatchery-origin spawners (pHOS) objectives and proportionate natural influence (PNI) targets. Kahler will discuss the JFP's proposed changes for steelhead with Douglas PUD staff, and prepare for further discussion at the November 17, 2011, Committees meeting.

Josh Murauskas said that Chelan PUD had received clarification from Tonseth on the couple of questions they had on the JFP proposal and are ready to agree to the proposed amendments. Murauskas said that an SOA on Chelan PUD's Implementation Plan that incorporated the JFP's proposed edits was distributed by Carmen Andonaegui this morning (November 8, 2011) by email to the Committees. Mike Schiewe said that the SOA would be considered for approval at the November 17, 2011, Committees' meeting.

Pearsons said he had some clarifying questions for the JFP on the RIP amendments. Regarding Nason Creek, he asked if the JFP dismissed the possibility of keeping Nason Creek as a fish refuge, foregoing potential conservation and scientific benefits. Tom Scribner said that was correct. Gale said the JFP saw no strong reason to step away from a Nason Creek spring Chinook program at this time. Pearsons said that Grant PUD's RIP proposal to put all Nason Creek spring Chinook production into the White River and to then backfill the

Methow Hatchery with about 60,000 smolts would meet maximum spring Chinook production levels, but distribute that production differently. He said that they could continue to discuss Wenatchee spring Chinook production at the November 16, 2011, HSC meeting. Schiewe asked if the Grant PUD RIP was consistent with the Sensitivity Analysis. Pearsons said that the Sensitivity Analysis referred to combined production for the White/Nason and that Grant PUD RIP clarified that the entire 160,000 smolt production would go into the White River. Pearsons next asked whether the design-and-build plans for spring Chinook overwintering acclimation in the Wenatchee Basin should be developed to accomodate the recalculated production level. Gale responded that with the next 10-year recalculation in 2024, it is possible that Grant PUD would need to accommodate a higher level of juvenile production, and so should not totally rely on this year's production level during design-and-build planning. Scribner said he did not want Grant PUD to be in the position in 2024 where there might be an obligation for them to rear more juveniles but not have the facility capacity to handle the increase, especially given how long it could take to permit and remodel a facility to accommodate an increase in production. Schiewe said that design of facilities and their construction and capacity was the unique responsibility of the PRCC and should be discussed in that forum. Gale said that a change in capacity for one PUD might cascade into affecting production and facility availability based on agreements among PUDs, and that this is one example of why PUD RIPs need to all be considered as a package. Schiewe reminded the Committees that Douglas and Chelan PUDs had individual stand-alone HCPs for each of their projects (one HCP for Douglas PUD's Wells Project and one HCP each for Chelan PUD's Rocky Reach and Rock Island projects), and that Grant PUD was operating under a Settlement Agreement which was not tied to the HCPs by any agreement. He said that each of the JFP-affiliated signatories acknowledged the independence of HCPs when they became signatories to the HCPs…that is, each member agency or tribe signed three separate HCP agreements and one Settlement Agreement, not one agreement binding all four Mid-Columbia PUD projects together. Schiewe also reminded the Committees that any signatory could introduce an SOA and request a vote 10 days later. Schiewe suggested that if the JFP-affiliated signatories to the HCPs delay approving individual RIPs until all issues are resolved with all three PUDs, then there was a strong possibility that this issue would be elevated for dispute resolution as described in the HCPs.

Pearsons asked for clarification as to whether the JFP wanted full build-out at the White River facility even though the JFP had proposed reducing spring Chinook production at that facility by one-half. Murdoch responded that full build-out is being proposed. Pearsons asked for clarification on why the JFP have proposed juvenile spring Chinook be overwintered in circular tanks at the planned White River facility and then be transferred to facility kidney ponds in the spring. Murdoch said it would allow for juveniles to be acclimated to outdoor, spring conditions in a larger rearing unit, which would be beneficial. Schiewe said that this was an issue more appropriately dealt with by the PRCC because it was a facility issue, and that this discussion should be continued in that forum.

Regarding species trades, Pearsons said that Grant PUD does not support the JFP's proposed one-to-one species swap of Methow spring Chinook for summer Chinook at Dryden. He said Grant PUD would consider the species swap at a three-to-one trade and only if it enabled Grant PUD to eliminate rearing at the Dryden facility. Scribner said the JFP considered the Grant PUD production at the Dryden facility and transfer of spring Chinook from the Methow to be tied to the JFP approval of Chelan PUD moving spring Chinook production from the Methow to the the Wenatchee. Gale reminded the PUDs that the JFP proposal should be viewed as a package and represented a compromise among the JFP. Truscott suggested that all Parties withhold making too firm a position on the issues presented until there could be further discussions with Grant PUD at the next PRCC meeting on November 17, 2011. Pearsons asked if there was interest from the JFP in doing a species trade of summer Chinook for fall Chinook. Truscott asked if the question was related to the 1 million fry. Pearsons responded that it was not related to the fry but related to Grant PUD's having rearing capacity at the Priest Rapids Hatchery. He said that Grant PUD would be interested in decreasing summer Chinook rearing at Dryden and increasing fall Chinook production at the Priest Rapids Hatchery. Scribner said that his very first thought would be that with ongoing negotiations to increase fall Chinook production at the John Day Facility, the Yakama Nation would not support the trade. Pearsons said he would like to continue these discussions at the next PRCC meeting.

Schiewe said that the call was productive in highlighting the issues in the JFP's response to the PUD RIP, and set up items for discussion at the next Hatchery Committees' meeting. He reiterated that each PUD is an independent entity and acknowledged the JFP interest in trying to keep PUDs' RIPs in sync for the purpose of coordination, meeting deadlines, and budgets. Pearsons committed to prioritizing developing a RIP for Grant PUD's hatchery production so as to not hold up progress on Chelan and Douglas PUDs' processes. Tonseth suggested switching the November 16, 2011, Hatchery Committees' meeting date with the PRCC HSC November 17, 2011, meeting date. He said with this switch, the HSC could discuss the substantial issues related to the RIPs that have bearing on the Chelan and Douglas PUDs' RIPs. Any further developement of these discussions could then be carried over into the Hatchery Committees meeting the following day. All agreed to move the HSC meeting to November 16, 2011, and the Hatchery Committees' meeting to November 17, 2011. Andonaegui will coordinate with Murauskas and Kahler on meeting room availability at one of the PUD meeting rooms. She will coordinate with Pearsons regarding whether the Hatchery Committees would need the room reserved by the PRCC at the Cedars Inn in East Wenatchee for the November 17, 2011 meeting.

List of Attachments

Attachment A – List of Attendees
Attachment B – JFP Response to the PUDs' Draft Recalculation Implementation Plan

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Tom Kahler*	Douglas PUD
Craig Busack*	NOAA
Kirk Truscott*	CCT
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Andy Chinn	Ross & Associates
Todd Pearsons	Grant PUD
Tom Scribner*	Yakama Nation
Keely Murdoch*	Yakama Nation

* Denotes Hatchery Committees' member or alternate

Attachment B

Proposed JFP 11/04/11 Amendments to PUD Implementation Plan

This JFP proposed amended NNI Recalculation Implementation Plan (RIP) is set forth to the Grant/Chelan/Douglas PUD's as a response/alternate proposal of JFP management priorities and considerations for production of individual plan species among basins to the joint PUD plan.

Spring Chinook

Okanogan Basin

Under this proposed plan, Grant, Chelan and Douglas spring Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this proposed plan, Grant, Chelan and Douglas spring Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Wenatchee Basin

Under this proposed plan, Chelan spring Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP which includes the transfer of approximately 61,000 of their Methow spring Chinook obligation to the Chiwawa spring Chinook program for a combined Chiwawa program of 204,542.

Under this proposed plan, spring Chinook production obligations for Grant PUD in the Wenatchee Basin is revised as follows:

Retain Wenatchee spring Chinook programs in the White River and Nason Creek. GCPUD will provide for programs of 75,000 program in the White River and 150,000 in Nason Creek. This represents an increase in GCPUD spring Chinook 'maximum' production by 61,846 fish which results from a one-for-one reduction in GCPUD summer Chinook production (659,816 PUD proposal to 597,970 draft JFP proposal). The balance of the Nason Creek program would be derived through a reduction in the size of the White River spring Chinook program to 75K.

While the reduction in the White River is reduced from levels indentified in current facility designs and permit packages, the PUD's and the JFP's were aware of the potential reduction in programs associated with recalculation of the respective PUD's mitigation obligations. With the White River program in particular there is a great deal of uncertainty surrounding the programs ability to a) transition to an adult based supplementation, particularly at the 150K level, within the next 10 year period, and b) there is similar uncertainty in managing for disease in that portion of the production which would be reared in the kidney ponds. With a program sized at 75K, and with the current facility designs, 100% of the production could be overwintered in the circulars – making more of the limited ground water available, and then transferred to the kidney ponds in the spring after ice-out, while retaining capacity should the mitigation obligation increase in the future.

Attachment B

Table 1 (previously Table 6 in PUD RIP). Proposed implementation of mid-Columbia spring Chinook programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000	
Okanogan Total						*900,000*	
Methow Hatchery	29,123	0	194,642	0	0	223,765	550,000
Winthrop NFH				400,000		400,000	600,000
Methow Total						*623,765*	*1,150,000*
Chiwawa		204,542				204,542	298,000
White			75,000			75,000	150,000
Nason			150,000			150,000	250,000
Leavenworth				1,200,000		1,200,000	1,200,000
Wenatchee Total						*1,629,452*	*1,898,000*
Total	**62,423**	**319,832**	**529,642**	**1,800,000**		**3,153,307**	**3,048,000**
Change from PUD RIP	**No change**	**No change**	**+61,846**	**No change**	**No change**	**+61,846**	

Summer Chinook

Okanogan Basin

Under this proposed plan, Grant summer Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP. For Chelan and Douglas PUD, summer Chinook will include both yearling and sub-yearling production at CJH, consistent with yearling survival studies for Wells, Rocky Reach and Rock Island Dams and the HCP assumed sub-yearling survival. The amended summer Chinook production for Douglas PUD is consistent with the Douglas PUD/BPA cost-share agreement for CJH. The amended summer Chinook production for Chelan PUD are assumed values pending a completed cost-share agreement for CJH.

Methow Basin

Under this proposed plan, Chelan and Douglas summer Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP. Grant PUD summer Chinook production at Carlton Pond would drop from 200,000 to 194,970 fish. The difference (5,030 fish) is part of a 1:1 summer Chinook to spring Chinook conversion (species swap) to fulfill, in part, a 150k Nason Creek spring Chinook program. Over-winter acclimation would remain a requirement of this program.

Attachment B

Wenatchee Basin

Under this proposed plan, Chelan summer Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP. Grant PUD summer Chinook production at Dryden Pond would drop from 181,816 to 125,000 fish. The difference (56,816 fish) is part of a 1:1 summer Chinook to spring Chinook conversion (species swap) to fulfill, in part, a 150k Nason Creek spring Chinook program.

Table 2 (previously Table 8 in PUD RIP). Proposed implementation of mid-Columbia summer Chinook programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joe CH1		166,569	278,000	0		1,300,000	
	48,100				807,331		
Chief Joe CH0	49,000	94,570				700,000	
					556,430		
Okanogan Total						*2,000,000*	*556,000*
Carlton	0	0	194,970	0	0	194,970	
Methow Total						*194,970*	*400,000*
Dryden	0	318,185	125,000	0	0	443,185	
Wenatchee Total						*443,185*	*872,000*
Entiat				400,000		400,000	
Entiat Total				*400,000*		*400,000*	*400,000*
Chelan Falls		176,000				176,000	200,000
Chelan Falls Inundation		400,000				400,000	400,000
Wells Inundation yearling	320,000	0				320,000	320,000
Wells Inundation subs	484,000	0				484,000	484,000
Columbia Total						*1,380,000*	*1,404,000*
Total	*901,100*	*1,155,324*	*597,970*	*400,000*	*1,363,761*	*4,418,155*	*3,632,000*
Change from PUD RIP	+42,525	+72,148	*-61,846*	**No change**	-114,672	*+167,499*	

Steelhead

Okanogan Basin

Under this proposed plan, Grant PUD summer steelhead production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Attachment B

Methow Basin

Under this proposed plan, Douglas summer steelhead production for the Methow Basin would be amended as follows:

The Joint Fisheries Parties are concerned that the size of Douglas County PUDs Twisp steelhead program if implemented as outlined in the 9/28/2011 implementation plan will be too small to provide a viable conservation hatchery program for the Twisp spawning aggregate of the Methow River steelhead population. The JFP request shifting production from DPUDs inundation obligation to maintain the current size of this program. Specifically we request the following changes be made to the implementation plan:

- Maintain the current size (48K) of the Twisp program by utilizing fish to be reared for Douglas County PUD's inundation (40K) and No Net Impact (8K) obligations for this program. Change footnote 4 in Table 2 to discuss the fact that the Twisp program will be utilizing both NNI and Inundation fish.

- Reduce the number of fish to be released as mitigation for inundation in the Columbia R. mainstem to a total of 160K.

- Leave the Lower Methow Inundation entry in Table 2 as it currently stands (100K).

- Add a footnote to both the Columbia R mainstem Inundation entry and the Lower Methow Inundation entry in Table 2 to explain that the distribution of production between these is dependent on the conclusion of the NOAA consultation on the Wells steelhead HGMP and may change though the total obligation will not change.

- Additional space at Methow Fish Hatchery as a result of a decreased spring Chinook program would be used to overwinter 100K inundation steelhead in the Methow (rather than short term acclimation as per the revised HGMP.

Wenatchee Basin

Under this proposed plan, Chelan summer steelhead production for the Wenatchee Basin would remain at the current agreed to production level (HCP-HC SOA and *US v. OR* Agreement) of 247,500 fish which was identified as the available capacity at Chiwawa Ponds to overwinter this program. The PUD RIP originally identified a combined NNI/inundation program of 187,000 smolts using the minimum NNI recalculated value of 22K rather than the maximum of 46K. Under this amendment the currently agreed to production level would be maintained at 247,500and be derived through a combination of a 1:1 conversion (species swap) of 46,000 sockeye in addition to an increase in the NNI compensation to 36,500. For the next 10 year period (2014-2023) the 46,000 sockeye to steelhead conversion would be included in the NNI obligation for Chelan PUD and therefore subject to recalculation post 2023.

Attachment B

Table 3 (previously Table 7 in PUD RIP). Proposed implementation of mid-Columbia summer steelhead programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Wells (Okanogan)			100,000			100,000	100,000
Okanogan Total						*100,000*	*100,000*
Wells (Twisp Pond)	48,000					48,000	48,000
Wells (Methow inundation)	100,000					100,000	300,000
Winthrop NFH				200,000		200,000	100,000
Methow Total						*348,000*	*448,000*
Wenatchee (NNI)		36,500				36,500	235,000
Wenatchee (NNI Trade)		46,000				46,000	
Wenatchee (Inundation)		165,000				165,000	165,000
Wenatchee Total						*247,500*	*400,000*
Wells (Columbia)	160,000					160,000	
Columbia Total						*160,000*	
Total	**308,000**	**247,500**	**100,000**	**200,000**		**855,500**	**1,048,000**
Change from PUD RIP	**No change**	**+60,500**	**No change**	**No change**	**No change**	*+60,500*	

Sockeye

Wenatchee Basin

Under this proposed plan, Chelan sockeye production for the Wenatchee Basin would be converted 1:1 to Wenatchee steelhead in a species swap. Because mortality on Wenatchee sockeye will continue to occur at Rock Island Dam, monitoring and evaluation of the natural populations in the White and Little Wenatchee rivers will continue to occur. This will include but not be limited to current activities such as measuring juvenile emigration abundance/performance, adult spawner abundance/distribution, etc. as well as those biotic and abiotic variables which could be identified as limiting factors to natural productivity and juvenile/adult abundance (e.g. predation, etc.).

Fall Chinook

- Footnote 12 should be edited to include language that states that the fry exchange values provided in Table 5 have not yet been agreed to by the parties and may change based on the final fry to smolt exchange rate used when consensus on this issue is reached.

ANCHOR QEA
720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	December 14, 2011
From:	Carmen Andonaegui		
Cc:	Mike Schiewe, Chair		
Re:	Final Minutes of November 17, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Douglas PUD Headquarters in East Wenatchee, Washington, on Wednesday, November 17, 2011, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Mike Schiewe will email Craig Busack explaining Douglas PUD's request to change the final due date of the Douglas PUD 2012 Monitoring and Evaluation (M&E) annual report from April to July 2012 (Item II-A).
- Craig Busack will provide a response to Douglas PUD confirming the National Marine Fisheries Service's (NMFS's) agreement to change the due date of the final Douglas M&E annual report from April to July 2012 in future years, beginning in 2012 (Item II-A).
- Craig Busack will confirm the number of years covered by the Hatchery and Genetic Management Plans (HGMPs) that address HCP hatchery programs, and would report his findings back to the HCP Hatchery Committees (Item III-A).
- Greg Mackey will provide a revised Douglas PUD Recalculation Implementation Plan (RIP) to Mike Tonseth by November 18, 2011 (Item III-A).
- Mike Tonseth will incorporate the revised language on the Douglas, Chelan, and Grant PUDs' RIPs from today's discussions into the Joint Fisheries Parties (JFP) RIP proposal and send to Carmen Andonaegui for distribution to the Hatchery Committees and the Priest Rapids Coordinating Committees (PRCC) Hatchery Subcommittee (HSC) no later than November 22, 2011 (Item III-A).
- Carmen Andonaegui will schedule a Hatchery Committees' conference call for November 30, 2011, at 1 pm, to discuss the revised RIPs (Item III-A).

- Craig Busack will update the Hatchery Committees on the Winthrop and Methow steelhead HGMPs' permit timing (Item III-A).

STATEMENT OF AGREEMENT DECISION SUMMARY

- There were no Statements of Agreement (SOAs) approved at today's meeting.

AGREEMENTS

- The Hatchery Committees agreed to an expedited review of the Douglas PUD draft 2012 M&E Workplan. Comments are due to Douglas PUD no later than December 7, 2011, for a vote on approval of the 2012 M&E Workplan at the December 14, 2011, Committees' meeting (Item II-A).
- The Hatchery Committees approved Grant PUD's request to utilize excess capacity at Douglas PUD hatcheries in accordance with the Douglas PUD and Grant PUD hatchery sharing agreement (Item II-B).
- The Committees agreed to conduct the Non-target Taxa of Concern (NTTOC) risk analysis using recalculated production numbers (Item VI).

REVIEW ITEMS

- The Douglas PUD draft 2012 M&E Workplan has been distributed for expedited review. Comments are due to Greg Mackey no later than December 7, 2012.

REPORTS FINALIZED

- Chelan PUD's *2012 M&E Workplan* was finalized and emailed to Carmen Andonaegui for distribution by email to the Hatchery Committees on November 10, 2011.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. The following items were added to the agenda:

- Josh Murauskas added an update on Chelan PUD's 5-Year M&E Report

The draft October 19, 2011, Committees' meeting minutes were reviewed and approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Committees.

II. Douglas PUD

A. Update on 2012 M&E Workplan (Greg Mackey)

Greg Mackey said that the draft Douglas PUD 2012 M&E Workplan was distributed to the Hatchery Committees on November 16, 2011 (Attachment B). The transmittal email highlighted differences between the 2012 and 2011 workplans, which Mackey reviewed with the Committees. He said that Douglas PUD is asking for an expedited review and approval of the draft M&E 2012 Workplan so that Douglas PUD can have the 2012 M&E contract in place in January 2012. The Committees agreed to provide comments to Douglas PUD no later than December 7, 2011, for approval of the 2012 M&E Workplan at the December 14, 2011, Committees' meeting. Mackey requested that the Committees consider changing the due dates for the Hatchery Annual Report from April to July in future years, beginning in 2012. The later due date would allow Washington Department of Fish and Wildlife (WDFW) additional time to complete field work and receive coded-wire-tag data from Olympia. Mike Schiewe will work with Craig Busack to determine if this change affects any Endangered Species Act (ESA) permit requirements.

B. Grant PUD Hatchery Sharing Agreement (Greg Mackey)

Greg Mackey presented Grant PUD's request to rear up to 100,000 brood-year 2013 summer steelhead at the Wells Hatchery and up to 201,000 spring Chinook at the Methow Hatchery in 2012 in accordance with the Douglas PUD and Grant PUD Interlocal Hatchery Sharing Agreement (Attachment C). He said that the additional production can be accommodated without affecting Douglas PUD's HCP hatchery production and that the request is consistent with requests in past years. Mackey read from Grant PUD's statement that although they do not expect their request to exceed the 2012 production request, that total production may change based on recalculation. The Hatchery Committees approved the request.

C. Wells 5-Year M&E Hatchery Report Presentation (Andrew Murdoch)

Greg Mackey introduced Andrew Murdoch, WDFW, who presented the results of Douglas PUD's draft 5-Year Hatchery M&E Report. Mackey said that Douglas PUD was still reviewing the draft report, which he anticipated would be available for review by the Hatchery Committees before the end of the year. Murdoch's analysis covered all Douglas PUD hatchery programs, including Wells Hatchery production of yearling and sub-yearling summer Chinook, and Methow and Okanogan steelhead; and Methow Hatchery production of Methow, Twisp, and Chewuch spring Chinook. The analysis focused on evaluating the success of achieving targets for Douglas PUD's hatchery program objectives (Douglas PUD 2007[1]). Details of the analysis and draft results by hatchery program and objective are available in a Power Point presentation that Murdoch prepared for the Committees (Attachment D).

III. Hatchery Recalculation/Implementation

A. Discussion (Greg Mackey/Josh Murauskas/Todd Pearsons)

Greg Mackey said that Douglas PUD focused on the Methow steelhead portion of the JFP's amendments to the PUDs' draft RIP. Mackey said that Douglas PUD steelhead releases will follow the HGMP, with 2012 releases of 250,000 steelhead in the Methow Basin. Douglas PUD agreed to maintain the Twisp program at the current size of 48,000 smolts after 2012, but was concerned about using 40,000 Wells Hatchery Columbia River inundation fish for this purpose, stating the the Methow safety-net fish would be a more suitable source for the 40,000 smolts. However, Douglas PUD was willing to use 40,000 smolts from the Columbia release to augment the 8,000 NNI smolts in the Twisp to achieve a 48,000 fish release until NMFS issues a Biological Opinion (BiOp) on the Wells Complex Steelhead HGMP, at which time the BiOp would dictate the Douglas PUD steelhead program. Mackey also questioned the JFP proposed amendment to immediately begin overwintering 100,000 inundation steelhead at the Methow Hatchery; in contrast, the draft HGMP outlined a plan to implement spring acclimation for steelhead with a possible transition to overwintering if adult returns indicated that spring acclimation was not having the desired results. He said that, ultimately, the program would be guided by what NMFS required in the HGMP. Keely Murdoch said the footnote to Table 2 of the RIP was intended to indicate that the JFP

1 Douglas PUD, 2007. *Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas Public Utility District*. Prepared for the Douglas PUD Habitat Conservation Plan Hatchery Committee. Last modified September 2007. East Wenatchee, Washington.

understood that final distribution of Wells steelhead production was dependent on the NMFS consultation, although total obligation would not change.

Bill Gale said that he would be comfortable with copying and pasting the language on the Methow Hatchery steelhead acclimation in the HGMP into the RIP. Murdoch asked why overwintering of steelhead would not be done as a matter of course. Shane Bickford said that steelhead require almost twice as much space as spring Chinook and that the space at Methow Hatchery should be used to decrease spring Chinook densities to improve the quality and productivity of the fish. Mackey said that the Methow spring Chinook program is the conservation program for the Methow Basin spring Chinook population and that the steelhead are a safety-net program. He said that given the status of Methow spring Chinook as one of the most endangered stocks, safety-net steelhead were a lesser priority as far as the use of available acclimation space. The Committees discussed rearing densities and how to find efficiencies and make improvements to better accommodate acclimation needs. Mike Tonseth said that what Douglas PUD was proposing was consistent with what had been discussed and agreed to by the Committees in terms of the HGMP. Murdoch said that she would like to see Douglas PUD's recommended text as a revised RIP. Mackey will revise the Douglas PUD RIP as discussed today, and as agreed to by the Committees. He will provide the revised RIP to Tonseth by November 18, 2011. Tonseth will incorporate the revised Douglas PUD RIP text into the JFP RIP proposal for circulation to the Committees and the PRCC HSC no later than November 22, 2011.

Gale said that recent discussions between the U.S. Fish and Wildlife Service (USFWS) and NMFS indicated that the permits for the Winthrop National Fish Hatchery (NFH) steelhead programs would cover the 5-year period from 2013 to 2018, and asked Craig Busack if that would be the same for the Douglas PUD permits. Bickford said that the HCP guaranteed five, 10-year rolling permits, and that it was his understanding that the Methow permit would go through 2023. Busack said that he would look into the HGMPs and permit timing and report back to the Committees.

Josh Murauskas said an SOA documenting Chelan PUD's acceptance of the JFP amendments to the PUDs' RIP was distributed by email to the Committees on November 8, 2011. Murauskas said that Chelan PUD was asking for approval of the SOA at today's meeting.

Mike Schiewe asked each of the Committees' members if they approved the SOA. Each JFP member said he or she was not prepared to vote for approval of Chelan PUD's SOA at this time. Murdoch said that the Yakama Nation wanted agreement by all three PUDs (Douglas PUD, Chelan PUD, and Grant PUD) on the JFP-amended RIP before approving any individual RIP. Tonseth said that he still saw some outstanding issues with the RIPs. Kirk Truscott said that he could not yet approve the RIPs, given the outstanding issues with Grant PUD's RIP, which are linked to Chelan PUD's RIP. Joe Miller asked Committees' members for recommendations on how to move Chelan PUD's RIP to approval today, given that Chelan PUD is willing to accept the JFP proposal. Murdoch said that the JFP proposal for Chelan PUD programs is linked to Grant PUD agreeing to certain production levels and locations. She said that without agreement by Grant PUD on the Grant PUD section of the RIP, the Yakama Nation cannot approve Chelan PUD's SOA. Gale said that he prefered a joint RIP, but removal of the linkages to the Grant PUD programs could be a solution. Gale said that if Chelan PUD were to include language in the RIPs saying that they would produce 61,000 spring Chinook at the Methow and 140,000 spring Chinook for the Chiwawa, the RIPs would be acceptable. He said that the link to Grant PUD programs was the only obstacle to resolving HCP-related recalculation issues. Murauskas agreed to remove the link in the draft RIP between the Grant PUD's and Chelan PUD's hatchery programs and provide the revised language to Tonseth. Tonseth will incorporate the changes into the JFP RIP revision for distribution to the Committees and the PRCC HSC by November 22, 2011.

Gale asked Todd Pearsons about his position on Gale's recommendation to remove the link to Grant PUD hatchery programs from the Chelan PUD RIP, since the default maximum production indicated in the Sensitivity Analysis did not seem a preferable alternative for Grant PUD either. Pearson said that the Grant PUD position had not changed from the PRCC HSC meeting discussions held yesterday, November 16, 2011. He said that he understood the Committees were looking at creative ways to achieve a solution that would satisfy all parties. The Committees talked about the pros and cons of species swaps and production levels that had been suggested and discussed to date. Tonseth said that maintaining spring Chinook adult returns from the conservation program are a fisheries managers' priority.

Pearsons said that Grant PUD could accept spring Chinook production levels of 224,000 in the Wenatchee, and drop to 130,000 at Methow, 181,000 at Dryden, and 200,000 at Carlton. Tonseth said he would capture the proposed production levels in a revision of the JFP RIP for distribution to the Committees and the PRCC HSC by November 22, 2011.

Murauskas asked if JFP members had any ideas on how the extra space at the Chiwawa facility could be used if the default production of 140,000 spring Chinook was approved. Gale said that if Grant PUD was unable to meet its obligation for the White River or Nason Creek supplementation programs for any reasons, Grant PUD may need to look at fulfilling their obligations using other facilities. In such a scenario, the Chiwawa facility may be needed. Gale said that there could also be a scenario where it might be necessary to move Chelan PUD's Methow spring Chinook obligation down to the Wenatchee Basin. Miller said that it had been and will continue to be a challenge to continue spending money on the Chiwawa facility to meet changing production needs.

Andonaegui will schedule a Committees' conference call for November 30, 2011, at 1 pm for discussion and possible voting on the revised Douglas PUD and Chelan PUD RIPs. Andonaegui will contact Elizabeth McManus, PRCC HSC facilitator, and invite her to join the November 30, 2011, Committees' call. Murauskas said that Chelan PUD will request a vote on an SOA approving hatchery production discussed at today's meeting during the November 30 conference call, and, if necessary, again at the December 14, 2011, Hatchery Committees' Meeting. Schiewe said that if the SOA is not approved in December, it will likely go forward to dispute resolution; he said time is running out and WDFW staff need to complete and seek approval of new broodstock collection protocols by April 2012. He reminded the JFP members that their agencies or tribes signed and agreed to three separate HCPs for the Wells, Rocky Reach, Rock Island projects and their associated hatchery programs, and each will require a stand-alone SOA approving hatchery production levels and release locations for the period of 2013 to 2023.

IV. Chelan PUD

A. Chelan PUD 5-Year M&E Report Update (Josh Murauskas)

Josh Murauskas reported that Tracy Hillman, BioAnalysts, has almost completed his analysis. He said that within the next 30 days, Chelan PUD will have a draft report ready for distribution to the Hatchery Committees for their review. He said that Chelan PUD was looking forward to discussions within the Committees on how to better focus future M&E efforts to better meet program goals and improve efficiency.

V. NMFS

A. HGMP Update (Craig Busack)

Craig Busack reported that he was currently reviewing Douglas PUD's Wells steelhead HGMP and that additional NMFS staff were being made available to work on HGMPs.

VI. HETT Update

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) did not meet in November 2011, but that they were requesting direction from the Hatchery Committees regarding hatchery production levels to use in the NTTOC risk analysis: current numbers, recalculated numbers, or both. Andonaegui said that the HETT recommended performing the risk analyses using the recalculated production levels. Todd Pearsons said that using the recalculated production levels would require changing numbers in the risk analysis template and waiting until the recalculation levels are agreed to. The Committees agreed to conduct the NTTOC risk analysis using the recalculated production numbers.

VII. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are December 14, 2011 (Chelan PUD office), January 18, 2012 (Douglas PUD office), and February 15, 2012 (Chelan PUD office).

List of Attachments

Attachment A – List of Attendees
Attachment B – Douglas PUD Draft 2012 M&E Workplan
Attachment C – Douglas/Grant PUDs Hatchery Sharing Agreement 2012 Production Request
Attachment D – Douglas PUD Draft 5-Year Hatchery M&E Presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Shane Bickford	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Andrew Murdoch	WDFW
Keely Murdoch*	Yakama Nation
Bill Gale*	USFWS
Matt Cooper	USFWS
Craig Busack*†	NMFS

Notes:

* Denotes Hatchery Committees' member or alternate

† Joined by phone

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Shane Bickford	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Mike Tonseth*	WDFW
Andrew Murdoch	WDFW
Keely Murdoch*	Yakama Nation
Bill Gale*	USFWS
Matt Cooper	USFWS
Craig Busack*†	NMFS

Notes:

* Denotes Hatchery Committees' member or alternate

† Joined by phone

Attachment B

IMPLEMENTATION OF COMPREHENSIVE MONITORING AND EVALUATION OF DOUGLAS COUNTY PUD HATCHERY PROGRAMS IN 2012

Submitted to

Greg Mackey
and
Tom Kahler

Douglas County PUD

Submitted by

Andrew Murdoch
and
Charlie Snow

Supplementation Research Team
Hatchery/Wild Interactions Unit, Science Division
Washington Department of Fish and Wildlife
20268 Hwy 20, Suite 7
Twisp, WA 98856

November 2011

Introduction

The Douglas County PUD Monitoring and Evaluation Plan (M&E Plan; Wells HCP Hatchery Committee 2007) describes eight objectives specific to the hatchery programs funded by Douglas County PUD and two regional objectives that are related to artificial propagation. These same objectives have been identified in the M&E Plan for Chelan County PUD (Murdoch and Peven 2005) and are designed to address key questions regarding the use of supplementation as mitigation for mortality associated with the operation of Wells Hydroelectric Project. All objectives have specified indicators (i.e., primary) that will be measured and compared against target values established in the M&E Plan. Specific tasks and methodologies to be used in accomplishing the objectives are provided in the M&E Plan.

The primary focus of this proposal is the first eight objectives outlined in the M&E Plan, but additional regional objectives are included where warranted. Both disease (Objective 9) and non-target taxa risk assessment (Objective 10) have been identified as important components of the M&E Plan. The Hatchery Evaluation Technical Team (HETT) is currently addressing Objective 10. Objective 9 will be implemented once an experimental design has been developed and approved by the Wells HCP Hatchery Committee.

Successful implementation of the M&E Plan requires a continuation and potential expansion of existing relationships between the WDFW and other entities conducting similar field work in the Upper Columbia River Basin. Certain objectives require data to be collected from both target and reference populations. Field activities (i.e., data collection) not conducted by the WDFW, that are also required to implement the M&E Plan (i.e., reference populations) are not included in this proposal.

Addressing all the objectives within the M&E Plan will require multiple years of data collection. Several objectives may be adequately addressed after one year or five years (Table 1), and may require only periodic monitoring (e.g., every five or ten years). This proposal and budget encompasses one year of work in which WDFW will furnish all supervision, labor, services, materials, tools, and equipment necessary to implement the Monitoring and Evaluation Plan of hatchery programs funded by Douglas County PUD. All statistical analyses will be conducted consistent with the Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs (Hays et al. 2007), or revised versions of that document as applicable.

Table 1. A potential long-term implementation schedule of objectives outlined in the Douglas County PUD M&E Plan.

Objective	Year of implementation									
	1-4	5	6-9	10	11-14	15	16-19	20	21-24	25
1	X	X	X	X	X	X	X	X	X	X
2	X	X		X		X		X		X
3	X				X				X	
4	X	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X	X
8	X	X		X		X		X		X
9	Experimental design not complete									
10	HETT is currently conducting this assessment									

Reference Populations

Reference populations are a critical component of the M&E Plan (Goodman 2004; ISRP & ISAB 2005). The HETT has developed a methodology for assessing and choosing reference populations, and WDFW and Douglas PUD have incorporated reference population analyses for Spring Chinook under Objective 1 in the 2011 draft 5-year M&E report (submittal to the HCP Hatchery Committee is pending at this time). Reference populations for steelhead and summer Chinook have not been identified by the HETT due to lack of populations similar to target populations that have not been substantially supplemented, or because potentially suitable reference populations lack the required data sets. Future analyses of spring Chinook program/populations will be able to build from this initial work. However, it is unclear if suitable reference populations will be available for steelhead due to lack of data. For Wells Hatchery summer Chinook, identifying suitable reference populations is not necessary, since the program is focused on harvest augmentation and not supplementation.

WORK PLAN BY OBJECTIVE

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(s) (i.e., reference population) and b) the changes in the natural replacement rate (NRR) of the supplemented population are similar to that of the non-supplemented population(s).

Hypotheses:

- Ho_1: Number of hatchery fish that spawn naturally > number of naturally and hatchery produced fish taken for broodstock.
- Ha_1: Number of hatchery fish that spawn naturally ≤ number of naturally and hatchery produced fish taken for broodstock.
- Ho_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ ≥ ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ha_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ < ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho_3: Δ NRR $_{\text{Supplemented population}}$ ≥ Δ NRR $_{\text{Non-supplemented population}}$
- Ha_3: Δ NRR $_{\text{Supplemented population}}$ < Δ NRR $_{\text{Non-supplemented population}}$

General Approach

Spawning ground, broodstock, and harvest data (e.g., selective fisheries) will be the source of all abundance, composition, and productivity information required for this objective. Identification of suitable non-supplemented reference populations will be problematic in the Upper Columbia Basin because some species/races do not have populations that have not been either supplemented or influenced by hatchery fish, or do not have adequate data sets for analyses (see discussion, above). For those supplemented populations without a suitable spatial reference population, temporal references may be used (i.e., before-after hatchery intervention comparison). Temporal reference populations may also be initiated if deemed necessary, by discontinuing hatchery releases in a target population for a predetermined period of time (i.e., at least one generation minimum) to allow a before-after comparison.

Methodology

Standard spawning ground survey methodology outlined in Appendix F of the M&E Plan (Spawning ground surveys) and data analysis outlined in Appendix G of the M&E Plan (Relative Abundance) will be used under this objective. WDFW will coordinate with other Agencies (i.e., USFWS, USFS, Tribes) that conduct spawning ground surveys to ensure methodologies and sample rates are consistent with methodologies used in this objective (Table 2). Spawning/carcass surveys will be conducted for Methow Basin spring Chinook (WDFW); Methow Basin steelhead (WDFW); and Okanogan steelhead

(CCT). The use of a composite spring Chinook broodstock in the Methow and Chewuch Rivers suggests that the Methow and Chewuch spawning aggregates be treated as a single group. The combined group (i.e., MetChew) is supported by analysis of genetic data, which concluded that both spawning aggregates are very closely related (Snow et al. 2007). However, differences in spawner abundance and carrying capacity of the two subbasins may require that each subbasin be treated independently for data analysis purposes.

Table 2. Methodologies used to determine biological information used in Objective 1.

Population	Spawning ground methodology	Spawner composition	Age composition
Methow steelhead	Expanded index	Wells Dam	Wells Dam
Twisp steelhead	Total ground	Twisp weir	Twisp weir
Okanogan steelhead [a]	Total ground	Wells Dam	Wells Dam
Methow sp. Chinook	Total ground	Carcasses	Wells Dam
Chewuch sp. Chinook	Total ground	Carcasses	Wells Dam
Twisp sp. Chinook	Total ground	Carcasses	Wells Dam

[a] Conducted by CCT.

Schedule of Activities

Table 4. Schedule for conducting spawning ground surveys and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A	A	D	D	D	D	A	A	A	A	A	A
Methow Basin spring Chinook	A	A	A	A	D	D	D	D	D	A	A	A

Analysis within the draft 5-year M&E Plan report identified low survival of hatchery- and natural-origin spring Chinook as a factor in the decrease in natural-origin spawner abundance and poor overall productivity of spring Chinook stocks. For 2012, we propose to increase PIT-tagging of wild spring Chinook parr in the Methow and Chewuch rivers in addition to ongoing PIT-tagging of wild steelhead and spring Chinook in the Methow Basin (Table 3). This tagging is expected to provide adequate sample sizes of wild spring Chinook to estimate migration survival through the Columbia River so that factors affecting survival can be identified. Fish collection for this tagging will be conducted via hook-and-line angling, seine or dip netting, electroshocking, trapping at irrigation ditch returns, or rescue from irrigation ditches or naturally de-watering areas via traps, nets, or electroshocking equipment. Additional effort for steelhead tagging conducted in the Twisp River will address sample size requirements for an on-going relative reproductive success study funded under BPA contract # 49080. Tagging methodologies will be consistent with ongoing activities in the Wenatchee and Entiat basins following protocols developed under the ISEMP.

Recommendations within the 5-year report suggest the Chewuch spring Chinook program be adjusted to rely on wild Chewuch-origin broodstock, or be discontinued. However, options to increase the number of locally adapted wild fish within the broodstock are limited. We propose to investigate alternative methods of collecting adult natural origin fish for inclusion in the Methow River and Chewuch River broodstocks using netting techniques, temporary picket-type weirs, or hook-and-line angling. Any adult fish collected would be incorporated into the Methow Hatchery spring Chinook program under the "Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols" developed annually prior to broodstock collection activities.

WDFW may assist DPUD in an assessment of subyearling summer Chinook life history by PIT-tagging up to 10,000 summer Chinook subyearlings in the Methow Basin.

Table 3. PIT-tagging goals for juvenile wild fish in the Methow Basin.

Target population	Wild fish		
	Steelhead	Age-0 (spring) Chinook	Subyearling summer Chinook
Methow River	1,000	1,500	Up to 10,000
Twisp River	2,000[a]	1,500	0
Chewuch River	1,000	1,500	0
Misc. tributaries	1,000	0	0
Total	5,000	4,500	10,000
DPUD Contribution	3,500	4,500	10,000

[a] Includes 1,500 fish tagged and funded though BPA contract No. 49080.

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.

Hypotheses:

- Ho_4: Migration timing $_{\text{Hatchery Age X}}$ = Migration timing $_{\text{Naturally produced Age X}}$
- Ha_4: Migration timing $_{\text{Hatchery Age X}}$ ≠ Migration timing $_{\text{Naturally produced Age X}}$
- Ho_5: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$
- Ha_5: Spawn timing $_{\text{Hatchery}}$ ≠ Spawn timing $_{\text{Naturally produced}}$
- Ho_6: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$
- Ha_6: Redd distribution $_{\text{Hatchery}}$ ≠ Redd distribution $_{\text{Naturally produced}}$

General Approach

A properly integrated hatchery program produces fish that have life-history traits similar to naturally produced fish. Differences in any of these behavioral life history traits may affect progeny survival. Migration timing in the Columbia River of both juvenile and adult fish will be assessed using PIT tags when available. Migration timing into spawning tributaries will be assessed at broodstock-collection locations, or using in-stream PIT antenna arrays. In 2009, in-stream antenna arrays were installed in the lower Methow and Twisp rivers to assess the distribution and migration timing of adult hatchery and wild steelhead. These antennas, in conjunction with arrays installed by other researchers (i.e., USGS) will be used to assess steelhead and spring Chinook run timing and distribution throughout the Methow Basin.

Spawn timing and redd distribution data for spring Chinook will be collected during spawning-ground surveys. We propose selecting index reaches to evaluate spawn timing in reaches where similar proportions of hatchery and naturally produced fish are expected to spawn (based on carcass recovery data). The use of index reaches will eliminate any potential bias in spawn timing due to differences in spawning locations. Carcass recovery locations will be used as a surrogate for spawning location.

For summer steelhead, WDFW will conduct an evaluation in the Twisp River using visual observation of spawning fish to evaluate spawn timing and location. All fish sampled at the Twisp River weir in 2012 will be PIT-tagged and steelhead will also be externally Floy-tagged with origin- and sex-specific colors. Surveyors will conduct intensive surveys to quantify redd distribution and collect observational data from Floy-tagged fish. Adult female steelhead will be PIT-tagged in the body cavity to maximize the likelihood that PIT tags will be expelled into redds. Redds will be scanned with portable PIT-tag antennas to confirm the origin of females observed spawning, and to provide spawn timing information for redds where no visual observations of spawners were made. Further, temporary in-stream PIT antennas will be installed in selected Methow Basin tributaries to assess whether surveys are conducted in all spawning areas, and to estimate spawner abundance in areas where conducting systematic surveys is problematic (e.g., Lost River). Funding for increased spawning ground surveys, PIT tag monitoring, and Floy Tag detections above baseline Douglas PUD M&E activities will be funded by the Bonneville Power Association (BPA) through contracts 49080 and 47950.

Methodology

Migration Timing

As previously stated, when available, PIT tags will be used to evaluate differences in migration timing in the Columbia River. During broodstock collection activities at mainstem dams, tributary traps, and the Twisp River weir, PIT tags will be inserted in all fish captured and released so that data on migration timing to spawning tributaries can be collected (Table 5). Migration timing into spawning tributaries will be assessed using PIT antenna arrays deployed at long-term sites in the lower Methow and Twisp rivers, utilizing antennas installed by other researchers within the Methow and Okanogan Basins (e.g., USGS), and using PIT antennas installed on a temporary basis in selected tributaries.

Table 5. Methods and locations used for evaluating differences in migration timing between hatchery and naturally produced salmon and steelhead.

Target population	Migration timing	
	Columbia River[a]	Spawning tributary
Methow spring Chinook	Wells Dam, PIT tags, CWTs	Twisp Weir, Chewuch PIT array
Methow steelhead	Wells Dam, PIT tags, VIE	Twisp Weir, PIT arrays in select tribs
Okanogan steelhead	Wells Dam, PIT tags, Ad clip	Omak Cr. Weir/Zosel Dam

[a] PIT tags will be used when available (i.e., in conjunction with other objectives).

Spawn Timing

All spawn timing information necessary for evaluating differences between hatchery and naturally produced salmon and steelhead will be collected during spawning-ground surveys (M&E Plan Appendix F). Specific spawn timing information will only be collected within index spawning areas. Index areas identified are likely to have a similar proportion of hatchery and naturally produced fish spawning, based on carcass recoveries between 2003 and 2006 (Table 6). Carcass recovery date of female spring Chinook salmon will be compared to examine relative differences in spawn timing.

Determining the relative spawn timing of steelhead in the natural environment is problematic because not all hatchery fish are adipose fin-clipped. In 2012, an evaluation of steelhead spawn-timing in the Methow Basin will be conducted utilizing female steelhead Floy-tagged at the Twisp River weir. Floy tag colors will be alternated every other year between hatchery and wild fish to control for any potential color effects on reproductive success. In 2012, male and female hatchery fish will be tagged with pink and blue tags, respectively; and male and female wild fish with chartreuse and red tags, respectively. Approximately 85% of the steelhead in the Twisp River spawn upstream of the Twisp River weir (mean 2003-2005). Steelhead will be captured and tagged at the Twisp River weir between 1 March and 15 June. All fish captured will be examined to determine origin (VIE, PIT, CWT, or eroded fins), age, and PIT tags, and colored anchor tags will be applied depending on stock and origin. Surveyors will record the tag color and date of all female steelhead observed during surveys and record GPS locations of all redds. Surveyors will also record the incidence of non Floy-tagged fish upstream of the Twisp River weir to determine weir capture efficiency. Because redd residence time of steelhead can be very low, female steelhead will be PIT-tagged in the body cavity to encourage tag expulsion into the redd. Surveyors will periodically scan completed redds for PIT tags to confirm female origin, or to identify female origin for redds where no visual observations of spawners occurred. Sampling at the Twisp River weir will be accomplished in conjunction with an on-going relative reproductive success study of steelhead in the Twisp River which receives funding through this implementation plan, and BPA contract No. 49080.

Table 6. Potential tributary index areas identified for each respective target population used for evaluating differences in spawn timing between hatchery and naturally produced salmon and steelhead.

Target population	Historical reach(s)
Twisp spring Chinook	Twisp River (T5 - T6)
Chewuch spring Chinook	Chewuch River (C4 - C6)
Methow spring Chinook	Methow River (M9 - M11)
Twisp steelhead	Twisp River (T4 - T10)

Spawning Distribution

Redd distribution data will also be collected during spawning ground surveys (M&E Plan Appendix F). The origin of spawners will be identified from carcasses (i.e., scales or CWT), and carcass recovery location (i.e., rkm) of female spring Chinook will be used to determine redd distribution. Overall steelhead redd distribution will be determined from GPS location information for each redd observed. Distribution by origin of spawning adult steelhead cannot be determined without application of an additional mark (e.g., Floy tag) because not all hatchery steelhead were adipose fin-clipped. Steelhead spawning distribution by origin of spawning adults will be assessed at the Twisp River weir in 2012. Surveys will be conducted at least weekly in the Twisp River to assess distribution of Floy-tagged females and to scan for PIT tags as previously described. Resident rainbow, residual hatchery steelhead, and cutthroat trout females will also be PIT-tagged in the body cavity to determine if these species or resident stages contribute to steelhead redd count estimates. Additionally, temporary in-stream PIT tag antenna arrays will be placed in selected tributaries to assist with spawning distribution evaluation. In conjunction with adult salmonid tagging at the Twisp weir and Wells and Priest Rapids Dams, these arrays are expected to provide a reliable, cost-effective means of corroborating current survey methodologies with observed salmonid use, and assessing spawning distribution (if any) in locations where spawning is presumed to not occur, or where surveys are difficult to conduct.

Schedule of Activities

Table 7. Schedule for conducting migration timing, spawn timing, and spawning distribution field activities and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D	D	D	D	D	A	A
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

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.

Hypotheses related to the genetic diversity, population structure, and effective population size (Ho 7-9) were addressed in the 2008-2010 work plans and will not be addressed in 2012. The following hypotheses of age and size at maturity will be addressed in 2012:

- Ho_{10}: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$
- Ha_{10}: Age at Maturity $_{\text{Hatchery}}$ ≠ Age at Maturity $_{\text{Naturally produced}}$
- Ho_{11}: Size (length) at Maturity $_{\text{Hatchery Age X and Gender Y}}$ = Size (length) at Maturity $_{\text{Naturally produced Age X and Gender Y}}$
- Ha_{11}: Size (length) at Maturity by age and gender $_{\text{Hatchery}}$ ≠ Size (length) at Maturity by age and gender $_{\text{Naturally produced}}$

General Approach

Genetic Assessment (not performed in 2012): Genotypes of hatchery and naturally produced populations will be sampled and monitored based upon the schedule outlined in Appendix H of the Douglas PUD M&E Plan. Priority of analysis was based upon recovery needs or relative risk a hatchery program may have on the naturally produced population.

Phenotypic Assessment: Differences in phenotypic characteristics that may arise as a result of hatchery programs (i.e., domestication) will be measured using historical (i.e., prior to current hatchery programs) and recent data collected from wild fish and broodstock or carcasses recovered on the spawning grounds. Data related to additional important phenotypic characteristics will be collected and analyzed as part of Objective 2 (e.g., run timing, spawn timing, and spawning location), Objective 4 (e.g., fecundity), and Objective 7 (e.g., size and age at smolt migration).

Methodology

Data for monitoring phenotypic characteristics (i.e., age at maturity and size at maturity) will be collected annually as part of the broodstock collection protocol (M&E Plan Appendix B), run assessment, and carcass recoveries. Broodstock for all programs are not collected randomly from the run at large with respect to sex, origin, or age. However, trapping activities do provide an opportunity to collect data from a random sample of the run-at-large (i.e., those fish collected during broodstock trapping and released upstream). Historically, information related to the spawning population was derived from broodstock, carcasses, or a combination of both. Recent data suggest that carcass recovery and broodstock methods are biased and additional sampling at sampling/broodstock collection sites (e.g. Wells Dam) is required (Zhou 2002; Murdoch et al. 2005). Broodstock collection sites are located near or below a majority of the spawning locations (Table 8). All fish trapped, or a random sample depending on the stock, will be sampled to determine origin, age, and size. This will provide a sample that more accurately, in a less biased way, represents the population. Additionally, PIT tags may be inserted into adult fish released upstream of Wells Dam and the Twisp River weir to address other M&E Plan objectives (i.e., migration timing and spawning distribution, Objective 2; stray rates, Objective 5).

Table 8. Broodstock collection locations for stock assessment and phenotypic characterization of hatchery and naturally produced fish.

Stock	Primary location	Secondary location
Methow Basin spring Chinook	Wells Dam	Twisp Weir
Methow/Okanogan steelhead	Wells Dam	Twisp Weir / Priest Rapids Dam

Schedule of Activities

Table 9. Schedule for conducting size and age at maturity comparisons (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	D	D	D	D	A	A	D	D	D	D	D	D
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate; HRR) is greater than the natural adult-to-adult survival (i.e., natural replacement rate; NRR) and equal to or greater than the program specific expected value (BAMP 1998).

Hypotheses:

- Ho_{12}: $HRR_{\text{Year x}} \geq NRR_{\text{Year x}}$
- Ha_{12}: $HRR_{\text{Year x}} < NRR_{\text{Year x}}$
- Ho_{13}: HRR ≥ BAMP value (preferred)
- Ha_{13}: HRR < BAMP value

General Approach

The survival advantage from the hatchery (i.e., egg-to-smolt) must be sufficient to overcome lower post-release survival (i.e., smolt-to-adult) in order to produce a greater number of returning adults than if broodstock were allowed to spawn naturally. If a hatchery program cannot produce a biologically significant greater number of adults than naturally spawning fish, the program should be modified or discontinued. More simply, the hatchery replacement rate should always be greater than the natural replacement rate.

Hatchery programs in the Upper Columbia River were initially designed based on observed mean survival rates for each stock (BAMP 1998). Performance of the hatchery programs will be assessed using those expected survival rates and the number of broodstock collected on a brood year basis. Harvest augmentation hatchery programs will only be compared to the expected HRR value because a corresponding NRR is not available or applicable (e.g., Wells summer Chinook).

Methodology

Smolt to adult (SAR) and HRR values will be calculated for each stock. SAR values are currently calculated using CWT recoveries from all locations (harvest, hatcheries, and spawning grounds), except for steelhead, for which SAR values are calculated based on sampling that occurs at Priest Rapids Dam or Wells Dam to obtain an estimate of the number of returning adults from the hatchery program. HRR values that fall below the expected values or the corresponding estimate of NRR (M&E Plan Appendix G) will be evaluated to determine whether in-hatchery (M&E Plan Appendix C) or out-of-hatchery (M&E Plan Appendix D) factors contributed to the reduced survival.

The 5-year M&E Plan analysis report noted that survival rates for hatchery and naturally-produced spring Chinook were lower than expected and increased PIT-tagging of both hatchery and wild fish was recommended to help identify survival constraints. For life-stage survival comparisons, stray rate monitoring, and assessment of migration patterns, rate, and speed within the basin, we propose that hatchery steelhead and spring Chinook be tagged at the Wells and Methow hatcheries prior to release (Table 10) for comparison to naturally produced fish (see Table 3). Comparison groups of hatchery spring Chinook and steelhead were historically tagged at each smolt trap, but tag rates were likely too low to provide meaningful comparisons. Further, PIT-tagging at the Methow smolt trap likely incorporated fish from hatchery programs not covered under the M&E Plan (i.e., WNFH) because release time and hatchery mark were often the same for steelhead and spring Chinook released from WDFW and USFWS hatcheries in the Methow Basin. Since releases of fish from these hatcheries have exhibited different survival rates (Townsend and Skalski 2004), tagging should occur at the hatcheries of origin to ensure that evaluations are conducted with target stocks.

Table 10. PIT-tagging goals for Douglas PUD hatchery fish released in 2013.

Target population	Hatchery fish	
	Steelhead	Spring Chinook
Methow River	5,000	6,000[a]
Twisp River	5,000	5,000
Chewuch River	0	5,000
Wells Hatchery	5,000	NA
Douglas PUD total	15,000	10,000

[a] 6,000 PIT tags already proposed for 2012 through Yakama Nation multi-species acclimation project.

Schedule of Activities

Table 11. Schedule of activities for hatchery evaluation activities (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Wells summer Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Methow Basin spring Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation.

Hypotheses:

- Ho_{14}: Stray rate $_{\text{Hatchery fish}}$ < 5% of total brood return
- Ha_{14}: Stray rate $_{\text{Hatchery fish}}$ ≥ 5% of total brood return
- Ho_{15}: Stray hatchery fish < 5% of spawning escapement (based on run year) within other independent populations
- Ha_{15}: Stray hatchery fish ≥ 5% of spawning escapement (based on run year) within other independent populations
- Ho_{16}: Stray hatchery fish < 10% of spawning escapement (based on run year) of any non-target streams within independent populations
- Ha_{16}: Stray hatchery fish ≥ 10% of spawning escapement (based on run year) of any non-target streams within independent populations

General Approach

Excessive strays from hatchery programs pose significant genetic risk (loss of genetic variation between populations) and must be monitored in order to determine the magnitude of the problem and develop reasonable and appropriate recommendations. Stray rates will be monitored using CWT recoveries from Chinook spawning ground surveys. The Regional Mark Information System (RMIS) database will provide all necessary CWT information needed when calculating stray rates for each brood year or within and outside basin stray rates based on spawning escapement estimates.

Brood year stray rates will require multiple-year CWT recoveries (i.e., all age classes) from broodstock and carcass recoveries on the spawning grounds. The estimated number of strays for the entire brood year will be calculated by dividing the number of strays by the total number of hatchery fish that returned. Stray rates within, and between independent populations will be calculated in a similar manner as brood year stray rates, except on an annual basis and based on the estimated spawning escapement.

Collecting stray rate information for steelhead poses the greatest challenge because carcasses are not available for examination. When available, radio tag information and/or adult PIT-tag monitoring may provide adequate information for evaluating stray rates. Some data needed for evaluating stray rates for the Methow/Okanogan steelhead will be collected during broodstock trapping activities at Wells Dam (M&E Plan Appendix B), and through operation of the Twisp River weir when assessing spawn-timing (see Objective 2). Stray rates in other tributaries may need to be calculated by other types of sampling (i.e., PIT tags, radio tags, hook-and-line, electroshocking) if warranted. Antenna arrays installed by WDFW and other researchers should provide tributary stray rate information, provided that adequate numbers of juvenile fish are PIT-tagged prior to release (hatchery fish) or within natal streams (wild fish). Tagging of hatchery steelhead under Objective 4 (see Table 10) should satisfy within-basin and out-of-basin stray rate monitoring goals of fish destined for release in the Methow Basin.

Methodology

Stray rates will be calculated using procedures outlined in the spawning ground survey methodology (M&E Plan Appendix F). As stated previously, information needed to evaluate steelhead stray rates will be obtained during broodstock collection activities at Wells Dam, operation of the Twisp Weir and antenna array, and through other proposals. However, direct observations on the spawning grounds by other Agencies (e.g., USFWS, CCT, or USGS) or via PIT tags may be required in non-target streams (Table 12).

Table 12. Proposed methodologies used to evaluate stray rates for target and non-target streams.

Hatchery program	Target stream/release location	Method
Twisp steelhead NNI	Twisp	PIT/Observation/creel[a]
Methow steelhead safety-net	Methow Hatchery	PIT/Observation/creel[a]
Wells steelhead safety-net	Wells Hatchery	PIT/Observation/creel[a]
Okanogan steelhead	Okanogan, Similkameen	PIT/Observation/creel[a,b]
Twisp spring Chinook NNI	Twisp	CWT
Chewuch spring Chinook NNI	Chewuch	CWT
Methow spring Chinook NNI	Methow	CWT
Wells summer Chinook	Wells Hatchery	CWT

[a] The number of strays will also be estimated during broodstock collection activities or PIT tag detections at Columbia River or tributary dams/detectors, where applicable.
[b] The Okanogan steelhead assessment is performed by the CCT.

Schedule of Activities

Table 13. Schedule for data analysis to determine stray rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D						
Okanogan steelhead	A	A	D	D	D	D						
Methow Basin spring Chinook	A	A						D	D			
Wells summer Chinook	A	A								D	D	

Objective 6. Determine if hatchery fish were released at the programmed size and number.

Hypotheses:

- Ho_{17}: Hatchery fish $_{\text{Size at release}}$ = Programmed $_{\text{Size at release}}$
- Ha_{17}: Hatchery fish $_{\text{Size at release}}$ ≠ Programmed $_{\text{Size at release}}$
- Ho_{18}: Hatchery fish $_{\text{Number released}}$ = Programmed $_{\text{Number released}}$
- Ha_{18}: Hatchery fish $_{\text{Number released}}$ ≠ Programmed $_{\text{Number released}}$

General Approach

The HCP outlines the number and size at which fish of each program are to be released. However, analyses in the 5-year report revealed that past length-weight targets are not appropriate. The 5-year report offers new targets based on recent data. New targets should be established, and assessment under this M&E program for 2012 will use the new targets, pending acceptance of the 5-year report by the Hatchery Committee. The programmed size and number of fish for each program will be compared to actual values at release each year. The number of broodstock collected and the population-dynamics assumptions (i.e., sex ratio, fecundity, and survival) in the broodstock collection protocol are important components for consideration. A program's failure to meet the HCP standards (e.g., over or under program goals) will be evaluated taking into account the number of broodstock and associated population-dynamics assumptions. The size of fish will be compared using a representative sample collected immediately prior to release.

Methodology

The number and size of fish released will be calculated according to methodologies outlined in the M&E Plan (Appendix C). An annual review of size and number of fish from each program will be compared to those values defined in the HCP, or adjusted values agreed to by the Wells HCP Hatchery Committee. If release targets were achieved within acceptable levels (i.e., 10% +/- of HCP defined values) then no change would be recommended. If release targets are not achieved then causation will be determined and recommendations made based upon the results of the evaluation. A review of the broodstock protocols will occur every five years (or more frequently if necessary) concurrently with an evaluation of the number of fish released from each program.

Schedule of Activities

Table 14. Schedule of activities to determine the number and size of fish released (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Wells steelhead	D	D	D	D	D	A	D	D	D	D	D	D
Wells summer Chinook	D	D	D	D	D	D	D	A	D	D	D	D
Methow spring Chinook	D	D	D	D	D	A	D	D	D	D	D	D

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.

Hypotheses:

- Ho_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ = Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ha_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ ≠ Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ho_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is ≥ 1.
- Ha_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is < 1.

General Approach

Supplementation should result in an increase in the natural production of the target stock. Given variability in abundance of adult salmonid populations in the Upper Columbia River Basin, monitoring juvenile production (e.g., smolts/redd) should provide a direct assessment of the efficacy of hatchery fish in rebuilding natural populations. Monitoring the freshwater production of both supplemented and non-supplemented populations may provide an early indication of the reproductive success of hatchery fish on the spawning grounds (i.e., no out of basin effects on survival). Conversely, without a smolt monitoring program, changes in smolt production may be masked by out of basin effects. Thus, subsequent recommendations concerning hatchery program modifications may be misdirected.

Smolt monitoring programs are currently ongoing for most treatment streams (Table 15). Coordination with the Agencies operating the various traps is ongoing to ensure similar levels of effort and methodologies are used.

Table 15. Population and location of smolt traps that may be used in examining the influence of hatchery fish on freshwater productivity.

Population	Smolt trap	Size	Agency
Methow Basin spring Chinook	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp spring Chinook	Twisp	1 - 5 ft trap	WDFW
Methow Basin steelhead	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp steelhead	Twisp	1 - 5 ft trap	WDFW
Okanogan steelhead	Okanogan	1 - 8 ft trap; 1 - 5 ft trap	CCT

Comparisons between supplemented and unsupplemented populations require extensive data sets, with potentially high annual variability that may require years before the efficacy of the program can be determined. Furthermore, the Wells steelhead program began decades before the HCP was signed and pretreatment data may not be available. Similarly, large releases of spring Chinook occurred in the Methow Basin for decades before the HCP program began.

Methodology

Procedures for this objective are outlined in Appendix E of the M&E Plan. Redd count activities required for this Objective will be accomplished under Objective 2. Juvenile monitoring requires an extensive trapping period (Table 16) over many successive generations due to the diverse life-history of spring Chinook (subyearling and yearling emigrants) and summer steelhead (multiple age-class smolts). Random samples of scales must be collected for all stocks with multiple age-class smolts in order to calculate the number of smolts produced from each brood-year. Whenever possible, direct measurements of the proportion of hatchery fish on the spawning grounds (pHOS) will be conducted (i.e., Twisp Weir). Otherwise, the proportion of hatchery-origin fish on the spawning grounds will be estimated where possible, as will the Proportionate Natural Influence (PNI).

Current estimates of egg-to-smolt survival for Methow spring Chinook are much lower than expected. Based on scale analysis of returning Chinook adults, we assumed that all yearling emigrants at the Methow smolt trap were spring Chinook and subyearling emigrants were summer Chinook. Results of DNA sampling at the Methow River trap during the fall of 2006 and 2007 indicated that the majority of subyearling Chinook captured were spring Chinook. Because of this, fall trapping and DNA sampling will be conducted at the Methow smolt trap to estimate total spring Chinook emigrants.

The low abundance of steelhead and yearling Chinook captured at smolt traps in the Methow Basin limits the sample size to conduct migration timing comparisons and life-stage survival estimates (e.g., PIT tag recaptures). The installation of PIT tag antenna arrays in the lower Twisp and Methow rivers will provide additional opportunities to assess migration behavior and survival, and detection rates should increase with additional PIT-tagging of hatchery and wild fish conducted under Objective 4 and Objective 1, respectively.

Schedule of Activities

Table 16. Schedule of activities for smolt monitoring programs in the Methow Basin (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow Basin steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow Basin spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow summer Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Wells Chinook salmon).

Hypotheses:

- Ho_{21}: Harvest rate ≤ Maximum level to meet program goals
- Ha_{21}: Harvest rate > Maximum level to meet program goals
- Ho_{22}: Escapement ≥ Maximum level to meet supplementation goals
- Ha_{22}: Escapement < Maximum level to meet supplementation goals

General Approach

In years when the expected returns of hatchery adults are above the levels required to meet program goals (i.e., broodstock, natural escapement), surplus fish may be available for harvest. Harvest of returning adults is the goal of some programs (e.g., Wells summer Chinook) and an ancillary benefit of other programs (e.g., Methow/Okanogan steelhead). Contribution to fisheries, whether incidental or directed, will be monitored using CWT recoveries on a brood-year basis. Target harvest rates have not been outlined in the M&E Plan. Hence, a qualitative assessment of the contribution rates of hatchery fish to fisheries versus broodstock or spawning grounds is required to determine if the objective has been met.

One approach, based on the goal of the hatchery program, is to compare CWT recoveries by recovery location (i.e., broodstock, fisheries, or spawning grounds). For example, a majority of the CWT recoveries for harvest augmentation programs should occur in fisheries. Conversely, supplementation programs should have a majority of the CWT recoveries occur on the spawning grounds.

Methodology

Robust statistically valid creel survey programs will be conducted for all sport fisheries in the Upper Columbia River to estimate harvest of hatchery fish from hatchery programs funded by Douglas County PUD (M&E Plan Appendix D). Creel survey programs will be designed and implemented by WDFW Fish Management staff. Creel surveys in the Upper Columbia River are also an important component in calculating the HRR (Objective 4) because most CWT recoveries occur within the Upper Columbia River, the exception being summer Chinook. Significant time lags in reporting CWT recovery data to the Regional Mark Information System (RMIS) database requires a continual requerying of recovery data until the number of estimated fish does not change. The number of fish and proportion by brood year for CWT recoveries will be summarized in several categories (Table 17).

Table 17. Categories for CWT recoveries of hatchery fish released from Douglas County PUD funded programs.

Category	Estimated number of fish (%)		
Broodstock	Total	Target stream	Nontarget streams
Spawning ground	Total	Target stream	Nontarget streams
Fisheries	Total	Commercial	Sport
Commercial	Ocean	Columbia River Treaty	Columbia River non-Treaty
Sport	Ocean	Columbia River	Terminal

Schedule of Activities

Table 18. Schedule of activities to determine harvest rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	D	D	D	A	A	A		D	D	D	D	D
Wells summer Chinook	A	A					D	D	D	D		
Methow basin spring Chinook	A	A										

DELIVERABLES

Annual Reports: A draft annual report will be provided to Douglas PUD by 1 July, 2012. A final report will be provided to the HCP HC within 30 days of receiving comments on the draft report. The annual report will summarize all field activities conducted during the contract period. The format of the report will be similar to the 2010 annual report that has been provided to Douglas PUD, with each task reported in a separate chapter. Primary indicators and the data used in calculations during each task will also be presented in each chapter. Secondary and tertiary indicators will be reported if needed to calculate the primary indicator.

Chapter 1. Hatchery Brood Report

a. Broodstock
    - Number collected
    - Age composition
    - Size at maturity
    - Report on Chewuch spring Chinook broodstock collection efforts

b. Juvenile
    - Number released
    - Size at release

c. Hatchery replacement rates

Chapter 2. Harvest

a. Hatchery fish
    - Number
    - Location
    - Stray rates

b. Wild fish
    - Number
    - Location

Chapter 3. Smolt Monitoring

a. Smolt production
    - Number of smolts (captured and total estimate)
    - Smolts/redd
    - Size at emigration
    - Age at emigration

b. Survival
    - Egg to emigrant survival
    - Number of fish PIT-tagged
    - Smolt-to-smolt survival

c. Remote PIT-tagging
    - Number tagged

Chapter 4. Steelhead Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
    Number of redds
    Spawning escapement
    Spawner composition
    pHOS and PNI estimates
    Number of NOR
    NRR
    Stray rates

Chapter 5. Chinook Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
    Number of redds
    Spawning escapement
    Spawner composition
    pHOS and PNI estimates
    Number of NOR
    NRR
    Stray rates

Recommendations: Recommendations to modify the M&E Plan or reporting will occur on an annual basis and again within the five-year summaries. Initially, changes to protocols or methodologies may be necessary to ensure the data required in the M&E Plan is collected. Changes to the M&E Plans' implementation or hypotheses will be included in the five-year summary report. Recommendations will be consistent with the hatchery program goals and will be included in a separate section of the summary report.

Presentations: A formal presentation (i.e., PowerPoint format) of the M&E Plan results will be provided to Douglas PUD or the HCP HC at their convenience. Presentations will include the status of all hatchery programs in meeting their objectives, potential problems and recommendations. Similar presentations of annual results from field activities can be requested and provided if warranted.

COORDINATION BETWEEN DOUGLAS PUD AND HATCHERY STAFF

The WDFW Supplementation Research Team (a.k.a. Methow Field Office) has been directly involved in the evaluation, development, and implementation of the hatchery programs since 1992. Currently, the WDFW is contracted by Douglas PUD not only to operate its hatcheries, but also to implement the Evaluation Plan developed when the Methow Hatchery program came online.

Coordination with hatchery staff has been a continual process. Hatchery staff conducts routine sampling at the hatcheries and data is provided to us for inclusion in monthly reports. However, special meetings with the hatchery staff are typically conducted prior to significant events (i.e., broodstock collection, spawning, release of juveniles) to ensure proper methodologies are used and critical data is collected. Evaluation staff is present at all significant events and collect data needed for evaluation purposes.

Additional coordination between evaluation staff, hatchery staff, and the WDFW ESA Permitting biologist is often required to ensure that conditions of ESA Section 10 permits are not violated. The ESA permitting biologist is co-located with evaluation staff, which allows for efficient and effective communication on a daily basis in order to ensure compliance with existing permits. Currently, all ESA reporting related to the hatchery programs is the responsibility of the WDFW Permitting Biologist (0.5 FTE). Given the limited resources dedicated to ESA Permit reporting and the extensive workload required to meet reporting requirements, this relationship is critical to ensuring hatchery programs operate within the conditions of the permit.

Monthly reports have served as a primary mode of coordination and are used to keep Douglas PUD as well as HCP Committee members and co-managers informed on all hatchery and evaluation related activities. Unless otherwise requested by Douglas PUD, the role of monthly reports will remain the same. Upon request, additional information can be included in the monthly reports.

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Attachment C

Grant County
PUBLIC UTILITY DISTRICT
Innovation & Excellence... Yesterday, Today and Tomorrow

October 25, 2011

Greg Mackey, Fisheries Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway, East Wenatchee, WA 98802

Subject: Request for excess rearing capacity per Agreement 430-1217

Dear Mr. Greg Mackey

In August 2004, the Public Utility District No. 1 of Douglas County (Douglas PUD) and the Public Utility District No. 2 of Grant County (Grant PUD) jointly entered into an Interlocal Cooperative Agreement 430-1217 (Agreement) intended to provide Grant PUD with access to excess capacity at Douglas PUD's existing Methow and Wells fish hatcheries.

Under Agreement 430-1217, Douglas PUD allows Grant PUD to utilize excess rearing capacity at the Wells and Methow fish hatcheries owned by Douglas PUD and operated by WDFW to rear UCR steelhead, UCR spring Chinook salmon, summer Chinook salmon, and survival study fish. The term of Agreement is 10 years, signed August 9th 2004. Under the Agreement, Grant PUD has the opportunity to request use of the excess rearing capacity for five groups of fish (not all groups can be reared during the same annual cycle), which are summarized below.

- Group 1 – Access to Douglas PUD's excess rearing capacity at the Wells Fish Hatchery (120,000 fish). The group 1 strategy only provides fish to Grant PUD for annual survival studies;
- Group 2 – Access to Douglas PUD's excess rearing capacity at the Wells Fish Hatchery for up to 200,000 yearling summer Chinook;
- Group 3 – Access to Douglas PUD's excess rearing capacity at the Wells Fish Hatchery for up to 100,000 yearling steelhead;
- Group 4 – Access to Douglas PUD's excess rearing capacity at the Methow Fish Hatchery for up to 201,000 yearling spring Chinook; and
- Group 5 – Access to Douglas PUD's excess rearing capacity at the Methow Fish Hatchery for up to an additional 188,000 yearling spring Chinook.

At this time, Grant PUD is requesting formal approval from Douglas PUD to implement the following two groups at Methow and Wells hatchery facilities for brood years 2012 (spring Chinook) and 2013 (steelhead), respectively. We recommend this request be presented in the Habitat Conservation Plan for approval in the November meeting as Grant PUD presented and discussed the contents of this letter in the Priest Rapids Coordinating Committee Hatchery Subcommittee meeting on October 20.

- **Group 3 – Up to 100,000 summer steelhead (brood year 2012) from the Wells Hatchery and locally-adapted steelhead captured and transported to the Wells Hatchery from the Okanogan Basin by the Colville Confederated Tribes.**

- **Group 4 – Up to 201,000 spring Chinook (brood year 2012) from the Methow Hatchery.**

Because a 2013 hatchery recalculation implementation plan within the HCP and PRCC HSC is in development, it is unknown at this point when this process may be finalized. The numbers reflected above may change based on future decisions by these committees.

This request does not limit Grant PUD's ability to request production levels for other species (such as yearling summer Chinook) in out-years at the Wells or Methow facilities. Specific details contained in the Interlocal Cooperative Agreement can be reviewed at http://www.gcpud.org/resources/resdocs/index.htm

Following formal approval by the Priest Rapids Coordinating Committee and Priest Rapids Hatchery Subcommittee and pursuant to Section 8 (Notification) of the Interlocal Cooperation Agreement, Grant PUD will submit to Douglas PUD written notification of the production levels required to meet Grant PUD's requirements under the Biological Opinion issued for the Priest Rapids Hydroelectric Project (FERC No. 2114) by NMFS on February 1, 2008 and included in FERC License Order issued on April 17, 2008.

Cc: NR-Records
Shane Bickford
Priest Rapids Coordinating Committee
Jeff Grizzel
Elizabeth McManus for Priest Rapids Coordinating Committee Hatchery Subcommittee

Attachment D

Evaluation of Wells and Methow Hatchery Programs in the upper Columbia Basin

Attachment D

Acknowledgements

- WDFW Methow Research Team
- WDFW Molecular Genetics Lab
- Hatchery Evaluation Technical Team
- Wells HCP Hatchery Committee
- Douglas County PUD
- Grant PUD
- Chelan PUD

Attachment D

Agenda

- Hatchery Programs
- M & E Plan
- Summer Chinook
- Steelhead
- Spring Chinook

Attachment D

Hatchery Programs

Program	Hatchery	Release Target
Summer Chinook Yearling	Wells	320,000
Summer Chinook Subyearling	Wells	484,000
Methow Steelhead	Wells	320,000
Okanogan Steelhead	Wells	130,000
Methow Spring Chinook	Methow	183,333
Twisp Spring Chinook	Methow	183,334
Chewuch Spring Chinook	Methow	183,333

Attachment D

M & E Plan

Obj.	Description	Target	Program
1	Spawner Abundance (S)	Increase	Sthd./Spr. Ch
	Natural Origin Recruit Abundance (R)	Increase	Sthd./Spr. Ch
	Adult Productivity (R/S)	No Decrease	Sthd./Spr. Ch
2	Migration timing	H = W	Sthd./Spr. Ch
	Spawn timing	H = W	Sthd./Spr. Ch
	Spawning location	H = W	Sthd./Spr. Ch
3	Genetic Monitoring	No change	Sthd./Spr. Ch
	Age and Size at Maturity	H = W	Sthd./Spr. Ch
4	Hatchery Survival (HRR)	Program specific	All
5	Stray rates	5% or 10%	All
6	Number and size of fished released	Program specific	All
7	Freshwater productivity	No Decrease	Sthd./Spr. Ch.
8	Harvest	Maximum	Summer Ch.

Attachment D

Wells summer Chinook Goal

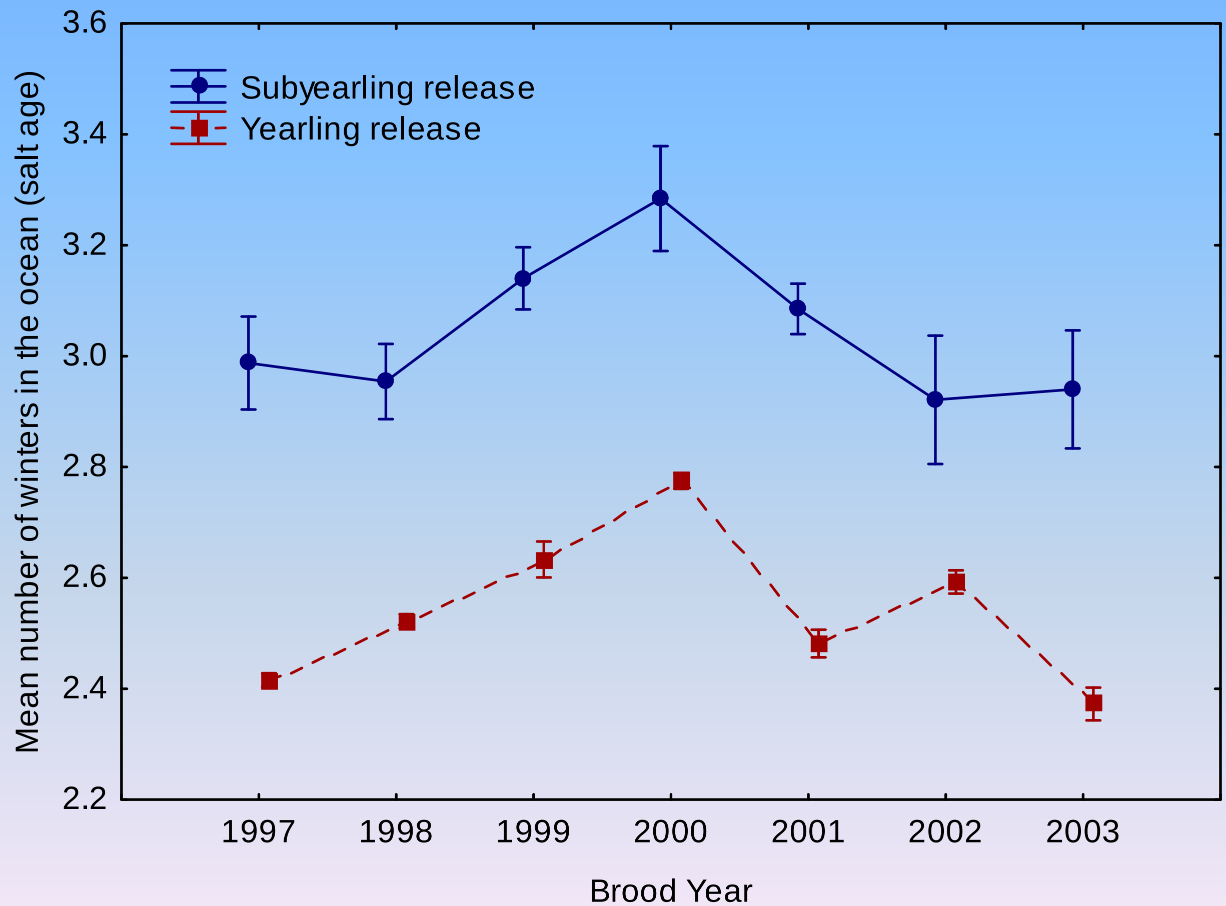
- Provide salmon for harvest and increase harvest opportunities, while segregating returning adults from natural spawning populations.

Wells Summer Chinook

- Post release survival targets
  - Yearling program = 4.9
  - Subyearling program = 3.0
- Results (Geometric means)
  - Yearling program = 11.8 ($P < 0.004$)
  - Subyearling program = 0.8 ($P < 0.002$)
- Recent changes in release time for subyearling Chinook from June to May has increased HRR to 3.0

Attachment D

Salt age at return



Wells Summer Chinook

- Stray rate targets
  - 5% brood year
  - 5% of the receiving spawning population
- Brood year
  - Mean (SD) = 8.6% (6.7%)
  - Not greater than 5% (P =0.17)
- Spawning populations
  - Entiat (3.4), Methow (5.0), Okanogan (3.4), Similkameen (0.0), Wenatchee (0.0), Chelan (15.7)

Attachment D

Wells Summer Chinook

- Size at release
  - Subyearling target = 116mm, 22.7 g
  - Yearling target = 162 mm, 45.4g
- Results
  - Subyearling = 111 mm ($P = 0.06$), 16.4g ($P < 0.001$)
  - Yearling = 166 mm ($P = 0.31$), 51.8g ($P = 0.09$)

Attachment D

Wells Summer Chinook

- Number releases
  - Subyearling target = 466,727
  - Yearling target = 320,000
- Results
  - Subyearling = 421,598 ($P = 0.10$)
  - Yearling = 337,983 ($P = 0.22$)

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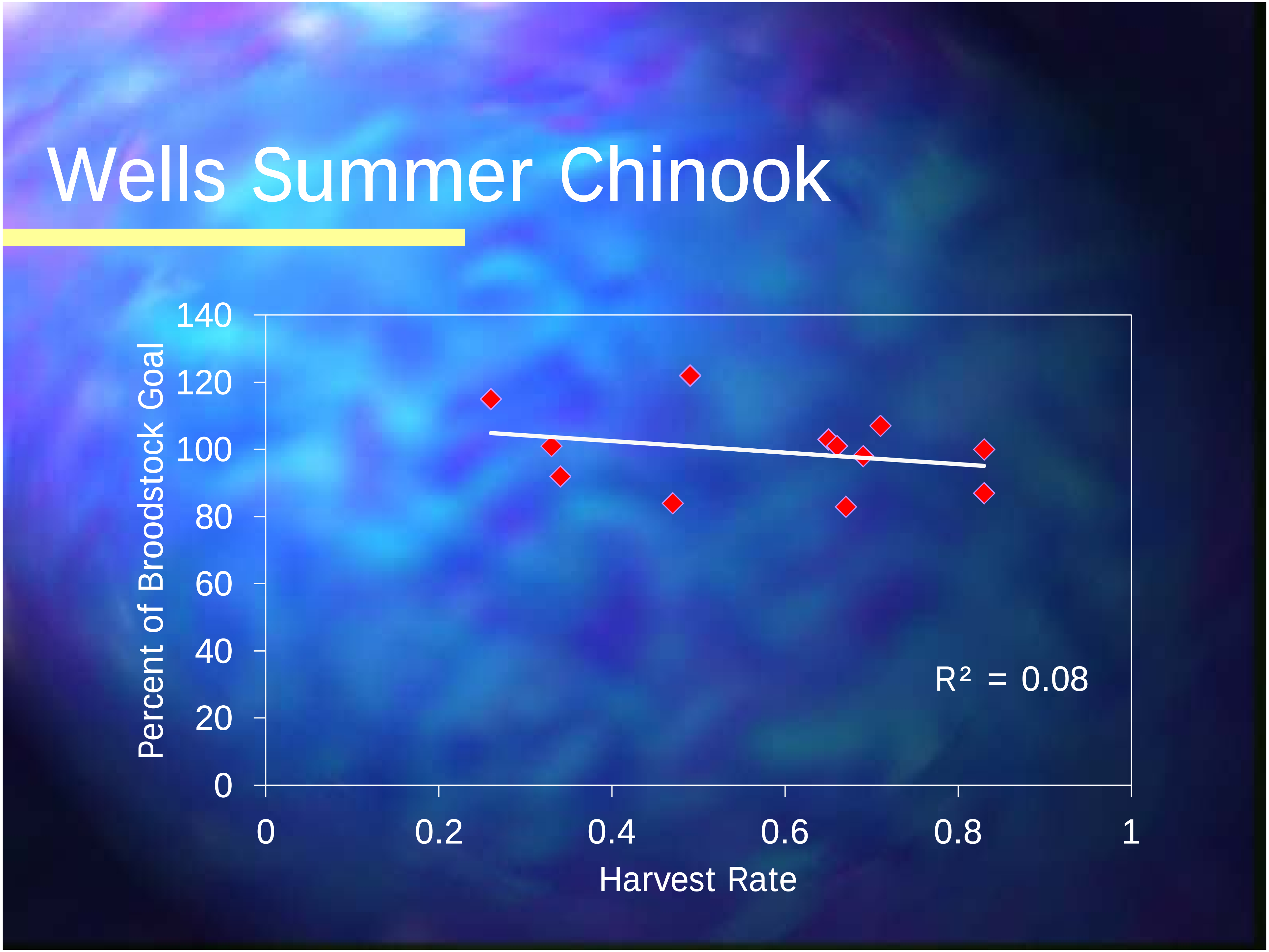


Summary and Recommendations

- The Wells summer Chinook program has performed as planned.
- Continue to evaluate factors reducing survival of subyearling program.
- Continue or increase sport fisheries in upper Columbia and removal of excess fish at Wells FH to maintain low stray rates.
- Collect a minimum of 10% NORs for broodstock to minimize genetic impacts of straying and domestication within the broodstock.

Attachment D

Methow/Okanogan Steelhead Goal

- Support recovery by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.
  - While the HCP is not a recovery plan into itself, the hatchery component of it must be consistent with hatchery goals and objectives through the ESA, and as such should aid in the recovery of listed fish.

Attachment D

Steelhead Recovery Goals

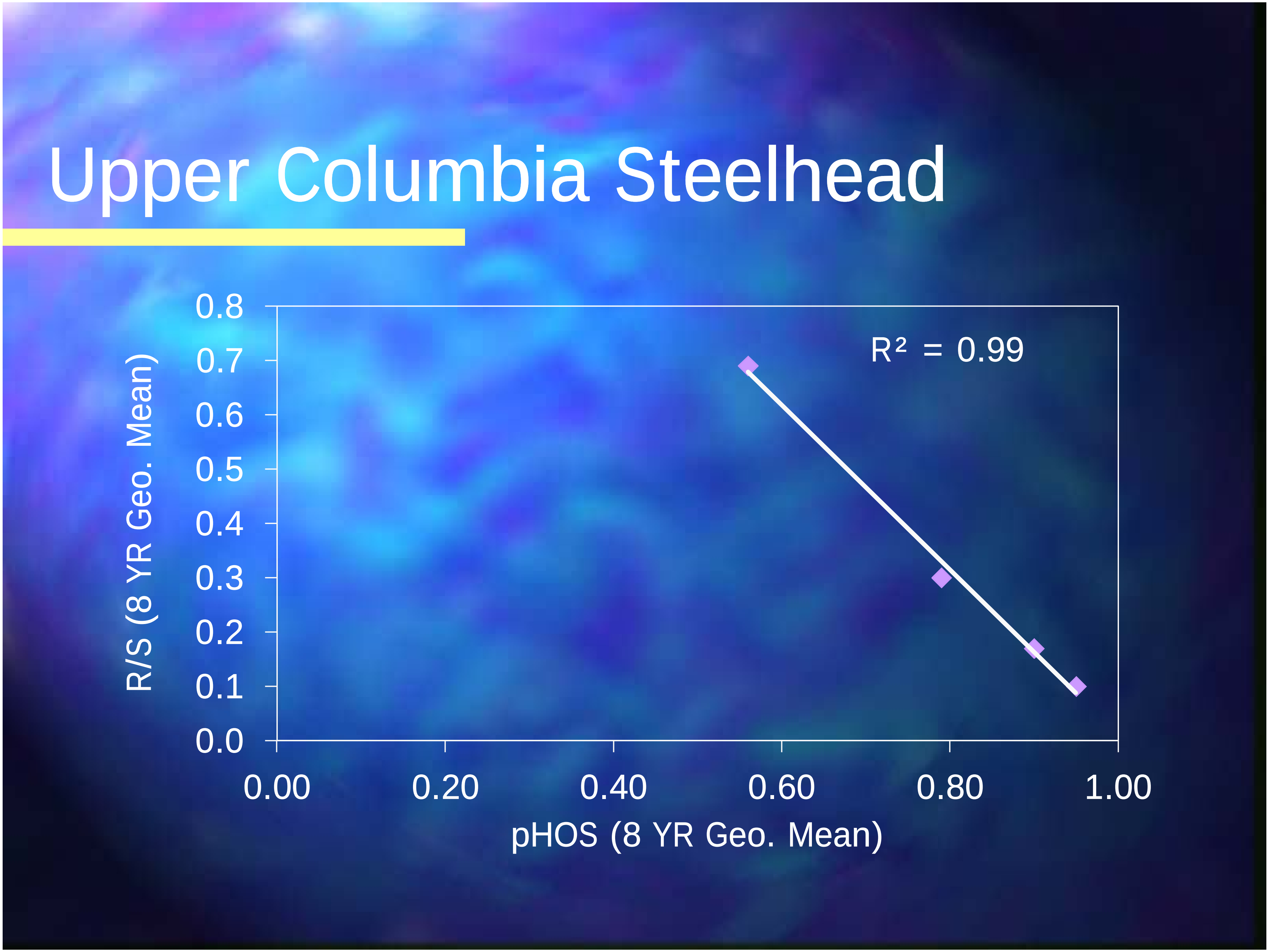
	Wenatchee	Entiat	Methow	Okanogan
Recovery Goal (NOR)	1000	500	1000	500
8 year Geo. Mean	962	126	556	166
% of Goal	96%	25%	56%	33%
Recovery Goal (R/S)	1.10	1.20	1.20	1.20
8 year Geo. Mean	0.69	0.3	0.17	0.1
% of Goal	63%	25%	14%	8%

Attachment D

Upper Columbia steelhead

	Wenatchee	Entiat	Methow	Okanogan
1997 - 2004 Geo. Mean				
NOR	962	126	556	166
R/S	0.69	0.30	0.17	0.10
Spawners	1397	426	3285	1694
PNI	0.12	0.10	0.08	0.08
pHOS	0.56	0.79	0.90	0.95
2005 - 2010 Geo. Mean				
Spawners	2534	587	3828	1920
PNI	0.47	0.42	0.18	0.19
pHOS	0.62	0.74	0.85	0.91

Attachment D



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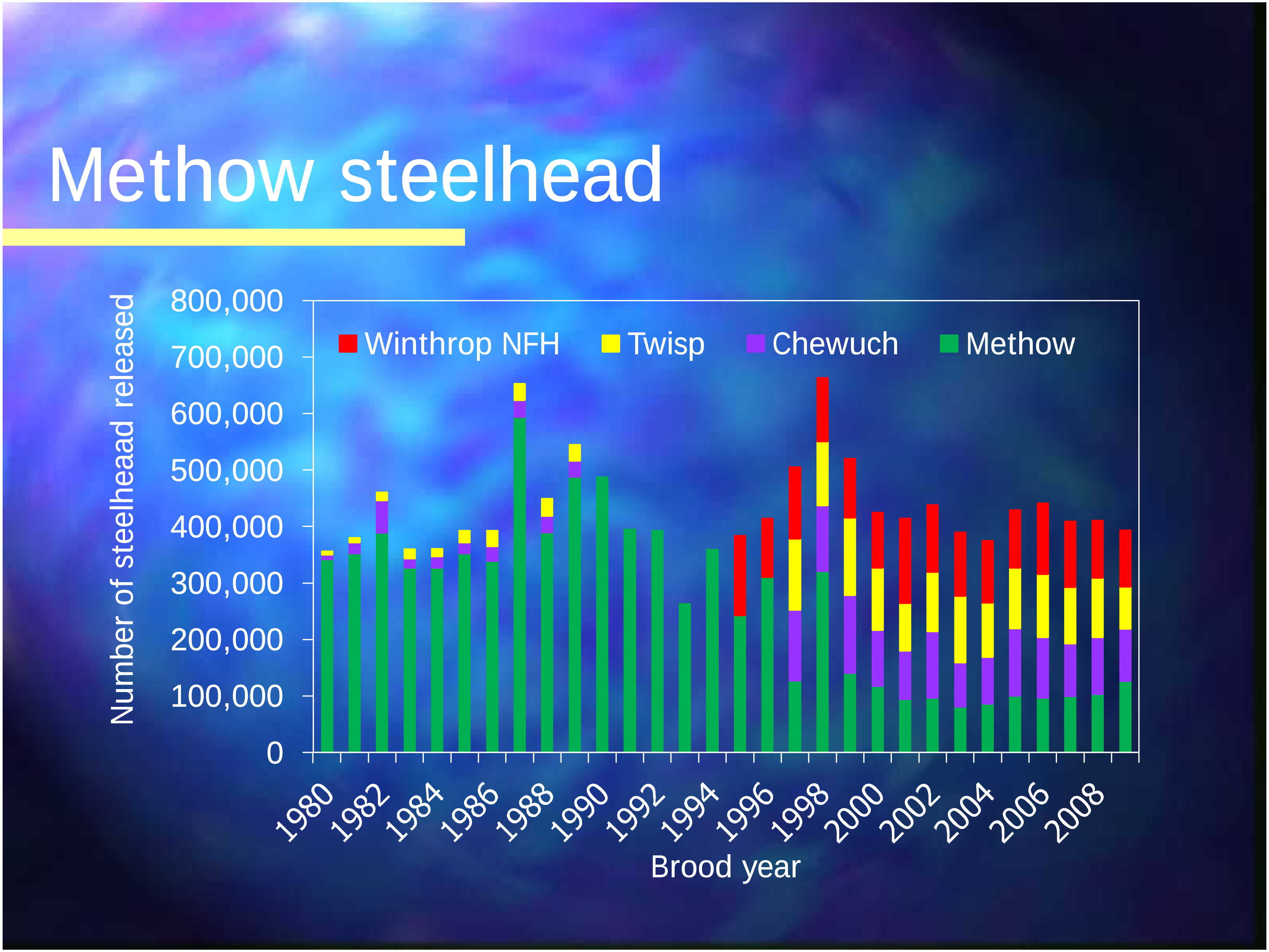

Methow steelhead

- No reference populations (BA instead of BACI)
- Mean number released
  - 1981 – 1996 brood years = 418,200
  - 1997 – 2009 brood years = 442,597
- No estimate of spawners until recently
- Used modeled run escapement data minus harvest

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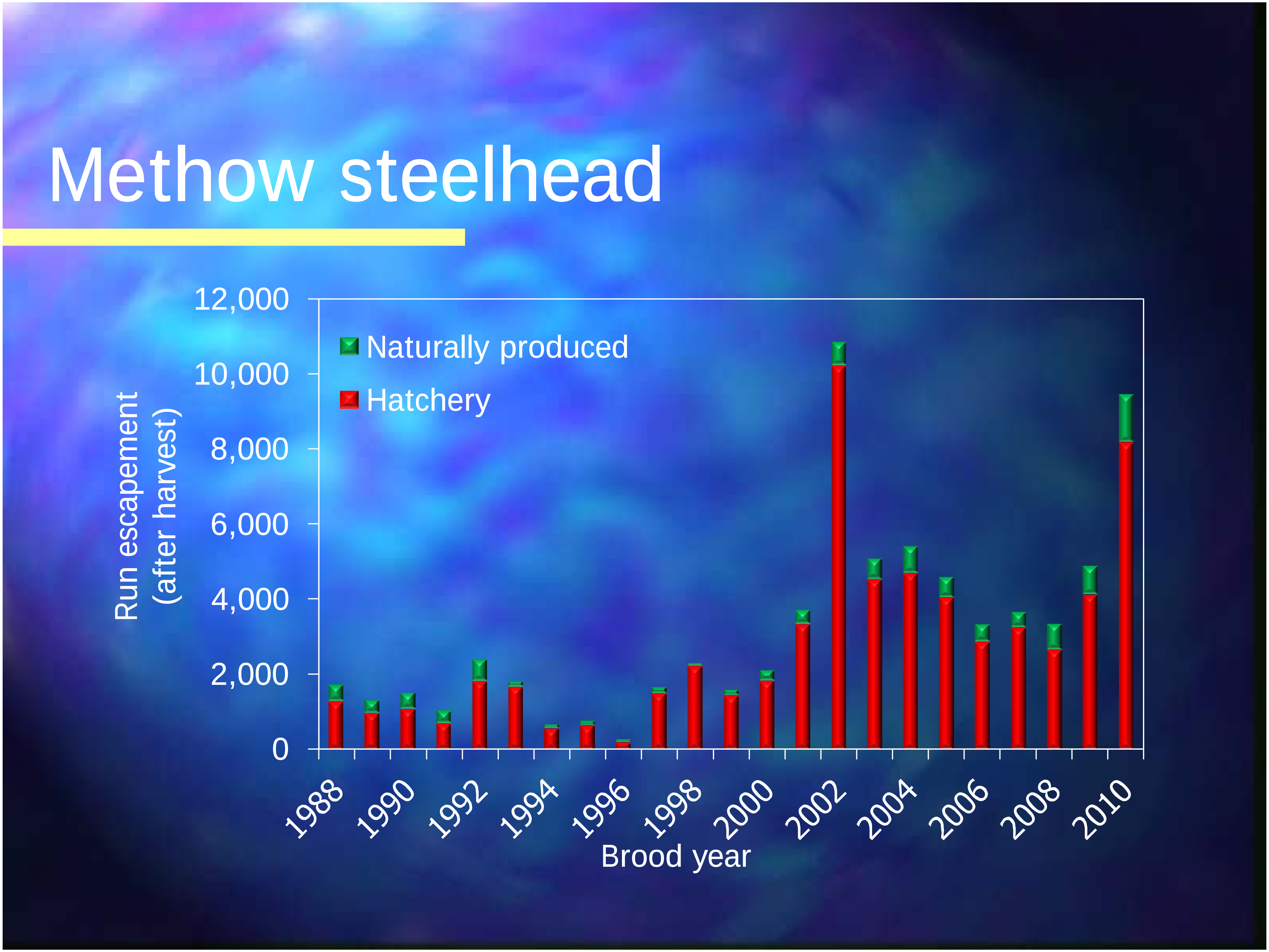

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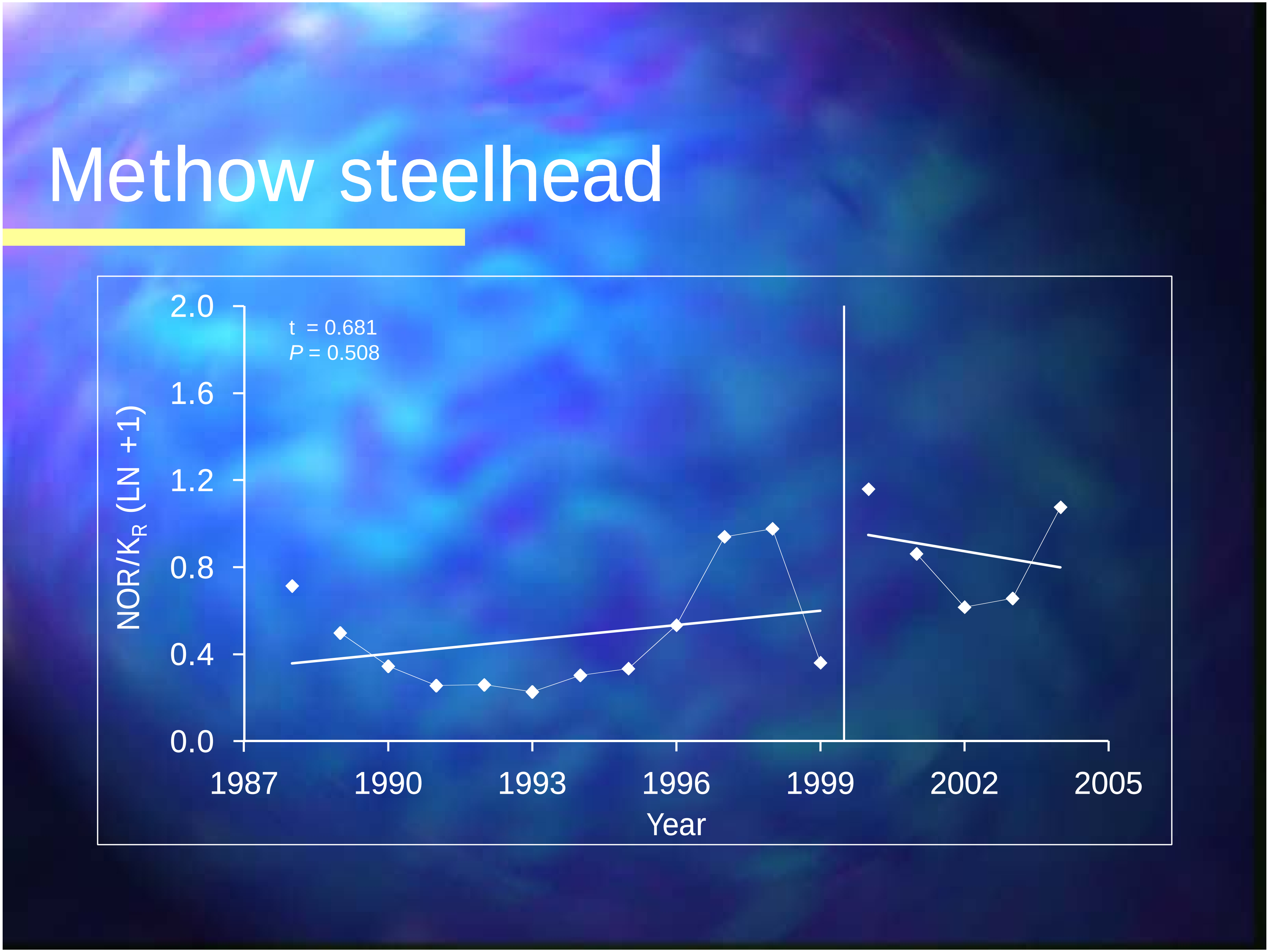
Attachment D



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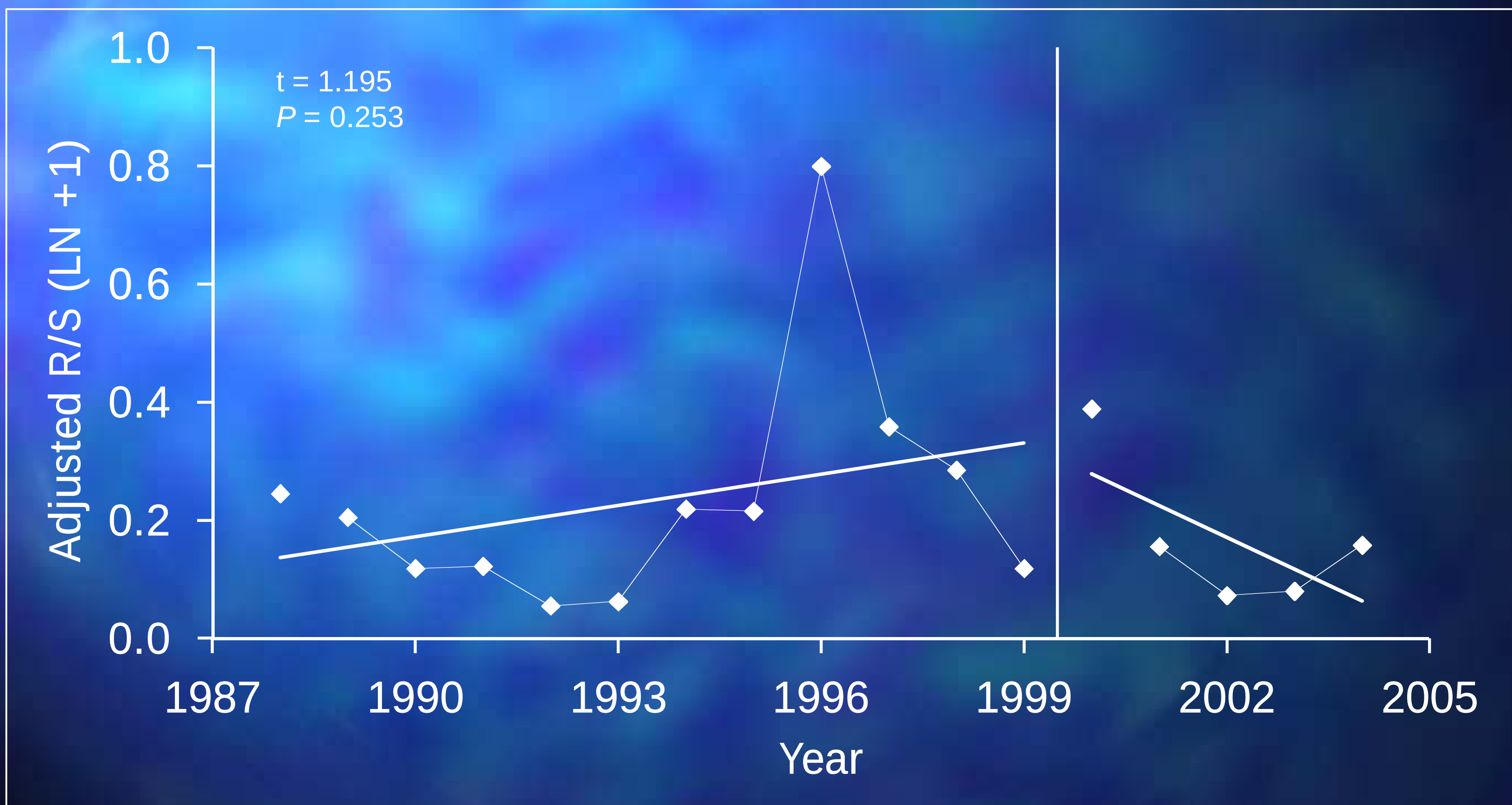
Methow steelhead



Methow steelhead

Response variable	Mean		t-value	P-value	Result
	Before	During			
Abundance	1,407	5,111	-5.690	0.000	Increase
NORs	305	662	-2.874	0.012	Increase
Productivity	0.290	0.185	0.640	0.532	No change

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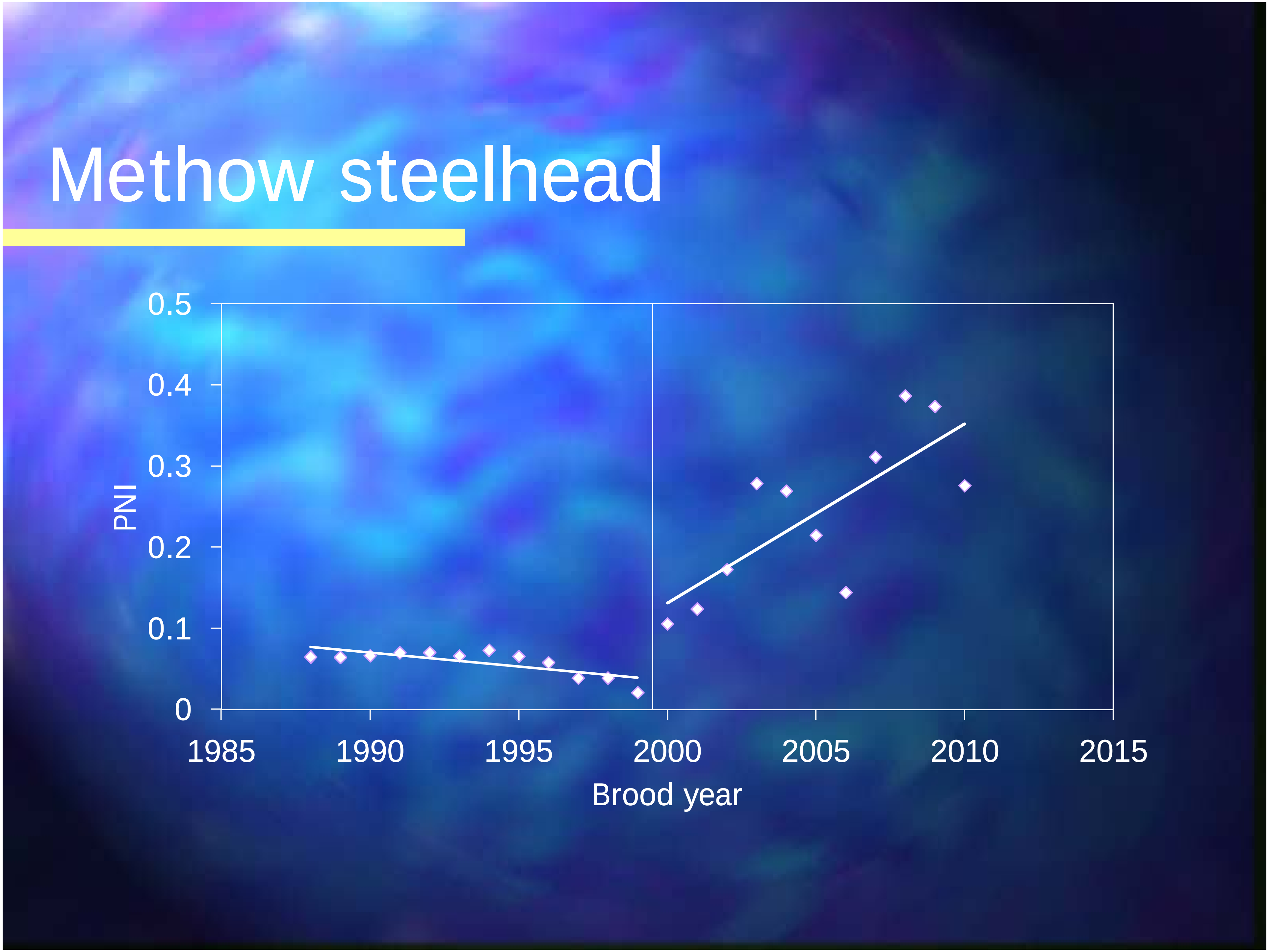
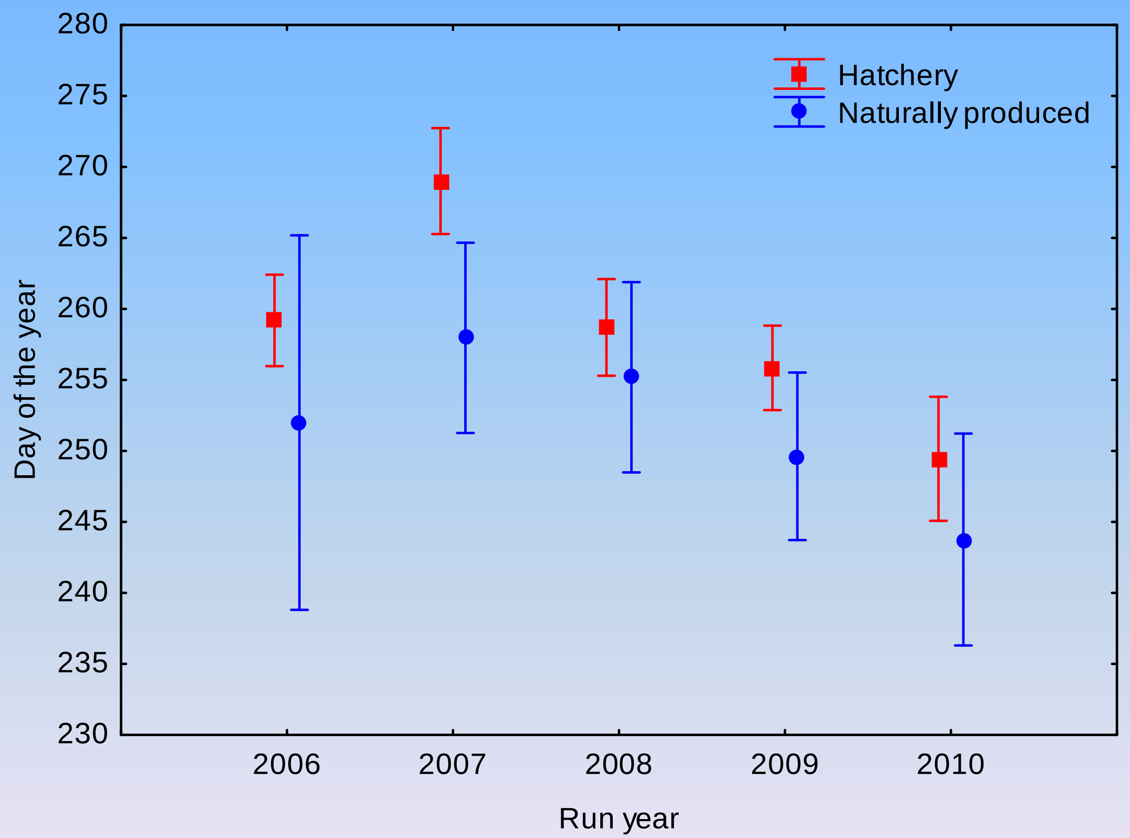


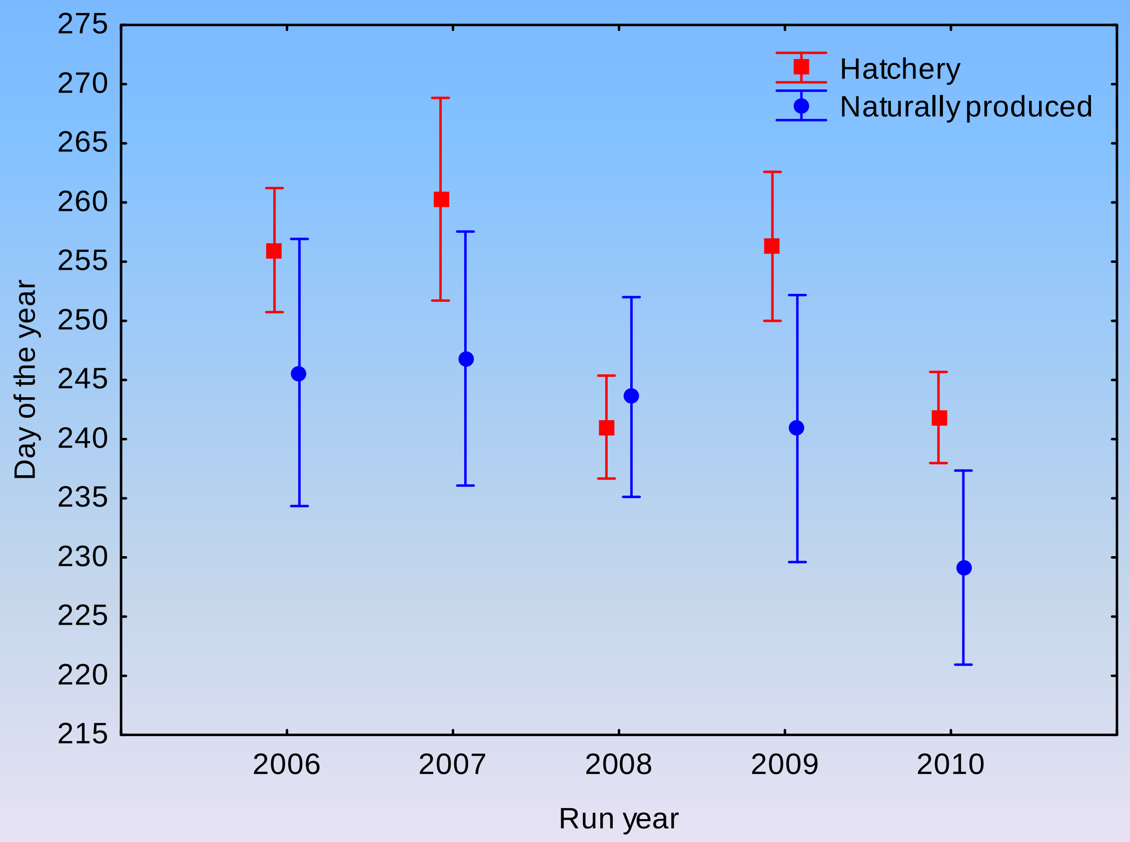
Attachment D

Migration timing (1-salt males)



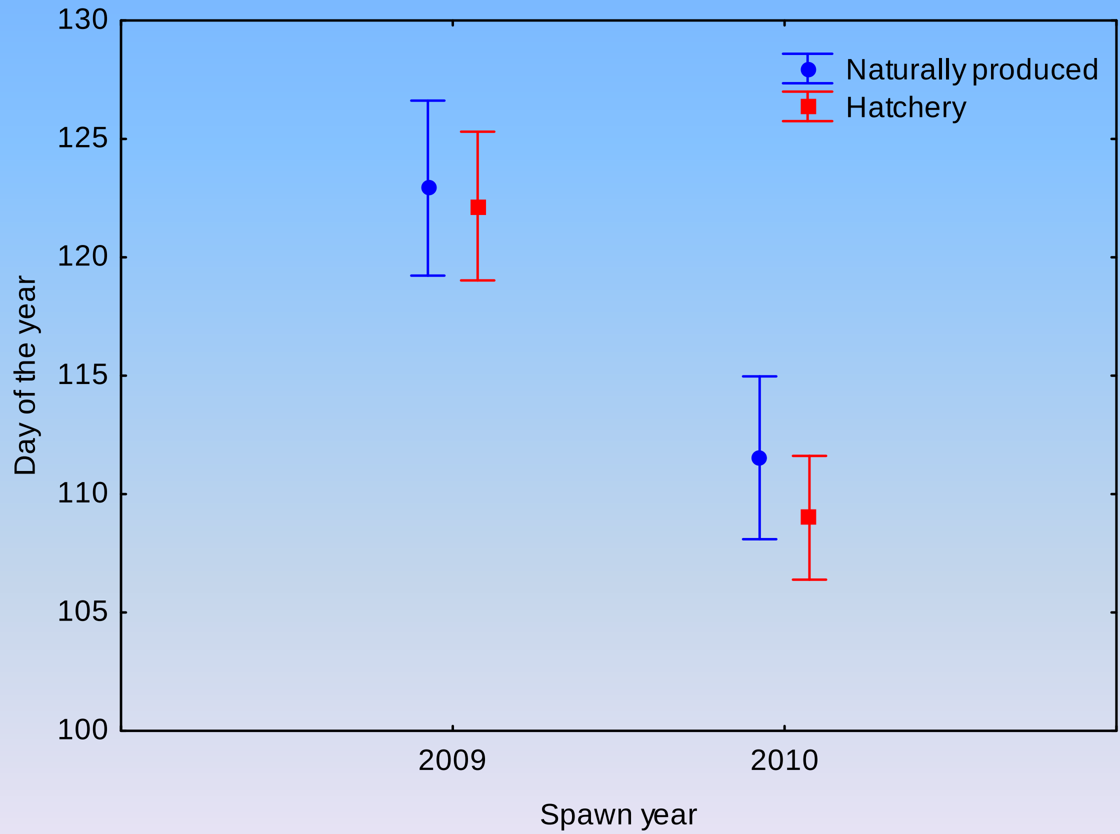
Attachment D

Migration timing (2-salt female)

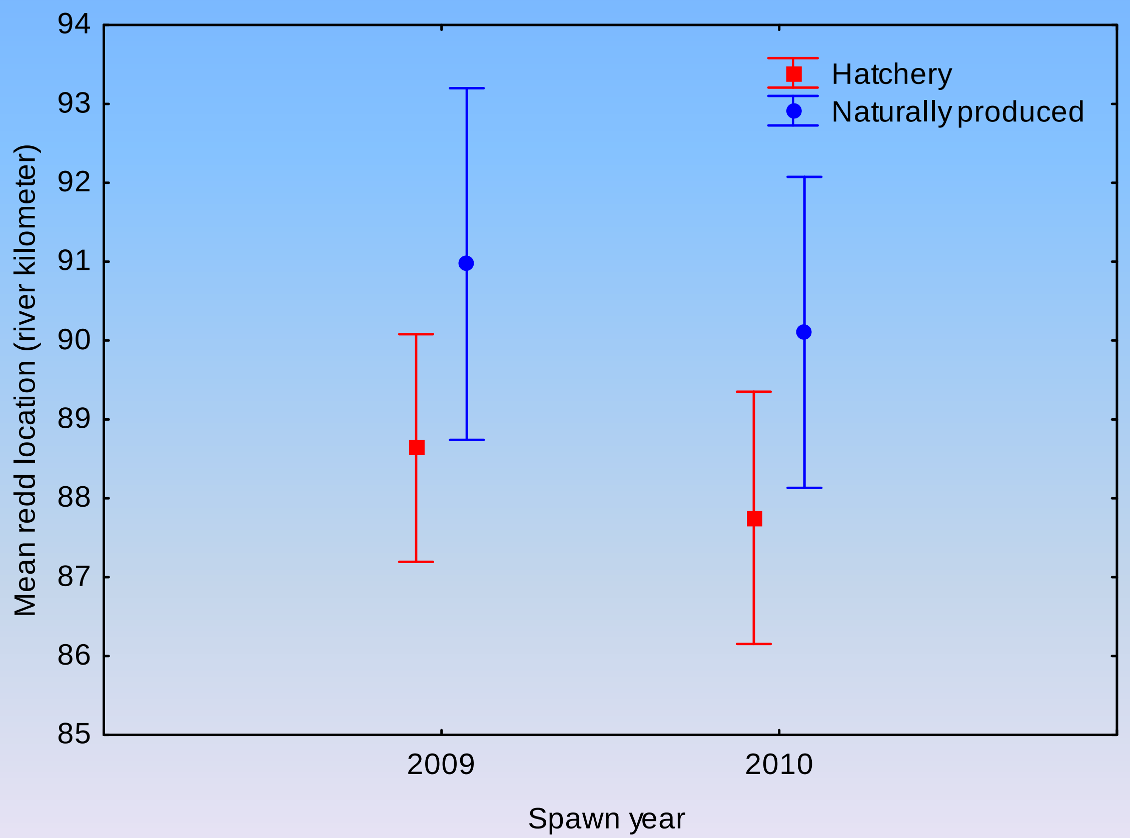


Attachment D

Spawn timing in the Twisp River



Spawn location in the Twisp River

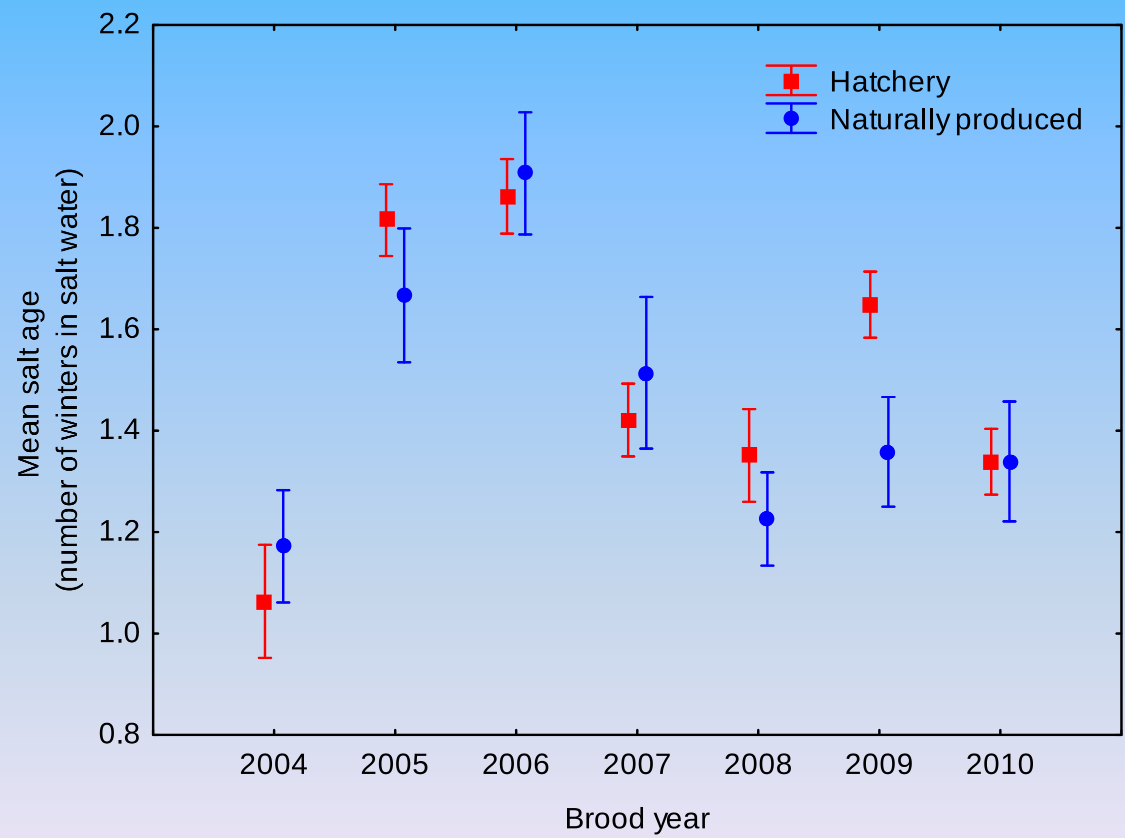


Methow steelhead

- Genetic Monitoring (Blankenship et al. 2006)
- Natural origin steelhead collected at Wells Dam
  - No difference across years
  - No population structure
- Hatchery origin steelhead
  - Different from natural origin fish
- Natural origin juveniles
  - Twisp and Chewuch somewhat differentiated
  - Methow juveniles similar to adults

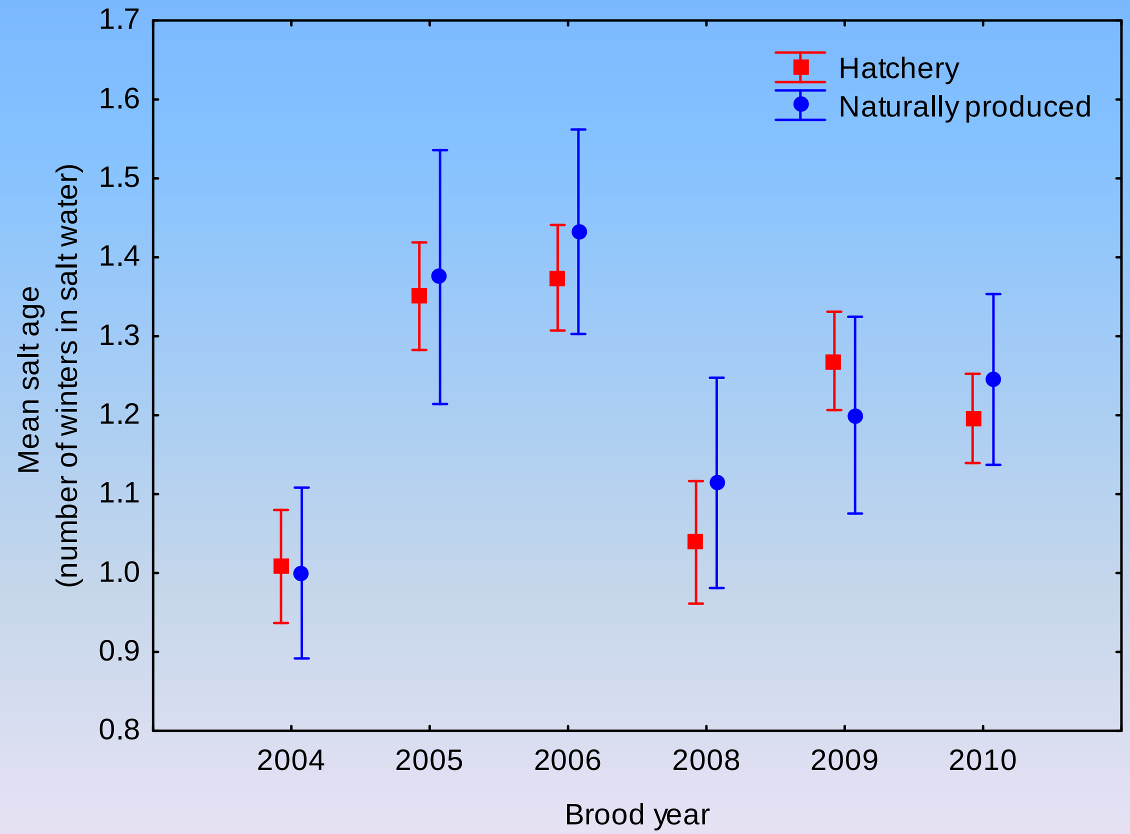
Attachment D

Female salt age at return



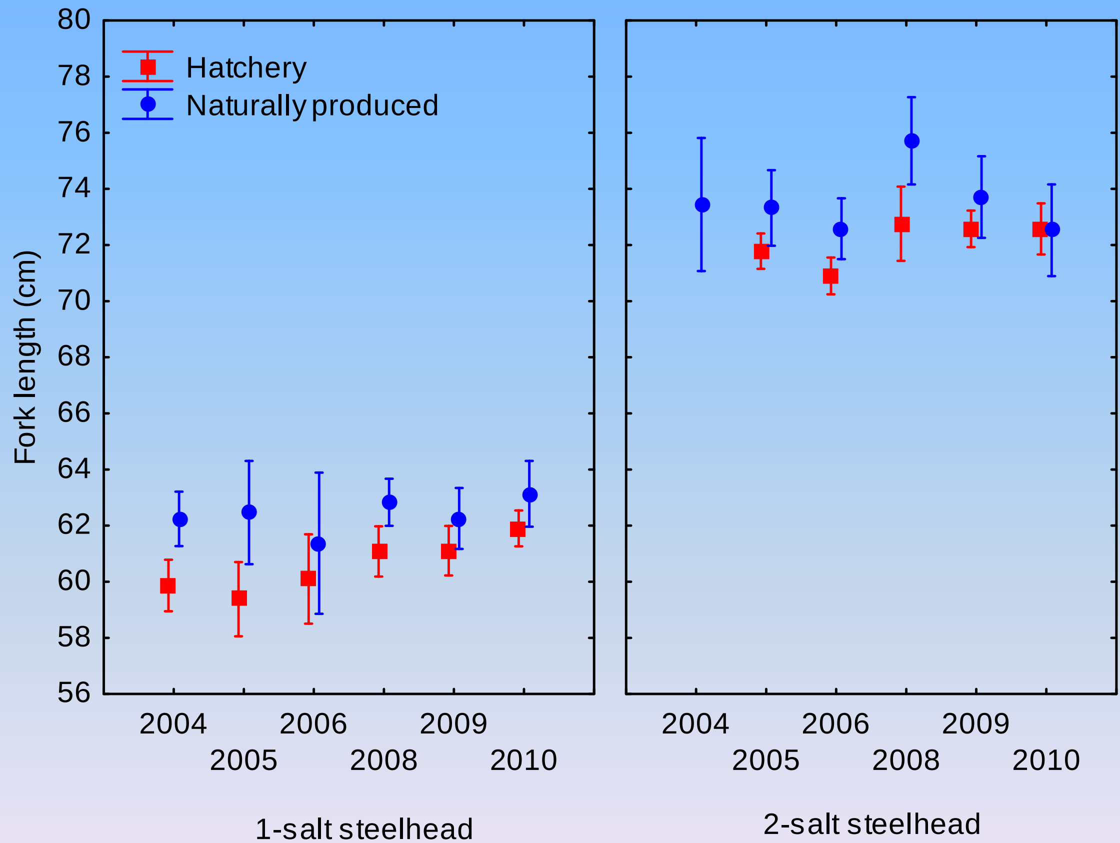
Attachment D

Male salt age at return



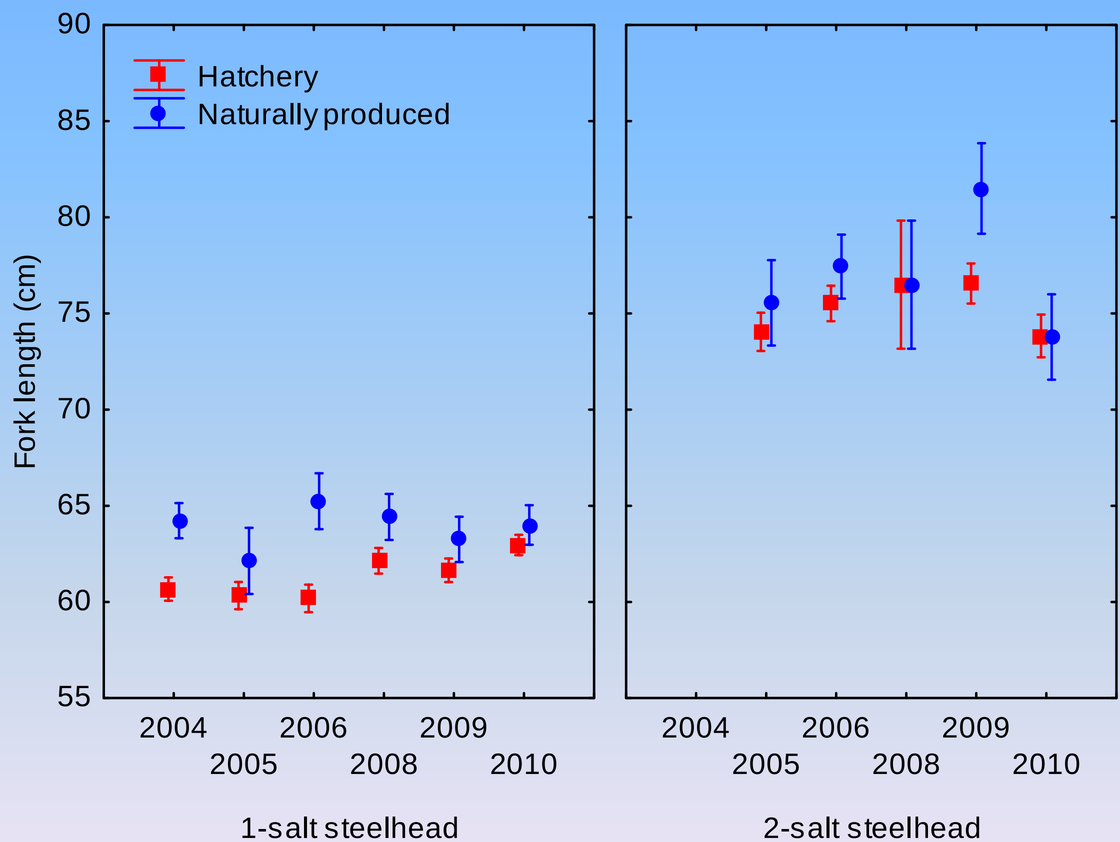
Attachment D

Female size at return



Attachment D

Male size at return



Methow steelhead

- Post release survival target (19.6)
- Results (Geometric means)
- HRR = 20.7 (P = 0.22)
- NRR = 0.21 (P < 0.001)
  - Hatchery fish have 9661% survival advantage

Methow steelhead

- Stray rates targets
  - 5% brood year returns
  - 5% of spawners of receiving population
    - e.g., Methow straying into Okanogan
  - 10% of spawners within population
    - e.g., Twisp straying into Methow
- Limited results
  - 0.54% of the brood year returns (2002-2004 brood years)

Methow steelhead

- Size at release targets
  - Fork length = 191 mm
  - Weight = 75.6 g
- Results
  - Fork length = 182 mm ($P < 0.001$)
  - Weight = 70.6 g ($P = 0.06$)
- No negative effect on survival

Attachment D

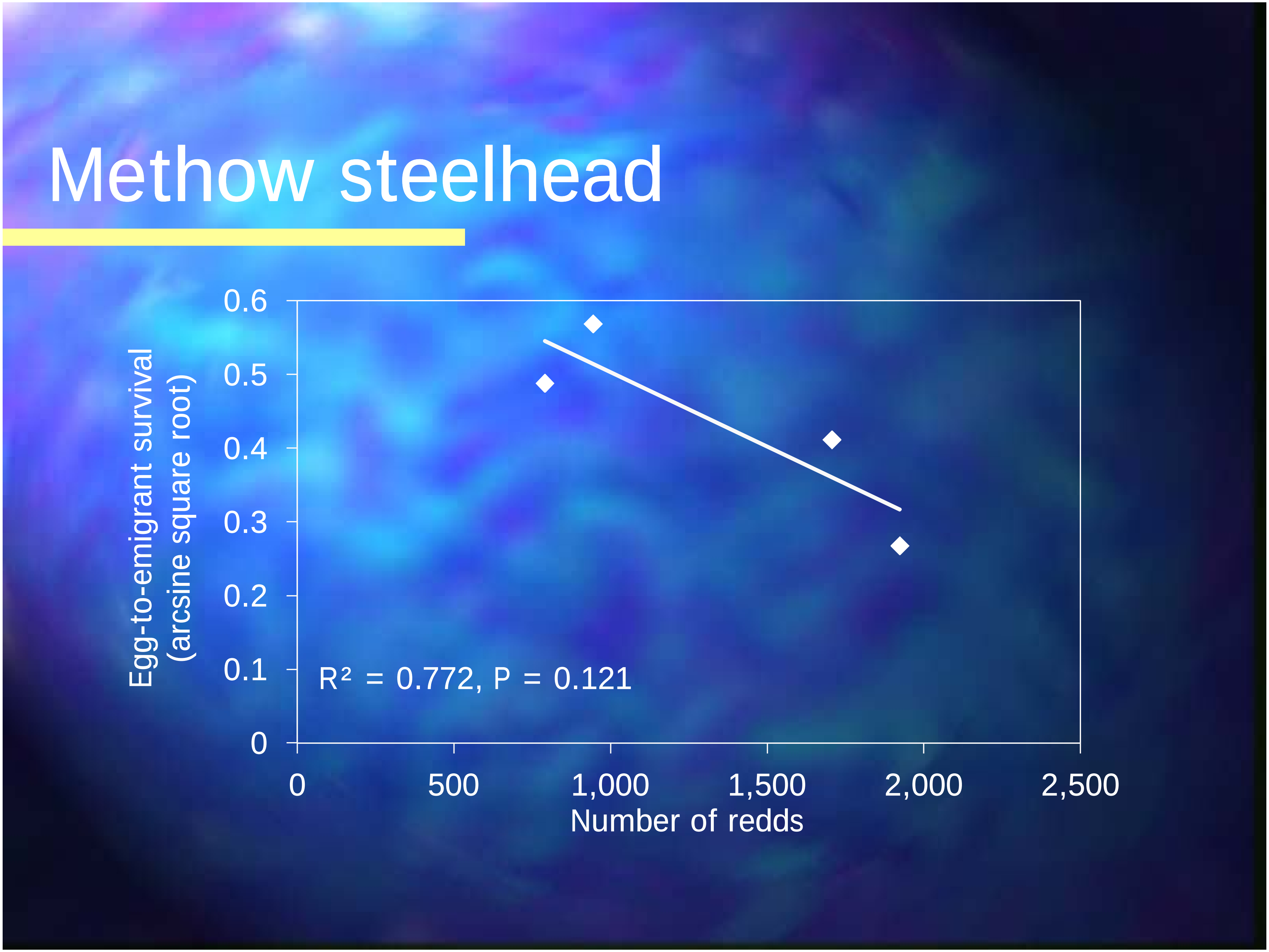
Methow steelhead

- Number released
  - Yearling target = 320,000
- Results
  - Number released = 329,359 (P = 0.69)

Methow steelhead

- Freshwater productivity (4 brood years)
  - Total basin estimate of redds
  - Total basin estimate of emigrants
- Both estimates may be negatively biased . Studies ongoing to develop more accurate estimates.

Attachment D



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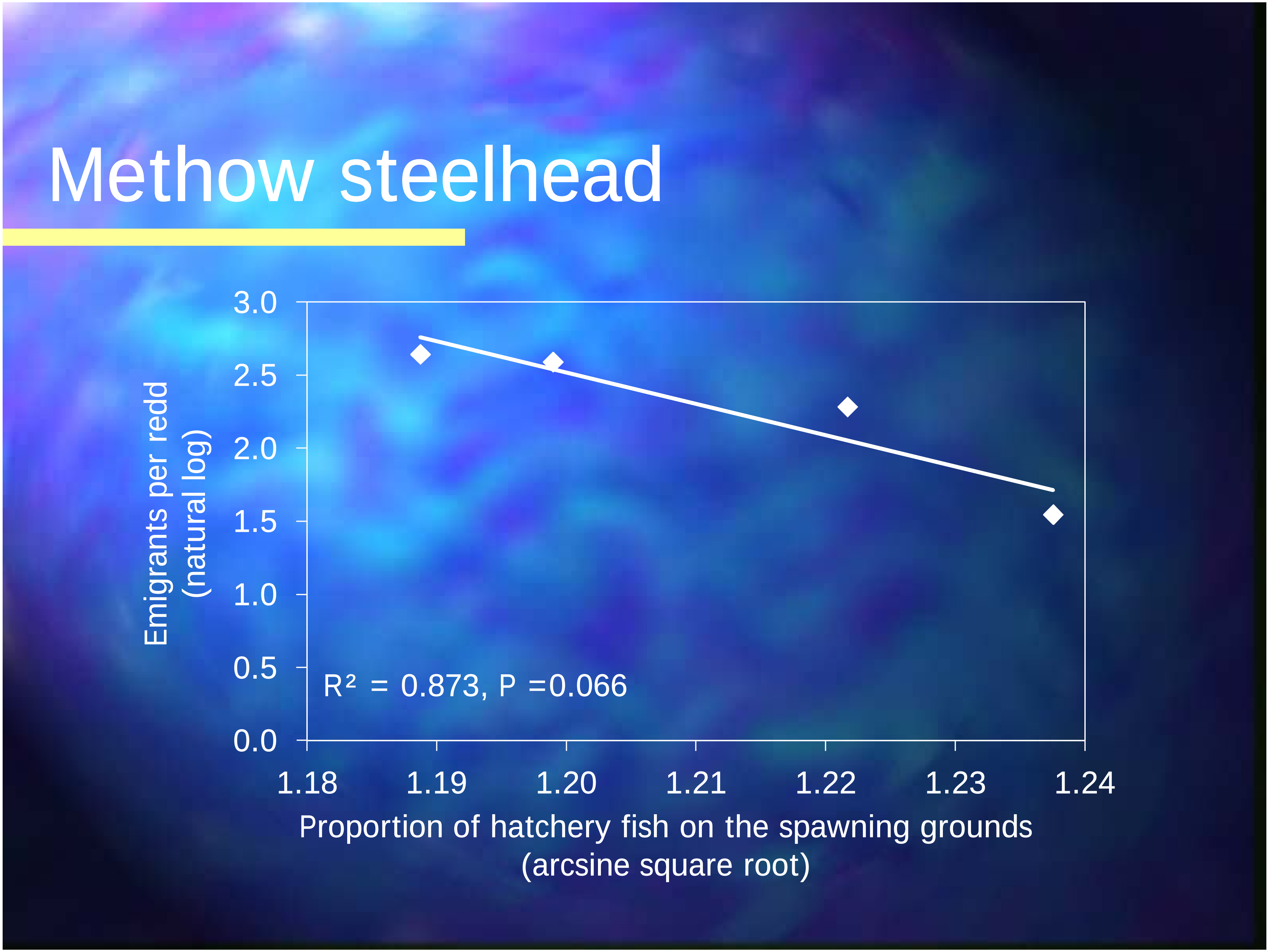


Methow steelhead

- Harvest data is incomplete
  - Based on adult returns to Wells FH, harvest in the Ocean and lower Columbia is very low and not a limiting factor
  - Sport harvest above Wells Dams
    - 1999 – 2006 averaged 539
    - 2007 – 2010 averaged 2,886

Methow steelhead Recommendations

- Recommendations were based on the goal of the program (i.e., assist in recovery).
- Recommendations are consistent with the intent of the HSRG recommendations, but also include some of the proposed changes in draft HGMPs.

Attachment D

Methow steelhead Recommendations

- Develop life cycle models for both hatchery and natural origin fish using PIT tags or other methods if required.
  - Life stage survival
  - Population estimates
  - Carrying capacity
  - Migration patterns
  - Homing and straying

Methow steelhead Recommendations

- Improve methodologies to estimate run and spawner escapement
- Discontinue broodstock collection at Wells Dam. Collect 100% NOR broodstock from the Methow River.
- Adipose fin clip all hatchery production
- Evaluate efficacy of removing excess hatchery fish at Wells, Methow, and Winthrop hatcheries

Attachment D

Methow steelhead Recommendations

- Implement new Twisp River program
  - 100% NOR broodstock
  - 50,000 maximum smolt release
  - Remove excess hatchery fish at weir
  - Use results from M & E program and relative reproductive success study to better inform adaptive management of other steelhead programs

Methow steelhead Recommendations

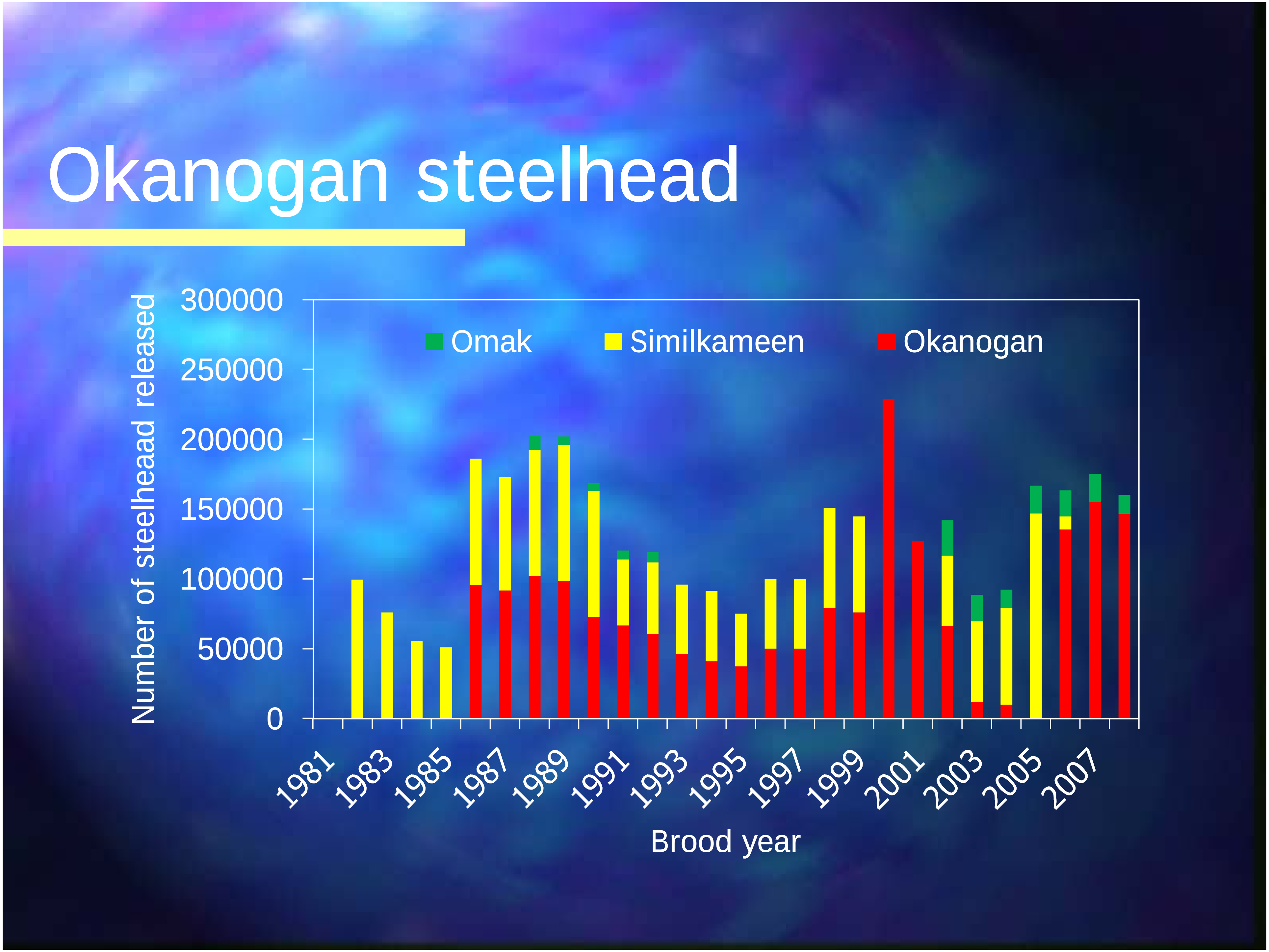
- Increase PNI to 0.67. Productivity of Wells FH steelhead is likely not sufficient to provide any recovery benefit.
- Assess the proportion of excess hatchery fish that can be removed through fisheries, hatcheries, and weirs.
- Reduce or relocate production to a level that will result in an acceptable number of hatchery fish on the spawning grounds to achieve PNI goals.

Attachment D

Methow steelhead Recommendations

- Develop and implement a comprehensive hatchery management plan that include DCPUD and USFWS programs.
- Increase coordination and collaboration with USFWS to include annual production levels, hatchery research, and M & E.

Attachment D

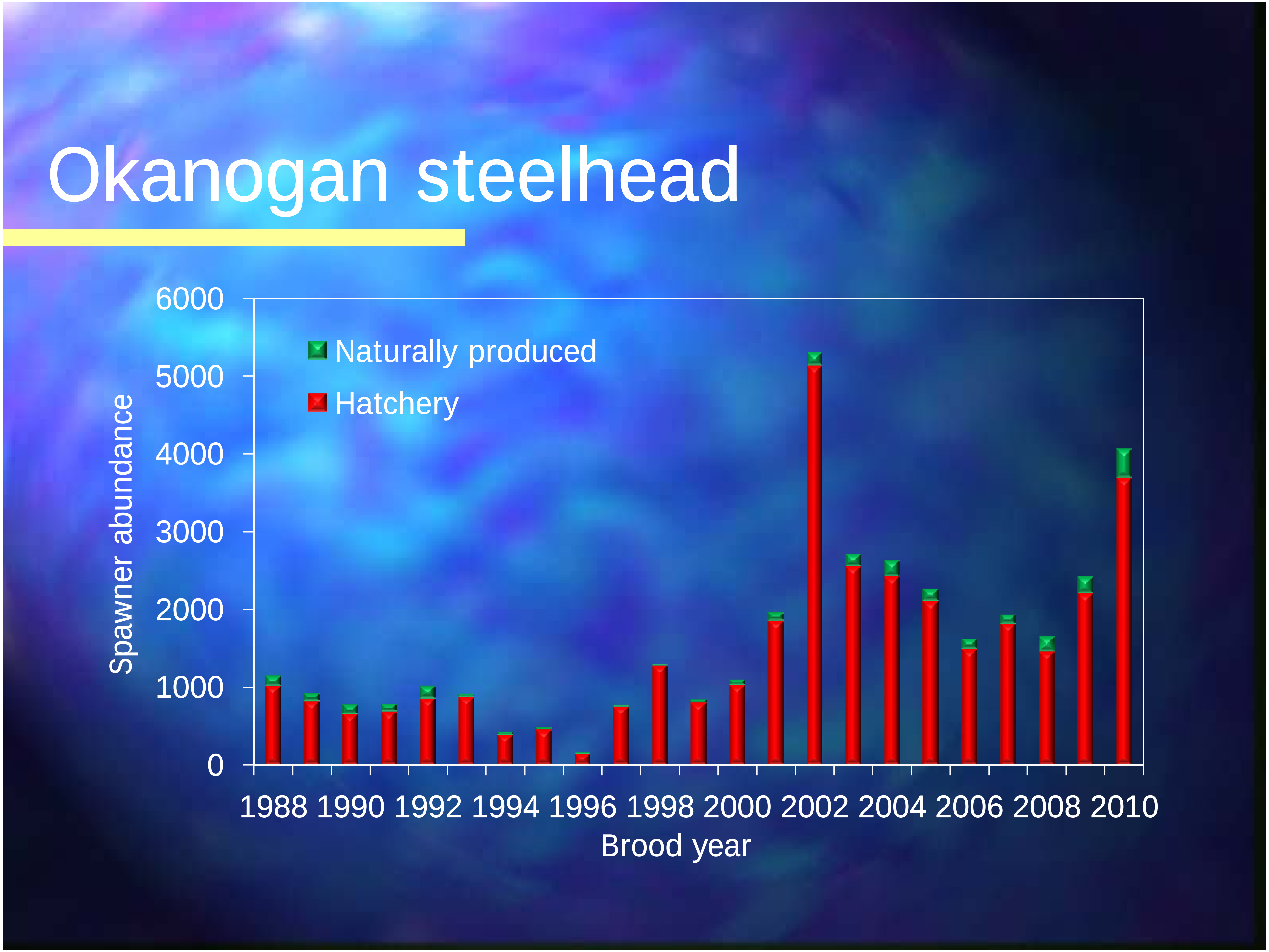


Attachment D

Okanogan steelhead

- No reference populations (BA instead of BACI)
- Mean number released
  - 1981 – 1996 brood years = 121,059
  - 1997 – 2009 brood years = 143,376
- No estimate of spawners until recently
- Used modeled run escapement data minus harvest

Attachment D



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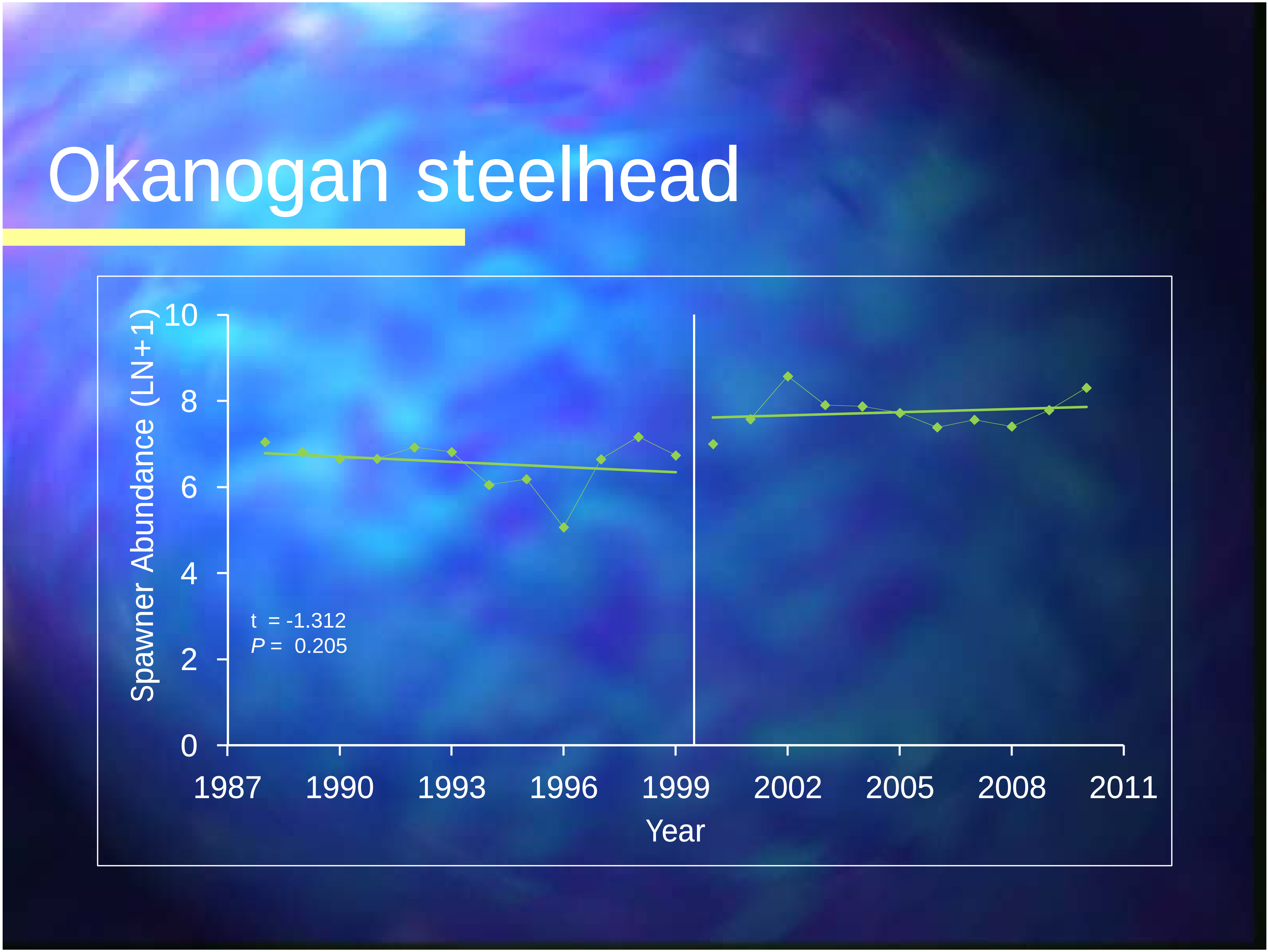

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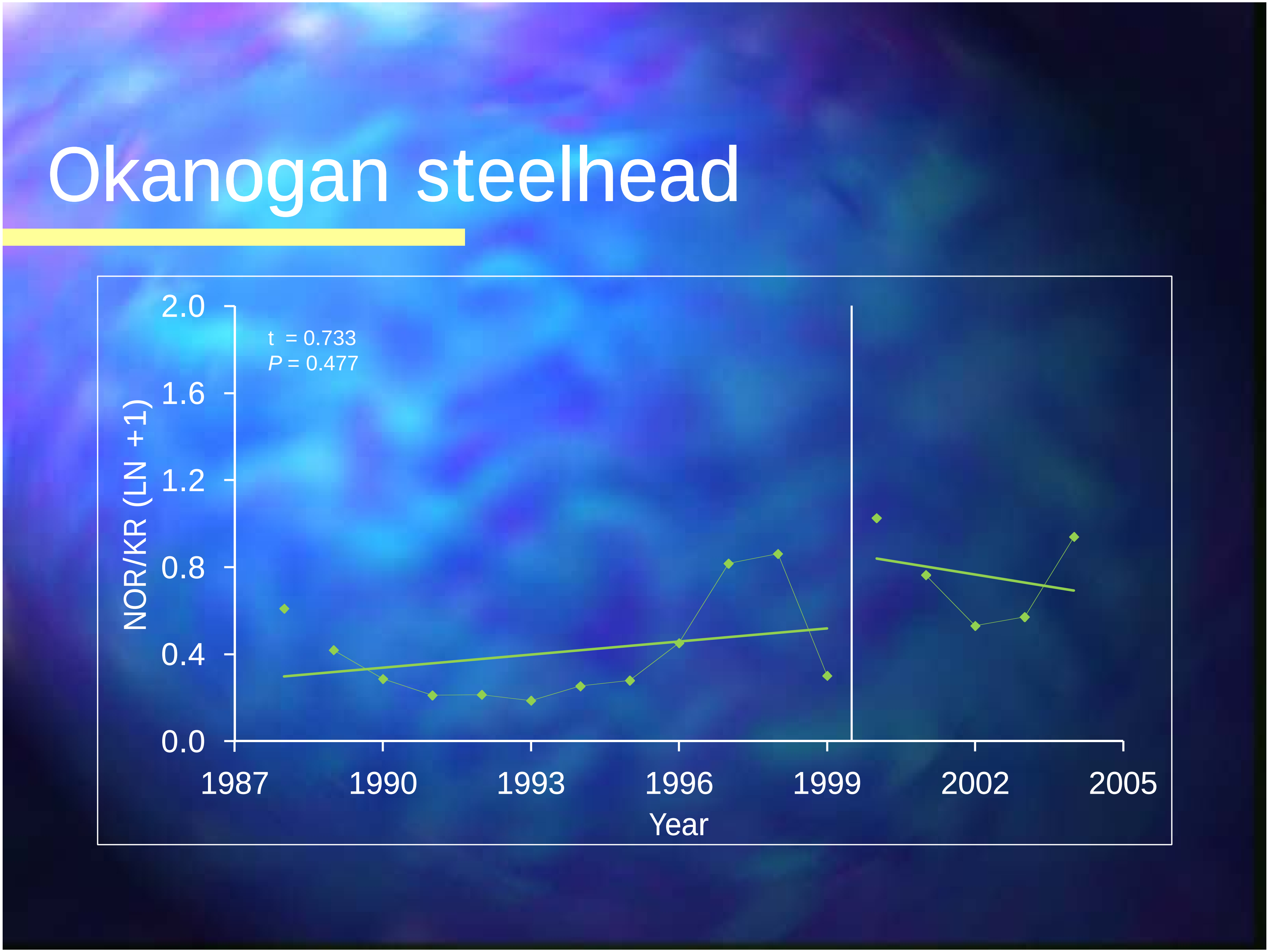

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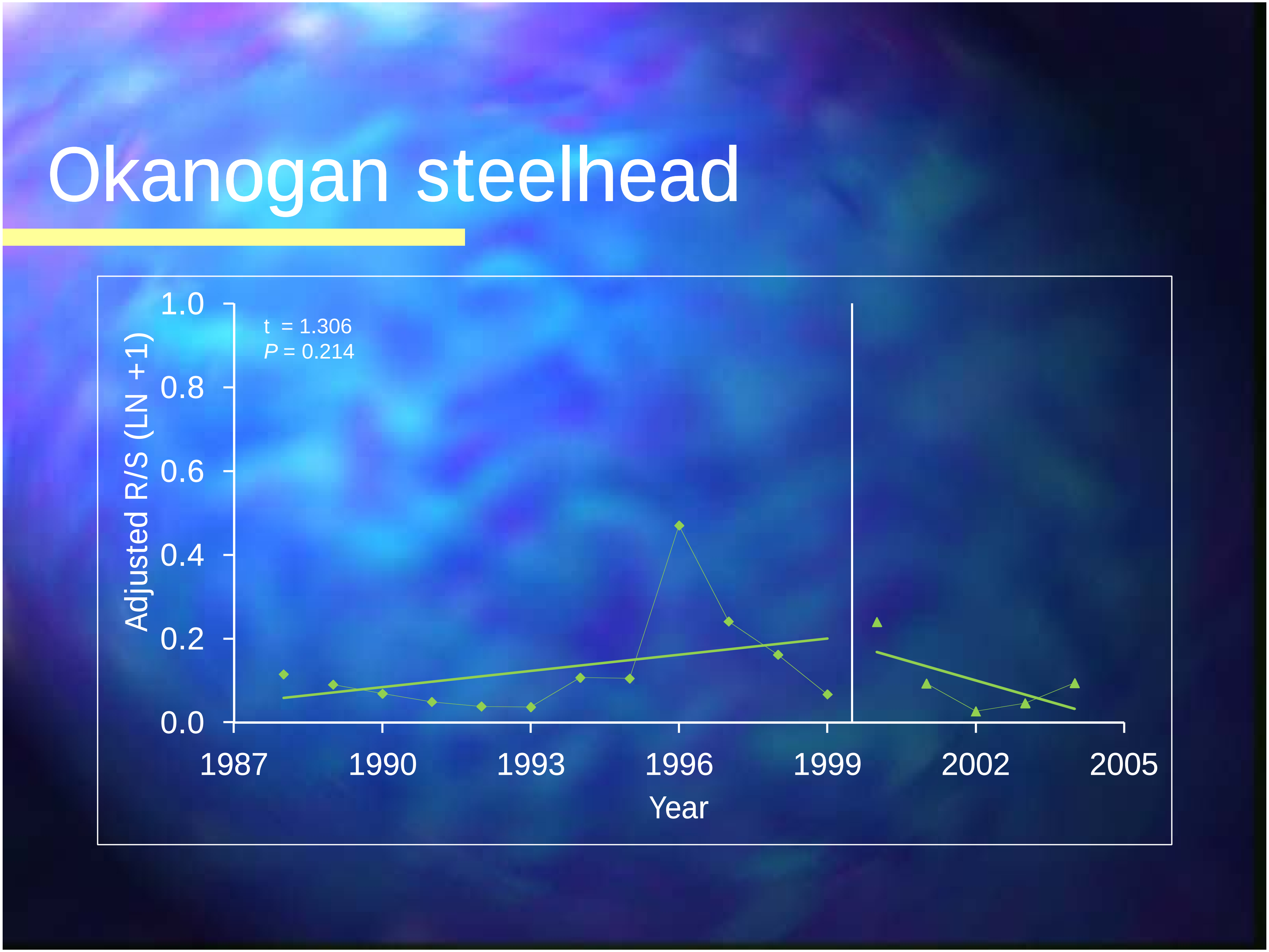
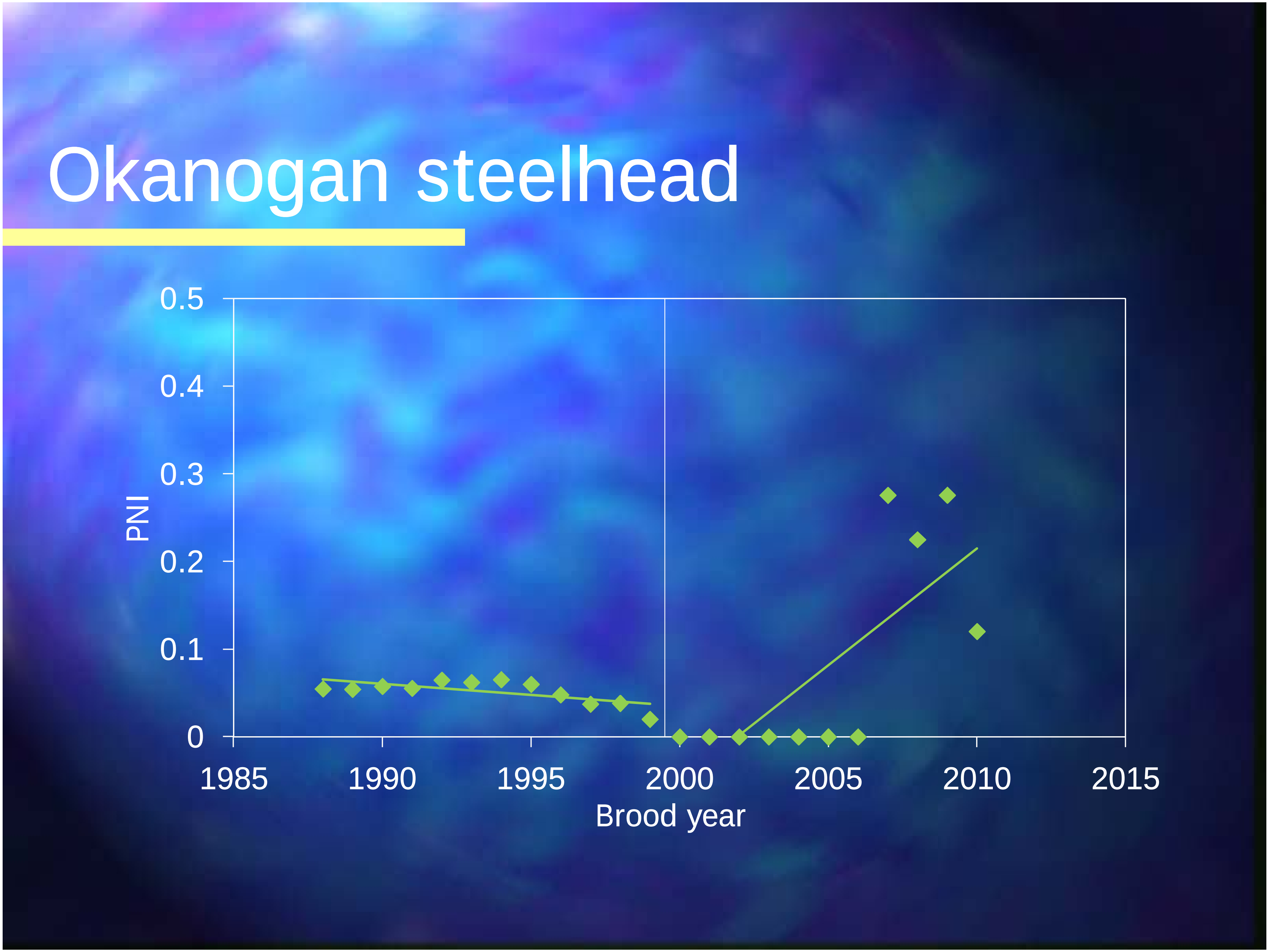


Attachment D

Okanogan steelhead

Response variable	Mean		t-value	P-value	Result
	Before	During			
Abundance	793	2,510	-5.58	0.000	Increase
NORs	305	662	-2.92	0.017	Increase
Productivity	0.290	0.185	0.029	0.634	No change

Attachment D



Okanogan steelhead

- Migration timing
  - See Methow steelhead (No difference)
- Spawn timing and location
  - CCT conducts redd counts, but no distinction between hatchery and natural origin fish

Attachment D

Okanogan steelhead

- Genetic Monitoring (Blankenship et al. 2006)
- Natural origin steelhead collected at Wells Dam
- Natural origin juveniles
  - Most divergent from natural origin adults at Wells Dam
  - Differences found between years (2007 and 2008 collections) and different from Methow juveniles.
  - Most divergent of the samples examined above Wells Dam

Okanogan steelhead

- Age and size at return
  - No population specific samples available.
  - See Methow steelhead (No difference).

Attachment D

Okanogan steelhead

- Post release survival target (19.6)
- Results (Geometric means)
- HRR = 20.7 (P = 0.74)
- NRR = 0.12 (P < 0.001)
  - Hatchery fish have 17,152% survival advantage

Okanogan steelhead

- Stray rates targets
  - 5% brood year returns
  - 5% of spawners of receiving population
    - e.g., Okanogan straying into Methow
  - 10% of spawners within population
    - e.g., Okanogan straying into Omak
- Limited results
  - 0.54% of the brood year returns (2002-2004 brood years)

Okanogan steelhead

- Size at release targets
  - Fork length = 191 mm
  - Weight = 75.6 g
- Results
  - Fork length = 184 mm ($P < 0.02$)
  - Weight = 71.3 g ($P = 0.14$)
- No negative effect on survival

Attachment D

Okanogan steelhead

- Number released
  - Yearling target = 130,000
- Results
  - Number released = 134,417 (P = 0.73)

Attachment D

Okanogan steelhead

- Freshwater productivity
  - CCT recently operated smolts traps in lower Okanogan and Omak Creeks
  - Data not available or incomplete for analysis

Attachment D

Okanogan steelhead

- Harvest data is incomplete
  - Based on adult returns to Wells FH, harvest in the Ocean and lower Columbia is very low and not a limiting factor
  - Sport harvest above Wells Dams
    - 1999 – 2006 averaged 557
    - 2007 – 2010 averaged 2,067

Okanogan steelhead Recommendations

- Recommendations were based on the goal of the program (i.e., assist in recovery).
- Recommendations are consistent with the intent of the HSRG recommendations, but also include some of the proposed changes in draft HGMPs.

Attachment D

Okanogan steelhead Recommendations

- Collect or analyze data on the abundance and spatial distribution of naturally produced juvenile steelhead (e.g., OBMEP) to better understand current habitat conditions and productivity
- Develop life cycle models for both hatchery and natural origin fish using PIT tags or other methods if required.
  - Life stage survival
  - Population estimates
  - Carrying capacity
  - Migration patterns
  - Homing and straying

Attachment D

Okanogan steelhead Recommendations

- Improve methodologies to estimate run and spawner escapement
- Discontinue broodstock collection at Wells Dam. Collect 100% NOR broodstock from the Okanogan River.
- Adipose fin clip all hatchery production
- Evaluate efficacy of removing excess hatchery fish at Wells FH or weirs

Attachment D

Okanogan steelhead Recommendations

- Implement new Omak Creek program
  - 100% NOR broodstock
  - 20,000 smolt release
  - Remove excess hatchery fish at weir
  - Use results from M & E program and relative reproductive success study (Wenatchee and Twisp) to better inform adaptive management of other steelhead programs

Okanogan steelhead Recommendations

- Increase PNI to 0.67. Productivity of Wells FH steelhead is likely not sufficient to provide any recovery benefit.
- Assess the proportion of excess hatchery fish that can be removed through fisheries, hatcheries, and weirs.
- Reduce or relocate production (e.g., unsuitable habitat or CJH) to a level that will result in an acceptable number of hatchery fish on the spawning grounds to achieve PNI goals.

Attachment D

Okanogan steelhead Recommendations

- Develop and implement a comprehensive hatchery management plan that include GCPUD and CCT programs.
- Increase coordination and collaboration with WDFW and USFWS to include annual production levels, hatchery research, and M & E.

Methow spring Chinook Goal

- Support recovery by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.
  - While the HCP is not a recovery plan into itself, the hatchery component of it must be consistent with hatchery goals and objectives through the ESA, and as such should aid in the recovery of listed fish.

Attachment D

Spring Chinook Recovery Goal

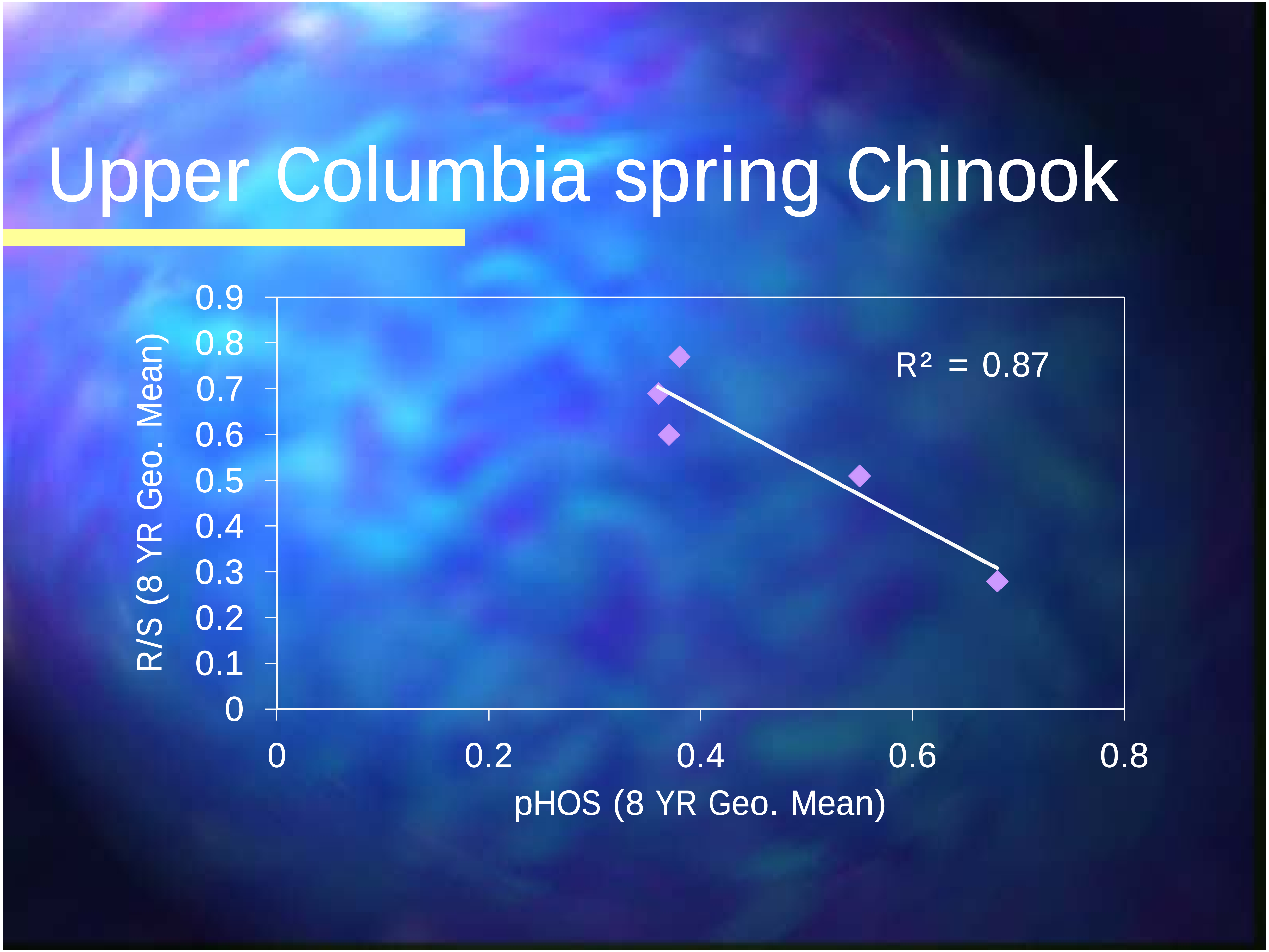
	Chiwawa	Twisp	Chewuch	Methow	Entiat
Recovery Goal (NOR)	1115	656	1380	1311	500
8 year Geo. Mean	229	63	82	120	128
% of Goal	21%	10%	6%	9%	26%
Recovery Goal (R/S)	1.20	1.20	1.20	1.20	1.20
8 year Geo. Mean	0.69	0.6	0.51	0.28	0.77
% of Goal	58%	50%	43%	23%	64%

Attachment D

Upper Columbia Spring Chinook

	Chiwawa	Twisp	Chewuch	Methow	Entiat
1997 - 2004 Geo. Mean					
NOR	229	63	82	120	128
R/S	0.69	0.60	0.51	0.28	0.77
Spawners	333	159	105	423	165
PNI	0.40	0.02	0.05	0.03	0.00
pHOS	0.36	0.37	0.55	0.68	0.38
2005 - 2010 Geo. Mean					
Spawners	943	437	150	985	302
PNI	0.30	0.04	0.13	0.07	0.00
pHOS	0.77	0.53	0.67	0.80	0.47

Attachment D



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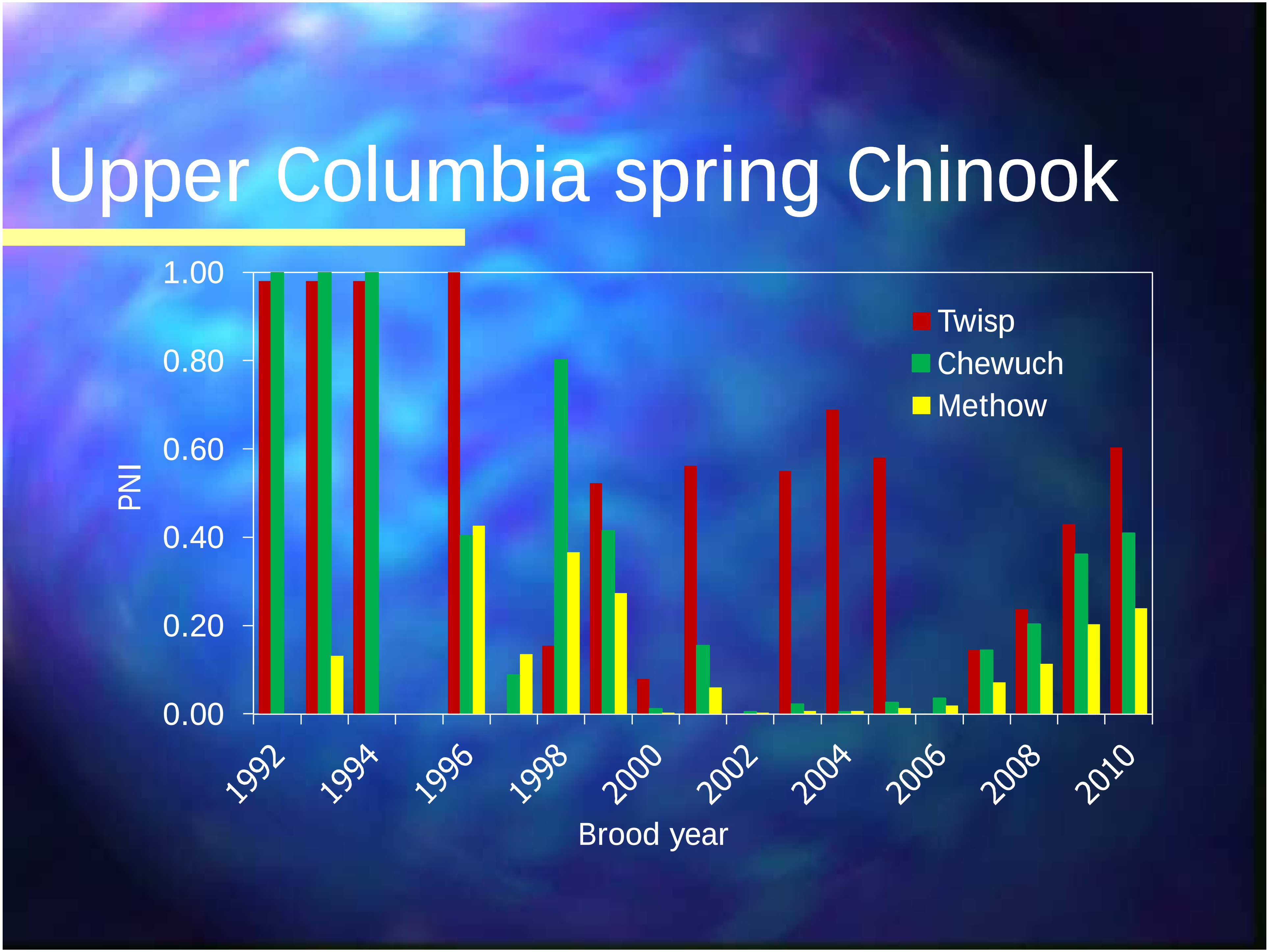

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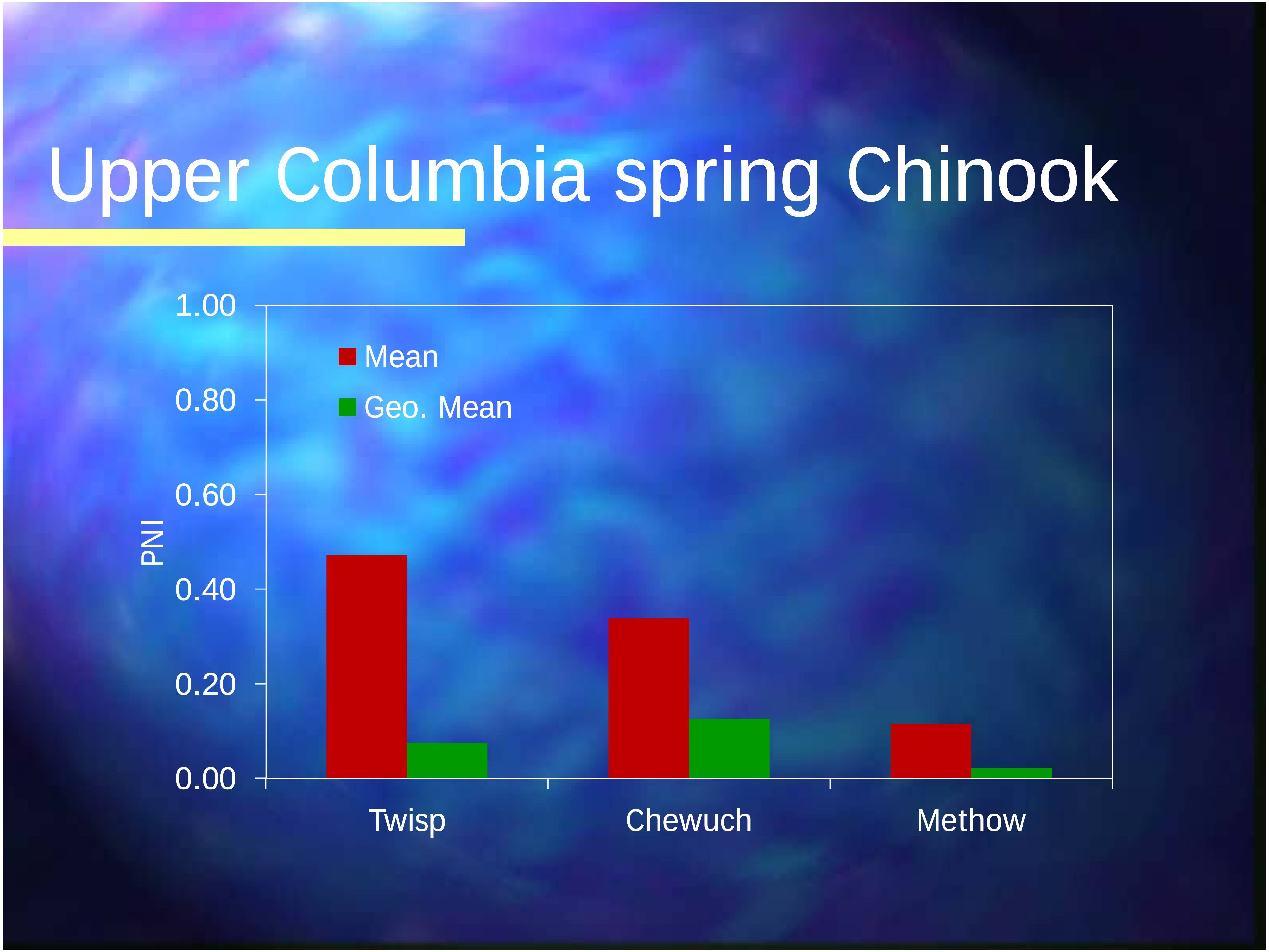

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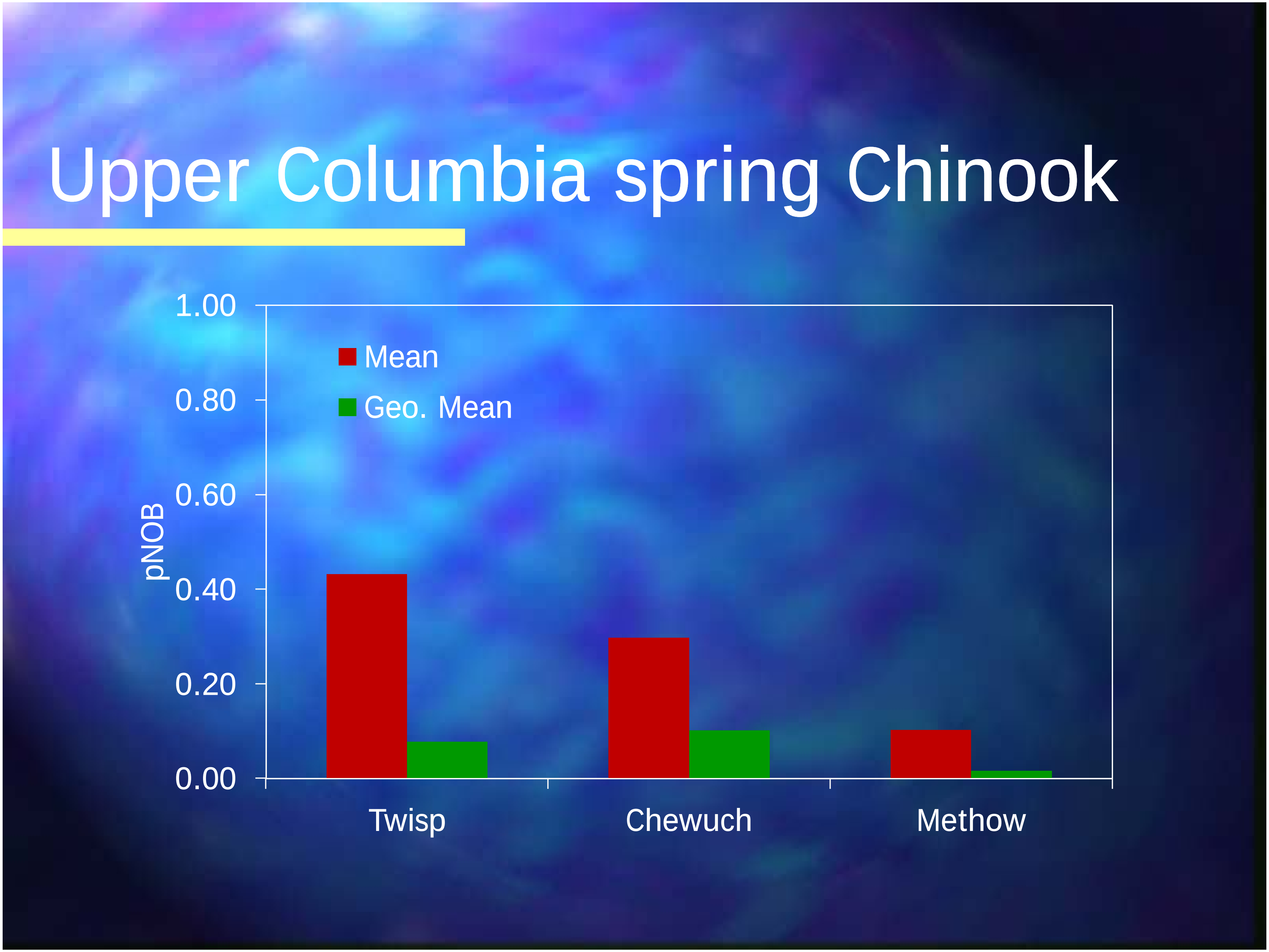

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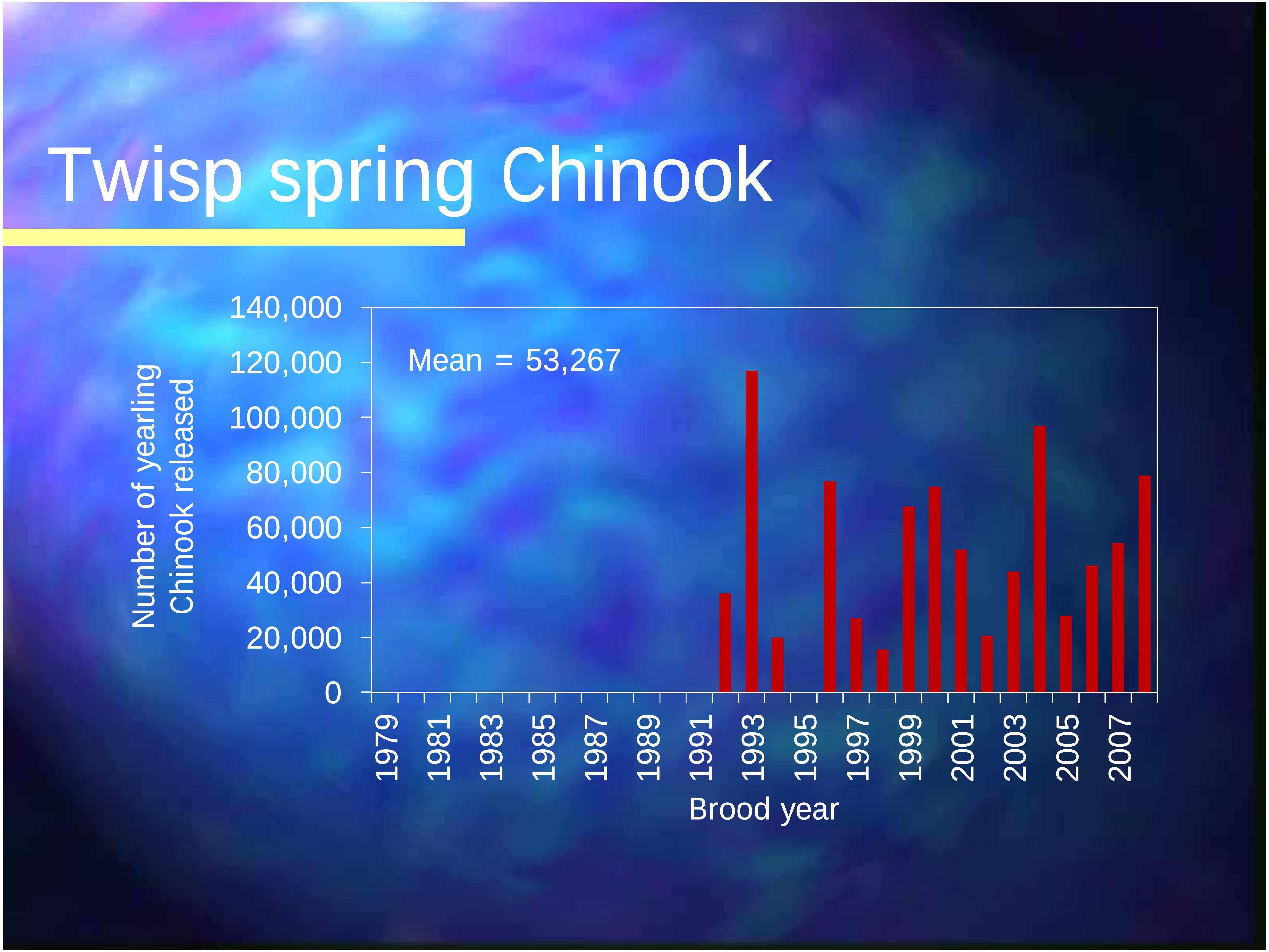

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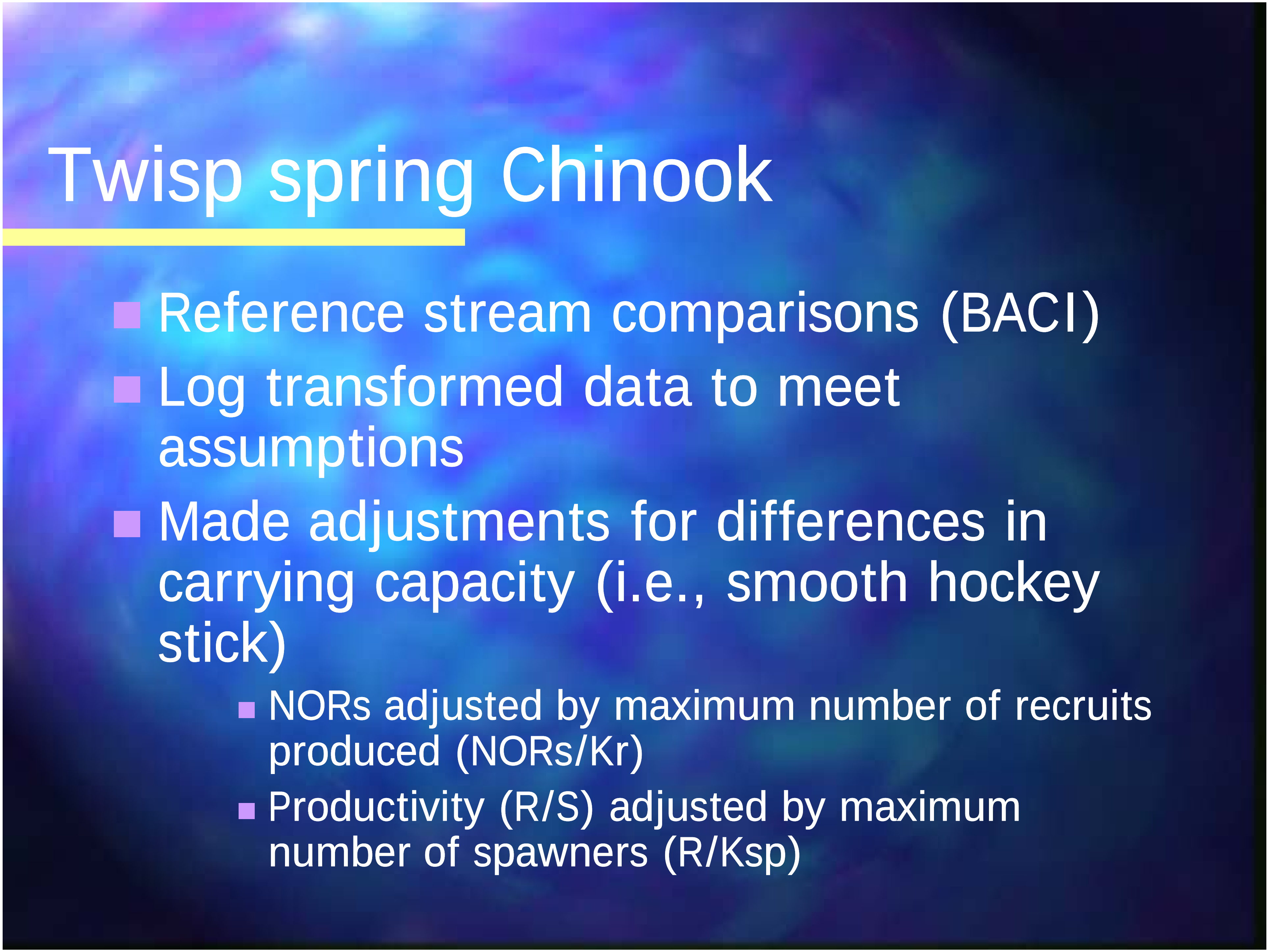
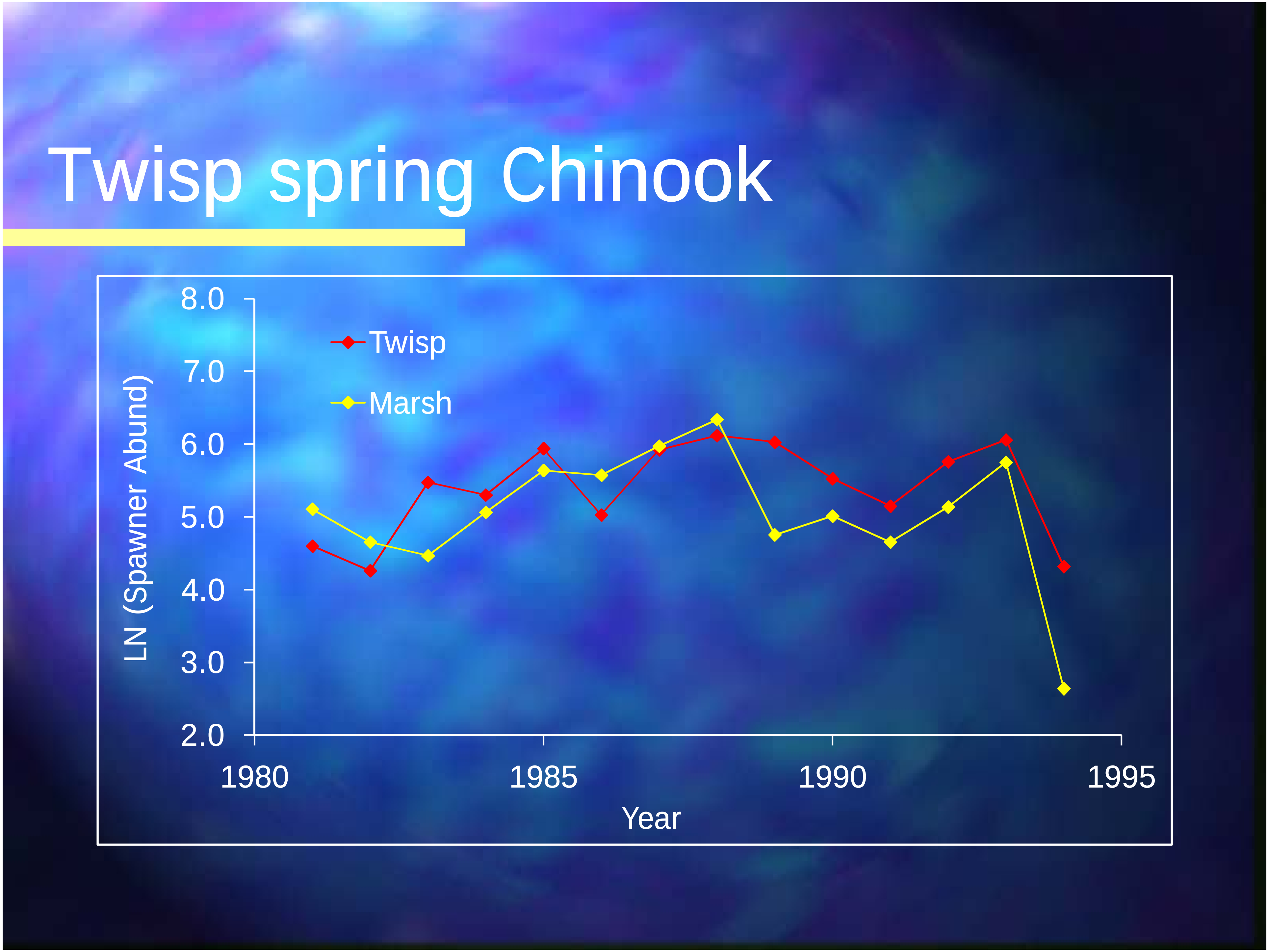


Attachment D

Twisp spring Chinook

- Reference stream analysis
  - pHOS in both before and after periods
  - Correlation in before period
  - Difference in trends in before period
  - CV of ratio scores (T/C)

Attachment D



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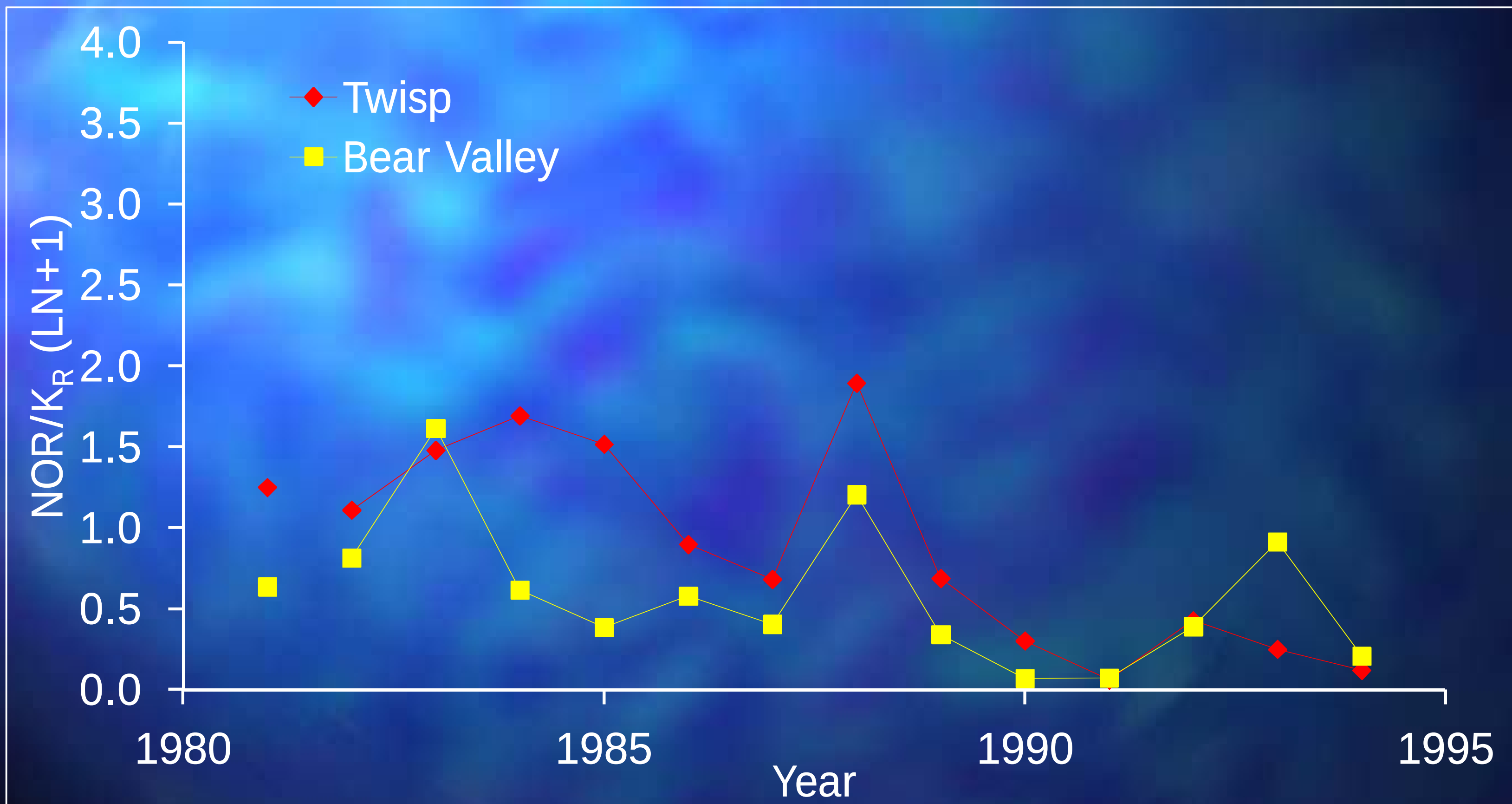
Twisp spring Chinook



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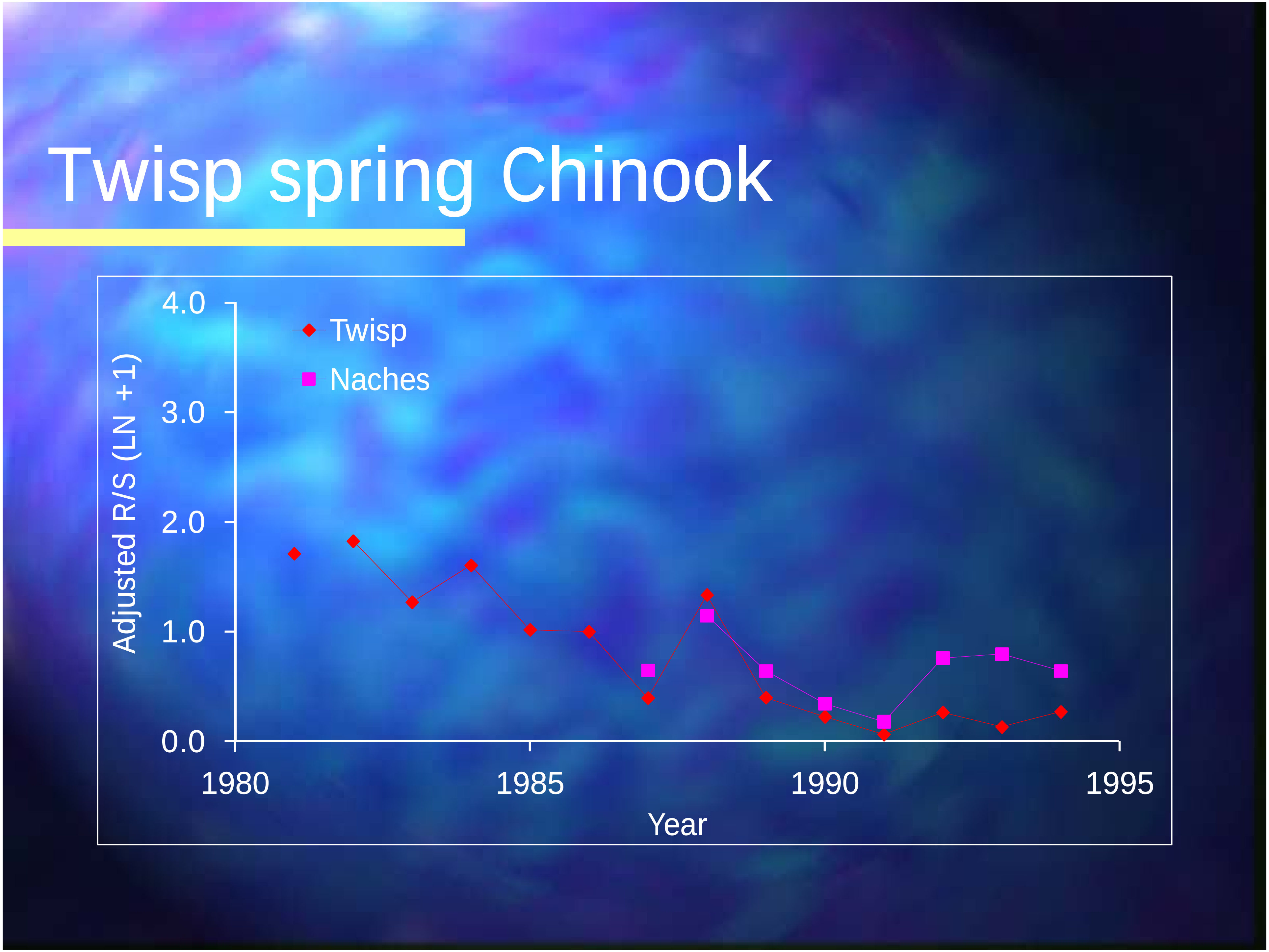
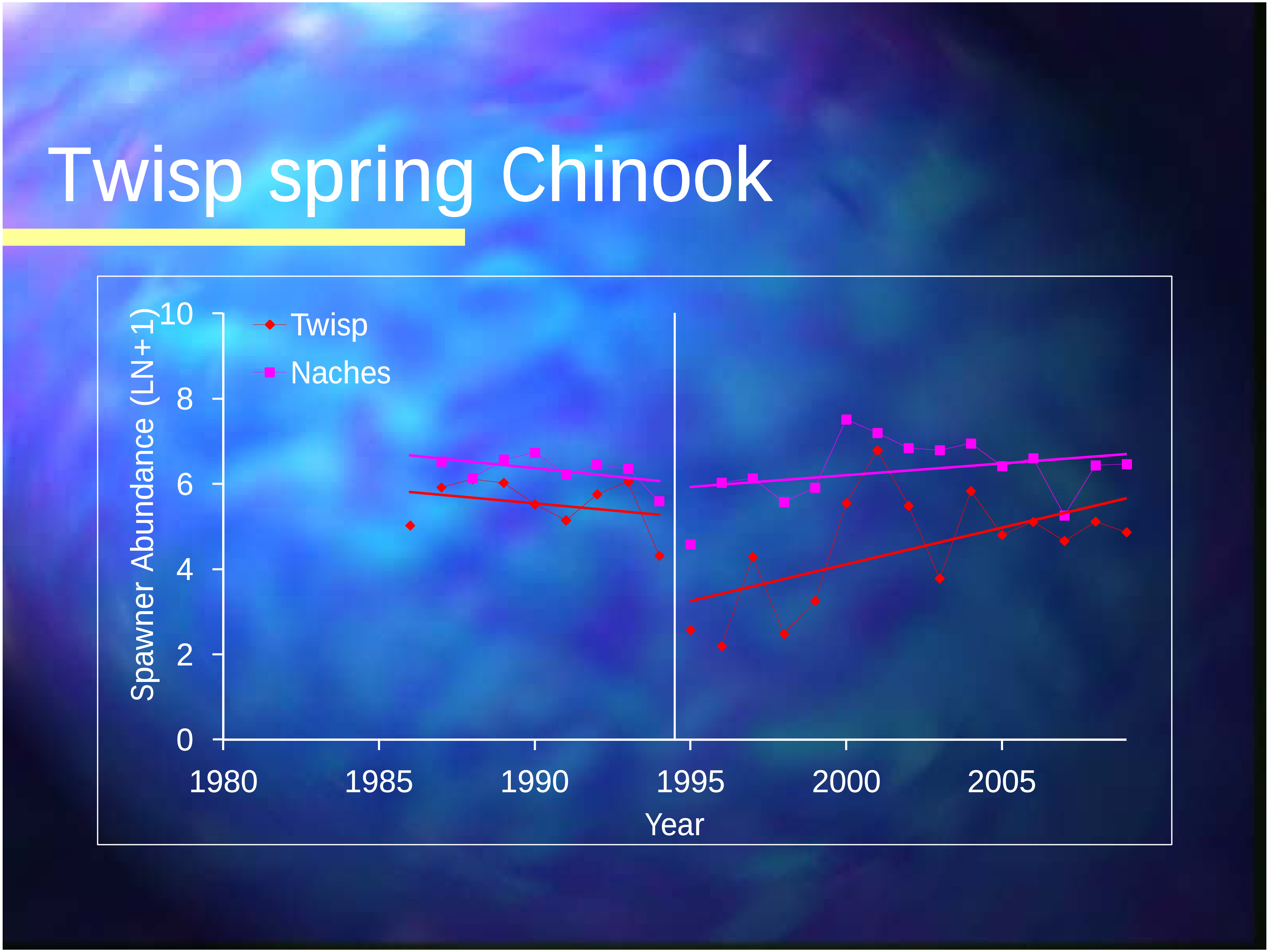


Attachment D

Twisp Reference Streams

Reference populations	Weighted score			Ranking		
	Spawner abundance	Natural origin recruits	Productivity	Spawner abundance	Natural origin recruits	Productivity
Naches	92	85	85	1	1	1
Marsh	90	83	81	2	3	3
Secesh	86	83	85	4	3	1
Bear Valley	88	84	83	3	2	2

Attachment D



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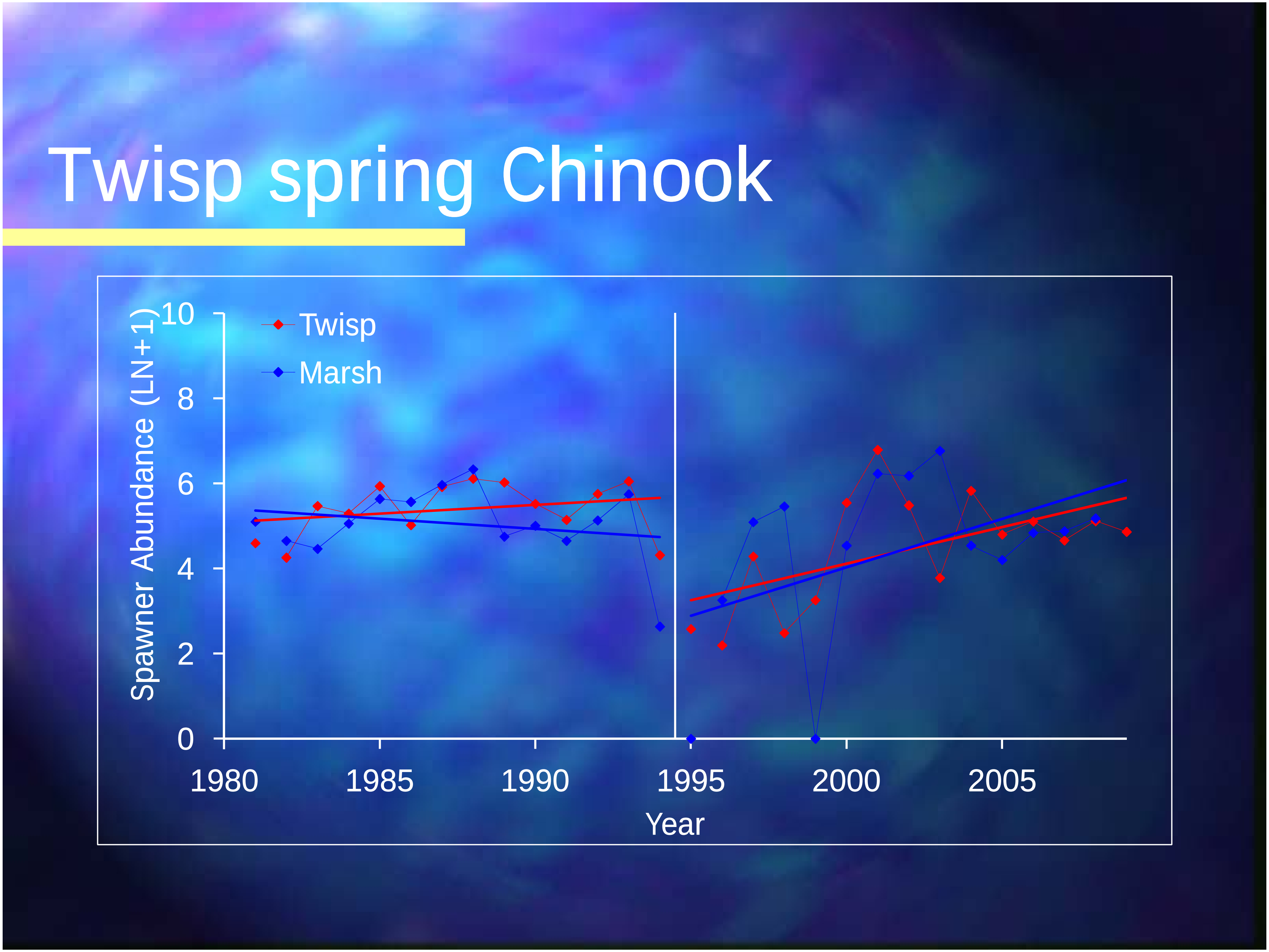

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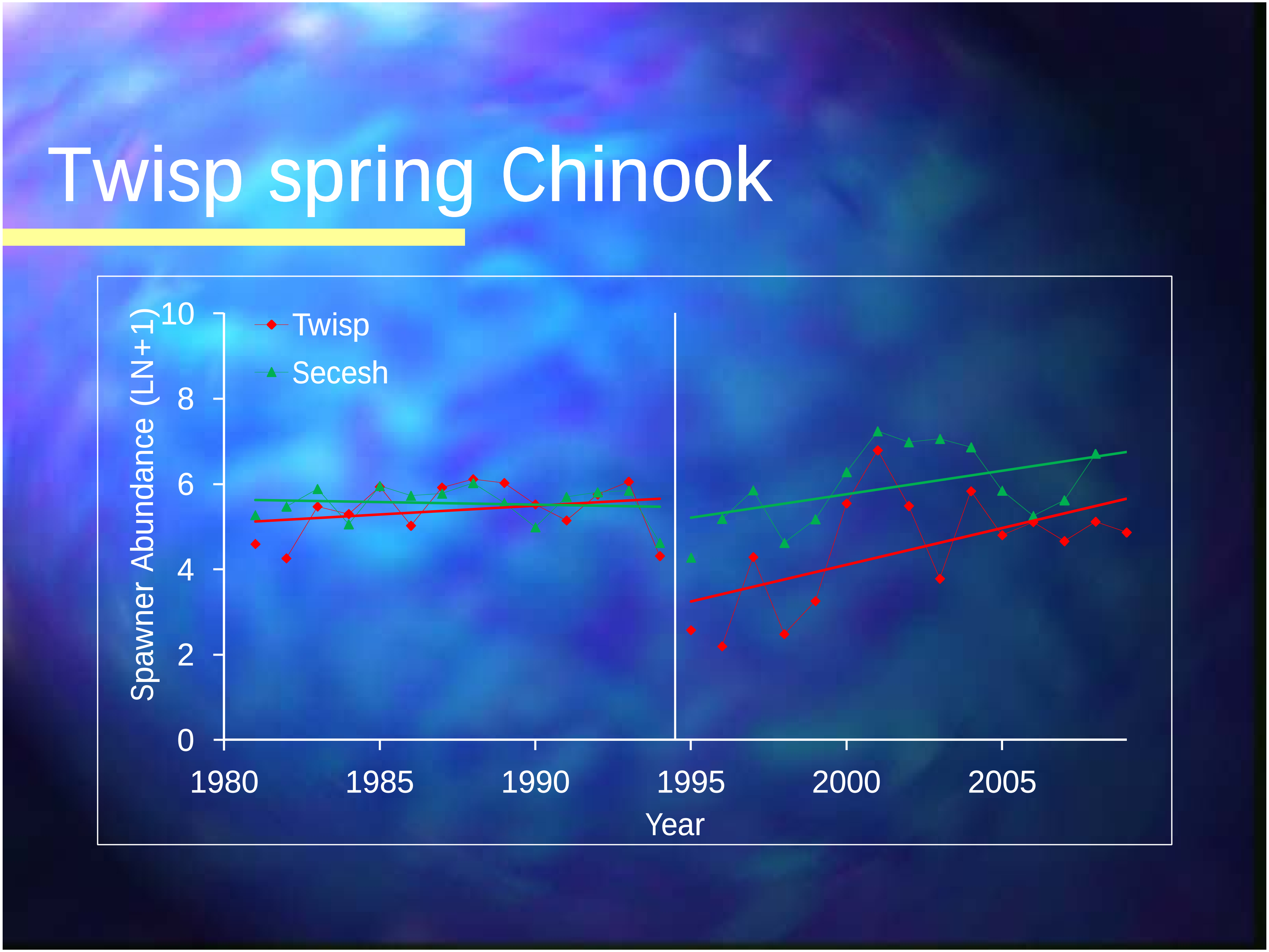

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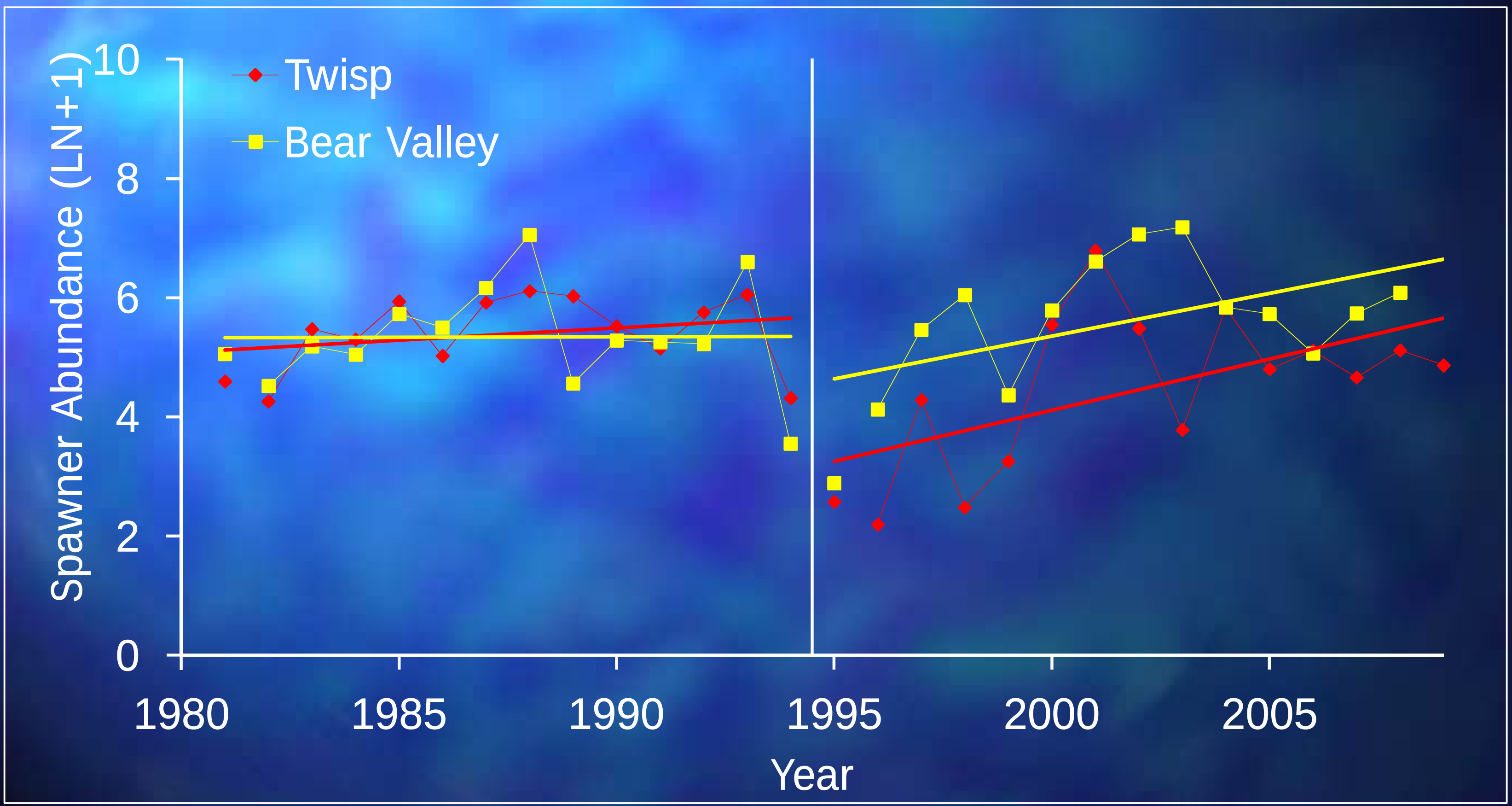
Twisp spring Chinook



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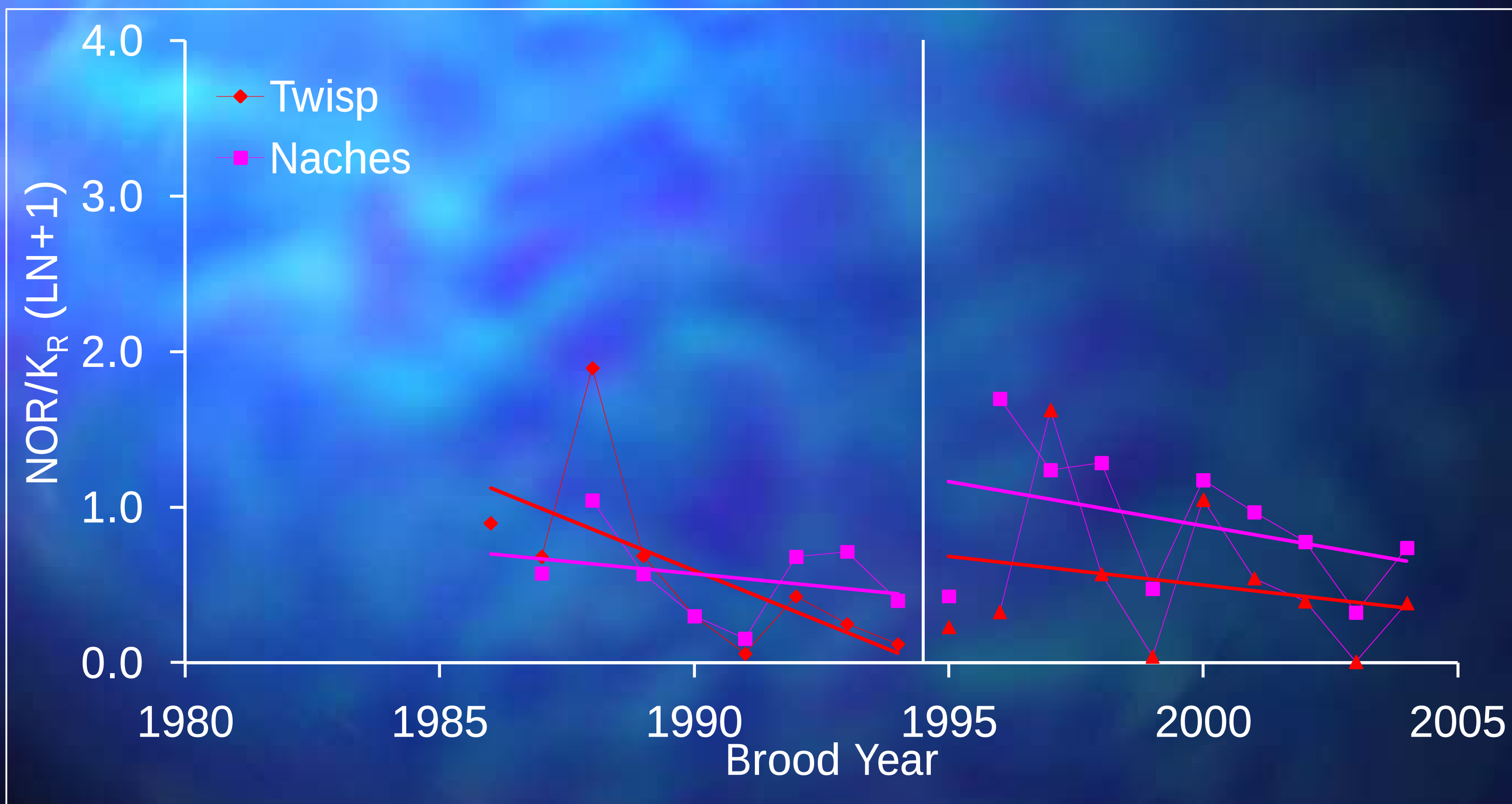
Twisp spring Chinook



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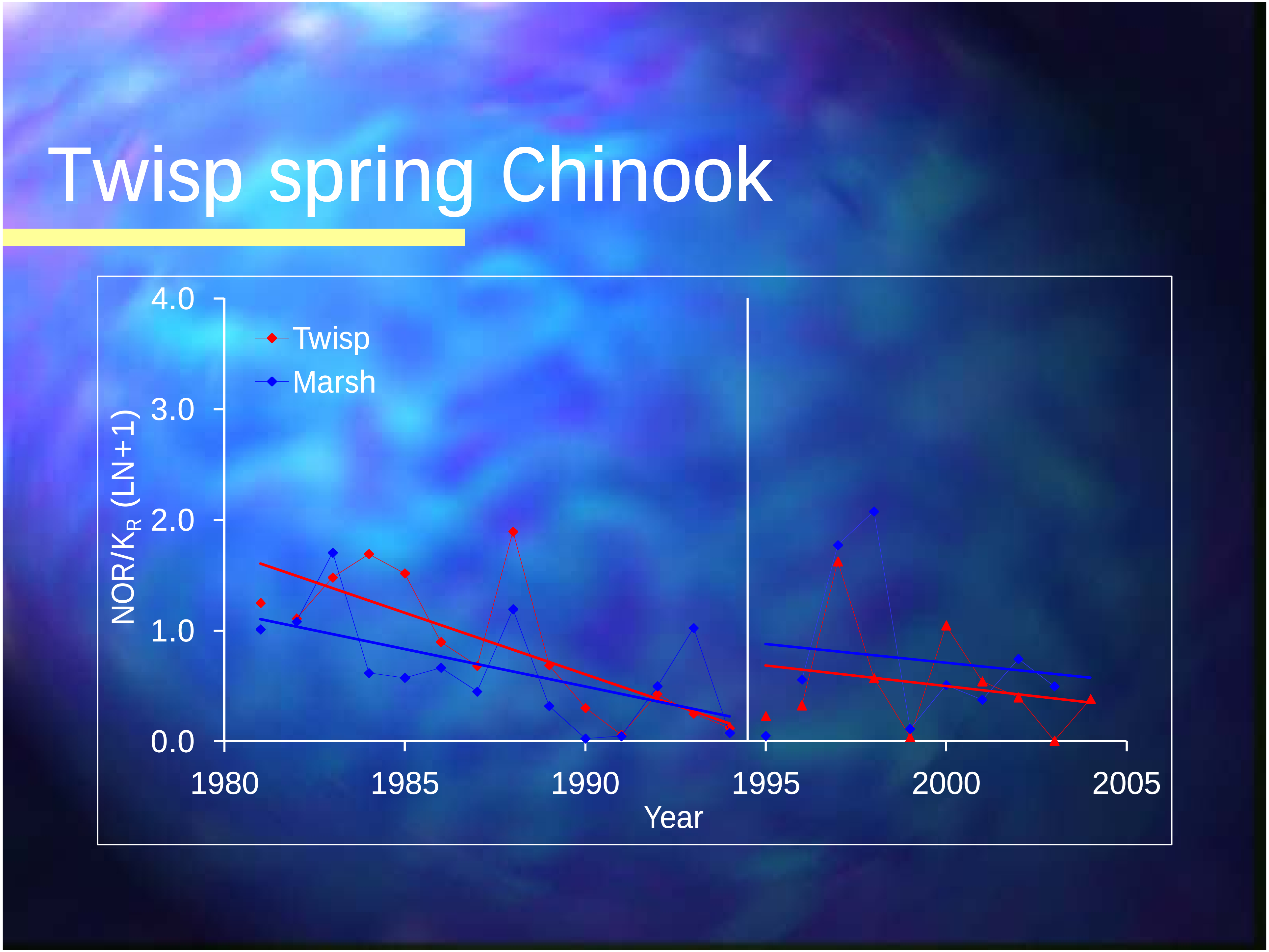

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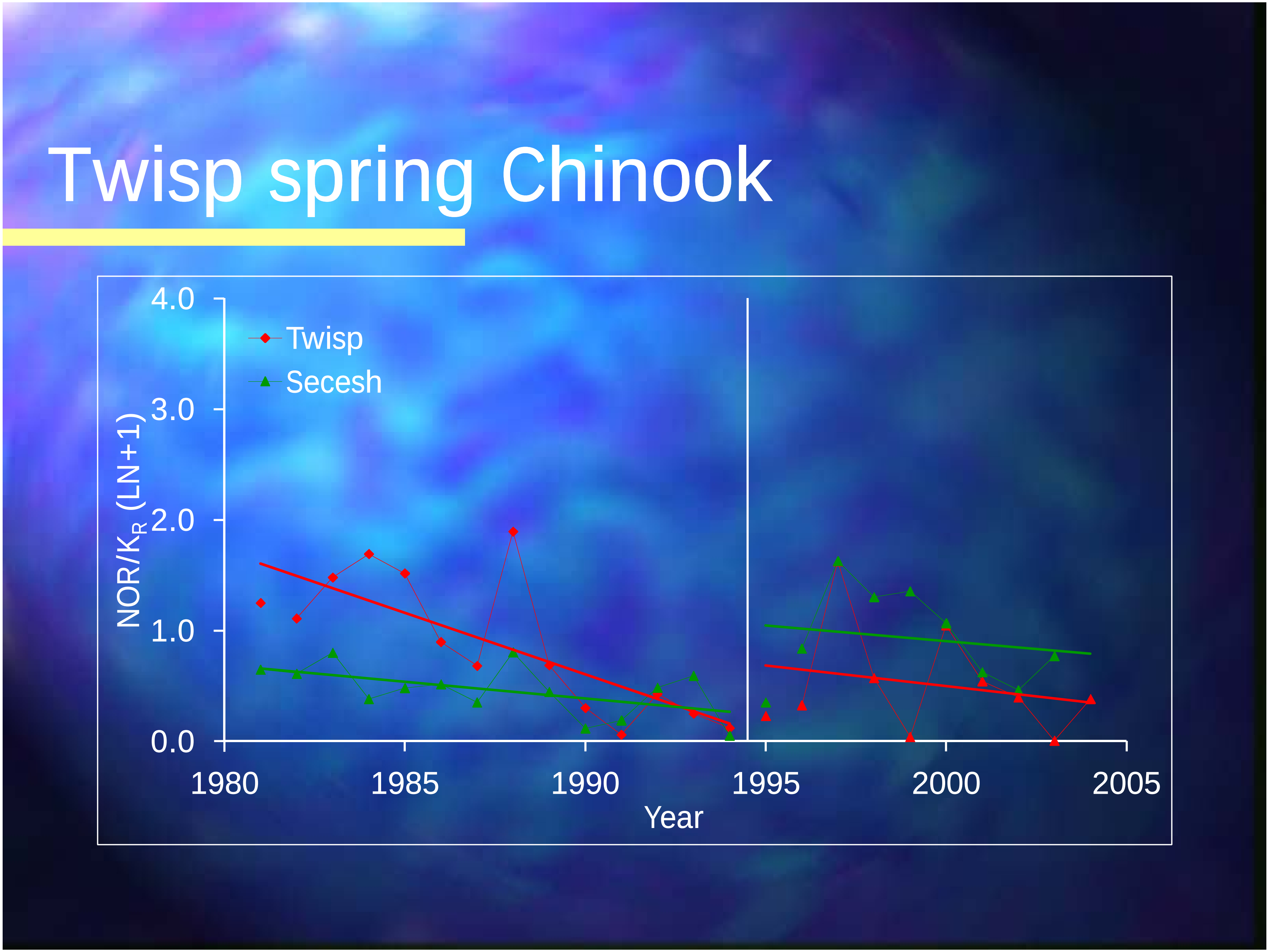

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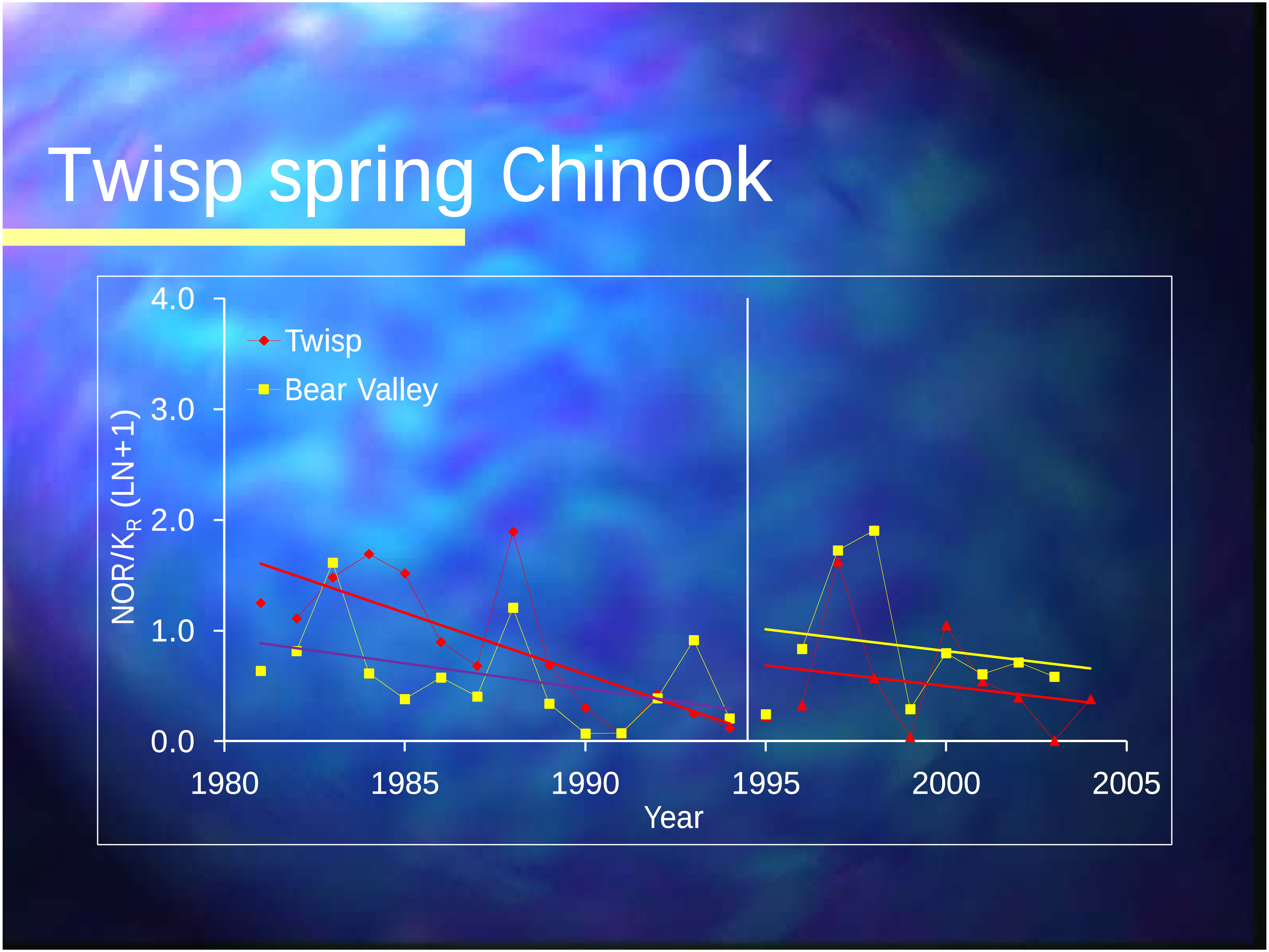

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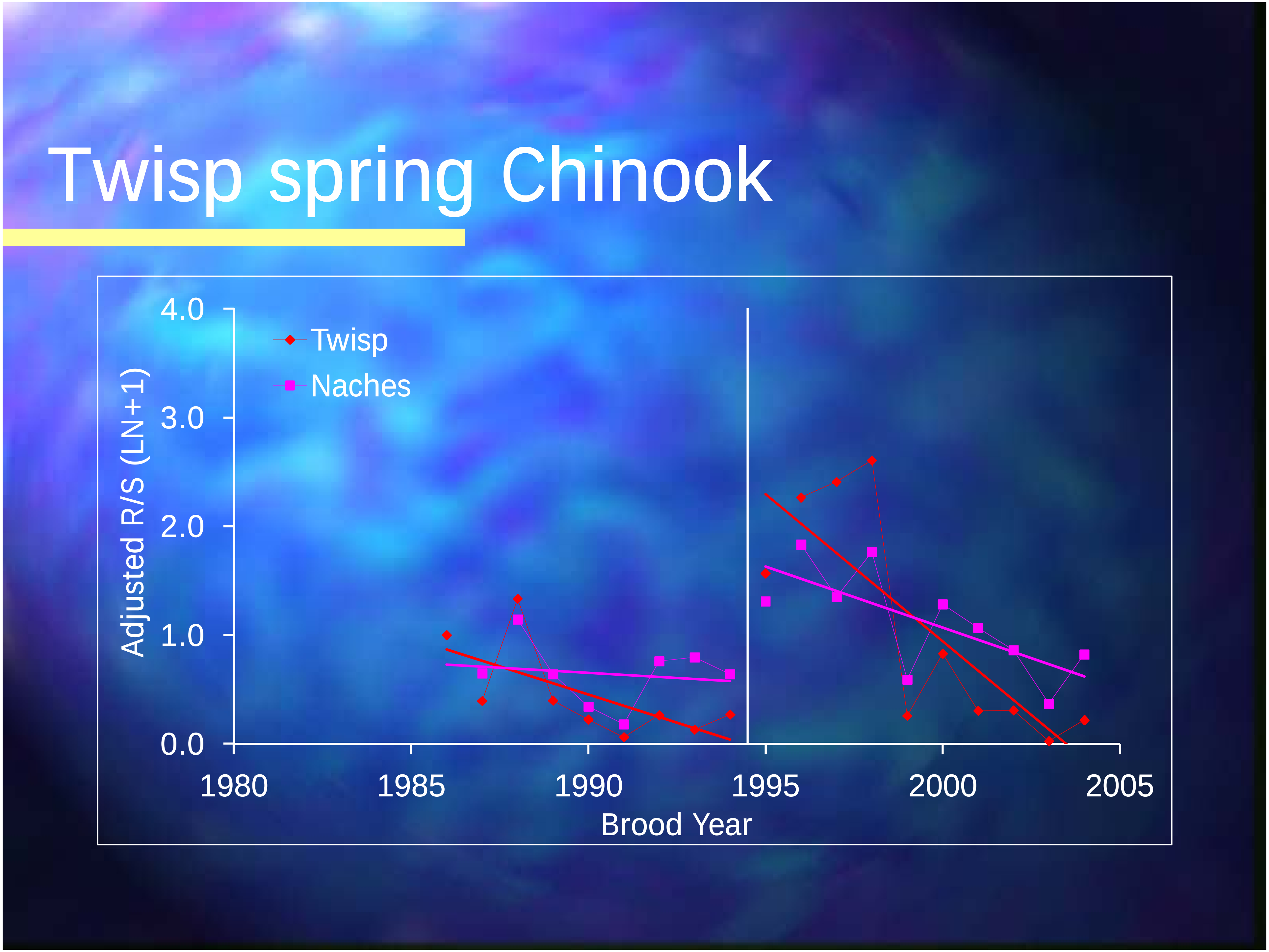

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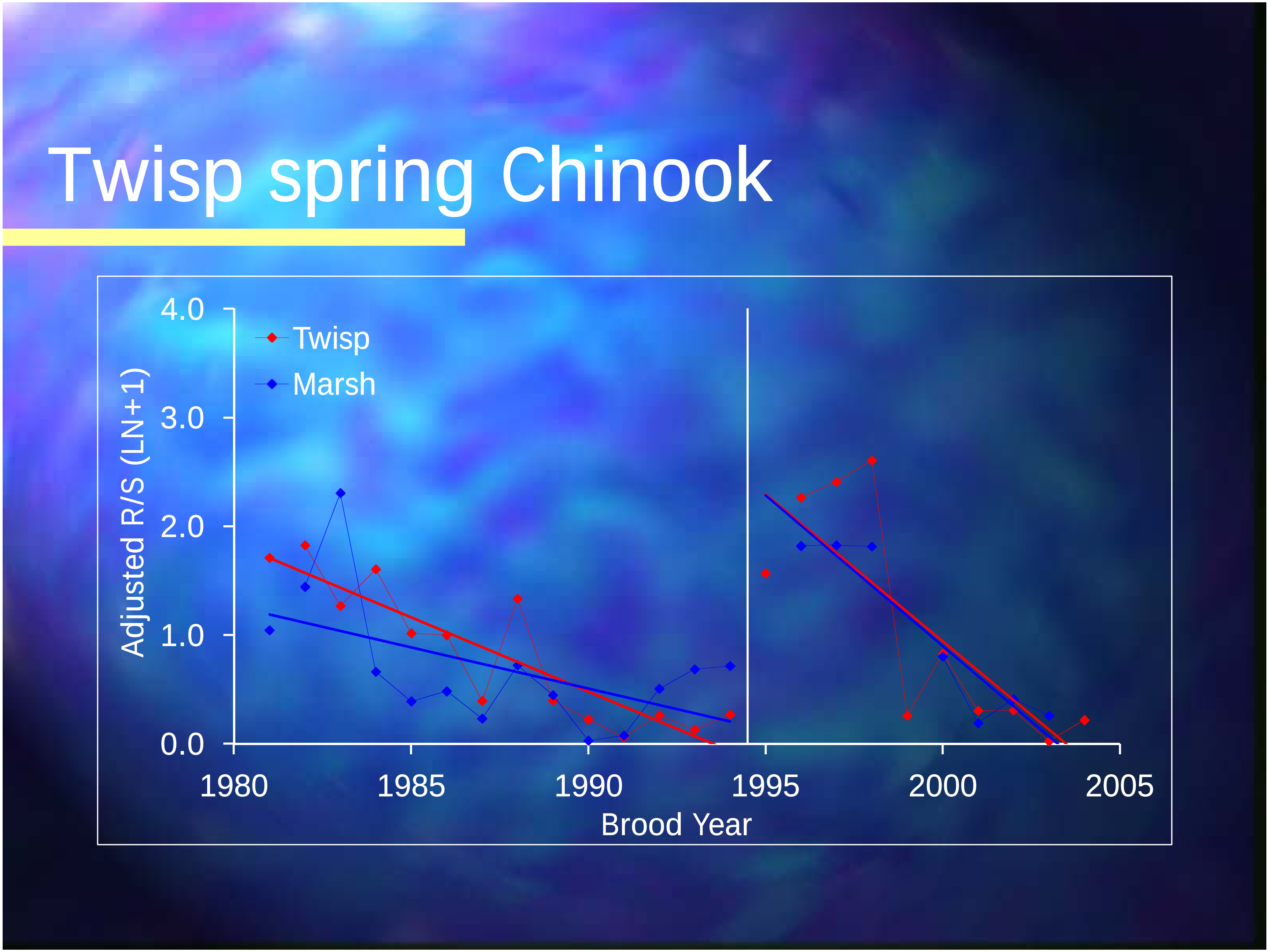

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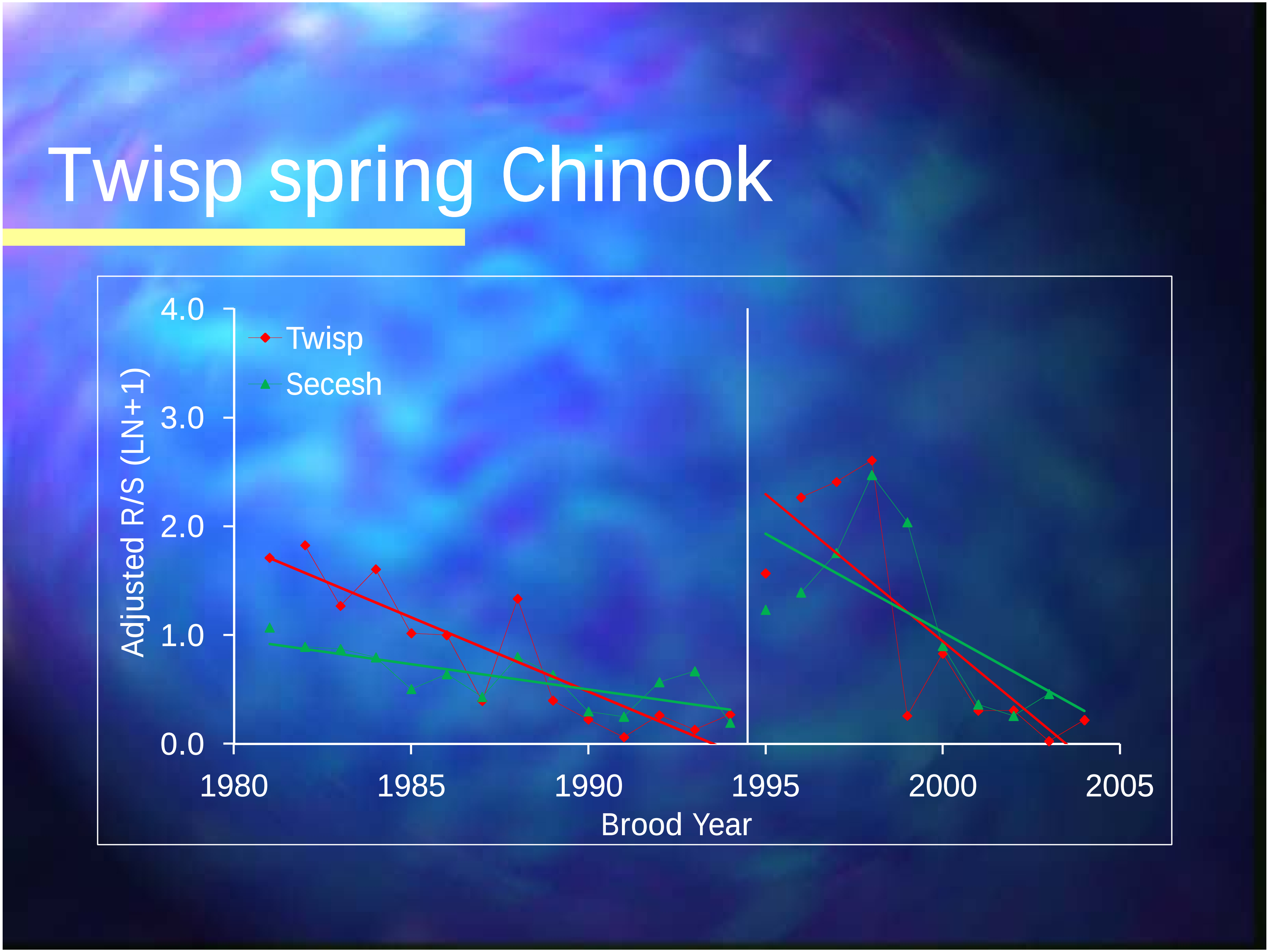

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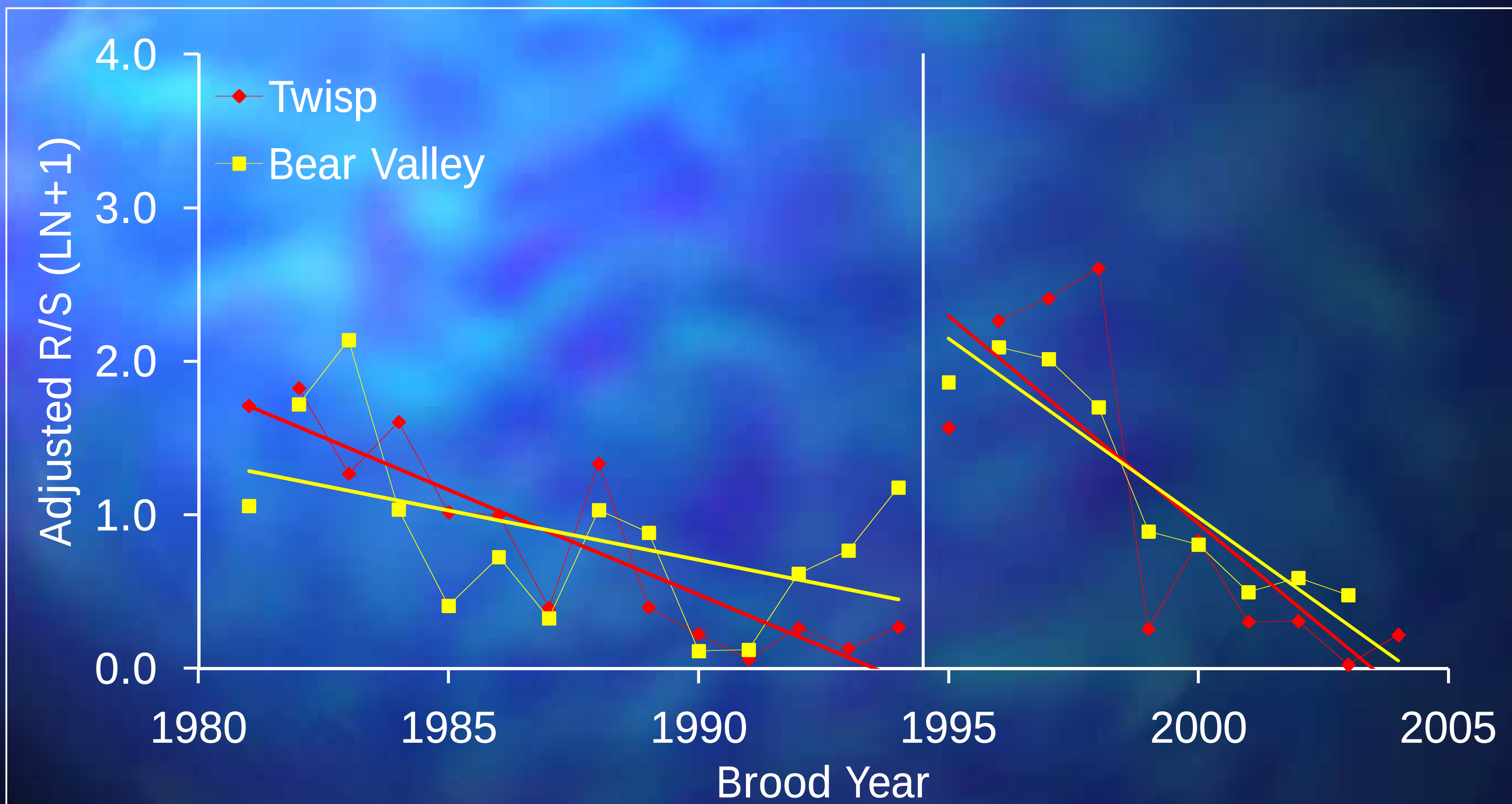
Twisp spring Chinook



Attachment D

Twisp spring Chinook (All years)

Response variable	Statistic	Reference populations			
		Naches	Marsh	Secesh	Bear Valley
Spawner abundance	T-test (P-value)	0.001	0.088	0.000	0.001
	Effect size	0.188	0.163	0.235	0.225
	Result	Decrease	ND	Decrease	Decrease
NOR	T-test (P-value)	0.125	0.337	0.001	0.011
	Effect size	0.350	1.009	1.371	1.171
	Result	ND	ND	Decrease	Decrease
Productivity	T-test (P-value)	0.298	0.359	0.317	0.317
	Effect size	0.235	0.678	0.270	0.273
	Result	ND	ND	ND	ND

Attachment D

Twisp spring Chinook (No 1996 or 1998)

Response variable	Statistic	Reference populations			
		Naches	Marsh	Secesh	Bear Valley
Spawner abundance	T-test (P-value)	0.008	0.290	0.000	0.003
	Effect size	0.143	0.090	0.193	0.171
	Result	Decrease	ND	Decrease	Decrease
NOR	T-test (P-value)	0.226	0.504	0.006	0.032
	Effect size	0.303	0.790	1.323	1.096
	Result	ND	ND	Decrease	Decrease
Productivity	T-test (P-value)	0.704	0.370	0.200	0.162
	Effect size	0.089	0.787	0.384	0.419
	Result	ND	ND	ND	ND

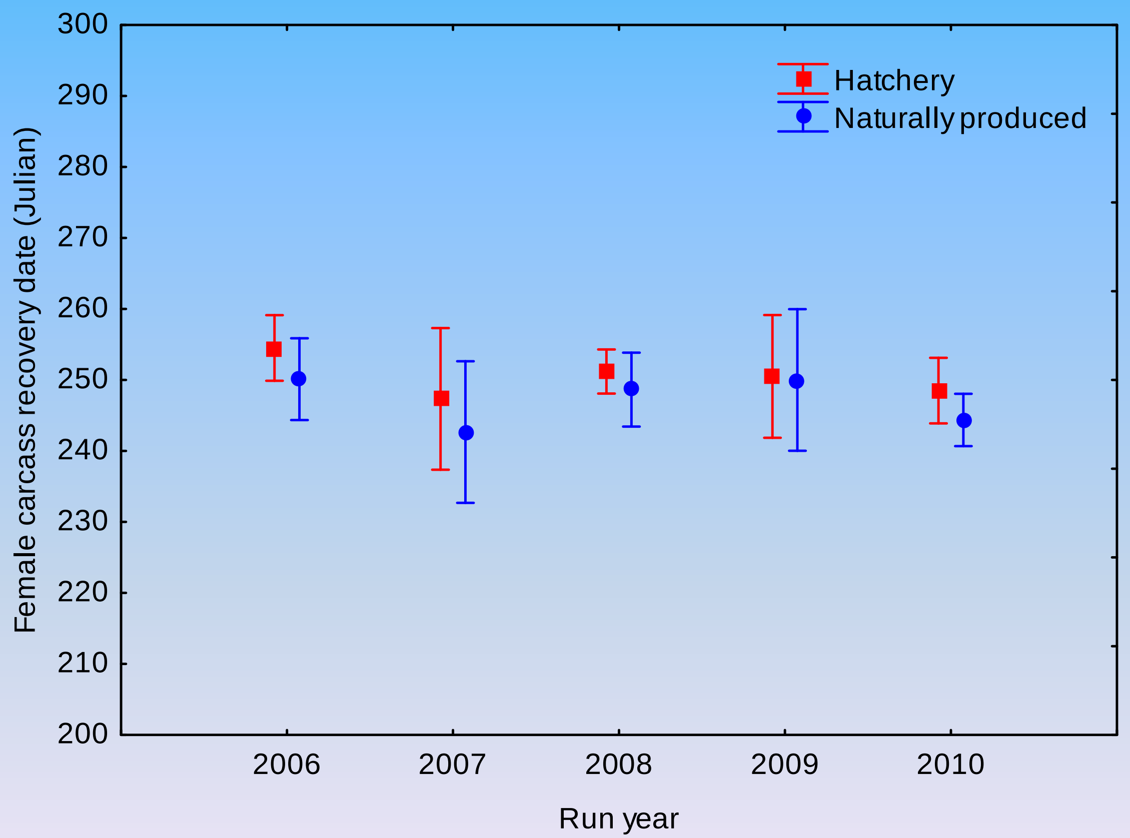
Attachment D

Twisp spring Chinook

- Migration timing
  - Low sample size prevented an analysis by origin, sex, and age.

Attachment D

Twisp spring Chinook



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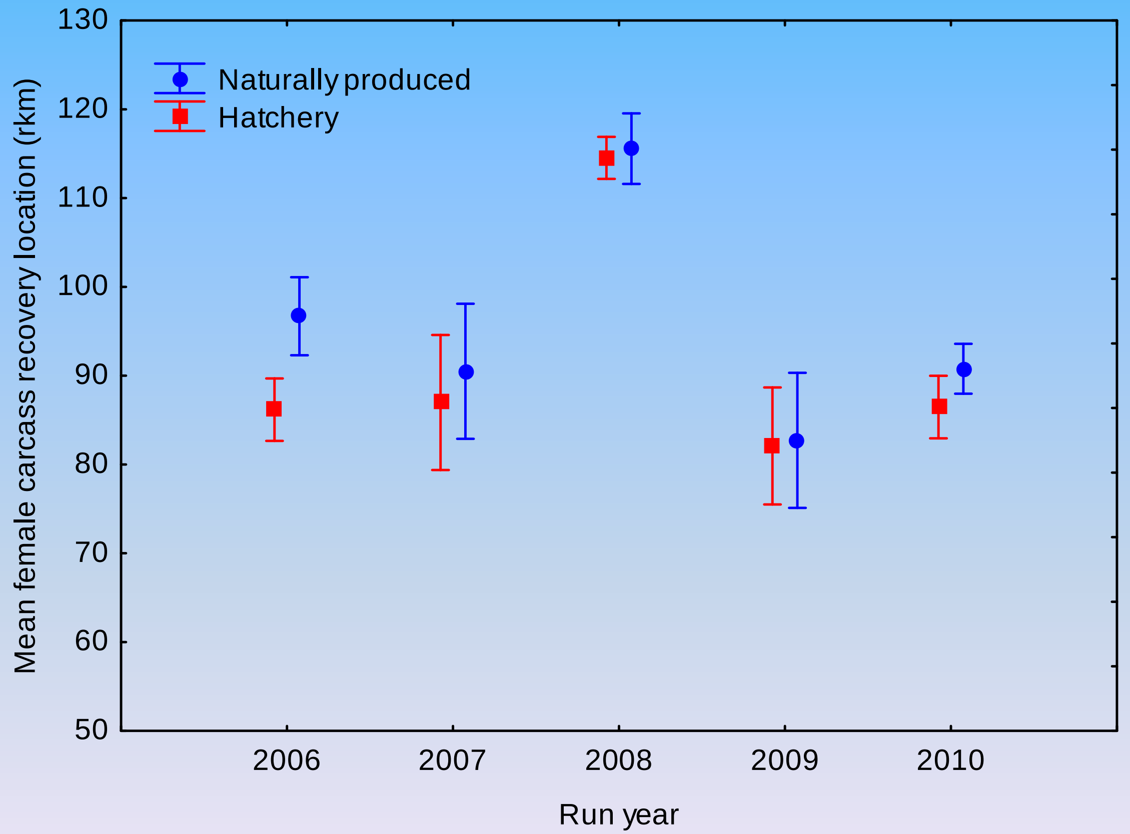
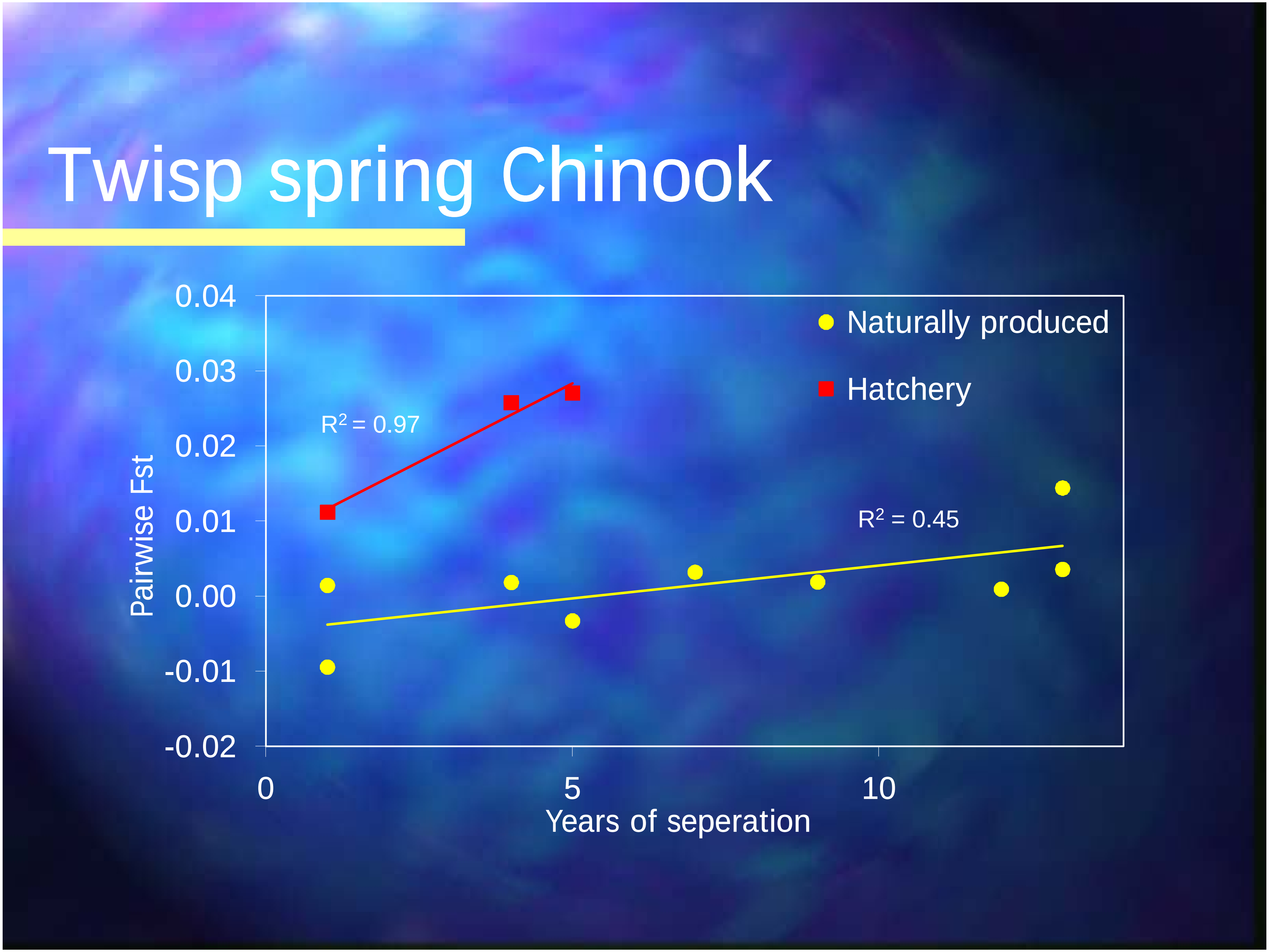
Twisp spring Chinook



Twisp spring Chinook

- Genetic Monitoring (Small et al. 2007)
- Hatchery fish differentiated from naturally produced fish, but more similar than Chewuch and Methow
- Differentiation between hatchery and naturally produced fish increasing over time (i.e., genetic drift)

Attachment D



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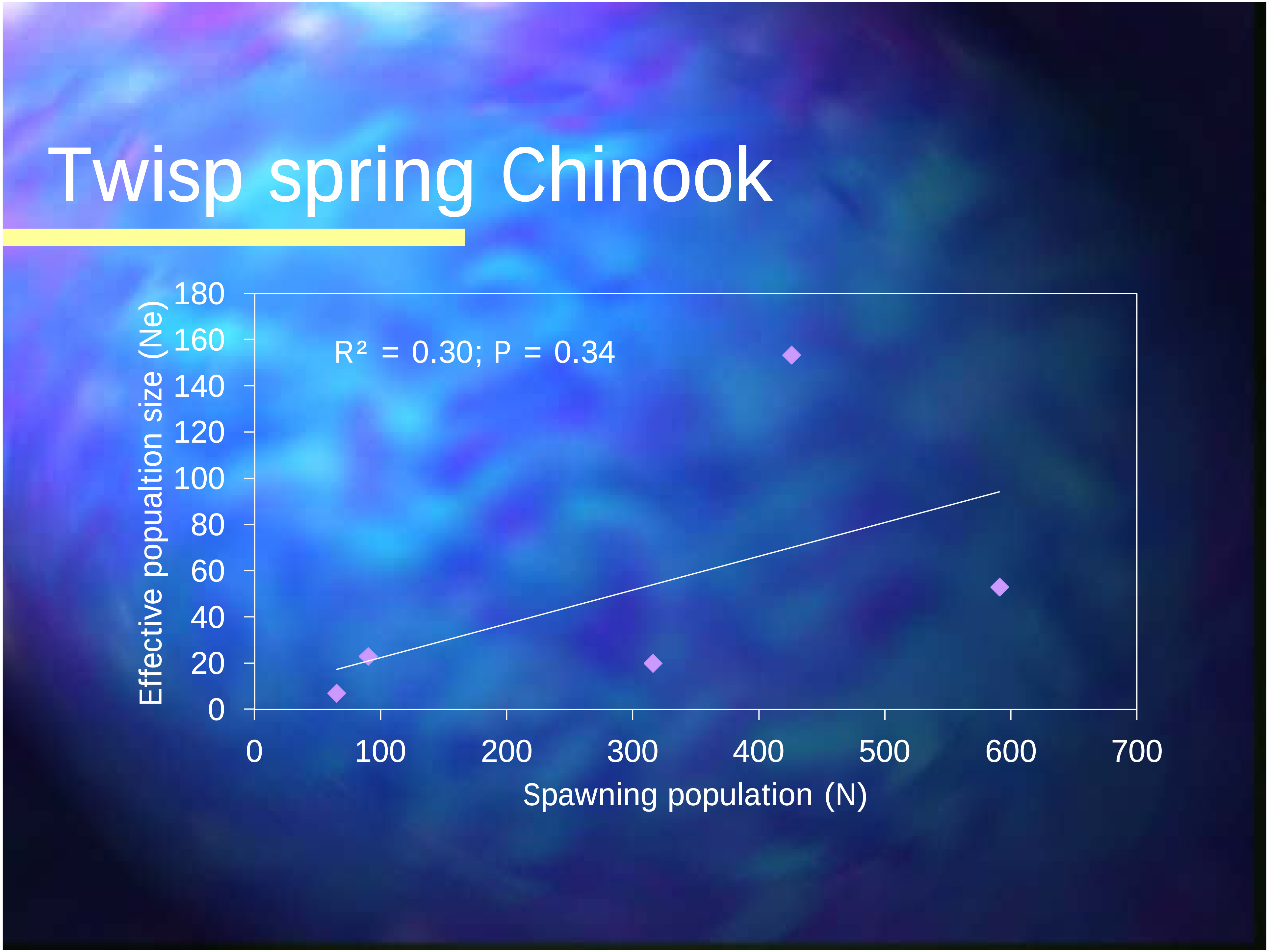

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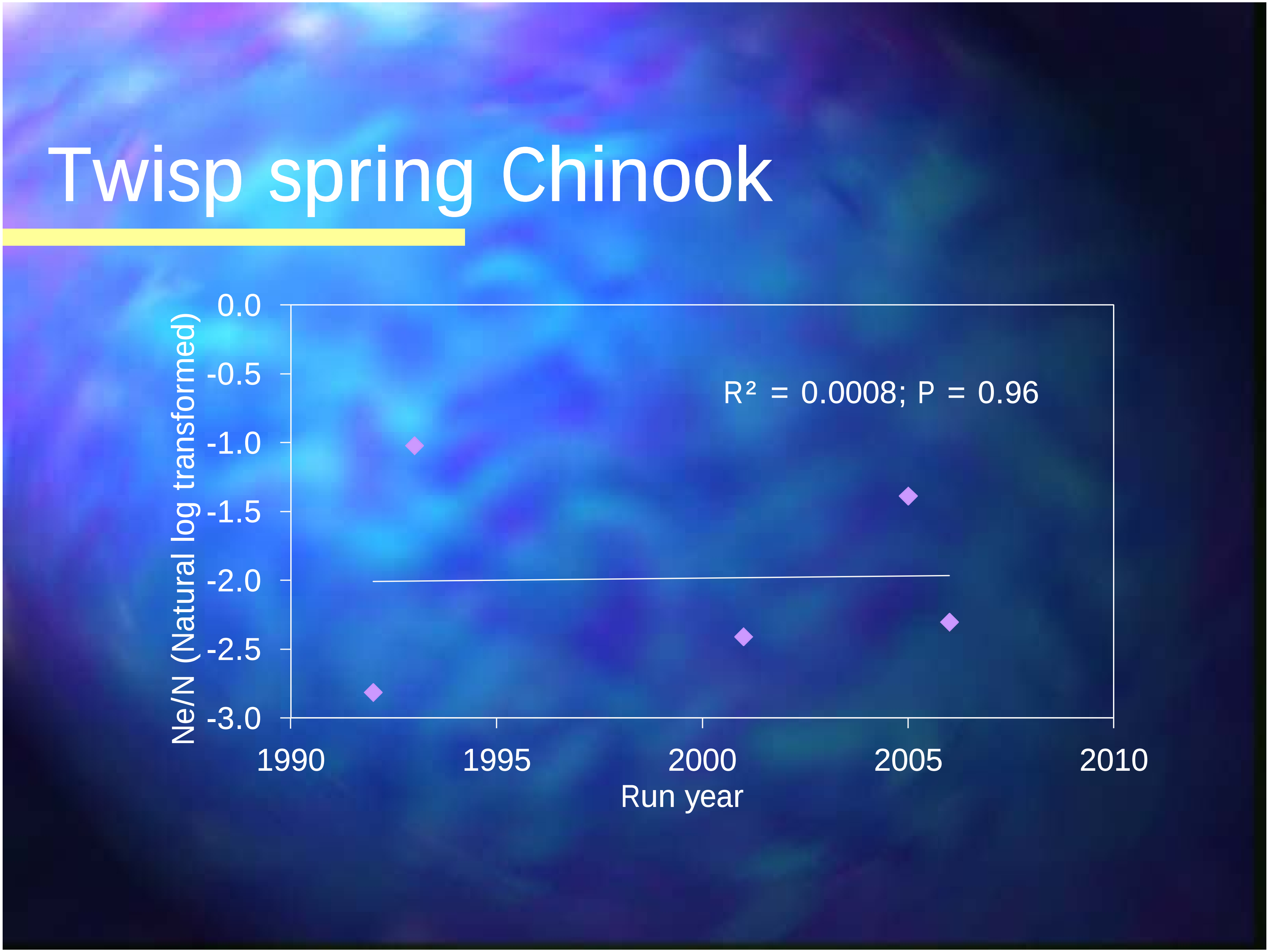

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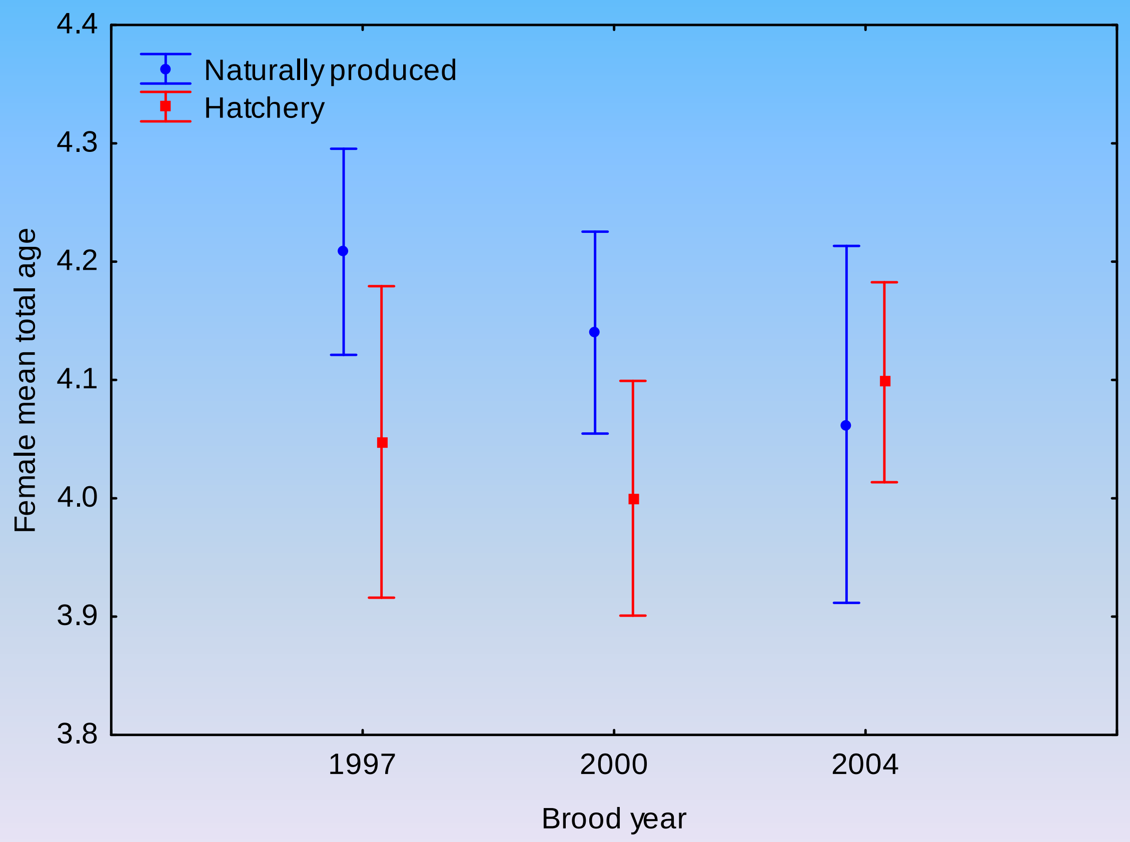
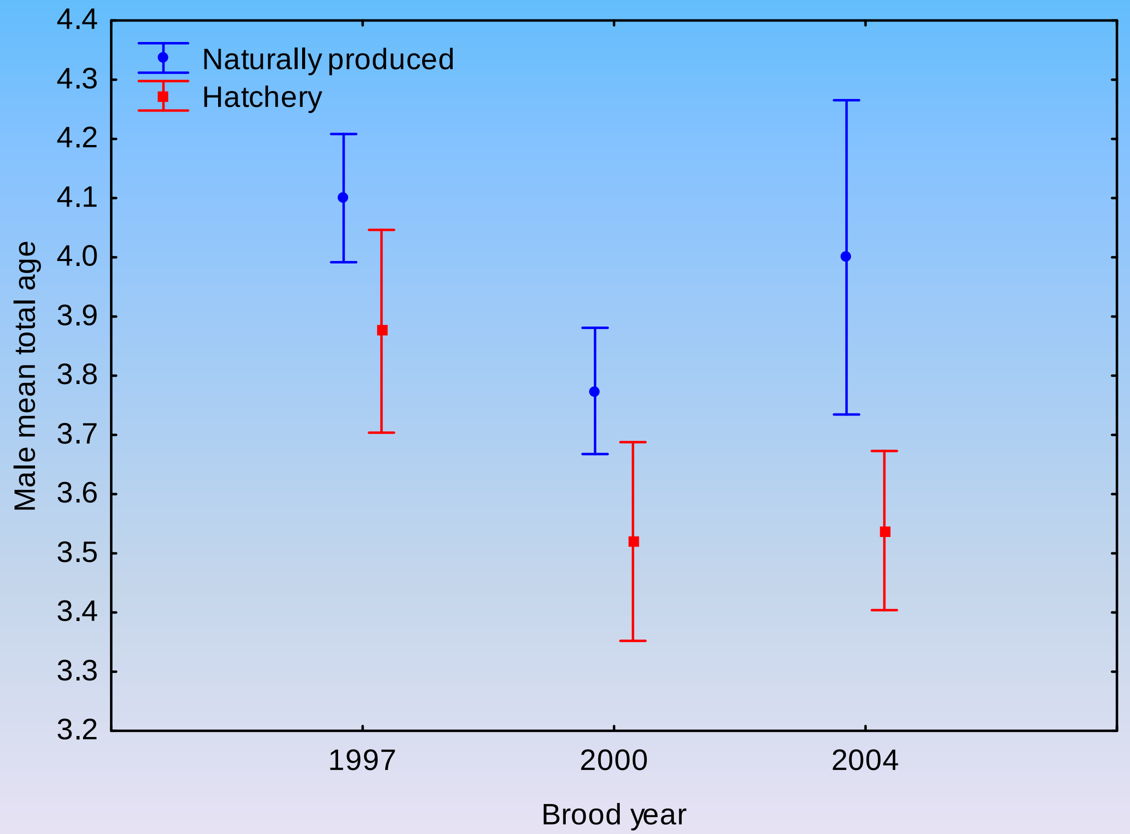
Twisp spring Chinook



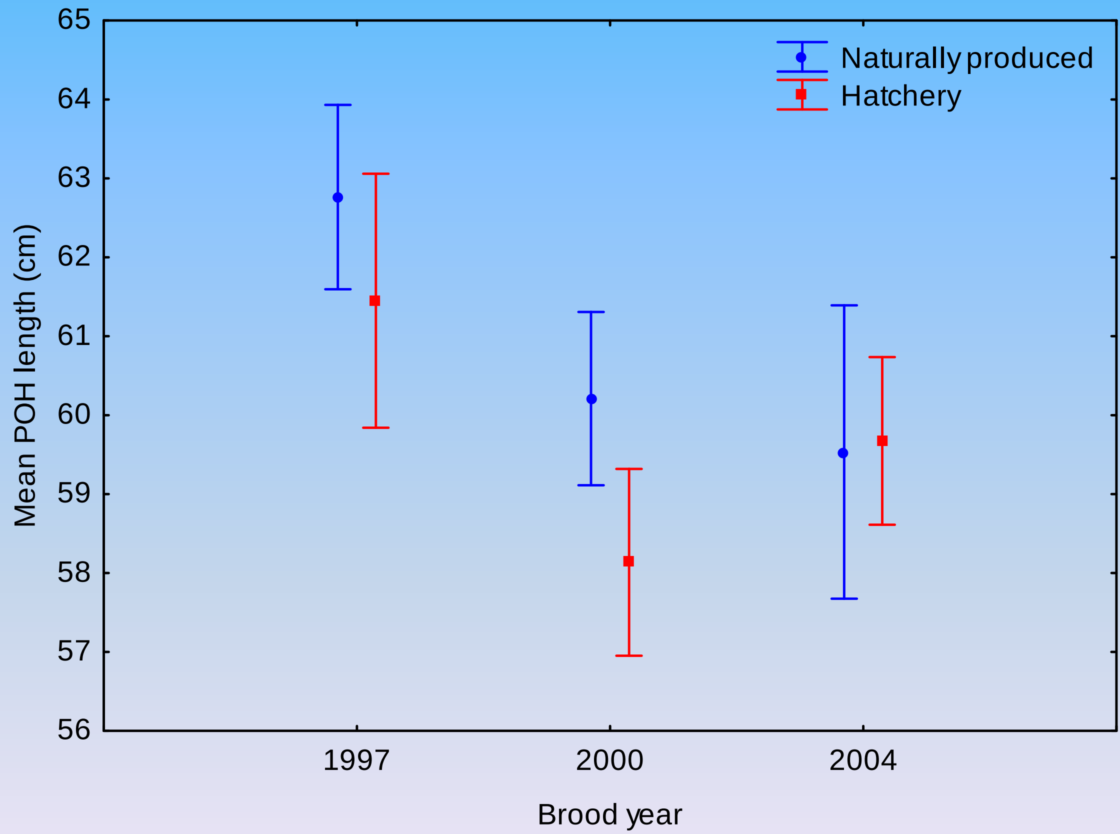
Attachment D

Twisp spring Chinook



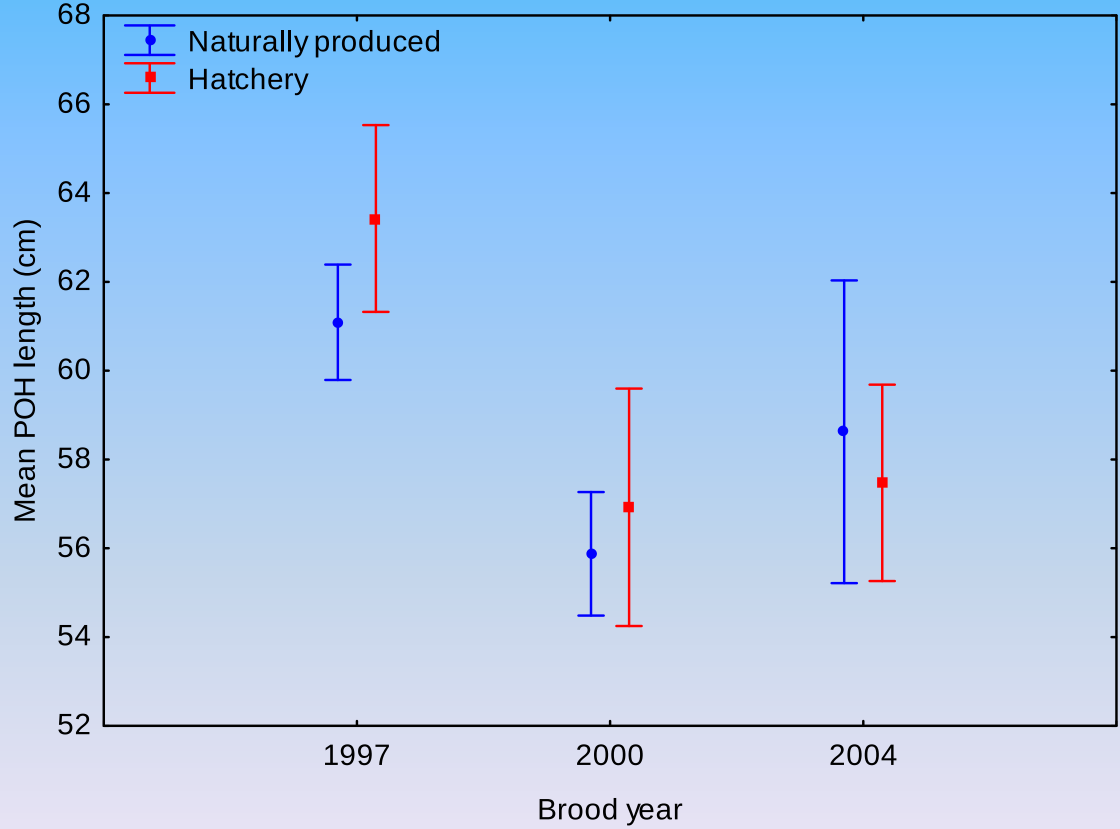
Attachment D

Twisp spring Chinook (Age-4 Female)



Attachment D

Twisp spring Chinook (Age-4 Male)



Attachment D

Twisp spring Chinook

- Post release survival target (4.5)
- Results (Geometric means)
- HRR = 2.3 ($P < 0.02$)
- NRR = 1.2 ($P < 0.04$)
  - Hatchery fish have 92% survival advantage

Attachment D

Twisp spring Chinook

- Stray rates targets
  - 5% brood year returns
  - 5% of spawners of receiving population
    - e.g., Twisp straying into Entiat
  - 10% of spawners within population
    - e.g., Twisp straying into Methow
- Results
  - Mean brood year = 25% ($P < 0.02$)
  - Mean outside pop. = 2.5% (2007 Entiat)
  - Mean within pop. = 3% Methow ($P < 0.001$)

Attachment D

Twisp spring Chinook

- Size at release targets
  - Fork length = 135 mm
  - Weight = 30.2 g
- Results
  - Fork length = 135 mm (P = 0.86)
  - Weight = 29.9 g (P = 0.74)
- No negative effect on survival

Attachment D

Twisp spring Chinook

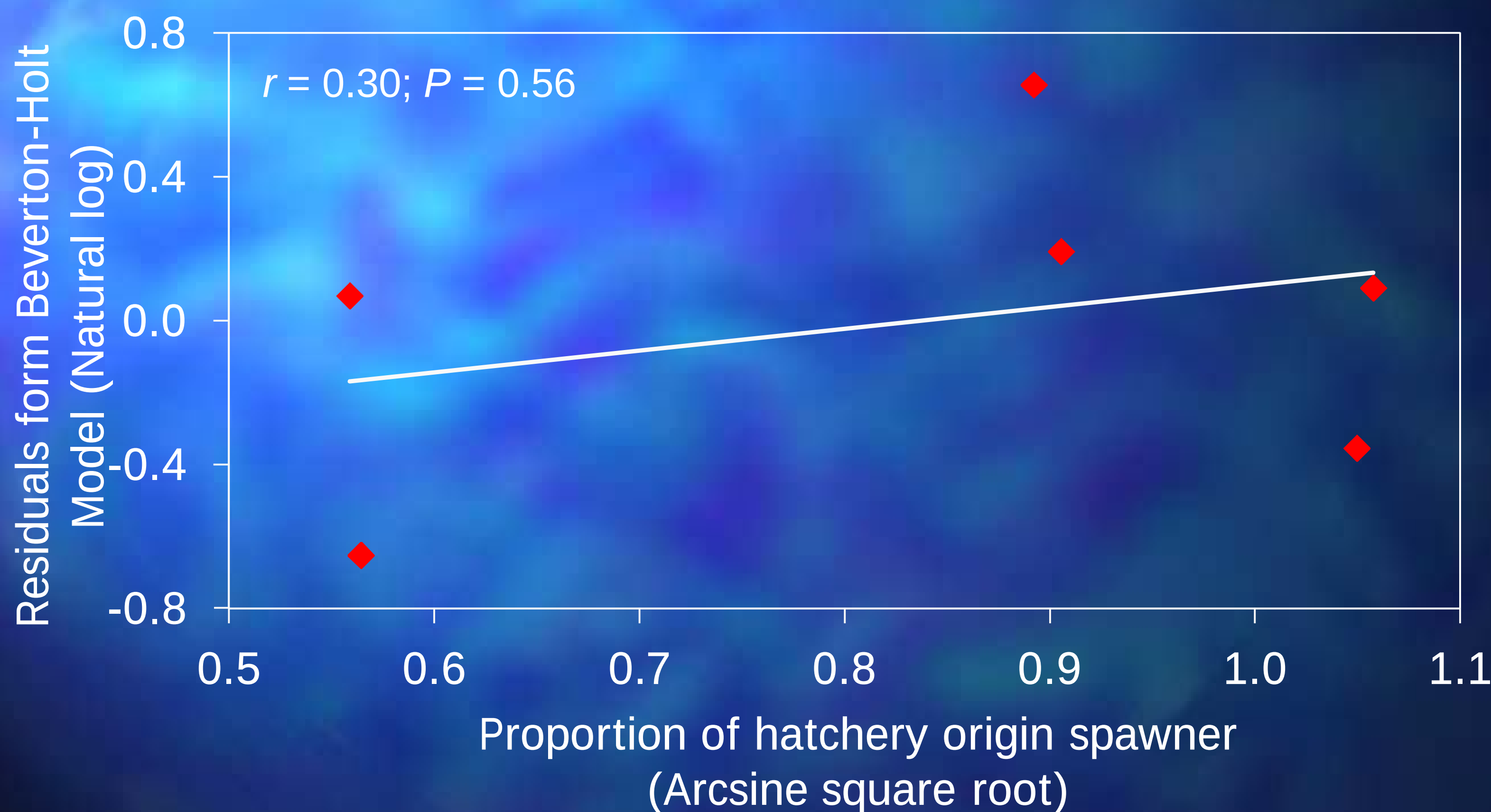
- Number released
  - Yearling target = 183,024
- Results
  - Number released = 53,267 ($P < 0.001$)
  - Broodstock limited
  - Very low pNOB
    - 1992 – 2010 Geo. Mean = 8%

Twisp spring Chinook

- Freshwater productivity
- Mean egg to emigrant = 5%
  - 2004-2009
  - Spawner abundance below capacity
  - Negative bias in estimate due to environmental conditions limiting trap operation
  - Poor reproductive success
  - Poor habitat quality

Attachment D

Twisp spring Chinook



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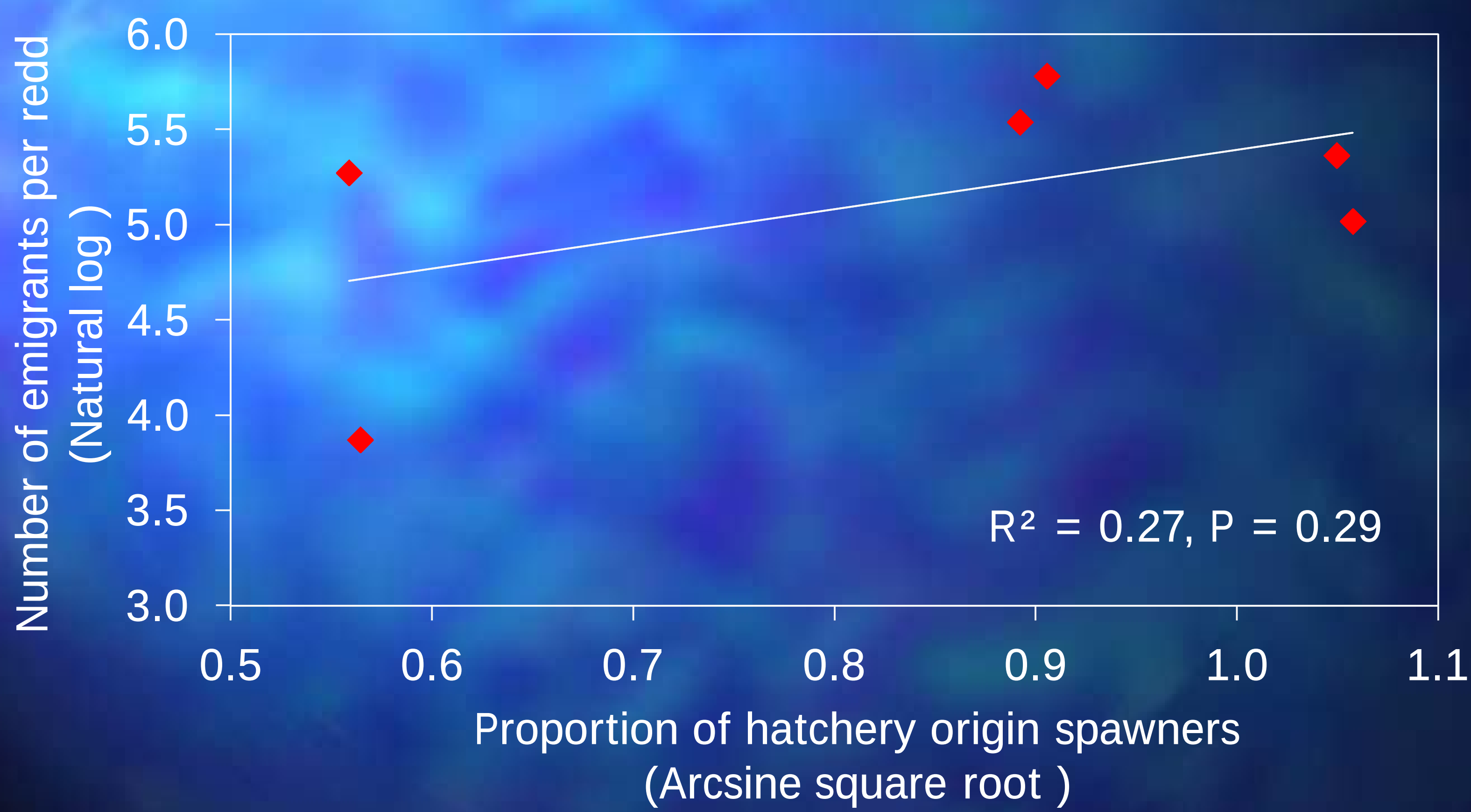
Twisp spring Chinook

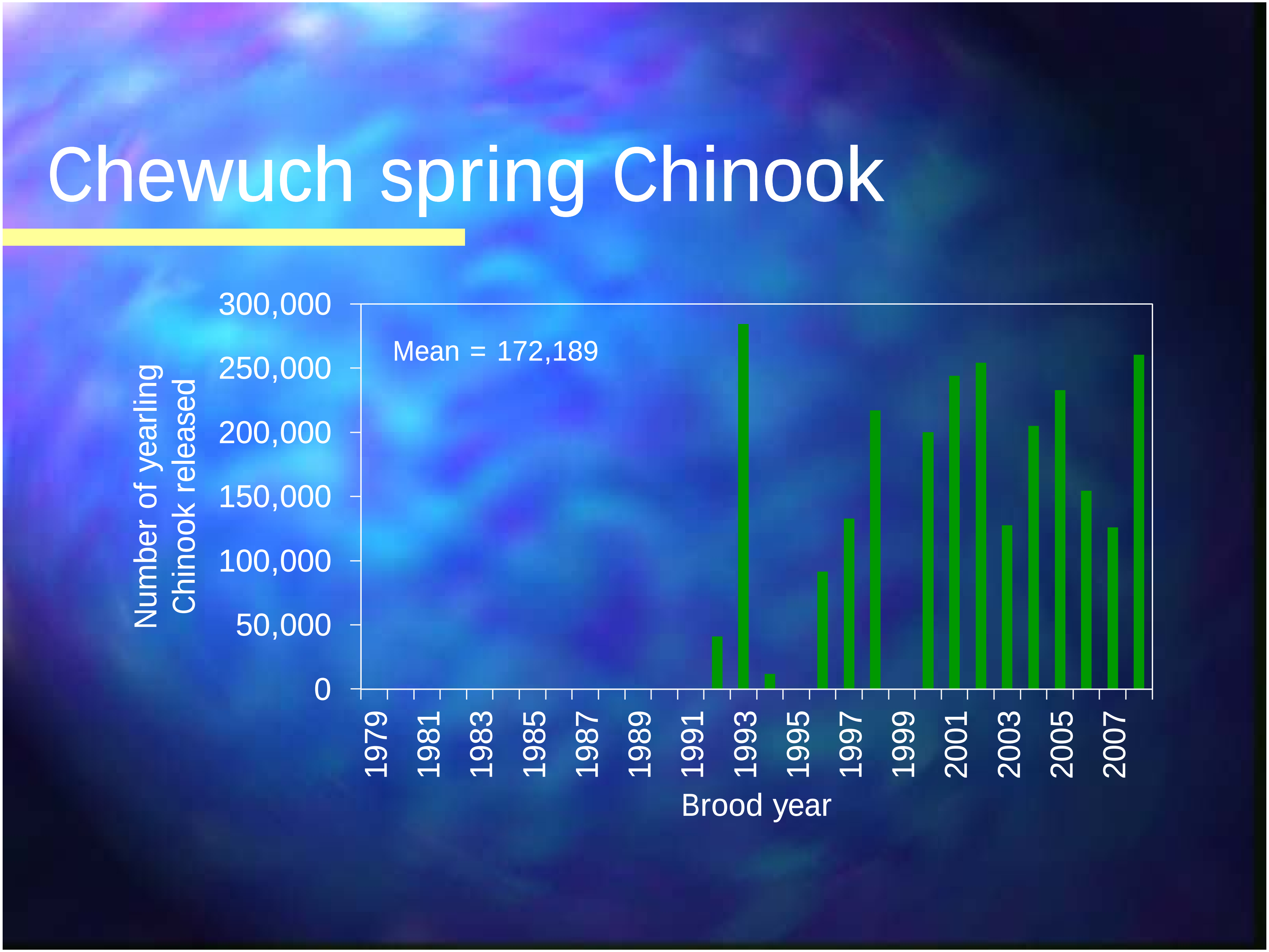


Attachment D

Twisp spring Chinook

- Harvest
- No adipose fin clips since 2000 brood.
- Mean 1992 – 1999 = 17%
- Mean 2000 – 2004 = 9% (including hooking mortality)

Attachment D



Chewuch spring Chinook

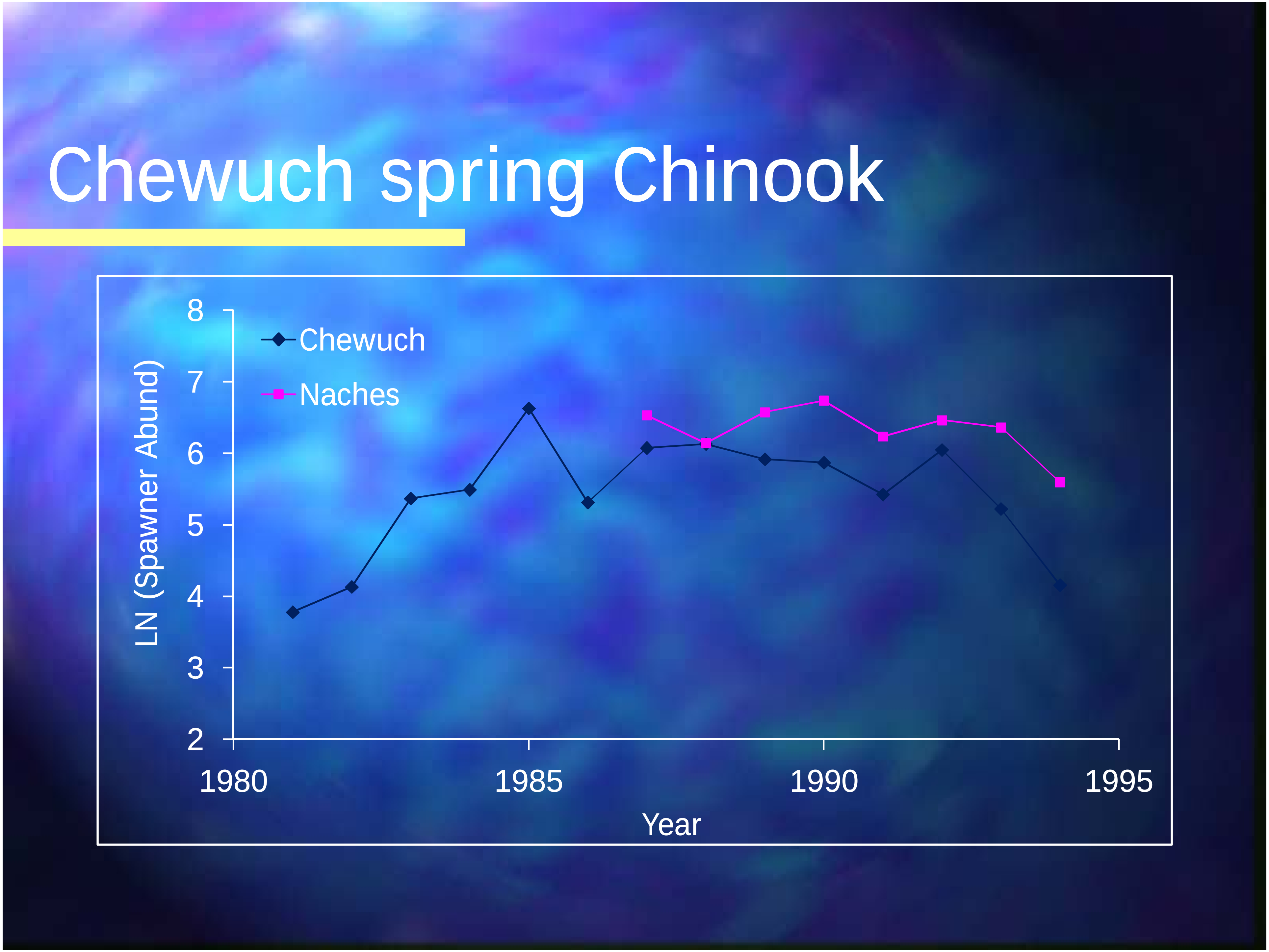
- Reference stream comparisons (BACI)
- Log transformed data to meet assumptions
- Made adjustments for differences in carrying capacity (i.e., smooth hockey stick)
  - NORs adjusted by maximum number of recruits produced (NORs/Kr)
  - Productivity (R/S) adjusted by maximum number of spawners (R/Ksp)

Attachment D

Chewuch spring Chinook

- Reference stream analysis
  - pHOS in both before and after periods
  - Correlation in before period
  - Difference in trends in before period
  - CV of ratio scores (T/C)

Attachment D



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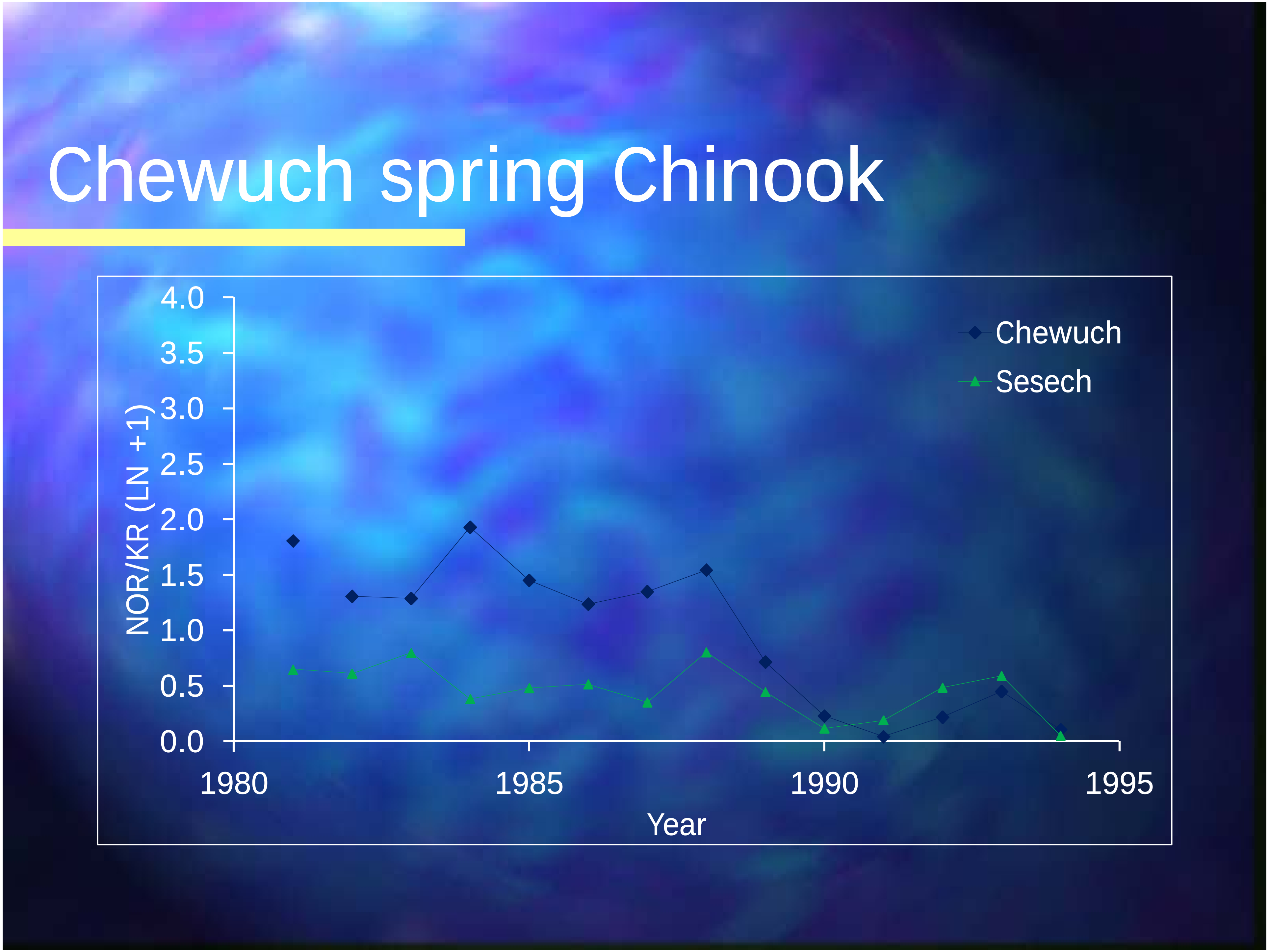

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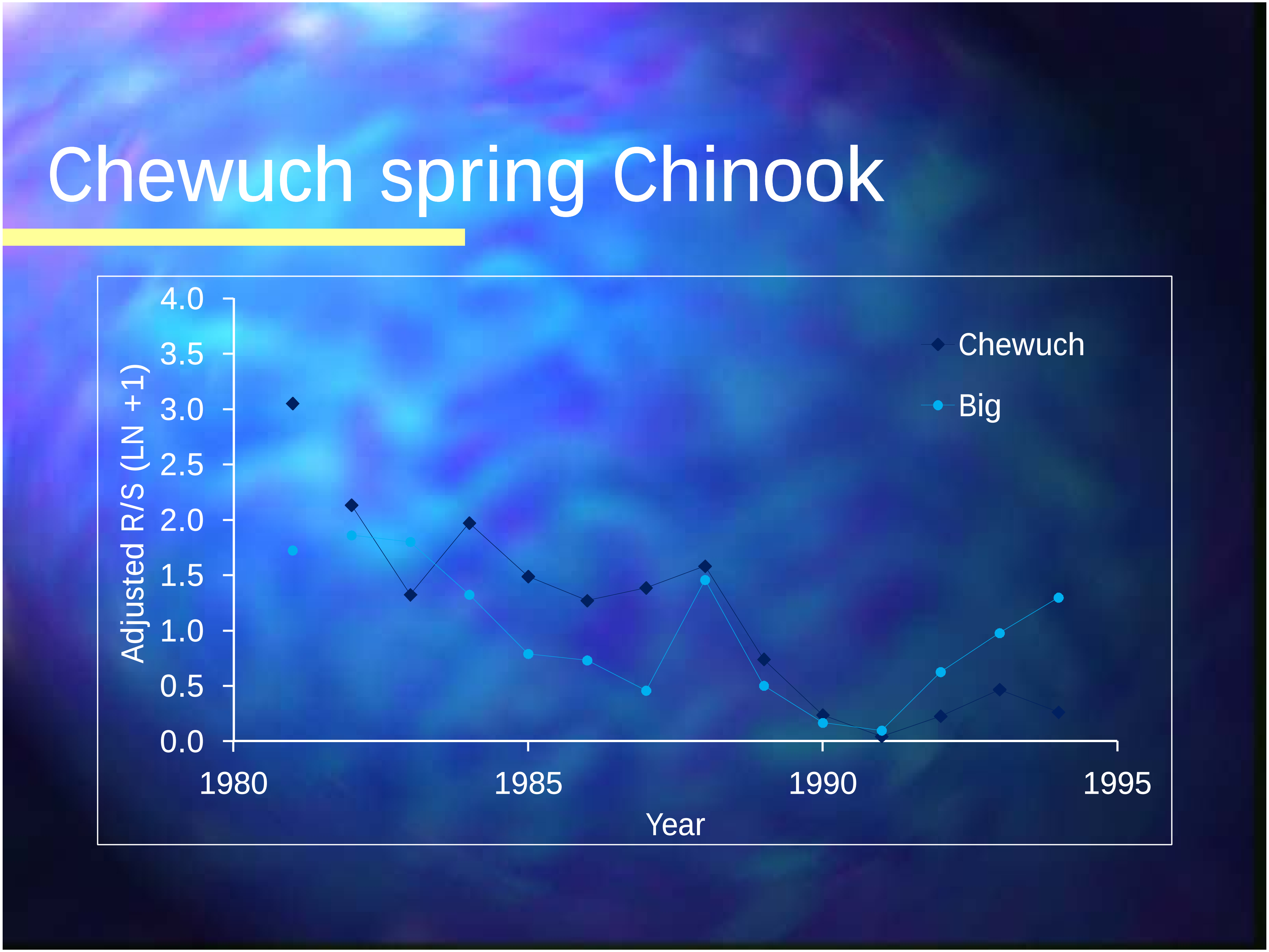
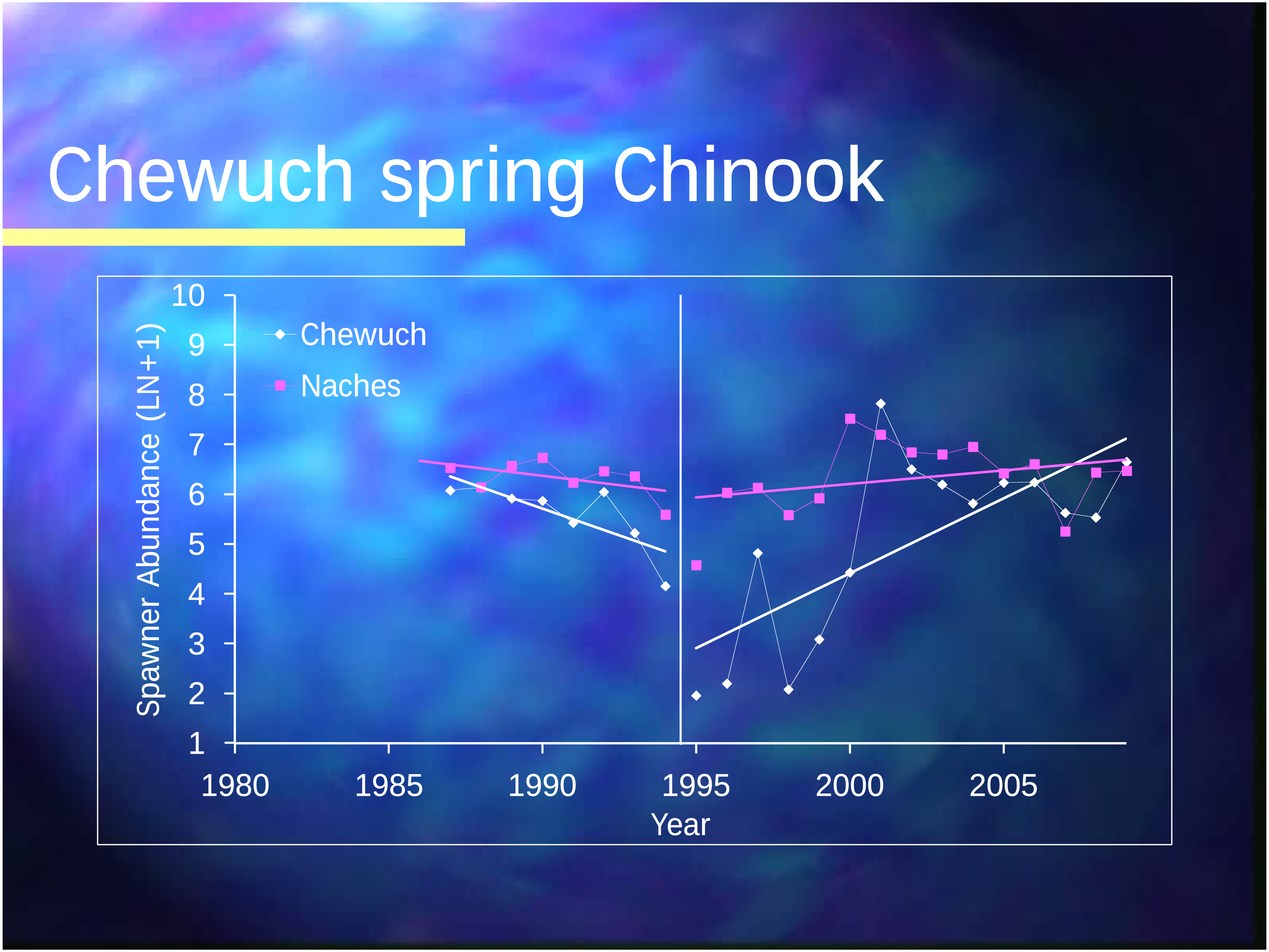


Attachment D

Chewuch Reference Streams

Reference populations	Weighted score			Ranking		
	Spawner abundance	Natural origin recruits	Productivity	Spawner abundance	Natural origin recruits	Productivity
Naches	92	82	82	1	2	3
Secesh	84	81	84	3	3	2
Big	90	87	86	2	1	1

Attachment D



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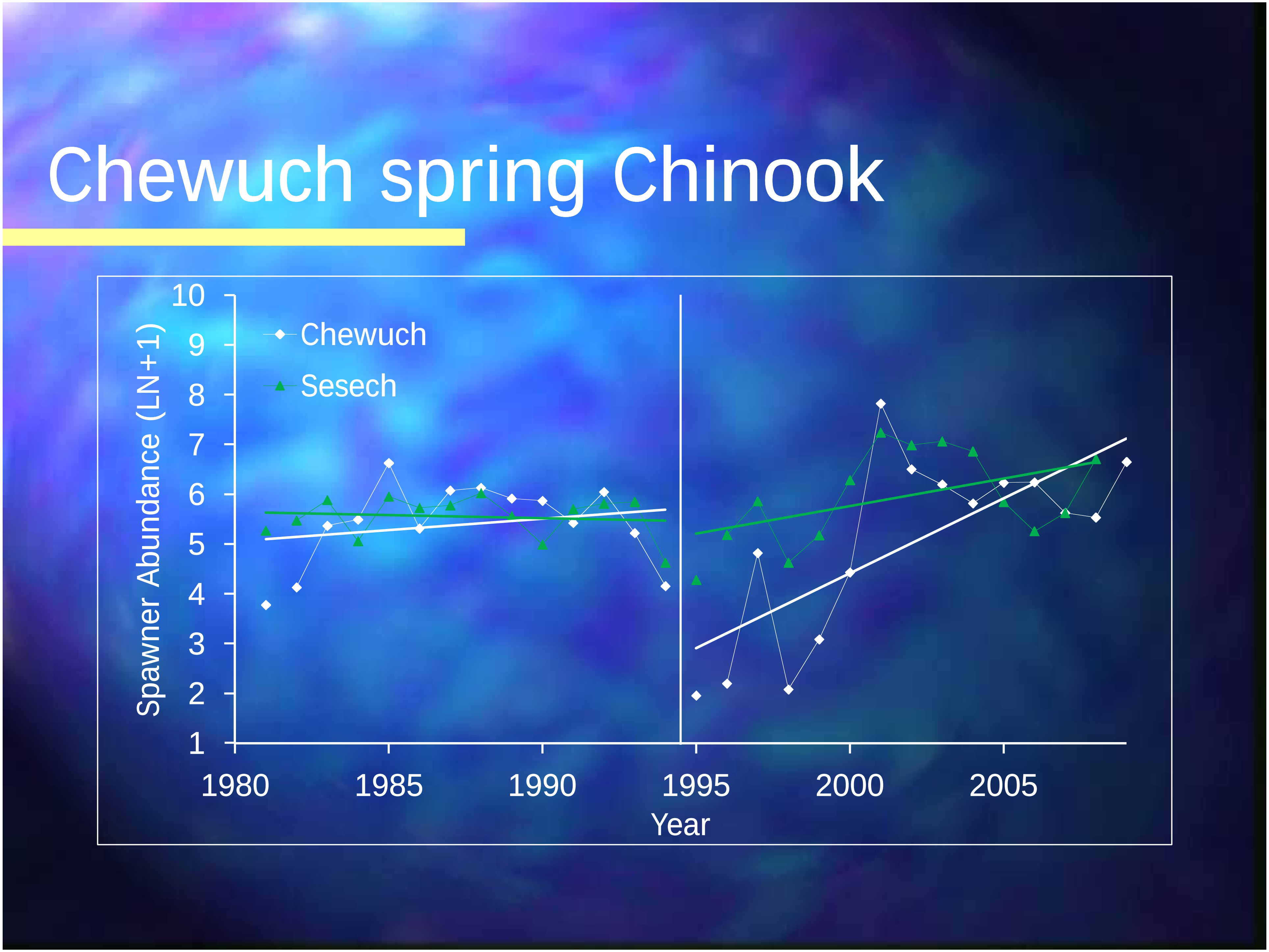

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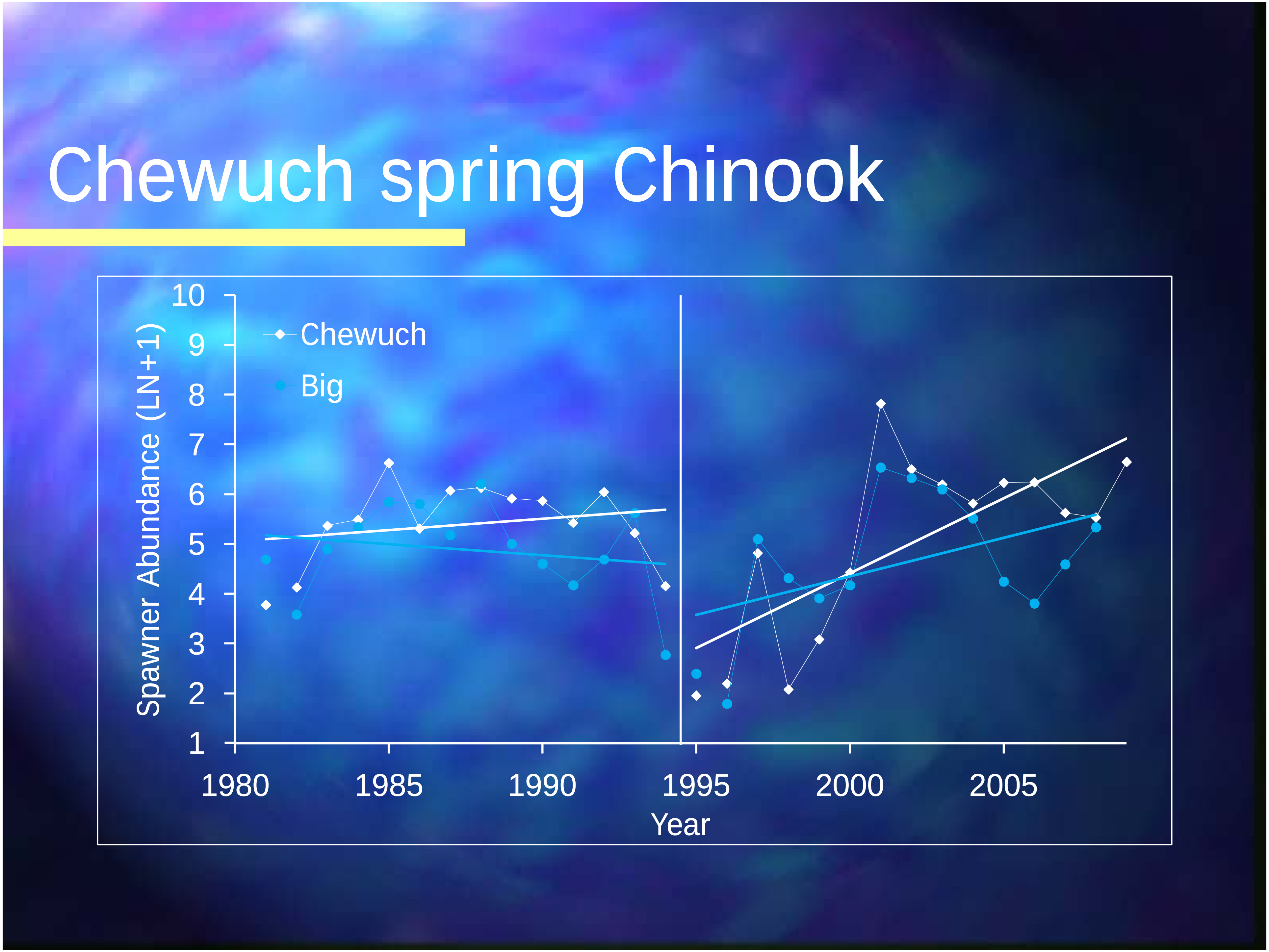
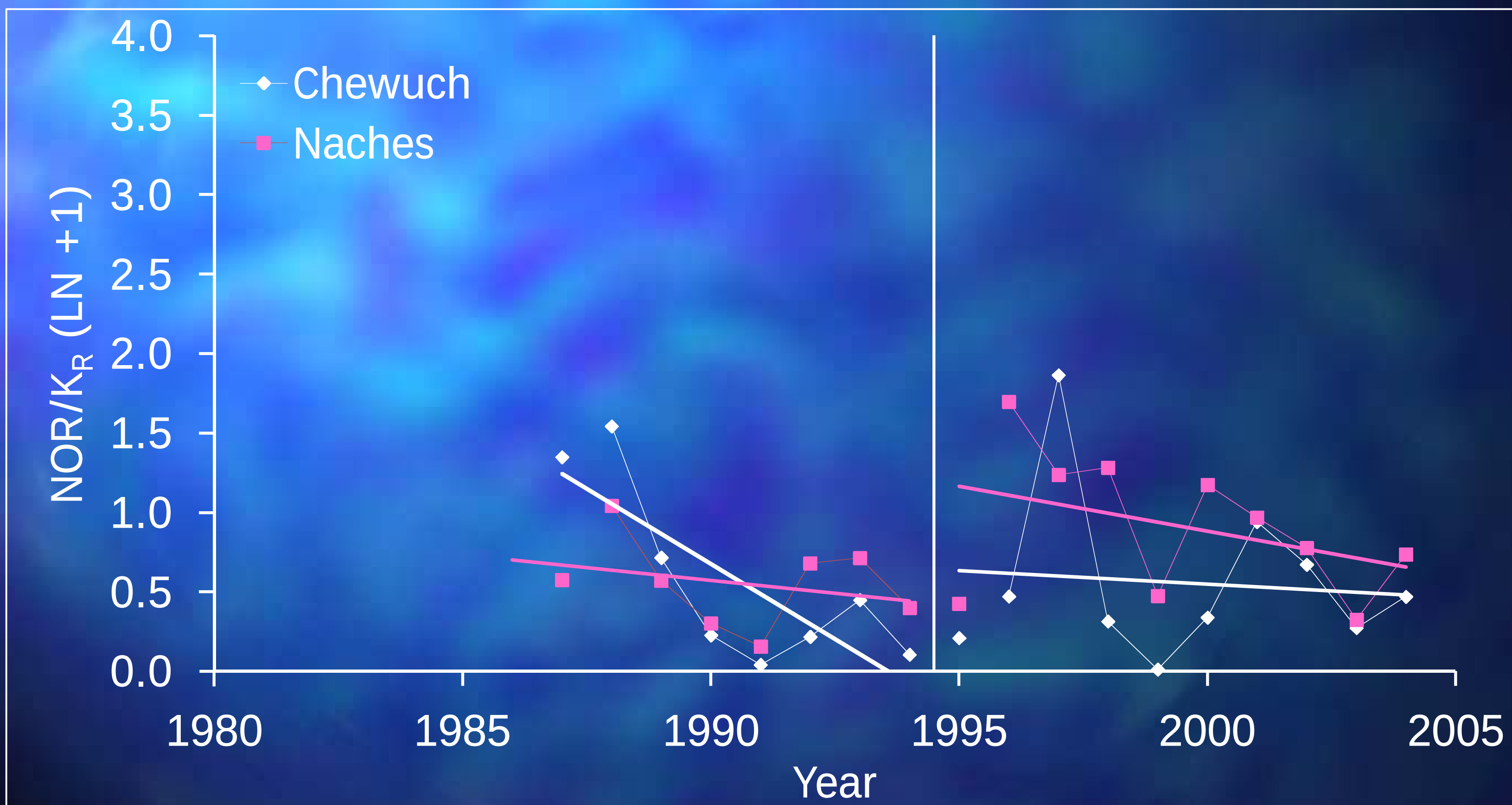


Attachment D

Chewuch spring Chinook



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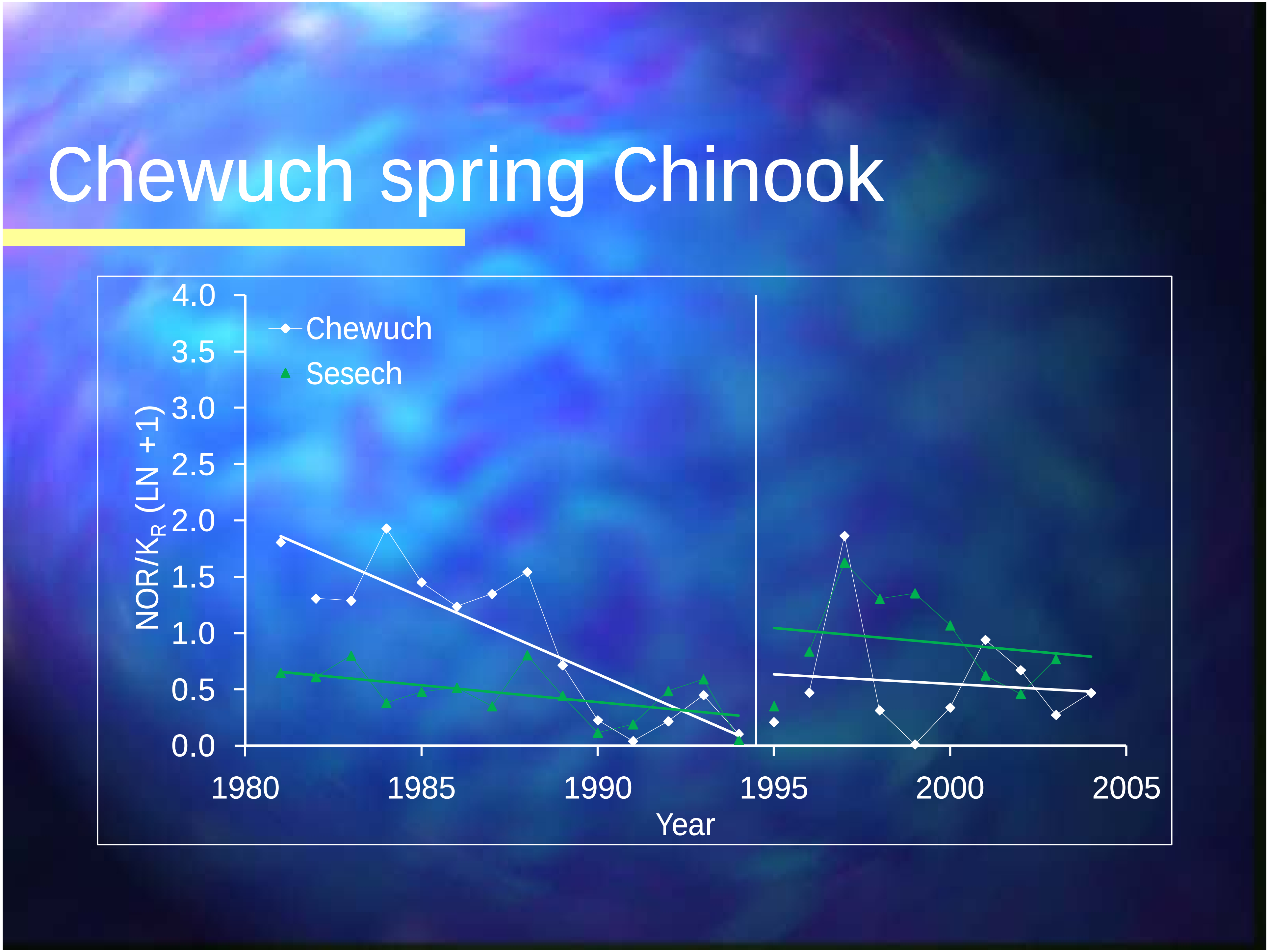

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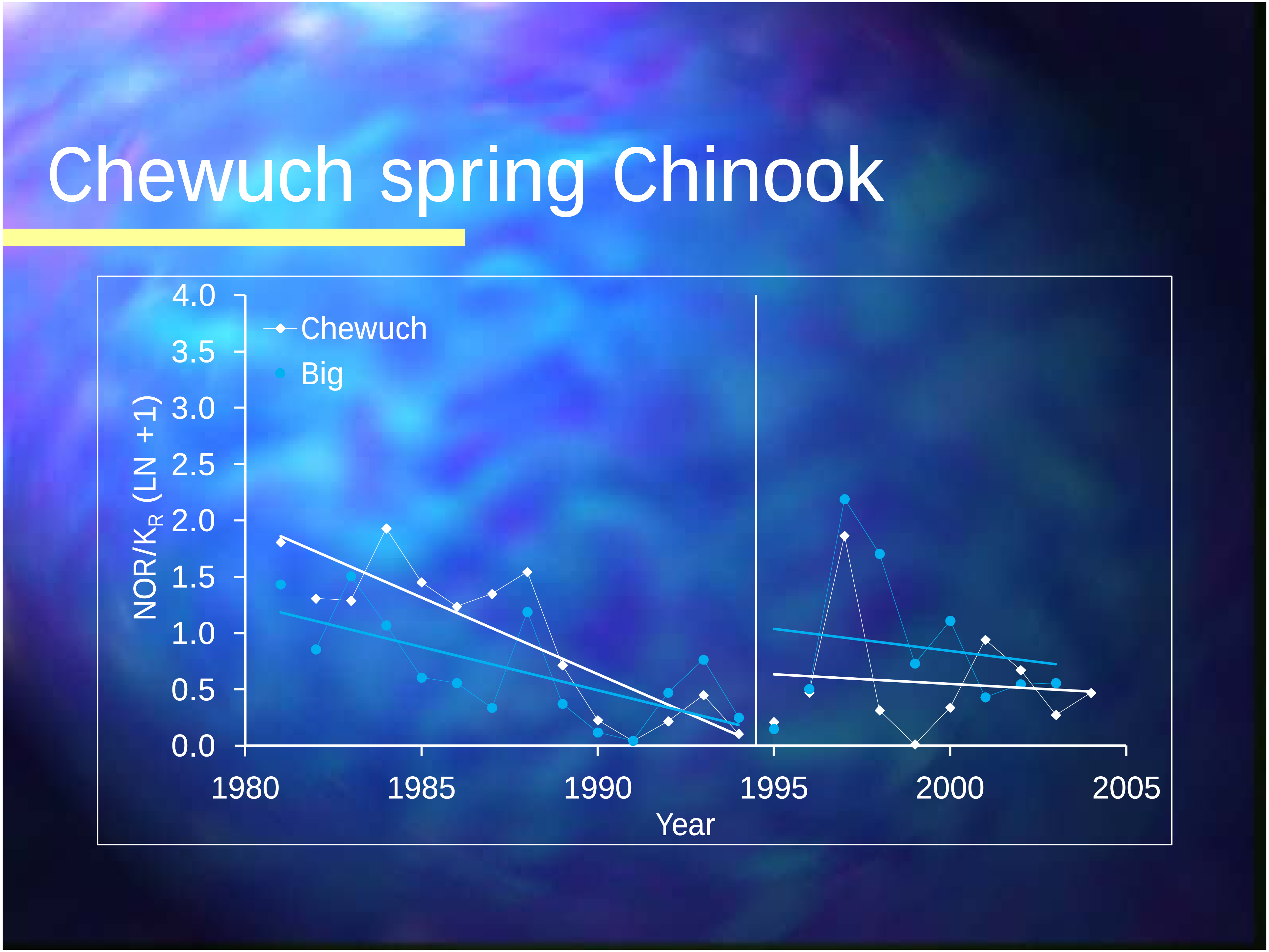

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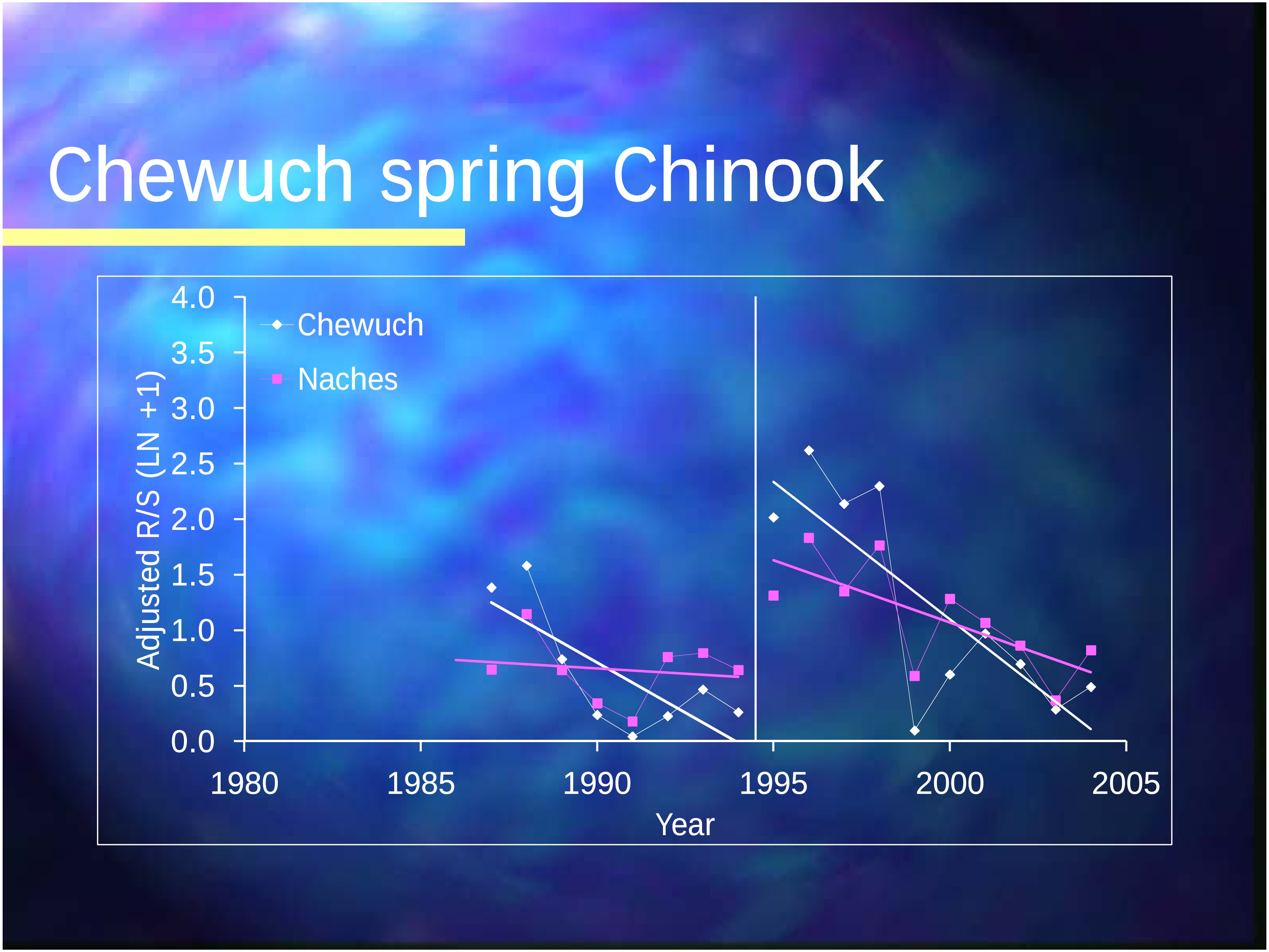

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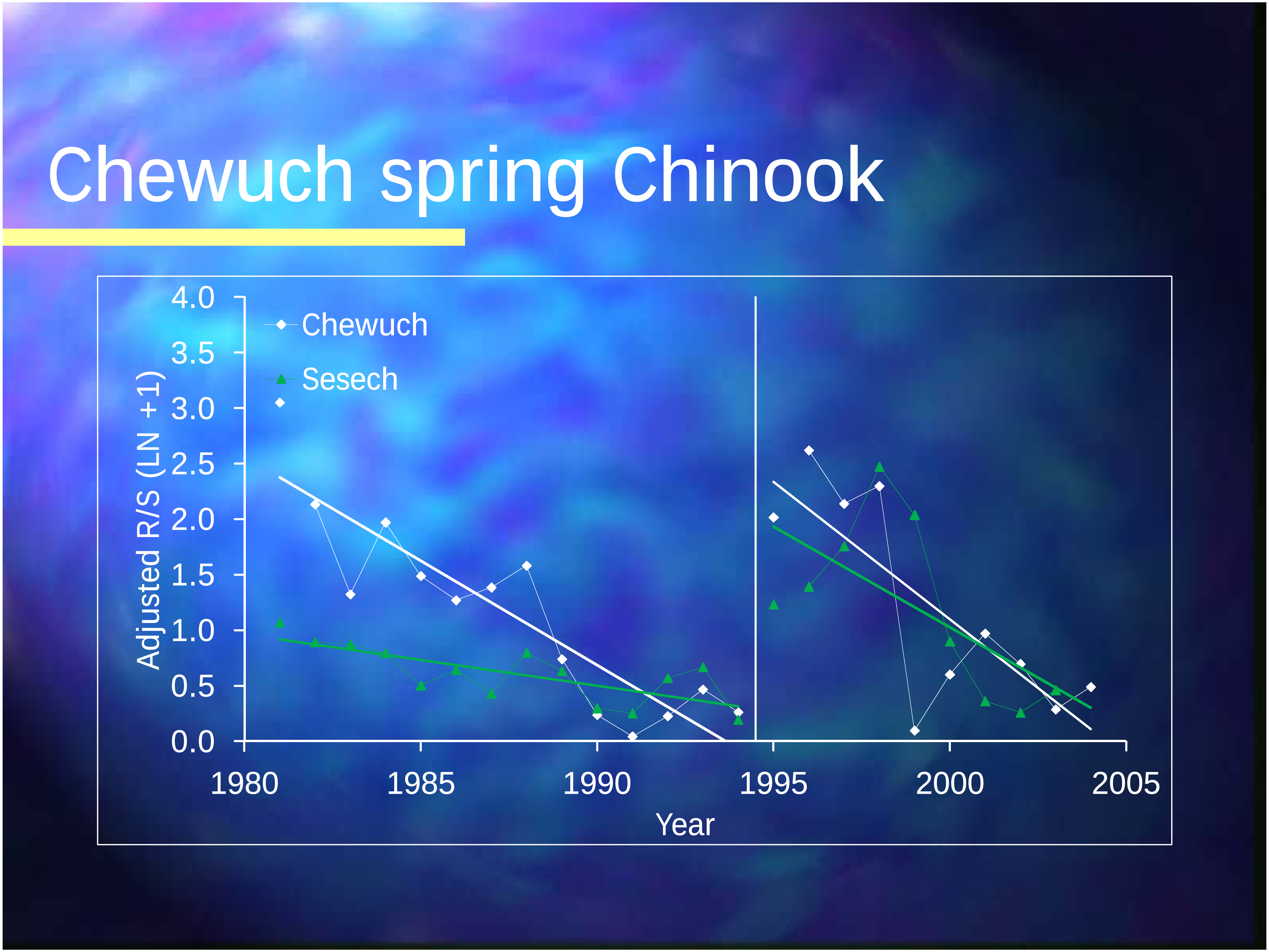

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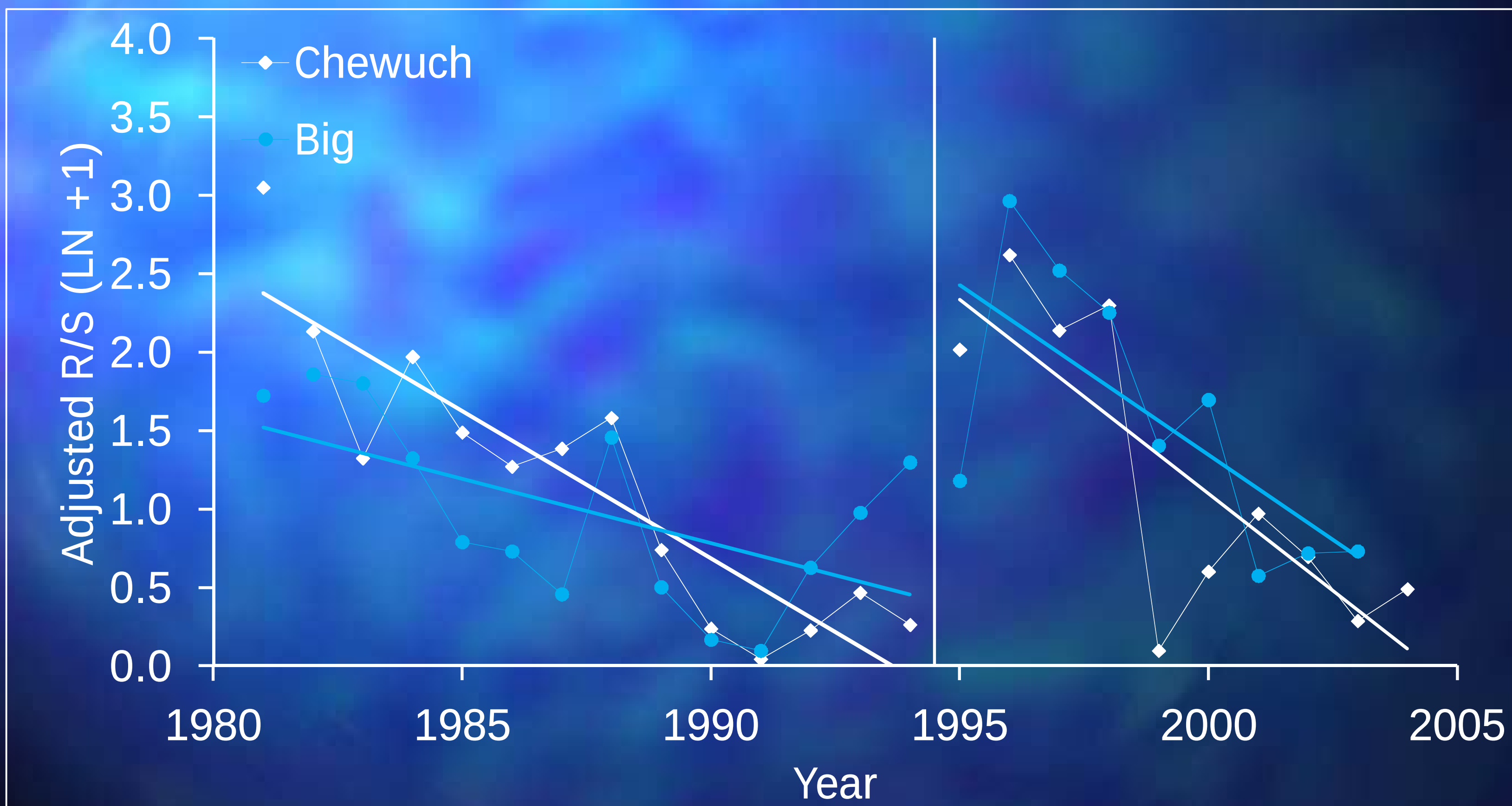
Chewuch spring Chinook



Attachment D

Chewuch spring Chinook (All years)

Response variable	Statistic	Reference populations		
		Naches	Secesh	Big
Spawner abundance	T-test (P-value)	0.172	0.038	0.703
	Effect size	0.102	0.167	0.036
	Result	ND	Decrease	ND
NOR	T-test (P-value)	0.300	0.005	0.073
	Effect size	0.298	1.443	0.696
	Result	ND	Decrease	ND
Productivity	T-test (P-value)	0.732	0.425	0.219
	Effect size	0.094	0.335	0.352
	Result	ND	ND	ND

Attachment D

Chewuch spring Chinook (No 1996 or 1998)

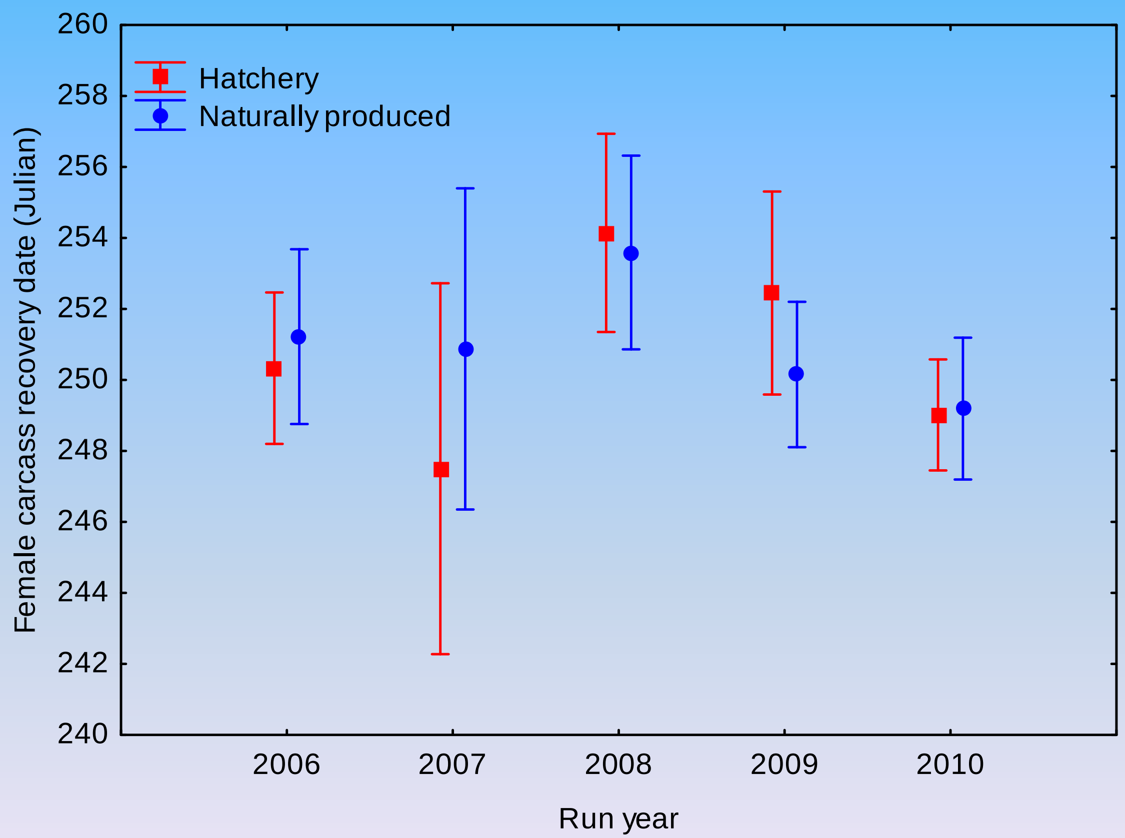
Response variable	Statistic	Reference populations		
		Naches	Secesh	Big
Spawner abundance	T-test (P-value)	0.558	0.132	0.938
	Effect size	0.039	0.105	0.007
	Result	ND	ND	ND
NOR	T-test (P-value)	0.503	0.017	0.153
	Effect size	0.210	1.36	0.615
	Result	ND	Decrease	ND
Productivity	T-test (P-value)	0.976	0.467	0.284
	Effect size	0.009	0.344	0.373
	Result	ND	ND	ND

Attachment D

Chewuch spring Chinook

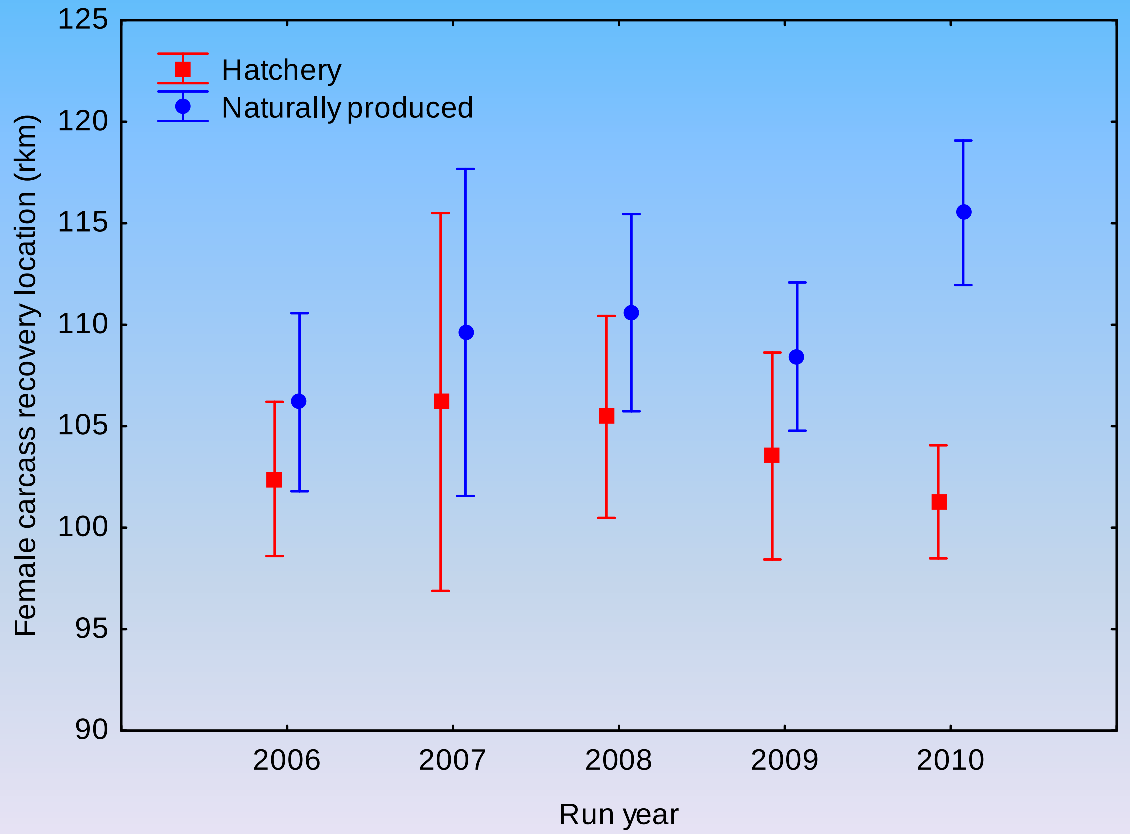
- Migration timing
  - Low sample size prevented an analysis by origin, sex, and age.

Chewuch spring Chinook



Attachment D

Chewuch spring Chinook

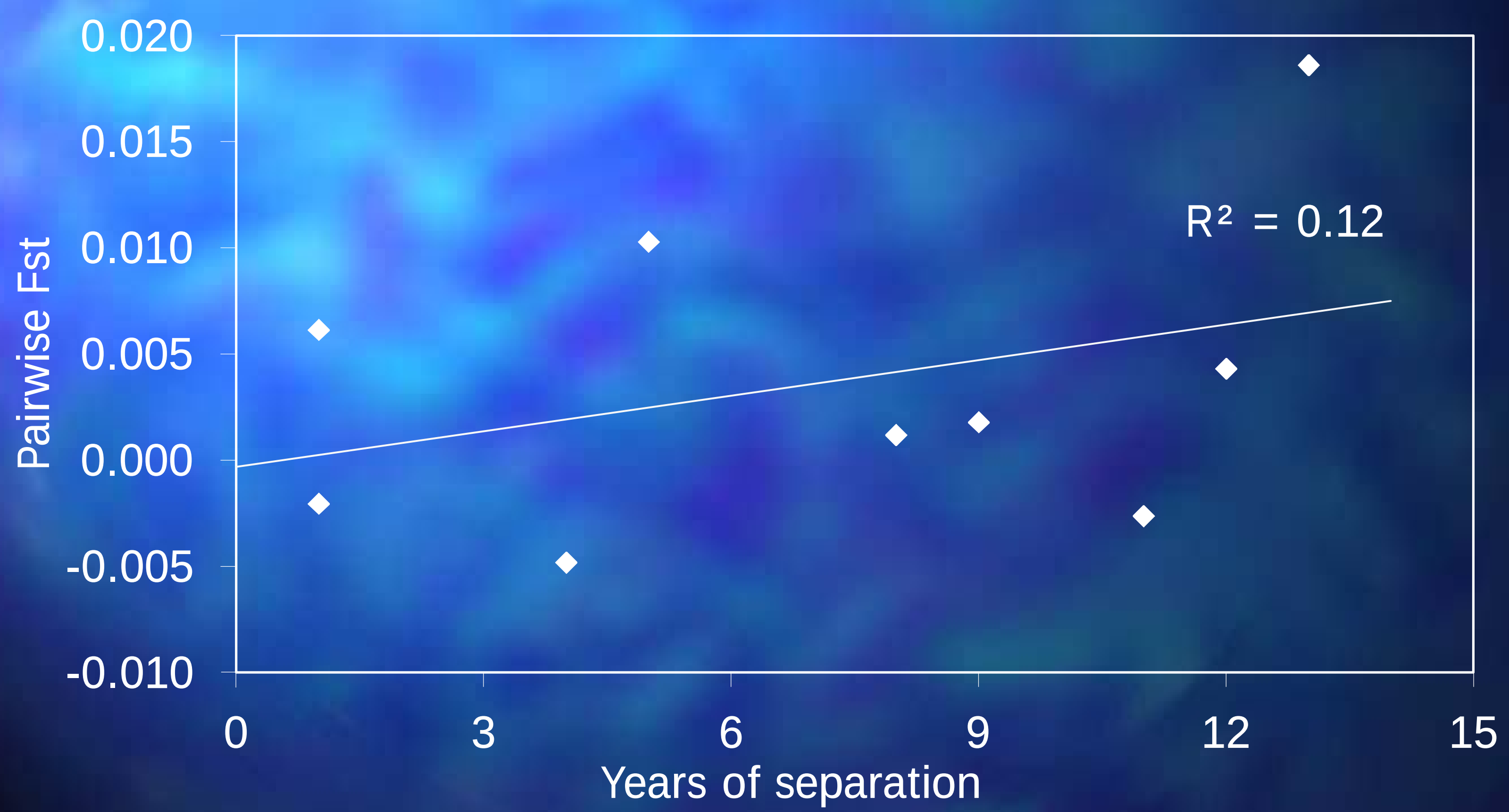


Chewuch spring Chinook

- Genetic Monitoring (Small et al. 2007)
- Hatchery and naturally produced Chewuch fish had low but significant differentiation
- Chewuch and Methow had some low differentiation, but some samples were not differentiated

Attachment D

Chewuch spring Chinook



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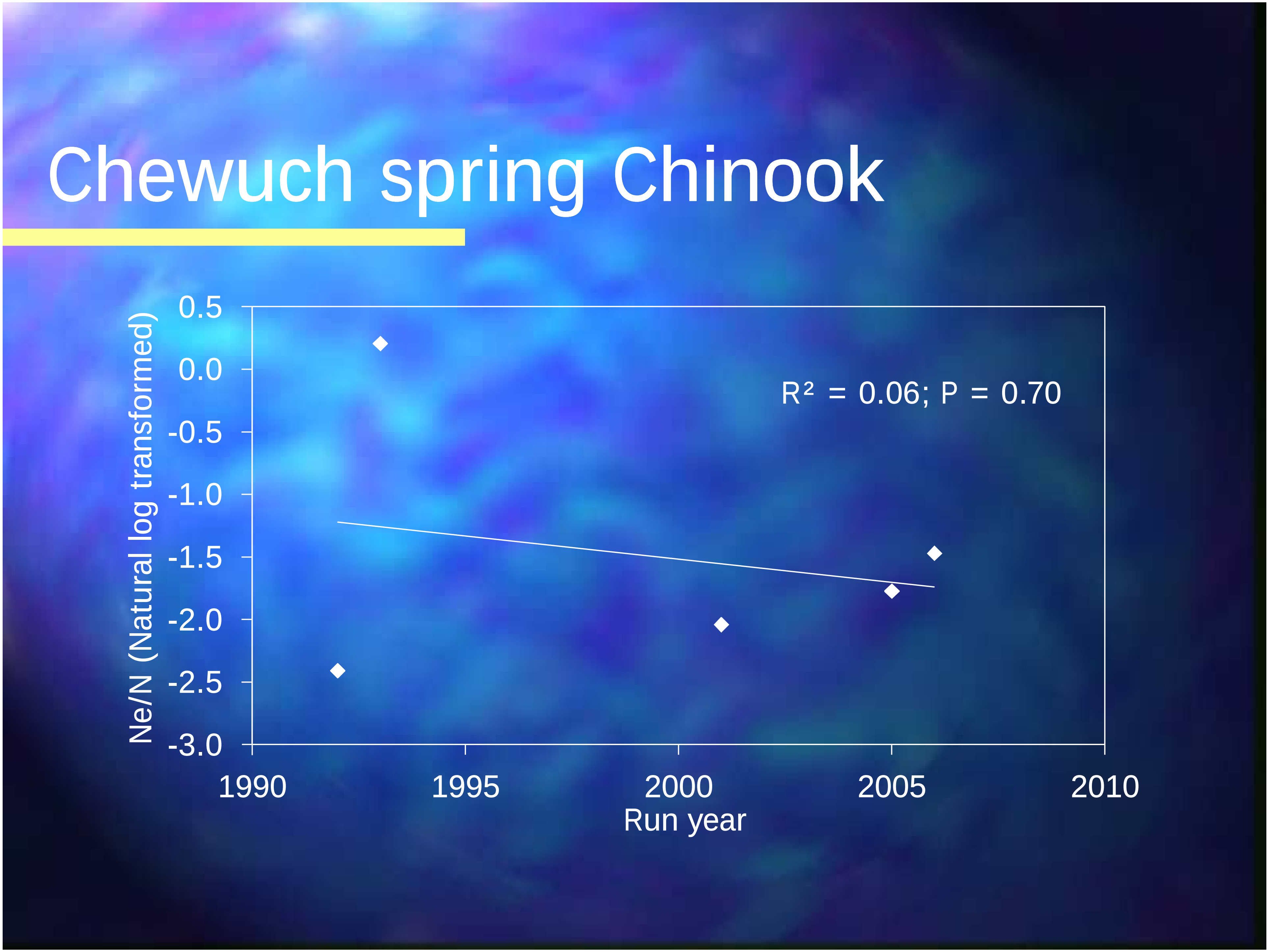

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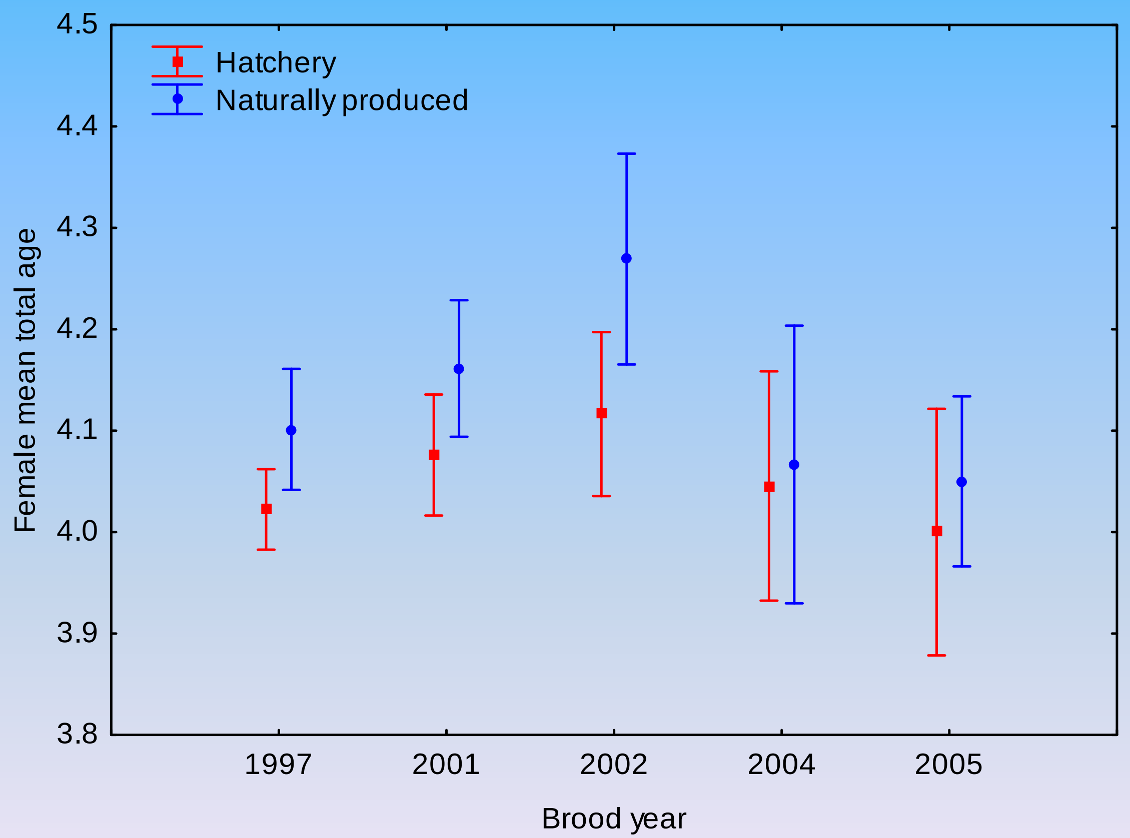

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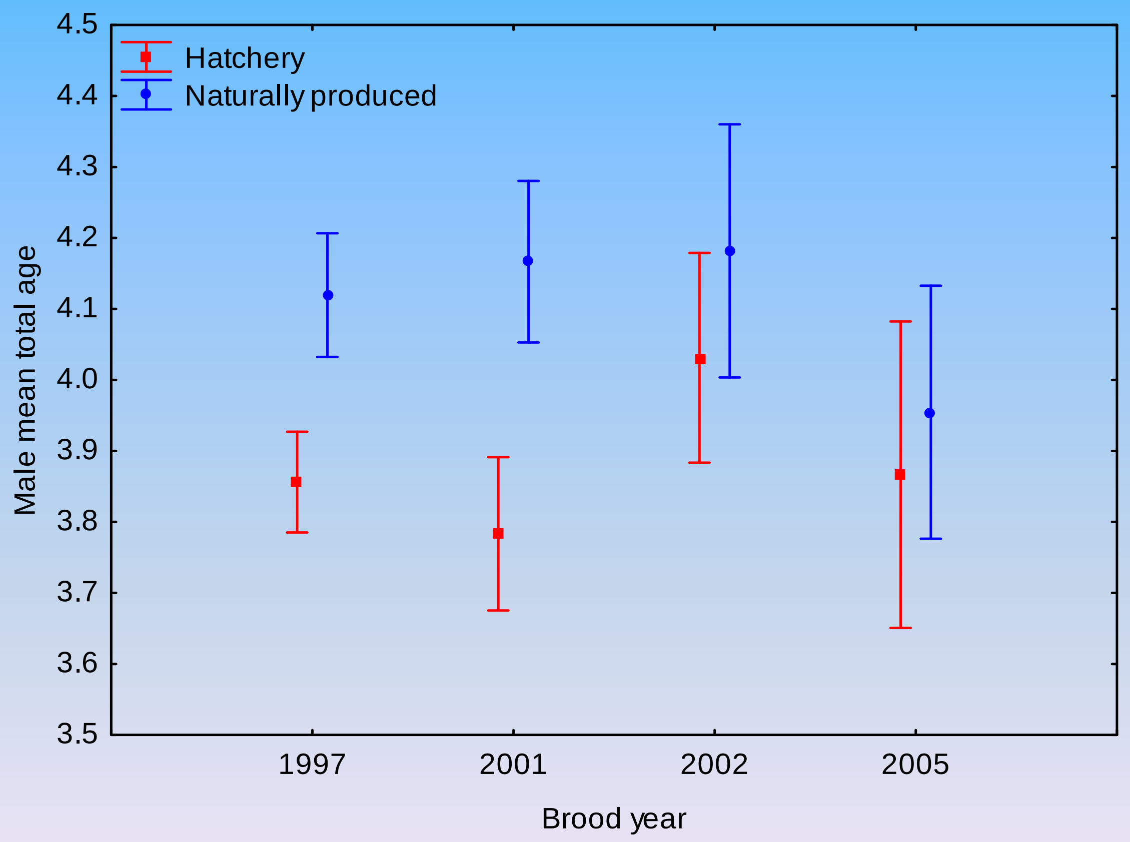

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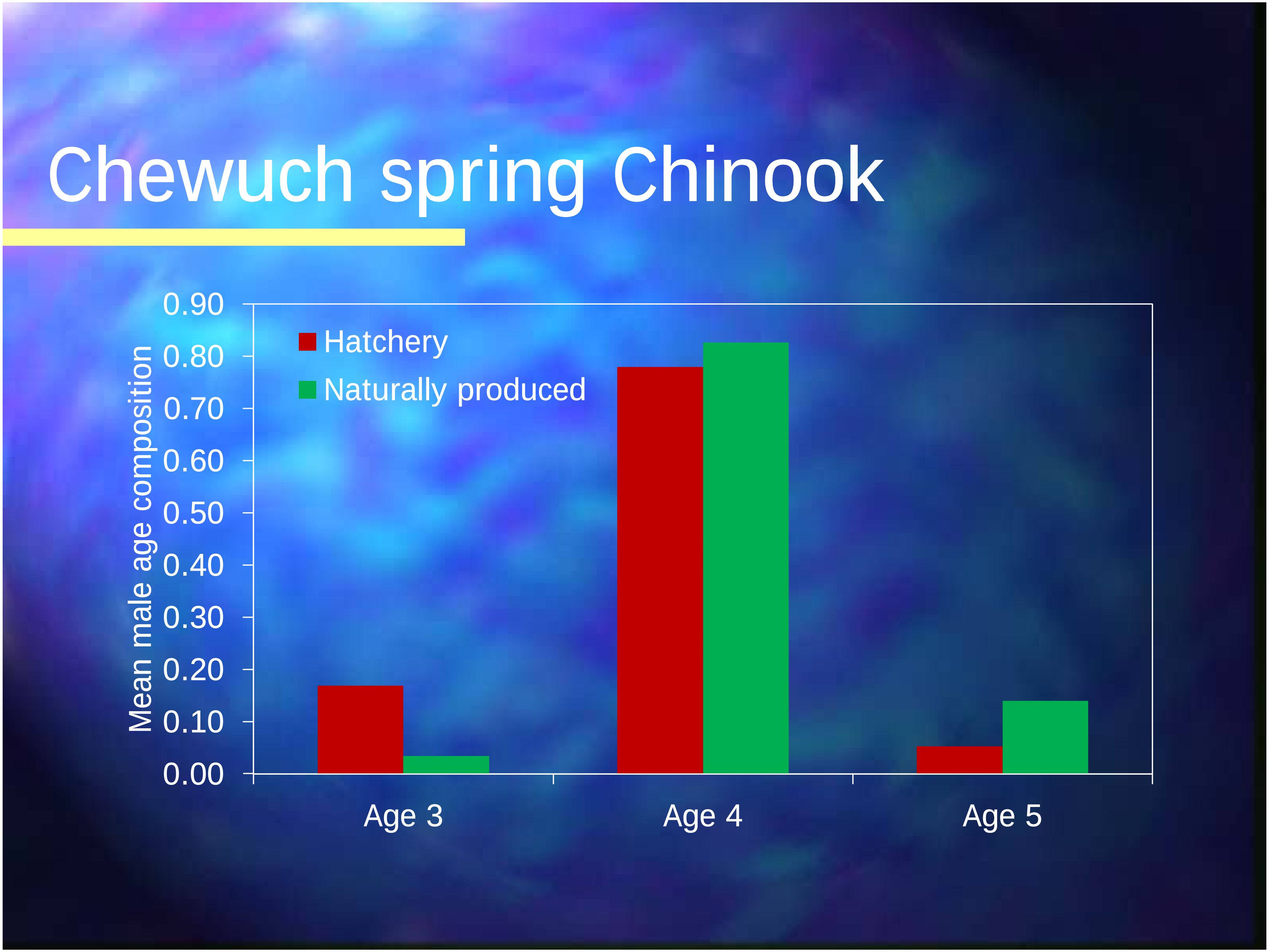
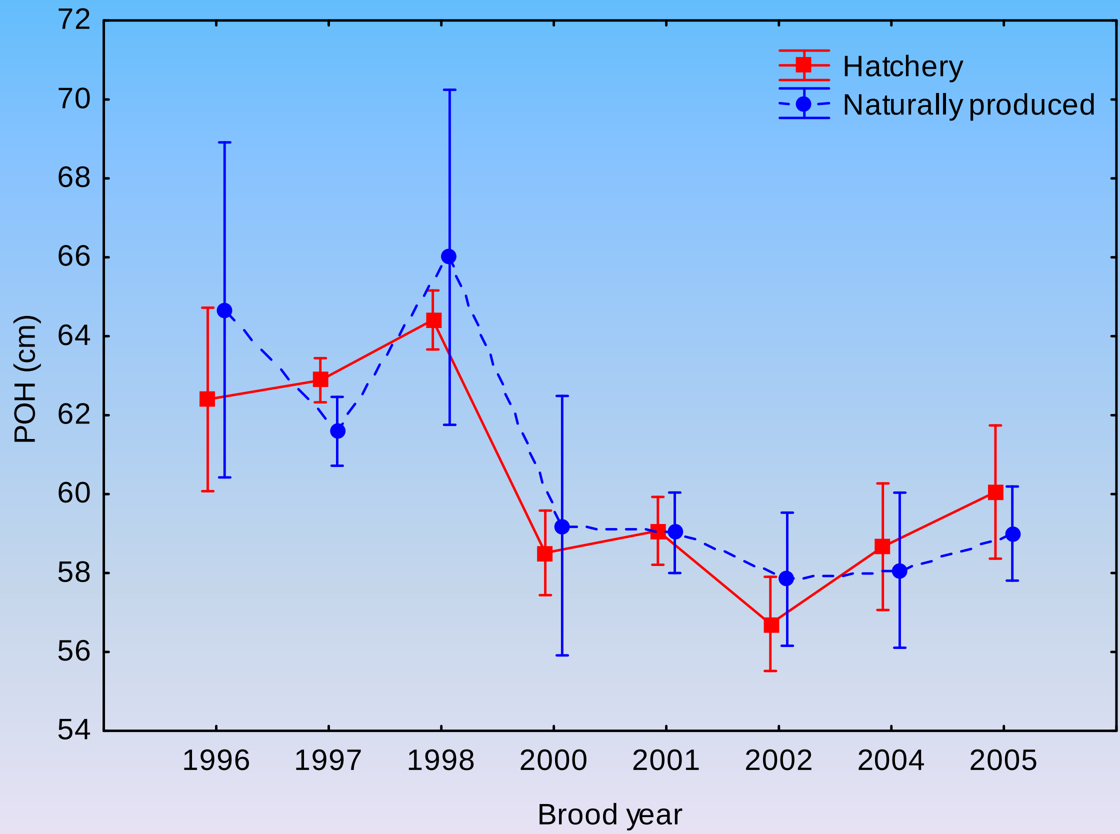


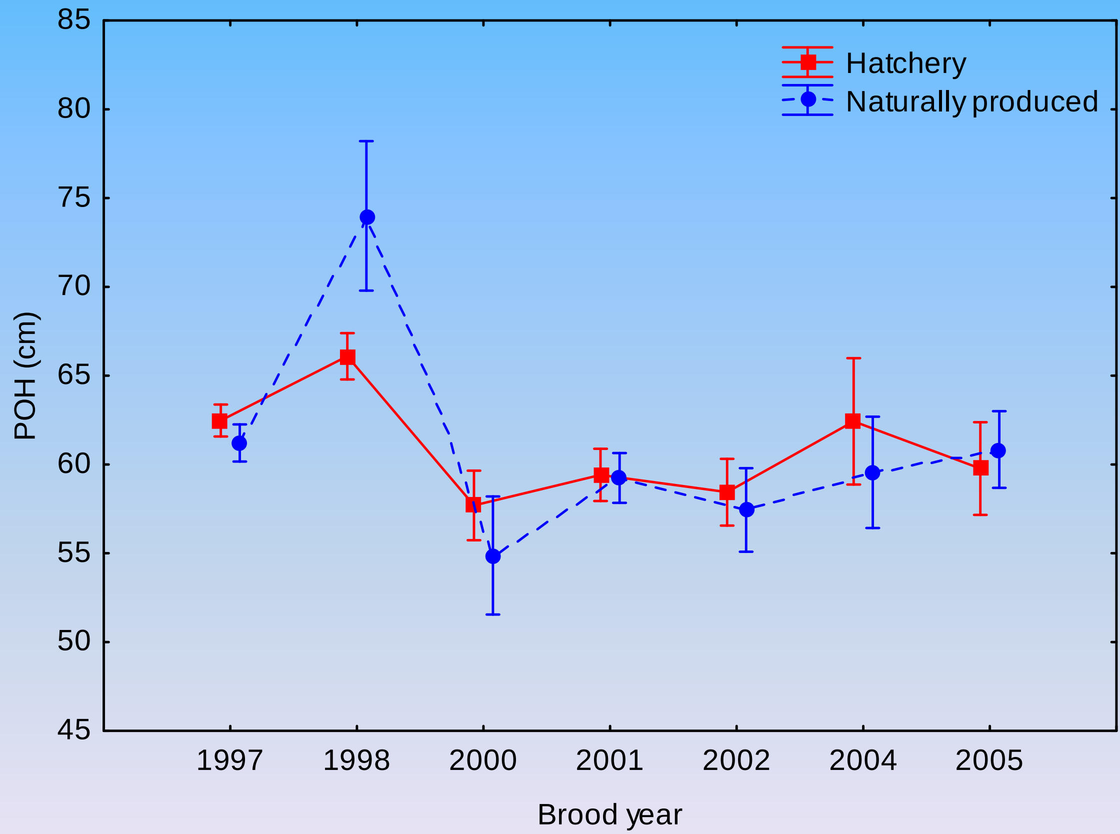
Attachment D

Chewuch spring Chinook (Age-4 female)



Attachment D

Chewuch spring Chinook (Age-4 male)



Attachment D

Chewuch spring Chinook

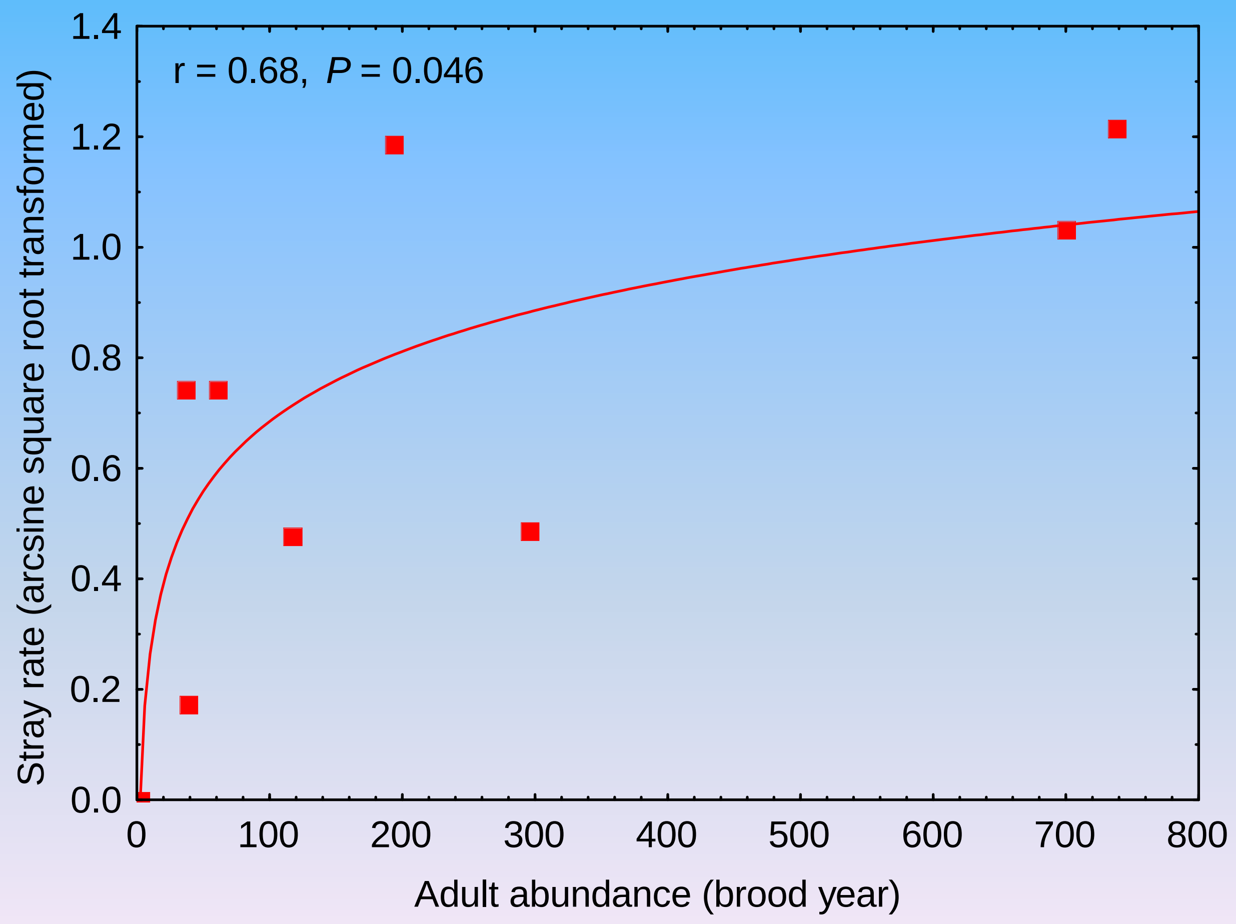
- Post release survival target (4.5)
- Results (Geometric means)
- HRR = 1.6 (P = 0.22)
- NRR = 0.5 (P = 0.08)
  - Hatchery fish have 220% survival advantage

Chewuch spring Chinook

- Stray rates targets
  - 5% brood year returns
  - 5% of spawners of receiving population
    - e.g., Chewuch straying into Entiat
  - 10% of spawners within population
    - e.g., Chewuch straying into Methow
- Results
  - Mean brood year = 43% ($P < 0.02$)
  - Mean outside pop. = 0% (Similkameen)
  - Mean within pop. = 10.5% Methow ($P = 0.57$); 0.7% Twisp ($P < 0.001$)

Attachment D

Chewuch spring Chinook



Attachment D

Chewuch spring Chinook

- Size at release targets
  - Fork length = 136 mm
  - Weight = 30.3 g
- Results
  - Fork length = 134 mm (P = 0.51)
  - Weight = 29.8 g (P = 0.81)

Attachment D

Chewuch spring Chinook

- Number released
  - Yearling target = 183,333
- Results
  - Number released = 172,189 (P = 0.61)
  - Very low pNOB
    - 1992 – 2010 Geo. Mean = 10%

Chewuch spring Chinook

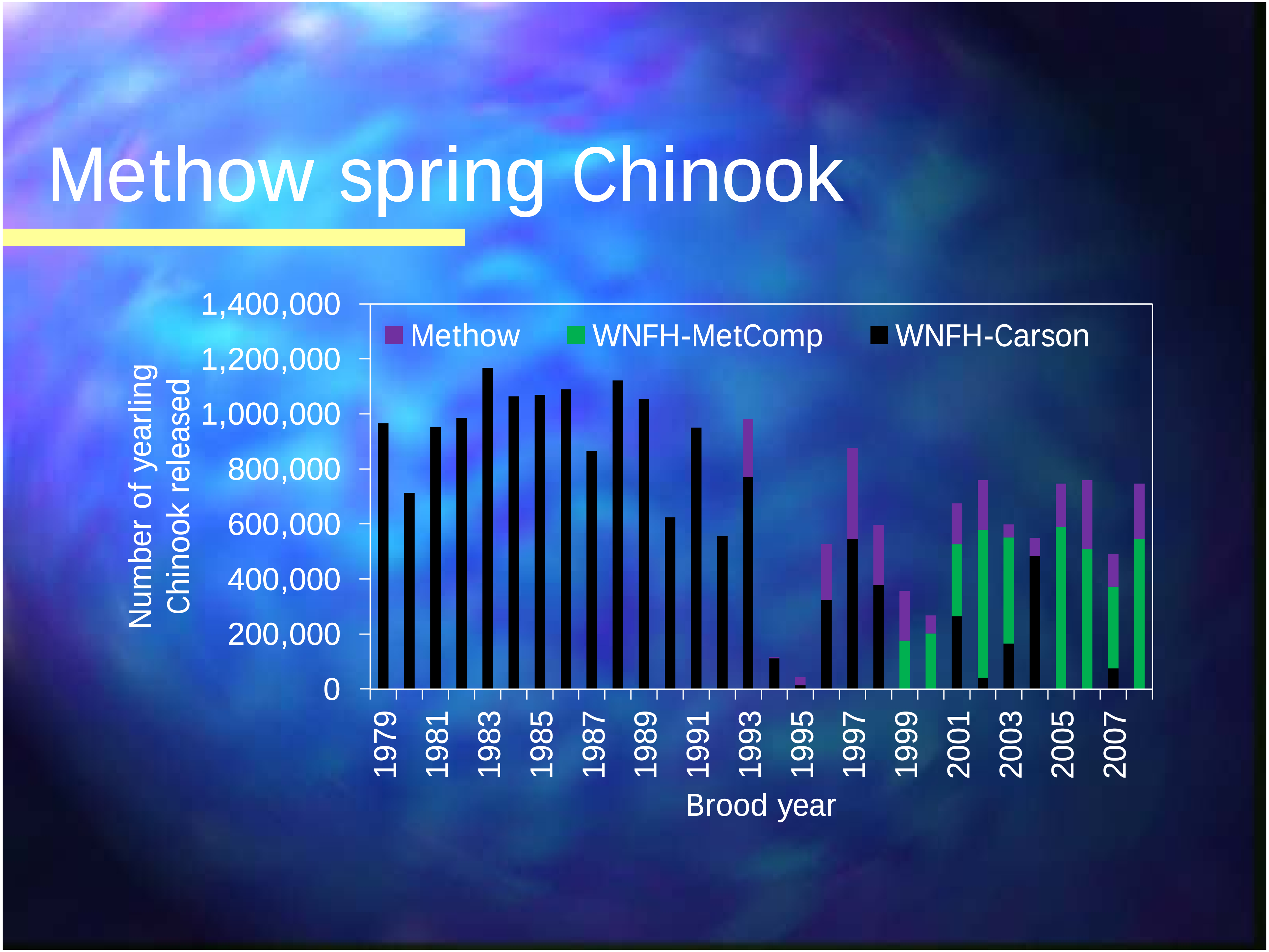
- Freshwater productivity
  - Data incomplete or unavailable
  - USGS currently operating screw trap in old YN location, but not estimating production

Attachment D

Chewuch spring Chinook

- Harvest
- No adipose fin clips since 2000 brood.
- Mean 1992 – 1999 = 17%
- Mean 2000 – 2004 = 9% (including hooking mortality)

Attachment D



Attachment D

Methow spring Chinook

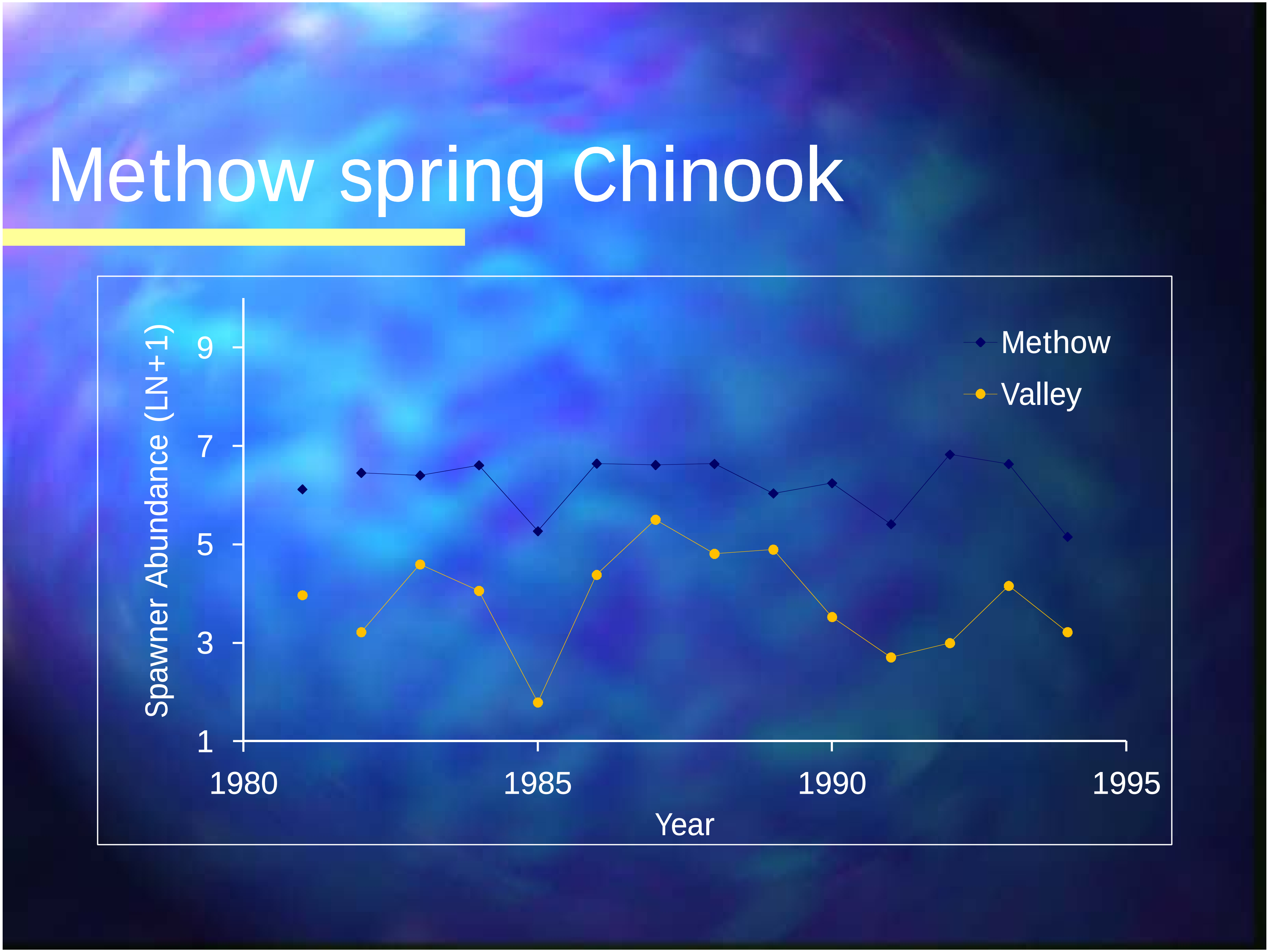
- Reference stream comparisons (BACI)
- Log transformed data to meet assumptions
- Made adjustments for differences in carrying capacity (i.e., smooth hockey stick)
  - NORs adjusted by maximum number of recruits produced (NORs/Kr)
  - Productivity (R/S) adjusted by maximum number of spawners (R/Ksp)

Attachment D

Methow spring Chinook

- Reference stream analysis
  - pHOS in both before and after periods
  - Correlation in before period
  - Difference in trends in before period
  - CV of ratio scores (T/C)

Attachment D



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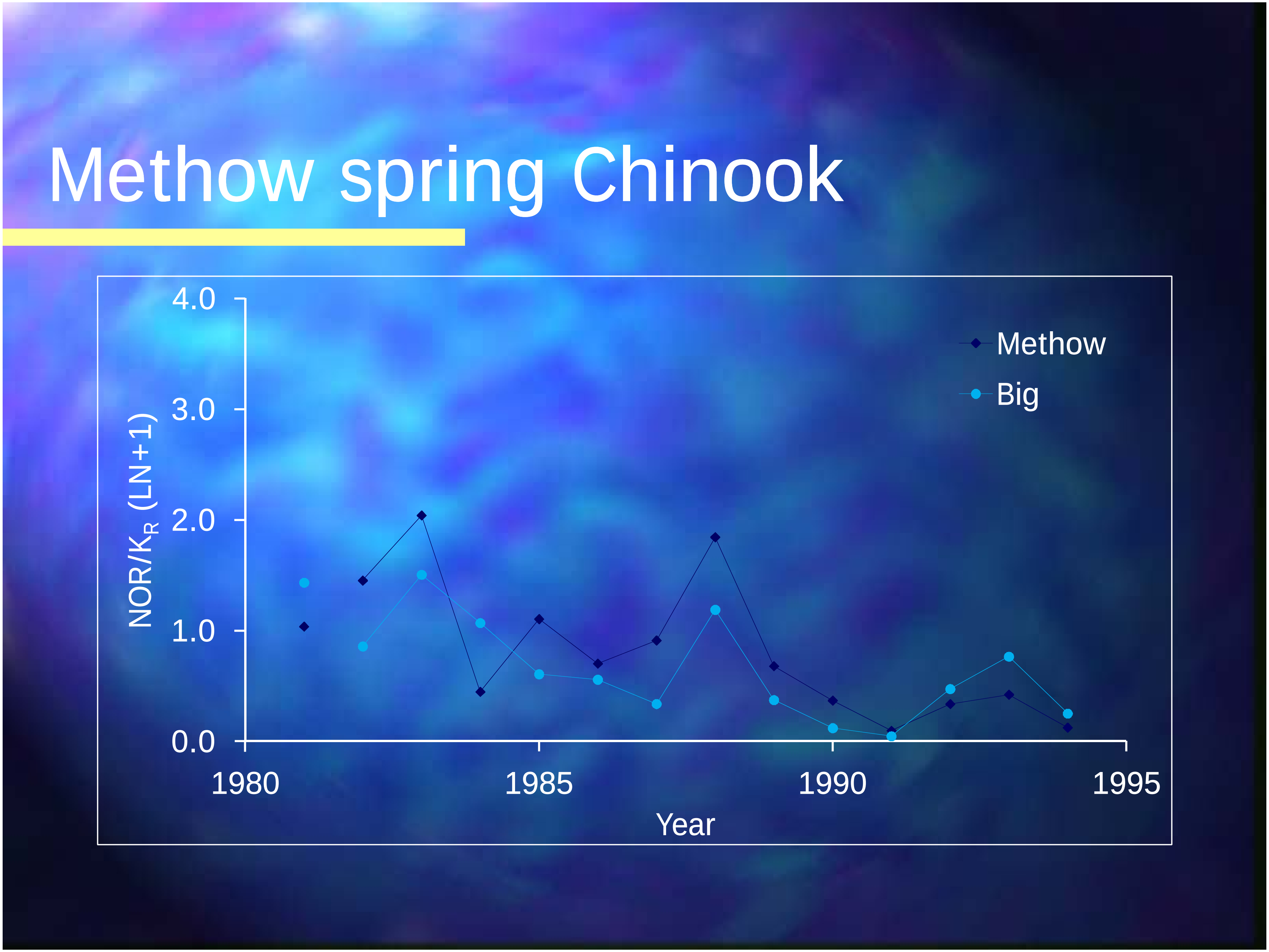

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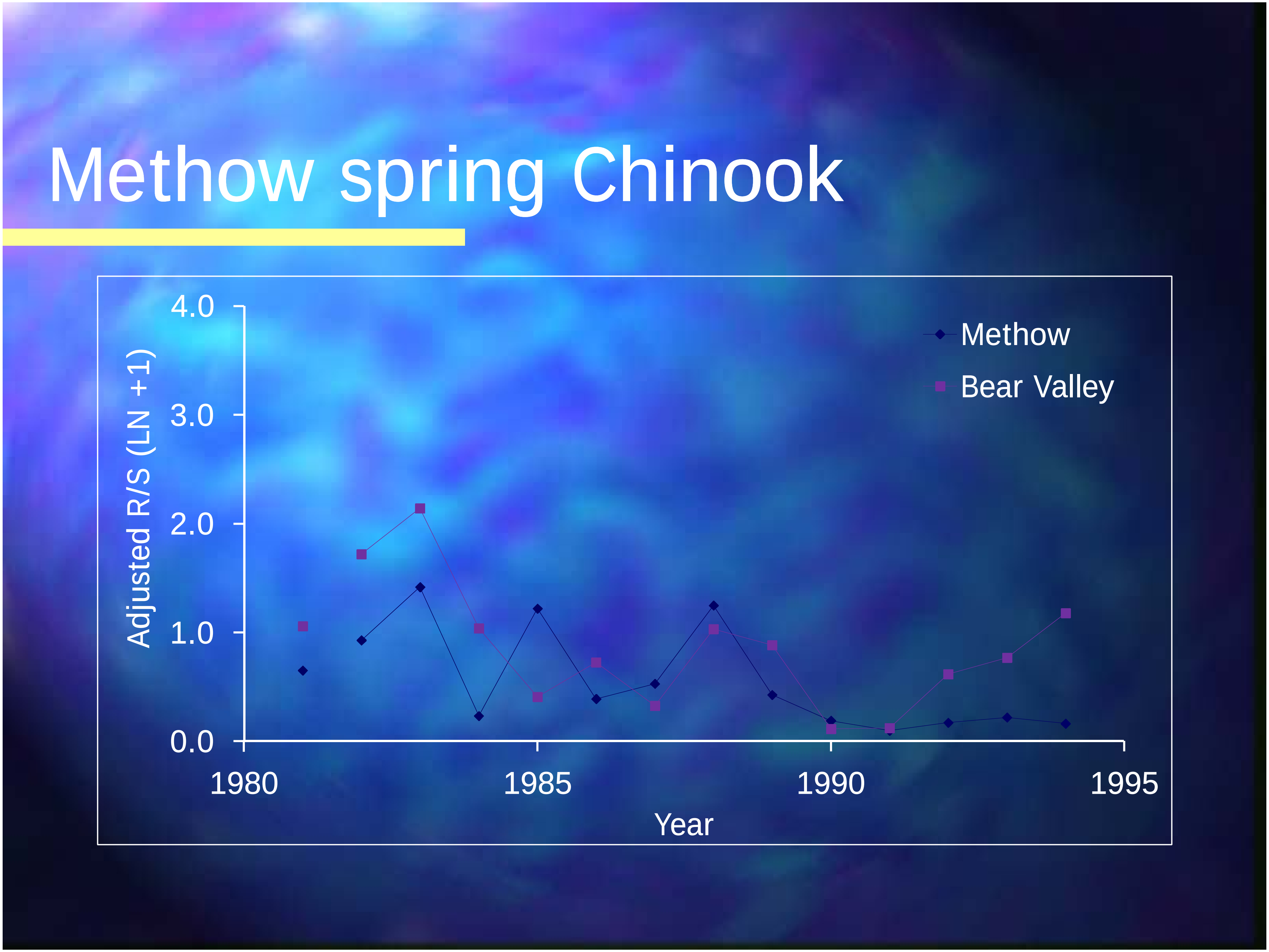
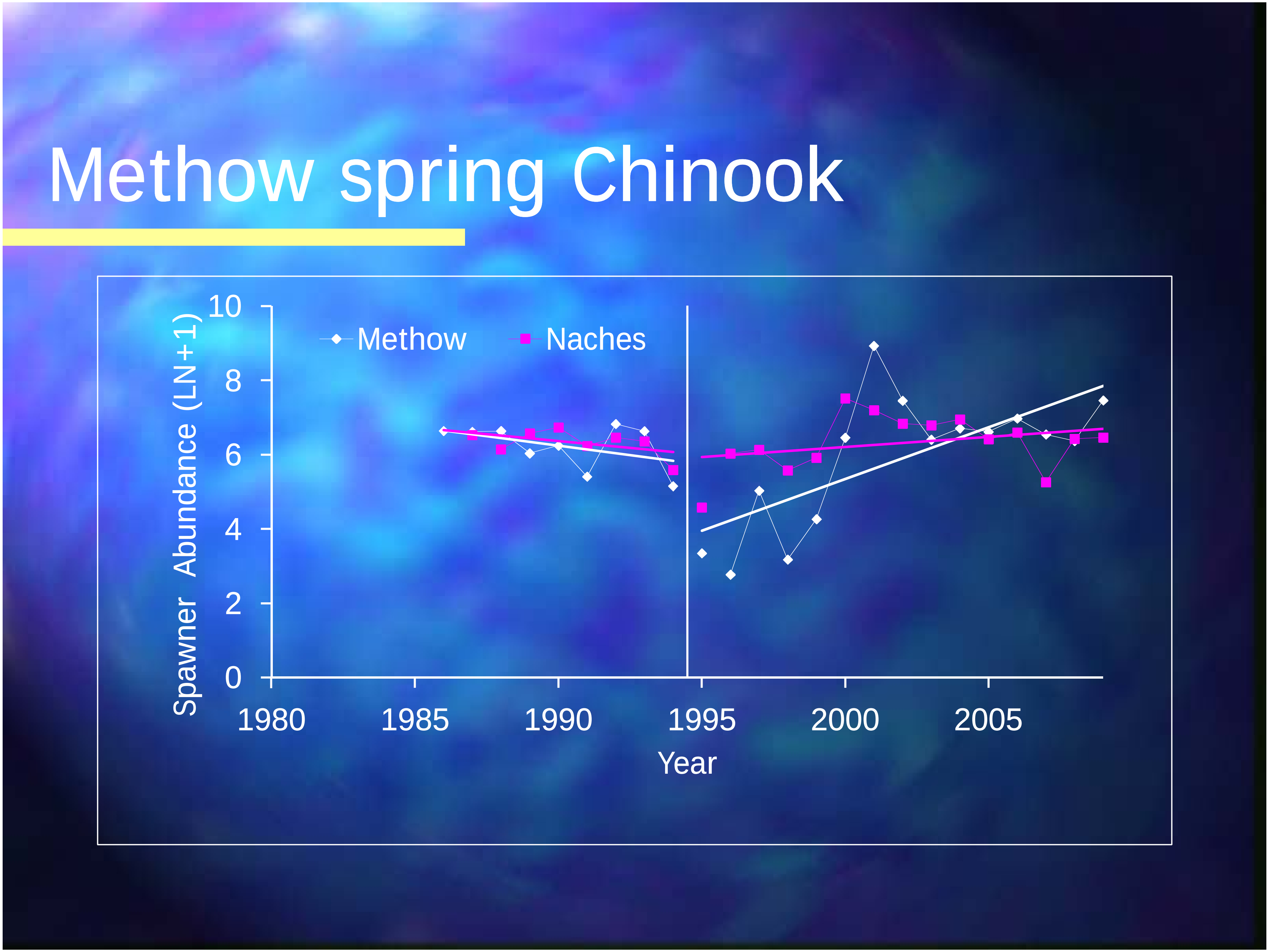


Attachment D

Methow Reference Streams

Reference populations	Weighted score			Ranking		
	Spawner abundance	Natural origin recruits	Productivity	Spawner abundance	Natural origin recruits	Productivity
Naches	92	86	87	1	3	1
Valley	91	-	-	2	-	-
Marsh	89	86	84	3	3	3
Secesh	84	85	82	-	4	4
Big	88	89	87	4	1	1
Bear Valley	85	87	85	5	2	2

Attachment D



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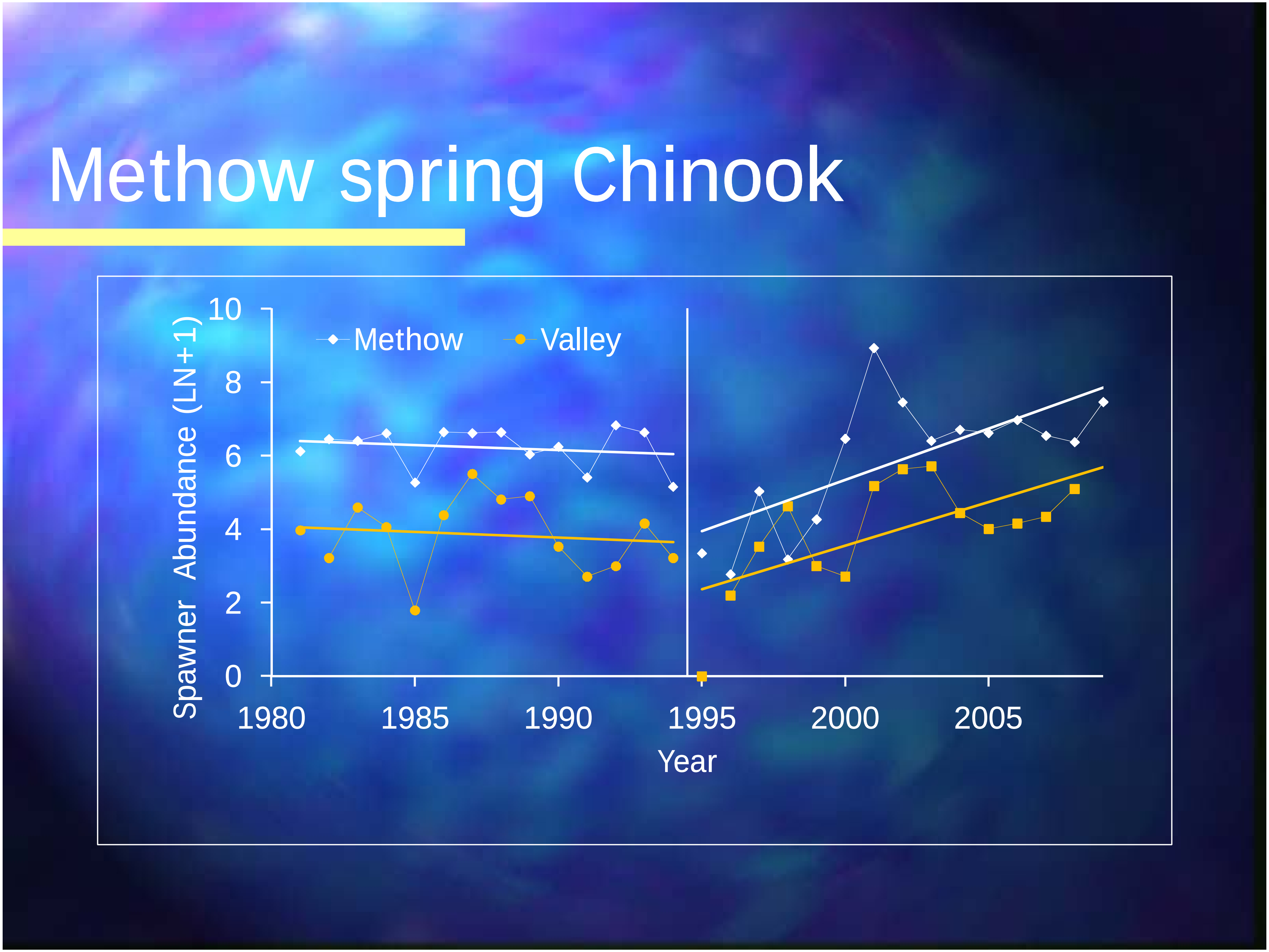

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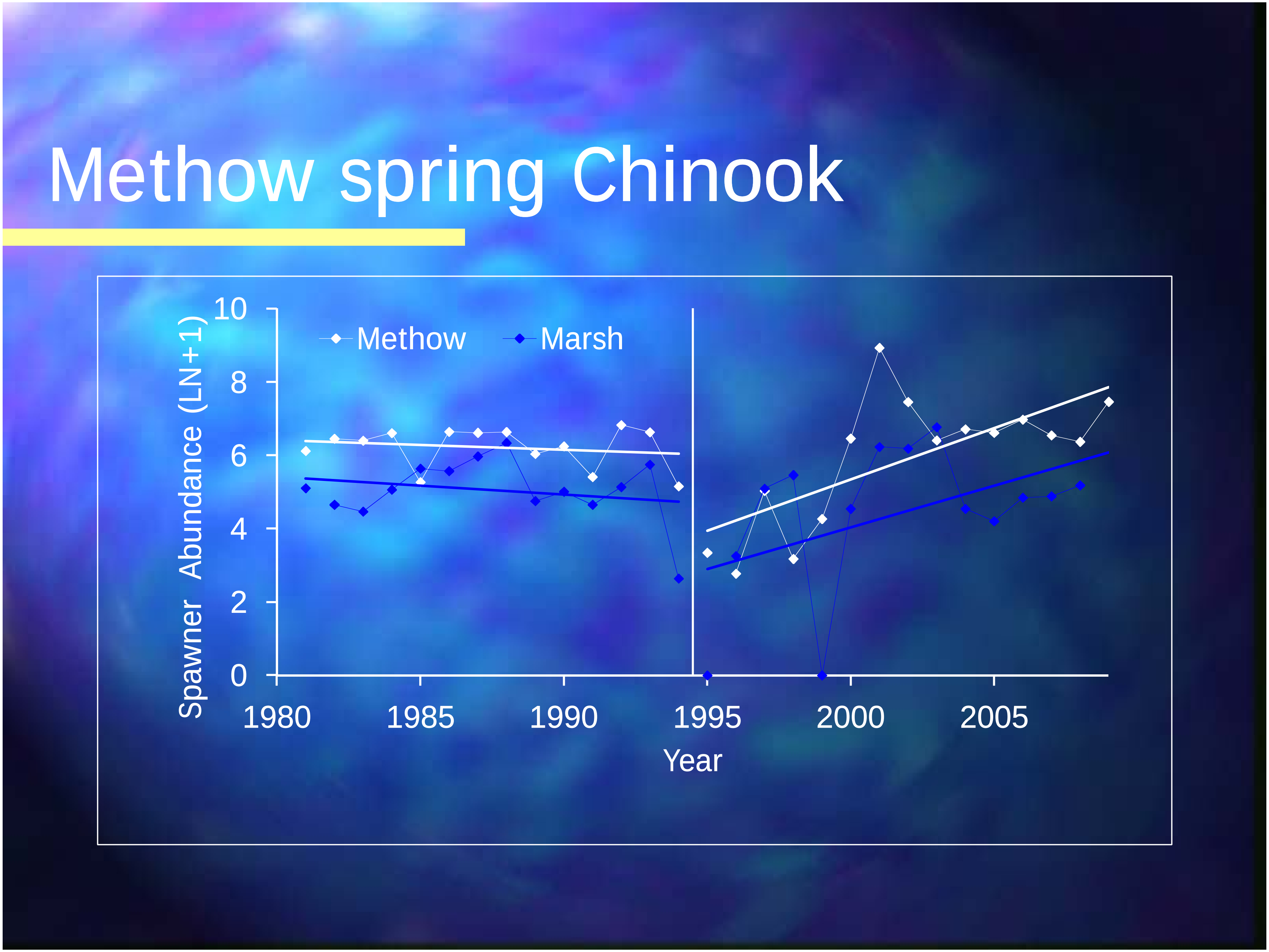

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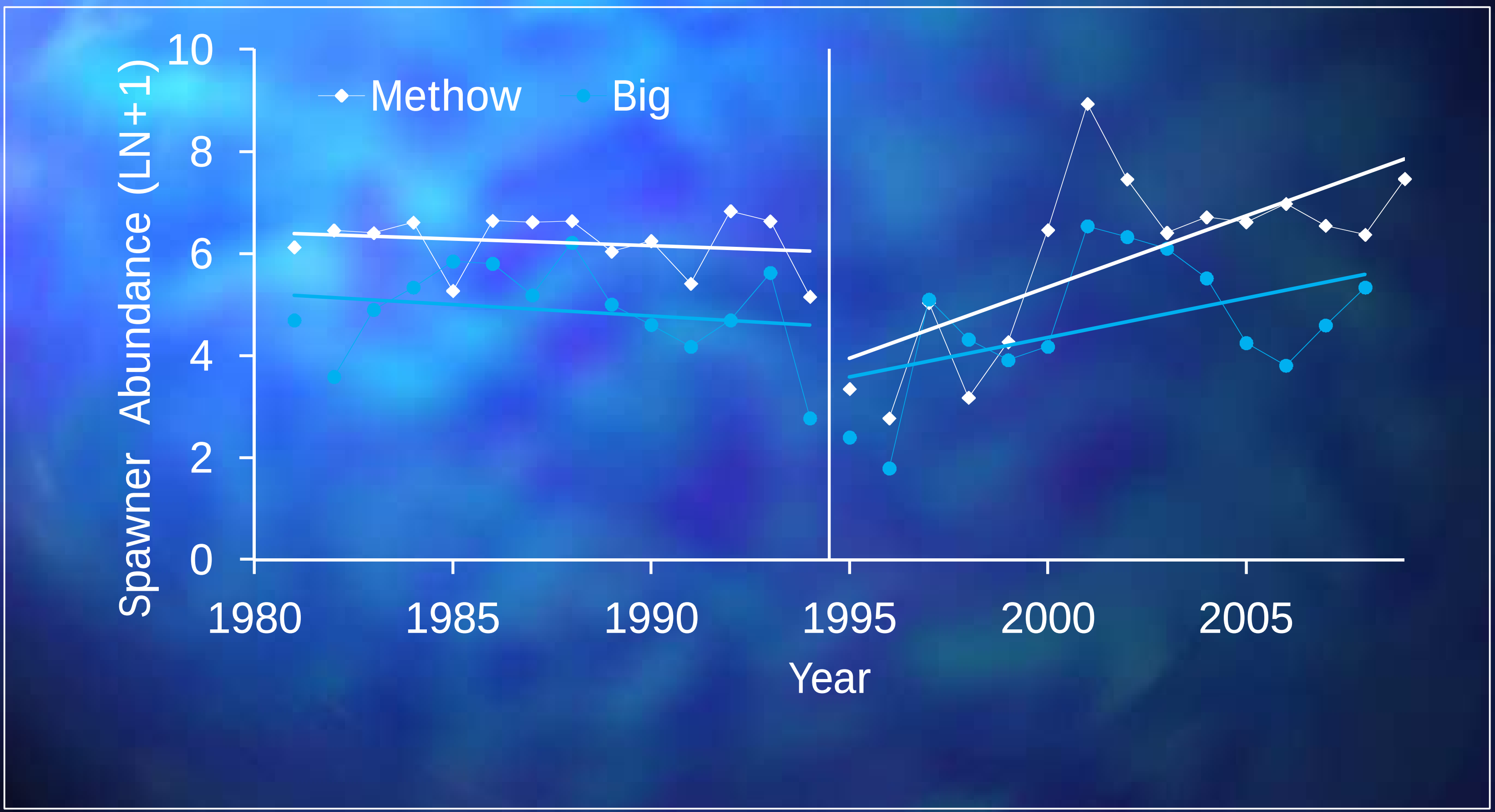
Methow spring Chinook



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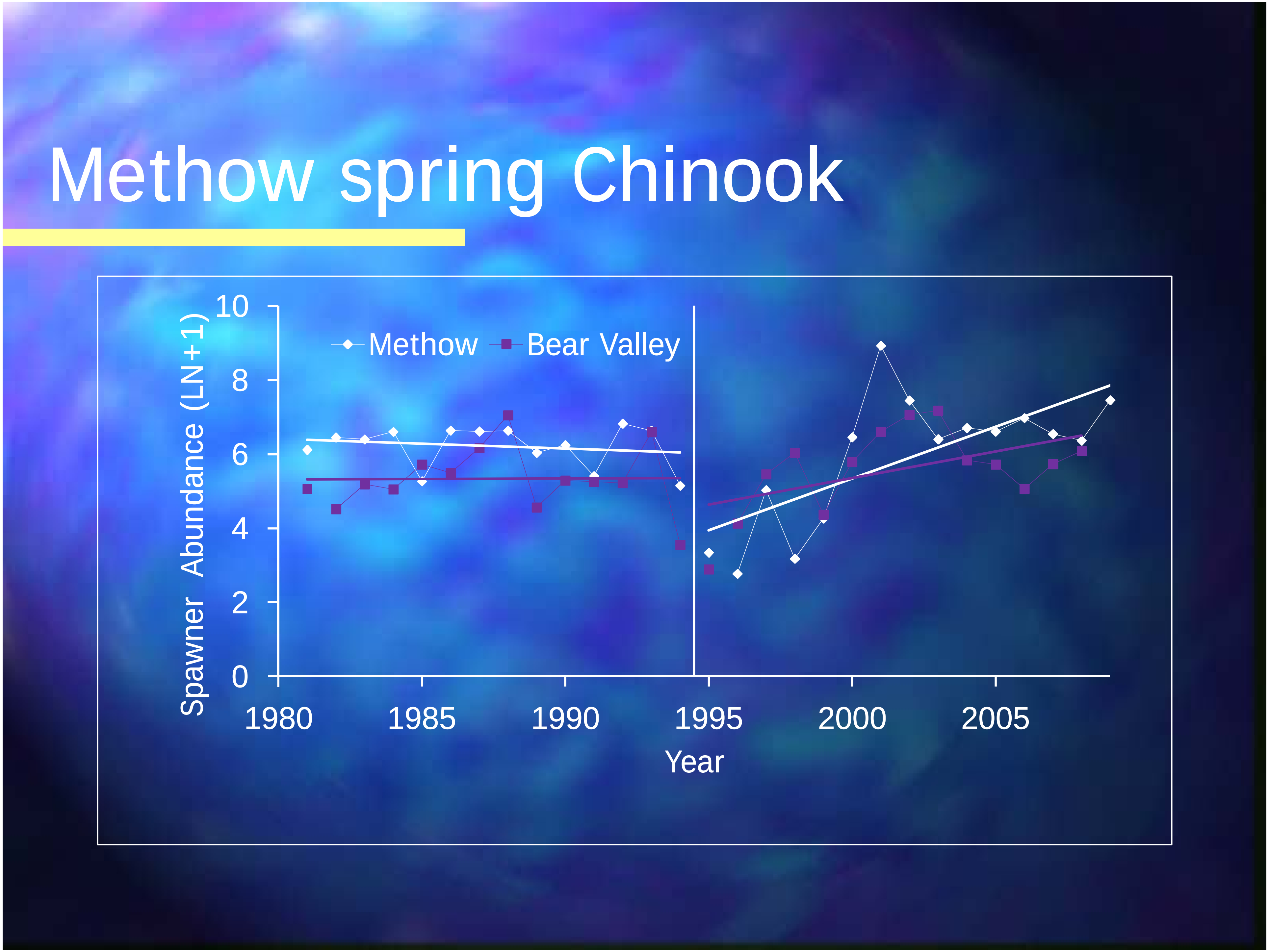

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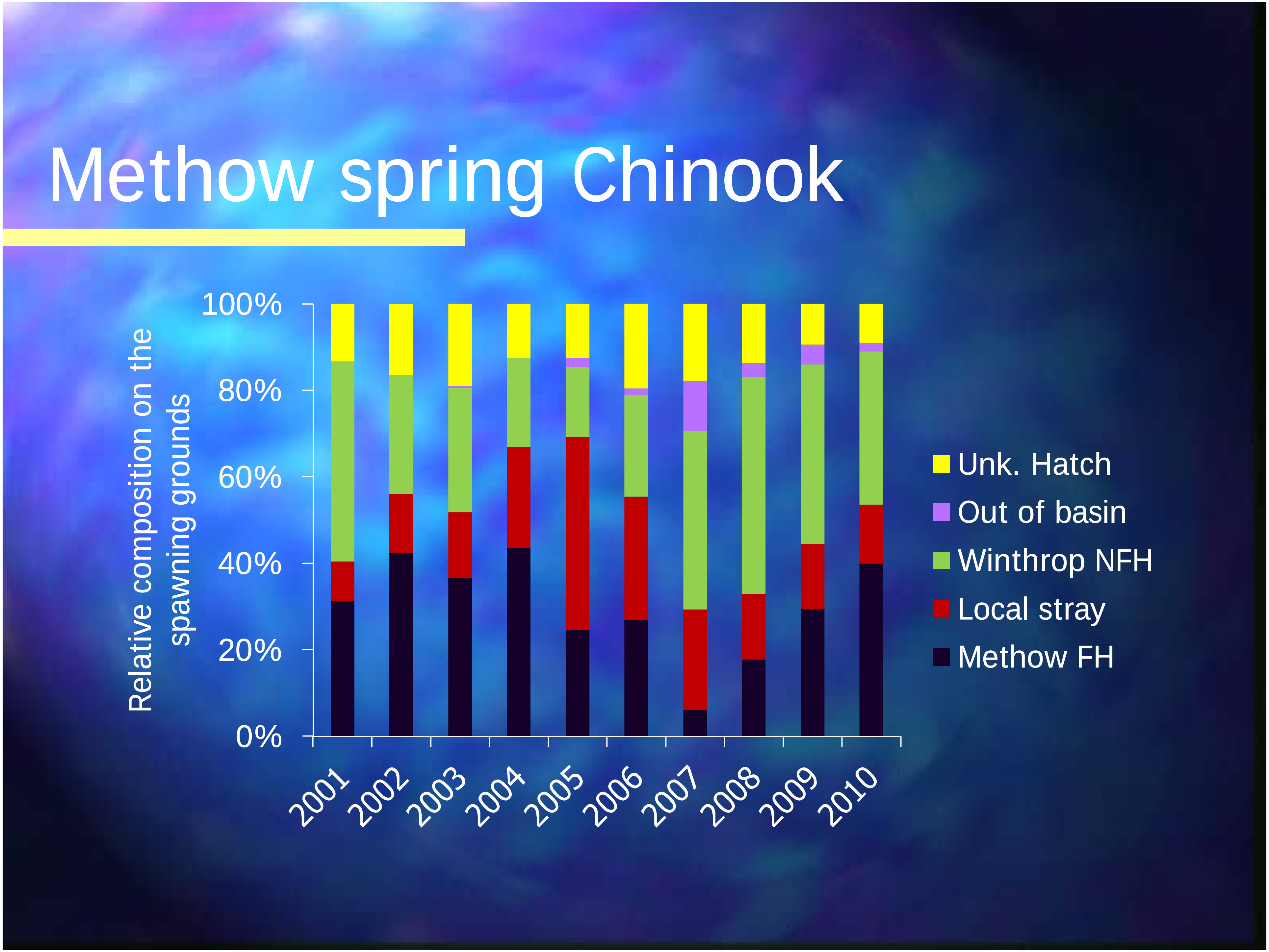

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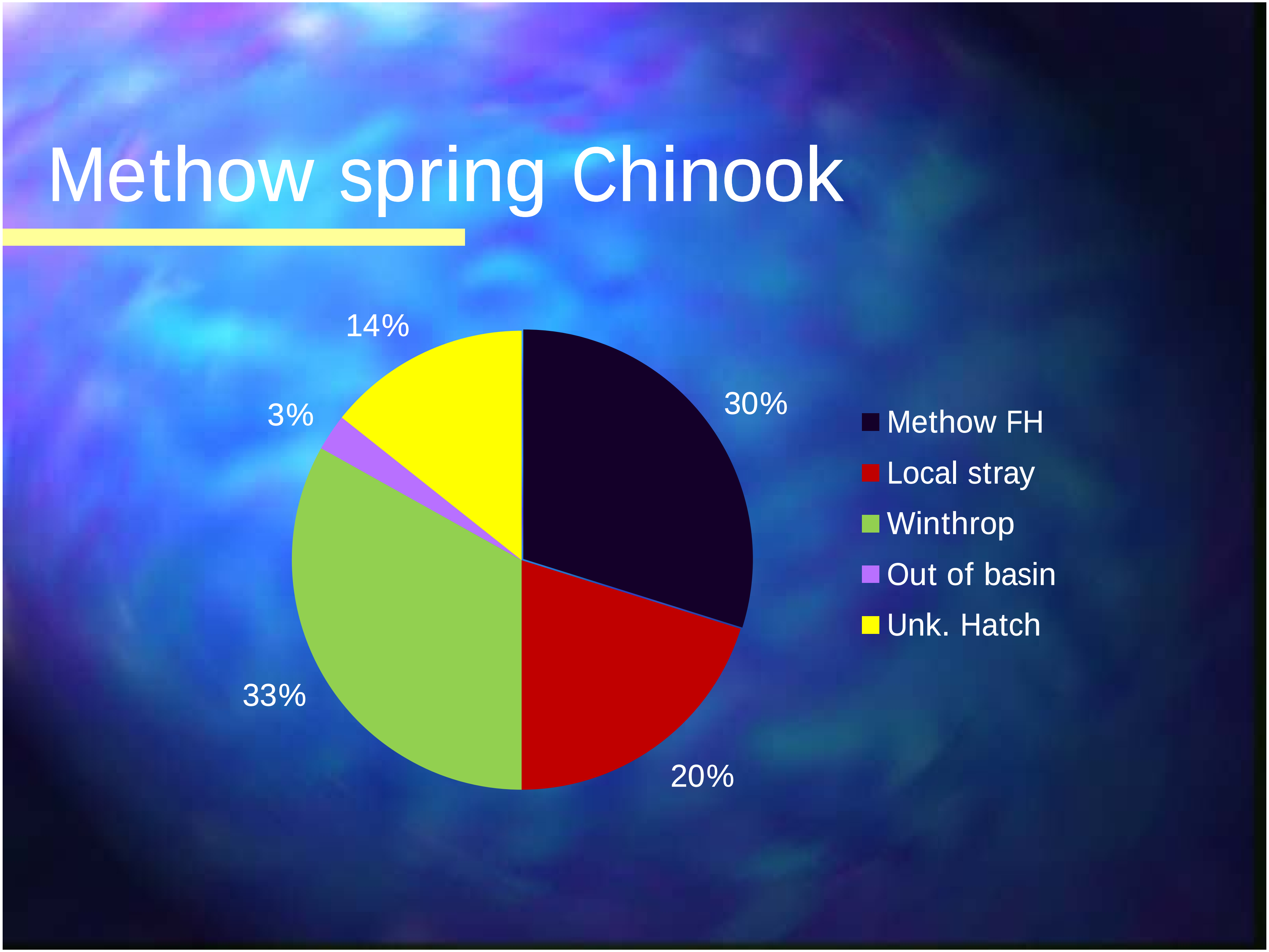

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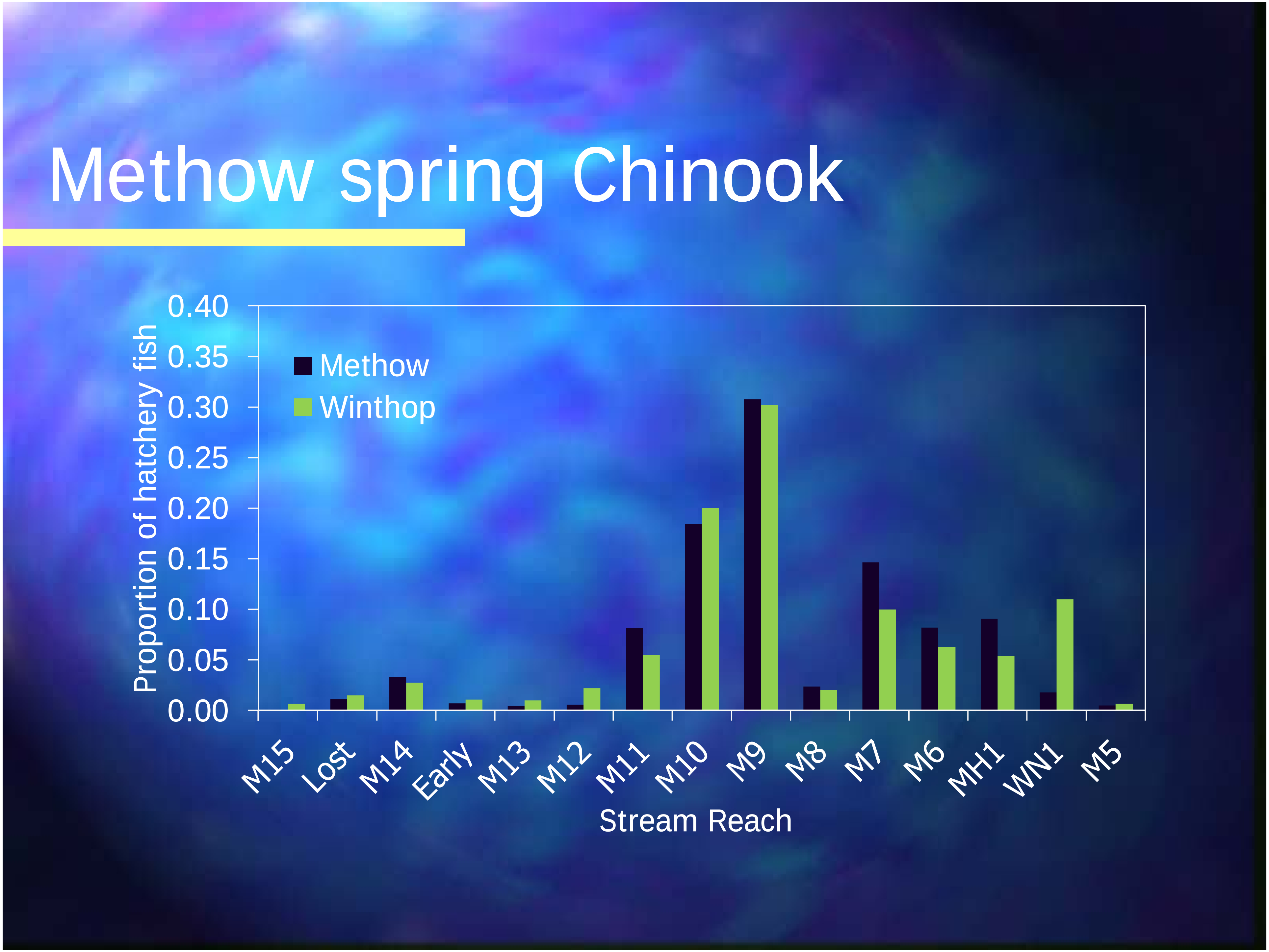

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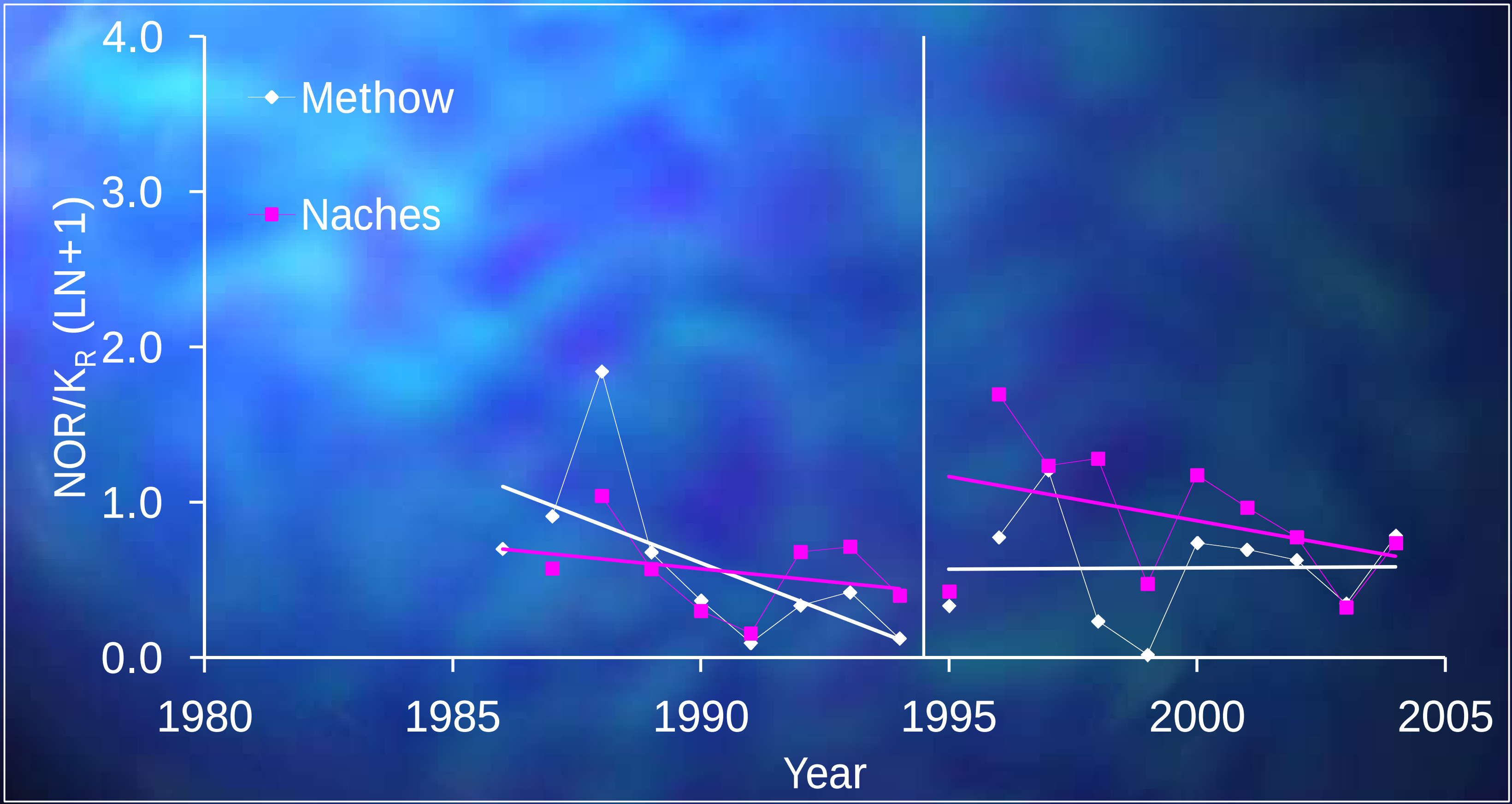
Methow spring Chinook



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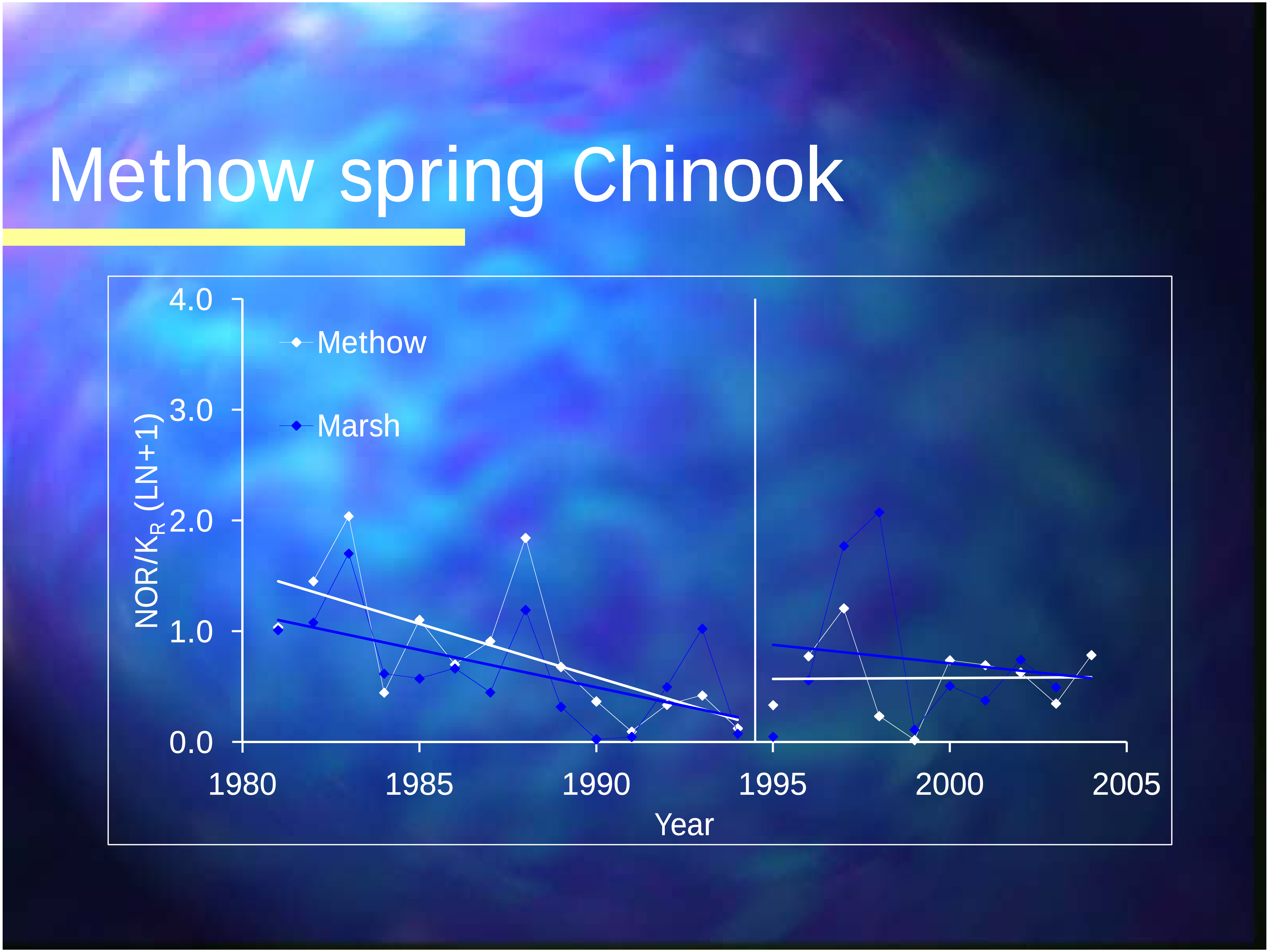

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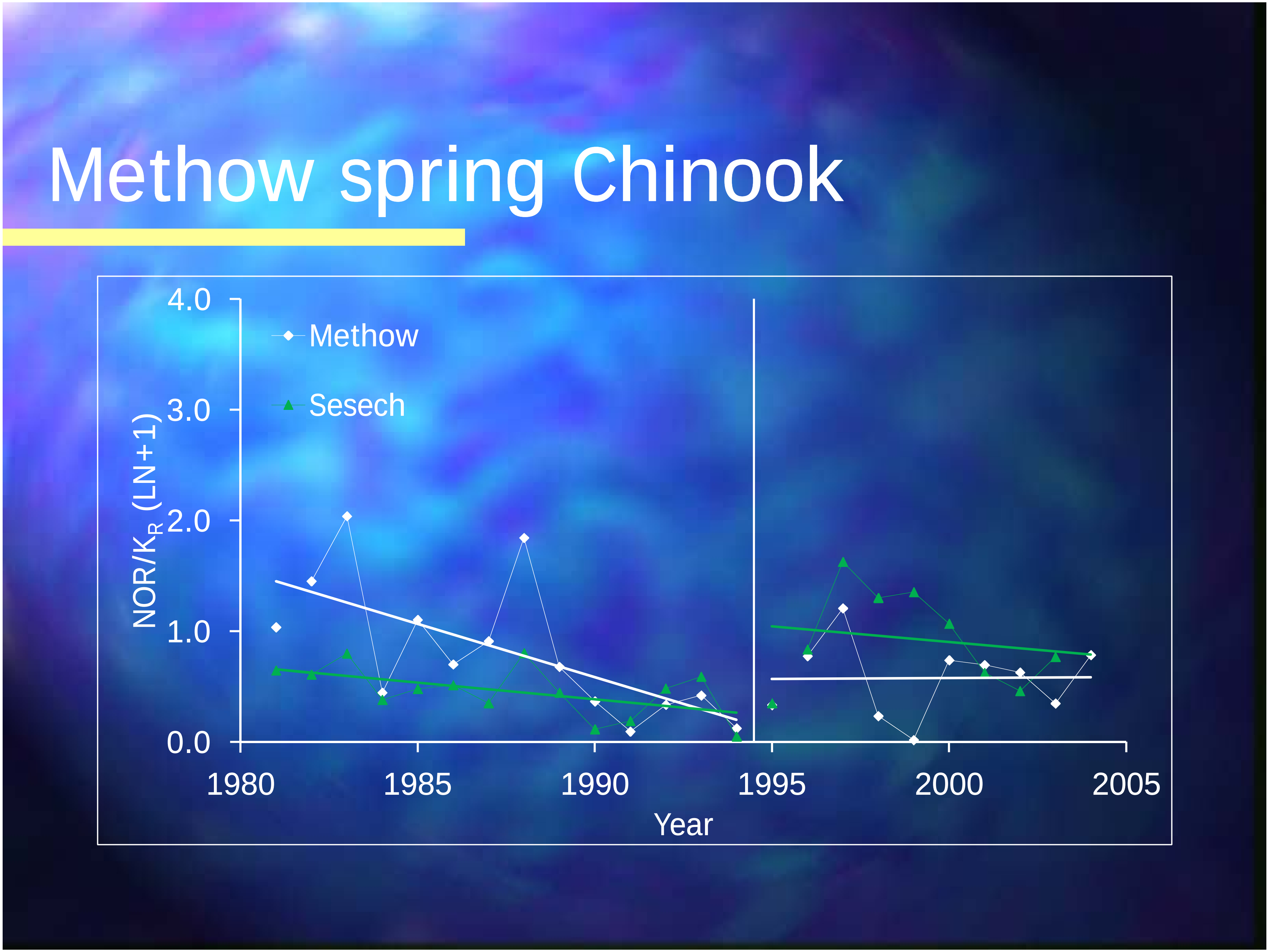

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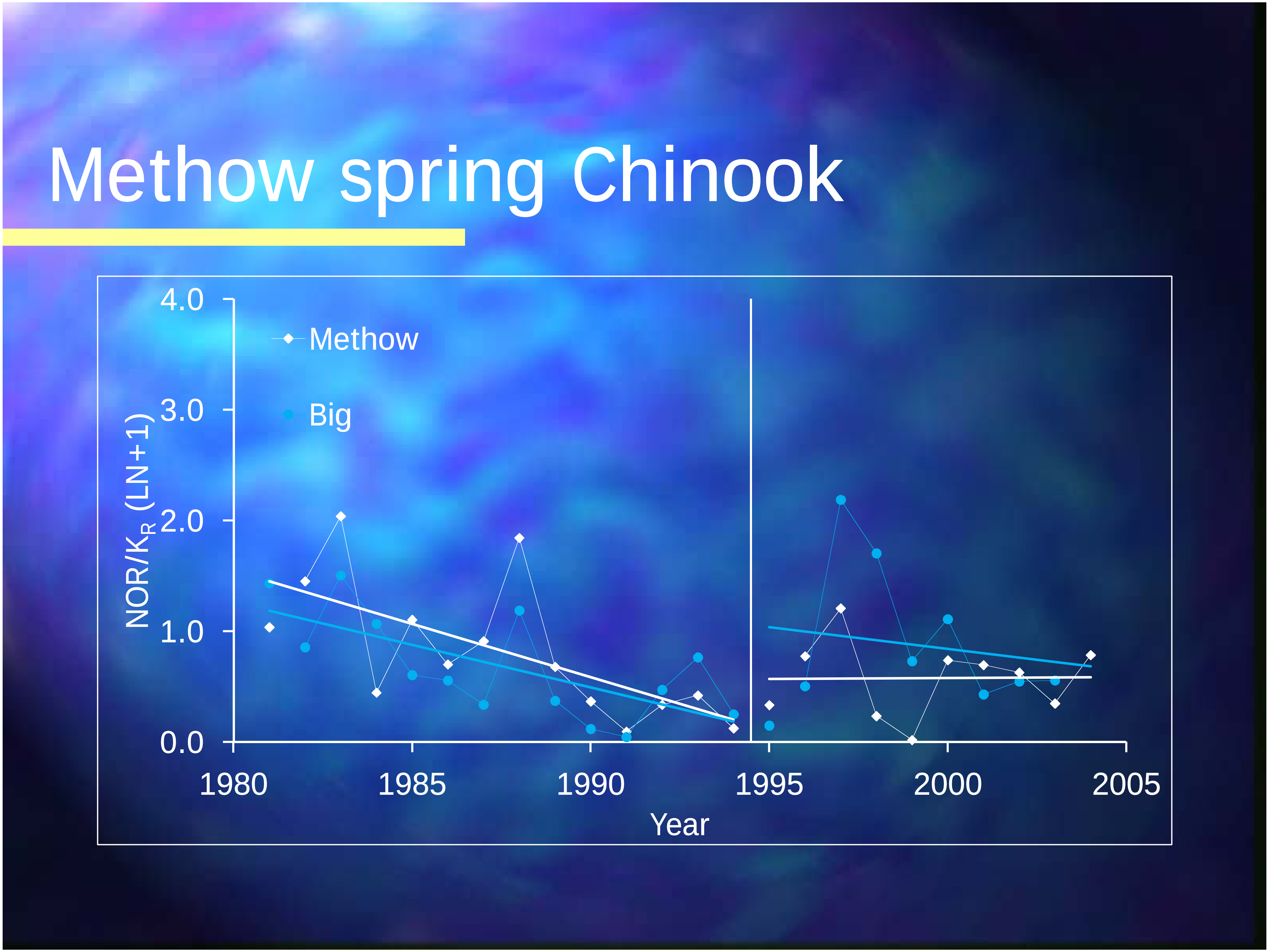

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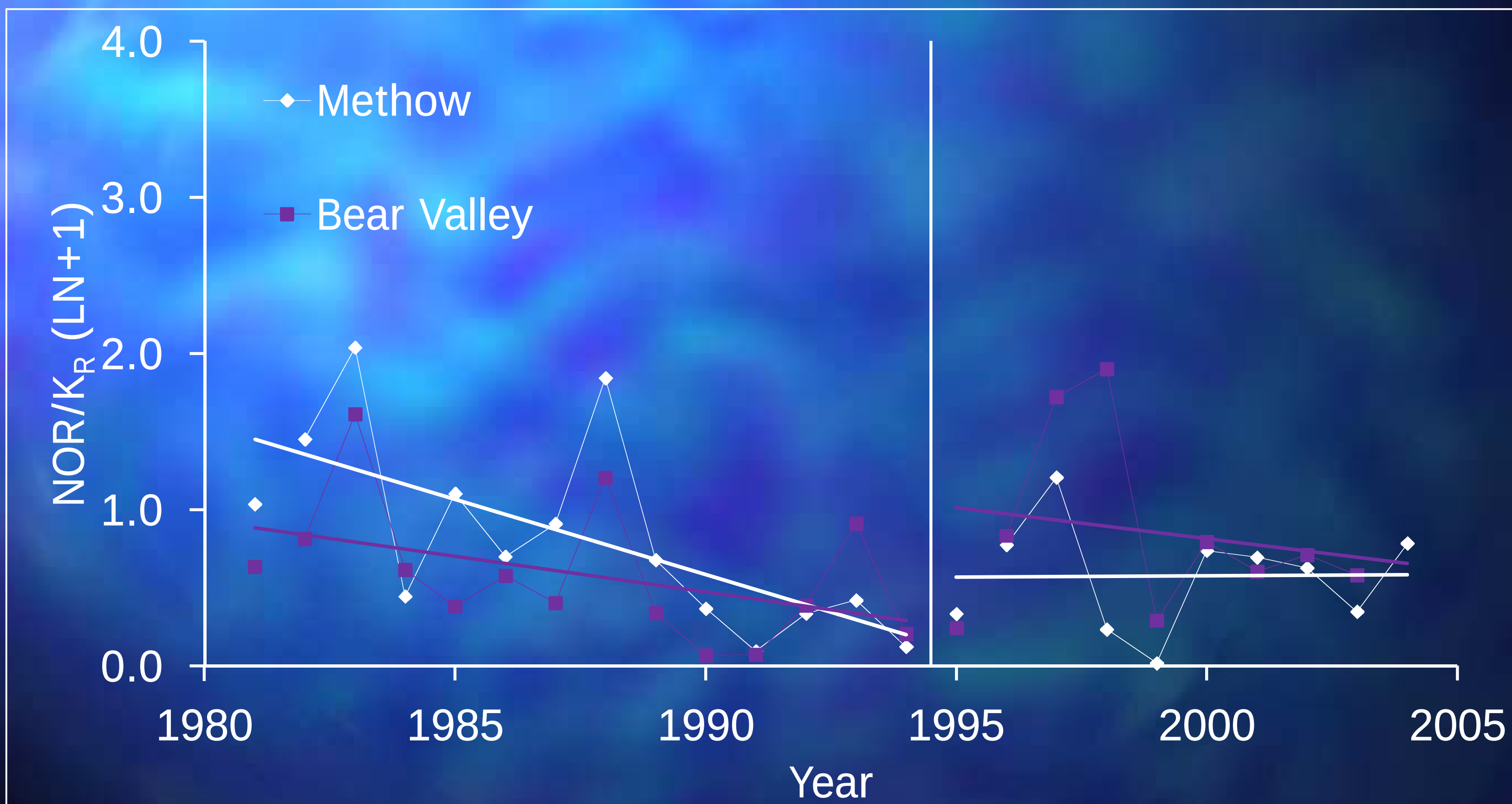
Methow spring Chinook



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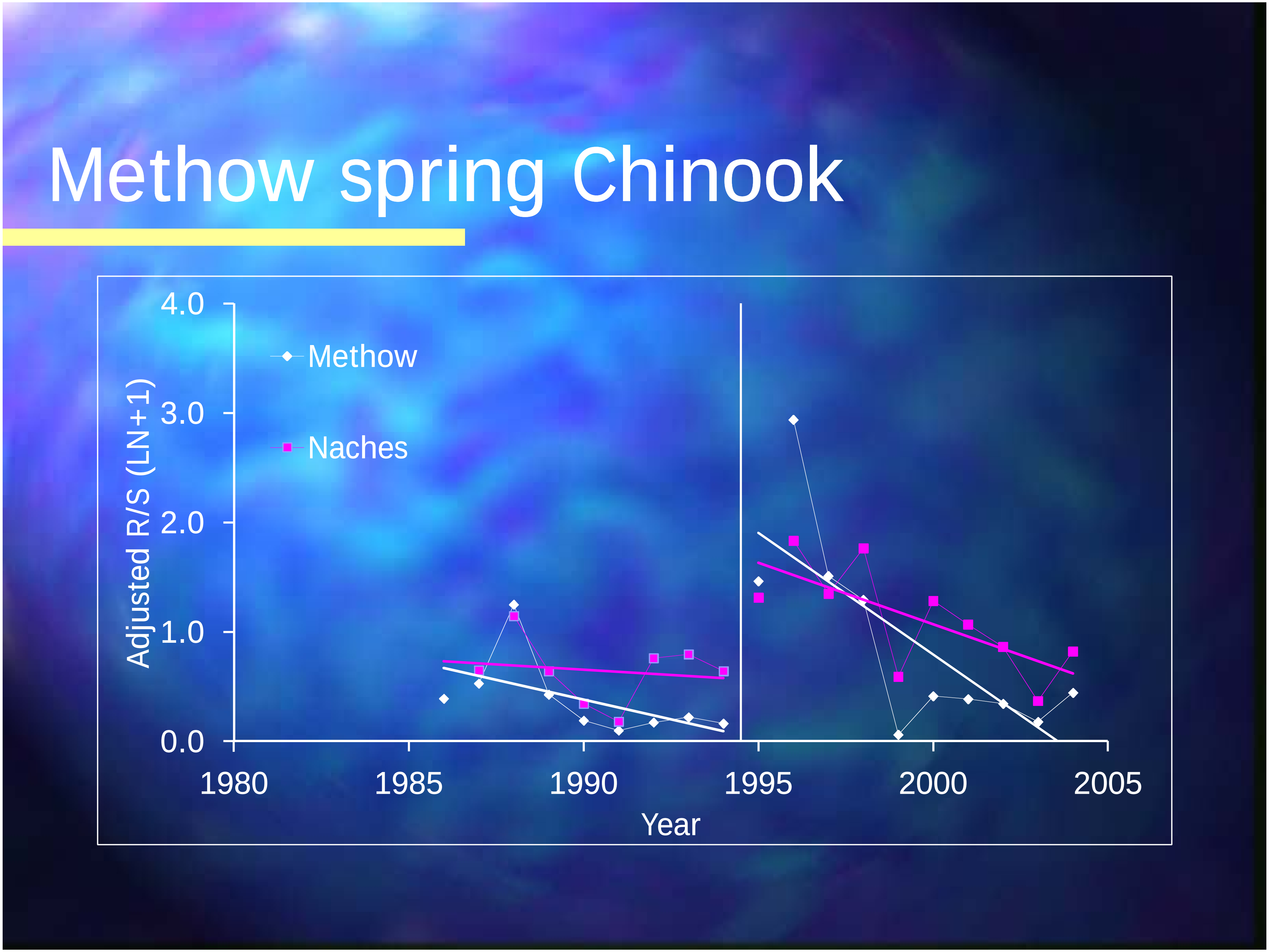

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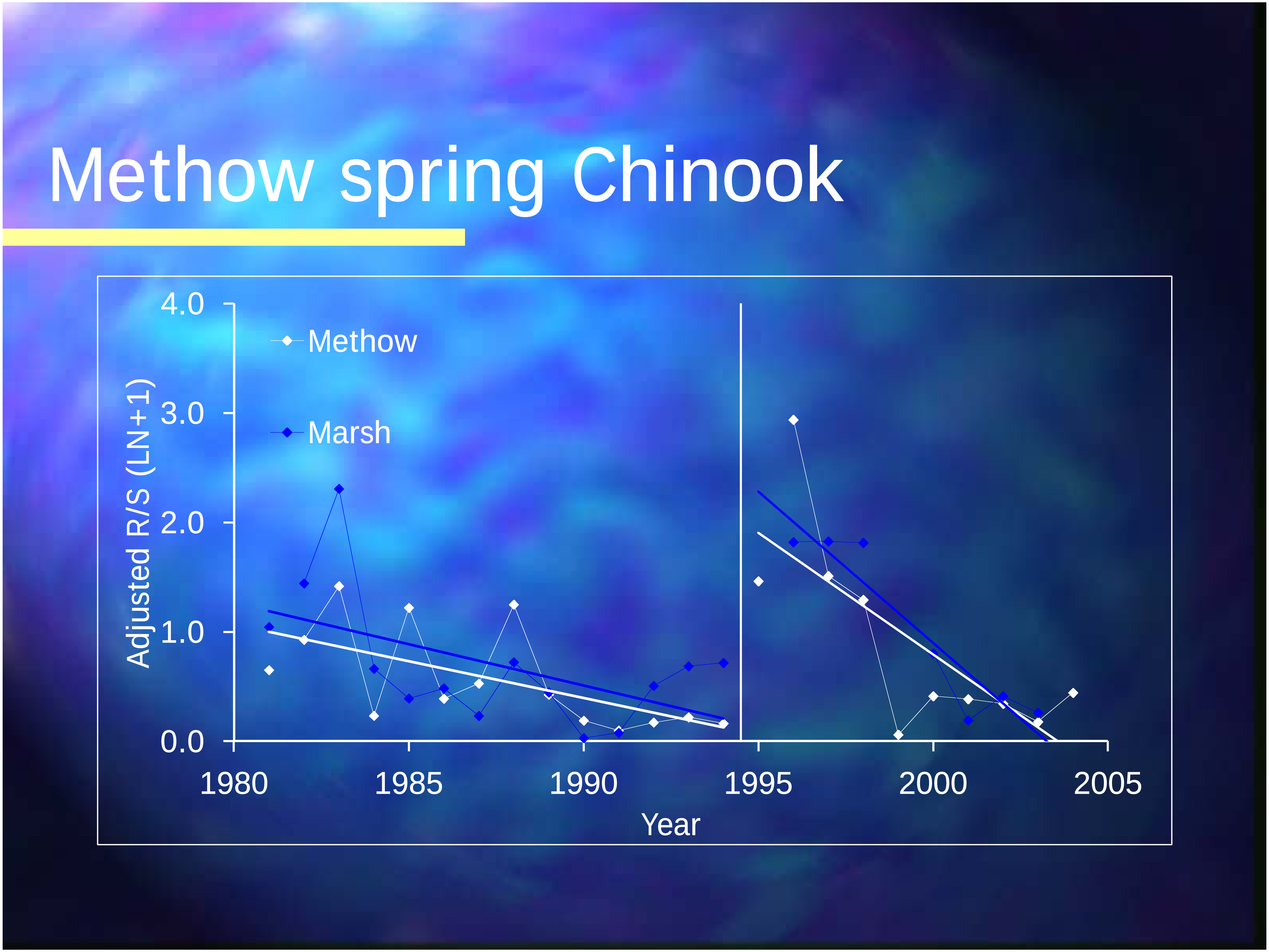

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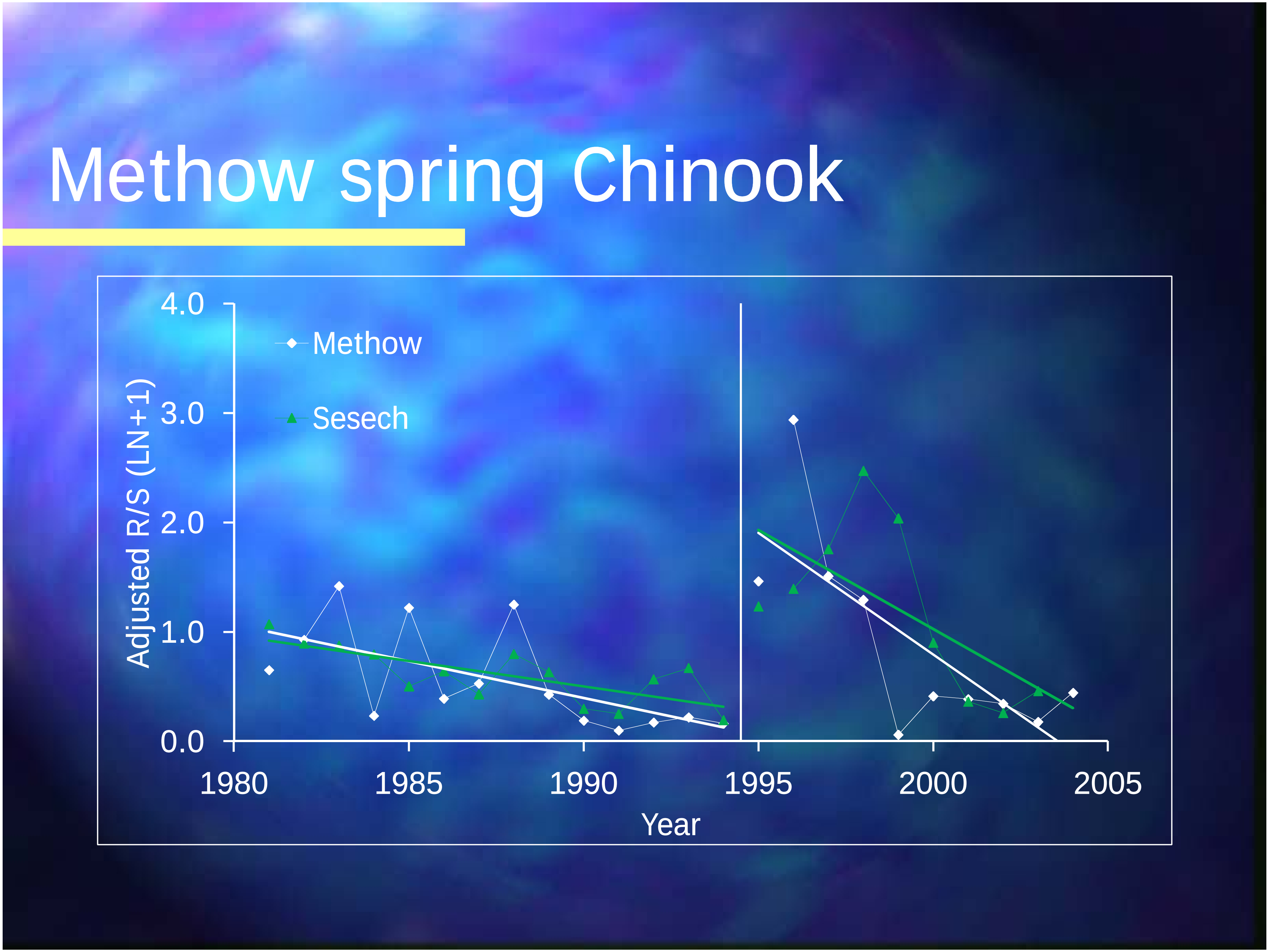

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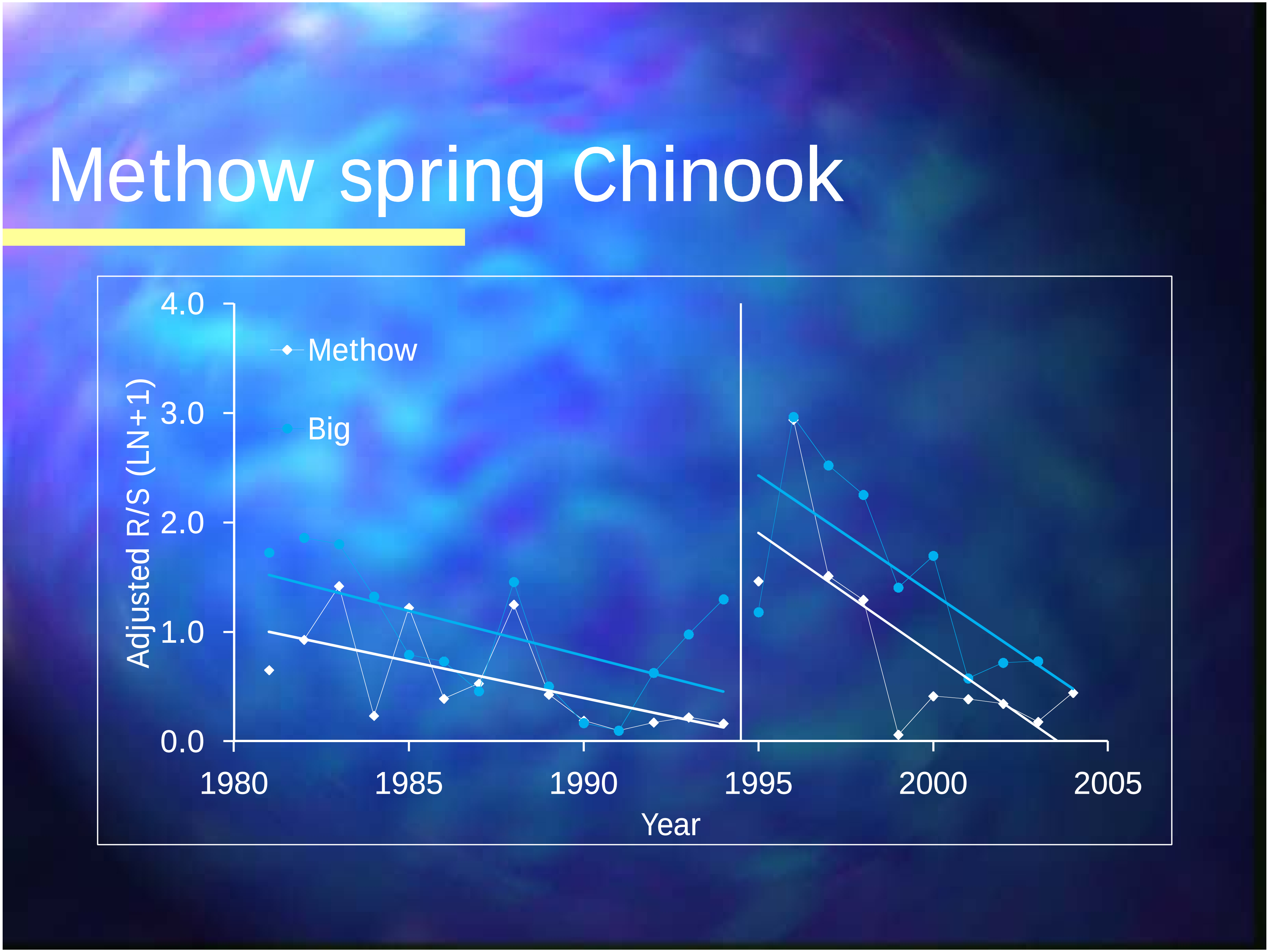

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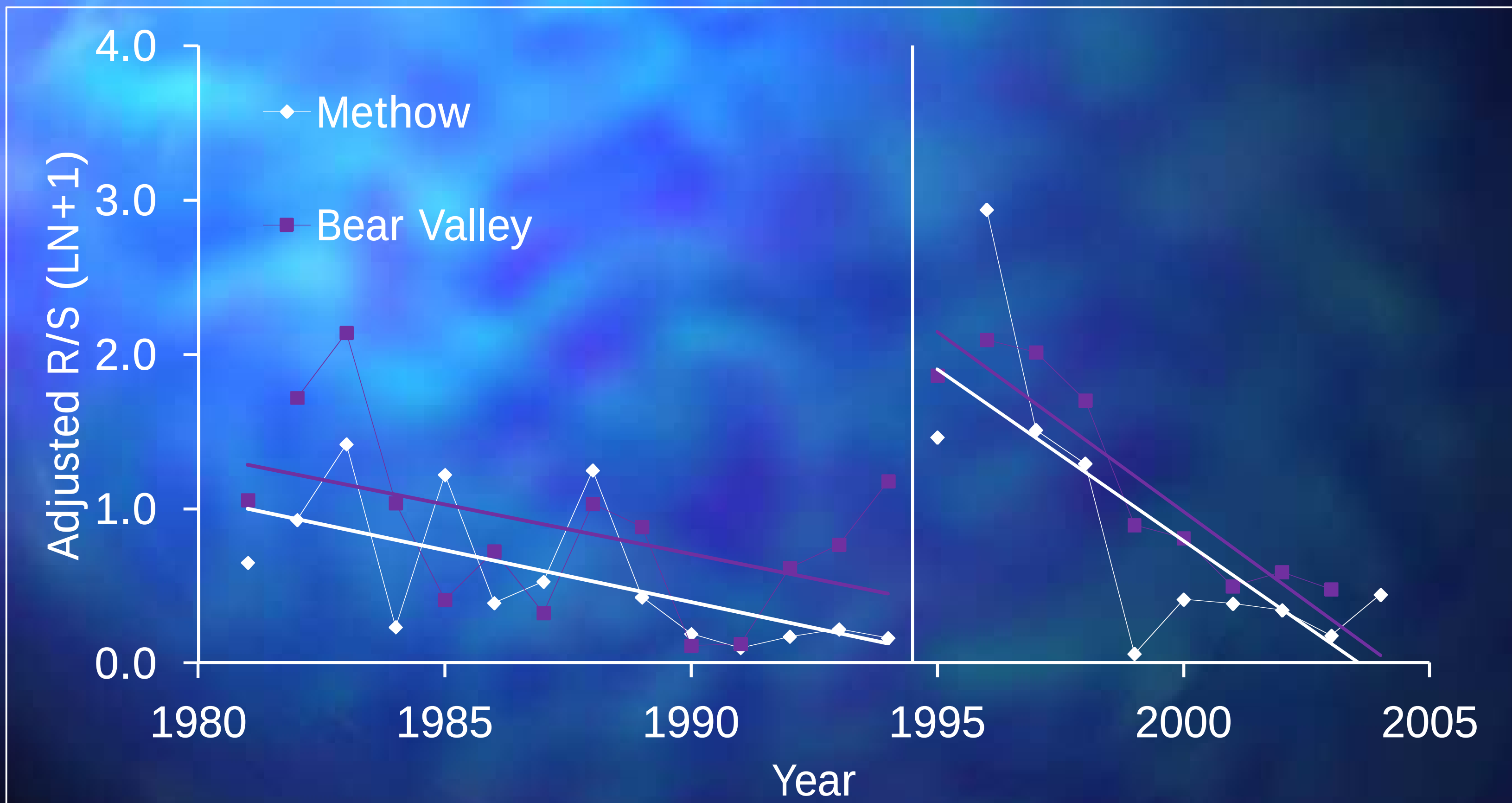
Methow spring Chinook



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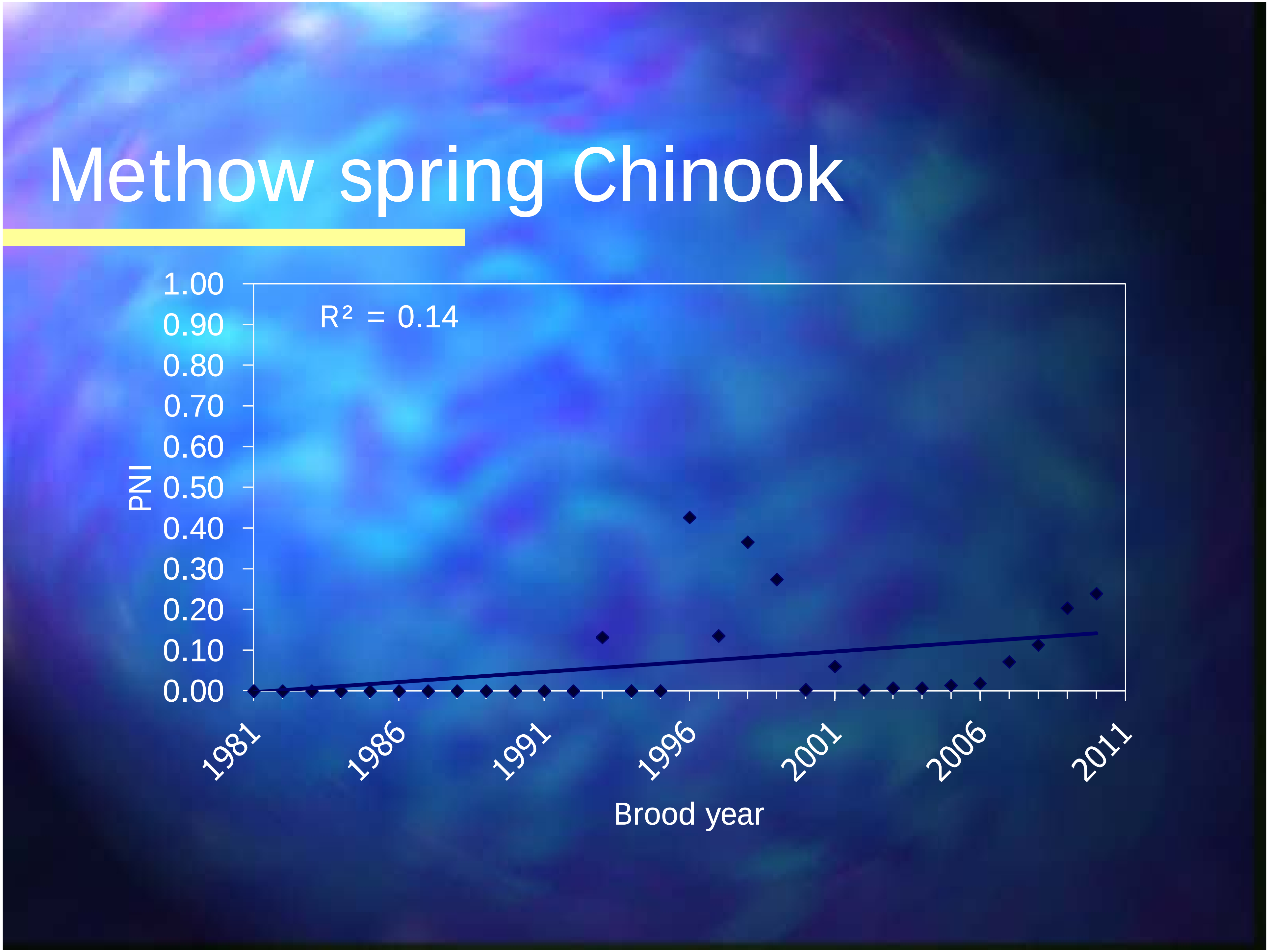


Attachment D

Methow spring Chinook (All years)

Response variable	Statistic	Reference populations					
		Naches	Valley	Marsh	Secesh	Big	Bear V.
Spawner abundance	T-test (P-value)	0.428	0.126	0.586	-	0.850	0.065
	Effect size	0.054	0.263	0.059	-	0.020	0.149
	Result	ND	ND	ND	-	ND	ND
NOR	T-test (P-value)	0.179	-	0.568	0.001	0.155	0.038
	Effect size	0.297	-	0.754	1.090	0.500	0.957
	Result	ND	-	ND	Decrease	ND	Decrease
Productivity	T-test (P-value)	0.522	-	0.573	0.961	0.514	0.498
	Effect size	0.125	-	0.374	0.013	0.117	0.192
	Result	ND	-	ND	ND	ND	ND

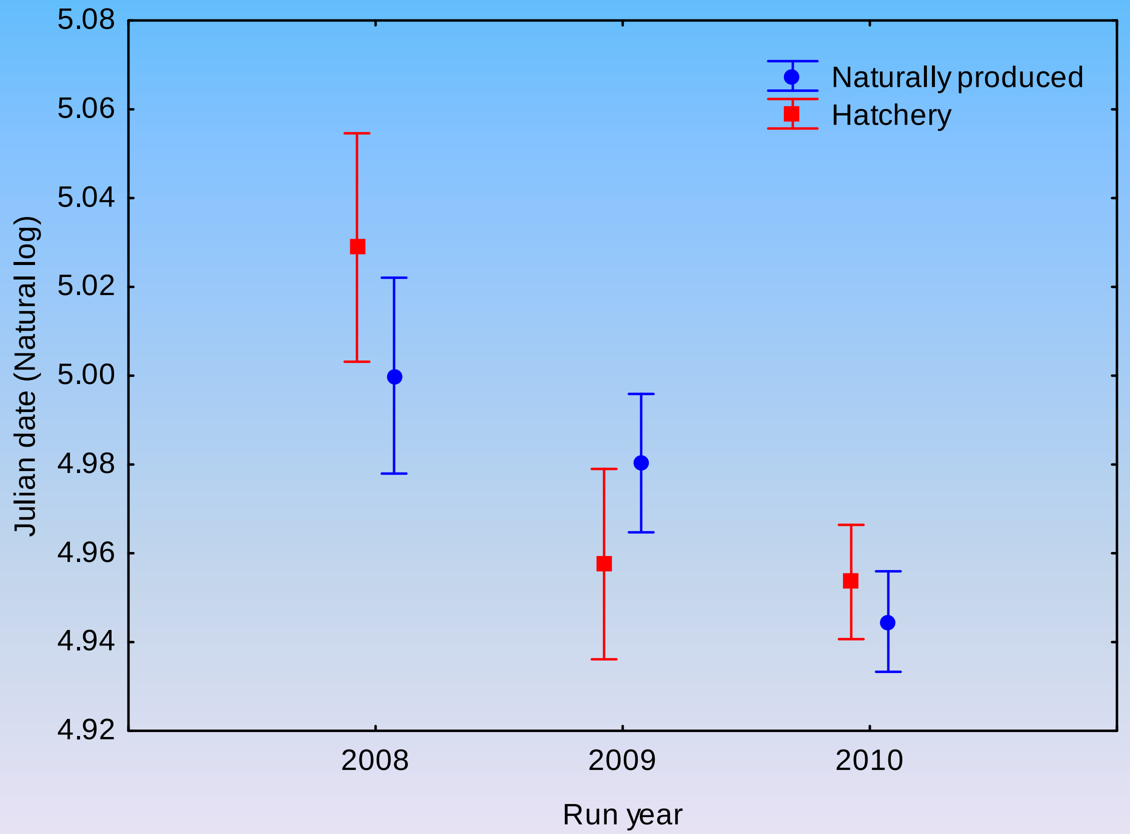
Attachment D

Methow spring Chinook (No 1996 and 1998)

Response variable	Statistic	Reference populations					
		Naches	Valley	Marsh	Secesh	Big	Bear V.
Spawner abundance	T-test (P-value)	0.884	0.304	0.678	-	0.952	0.247
	Effect size	0.010	0.174	0.040	-	0.006	0.075
	Result	ND	ND	ND	-	ND	ND
NOR	T-test (P-value)	0.369	-	0.724	0.001	0.223	0.083
	Effect size	0.209	-	0.528	1.040	0.468	0.893
	Result	ND	-	ND	Decrease	ND	ND
Productivity	T-test (P-value)	0.990	-	0.586	0.616	0.369	0.322
	Effect size	0.002	-	0.428	0.137	0.179	0.311
	Result	ND	-	ND	ND	ND	ND

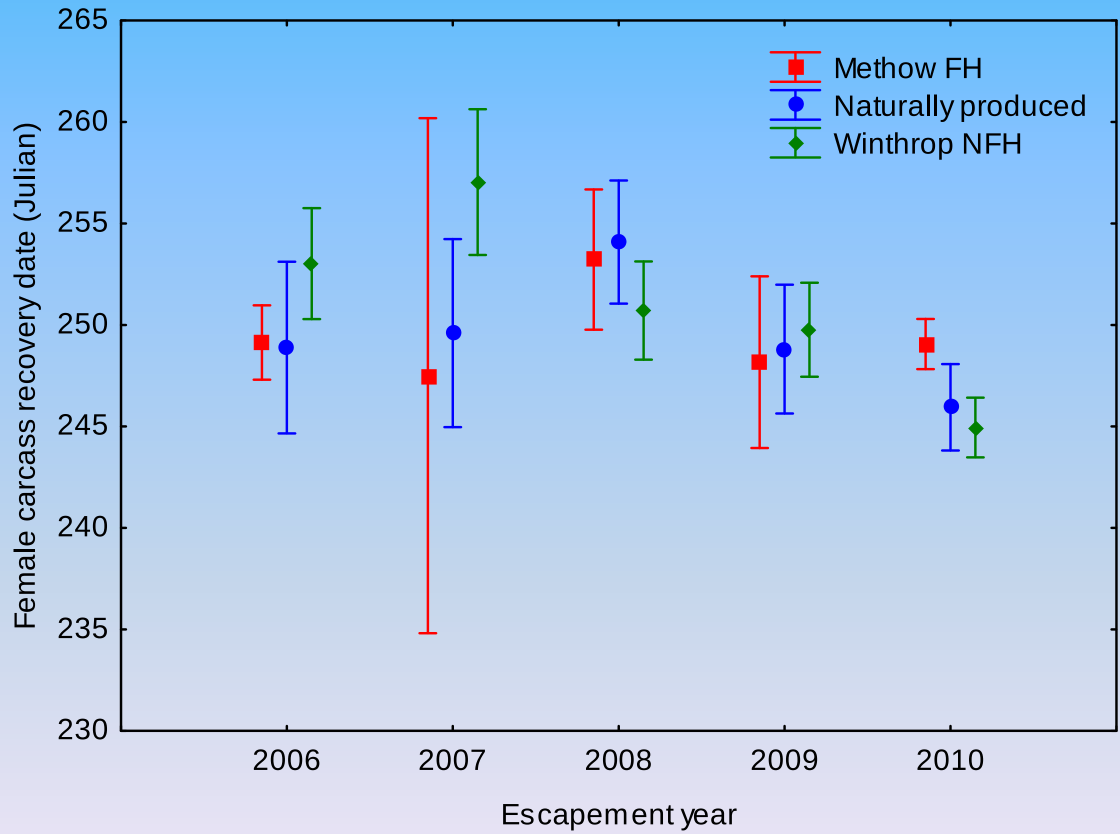
Attachment D

Methow spring Chinook (Age-4 at Wells Dam)



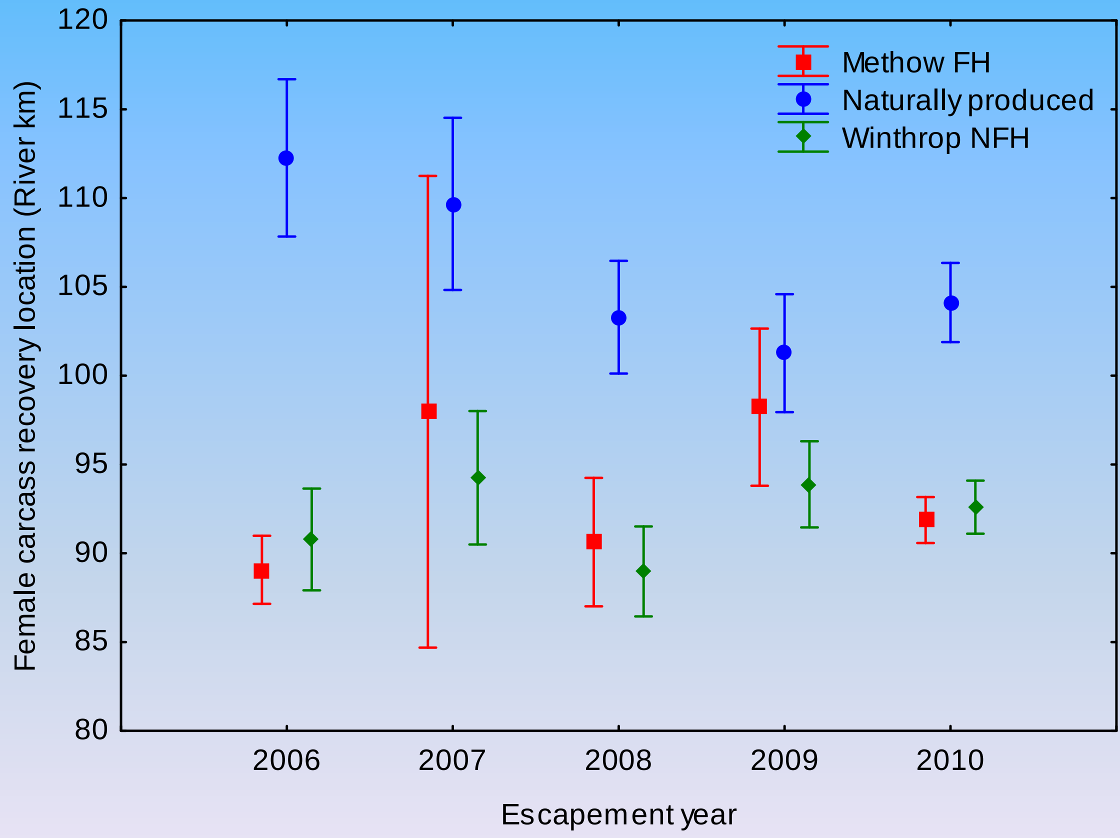
Attachment D

Methow spring Chinook



Attachment D

Methow spring Chinook



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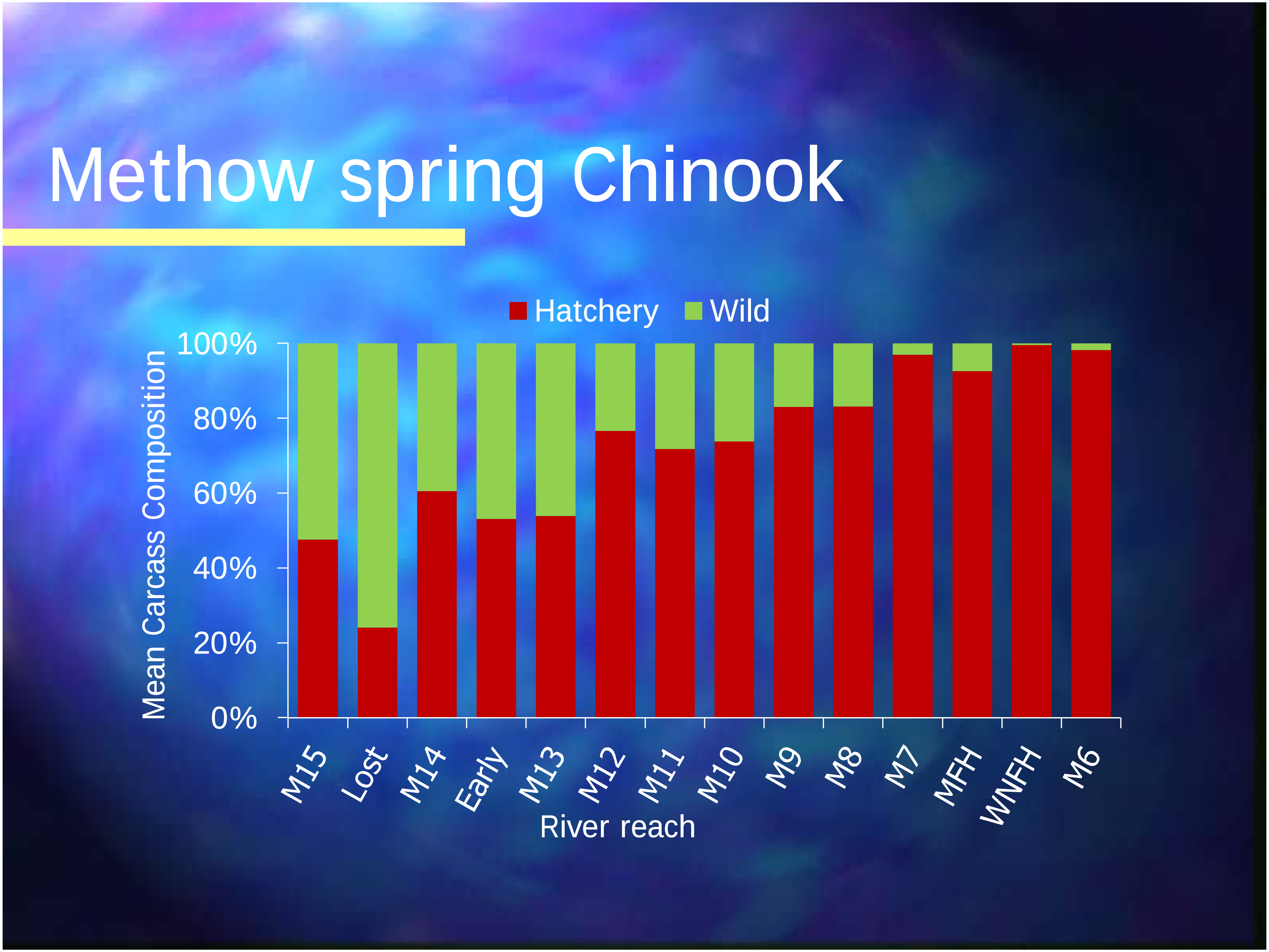

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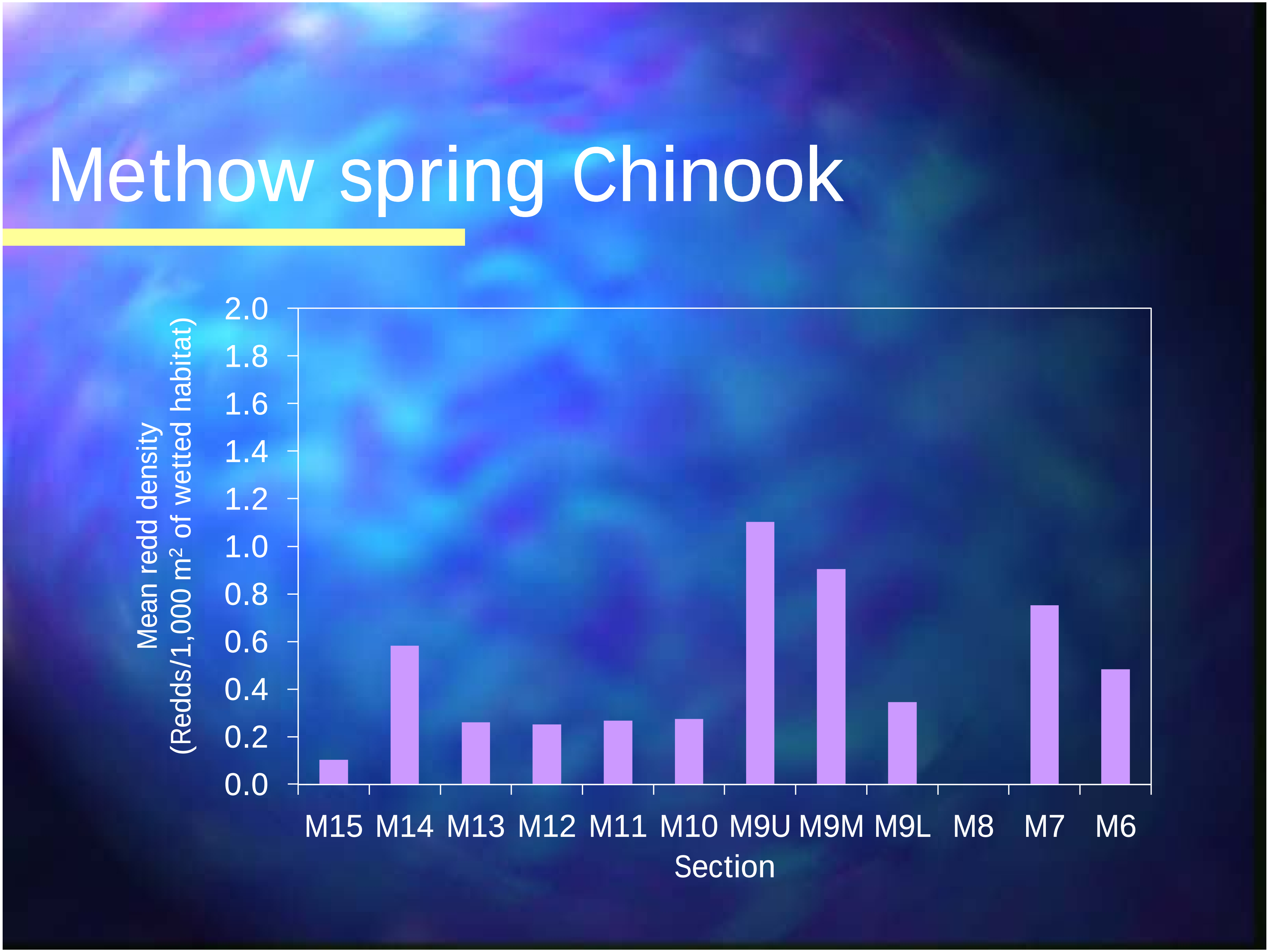
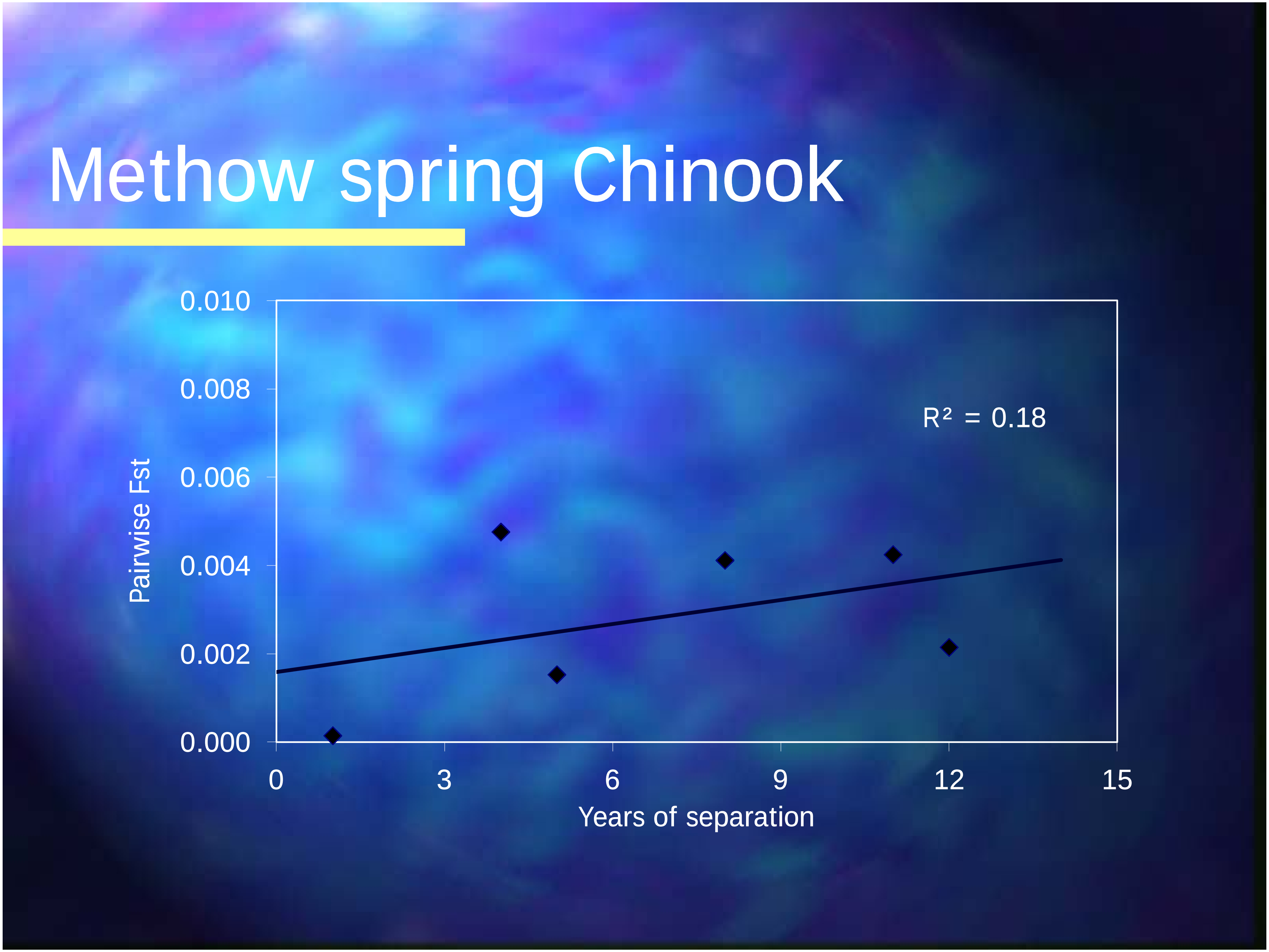


Attachment D

Methow spring Chinook

- Genetic Monitoring (Small et al. 2007)
- Methow natural origin and Winthrop (Carson) have only slight differentiation
- Methow and Chewuch natural origin also similar with low differentiation

Attachment D



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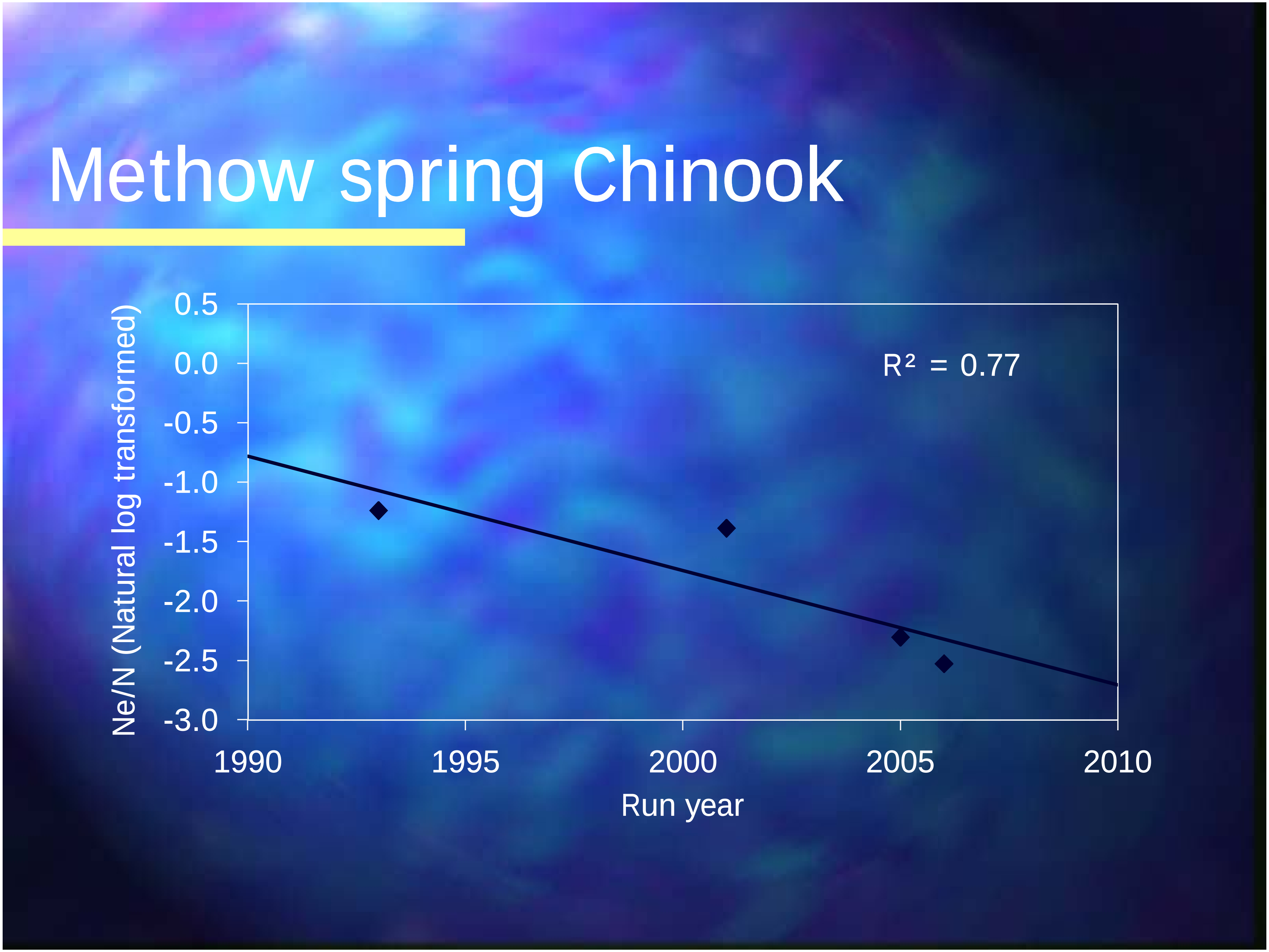
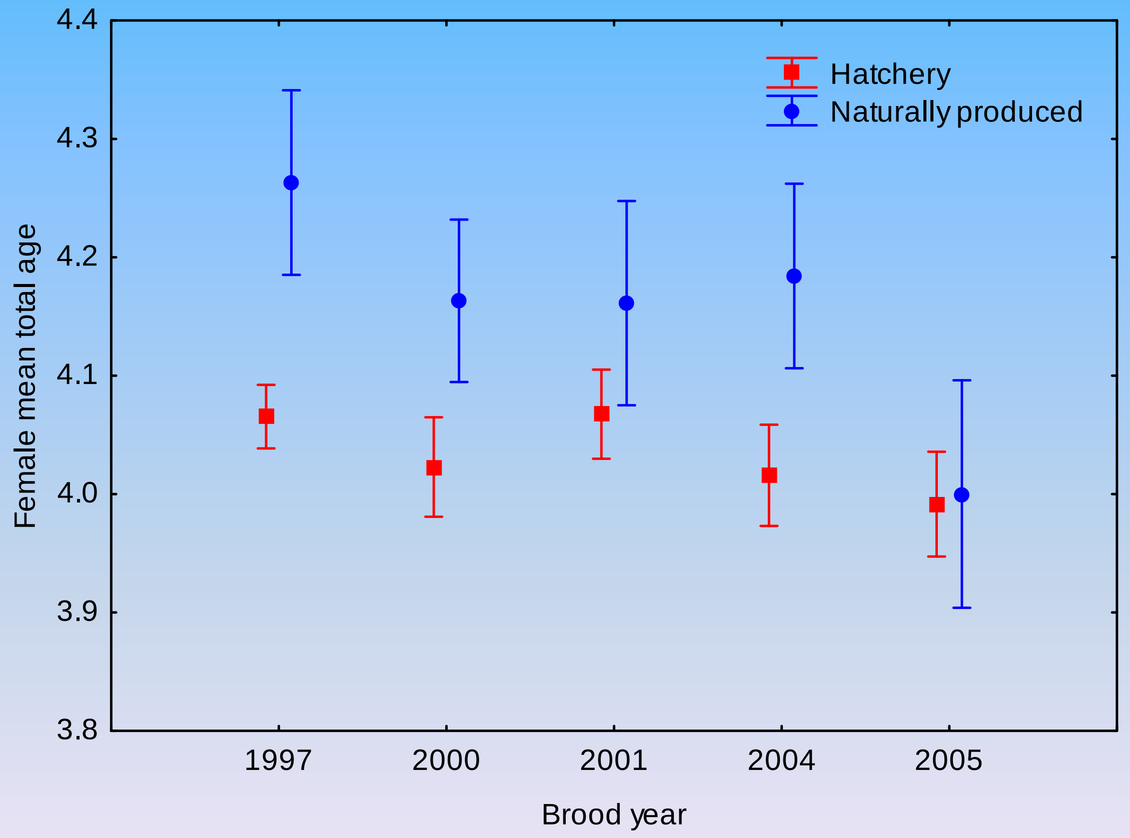


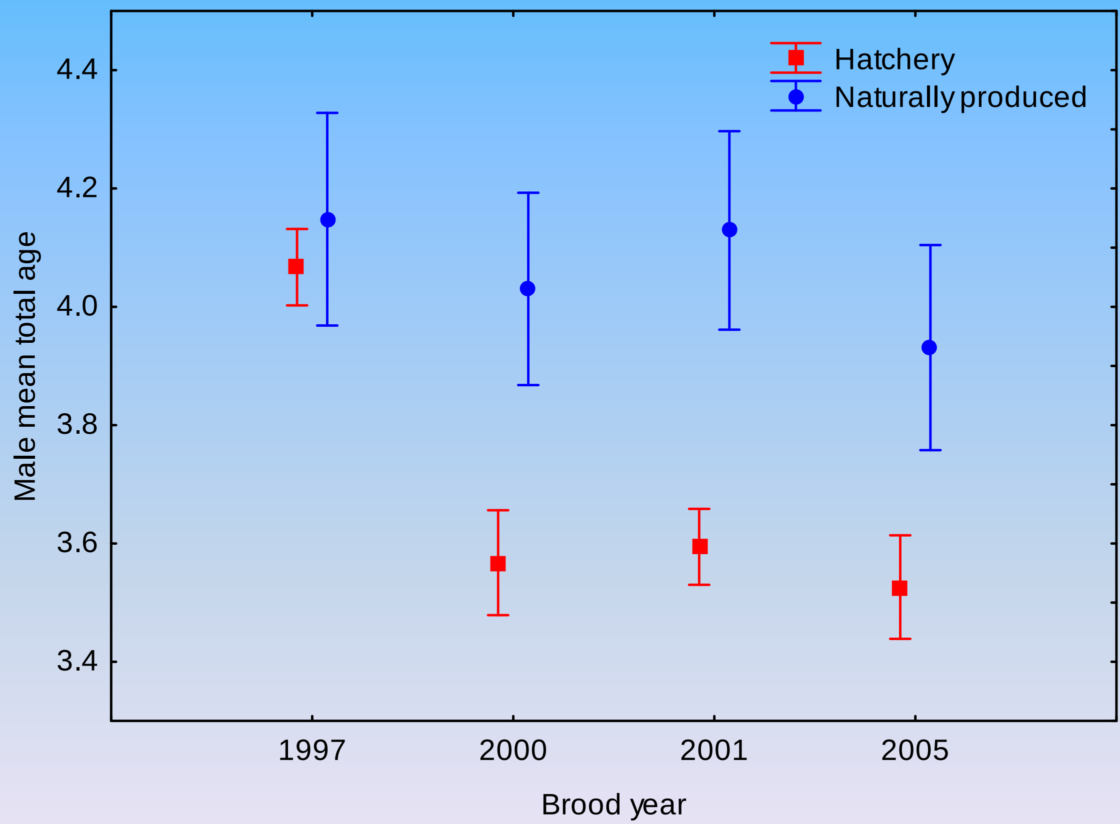
Attachment D

Methow spring Chinook



Attachment D

Methow spring Chinook



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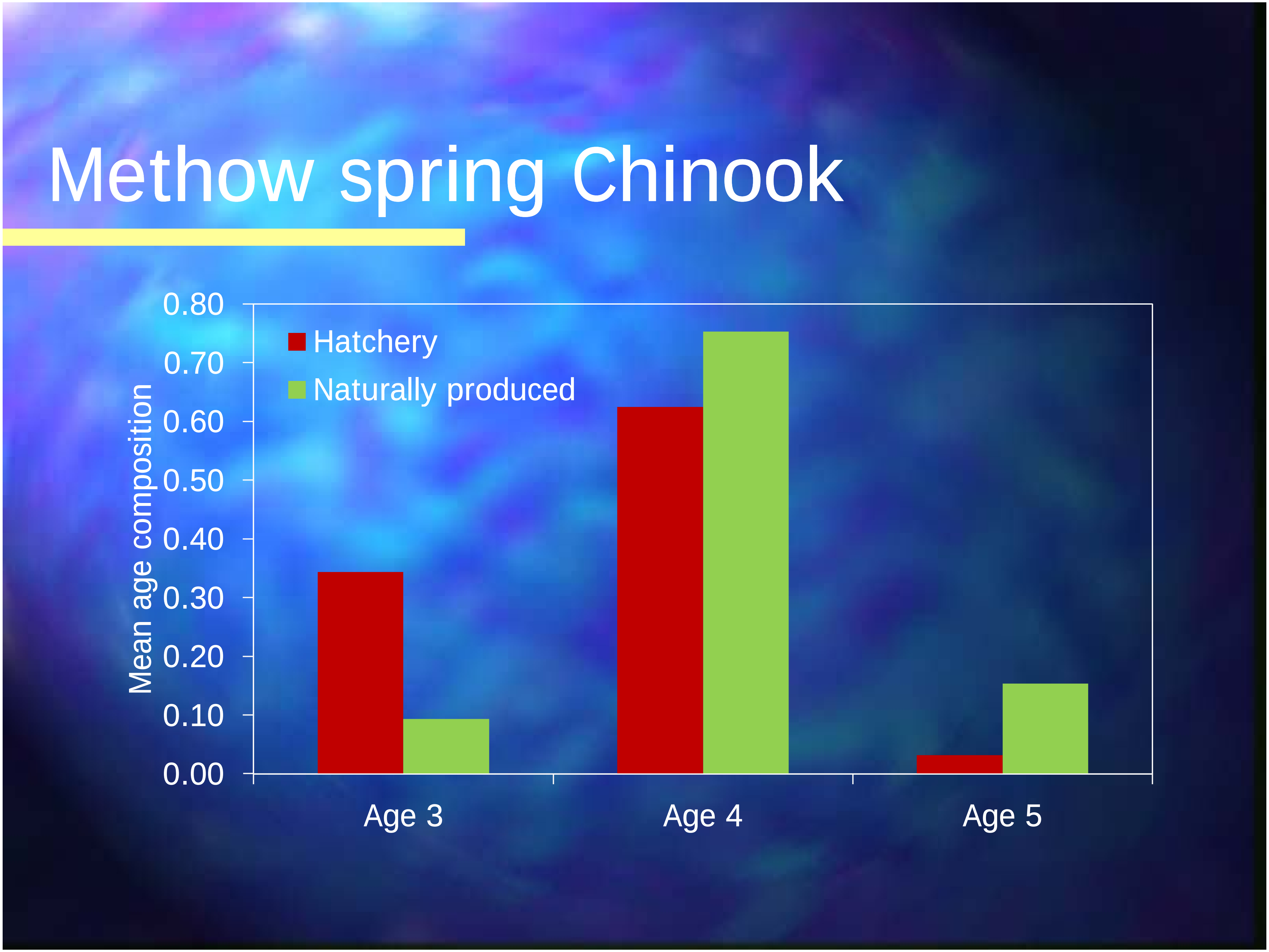
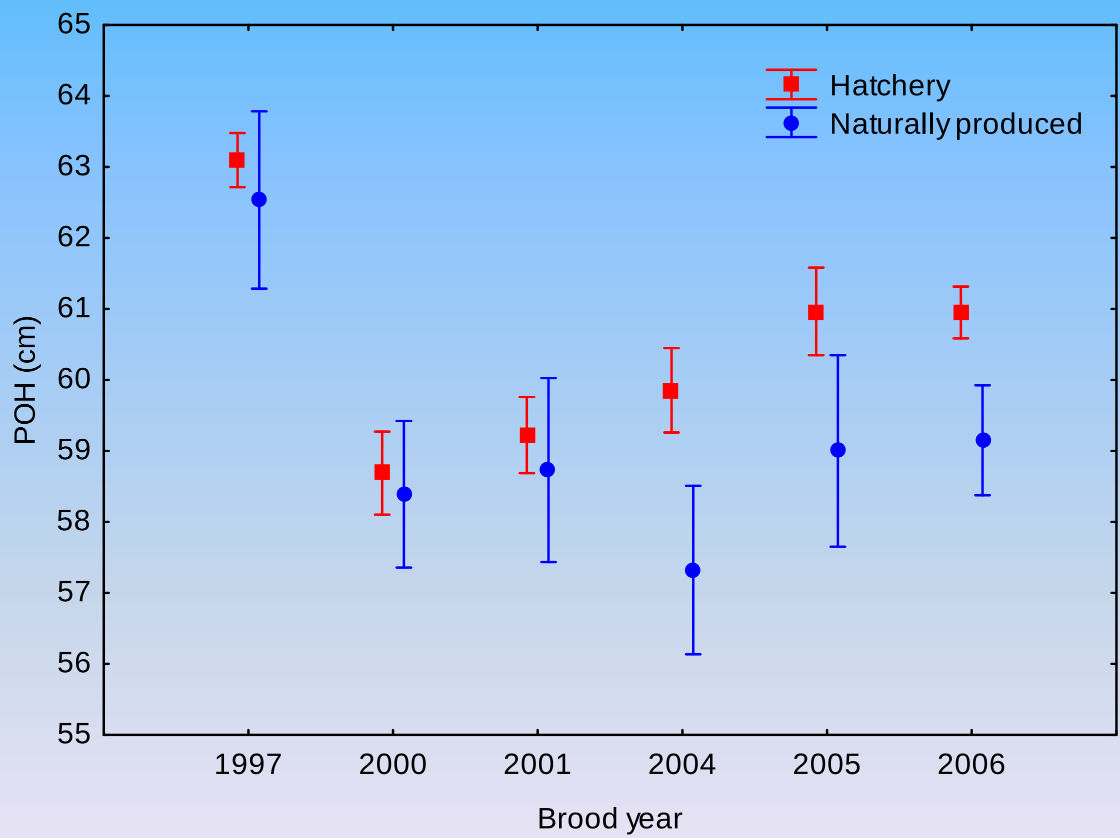


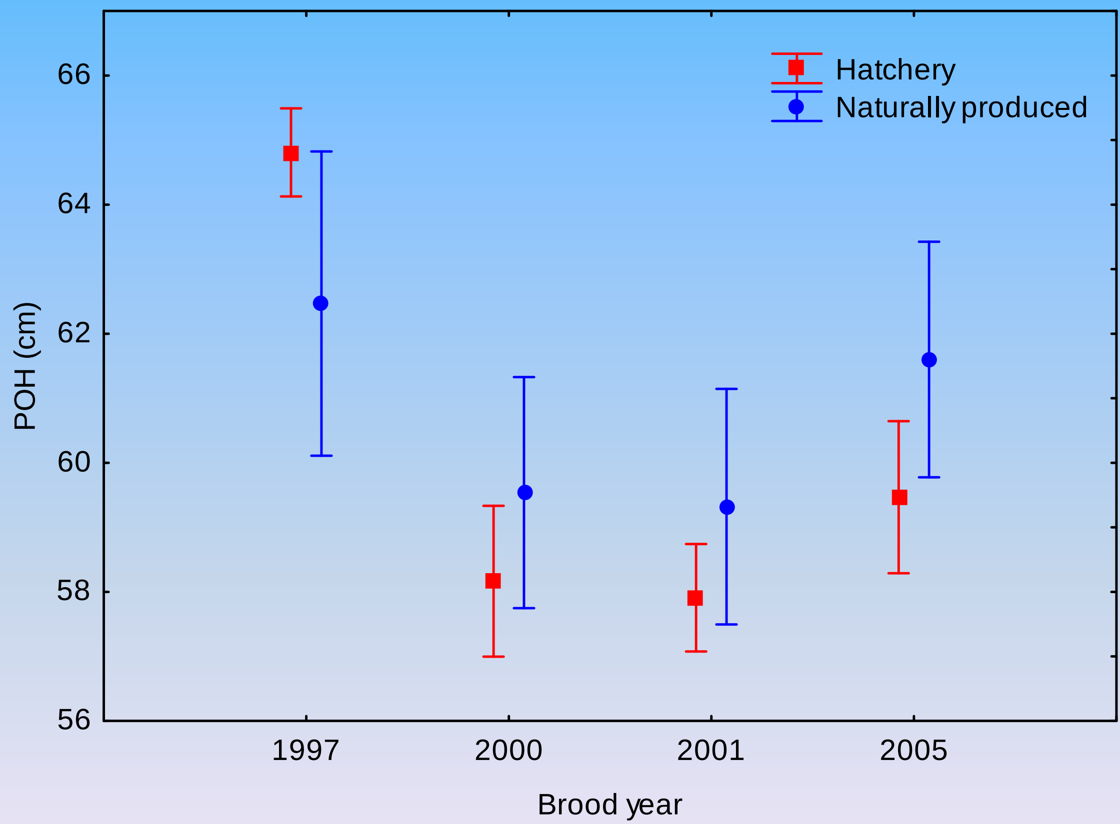
Attachment D

Methow spring Chinook (Age-4 female)



Attachment D

Methow spring Chinook (Age-4 male)



Methow spring Chinook

- Post release survival target (4.5)
- Results (Geometric means)
- HRR = 4.0 (P = 0.15)
- NRR = 1.0 (P < 0.007)
  - Hatchery fish have 300% survival advantage

Attachment D

Methow spring Chinook

- Stray rates targets
  - 5% brood year returns
  - 5% of spawners of receiving population
    - e.g., Methow straying into Entiat
  - 10% of spawners within population
    - e.g., Methow straying into Twisp
- Results
  - Mean brood year = 2.5% ($P < 0.02$)
  - Mean outside pop. = <2% (Entiat, Chiwawa)
  - Mean within pop. = 6.7% Chewuch ($P < 0.001$); 0.03% Twisp ($P < 0.0001$)

Attachment D

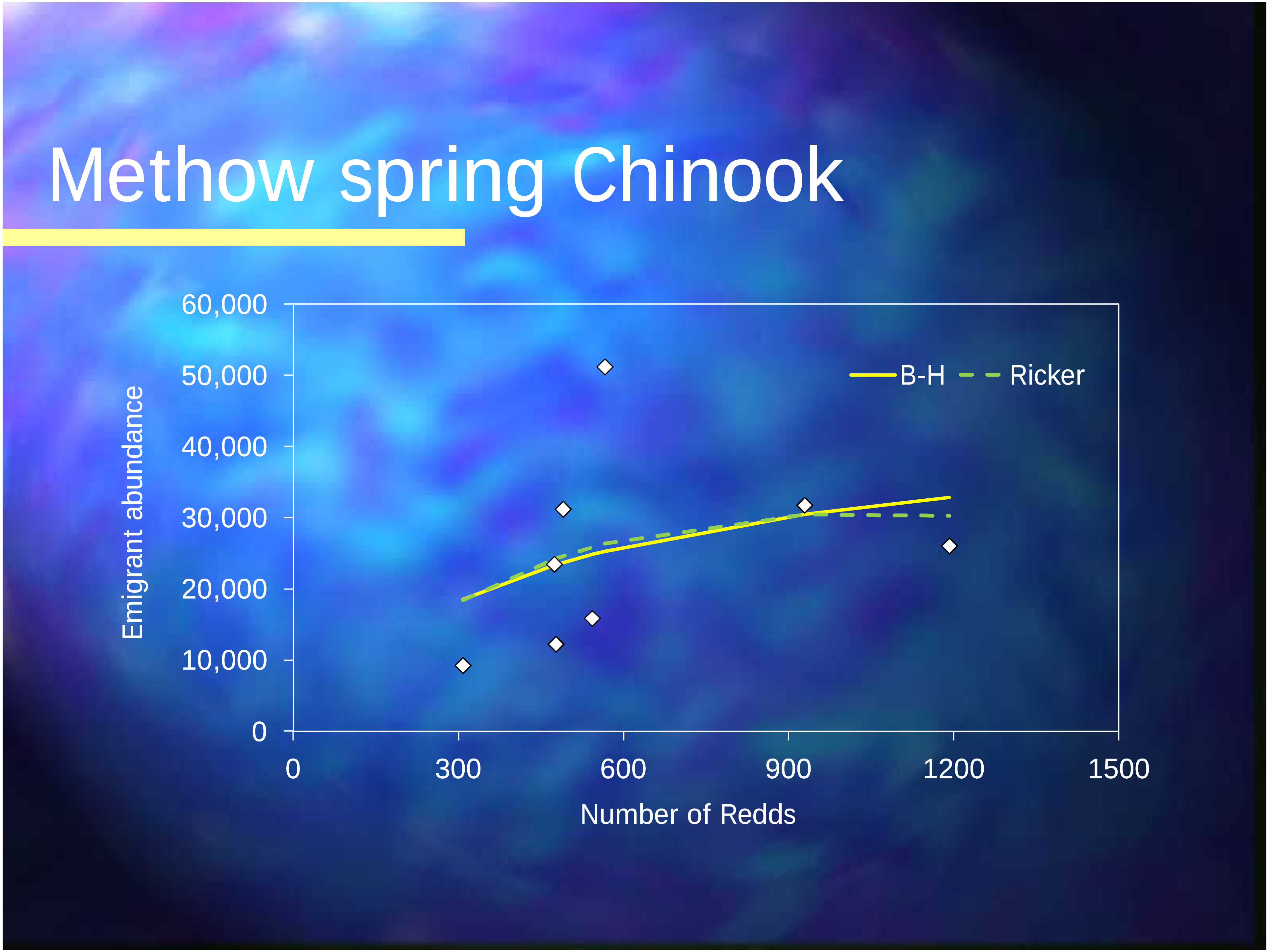
Methow spring Chinook

- Size at release targets
  - Fork length = 137 mm
  - Weight = 30.3 g
- Results
  - Fork length = 133 mm ($P < 0.02$)
  - Weight = 28.7 g ($P = 0.07$)

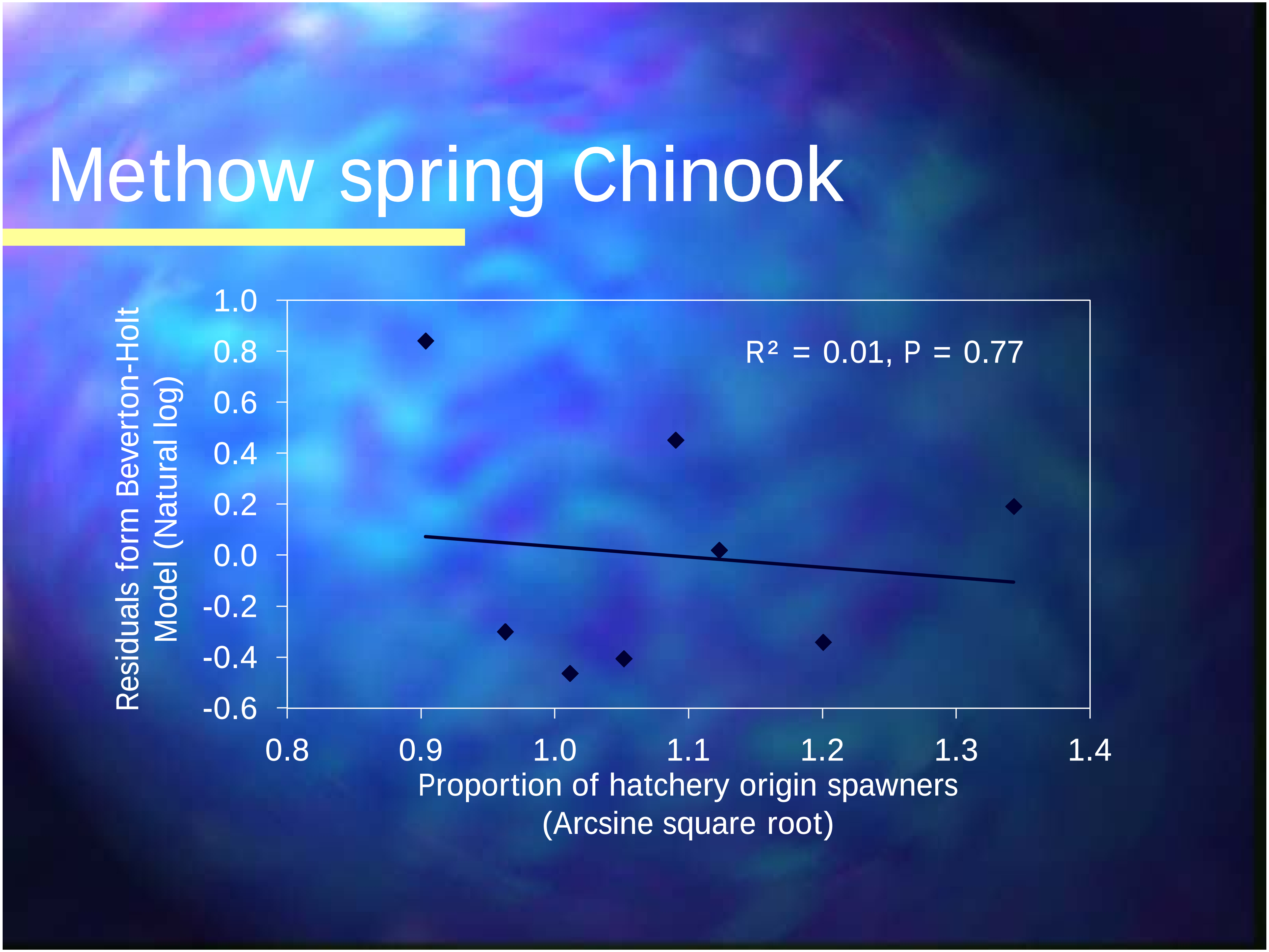
Methow spring Chinook

- Number released
  - Yearling target = 183,333
- Results
  - Number released = 150,971 (P = 0.17)
  - Very low pNOB
    - 1992 – 2010 Geo. Mean = 3.8% (no WNFH)
    - 1992 – 2010 Geo. Mean = 1.5% (with WNFH)

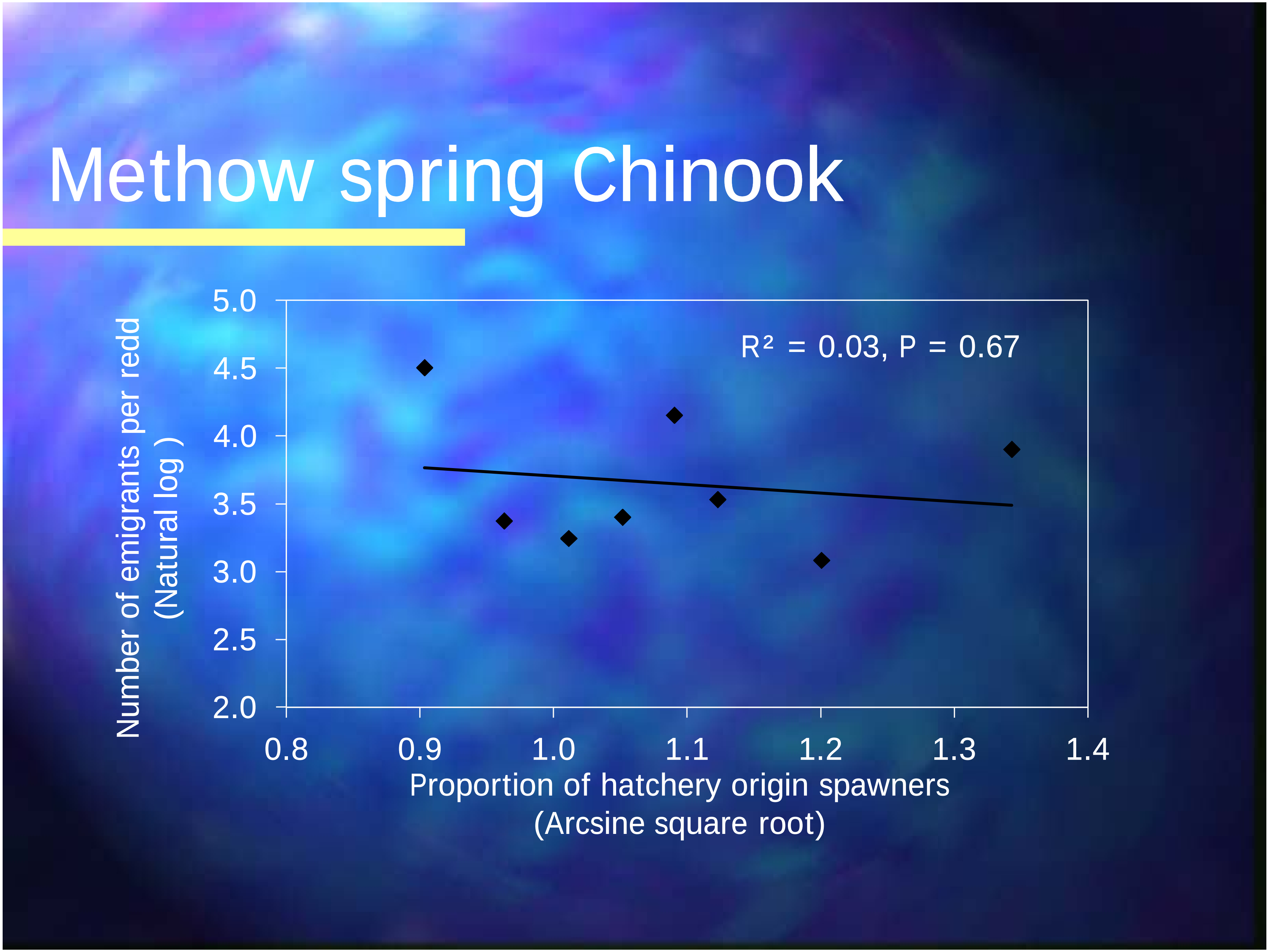
Attachment D



Attachment D



Attachment D



Attachment D

Methow spring Chinook

- No apparent effect of hatchery fish on the spawning grounds
- Number of spawners account for only 18% of variation in number of emigrants
  - Chiwawa = 60%
- Mean egg to emigrant survival
  - 2004 – 2009 broods = 1%

Attachment D

Methow spring Chinook

- Possible factors reducing survival
  - Biased estimates
  - Poor habitat quality
  - Over escapement
  - Low reproductive success

Methow spring Chinook

- Harvest
- No adipose fin clips since 2000 brood.
- Mean 1992 – 1999 = 17%
- Mean 2000 – 2004 = 9% (including hooking mortality)

Attachment D

Methow Spring Chinook Recommendations

- Recommendations are based on the goals of the program (i.e., assist in recovery by increasing NORs)
- Some specific recommendations may not be independent

Attachment D

Methow spring Chinook Recommendations

- Winthrop NFH
  - NORs insufficient for recovery purposes
  - Remove a minimum 90% of returning adults
  - 100% adipose fin clipped
  - Reevaluate and reprogram if required
  - Implement adult management plan in draft HGMP for both WNFH and MFH

Attachment D

Methow spring Chinook Recommendations

- Methow FH
  - Reduce production to achieve PNI of 0.67 (no more than 225k)
    - Conservation program based on natural origin broodstock collected (W x W)
    - Safety net program back fills production (H x H)
  - 100% adipose fin clip safety net program

Attachment D

Methow spring Chinook Recommendations

- Methow FH
  - Increase pNOB
    - Fewer broodstock are needed
    - Collect Methow NORs from Wells Dam until rebuild of Foghorn Dam is complete
    - Maximize Twisp weir operation and collection
    - Discontinue Chewuch program
  - Reduce pHOS
    - Lower production from Methow FH
    - Removal of 90% of “safety net” adults
    - Removal of 90% of WNFH adults

Attachment D

Methow spring Chinook Recommendations

- Increase homing of Twisp hatchery fish
  - Increase acclimation
    - Begin earlier or release later or both
  - Increase exposure to Twisp River water whenever possible
    - Incubate eggs on Twisp River water

Methow spring Chinook Recommendations

- Develop PIT tag based approaches for hatchery and natural origin fish to include:
  - Estimate life stage survival rates
  - Populations estimates
  - Migration patterns
  - Homing/stray rates

Attachment D

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	January 19, 2012
From:	Michael Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of the November 30, 2011, HCP Hatchery Committees' Conference Call		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met by conference call on Wednesday, November 30, 2011, from 1:00 pm to 2:30 pm. Attendees are listed in Attachment A to these conference call minutes.

ACTION ITEM SUMMARY

- Chelan PUD and Douglas PUD will provide Statements of Agreement (SOAs) to Carmen Andonaegui for distribution to the Hatchery Committees for approval at the December 14, 2011, Committees' meeting (Item II-C).
- Chelan PUD, Douglas PUD, and Grant PUD will finalize the Hatchery Committees' and Priest Rapids Coordinating Committees' (PRCC's) Hatchery Subcommittee Master Recalculation Implementation Plan (RIP) and email it to Carmen Andonaegui for distribution to the Hatchery Committees (Item II-C).

STATEMENT OF AGREEMENT DECISION SUMMARY

- No SOAs were approved at today's meeting.

AGREEMENTS

- There were no agreements at today's meeting.

I. Welcome

Mike Schiewe opened the call saying that Chelan PUD, Douglas PUD, and Grant PUD had each prepared and distributed an SOA for consideration by the Hatchery Committees, as well as amended RIPs reflecting edits discussed at the November 17, 2011, Committees' meeting. He asked each PUD representative to summarize their changes to their respective SOAs and RIPs in response to the most recent Joint Fisheries Parties (JFP) proposal (Attachment B).

II. All Parties

A. Douglas PUD (Greg Mackey)

Greg Mackey said that on Monday, November 28, 2011, Douglas PUD's SOA and Wells RIP was distributed by email to the Hatchery Committees (Attachment C). He said that the RIP and SOA reflected the conditions in the November 28, 2011, updated version of the JFP's proposal. He said that Table 1 of the RIP provided production targets by species, facility, general release location, and type of mitigation. Mackey said that additional details are provided in the table footnotes.

Mike Schiewe asked for Committees' feedback on the Douglas PUD SOA. Kirk Truscott said that although he had not had an opportunity to review the SOA[1], if the Wells RIP was based on the JFP proposal updated November 28, 2011, he did not have concerns with the SOA. However, he said that in Table 1 and Table 2 of the JFP proposal, for the Chief Joseph Hatchery Facility the location (as indicated in the tables by italics) should be changed from "*Okanogan*" to "*Okanogan/Upper Columbia River Mainstem*".

B. Chelan PUD (Josh Murauskas)

Josh Murauskas said that Chelan PUD's revised SOA (Attachment D) eliminated the species trade with Grant PUD, and was consistent with the JFP proposal updated on November 28, 2011.

Keely Murdoch said that Yakama Nation comments on the Douglas PUD and Chelan PUD proposals were captured with changes tracked in the Grant PUD SOA and associated documents (Attachment E). She said that she would like the RIP to be referred to as a "Hatchery Committees' Implementation Plan" rather than a "JFP Implementation Plan," or a

[1] During the meeting, it was discovered that due to an email server problem, Truscott had not received the email distributing the Douglas PUD SOA.

"PUD Implementation Plan," because it is the product of the full Committees. She also asked that the following statement or a similar statement be added to each of the individual SOAs: "*The methodologies used in the recalculation and development of this implementation plan do not set precedence for future recalculations."* Murdoch said that she wanted the SOAs to be clear that Committees' representatives involved in future recalculation efforts were not obligated to use the methods from the 2013 recalculation.

Mike Tonseth said that he provided a comment to Grant PUD's Microsoft Word version of the SOA, with changes tracked, that is also applicable to Chelan PUD's SOA,. The comment is for clarification and applies to the first sentence of the first paragraph of the SOA under the subheading Background. The recommended edit would make the language in the SOA consistent with the language in Chelan PUD's HCP.

Murdoch asked that the text in both Chelan PUD's and Grant PUD's draft SOAs, and in Appendix B of those SOAs, be revised per her tracked edits provided in Grant PUD's Microsoft Word version of the SOA. She said that revising both documents as per her edits would make the documents read similarly, where appropriate. Mike Schiewe indicated that the appendices were not needed as part of the SOAs, since the documents referred to in the SOAs were already part of the HCP administrative record.

Not hearing any more requests for substantive changes to the SOAs, Mike Schiewe asked for a vote by Committees' members on the SOAs. Regarding Douglas PUD's SOA: Truscott said he was fine with the SOA if the suggested revision were incorporated; Bill Gale said he was fine with SOA but was not prepared to vote until the Committees' meeting on December 14, 2011, following internal U.S. Fish and Wildlife Service (USFWS) review of the SOA; Tonseth said he was ready to vote for approval of the SOA as revised; Murdoch said she was ready to vote for approval of the SOA as revised; Craig Busack said he was not prepared to vote until the next Committees' meeting, following internal review of the final SOA; and Mackey said that he was fine with the changes recommended today by Committees' members.

Regarding the Chelan PUD SOA, all Committees' members said their responses were the same as their responses for a request for approval of the Douglas PUD SOA. Joe Miller said that Chelan PUD was fine with the changes recommended by the Committees today and that Chelan PUD's SOA would be revised to reflect today's recommended changes for a final vote at the next Committees' meeting on December 14, 2011.

C. Grant PUD (Todd Pearsons)

Todd Pearsons said that Grant PUD's SOA was very similar to Chelan PUD's SOA in its organization. He said that he received comments from Mike Tonseth and Keely Murdoch. Tonseth's recommendation to make language in the SOA regarding timing of periodic review of hatchery production levels for No Net Impact (NNI) the same as the language used in the Grant PUD 2006 Priest Rapids Project Salmon and Steelhead Settlement Agreement (Settlement Agreement), will be made to Grant PUD's SOA. He said that he would make the revisions to the SOA and Appendix B as recommended by Murdoch to change references from the "JFP Implementation Plan" to the "Committees' Implementation Plan"; include language that 2013 recalculation methods do not set a precedence for future recalculations; include a footnote for Table 1 saying that overwinter acclimation would be implemented for the Carlton and Dryden summer Chinook production if feasible, as per the PRCC SOA 2009-09; and include text in the SOA referring to language in Section 8.3 of the 2006 Settlement Agreement and 2008 Biological Opinion regarding Grant PUD's responsibilities to continue to provide mitigation even should unforeseen circumstances occur. Truscott said that he was fine with Grant PUD's SOA as discussed, but would want to see the final revised SOA for a vote at the next PRCC Hatchery Subcommittee (HSC) meeting.

Mike Schiewe summarized that the documents previously referred to as either the PUD or JFP RIP would be referred to in the future as the "HCP Hatchery Committees and PRCC HSC Implementation Plan." All Committees' members agreed that there were no additional comments on the SOAs or RIPs.

Schiewe asked the PUDs to provide the Committees with Microsoft Word versions of their revised SOAs and Hatchery Committees' Implementation Plan so that any final edits or changes could be provided in advance of and considered prior to the December 14, 2011, Hatchery Committees' meeting. Schiewe said that there will be a final vote for approval of the Douglas PUD and Chelan PUD SOAs on December 14, 2011.

List of Attachments

Attachment A – List of Attendees
Attachment B – Final JFP Position on Recalculation Implementation Plans (updated November 28, 2011)
Attachment C – Douglas PUD NNI Recalculation Implementation SOA (dated November 28, 2011)
Attachment D – Chelan PUD Recalculation SOA (for approval at the November 30, 2011, conference call)
Attachment E – Grant PUD Recalculation SOA (draft for the November 30, 2011 meeting)

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Joe Miller*	Chelan PUD
Josh Murauskas*	Chelan PUD
Shane Bickford	Douglas PUD
Tom Kahler*	Douglas PUD
Greg Mackey*	Douglas PUD
Craig Busack*	NOAA
Kirk Truscott*	CCT
Bill Gale*	USFWS
Mike Tonseth*	WDFW
Keely Murdoch*	Yakama Nation
Elizabeth McManus	Ross & Associates
Todd Pearsons	Grant PUD
Shannon Lowery	Grant PUD

* Denotes Hatchery Committees' member or alternate

Attachment B

11/18/11(updated 11/28/11) - Revised JFP Implementation Plan

This JFP proposed amended NNI Recalculation Implementation Plan (RIP) is set forth to the Grant/Chelan/Douglas PUD's as a response/alternate proposal of JFP management priorities and considerations for production of individual plan species among basins to the joint PUD plan.

Spring Chinook

Okanogan Basin

Under this plan, Grant, Chelan and Douglas spring Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this plan, Douglas spring Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Under this plan, Chelan PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 60,516 fish.

Under this plan, Grant PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 134,126 fish.

Wenatchee Basin

Under this plan, spring Chinook obligations for Chelan PUD in the Wenatchee Basin would remain as recalculated for a program of 144,026 fish.

Under this proposed plan, spring Chinook production obligations for Grant PUD in the Wenatchee Basin remains as in-kind/in-place compensations and is as follows:

The Grant PUD Wenatchee Basin spring Chinook production obligation remains at the recalculated value of 223,670 fish with the Nason Creek and White River programs being allocated at 149,114 and 74,556 fish, respectively.

While the program levels identified in the White River and Nason Creek programs is reduced from levels indentified in current facility designs and permit packages, the JFP's maintain concerns about reducing the size of the facilities to meet the new production levels. While the JFP's do not necessarily agree with downsizing the facilities to meet the new production levels, in particular the White River facility, we recognize that there may be financial considerations and would not be opposed it, provided there would be no delays in implementing the programs (facility operation) within the current identified time frame. In addition, the JFP's have the expectation that if the White River/Nason Creek facilities are downsized, and if at the next recalculation period, production in those programs increase, there will be no delay in meeting that obligation in a manner agreeable to parties through Committee discussions.

Attachment B

Table 1. Proposed implementation of mid-Columbia spring Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000	
Okanogan Total						*900,000*	
Methow Hatchery	29,123	60,516	134,126	0	0	223,765	550,000
Winthrop NFH				400,000		400,000	600,000
Methow Total						*623,765*	*1,150,000*
Chiwawa		144,026				144,026	298,000
White			74,556			74,556	150,000
Nason			149,114			149,114	250,000
Leavenworth				1,200,000		1,200,000	1,200,000
Wenatchee Total						*1,567,696*	*1,898,000*
Total	**62,423**	**319,832**	**467,796**	**1,800,000**	**441,410**	**3,091,461**	**3,048,000**

Summer Chinook

Okanogan Basin

Under this plan, Grant summer Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP. For Chelan and Douglas PUD, summer Chinook will include both yearling and sub-yearling production at CJH, consistent with yearling survival studies for Wells, Rocky Reach and Rock Island Dams and the HCP assumed sub-yearling survival. The amended summer Chinook production for Douglas PUD is consistent with the Douglas PUD/BPA cost-share agreement for CJH. The amended summer Chinook production for Chelan PUD are assumed values pending a completed cost-share agreement for CJH.

Methow Basin

Under this plan, Grant summer Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Wenatchee Basin

Under this plan, Chelan and Grant summer Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP.

Attachment B

Table 2. Proposed implementation of mid-Columbia summer Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joe CH1	48,100	166,569	278,000	0	807,331	1,300,000	
Chief Joe CH0	49,000	94,570			556,430	700,000	
Okanogan Total						*2,000,000*	*556,000*
Carlton	0	0	200,000	0	0	200,000	
Methow Total						*200,000*	*400,000*
Dryden	0	318,185	181,816	0	0	500,001	
Wenatchee Total						*500,001*	*872,000*
Entiat				400,000		400,000	
Entiat Total				*400,000*		*400,000*	*400,000*
Chelan Falls		176,000				176,000	200,000
Chelan Falls Inundation		400,000				400,000	400,000
Wells Inundation yearling	320,000	0				320,000	320,000
Wells Inundation subs	484,000	0				484,000	484,000
Columbia Total						*1,380,000*	*1,404,000*
Total	***901,100***	***1,155,324***	***659,816***	***400,000***	***1,363,761***	***4,480,001***	***3,632,000***

Steelhead

Okanogan Basin

Under this plan, Grant PUD summer steelhead production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this plan, Douglas summer steelhead production for the Methow Basin would be amended as follows:

Implementation of the adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will comprise 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS BiOp for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the

terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."

Wenatchee Basin

Under this plan, Chelan summer steelhead production for the Wenatchee Basin would remain at the current agreed to production level (HCP-HC SOA and *US v. OR* Agreement) of 247,300 fish which was identified as the available capacity at Chiwawa Ponds to overwinter this program. The PUD RIP originally identified a combined NNI/inundation program of 187,000 smolts using the minimum NNI recalculated value of 22K rather than the maximum of 46K. Under this amendment the currently agreed to production level would be maintained at 247,300and be derived through a combination of a 1:1 conversion (species swap) of 46,000 sockeye in addition to an increase in the NNI compensation to 36,300. For the next 10 year period (2014-2023) the 46,000 sockeye to steelhead conversion would be included in the NNI obligation for Chelan PUD and therefore subject to recalculation post 2023.

Table 3. Proposed implementation of mid-Columbia summer steelhead programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Wells (Okanogan)			100,000			100,000	100,000
Okanogan Total						*100,000*	*100,000*
Wells (Twisp Pond)	48,000					48,000	48,000
Wells (Methow inundation)[1]	100,000					100,000	300,000
Winthrop NFH				200,000		200,000	100,000
Methow Total						*348,000*	*448,000*
Wenatchee (NNI)		36,300				36,300	235,000
Wenatchee (NNI Trade)		46,000				46,000	
Wenatchee (Inundation)		165,000				165,000	165,000
Wenatchee Total						*247,300*	*400,000*
Wells (Columbia)[1]	160,000					160,000	
Columbia Total						*160,000*	
Total	**308,000**	**247,300**	**100,000**	**200,000**		**855,300**	**1,048,000**

1 The distribution of production from the inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued to the program the conclusion of the NOAA consultation on the Wells steelhead HGMP. Release levels in the respective areas may change however the total obligation will remain the same.

Sockeye

Wenatchee Basin

Under this plan, Chelan sockeye production for the Wenatchee Basin would be converted 1:1 to Wenatchee steelhead in a species swap. Because mortality on Wenatchee sockeye will continue to occur at Rock Island Dam, monitoring and evaluation of the natural populations in the White and Little Wenatchee rivers will continue to occur. This will include but not be limited to current activities such as measuring juvenile emigration abundance/performance, adult spawner abundance/distribution, etc. as well as those biotic and abiotic variables which could be identified as limiting factors to natural productivity and juvenile/adult abundance (e.g. predation, etc.).

Fall Chinook

Under this plan, Grant fall Chinook production would remain as proposed in the joint PUD RIP with the exception of the fry conversion (see footnote in Table 4).

Table 4. Proposed implementation of mid-Columbia fall Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Inundation			5,000,000				5,000,000
Fry[1]			1,000,000				1,000,000
Smolts			325,543				1,000,000
Total			**6,635,543**				**7,000,000**

1 The JFP recognize and agree with having consensus on a fall Chinook fry conversion as part of the whole GCPUD implementation plan but do not want to have it as a confounding issue during development of the NNI recalculation implementation plan. At this time the fry conversion will be included in the overall plan but not considered within this recalculation implementation plan.

Attachment C

Wells HCP Hatchery Committee

Final Statement of Agreement (SOA)

Regarding the 2013 No Net Impact (NNI) Recalculation and Implementation Plan

Approved on 30 November 2011

Statement

The Wells HCP Hatchery Committee (HC) approves the implementation of Douglas PUD's hatchery obligations (both recalculated NNI and inundation compensation production) as described in the *Implementation Plan for Wells HCP Plan Species Hatchery Programs: 2013-2023* (Appendix A).

Attachment C

Appendix A

Implementation Plan for Wells HCP Plan Species Hatchery Programs: 2013-2023

November 28, 2011

The 2013-2023 Wells HCP Hatchery Implementation Plan is consistent with the terms of the Wells HCP and is based on the Hatchery Recalculation Sensitivity Analysis, the Wells Complex Summer Steelhead Hatchery Genetics Management Plan (HGMP) (submitted to NMFS on April 13, 2011) and the Methow Spring Chinook HGMP (submitted to NMFS on March 12, 2010). Table 1 shows Douglas PUD's recalculated hatchery obligations by species and location.

Implementation of Douglas PUD's adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will consist of 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS Biological Opinion (BiOp) for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp River (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

> *"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."*

Attachment C

Appendix A

Table 1. Implementation of Douglas PUD's recalculated hatchery obligations by species.

Species	Facility	Location	Production target	Purpose
Spring Chinook	Chief Joseph[1]	Okanogan Basin	33,300	NNI
	Methow	Methow Basin	29,123	NNI
Summer Chinook	Chief Joseph (yearling)[2]	Columbia/Okanogan	48,100	NNI
	Chief Joseph (sub-yearling)[2]	Columbia/Okanogan	49,000	NNI
	Wells (yearling)	Columbia River	320,000	Inundation
	Wells (sub-yearling)	Columbia River	484,000	Inundation
Steelhead	Wells	Twisp River	8,000	NNI
	Wells[3]	Twisp River	40,000	Inundation
	Wells[4]	Methow River	100,000	Inundation
	Wells[5]	Columbia River	160,000	Inundation
Sockeye	NNI met through funding of Fish-Water Management Tool			
Coho	Funding Agreement for the Yakama Nation Coho Reintroduction Program			

[1] Douglas PUD has agreed to provide funding for spring Chinook salmon at Chief Joseph Hatchery.

[2] Douglas PUD has agreed to provide funding for summer Chinook salmon at Chief Joseph Hatchery ((54,575 yearlings, or 48,100 yearlings plus 49,000 sub-yearlings).

[3] These are inundation fish representing 2/15 of the Wells 300,000 inundation steelhead.

[4] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the Wells Steelhead HGMP. These fish represent 5/15 of the Wells 300,000 inundation steelhead. The distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

[5] A portion of these fish may be released in the Okanogan River, as per the Wells Complex Steelhead HGMP. These fish represent 8/15 of the Wells 300,000 inundation steelhead. The distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

Attachment D

Rock Island and Rocky Reach HCP Hatchery Committees

Statement of Agreement

Mid-Columbia PUD Hatchery Production Objectives, Release Years 2014-2023

For Approval at November 30th, 2011 Conference Call

Statement

The Rock Island and Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan (HCP) Hatchery Committees (HC) approve the adjusted hatchery compensation for spring Chinook, steelhead, summer Chinook, and sockeye proposed in the Implementation Plan (Plan; Appendix A), including amendments from the Joint Fisheries Parties[1] (JFP; Appendix B and Appendix C). The final agreed-upon production levels specific to the Rock Island and Rocky Reach HCPs are presented in Table 1 and represent total hatchery compensation for NNI and Inundation as described in sections 3.1 and 8.4 of the HCPs. The adjusted hatchery compensation within the Plan begins with the 2014 releases and continues until the next adjustment of hatchery compensation, with releases beginning in 2024 [Section 8.4]. Further adjustments of the Plan may occur between 2014 and 2023 as described in the Rock Island and Rocky Reach HCPs [Section 8.4].

***Table 1**. Rock Island and Rocky Reach HCP recalculated hatchery production objectives, 2014-2023.*

Species	Facility	Chelan smolt production target	Project(s)	Purpose
Spring Chinook	Chief Joseph	115,290 (12.81% of CJH production)	RIS/RRH	NNI
	Chiwawa	144,026	RIS	NNI
	Methow	60,516	RRH	NNI
Summer Chinook	Chief Joseph/Similkameen	166,569 (12.81% of CJH production)	RIS/RRH	NNI
	Chief Joseph (sub-yearling)	94,570 (13.51% of CJH production)	RIS/RRH	NNI
	Carlton[2]	0	-	-
	Chelan Falls	400,000	RRH	Inundation
	Chelan Falls	176,000	RRH	NNI
	Dryden[2]	318,000	RIS	NNI
Steelhead	Chiwawa	165,000	RRH	Inundation
	Chiwawa	22,000	RIS/RRH	NNI
	Chiwawa	60,300	RIS	Species trade[3]
Sockeye	Wenatchee	White/Little Wenatchee M&E	RIS	Species trade[3]
	Penticton Hatchery	Skaha Reintroduction Program	RIS/RRH	NNI
Coho		Yakama Nation Coho Program	RIS/RRH	NNI

[1] Including U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, Confederated Tribes of the Colville Reservation, and Confederated Tribes and Bands of the Yakama Indian Nation.

[2] Capacity is available at these facilities to implement hatchery sharing agreements with other parties. As per July 21, 2010 SOA, size criteria for the Rock Island NNI production at Dryden would change if Grant PUD funds overwinter acclimation at Dryden. Chelan PUD has agreed to assess the feasibility of Grant PUD constructing overwinter modifications at these facilities, which in itself does not represent a commitment by Chelan PUD to develop overwinter acclimation at these facilities.

[3] The JFP amended production targets included a species trade of the recalculated sockeye production (46,000) for additional steelhead production (60,300) to remain consistent with the 2010 HCP-HC SOA (March 16, 2011) and *US v. OR* agreements to produce a total of up to 247,300 steelhead smolts at Chiwawa utilizing existing infrastructure.

Background

The mid-Columbia River PUD HCPs state that hatchery compensation levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter based on population dynamics. The HC initiated discussion on the first adjustment of hatchery compensation under the HCPs (set for the 2014 releases) during the fall of 2010, and ultimately agreed to a methodology to calculate the adjustments (SOA dated July 20th, 2011). A technical subcommittee of the HCs developed a database in a parallel effort for use in the hatchery compensation adjustment efforts (approved on August 17th, 2011). These methods and associated data were then used to develop ranges of hatchery compensation (i.e., "Sensitivity Analysis"). The Sensitivity Analysis was distributed on August 16th, 2011, and the HC agreed during the August 17th meeting and August 30th, 2011 conference call to use the Sensitivity Analysis ranges of hatchery compensation as the basis for development of an Implementation Plan.

A draft Implementation Plan was provided and discussed at the September 21st, 2011 HC meeting. Comments and clarifications requested by the HCs were adapted and the updated Implementation Plan (Appendix A) was provided to the HC on September 28th, 2011. The updated Plan included more detail on specific PUD hatchery compensation by facility and basin, as well as more extensive annotation of programs, as requested by the HC. The JFP proposed amendments to the Implementation Plan on November 4th (Appendix B). Amendments concerning the Rock Island and Rocky Reach HCPs included (1) a delineation between yearling and sub-yearling production at Chief Joseph Hatchery; and, (2) an exchange of sockeye production in Lake Wenatchee for steelhead production at Chiwawa Acclimation Ponds to maintain a prior production agreement. The original JFP amendment included a multi-PUD species trade that consolidated all of Chelan's spring Chinook production (outside of Chief Joseph Hatchery) to Chiwawa Acclimation Ponds. The species trade did not materialize and the JFP revised their amendments accordingly (Appendix C), resulting in Chelan PUD production levels of 144,026 spring Chinook smolts at Chiwawa Acclimation Ponds and 60,516 smolts at the Methow Hatchery and a future funding commitment to Chief Joseph Hatchery based on 12.81% of spring Chinook production there.

The JFP has also indicated a desire for Grant PUD to construct overwinter acclimation facilities for summer Chinook production at the Chelan PUD-owned Dryden and Carlton acclimation ponds. Chelan PUD has agreed to assess the feasibility of Grant PUD modifying these facilities to accommodate overwinter rearing. However, the execution of a feasibility assessment does not obligate Chelan PUD to modify any facility unless both PUDs can reach agreement on the terms and conditions of a facility modification contract. In the interim, Chelan PUD will provide existing hatchery capacity to Grant PUD according to the existing Hatchery Sharing Agreement between the two PUDs.

The adjustments and final production agreements described herein are specific to the Rock Island and Rocky Reach HCPs and do not commit other mid-Columbia River PUDs or entities to current and future production targets.

APPENDIX A

IMPLEMENTATION OF PUD HATCHERY PRODUCTION, 2014-2023

INTRODUCTION

This proposed *Implementation Plan for Mid-Columbia PUD Hatchery Production* (Plan) scheduled for the 2014 to 2023 juvenile migration years represents an effort to balance direction provided by the Joint Fishery Parties (JFP) and an "efficient use of existing facilities owned by the District[s]," consistent with the mid-Columbia River Habitat and Conservation Plans (HCPs; i.e., Section 8.6), Grant PUD's Salmon and Steelhead Settlement Agreement, and within the agreed upon recalculation ranges that were presented in the sensitivity analysis. Previous work elements that have led to this Plan include: 1) an SOA describing the methodology for recalculating hatchery production, 2) a database for use in these calculations, and 3) a Sensitivity Analysis that generated a range of recalculation values.

The Sensitivity Analysis determined a range of recalculation outcomes for each Plan Species, providing a minimum and maximum production outcome (options 1 and 3, respectively) depending on inclusion of approaches not yet agreed to by the Hatchery Committee or Priest Rapids Coordinating Committees' Hatchery Sub-committee (HC or HSC, respectively; for example, whether or not to include inundation production from upstream projects in the recalculation). Rather than continued discussion on how to resolve different perspectives on these methods, the HC and HSC decided to accept the range of outcomes as the basis for developing this Plan, with the understanding that the range provides flexibility and management discretion to arrive at final production targets.

The Plan described herein reflects a multifaceted response to allocation of recalculated hatchery production targets based on previous Statement of Agreements within the HC and HSC, draft Hatchery and Genetic Management Plans (HGMPs), regulatory considerations (such as the Endangered Species Act, previously issued Biological Opinions, and State Water Quality Standards), hatchery sharing agreements among the PUDs, proposed facility modifications, and funding arrangements between the PUDs and the Colville Confederated Tribes at the new Chief Joseph Fish Hatchery. The Plan further provides assurance on agency requests for maximum production outcomes for spring Chinook salmon. The general approach to the Plan was to use the maximum recalculated values (from the Sensitivity Analysis) for spring Chinook salmon, middle of the range values for summer Chinook salmon, minimum values for steelhead, and actual values for sockeye and fall Chinook salmon.

Finally, this Plan is set forth to the JFP as a basis for discussion on management priorities and proposed species trades and/or reallocation of production of individual species among basins. The first section (Tables 1-5) describes minimum, maximum, and proposed production targets by river basin. The minimum and the maximum production targets are consistent with options 1 and 3, respectively, in the Sensitivity Analysis. The second section (Tables 6-8) describes minimum, maximum, and proposed production targets by facility and also includes non-PUD production to provide context on regional production levels.

DISTRIBUTION OF PRODUCTION BY RIVER BASIN

Table 1. Proposed implementation of mid-Columbia PUD spring Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan Basin[4]	259,000	259,000	259,000
Methow Basin[5]	150,000	224,000	224,000
Wenatchee Basin[2]	157,000	367,000	367,000
Total	**566,000**	**850,000**	**850,000**

** Additional spring Chinook production in the Wenatchee River totals 1,200,000 (Leavenworth); additional spring Chinook production in the Methow River totals 400,000 (Winthrop NFH); additional spring Chinook production in the Okanogan River totals up to 641,000 (Chief Joseph). These targets would represent an additional 2,241,000 spring Chinook smolts in addition to the proposed 850,000 PUD-funded target releases.*

Table 2. Proposed implementation of mid-Columbia PUD steelhead programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	101,000	196,000	100,000[6]
Methow R.[7]	7,000	8,000	8,000
Methow R. Inundation[8]	100,000	100,000	100,000
Columbia R. Inundation[9]	200,000	200,000	200,000
Wenatchee R.	22,000	46,000	22,000
Wenatchee R. Inundation	165,000	165,000	165,000
Total	**595,000**	**715,000**	**595,000**

** Additional steelhead production in the Methow River totals 100,000 (Winthrop NFH). These targets would represent an additional 100,000 steelhead smolts in addition to the proposed 595,000 PUD-funded target releases.*

[4] Grant (110,000), Chelan (115,290), and Douglas (33,300) PUDs have agreed to provide funding for spring Chinook production at Chief Joseph Hatchery to represent obligations in the Okanogan River Basin. Total production reflects a proportion of up to 900,000 yearling spring Chinook to be produced at Chief Joseph.

[5] The Methow + Wenatchee spring Chinook production equals the total spring Chinook production levels in the Sensitivity Analysis.

[6] The Grant PUD Biological Opinion calls for production of up to 100,000 steelhead smolts. To be consistent with the Biological Opinion, the 1,000 smolt difference between the proposed and minimum calculation options was added to the Methow River component to maintain consistency with the minimum 595,000 calculated production option.

[7] This is the Twisp River steelhead NNI program.

[8] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent 1/3 of the Wells 300,000 inundation steelhead.

[9] A portion of these fish may be released in the Okanogan River, as per the draft Wells Steelhead HGMP. These fish represent 2/3 of the Wells 300,000 inundation steelhead.

Table 3. Proposed implementation of mid-Columbia PUD summer Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	207,000	207,000	522,000[10]
Methow R.	167,000	335,000	200,000[11]
Chelan R.	176,000	185,000	176,000
Chelan R. Inundation	400,000	400,000	400,000
Wenatchee R.	719,000	743,000	500,000[12]
Wells Inundation CH-0	484,000	484,000	484,000
Wells Inundation CH-1	320,000	320,000	320,000
Total[13]	**2,110,000**	**2,311,000**	**2,239,000**

** Additional summer Chinook production in the Entiat River totals 400,000 (Entiat NFH); additional summer Chinook production in the Okanogan River totals 953,000 yearling equivalents (Chief Joseph). These targets would represent an additional 1,353,000 summer Chinook smolts in addition to the proposed 2,239,000 PUD-funded target releases.*

Table 4. Proposed implementation of mid-Columbia PUD sockeye programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	WMT/Skaha	WMT/Skaha	WMT/Skaha[14]
Wenatchee R.	46,000	46,000	46,000
Total	**46,000**	**46,000**	**46,000**

Table 5. Proposed implementation of mid-Columbia Grant PUD fall Chinook programs at the Priest Rapids Hatchery, 2014-2023. The column "Planned" represents the numbers of fish in the Salmon and Steelhead Settlement Agreement.

Program	Planned	Proposed[12]
Inundation	5,000,000	5,000,000
Fry	1,000,000	.
Smolts (NNI)	1,000,000	325,543
Smolts (fry exchange)	.	200,000

** An additional 1.7 million fall Chinook are planned to be reared and released at the Priest Rapids Hatchery by a funding agreement with the Army Corps of Engineers. Other production at the hatchery is currently being negotiated.*

[10] Grant (278,000 yearlings), Chelan (188,992 yearlings), and Douglas (54,575 yearlings, or 48,100 yearlings plus 49,000 sub yearlings) PUDs have agreed to provide funding for a portion of summer Chinook production at Chief Joseph Hatchery.

[11] The proposed Carlton Pond production of 200,000 smolts represents the PUDs understanding of current SOAs and previous allocation of summer Chinook production between the Wenatchee and Methow basins.

[12] The proposed Dryden Pond production of 500,000 smolts represents the PUDs understanding of current SOAs and previous allocation of summer Chinook production between the Wenatchee and Methow basins.

[13] Total represents yearling equivalents. Wells Hatchery total summer Chinook inundation production was reported as 441,000 yearling equivalents in the sensitivity analysis.

[14] Grant, Chelan, and Douglas PUDs have met obligations for sockeye salmon in the Okanogan River Basin through funding the Fish-Water Management Tool and the Skaha Reintroduction Program.

[12] The NNI smolts used a nadir estimate of natural origin fall Chinook at Rock Island Dam. The fry exchange was requested by the JFP and was not based on a recalculation. The value was in the middle of the range of values previously discussed by the HSC.

DISTRIBUTION OF PRODUCTION BY FACILITY

Table 6. Proposed implementation of mid-Columbia PUD spring Chinook programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000
Okanogan Total						*900,000*
Methow Hatchery[15]	29,123	0	194,642	0	0	223,765
Winthrop NFH	0	0	0	400,000	0	400,000
Methow Total						*623,765*
Chiwawa	0	204,542	0	0	0	204,542
White/Nason[16]	0	0	163,154	0	0	163,154
Leavenworth	0	0	0	1,200,000	0	1,200,000
Wenatchee Total						*1,567,696*
Total	**62,423**	**319,832**	**467,796**	**1,800,000**	**441,410**	**3,091,461**

Table 7. Proposed implementation of mid-Columbia PUD steelhead programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Wells (Okanogan) [17]	0	0	100,000	0	0	100,000
Okanogan Total						*100,000*
Wells (Twisp Pond) [18]	8,000	0	0	0	0	8,000
Wells Inundation (Methow) [19]	100,000	0	0	0	0	100,000
Winthrop NFH	0	0	0	100,000	0	100,000
Methow Total						*208,000*
Chiwawa (NNI)	0	22,000	0	0	0	22,000
Chiwawa (RRH Inundation)	0	165,000	0	0	0	165,000
Wenatchee Total						*187,000*
Wells Inundation (Columbia) [20]	200,000	0	0	0	0	200,000
Columbia Total						*200,000*
Total	**308,000**	**187,000**	**100,000**	**100,000**	**0**	**695,000**

[15] Total spring Chinook production from the Methow and Chiwawa facilities is consistent with maximum recalculated outcomes; contribution among PUDs is established through hatchery sharing agreements.
[16] The White River facility is designed to accommodate acclimation up to 165,000 spring Chinook smolts and is designed with some of the most conservative rearing standards (e.g., extremely low rearing densities).
[17] Includes Omak program (approximately 20,000 smolts) and Okanogan program (approximately 80,000 smolts).
[18] This is the Twisp River steelhead NNI program.
[19] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent 1/3 of the Wells 300,000 inundation steelhead.
[20] A portion of these fish may be released in the Okanogan River, as per the draft Wells Steelhead HGMP. These fish represent 2/3 of the Wells 300,000 inundation steelhead.

Table 8. Proposed implementation of mid-Columbia PUD summer Chinook programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Chief Joe CH1	54,575[21]	188,992	278,000	0	778,433	1,300,000
Chief Joe CH0	0	0	0	0	700,000	700,000
Okanogan Total						*2,000,000*
Carlton	0	0	200,000	0	0	200,000
Methow Total						*200,000*
Dryden	0	318,185	181,816	0	0	500,000
Wenatchee Total						*500,000*
Chelan Falls	0	176,000	0	0	0	176,000
Chelan Falls Inundation	0	400,000	0	0	0	400,000
Wells Inundation yearling	320,000	0	0	0	0	320,000
Wells Inundation subs	484,000	0	0	0	0	484,000
Columbia Total						*1,380,000*
Total Yearlings	**374,575**	**1,083,176**	**659,816**	**0**	**778,433**	**2,896,000**
Total Sub yearlings	**484,000**	**0**	**0**	**0**	**700,000**	***1,184,000***

[21] Douglas PUD will contribute either 48,100 yearlings plus 49,000 sub yearlings, or 54,575 yearlings.

APPENDIX B

Proposed JFP 11/04/11 Amendments to PUD Implementation Plan

This JFP proposed amended NNI Recalculation Implementation Plan (RIP) is set forth to the Grant/Chelan/Douglas PUD's as a response/alternate proposal of JFP management priorities and considerations for production of individual plan species among basins to the joint PUD plan.

Spring Chinook

Okanogan Basin

Under this proposed plan, Grant, Chelan and Douglas spring Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this proposed plan, Grant, Chelan and Douglas spring Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Wenatchee Basin

Under this proposed plan, Chelan spring Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP which includes the transfer of approximately 61,000 of their Methow spring Chinook obligation to the Chiwawa spring Chinook program for a combined Chiwawa program of 204,542.

Under this proposed plan, spring Chinook production obligations for Grant PUD in the Wenatchee Basin is revised as follows:

Retain Wenatchee spring Chinook programs in the White River and Nason Creek. GCPUD will provide for programs of 75,000 program in the White River and 150,000 in Nason Creek. This represents an increase in GCPUD spring Chinook 'maximum' production by 61,846 fish which results from a one-for-one reduction in GCPUD summer Chinook production (659,816 PUD proposal to 597,970 draft JFP proposal). The balance of the Nason Creek program would be derived through a reduction in the size of the White River spring Chinook program to 75K.

While the reduction in the White River is reduced from levels indentified in current facility designs and permit packages, the PUD's and the JFP's were aware of the potential reduction in programs associated with recalculation of the respective PUD's mitigation obligations. With the White River program in particular there is a great deal of uncertainty surrounding the programs ability to a) transition to an adult based supplementation, particularly at the 150K level, within the next 10 year period, and b) there is similar uncertainty in managing for disease in that portion of the production which would be reared in the kidney ponds. With a program sized at 75K, and with the current facility designs, 100% of the production could be overwintered in the circulars – making more of the limited ground water available, and then transferred to the kidney ponds in the spring after ice-out, while retaining capacity should the mitigation obligation increase in the future.

Table 1 (previously Table 6 in PUD RIP). Proposed implementation of mid-Columbia spring Chinook programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000	
Okanogan Total						*900,000*	
Methow Hatchery	29,123	0	194,642	0	0	223,765	550,000
Winthrop NFH				400,000		400,000	600,000
Methow Total						*623,765*	*1,150,000*
Chiwawa		204,542				204,542	298,000
White			75,000			75,000	150,000
Nason			150,000			150,000	250,000
Leavenworth				1,200,000		1,200,000	1,200,000
Wenatchee Total						*1,629,452*	*1,898,000*
Total	**62,423**	**319,832**	**529,642**	**1,800,000**		**3,153,307**	**3,048,000**
Change from PUD RIP	**No change**	**No change**	**+61,846**	**No change**	**No change**	**+61,846**	

Summer Chinook

Okanogan Basin

Under this proposed plan, Grant summer Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP. For Chelan and Douglas PUD, summer Chinook will include both yearling and sub-yearling production at CJH, consistent with yearling survival studies for Wells, Rocky Reach and Rock Island Dams and the HCP assumed sub-yearling survival. The amended summer Chinook production for Douglas PUD is consistent with the Douglas PUD/BPA cost-share agreement for CJH. The amended summer Chinook production for Chelan PUD are assumed values pending a completed cost-share agreement for CJH.

Methow Basin

Under this proposed plan, Chelan and Douglas summer Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP. Grant PUD summer Chinook production at Carlton Pond would drop from 200,000 to 194,970 fish. The difference (5,030 fish) is part of a 1:1 summer Chinook to spring Chinook conversion (species swap) to fulfill, in part, a 150k Nason Creek spring Chinook program. Over-winter acclimation would remain a requirement of this program.

Wenatchee Basin

Under this proposed plan, Chelan summer Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP. Grant PUD summer Chinook production at Dryden Pond would drop from 181,816 to 125,000 fish. The difference (56,816 fish) is part of a 1:1 summer Chinook to spring Chinook conversion (species swap) to fulfill, in part, a 150k Nason Creek spring Chinook program.

Table 2 (previously Table 8 in PUD RIP). Proposed implementation of mid-Columbia summer Chinook programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joe CH1		166,569	278,000	0		1,300,000	
	48,100				807,331		
Chief Joe CH0	49,000	94,570				700,000	
					556,430		
Okanogan Total						*2,000,000*	*556,000*
Carlton	0	0	194,970	0	0	194,970	
Methow Total						*194,970*	*400,000*
Dryden	0	318,185	125,000	0	0	443,185	
Wenatchee Total						*443,185*	*872,000*
Entiat				400,000		400,000	
Entiat Total				*400,000*		*400,000*	*400,000*
Chelan Falls		176,000				176,000	200,000
Chelan Falls Inundation		400,000				400,000	400,000
Wells Inundation yearling	320,000	0				320,000	320,000
Wells Inundation subs	484,000	0				484,000	484,000
Columbia Total						*1,380,000*	*1,404,000*
Total	*901,100*	*1,155,324*	*597,970*	*400,000*	*1,363,761*	*4,418,155*	*3,632,000*
Change from PUD RIP	+42,525	+72,148	*-61,846*	**No change**	-114,672	*+167,499*	

Steelhead

Okanogan Basin

Under this proposed plan, Grant PUD summer steelhead production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this proposed plan, Douglas summer steelhead production for the Methow Basin would be amended as follows:

The Joint Fisheries Parties are concerned that the size of Douglas County PUDs Twisp steelhead program if implemented as outlined in the 9/28/2011 implementation plan will be too small to provide a viable conservation hatchery program for the Twisp spawning aggregate of the Methow River steelhead population. The JFP request shifting production from DPUDs inundation obligation to maintain the current size of this program. Specifically we request the following changes be made to the implementation plan:

- Maintain the current size (48K) of the Twisp program by utilizing fish to be reared for Douglas County PUD's inundation (40K) and No Net Impact (8K) obligations for this program. Change footnote 4 in Table 2 to discuss the fact that the Twisp program will be utilizing both NNI and Inundation fish.

- Reduce the number of fish to be released as mitigation for inundation in the Columbia R. mainstem to a total of 160K.

- Leave the Lower Methow Inundation entry in Table 2 as it currently stands (100K).

- Add a footnote to both the Columbia R mainstem Inundation entry and the Lower Methow Inundation entry in Table 2 to explain that the distribution of production between these is dependent on the conclusion of the NOAA consultation on the Wells steelhead HGMP and may change though the total obligation will not change.

- Additional space at Methow Fish Hatchery as a result of a decreased spring Chinook program would be used to overwinter 100K inundation steelhead in the Methow (rather than short term acclimation as per the revised HGMP.

Wenatchee Basin

Under this proposed plan, Chelan summer steelhead production for the Wenatchee Basin would remain at the current agreed to production level (HCP-HC SOA and *US v. OR* Agreement) of 247,500 fish which was identified as the available capacity at Chiwawa Ponds to overwinter this program. The PUD RIP originally identified a combined NNI/inundation program of 187,000 smolts using the minimum NNI recalculated value of 22K rather than the maximum of 46K. Under this amendment the currently agreed to production level would be maintained at 247,500and be derived through a combination of a 1:1 conversion (species swap) of 46,000 sockeye in addition to an increase in the NNI compensation to 36,500. For the next 10 year period (2014-2023) the 46,000 sockeye to steelhead conversion would be included in the NNI obligation for Chelan PUD and therefore subject to recalculation post 2023.

Table 3 (previously Table 7 in PUD RIP). Proposed implementation of mid-Columbia summer steelhead programs by hatchery facility. Highlights denotes changes from the joint PUD implementation plan.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Wells (Okanogan)			100,000			100,000	100,000
Okanogan Total						*100,000*	*100,000*
Wells (Twisp Pond)	48,000					48,000	48,000
Wells (Methow inundation)	100,000					100,000	300,000
Winthrop NFH				200,000		200,000	100,000
Methow Total						*348,000*	*448,000*
Wenatchee (NNI)		36,500				36,500	235,000
Wenatchee (NNI Trade)		46,000				46,000	
Wenatchee (Inundation)		165,000				165,000	165,000
Wenatchee Total						*247,500*	*400,000*
Wells (Columbia)	160,000					160,000	
Columbia Total						*160,000*	
Total	**308,000**	**247,500**	**100,000**	**200,000**		**855,500**	**1,048,000**
Change from PUD RIP	**No change**	**+60,500**	**No change**	**No change**	**No change**	*+60,500*	

Sockeye

Wenatchee Basin

Under this proposed plan, Chelan sockeye production for the Wenatchee Basin would be converted 1:1 to Wenatchee steelhead in a species swap. Because mortality on Wenatchee sockeye will continue to occur at Rock Island Dam, monitoring and evaluation of the natural populations in the White and Little Wenatchee rivers will continue to occur. This will include but not be limited to current activities such as measuring juvenile emigration abundance/performance, adult spawner abundance/distribution, etc. as well as those biotic and abiotic variables which could be identified as limiting factors to natural productivity and juvenile/adult abundance (e.g. predation, etc.).

Fall Chinook

- Footnote 12 should be edited to include language that states that the fry exchange values provided in Table 5 have not yet been agreed to by the parties and may change based on the final fry to smolt exchange rate used when consensus on this issue is reached.

APPENDIX C

11/18/11 - Revised JFP Implementation Plan

This JFP proposed amended NNI Recalculation Implementation Plan (RIP) is set forth to the Grant/Chelan/Douglas PUD's as a response/alternate proposal of JFP management priorities and considerations for production of individual plan species among basins to the joint PUD plan.

Spring Chinook

Okanogan Basin

Under this plan, Grant, Chelan and Douglas spring Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this plan, Douglas spring Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Under this plan, Chelan PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 60,516 fish.

Under this plan, Grant PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 134,126 fish.

Wenatchee Basin

Under this plan, spring Chinook obligations for Chelan PUD in the Wenatchee Basin would remain as recalculated for a program of 144,026 fish.

Under this proposed plan, spring Chinook production obligations for Grant PUD in the Wenatchee Basin remains as in-kind/in-place compensations and is as follows:

The Grant PUD Wenatchee Basin spring Chinook production obligation remains at the recalculated value of 223,670 fish with the Nason and White river programs being allocated at 149,114 and 74,556 fish, respectively.

While the program levels identified in the White River and Nason Creek programs is reduced from levels indentified in current facility designs and permit packages, the JFP's maintain concerns about reducing the size of the facilities to meet the new production levels. While the JFP's do not necessarily agree with downsizing the facilities to meet the new production levels, in particular the White River facility, we recognize that there may be financial considerations and would not be opposed it, provided there would be no delays in implementing the programs (facility operation) within the current identified time frame. In addition, the JFP's have the expectation that if the White River/Nason Creek facilities are downsized, and if at the next recalculation period, production in those programs increase, there will be no delay in meeting that obligation in a manner agreeable to parties through Committee discussions.

Table 1. Proposed implementation of mid-Columbia spring Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000	
Okanogan Total						*900,000*	
Methow Hatchery	29,123	60,516	134,126	0	0	223,765	550,000
Winthrop NFH				400,000		400,000	600,000
Methow Total						*623,765*	*1,150,000*
Chiwawa		144,026				144,026	298,000
White			74,556			74,556	150,000
Nason			149,114			149,114	250,000
Leavenworth				1,200,000		1,200,000	1,200,000
Wenatchee Total						*1,567,696*	*1,898,000*
Total	**62,423**	**319,832**	**467,796**	**1,800,000**	**441,410**	**3,091,461**	**3,048,000**

Summer Chinook

Okanogan Basin

Under this plan, Grant summer Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP. For Chelan and Douglas PUD, summer Chinook will include both yearling and sub-yearling production at CJH, consistent with yearling survival studies for Wells, Rocky Reach and Rock Island Dams and the HCP assumed sub-yearling survival. The amended summer Chinook production for Douglas PUD is consistent with the Douglas PUD/BPA cost-share agreement for CJH. The amended summer Chinook production for Chelan PUD are assumed values pending a completed cost-share agreement for CJH.

Methow Basin

Under this plan, Chelan and Douglas summer Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Wenatchee Basin

Under this plan, Chelan and Grant summer Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP.

Table 2. Proposed implementation of mid-Columbia summer Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joe CH1		166,569	278,000	0		1,300,000	
	48,100				807,331		
Chief Joe CH0	49,000	94,570				700,000	
					556,430		
Okanogan Total						*2,000,000*	*556,000*
Carlton	0	0	200,000	0	0	194,970	
Methow Total						*194,970*	*400,000*
Dryden	0	318,185	181,816	0	0	443,185	
Wenatchee Total						*443,185*	*872,000*
Entiat				400,000		400,000	
Entiat Total				*400,000*		*400,000*	*400,000*
Chelan Falls		176,000				176,000	200,000
Chelan Falls Inundation		400,000				400,000	400,000
Wells Inundation yearling	320,000	0				320,000	320,000
Wells Inundation subs	484,000	0				484,000	484,000
Columbia Total						*1,380,000*	*1,404,000*
Total	***901,100***	***1,155,324***	***659,816***	***400,000***	***1,363,761***	***4,418,155***	***3,632,000***

Steelhead

Okanogan Basin

Under this proposed plan, Grant PUD summer steelhead production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this proposed plan, Douglas summer steelhead production for the Methow Basin would be amended as follows:

Implementation of the adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will comprise 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS BiOp for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the

terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."

Wenatchee Basin

Under this proposed plan, Chelan summer steelhead production for the Wenatchee Basin would remain at the current agreed to production level (HCP-HC SOA and *US v. OR* Agreement) of 247,300 fish which was identified as the available capacity at Chiwawa Ponds to overwinter this program. The PUD RIP originally identified a combined NNI/inundation program of 187,000 smolts using the minimum NNI recalculated value of 22K rather than the maximum of 46K. Under this amendment the currently agreed to production level would be maintained at 247,300and be derived through a combination of a 1:1 conversion (species swap) of 46,000 sockeye in addition to an increase in the NNI compensation to 36,300. For the next 10 year period (2014-2023) the 46,000 sockeye to steelhead conversion would be included in the NNI obligation for Chelan PUD and therefore subject to recalculation post 2023.

Table 3. Proposed implementation of mid-Columbia summer steelhead programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Wells (Okanogan)			100,000			100,000	100,000
Okanogan Total						*100,000*	*100,000*
Wells (Twisp Pond)	48,000					48,000	48,000
Wells (Methow inundation)[1]	100,000					100,000	300,000
Winthrop NFH				200,000		200,000	100,000
Methow Total						*348,000*	*448,000*
Wenatchee (NNI)		36,300				36,300	235,000
Wenatchee (NNI Trade)		46,000				46,000	
Wenatchee (Inundation)		165,000				165,000	165,000
Wenatchee Total						*247,300*	*400,000*
Wells (Columbia)[1]	160,000					160,000	
Columbia Total						*160,000*	
Total	**308,000**	**247,300**	**100,000**	**200,000**		**855,300**	**1,048,000**

1 The distribution of production from the inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued to the program the conclusion of the NOAA consultation on the Wells steelhead HGMP. Release levels in the respective areas may change however the total obligation will remain the same.

Sockeye

Wenatchee Basin

Under this proposed plan, Chelan sockeye production for the Wenatchee Basin would be converted 1:1 to Wenatchee steelhead in a species swap. Because mortality on Wenatchee sockeye will continue to occur at Rock Island Dam, monitoring and evaluation of the natural populations in the White and Little Wenatchee rivers will continue to occur. This will include but not be limited to current activities such as measuring juvenile emigration abundance/performance, adult spawner abundance/distribution, etc. as well as those biotic and abiotic variables which could be identified as limiting factors to natural productivity and juvenile/adult abundance (e.g. predation, etc.).

Fall Chinook

The JFP recognize and agree with having consensus on the fall Chinook fry conversion as part of the whole GCPUD implementation plan but do not want to have it as a confounding issue during development of the NNI recalculation implementation plan. At this time the fry conversion will be included in the overall plan but not considered within the recalculation implementation plan.

Attachment E

Priest Rapids Coordinating Committee's Hatchery Sub-Committee

Statement of Agreement

Grant PUD Hatchery Production Objectives, Release Years 2014-2023

Draft for November 30th, 2011 Meeting

Statement

The Priest Rapids Coordinating Committee's Hatchery Sub-committee approves the adjusted NNI hatchery compensation for spring Chinook, steelhead, summer Chinook, and fall Chinook, described in the Implementation Plan (Plan; Appendix A) and the JFP amendments (Attachment B) and presented here in Table 1. The adjusted hatchery compensation within the Plan begins with the 2014 releases and continues until the next adjustment of hatchery compensation, with releases beginning in 2024. Further adjustments of the Plan may occur between 2014 and 2023 as described in the Salmon and Steelhead Settlement Agreement.

Table 1*. Priest Rapids Project (Wanapum and Priest Rapids dams) recalculated hatchery production objectives, 2014-2023.*

Species	Facility	Smolt production obligation	Purpose
Spring Chinook	Chief Joseph	110,000	NNI
	Methow	134,126	NNI
	White	74,556	NNI
	Nason	149,114	NNI
Summer Chinook	Chief Joseph	278,000	NNI
	Carlton	200,000	NNI
	Dryden	181,816	NNI
Fall Chinook	Priest Rapids	5,000,000	Inundation
		325,543	NNI
		1,000,,000 fry	SSSA
Steelhead	Wells/Okanogan	100,000	NNI
Sockeye	Penticton Hatchery	Fund Skaha Reintroduction Program	NNI
Coho		Fund Yakama Nation Coho Program	NNI

Background

The Salmon and Steelhead Settlement states that hatchery compensation levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter based on population dynamics information. The Habitat Conservation Plans's (HCP) Hatchery Committee (HC) initiated discussion on the first adjustment of hatchery compensation under the HCPs (set for the 2014 releases) during the fall of 2010, and ultimately agreed to a methodology to calculate the adjustments (SOA dated July 20th, 2011). Grant PUD was included in the recalculation discussions in hope of having a coordinated approach among the mid-Columbia PUDs. A technical subcommittee of the HCs and HSC developed a database in a parallel effort for use in the hatchery compensation adjustment efforts (approved on August 17th, 2011). These methods and associated data were then used to develop ranges of hatchery compensation (i.e., "Sensitivity Analysis"). The Sensitivity Analysis was distributed on August 16th, 2011, and the HC agreed during the August 17th meeting and August 30th, 2011 conference call to use the Sensitivity Analysis ranges of hatchery compensation as the basis for development of an Implementation Plan. A draft Implementation Plan was provided by the three Mid-Columbia PUDs and discussed at the September 21st, 2011 HC meeting. Comments and clarifications requested by the HCs and HSC were adapted and the updated Implementation Plan (Appendix A) was provided to the HC and HSC on September 28th, 2011. The updated Plan included more detail on specific PUD hatchery compensation by facility and basin, as well as more extensive annotation of programs, as requested by the HC and HSC. The JFP provided an amendment to the PUD Plan on November 4, 2011, then Grant PUD provided a counter to the JFP amendment on November 14, 2011, and finally the JFP provided a final amendment on November 28, 2011 (Appendix B).

APPENDIX A

IMPLEMENTATION OF PUD HATCHERY PRODUCTION, 2014-2023

INTRODUCTION

This proposed *Implementation Plan for Mid-Columbia PUD Hatchery Production* (Plan) scheduled for the 2014 to 2023 juvenile migration years represents an effort to balance direction provided by the Joint Fishery Parties (JFP) and an "efficient use of existing facilities owned by the District[s]," consistent with the mid-Columbia River Habitat and Conservation Plans (HCPs; i.e., Section 8.6), Grant PUD's Salmon and Steelhead Settlement Agreement, and within the agreed upon recalculation ranges that were presented in the sensitivity analysis. Previous work elements that have led to this Plan include: 1) an SOA describing the methodology for recalculating hatchery production, 2) a database for use in these calculations, and 3) a Sensitivity Analysis that generated a range of recalculation values.

The Sensitivity Analysis determined a range of recalculation outcomes for each Plan Species, providing a minimum and maximum production outcome (options 1 and 3, respectively) depending on inclusion of approaches not yet agreed to by the Hatchery Committee or Priest Rapids Coordinating Committees' Hatchery Sub-committee (HC or HSC, respectively; for example, whether or not to include inundation production from upstream projects in the recalculation). Rather than continued discussion on how to resolve different perspectives on these methods, the HC and HSC decided to accept the range of outcomes as the basis for developing this Plan, with the understanding that the range provides flexibility and management discretion to arrive at final production targets.

The Plan described herein reflects a multifaceted response to allocation of recalculated hatchery production targets based on previous Statement of Agreements within the HC and HSC, draft Hatchery and Genetic Management Plans (HGMPs), regulatory considerations (such as the Endangered Species Act, previously issued Biological Opinions, and State Water Quality Standards), hatchery sharing agreements among the PUDs, proposed facility modifications, and funding arrangements between the PUDs and the Colville Confederated Tribes at the new Chief Joseph Fish Hatchery. The Plan further provides assurance on agency requests for maximum production outcomes for spring Chinook salmon. The general approach to the Plan was to use the maximum recalculated values (from the Sensitivity Analysis) for spring Chinook salmon, middle of the range values for summer Chinook salmon, minimum values for steelhead, and actual values for sockeye and fall Chinook salmon.

Finally, this Plan is set forth to the JFP as a basis for discussion on management priorities and proposed species trades and/or reallocation of production of individual species among basins. The first section (Tables 1-5) describes minimum, maximum, and proposed production targets by river basin. The minimum and the maximum production targets are consistent with options 1 and 3, respectively, in the Sensitivity Analysis. The second section (Tables 6-8) describes minimum, maximum, and proposed production targets by facility and also includes non-PUD production to provide context on regional production levels.

DISTRIBUTION OF PRODUCTION BY RIVER BASIN

Table 1. Proposed implementation of mid-Columbia PUD spring Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan Basin[1]	259,000	259,000	259,000
Methow Basin[2]	150,000	224,000	224,000
Wenatchee Basin[2]	157,000	367,000	367,000
Total	**566,000**	**850,000**	**850,000**

** Additional spring Chinook production in the Wenatchee River totals 1,200,000 (Leavenworth); additional spring Chinook production in the Methow River totals 400,000 (Winthrop NFH); additional spring Chinook production in the Okanogan River totals up to 641,000 (Chief Joseph). These targets would represent an additional 2,241,000 spring Chinook smolts in addition to the proposed 850,000 PUD-funded target releases.*

Table 2. Proposed implementation of mid-Columbia PUD steelhead programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	101,000	196,000	100,000[3]
Methow R.[4]	7,000	8,000	8,000
Methow R. Inundation[5]	100,000	100,000	100,000
Columbia R. Inundation[6]	200,000	200,000	200,000
Wenatchee R.	22,000	46,000	22,000
Wenatchee R. Inundation	165,000	165,000	165,000
Total	**595,000**	**715,000**	**595,000**

** Additional steelhead production in the Methow River totals 100,000 (Winthrop NFH). These targets would represent an additional 100,000 steelhead smolts in addition to the proposed 595,000 PUD-funded target releases.*

[1] Grant (110,000), Chelan (115,290), and Douglas (33,300) PUDs have agreed to provide funding for spring Chinook production at Chief Joseph Hatchery to represent obligations in the Okanogan River Basin. Total production reflects a proportion of up to 900,000 yearling spring Chinook to be produced at Chief Joseph.

[2] The Methow + Wenatchee spring Chinook production equals the total spring Chinook production levels in the Sensitivity Analysis.

[3] The Grant PUD Biological Opinion calls for production of up to 100,000 steelhead smolts. To be consistent with the Biological Opinion, the 1,000 smolt difference between the proposed and minimum calculation options was added to the Methow River component to maintain consistency with the minimum 595,000 calculated production option.

[4] This is the Twisp River steelhead NNI program.

[5] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent 1/3 of the Wells 300,000 inundation steelhead.

[6] A portion of these fish may be released in the Okanogan River, as per the draft Wells Steelhead HGMP. These fish represent 2/3 of the Wells 300,000 inundation steelhead.

Table 3. Proposed implementation of mid-Columbia PUD summer Chinook programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	207,000	207,000	522,000[7]
Methow R.	167,000	335,000	200,000[8]
Chelan R.	176,000	185,000	176,000
Chelan R. Inundation	400,000	400,000	400,000
Wenatchee R.	719,000	743,000	500,000[9]
Wells Inundation CH-0	484,000	484,000	484,000
Wells Inundation CH-1	320,000	320,000	320,000
Total[10]	**2,110,000**	**2,311,000**	**2,239,000**

** Additional summer Chinook production in the Entiat River totals 400,000 (Entiat NFH); additional summer Chinook production in the Okanogan River totals 953,000 yearling equivalents (Chief Joseph). These targets would represent an additional 1,353,000 summer Chinook smolts in addition to the proposed 2,239,000 PUD-funded target releases.*

Table 4. Proposed implementation of mid-Columbia PUD sockeye programs by river basin, 2014-2023.

Basin	Minimum	Maximum	Proposed
Okanogan R.	WMT/Skaha	WMT/Skaha	WMT/Skaha[11]
Wenatchee R.	46,000	46,000	46,000
Total	**46,000**	**46,000**	**46,000**

Table 5. Proposed implementation of mid-Columbia Grant PUD fall Chinook programs at the Priest Rapids Hatchery, 2014-2023. The column “Planned” represents the numbers of fish in the Salmon and Steelhead Settlement Agreement.

Program	Planned	Proposed[12]
Inundation	5,000,000	5,000,000
Fry	1,000,000	.
Smolts (NNI)	1,000,000	325,543
Smolts (fry exchange)	.	200,000

** An additional 1.7 million fall Chinook are planned to be reared and released at the Priest Rapids Hatchery by a funding agreement with the Army Corps of Engineers. Other production at the hatchery is currently being negotiated.*

[7] Grant (278,000 yearlings), Chelan (188,992 yearlings), and Douglas (54,575 yearlings, or 48,100 yearlings plus 49,000 sub yearlings) PUDs have agreed to provide funding for a portion of summer Chinook production at Chief Joseph Hatchery.

[8] The proposed Carlton Pond production of 200,000 smolts represents the PUDs understanding of current SOAs and previous allocation of summer Chinook production between the Wenatchee and Methow basins.

[9] The proposed Dryden Pond production of 500,000 smolts represents the PUDs understanding of current SOAs and previous allocation of summer Chinook production between the Wenatchee and Methow basins.

[10] Total represents yearling equivalents. Wells Hatchery total summer Chinook inundation production was reported as 441,000 yearling equivalents in the sensitivity analysis.

[11] Grant, Chelan, and Douglas PUDs have met obligations for sockeye salmon in the Okanogan River Basin through funding the Fish-Water Management Tool and the Skaha Reintroduction Program.

[12] The NNI smolts used a nadir estimate of natural origin fall Chinook at Rock Island Dam. The fry exchange was requested by the JFP and was not based on a recalculation. The value was in the middle of the range of values previously discussed by the HSC.

DISTRIBUTION OF PRODUCTION BY FACILITY

Table 6. Proposed implementation of mid-Columbia PUD spring Chinook programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000
Okanogan Total						*900,000*
Methow Hatchery[12]	29,123	0	194,642	0	0	223,765
Winthrop NFH	0	0	0	400,000	0	400,000
Methow Total						*623,765*
Chiwawa	0	204,542	0	0	0	204,542
White/Nason[13]	0	0	163,154	0	0	163,154
Leavenworth	0	0	0	1,200,000	0	1,200,000
Wenatchee Total						*1,567,696*
Total	**62,423**	**319,832**	**467,796**	**1,800,000**	**441,410**	**3,091,461**

Table 7. Proposed implementation of mid-Columbia PUD steelhead programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Wells (Okanogan)[14]	0	0	100,000	0	0	100,000
Okanogan Total						*100,000*
Wells (Twisp Pond)[15]	8,000	0	0	0	0	8,000
Wells Inundation (Methow)[16]	100,000	0	0	0	0	100,000
Winthrop NFH	0	0	0	100,000	0	100,000
Methow Total						*208,000*
Chiwawa (NNI)	0	22,000	0	0	0	22,000
Chiwawa (RRH Inundation)	0	165,000	0	0	0	165,000
Wenatchee Total						*187,000*
Wells Inundation (Columbia)[17]	200,000	0	0	0	0	200,000
Columbia Total						*200,000*
Total	**308,000**	**187,000**	**100,000**	**100,000**	**0**	**695,000**

[12] Total spring Chinook production from the Methow and Chiwawa facilities is consistent with maximum recalculated outcomes; contribution among PUDs is established through hatchery sharing agreements.
[13] The White River facility is designed to accommodate acclimation up to 165,000 spring Chinook smolts and is designed with some of the most conservative rearing standards (e.g., extremely low rearing densities).
[14] Includes Omak program (approximately 20,000 smolts) and Okanogan program (approximately 80,000 smolts).
[15] This is the Twisp River steelhead NNI program.
[16] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent 1/3 of the Wells 300,000 inundation steelhead.
[17] A portion of these fish may be released in the Okanogan River, as per the draft Wells Steelhead HGMP. These fish represent 2/3 of the Wells 300,000 inundation steelhead.

Table 8. Proposed implementation of mid-Columbia PUD summer Chinook programs by hatchery facility, 2014-2023.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total
Chief Joe CH1	54,575[18]	188,992	278,000	0	778,433	1,300,000
Chief Joe CH0	0	0	0	0	700,000	700,000
Okanogan Total						*2,000,000*
Carlton	0	0	200,000	0	0	200,000
Methow Total						*200,000*
Dryden	0	318,185	181,816	0	0	500,000
Wenatchee Total						*500,000*
Chelan Falls	0	176,000	0	0	0	176,000
Chelan Falls Inundation	0	400,000	0	0	0	400,000
Wells Inundation yearling	320,000	0	0	0	0	320,000
Wells Inundation subs	484,000	0	0	0	0	484,000
Columbia Total						*1,380,000*
Total Yearlings	**374,575**	**1,083,176**	**659,816**	**0**	**778,433**	**2,896,000**
Total Sub yearlings	**484,000**	**0**	**0**	**0**	**700,000**	***1,184,000***

[18] Douglas PUD will contribute either 48,100 yearlings plus 49,000 sub yearlings, or 54,575 yearlings.

Appendix B

11/18/11(updated 11/28/11) - Revised JFP Implementation Plan

This JFP proposed amended NNI Recalculation Implementation Plan (RIP) is set forth to the Grant/Chelan/Douglas PUD's as a response/alternate proposal of JFP management priorities and considerations for production of individual plan species among basins to the joint PUD plan.

Spring Chinook

Okanogan Basin

Under this plan, Grant, Chelan and Douglas spring Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this plan, Douglas spring Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Under this plan, Chelan PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 60,516 fish.

Under this plan, Grant PUD spring Chinook production for the Methow Basin would remain at Methow Hatchery at the recalculated value of 134,126 fish.

Wenatchee Basin

Under this plan, spring Chinook obligations for Chelan PUD in the Wenatchee Basin would remain as recalculated for a program of 144,026 fish.

Under this proposed plan, spring Chinook production obligations for Grant PUD in the Wenatchee Basin remains as in-kind/in-place compensations and is as follows:

The Grant PUD Wenatchee Basin spring Chinook production obligation remains at the recalculated value of 223,670 fish with the Nason Creek and White River programs being allocated at 149,114 and 74,556 fish, respectively.

While the program levels identified in the White River and Nason Creek programs is reduced from levels indentified in current facility designs and permit packages, the JFP's maintain concerns about reducing the size of the facilities to meet the new production levels. While the JFP's do not necessarily agree with downsizing the facilities to meet the new production levels, in particular the White River facility, we recognize that there may be financial considerations and would not be opposed it, provided there would be no delays in implementing the programs (facility operation) within the current identified time frame. In addition, the JFP's have the expectation that if the White River/Nason Creek facilities are downsized, and if at the next recalculation period, production in those programs increase, there will be no delay in meeting that obligation in a manner agreeable to parties through Committee discussions.

Table 1. Proposed implementation of mid-Columbia spring Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joseph Hatchery	33,300	115,290	110,000	200,000	441,410	900,000	
Okanogan Total						*900,000*	
Methow Hatchery	29,123	60,516	134,126	0	0	223,765	550,000
Winthrop NFH				400,000		400,000	600,000
Methow Total						*623,765*	*1,150,000*
Chiwawa		144,026				144,026	298,000
White			74,556			74,556	150,000
Nason			149,114			149,114	250,000
Leavenworth				1,200,000		1,200,000	1,200,000
Wenatchee Total						*1,567,696*	*1,898,000*
Total	**62,423**	**319,832**	**467,796**	**1,800,000**	**441,410**	**3,091,461**	**3,048,000**

Summer Chinook

Okanogan Basin

Under this plan, Grant summer Chinook production for the Okanogan Basin would remain as proposed in the joint PUD RIP. For Chelan and Douglas PUD, summer Chinook will include both yearling and sub-yearling production at CJH, consistent with yearling survival studies for Wells, Rocky Reach and Rock Island Dams and the HCP assumed sub-yearling survival. The amended summer Chinook production for Douglas PUD is consistent with the Douglas PUD/BPA cost-share agreement for CJH. The amended summer Chinook production for Chelan PUD are assumed values pending a completed cost-share agreement for CJH.

Methow Basin

Under this plan, Grant summer Chinook production for the Methow Basin would remain as proposed in the joint PUD RIP.

Wenatchee Basin

Under this plan, Chelan and Grant summer Chinook production for the Wenatchee Basin would remain as proposed in the joint PUD RIP.

Table 2. Proposed implementation of mid-Columbia summer Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Chief Joe CH1	48,100	166,569	278,000	0	807,331	1,300,000	
Chief Joe CH0	49,000	94,570			556,430	700,000	
Okanogan Total						*2,000,000*	*556,000*
Carlton	0	0	200,000	0	0	200,000	
Methow Total						*200,000*	*400,000*
Dryden	0	318,185	181,816	0	0	500,001	
Wenatchee Total						*500,001*	*872,000*
Entiat				400,000		400,000	
Entiat Total				*400,000*		*400,000*	*400,000*
Chelan Falls		176,000				176,000	200,000
Chelan Falls Inundation		400,000				400,000	400,000
Wells Inundation yearling	320,000	0				320,000	320,000
Wells Inundation subs	484,000	0				484,000	484,000
Columbia Total						*1,380,000*	*1,404,000*
Total	***901,100***	***1,155,324***	***659,816***	***400,000***	***1,363,761***	***4,480,001***	***3,632,000***

Steelhead

Okanogan Basin

Under this plan, Grant PUD summer steelhead production for the Okanogan Basin would remain as proposed in the joint PUD RIP.

Methow Basin

Under this plan, Douglas summer steelhead production for the Methow Basin would be amended as follows:

Implementation of the adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will comprise 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS BiOp for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the

terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."

Wenatchee Basin

Under this plan, Chelan summer steelhead production for the Wenatchee Basin would remain at the current agreed to production level (HCP-HC SOA and *US v. OR* Agreement) of 247,300 fish which was identified as the available capacity at Chiwawa Ponds to overwinter this program. The PUD RIP originally identified a combined NNI/inundation program of 187,000 smolts using the minimum NNI recalculated value of 22K rather than the maximum of 46K. Under this amendment the currently agreed to production level would be maintained at 247,300and be derived through a combination of a 1:1 conversion (species swap) of 46,000 sockeye in addition to an increase in the NNI compensation to 36,300. For the next 10 year period (2014-2023) the 46,000 sockeye to steelhead conversion would be included in the NNI obligation for Chelan PUD and therefore subject to recalculation post 2023.

Table 3. Proposed implementation of mid-Columbia summer steelhead programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Wells (Okanogan)			100,000			100,000	100,000
Okanogan Total						*100,000*	*100,000*
Wells (Twisp Pond)	48,000					48,000	48,000
Wells (Methow inundation)[1]	100,000					100,000	300,000
Winthrop NFH				200,000		200,000	100,000
Methow Total						*348,000*	*448,000*
Wenatchee (NNI)		36,300				36,300	235,000
Wenatchee (NNI Trade)		46,000				46,000	
Wenatchee (Inundation)		165,000				165,000	165,000
Wenatchee Total						*247,300*	*400,000*
Wells (Columbia)[1]	160,000					160,000	
Columbia Total						*160,000*	
Total	**308,000**	**247,300**	**100,000**	**200,000**		**855,300**	**1,048,000**

1 The distribution of production from the inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued to the program the conclusion of the NOAA consultation on the Wells steelhead HGMP. Release levels in the respective areas may change however the total obligation will remain the same.

Sockeye

Wenatchee Basin

Under this plan, Chelan sockeye production for the Wenatchee Basin would be converted 1:1 to Wenatchee steelhead in a species swap. Because mortality on Wenatchee sockeye will continue to occur at Rock Island Dam, monitoring and evaluation of the natural populations in the White and Little Wenatchee rivers will continue to occur. This will include but not be limited to current activities such as measuring juvenile emigration abundance/performance, adult spawner abundance/distribution, etc. as well as those biotic and abiotic variables which could be identified as limiting factors to natural productivity and juvenile/adult abundance (e.g. predation, etc.).

Fall Chinook

Under this plan, Grant fall Chinook production would remain as proposed in the joint PUD RIP with the exception of the fry conversion (see footnote in Table 4).

Table 4. Proposed implementation of mid-Columbia fall Chinook programs by hatchery facility.

Facility	Douglas	Chelan	Grant	USFWS	CCT	Total	Current production
Inundation			5,000,000				5,000,000
Fry[1]			1,000,000				1,000,000
Smolts			325,543				1,000,000
Total			**6,325,543**				**7,000,000**

1 The JFP recognize and agree with having consensus on a fall Chinook fry conversion as part of the whole GCPUD implementation plan but do not want to have it as a confounding issue during development of the NNI recalculation implementation plan. At this time the fry conversion will be included in the overall plan but not considered within this recalculation implementation plan.

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

FINAL MEMORANDUM

To:	Wells, Rocky Reach, and Rock Island HCPs Hatchery Committees	**Date:**	January 19, 2012
From:	Mike Schiewe, Chair		
Cc:	Carmen Andonaegui		
Re:	Final Minutes of December 14, 2011, HCP Hatchery Committees' Meeting		

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans (HCPs) Hatchery Committees met at Chelan PUD Headquarters in Wenatchee, Washington, on Wednesday, December 14, 2011, from 9:30 am to 2:30 pm. Attendees are listed in Attachment A to these meeting minutes.

ACTION ITEM SUMMARY

- Mike Schiewe will contact Craig Busack to ask about new information regarding the duration of the new hatchery permits (Item I).
- Bill Gale will contact Pat Connolly, U.S. Geological Service (USGS), to invite him to the March 14, 2012, Hatchery Committees meeting to present an overview of his Methow Basin research program. Opportunities to collaborate on research in the Methow will be discussed at the January Hatchery Committees meeting (Item II-B).
- Josh Murauskas will write up his analysis of size-at-release versus performance of Chiwawa spring Chinook for the Hatchery Committees to discuss and consider at the January18, 2012, meeting (Item IV-C).
- Mike Tonseth will check on the status of the 2011 Parental Based Tagging (PBT) study write-up to determine if the combined 2010-2011 results can be presented at the January 18, 2011, Hatchery Committees meeting (Item IV-D).

STATEMENT OF AGREEMENT DECISION SUMMARY

- The Hatchery Committees approved the Douglas PUD Statement of Agreement (SOA) Regarding the 2013 No Net Impact (NNI) Recalculation and Implementation Plan (Item II-A).
- The Hatchery Committees approved the Chelan PUD SOA on Hatchery Compensation for Release Years 2014–2023 (Item IV-A).

AGREEMENTS

- The Hatchery Committees agreed to invite Pat Connolly, USGS, to attend the March 14, 2012, Committees' meeting to discuss potential collaboration and coordination of Passive Integrated Transponder (PIT) tagging efforts in the Methow Basin (Item II-B).
- The Hatchery Committees approved the *Douglas PUD 2012 Hatchery Monitoring and Evaluation (M&E) Workplan*, with two abstentions (Item II-B).

REVIEW ITEMS

- There are no items being reviewed at this time.

REPORTS FINALIZED

- The *Douglas PUD 2012 Hatchery M&E Workplan* will be finalized and emailed to Carmen Andonaegui for distribution to the Hatchery Committees.

I. Welcome, Agenda Review, Meeting Minutes, and Action Items

Mike Schiewe welcomed the Hatchery Committees and reviewed the agenda. There were no items added to the agenda. Schiewe said that Craig Busack was unable to attend today's meeting so there would be no update on the status of review of Hatchery and Genetics Management Plans (HGMPs). Bill Gale asked whether Busack had provided any new information on the expected duration of the new permits for the Winthrop and Methow hatchery programs; this was an Action Item for Busack from the November 17, 2011, meeting. Schiewe said he had not received any new information, but would follow up with Busack.

The draft November 8, 2011, conference call minutes and the draft November 17, 2011, meeting minutes were reviewed. The November 17, 2011, meeting minutes were approved as revised. Keely Murdoch provided a recommended edit to the November 8, 2011, conference call minutes, clarifying the discussion about a Grant PUD/Chelan PUD species swap; Mike Tonseth corrected the minimum production number for Wenatchee steelhead from 247,000 to 247,300 on page 3 of the draft conference call minutes. The November 8, 2011, conference call minutes were approved as revised. Carmen Andonaegui will finalize the November 8, 2011, and November 17, 2011, minutes and distribute them to the Committees.

II. Douglas PUD

A. Douglas PUD Recalculation/ Implementation Plan SOA (Greg Mackey)

Greg Mackey summarized the new hatchery production numbers contained in the Douglas PUD SOA regarding the 2013 NNI Recalculation and Implementation Plan (Attachment B); he said that the SOA is up for approval at today's Hatchery Committees' meeting. Truscott asked that the following footnote be added to Table 1 in the SOA: "Due to construction delays at Chief Joseph Hatchery, release of spring Chinook would begin in 2015." Mackey also explained that an initial gap in summer Chinook 2014 release production at Chief Joseph Hatchery would be addressed by rearing at the Wells Hatchery progeny (target release of 48,540 yearlings) of broodstock collected by the Colvilles in brood-year 2012. The Wells-reared fish would be transferred to the Chief Joseph Hatchery, Omak Riverside Acclimation Facility for further further grow-out in 2013 and release in 2014. Mackey will revise the SOA, adding the requested footnote to Table 1, and send the final SOA to Carmen Andonaegui for distribution to the Committees. Mike Schiewe said that prior to this meeting, Craig Busack had provided him with his vote for approval of the SOA. All Committees members (representing the Yakama Nation [YN], U.S. Fish and Wildlife Service [USFWS], National Marine Fisheries Service [NMFS], Washington Department of Fish and Wildlife [WDFW], Colville Confederated Tribes [CCT], and Douglas PUD) voted to approve the Douglas PUD SOA.

B. 2012 M&E Workplan Approval (Greg Mackey)

Greg Mackey said that he had received no comments on the draft *Douglas PUD 2012 Hatchery M&E Workplan* (2012 Workplan) and asked for approval of the document. Kirk Truscott said that he was not able to review the 2012 Workplan so abstained from the vote. Keely Murdoch asked if the PIT-tagging efforts shown in Table 3 of the 2012 Workplan were coordinated with the USGS PIT-tagging efforts in the Methow Basin. Mackey said that the efforts were independent and the PIT-tagging was being conducted in different reaches of the Methow Basin, but that Charlie Snow (WDFW) did regularly communicate with Wes Tibbets (USGS). He said that WDFW had not been very successful in getting the USGS to exchange their data and coordinate activities. Bill Gale and Keely Murdoch said that in their experience the USGS had been forthcoming with information and recommended that the USGS be invited to attend a Hatchery Committees' meeting to further this kind of coordination. Gale said he had spoken with Pat Connolly and that March 2012 would be a good month for the USGS to attend a Committees meeting. The Committees agreed to invite Connolly to attend the March 14, 2012, Committees' meeting to discuss collaboration and coordination of USGS and Douglas PUD PIT-tagging efforts in the Methow Basin. Gale said that he would contact Connolly, USGS, about USGS attendance at the March 14, 2012, Committees' meeting. The Committees agreed to place on the January 18, 2012, agenda a discussion of possible ways to coordinate and collaborate with the USGS on PIT tag work in the Methow Basin, in preparation for the March 14, 2012, discussion with the USGS.

Murdoch asked about the absence of M&E actions for the Okanogan Basin in the 2012 Workplan. Mackey said that the 2012 Workplan is focused on the Methow and activites at Wells dam and Hatchery, written by WDFW for Douglas PUD, and describes M&E actions to be implemented by WDFW and funded by Douglas PUD. Truscott said that, as captured in the NNI production tables in the recalculation SOAs, steelhead production for the Okanogan Basin is a Grant PUD program. He said that the CCT had been talking with Grant PUD about conducting Okanogan Basin M&E in 2012 as robustly as M&E is conducted in other Upper Columbia basins. Tom Kahler said that once Chief Joseph Hatchery comes on line, Douglas PUD will indirectly fund a portion of the CCT M&E of spring and summer Chinook in the Okanogan Basin via our proportional funding of O&M and M&E for that facility . Truscott said that, in the future, CCT will have a Chief Joseph M&E workplan, which would be partially funded by Douglas PUD and Chelan PUD.

Gale said that he had not thoroughly reviewed the 2012 Workplan and abstained from the vote. He emphasized that it was important to continue review of how the different hatchery supplementation programs in the Methow Basin were interacting.

The Committees approved the Douglas PUD 2012 M&E Workplan, with two abstentions.

III. WDFW

A. Results of Wenatchee Spring Chinook and Steelhead Relative Reproductive Success Studies (RSS) (Mike Ford/Andrew Murdoch)

Mike Tonseth introduced Mike Ford and Andrew Murdoch, saying that they would be presenting the Wenatchee spring Chinook and steelhead RSS results (Attachment C). Tonseth also introduced Mike Hughes, a new WDFW biologist, who is working on the RSSs. Murdoch presented the study designs, objectives, and ecological and demographic results. Ford presented an overview of the genetic methods, and the preliminary results and conclusions.

IV. Chelan PUD

A. Chelan PUD Recalculation/Implementation Plan SOA (Josh Murauskas)

Josh Murauskas summarized the proposed hatchery production contained in the Chelan PUD SOA for Chelan PUD Hatchery Compensation, Release Years 2014–2023 (Attachment D); he said that the SOA is up for approval at today's Hatchery Committees' meeting. He reported that the SOA included an adjustment to address 2014 rearing and release locations for yearling Chinook for the 2012 brood collection. The change accommodated the delay in construction of the Chief Joseph Hatchery and was agreed to by Kirk Truscott. Similar to the Douglas PUD recalculation SOA, Truscott asked that the following footnote be added to Table 1 in the SOA: "Due to construction delays at Chief Joseph Hatchery, release of spring Chinook would begin in 2015." Murauskas will revise the SOA, adding the requested footnote to Table 1, and send the Final SOA to Carmen Andonaegui for distribution to the Committees.

Bill Gale asked about adding a footnote to Table 1 in the SOA regarding the need to continue funding sockeye M&E in the upper Wenatchee Basin. Murauskas said it was included in Table 1 of the SOA and confirmed that it was Chelan PUD's intent to support sockeye M&E in the upper Wenatchee Basin. Mike Schiewe said that prior to the meeting, Craig Busack had provided him with his vote for approval of the SOA. All Committees members (representing the YN, USFWS, NMFS, WDFW, CCT, and Chelan PUD) voted to approve the Chelan PUD SOA.

B. Presentation on Results of Physiological Testing of Summer Chinook Reared in Re-use Systems (Brian Beckman/Don Larsen/Deb Harstad)

Joe Miller said that Chelan PUD has been looking at selected physiological responses of summer Chinook reared in re-use tanks for the last few years, and that NMFS Northwest Fisheries Science Center (NWFSC) scientists were going to present the most recent results (Attachment E). The results of the first two years of the study, 2007 and 2008, were summarized and some of the differences in the study conditions between the two years were described. Highlights of study results from 2009, 2010, and 2011 were presented, along with a description of the differences in rearing conditions and fish sources from one year to the next.

In their summary, the researchers said that their results indicated that smolts reared in re-use systems performed at least as well as raceway-reared fish, and there were indications that the re-use fish may be doing better than raceway fish. Their second conclusion was that reduced growth rates during the winter period appeared to reduce the production of minijacks and enhance spring smolting.

C. Spring Chinook Length at Age of Maturity (Josh Murauskas)

Josh Murauskas presented results of an analysis of the relationship between size of hatchery versus wild fish and performance, as reflected in age-at-maturity and survival (Attachment F). He said that hatchery smolts released from the Chiwawa Facility survived to McNary Dam at a higher rate than wild fish, but that adult returns, based on PIT tag data, showed that wild fish had a higher adult return rate compared to hatchery fish. When comparing size-at-release to age-of-return, there was a related effect with larger smolts returning at a younger age. The break between small and large hatchery fish was generally between 80 and 90 millimeters (mm). Based on the analysis, Murauskas proposed considering adjusting size targets of Chiwawa program fish, identifying a more optimal release size based on discussions among M&E biologists. He said that Chelan PUD's M&E program would continue to include an evaluation the effect of release size on performance. Bill Gale asked Murauskas to write-up up his methods and results to support the discussion on adjusting target release sizes. Mike Tonseth said that, in addition to biological considerations on appropriateness of size-at-release, there are also facility conditions that need to be considered for hatchery production.

Gale asked that a summary of release sizes over the past years be included in the written report.

Gale said that target sizes during rearing should be considered, not just final target release size. Tonseth said that rearing conditions are being reviewed for White River hatchery production because of problems with early maturation. At Winthrop National Fish Hatchery, chillers were being used to delay egg development so emergence did not occur too early. Mike Schiewe said that the literature is rich with information on ways to manage growth and maturation during hatchery production and that Murauskas should include some of this information in the report he prepares on his analysis.

Andrew Murdoch said that current release targets were established during HCP and Settlement Agreement negotiations, and that a formal review of sizes at release would be helpful. He said that a better understanding of smolt survival, as well as the effect on adult returns, is needed. Time-of-release could also be a factor in performance. Tonseth asked Murauskas to talk with hatchery managers about hatchery facility limitations that may hinder the ability to meet target sizes. Murauskas said that he would have a report and proposal for the Hatchery Committees at the January18, 2012, meeting.

D. PBT Study Update (Josh Murauskas)

Josh Murauskas asked Mike Tonseth for an update on the status of continuing the PBT study in 2012, saying that it was his impression the study would not be continued. Tonseth said that Craig Busack was going to request a NMFS review of the 2011 PBT study results, but that he did not know if this had been done. He said that WDFW was not planning to continue the PBT study in 2012, and so did not have a formal proposal prepared for the Hatchery Committees to consider. Keely Murdoch said that there might be value in continuing the PBT study. She said that it was important that the results be reviewed to see if a reason can be determined for the poor probability of assigning parentage given the very high reliability of assigning parentage using PBT in other studies, as described by Busack. Tonseth said he will check with Busack on the status of the NMFS review and get back to the Hatchery Committees with a timeline for completing the review. Bill Gale said that the USFWS's Abernathy, Washington, genetics lab had staff that could conduct the review if an alternate review of the results is needed.

Joe Miller said that there are, in fact, two questions: the first question is about the assignment probabilities, but the second question is whether there is value in continuing the PBT study. Keely requested written results of the study to date (2010 and 2011) for review. Tonseth said that the 2011 results were pending, and that he would check on their status. He said that he would see if the results could be presented at the January 18, 2012, Committees' meeting. Miller said that the decision on whether or not to continue the PBT study in 2012 needs to occur quickly for budgetary reasons. Tonseth said that the study was approved by SOA for two years. Todd Pearsons said that Grant PUD was planning a PBT study for Nason Creek in 2012 and asked about the possibility of collecting broodstock at Tumwater Dam. Miller stated that, if parties are interested in continuing the PBT study in 2012, they need to have a proposal ready for approval at the January 18, 2012, Committees' meeting.

V. HETT Update

Carmen Andonaegui reported that the Hatchery Evaluation Technical Team (HETT) did not meet in December 2011. She said that at the HETT is waiting for the Hatchery Committees to approve recalculated hatchery production numbers, which they will then use to update the Non-Target Taxa of Concern (NTTOC) risk analysis database. At the January 2012 meeting, the HETT will begin working on preliminary runs of the risk assessment model.

Andonaegui said that Tracy Hillman and Andrew Murdoch were putting the final touches on a manuscript describing the model developed by the HETT for identifying and ranking reference streams. Hillman expected to have this available for HETT review in December 2011.

Bill Gale asked what the HETT mandate was. He said he was trying to determine the benefit of Matt Cooper's, USFWS, continuing participation in the HETT. Keely Murdoch said that the HETT was formed at the request of the Hatchery Committees to address technical issues that the Committees did not have the time to address. Mike Schiewe said that there was a charter for the HETT and that participation in the HETT was not representative but based on technical expertise. He said that when the HETT was formed, the primary purpose was to identify reference populations for HCP-supplemented populations at the request of the Committees and to then provide recommendations to the Committees based on their evaluation. Greg Mackey explained that the HETT's work on the NTTOC was part of a regional evaluation of the effect of supplementation on non-target taxa that included analysis of the USFWS supplementation programs as well as the PUD programs. He said that this was an effort that benefited from the USFWS's participation. Schiewe encouraged Gale to continue Cooper's involvement in the HETT because of the benefits of the HETT's work to the Committees.

VI. HCP Administration

A. Next Meetings

The next scheduled Hatchery Committees' meetings are January 18, 2012 (Douglas PUD office); February 15, 2012 (Chelan PUD office); and March 21, 2011 (Douglas PUD office).

List of Attachments

Attachment A – List of Attendees
Attachment B – Douglas PUD Recalculation SOA
Attachment C – NOAA Wenatchee RSS Results Presentation
Attachment D – Chelan PUD Recalculation SOA
Attachment E – Chelan PUD Water Re-use Physiology Study Results
Attachment F – Chelan PUD Spring Chinook Size at Maturity Presentation

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA, LLC
Carmen Andonaegui	Anchor QEA, LLC
Josh Murauskas*	Chelan PUD
Joe Miller*	Chelan PUD
Steve Hays	Chelan PUD
Greg Mackey*	Douglas PUD
Tom Kahler*	Douglas PUD
Todd Pearsons	Grant PUD
Kirk Truscott*	CCT
Andrew Murdoch	WDFW
Mike Tonseth*	WDFW
Mike Hughes	WDFW
Mike Ford	NMFS
Deb Harstad	NMFS
Brian Beckman	NMFS
Don Larsen	NMFS
Keely Murdoch*	Yakama Nation
Bill Gale*	USFWS

Notes:

* Denotes Hatchery Committees' member or alternate

Wells HCP Hatchery Committee

Final Statement of Agreement (SOA)

Regarding the 2013 No Net Impact (NNI) Recalculation and Implementation Plan

Approved on 14 December 2011

Statement

The Wells HCP Hatchery Committee (HC) approves the implementation of Douglas PUD's hatchery obligations (both recalculated NNI and inundation compensation production) as described in the *Implementation Plan for Wells HCP Plan Species Hatchery Programs: 2013-2023* (Appendix A). The methodology underlying this Agreement applies to this Agreement only and does not influence the methodologies that may be utilized in future recalculations.

Implementation Plan for Douglas PUD HCP Plan Species Hatchery Programs: 2013-2023

The Douglas PUD hatchery compensation adjustment implementation plan for Wells HCP Plan Species is consistent with the terms of the Wells HCP and is based on the Hatchery Recalculation Sensitivity Analysis, the Wells Complex Summer Steelhead Hatchery Genetics Management Plan (HGMP) (submitted to NMFS on April 13, 2011) and the Methow Spring Chinook HGMP (submitted to NMFS on March 12, 2010). Table 1 shows Douglas PUD's recalculated hatchery obligations by species and location.

Implementation of Douglas PUD adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will consist of 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS Biological Opinion (BiOp) for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp River (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

> *"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."*

Appendix A

Species	Facility	Location	Production target	Purpose
Spring Chinook	Chief Joseph[1]	Upper Columbia Mainstem/Okanogan	33,300	NNI
	Methow	Methow Basin	29,123	NNI
Summer Chinook	Chief Joseph (yearling)[2]	Upper Columbia Mainstem/Okanogan	48,100	NNI
	Chief Joseph (sub-yearling)[2]	Upper Columbia Mainstem/Okanogan	49,000	NNI
	Wells (yearling)	Columbia River	320,000	Inundation
	Wells (sub-yearling)	Columbia River	484,000	Inundation
Steelhead	Wells	Twisp River	8,000	NNI
	Wells[3]	Twisp River	40,000	Inundation
	Wells[4]	Methow River	100,000	Inundation
	Wells[5]	Columbia River	160,000	Inundation
Sockeye	NNI met through funding of Fish-Water Management Tool			
Coho	Funding Agreement for the Yakama Nation Coho Reintroduction Program			

[1] Douglas PUD has agreed to provide funding for spring Chinook salmon at Chief Joseph Hatchery. Due to delays in construction at Chief Joseph Hatchery, release of spring Chinook will begin in 2015.

[2] Douglas PUD has agreed to provide funding for summer Chinook salmon at Chief Joseph Hatchery ((54,575 yearlings, or 48,100 yearlings plus 49,000 sub-yearlings).

[3] These are inundation compensation fish representing a portion of the Wells 300,000 inundation steelhead.

[4] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent a portion of the Wells 300,000 inundation compensation steelhead. The final distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

[5] A portion of these fish may be released in the Okanogan River, as per the Wells Complex Steelhead HGMP. These fish represent a portion of the Wells 300,000 inundation compensation steelhead. The final distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

Attachment C

Wenatchee River Relative Reproductive Success Studies

Michael Ford (NOAA)
Andrew Murdoch (WDFW)

Acknowledgements

- Bonneville Power Administration
- Chelan PUD
- Grant PUD

Agenda

- Study Design
- Objectives
- Methods
- Results
  - Spring Chinook
  - Steelhead
- Discussion
- Questions

Study Design

- Spring Chinook
  - Multi-generational study (brood years 2004 – 2013)
  - Multiple life stages
    - Smolt
    - Adult
  - Adults sampled at Tumwater Dam
  - Smolts sampled at smolt traps
- Steelhead
  - 4 brood years (2008 – 2011)
  - Multiple juvenile life stages
    - Age 1
    - Smolts or age 2
  - Adult sampled at Tumwater Dam
  - Juveniles sampled at smolt traps and rearing areas (hook and line)

Study Objective

- Spring Chinook
  - directly measure the relative reproductive success of hatchery and natural-origin Chinook salmon in both **natural** and **hatchery** settings
  - determine the degree to which any differences in reproductive success between hatchery and natural Chinook salmon can be explained by measurable biological characteristics
  - estimate the relative fitness of hatchery-lineage Chinook salmon after they have experienced an entire generation in the natural environment

Study Objective

- Steelhead
  - directly measure the relative reproductive success of hatchery and natural-origin steelhead in the natural environment
  - determine the degree to which any differences in reproductive success between hatchery and natural steelhead can be explained by measurable biological characteristics

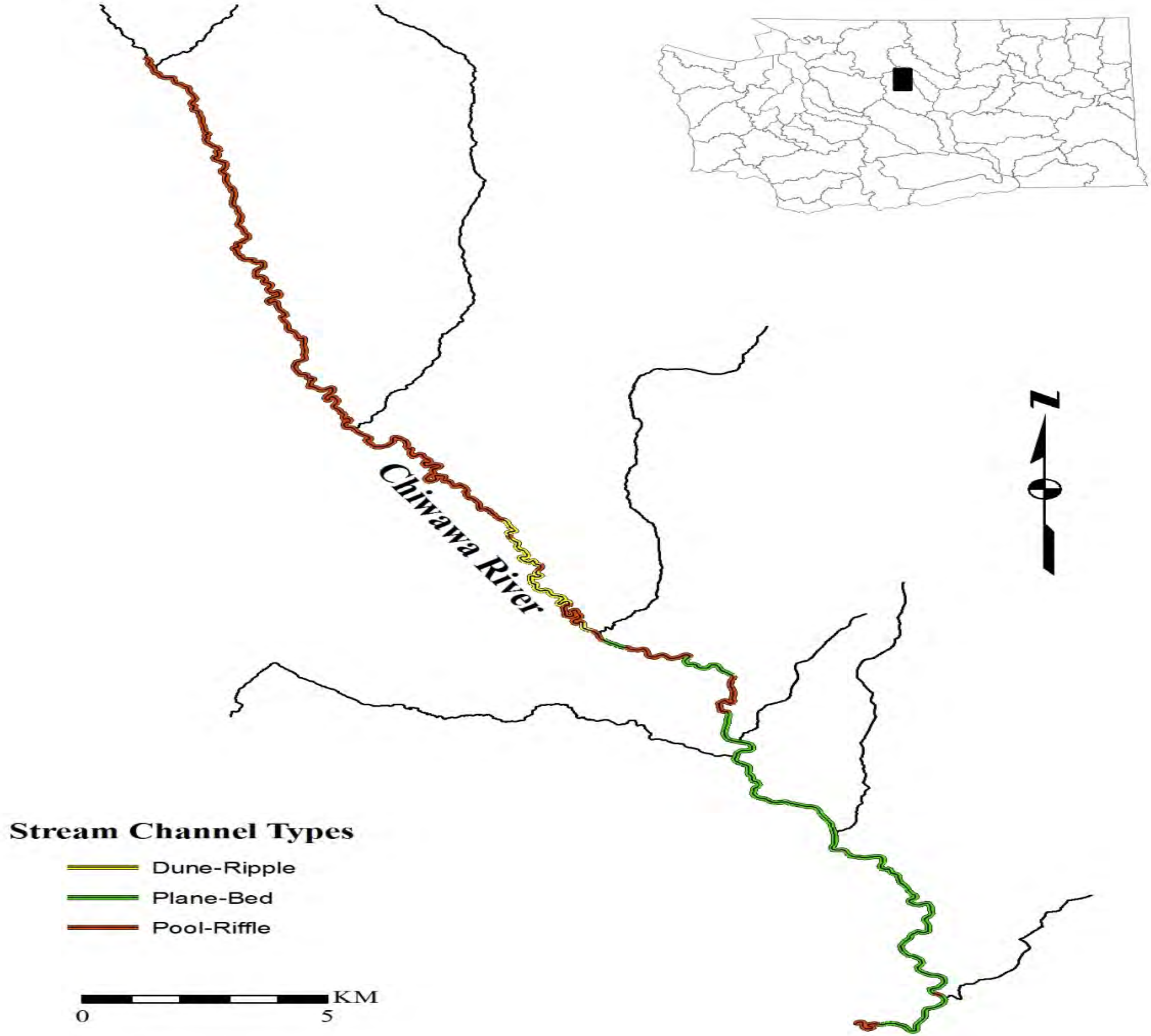
Ecological Investigations

- Phenotypic Differences
  - Migration timing
  - Age at maturity
  - Size at age
  - Fecundity
- Behavioral Differences
  - Spawn timing
  - Spawning location
  - Redd location*
  - Redd morphology*
  - Redd residence time*
  - Egg retention*

* Spring Chinook only

Spring Chinook Results

- Recent results and focus from the spawning grounds
- Update on relative reproductive success


Chiwawa River
Stream Channel Types
Dune-Ripple
Plane-Bed
Pool-Riffle
KM
0
5
N

Redd location based on channel type

	Dune-ripple	Plane-bed	Pool-riffle
Available spawning habitat	0.09	0.34	0.57
All redds	0.02	0.22	0.75
Natural	0.02	0.09	0.89
Hatchery	0.02	0.27	0.71
Redds with microhabitat	0.01	0.18	0.81

- Hatchery redd distribution different from wild redd distribution in all years
- Hatchery redd distribution also different from available habitat in all years
- 89% of all redds in plane-bed channel type were constructed by hatchery females

Attachment C

Redd morphology comparisons based on channel type

Redd attribute	Difference	Pool Riffle	Plane bed
Stream width	36%		+
Distance from stream bank	18%	+	
Distance to cover	21%		+
Redd area	29%	+	
Bowl depth	38%	+	
Tail depth	12%	+	
Redd water depth	15%	+	
Sand (tail)	45%		+
Gravel (tail)	23%	+	
Cobble (tail)	29%		+
Boulder (tail)	25%		+

Variation in redd morphology within pool-riffle habitat

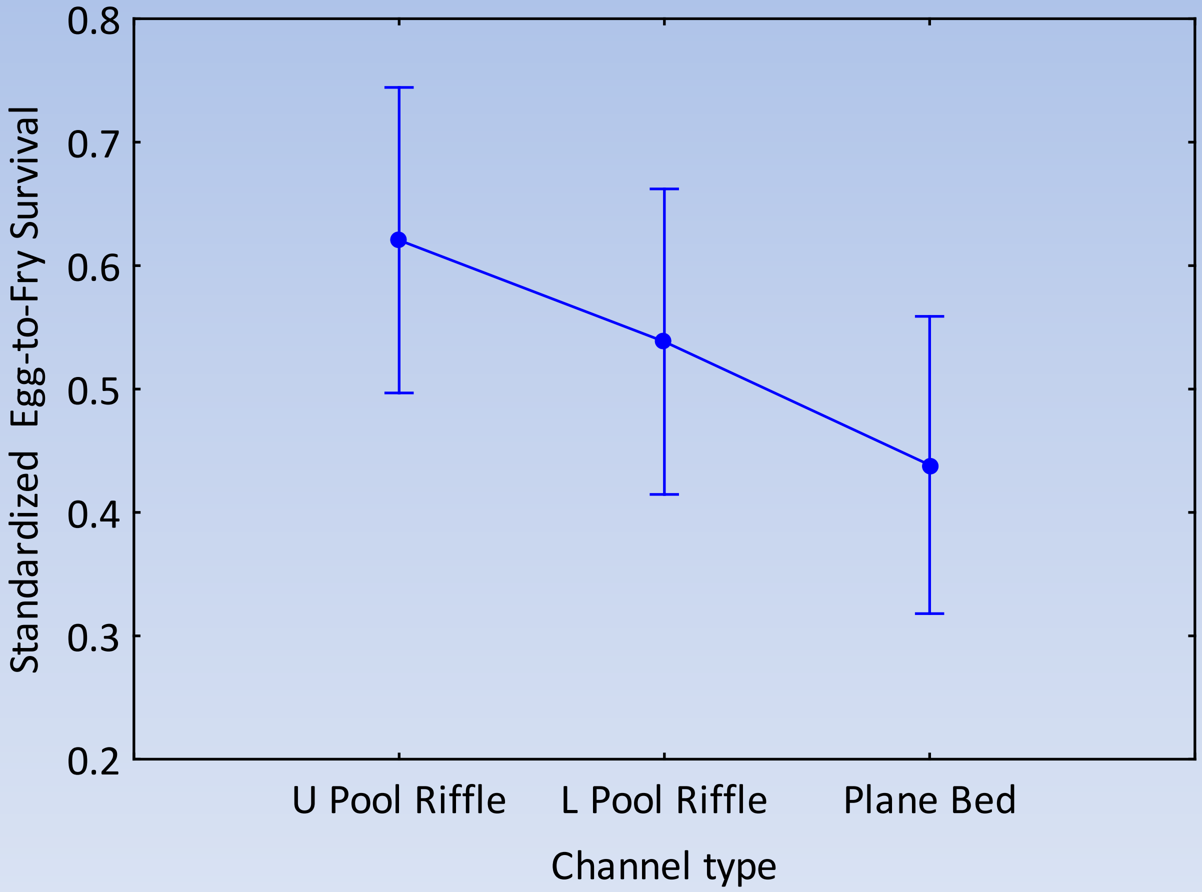
Habitat variable	Correlation (r_s) with river kilometer
Stream width	-0.36*
Redd water depth	-0.22*
Mean tail water velocity	-0.20*
Redd density (ISD)	-0.17*
Redd Area	0.25*
Bowl depth	0.28*

Redd morphology results

- Female size has little influence on redd morphology
- Compared to plane-bed redds, redds in pool-riffle channel type are constructed:
  - Further from the bank, but closer to cover
  - Deeper water, but of similar velocity
  - Redds are larger and dug deeper in substrate
  - And composed of more gravel
- Within pool-riffle channel type, as you move upstream redds are:
  - Constructed in shallower water with less velocity
  - Redds are larger and dug deeper in substrate, but are also constructed under less competition

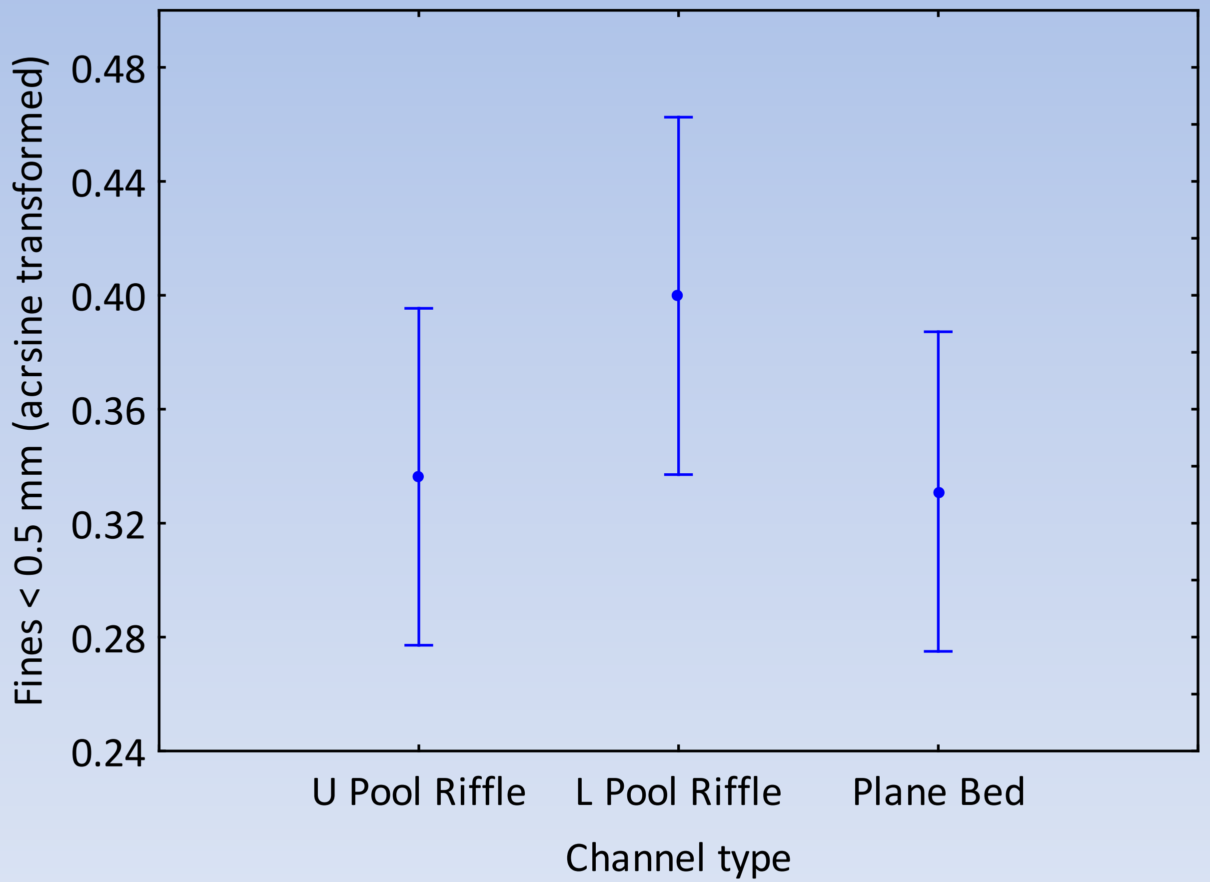
Attachment C

Egg to Fry Survival Study in 2010



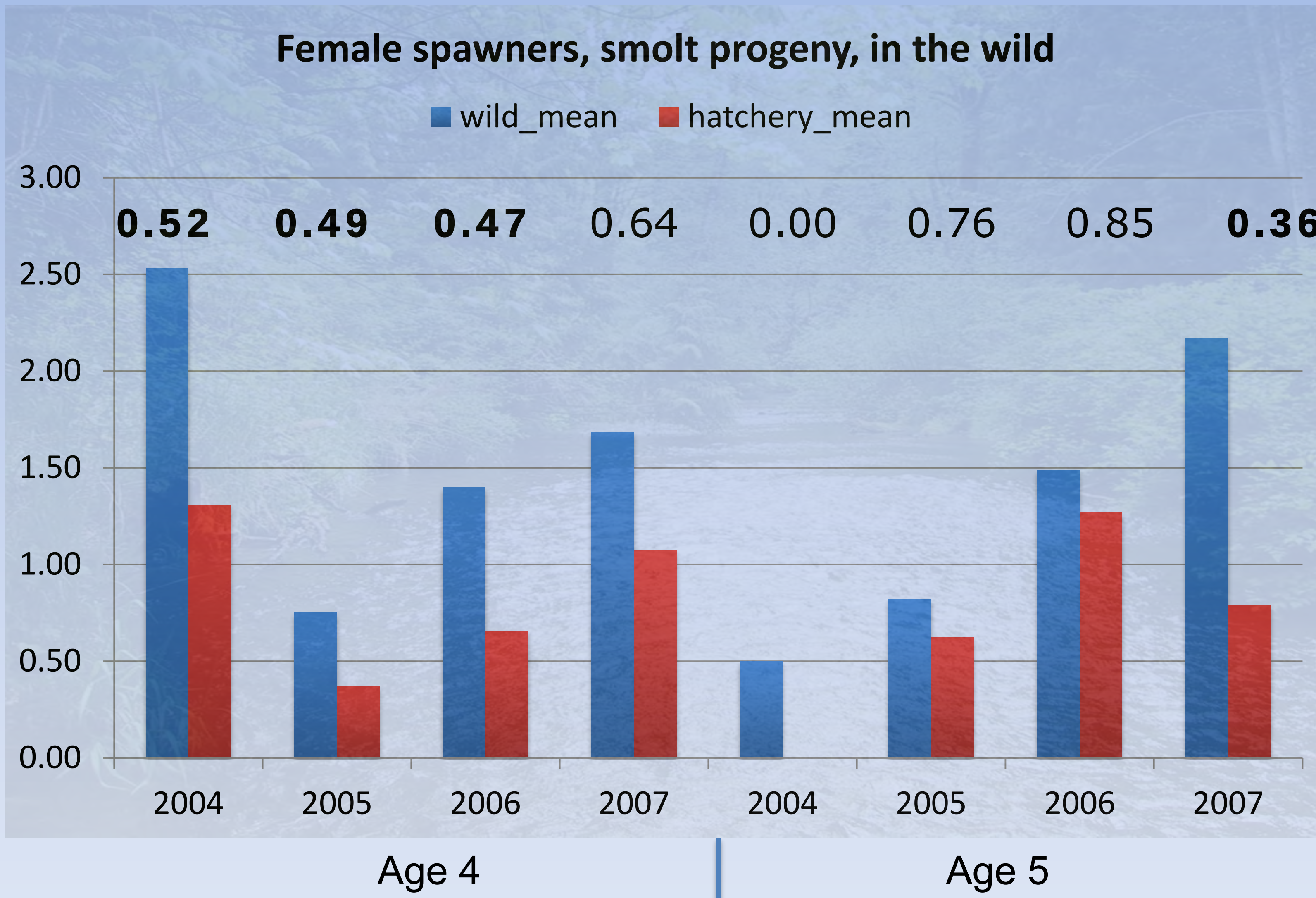
Attachment C

Egg to Fry Survival Study in 2010



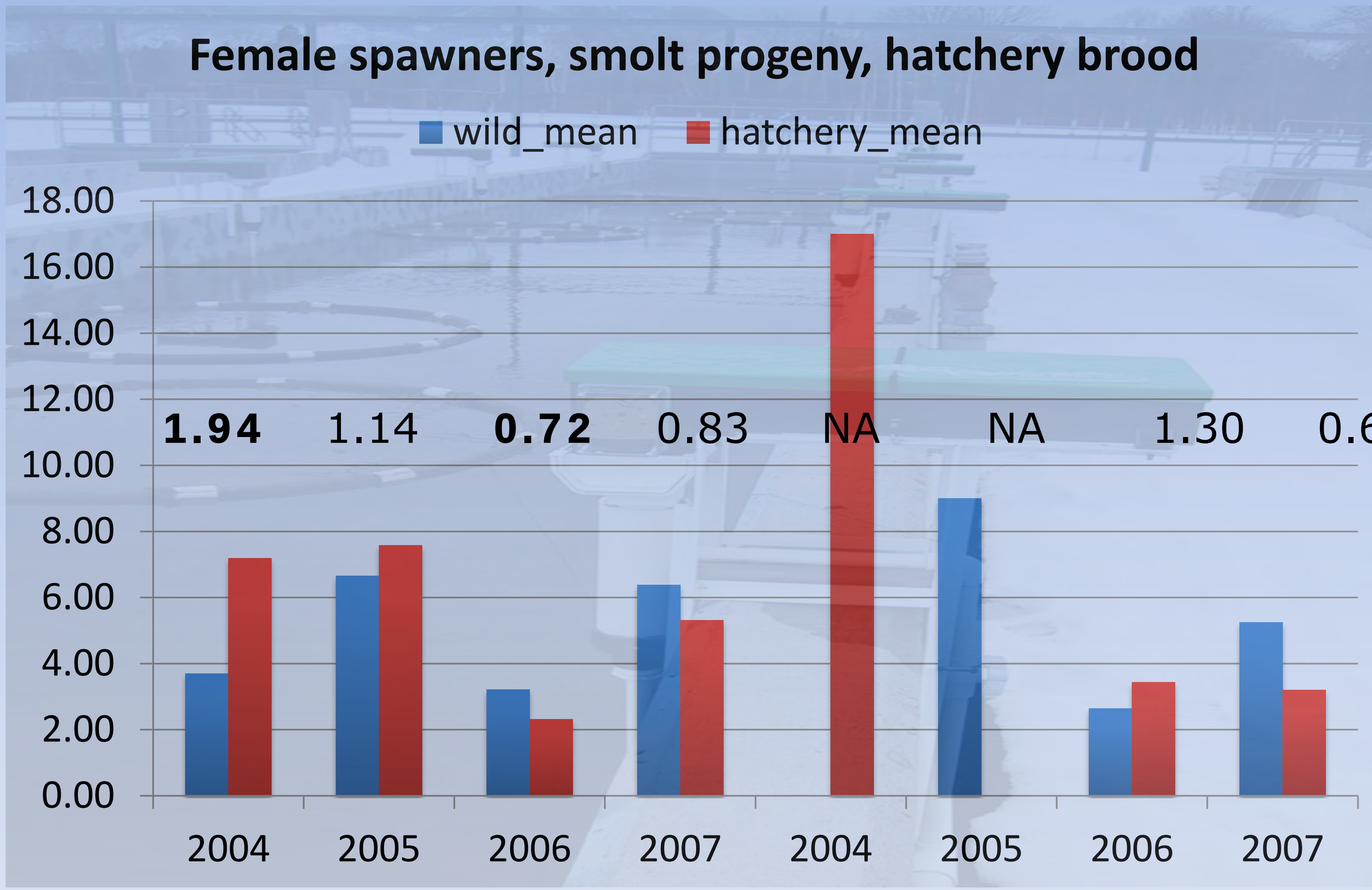
Attachment C

Relative reproductive success



Attachment C

Relative reproductive success

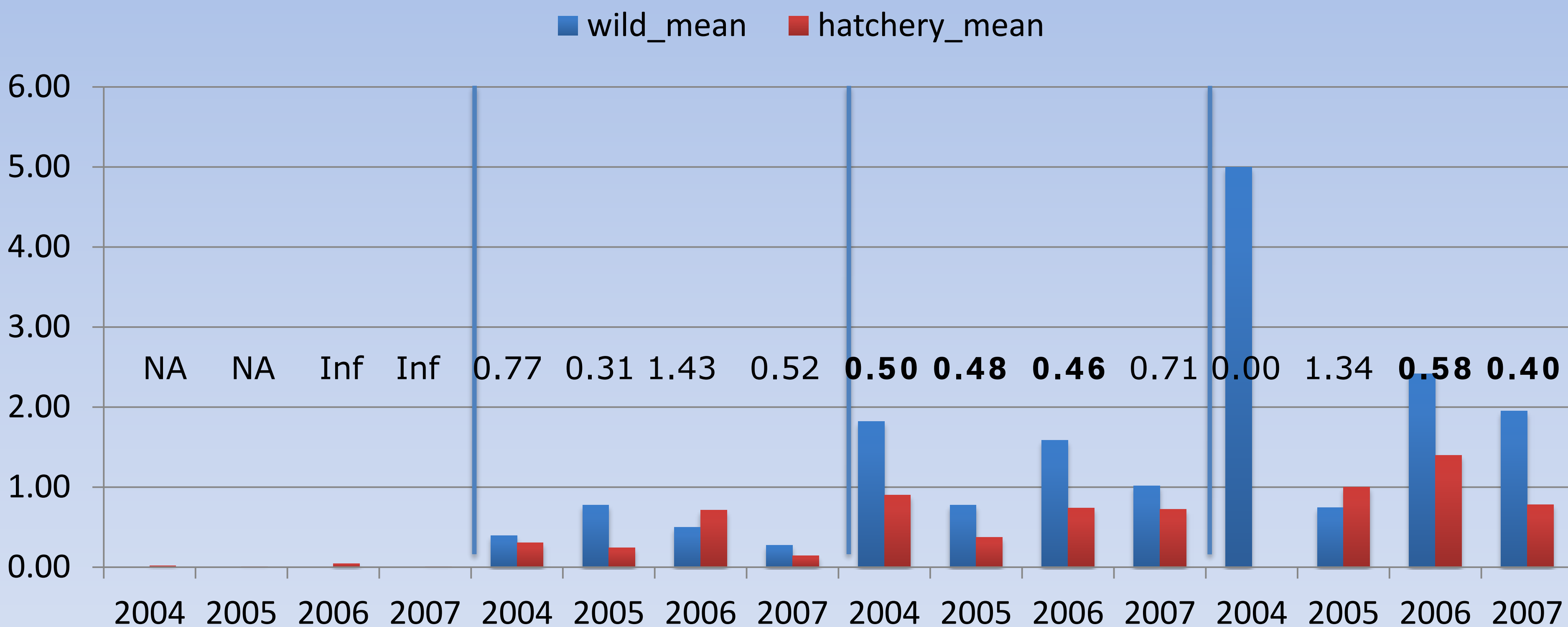


Age 4 | Age 5

Attachment C

Relative reproductive success

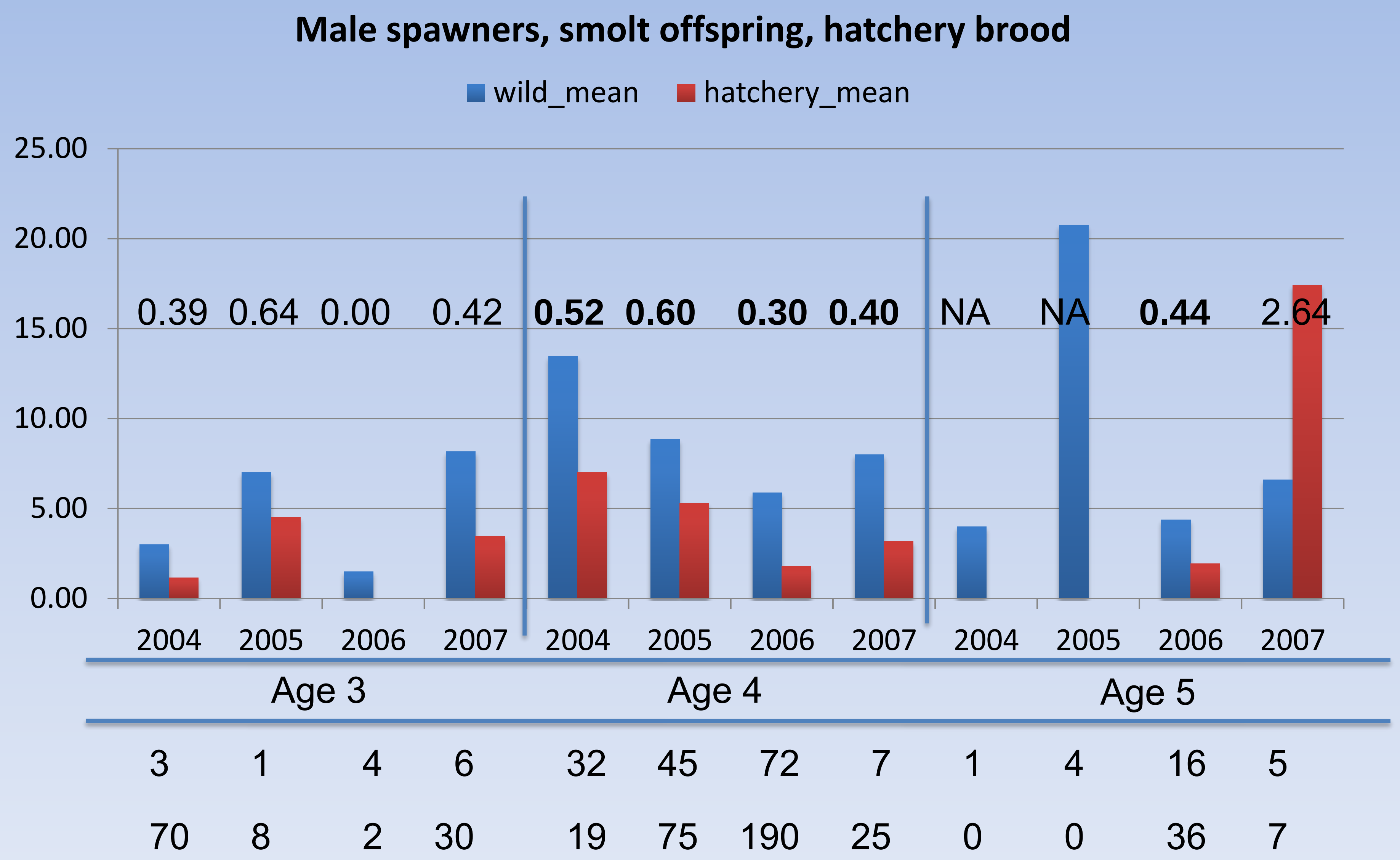
Males, smolt progeny, in the wild



	Age 2				Age 3				Age 4				Age 5			
W	0	0	1	1	28	9	4	40	388	184	119	54	4	39	65	79
H	609	289	194	253	724	127	161	2171	92	1105	309	272	1	3	63	37

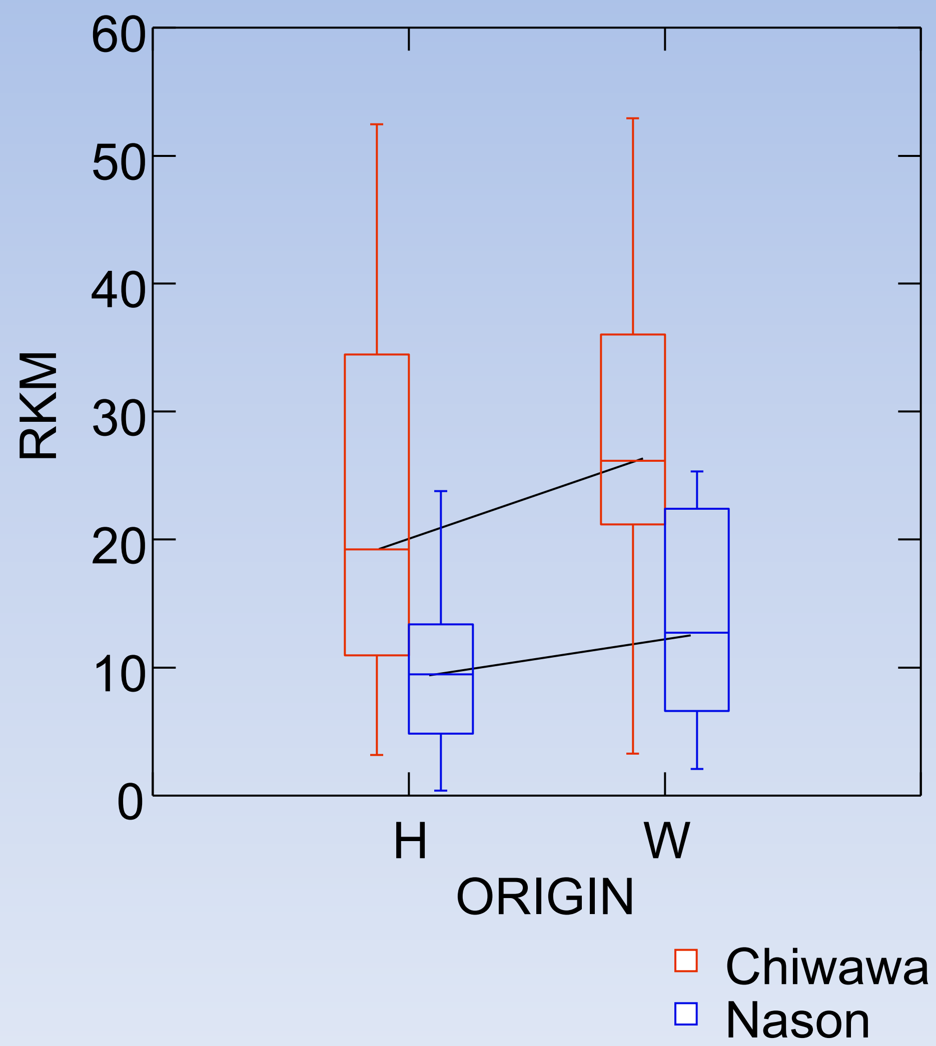
Attachment C

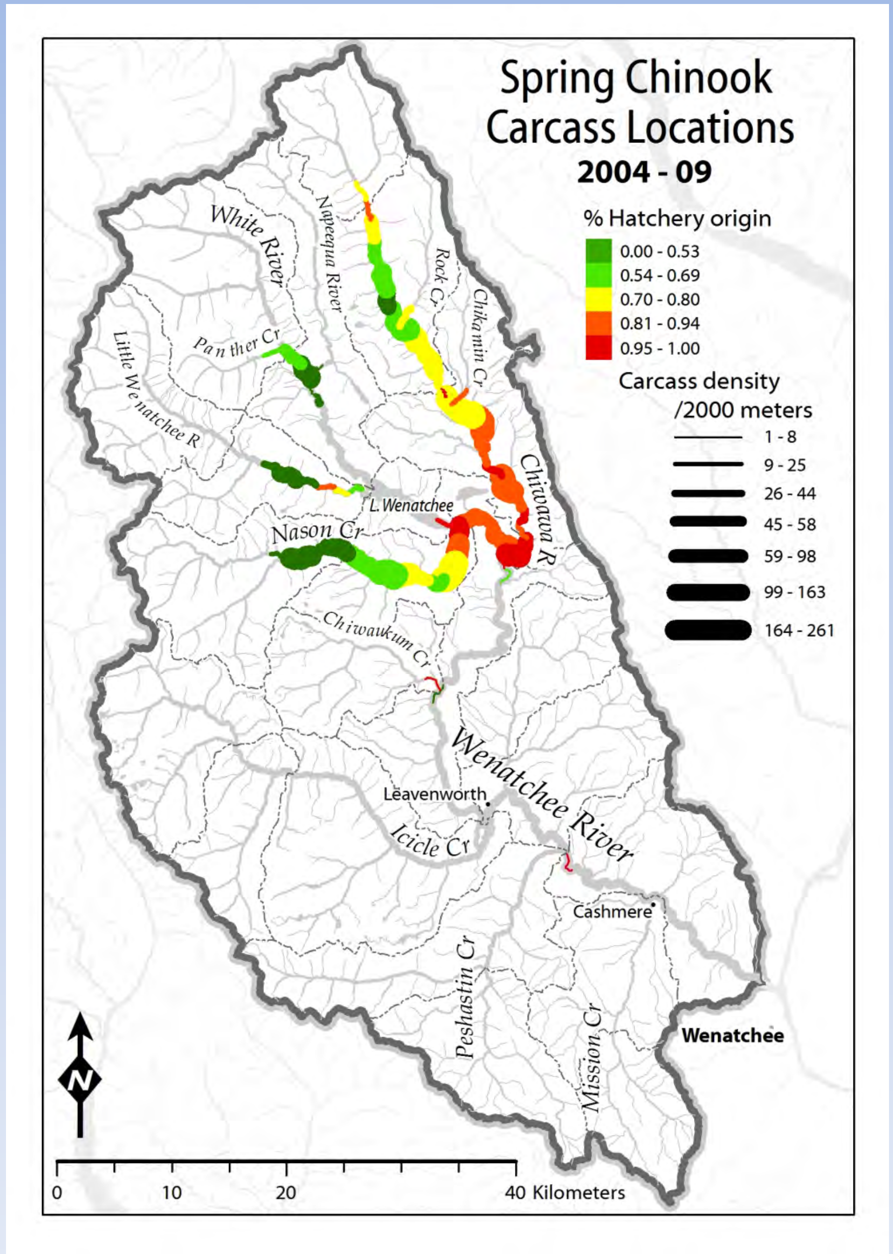
Relative reproductive success



Attachment C

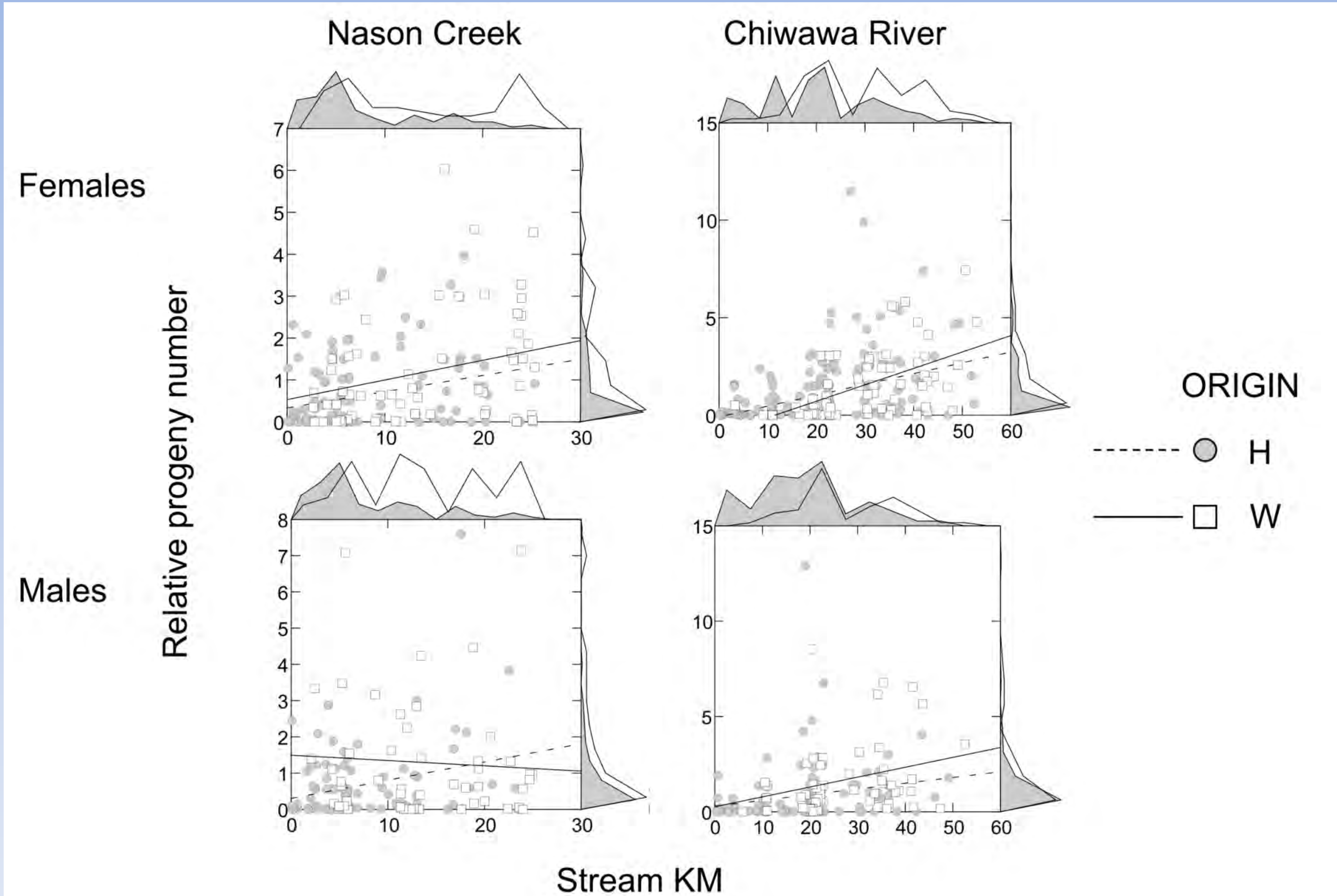
Traits – spawning location





Attachment C

Effect of spawning location on fitness



Generalized Linear Model fits

Males, smolt offspring, natural environment, with spawning location

	2004	p04	2005	p05	2006	p06	2007	p07
(Intercept)	-0.35	0.03	-0.68	0	0.92	0	-0.36	0.12
wt	1.23	0	0.49	0	0.11	0.09	0.23	0.02
origin2	-0.53	0.11	-0.08	0.74	-0.88	0	0.04	0.82
rt	0.1	0.17	0.15	0.12	-0.22	0	-0.2	0.04
age3	1.48	0	0.94	0.06	0.48	0.12	-0.75	0
rkm	0.32	0	0.33	0	0.28	0	0.64	0

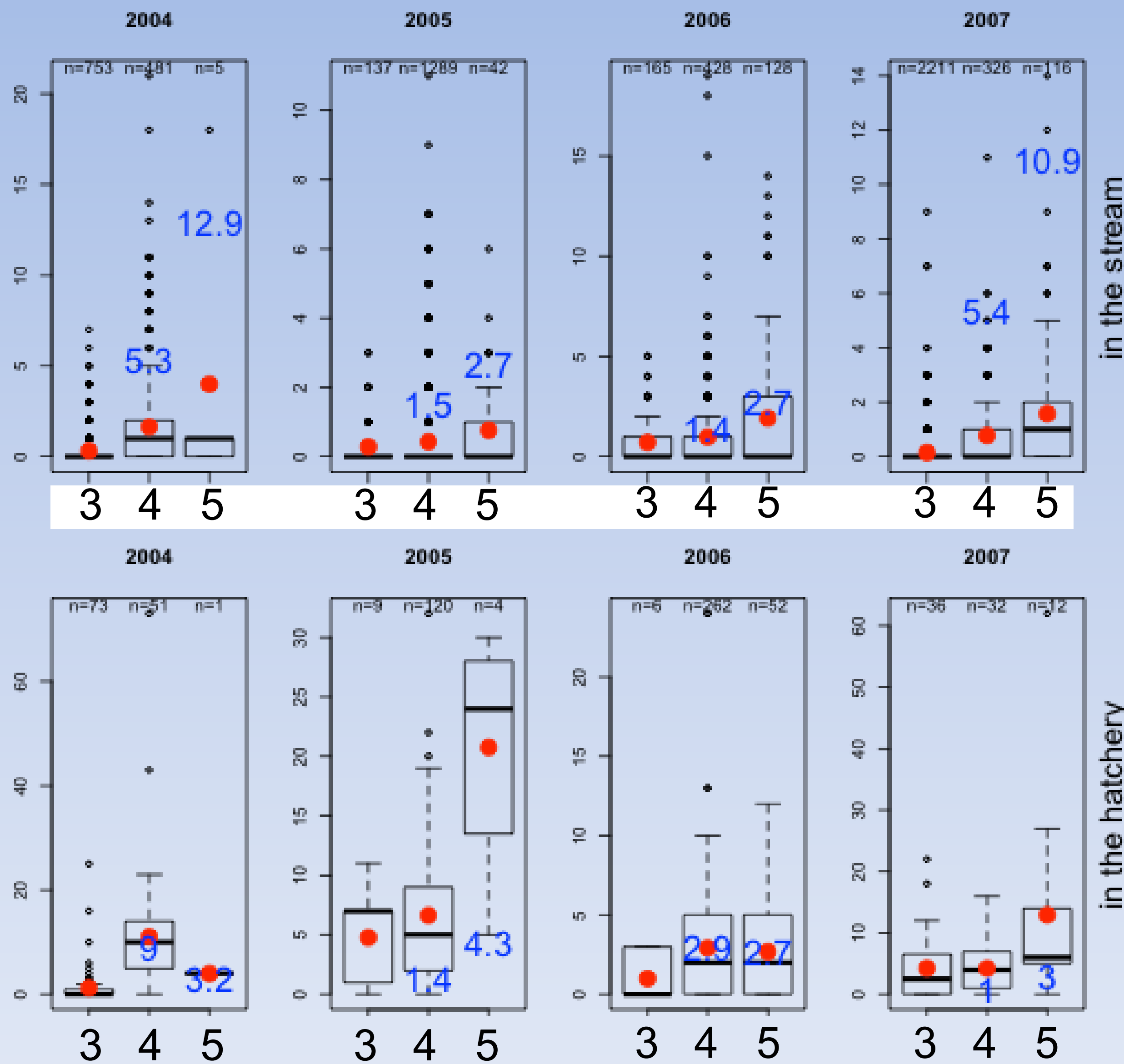
Females, smolt offspring, natural environment, with spawning location

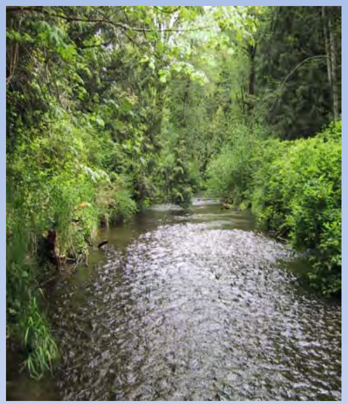
	2004	p04	2005	p05	2006	p06	2007	p07
(Intercept)	0.92	0	-0.48	0	0.42	0	0.38	0.01
wt	0.23	0	0.17	0.01	0.4	0	0.25	0
origin2	0.01	0.92	0.01	0.93	-0.03	0.78	0.16	0.28
rt	0.15	0.02	0.16	0.01	0.16	0	0.16	0
age4	-0.41	0.12	-0.73	0.01	-0.38	0	-0.17	0.42
rkm	0.58	0	0.66	0	0.48	0	0.51	0

Attachment C

Offspring production at age - males

males, smolt progeny



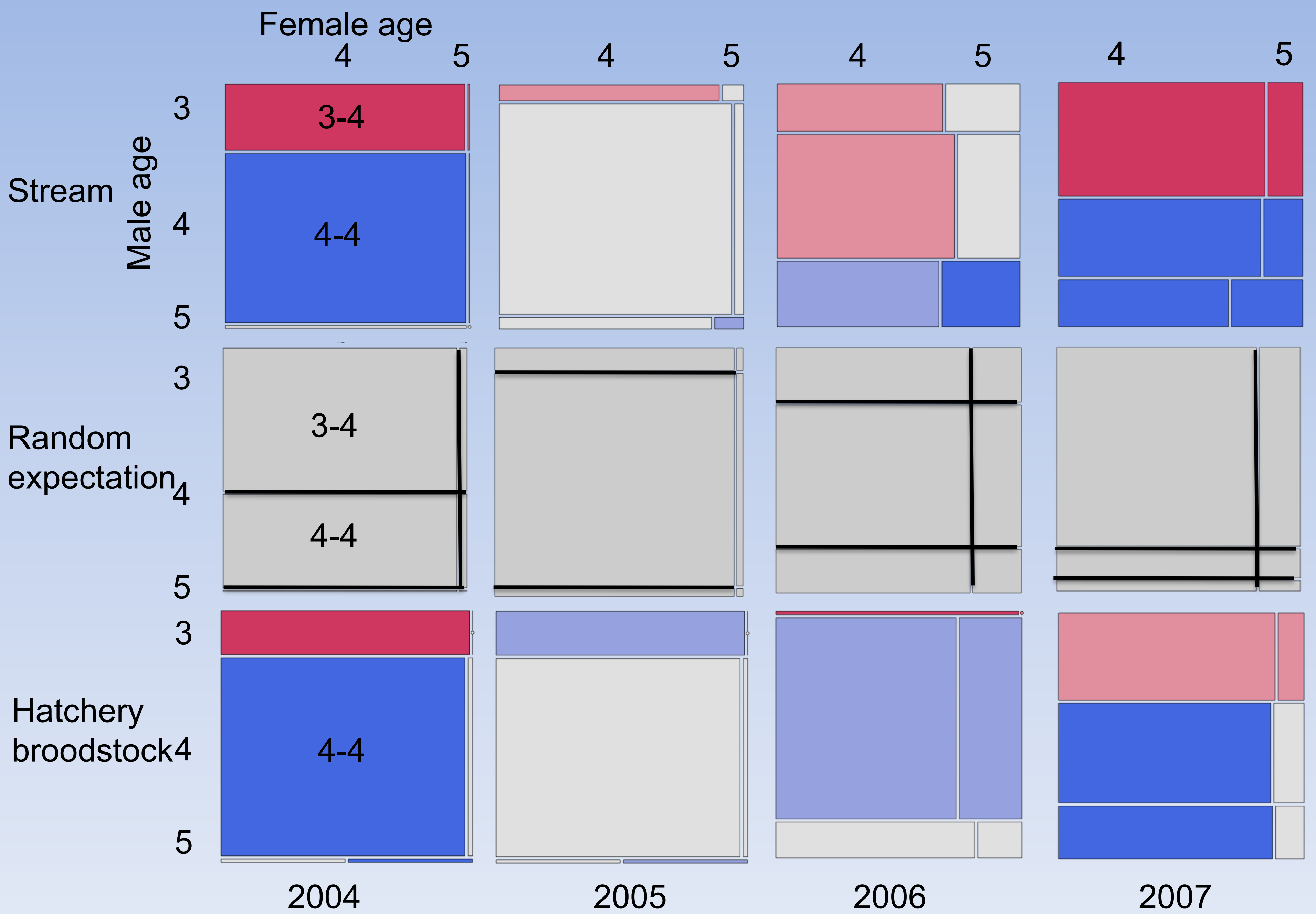


means

age/age-15.3

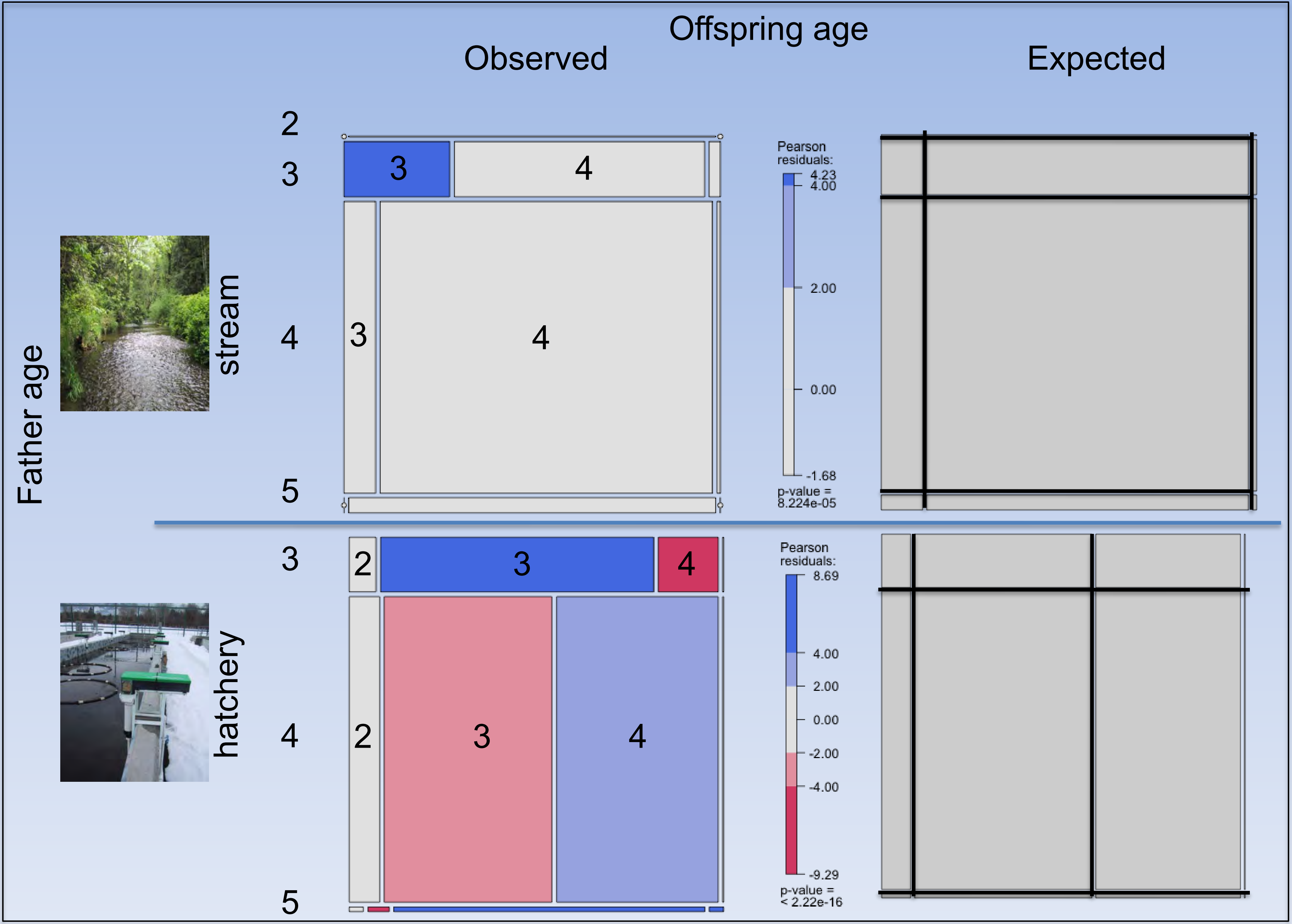
Attachment C

Mating pairs by age



Attachment C

Heritability of age at return



Attachment C

Fitness across generations

Generation 1

00
01
02

H W

Generation 2

04
05
06
07

H W

H(HH)
H(HW)
H(WH)
H(WW)

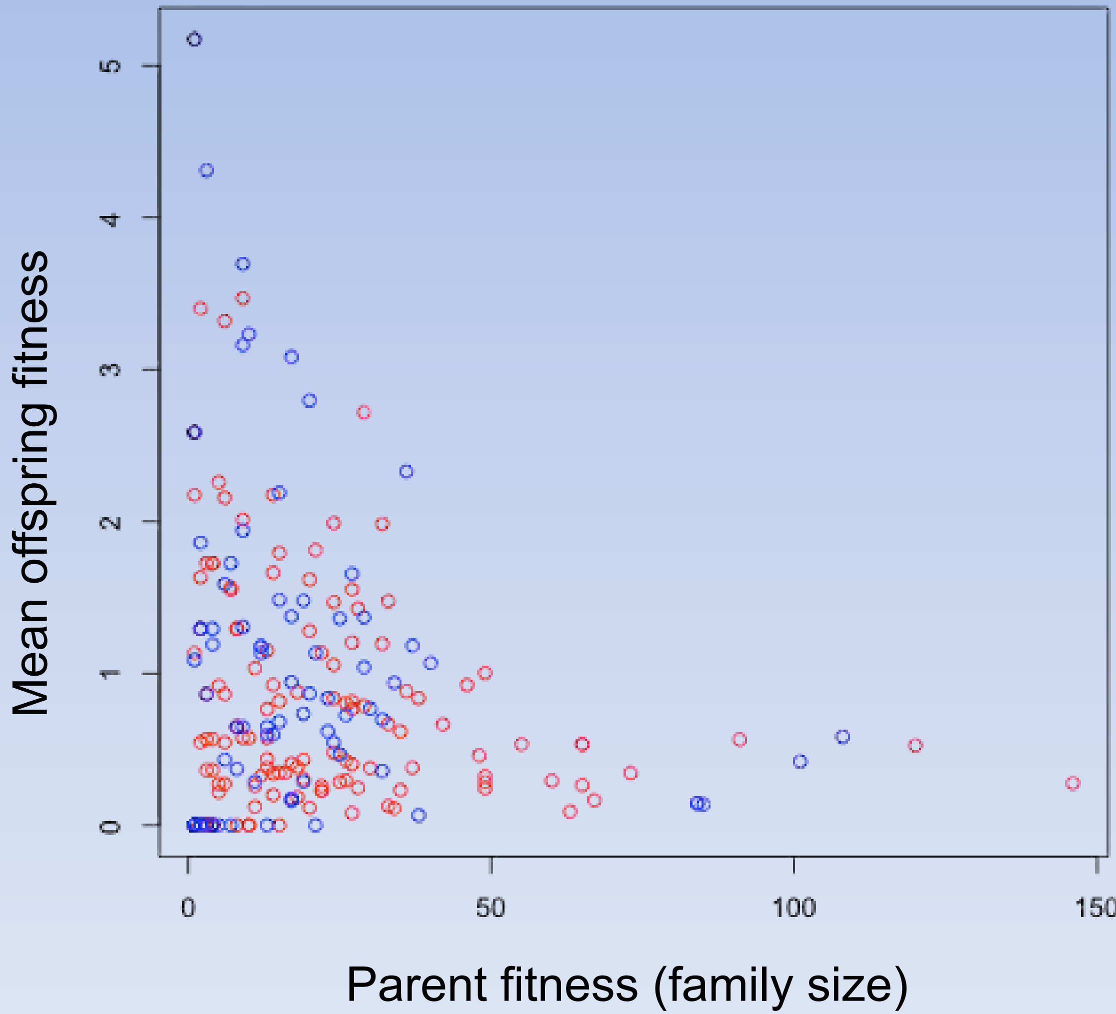
Generation 3

07
08
09

H W

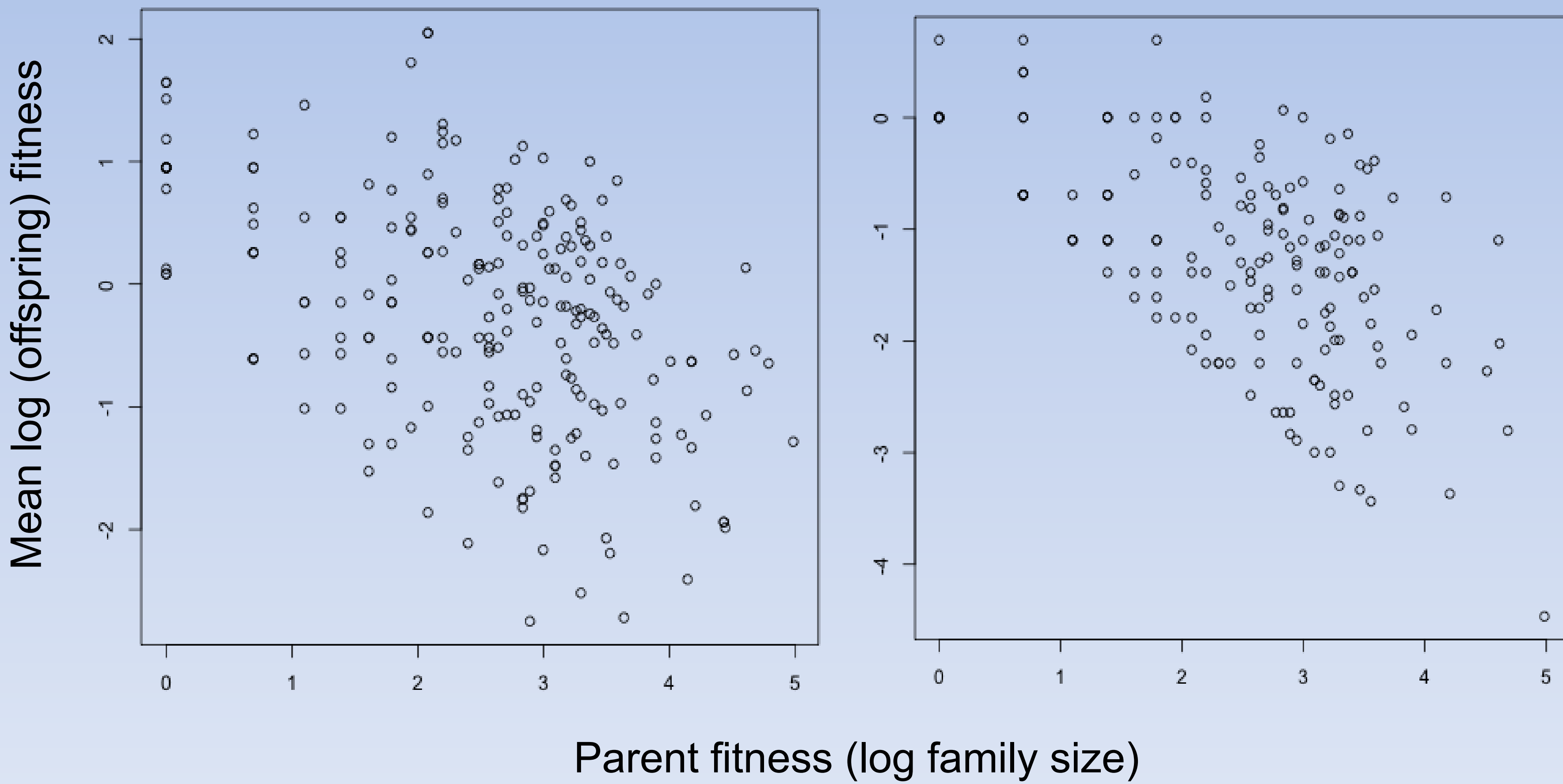
Attachment C

Fitness across generations



Attachment C

Fitness across generations



Attachment C

Fitness across generations

offspring = gen 1 fitness + length + mom origin + dad origin + mom*dad

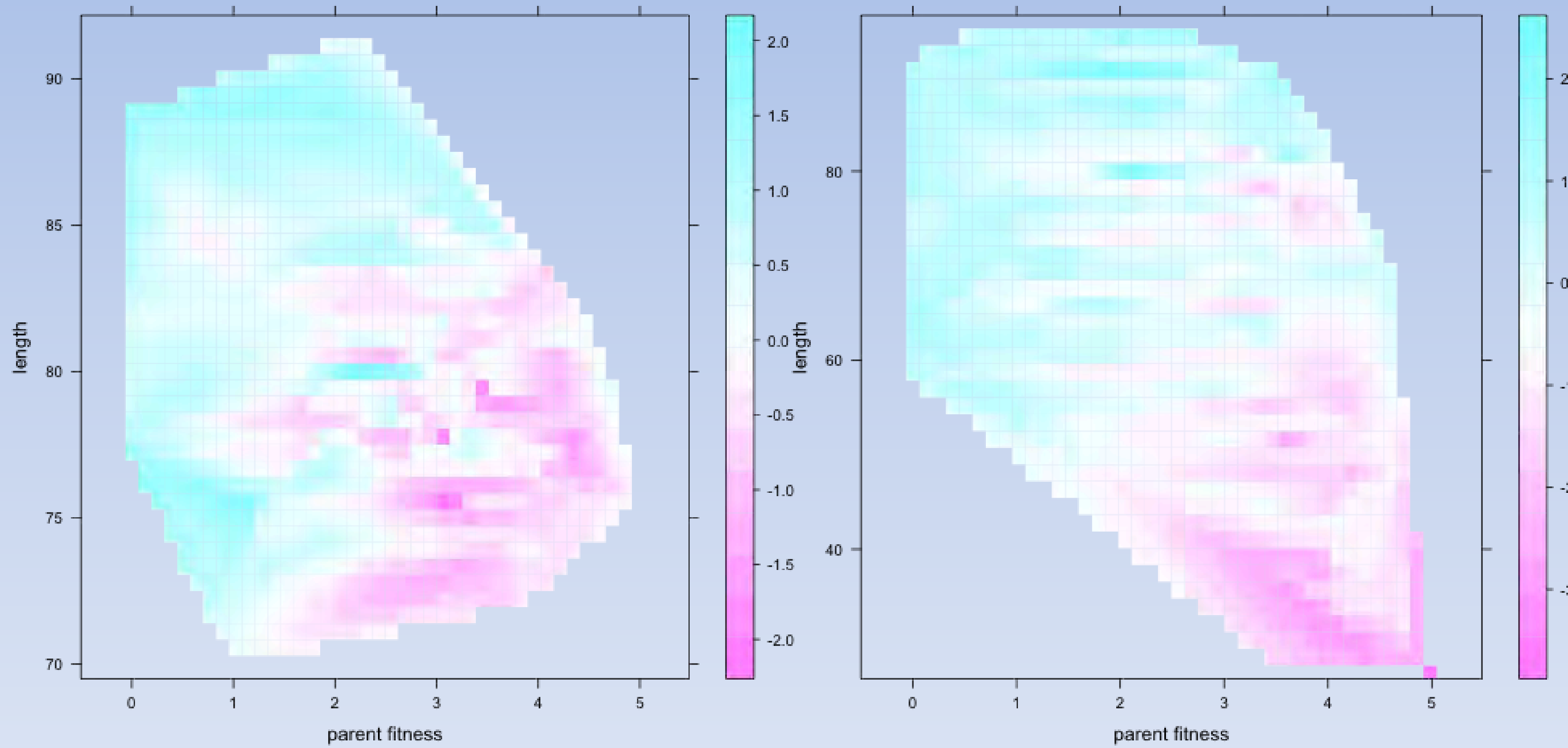
	fitness measured as smolts			fitness measured as adults		
	both sexes	**males**	**females**	**both sexes**	**males**	**females**
intercept	-1.41 (0.48)**	-1.34 (0.44)**	-2.25 (1.64)	-0.64 (0.46)	-0.49 (0.44)	-1.47 (2.84)
fitness, gen 1	-0.27 (0.06)***	-0.36 (0.08)***	-0.34 (0.07)***	-0.49 (0.07)***	-0.55 (0.08)***	-0.42 (0.10)***
length	0.02 (0.01)***	0.03 (0.00)***	0.04 (0.02).	0.01 (0.00)*	0.01 (0.00)***	0.02 (0.04)
wild gen 1 mom	0.16 (0.15)	0.13 (0.17)	0.27 (0.16)	-0.07 (0.17)	-0.12 (0.18)	-0.08 (0.21)
wild gen 1 dad	-0.14 (0.15)	-0.39 (0.16)*	0.18 (0.16)	-0.45 (0.17)**	-0.50 (0.17)**	-0.28 (0.22)
wild gen 1 mom and dad	-0.08 (0.37)	0.77 (0.42).	-0.34 (0.37)	0.71 (0.49)	2.08 (0.70)**	0.34 (0.53)

Attachment C

Fitness across generations

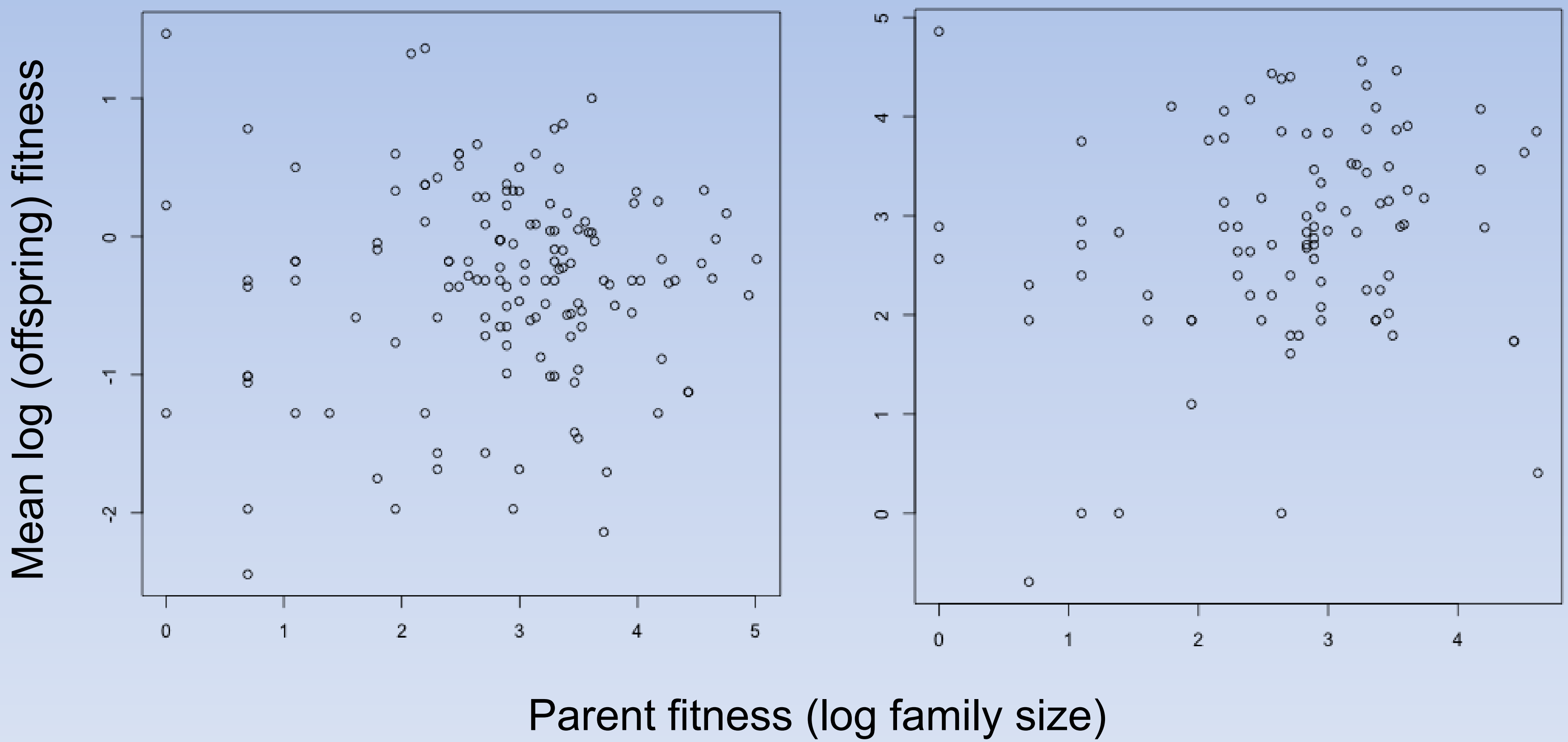
Female spawners

Male spawners



Attachment C

Fitness across generations



Attachment C

Fitness across generations

offspring = gen 1 fitness + length + mom origin + dad origin + mom*dad

	fitness measured as smolts			fitness measured as adults		
	both sexes	males	females	both sexes	males	females
intercept	-2.15 (0.53)***	-2.38 (0.65)***	-3.38 (1.09)**	-1.15 (0.96)	-1.53 (1.23)	-2.74 (2.09)
fitness, gen 1	0.14 (0.06)*	0.19 (0.09)*	0.04 (0.08)	0.35 (0.12)**	0.44 (0.18)*	0.22 (0.15)
length	0.02 (0.01)**	0.02 (0.01)*	0.04 (0.01)**	0.04 (0.01)***	0.04 (0.01)**	0.07 (0.03)*
wild gen 1 mom	0.05 (0.15)	-0.26 (0.22)	-0.05 (0.17)	-0.16 (0.27)	-0.58 (0.43)	-0.09 (0.27)
wild gen 1 dad	0.00 (0.16)	-0.19 (0.26)	0.02 (0.17)	0.34 (0.30)	0.56 (0.50)	0.02 (0.29)
wild gen 1 mom and dad	-0.48 (0.35)	0.33 (0.53)	-0.73 (0.38).	-0.32 (0.59)	0.01 (0.89)	0.18 (0.55)

Steelhead RRS

- Sampling update (adult and juvenile)
- Hatchery and wild comparisons of behavioral and phenotypic traits
- Update on relative reproductive success

Steelhead at Tumwater Dam

Brood Year	Hatchery	Wild	Total	% of Run Escapement	Run escapement
2008	842	454	1296	0.999	1297
2009	1196	349	1545	0.998	1548
2010	1456	776	2232	0.997	2238
2011	312	811	1123	0.990	1134
All years	3806	2390	6196	0.997	6217

Attachment C

Hatchery/Wild Ratios

Brood Year	Sex	Hatchery	Wild	H/W Ratio
2008	**All**	**842**	**454**	**1.85**
	Male	580	252	2.30
	Female	262	202	1.30
2009	**All**	**1196**	**349**	**3.43**
	Male	549	167	3.29
	Female	647	182	3.55
2010	**All**	**1456**	**776**	**1.88**
	Male	885	391	2.26
	Female	571	385	1.48
2011	**All**	**312**	**811**	**0.38**
	Male	171	325	0.53
	Female	141	486	0.29

Attachment C

Juvenile Samples

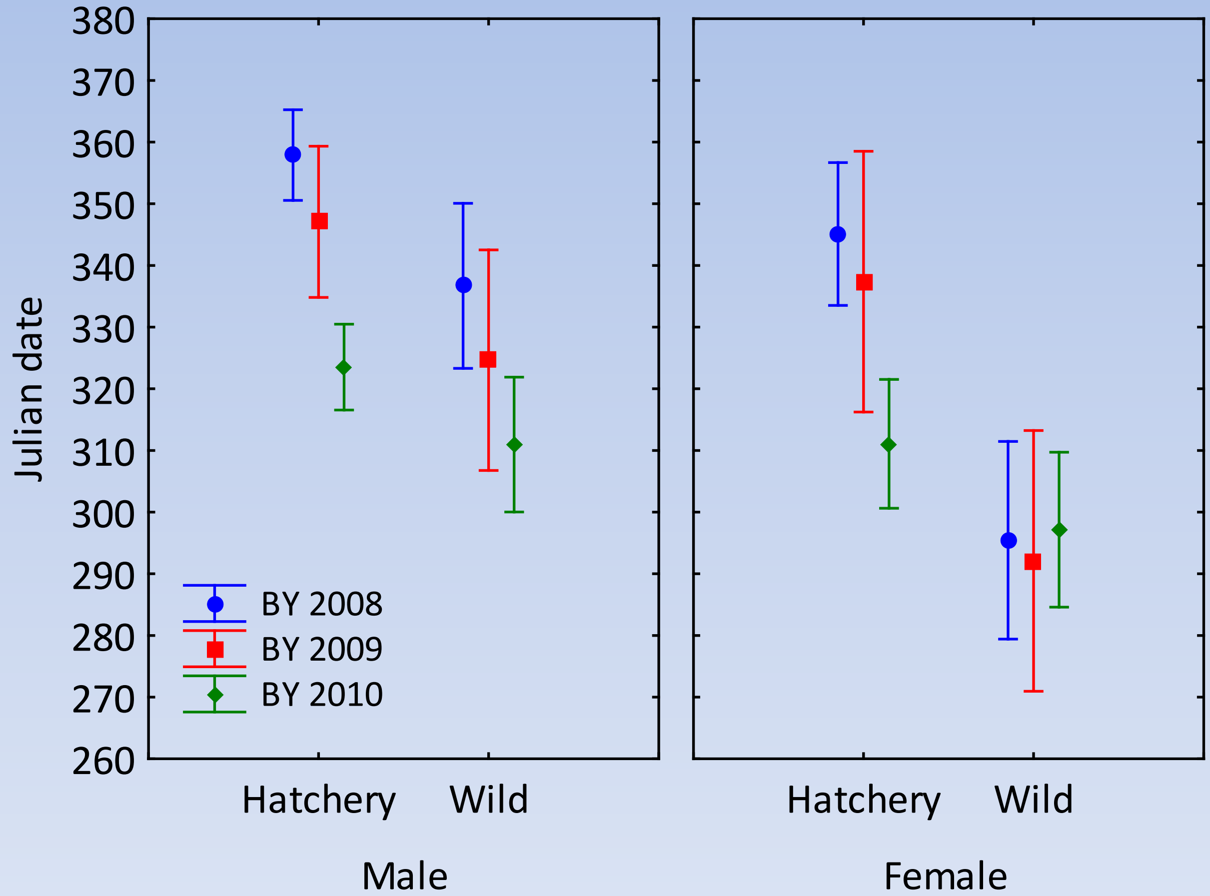
Brood year	Collection year	Age - 1	Age - 2	Age – 3
2008	2009	1,315		
	2010		1,030	
	2011			Pending
2009	2010	3,373		
	2011		Pending	
	2012			X
2010	2011	X		
	2012		X	
	2013			X
2011	2012	X		
	2013		X	
	2014			X

Migration Timing

- 1-salt fish
  - Differences detected in 2 out of 3 years for both male and females
  - Mean passage time of hatchery fish at Tumwater Dam was later and more variable than naturally produced fish
- 2- salt fish
  - No difference between hatchery and naturally produced fish within any year

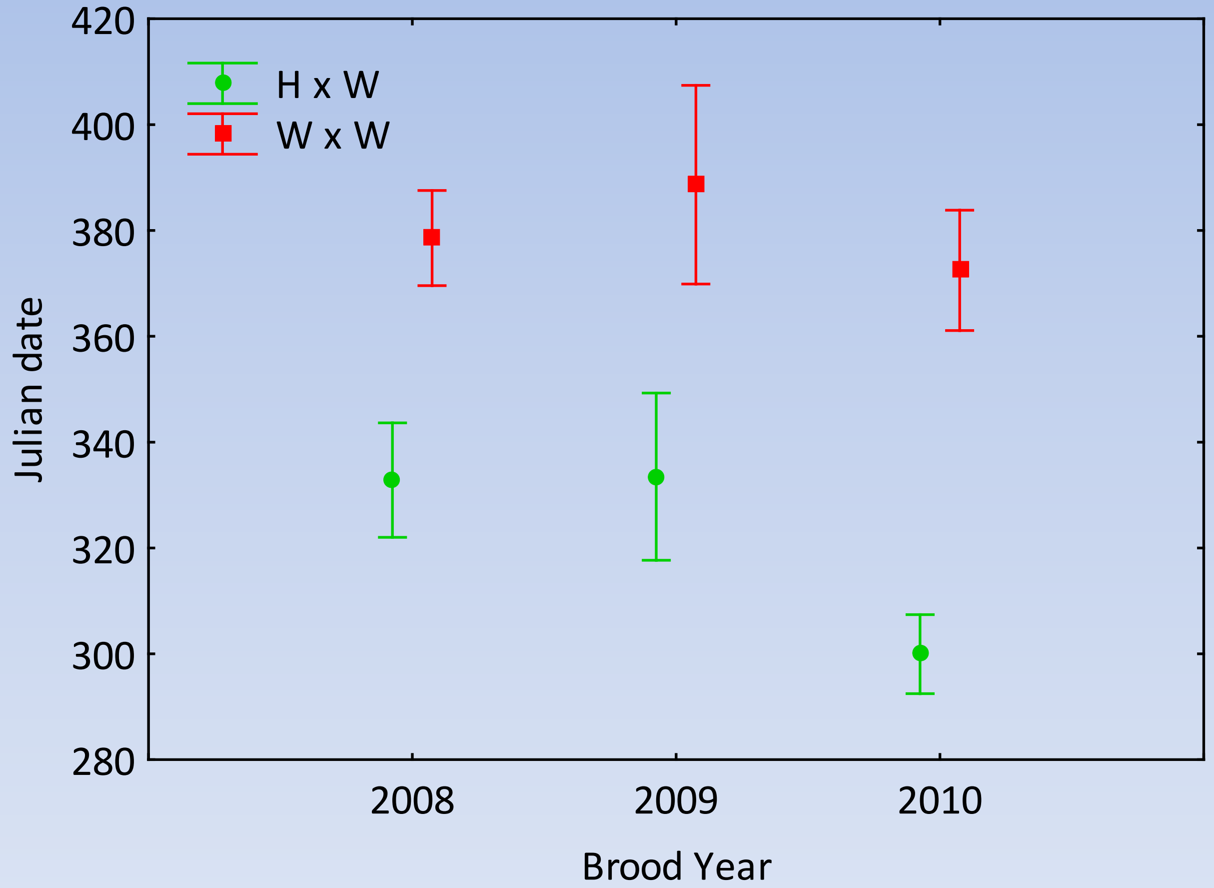
Attachment C

Migration timing 1-salt



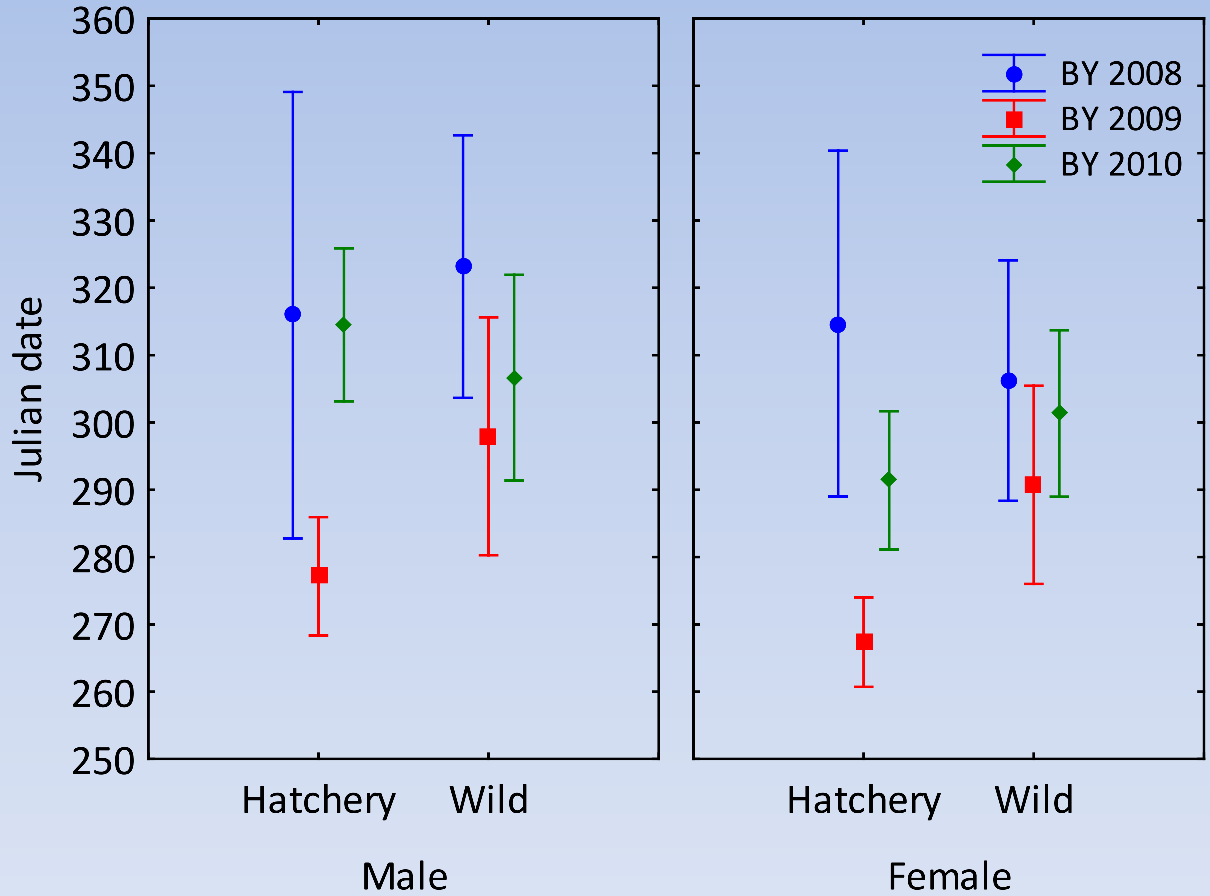
Attachment C

Migration timing by hatchery mating (1-salt fish only)



Attachment C

Migration timing 2-salt



Migration timing results

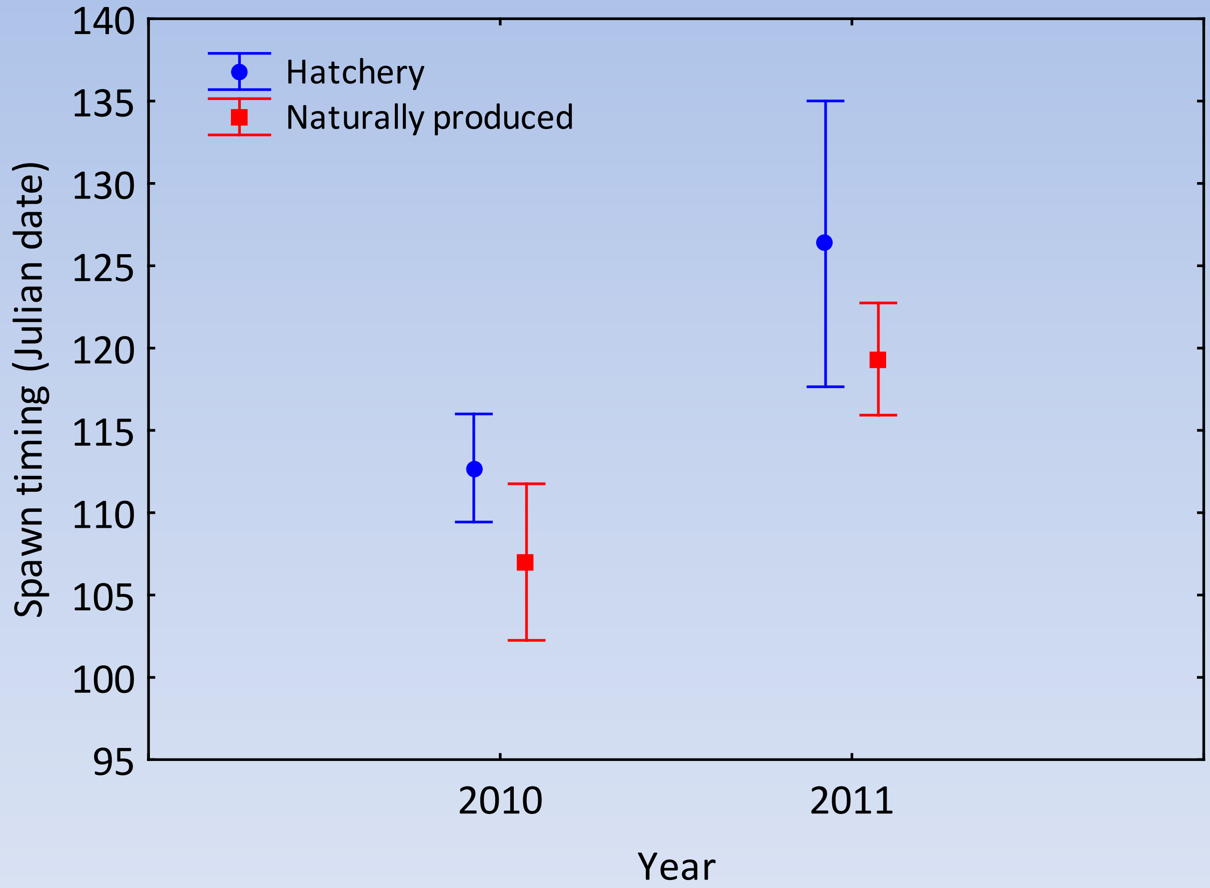
- Differences in migration timing of 1-salt fish
  - Genetic (parental crosses)
    - Influenced by the relative abundance of each parental mating
    - Why not effect 2-salt fish?
  - Harvest related
    - 2-fish migrate earlier and may arrive at Tumwater Dam before a sport fishery removes any fish

Spawn timing

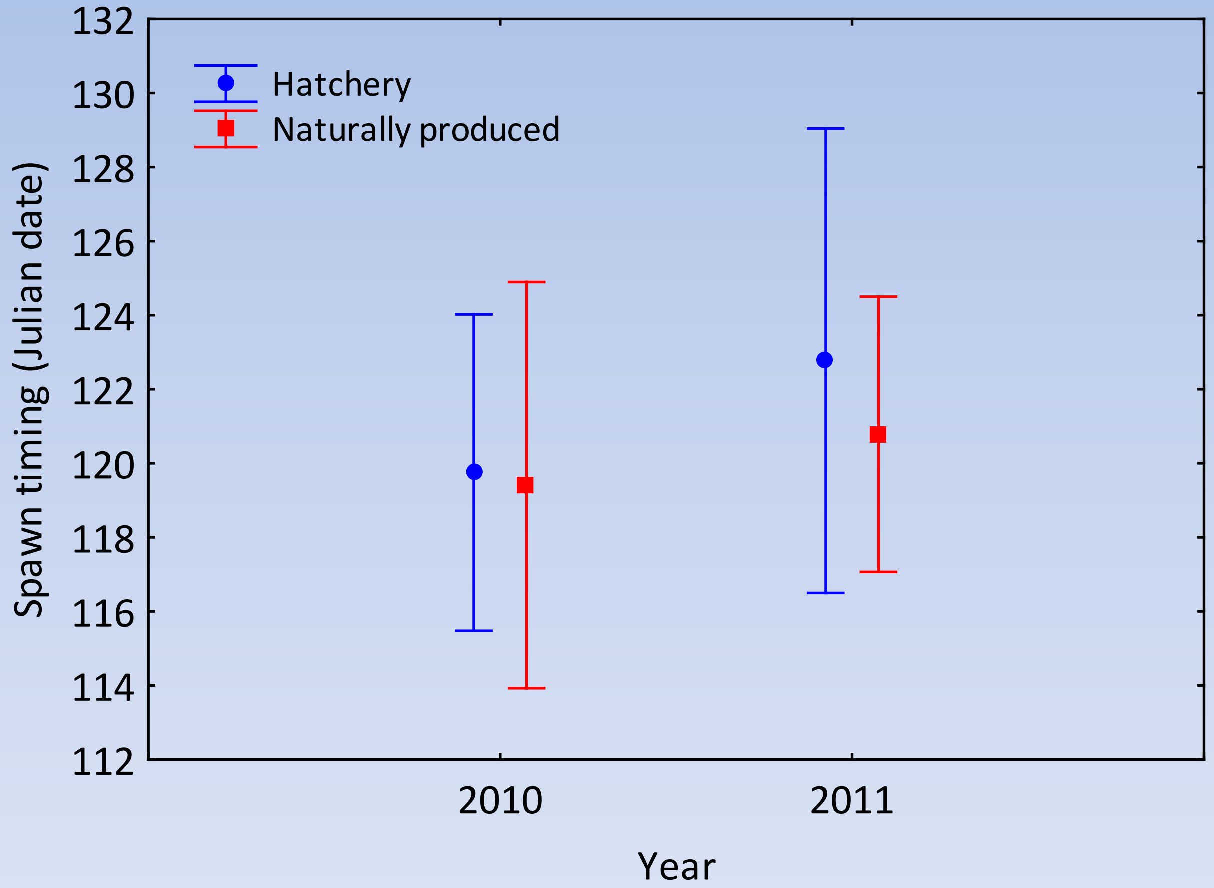
- Elevation was not a significant factor
  - Wenatchee River
    - Differences were detected between years (Kruskal – Wallis ANOVA: $P < 0.001$), but not between origins in 2010 ($P = 0.44$) or 2011 ($P = 0.67$).
  - Nason Creek
    - No difference was detected between or within years (Kruskal – Wallis ANOVA: $P = 0.16$)

Attachment C

Wenatchee River



Nason Creek



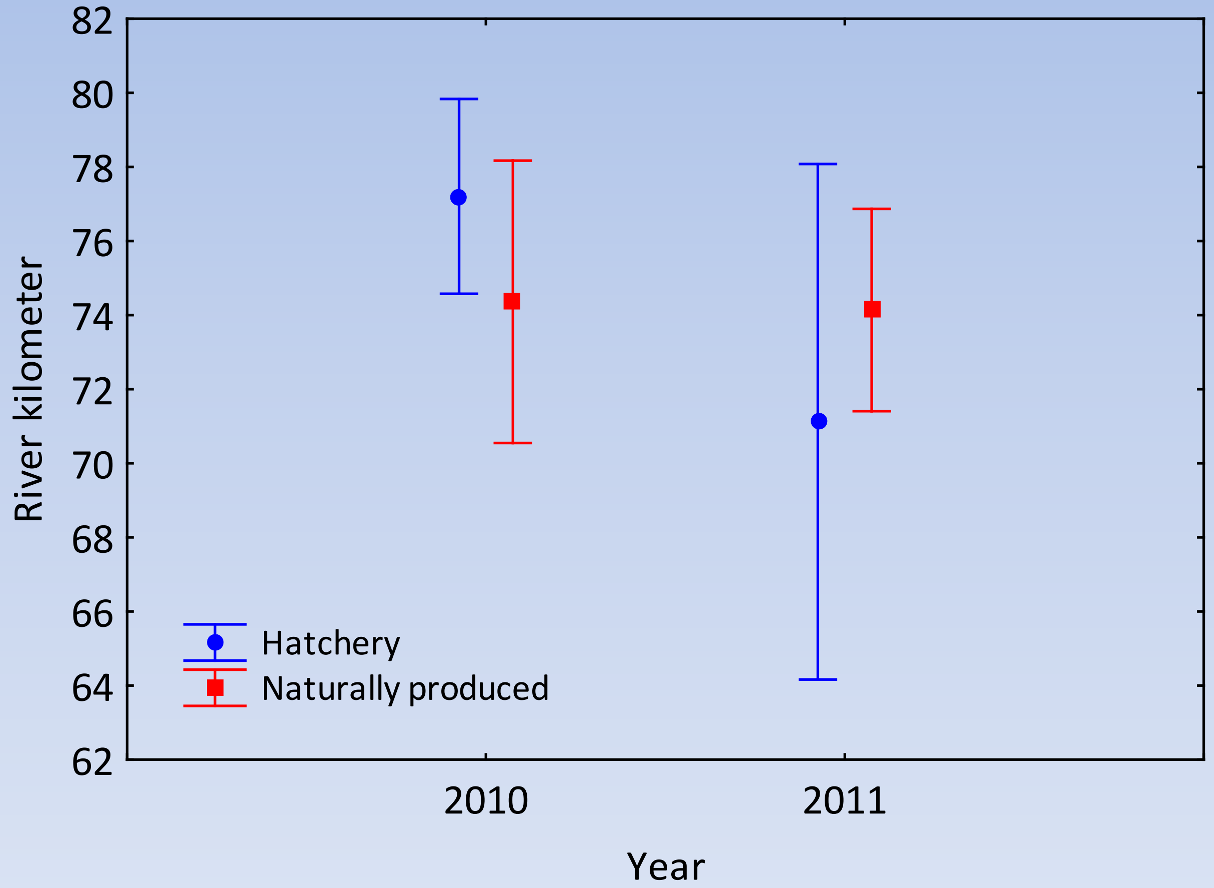
132
130
128
126
124
122
120
118
116
114
112
Spawn timing (Julian date)
Hatchery
Naturally produced
2010
2011
Year

Spawning location

- Elevation was not a significant factor
  - Wenatchee River
    - No difference was detected between or within years (Kruskal – Wallis ANOVA: $P = 0.07$)
  - Nason Creek
    - Differences were detected between years (Kruskal – Wallis ANOVA: $P = 0.05$), but not between origins in 2010 ($P = 1.0$) or 2011 ($P = 0.09$).

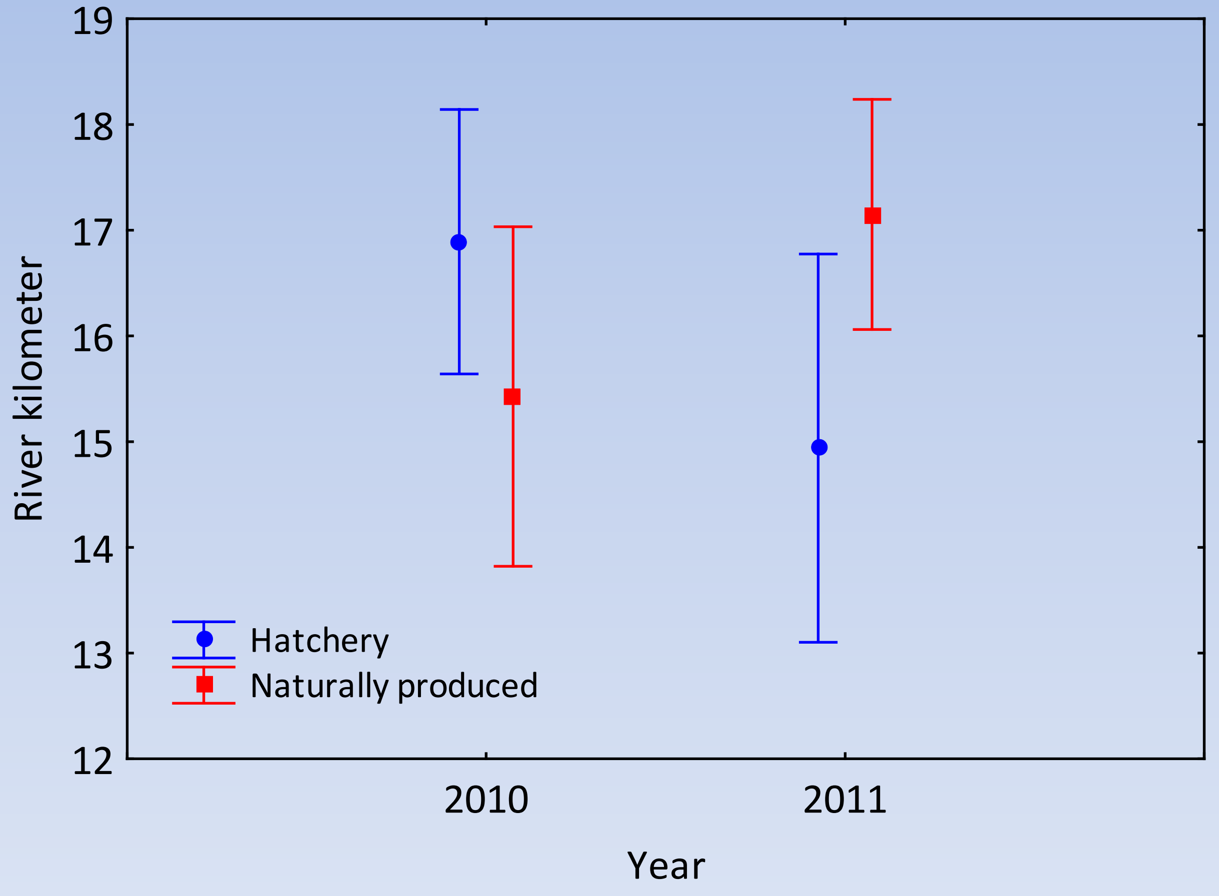
Attachment C

Wenatchee River



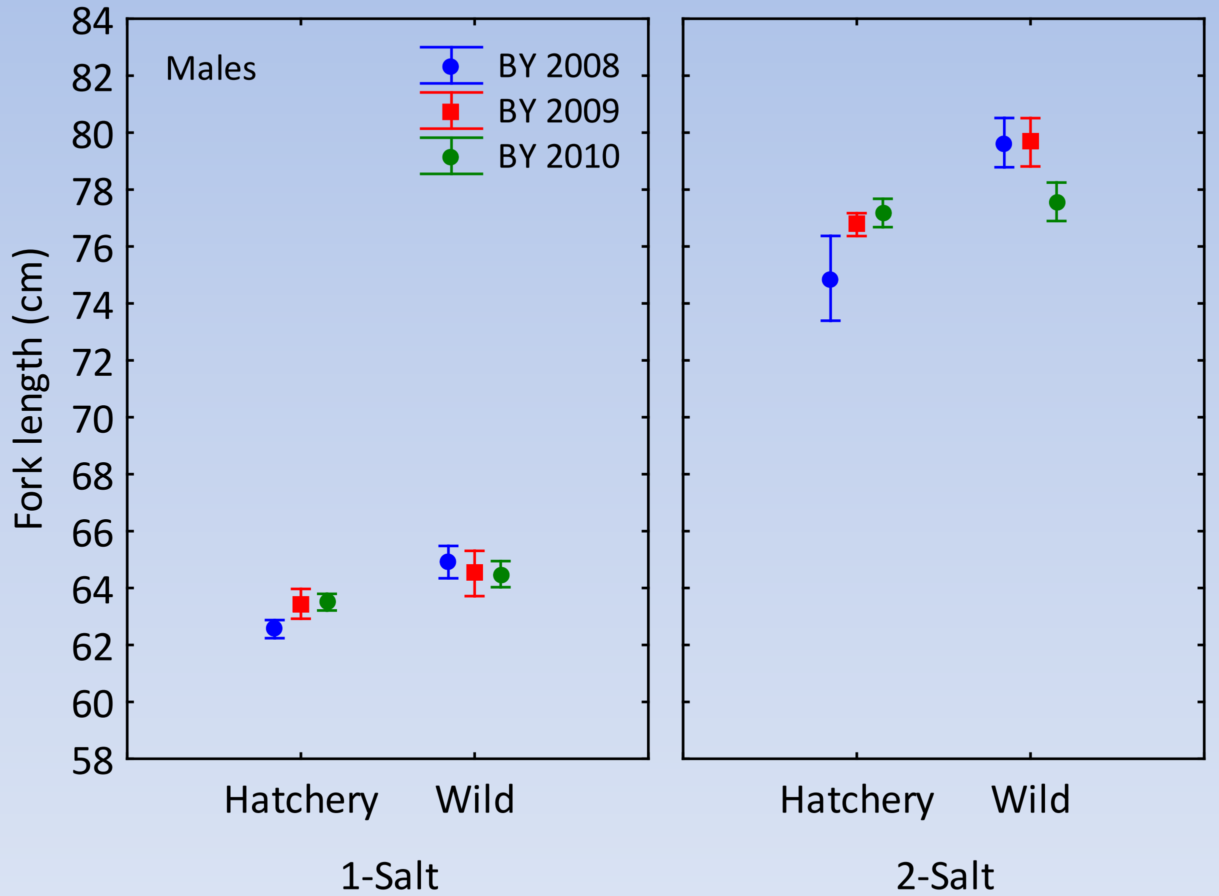
Attachment C

Nason Creek



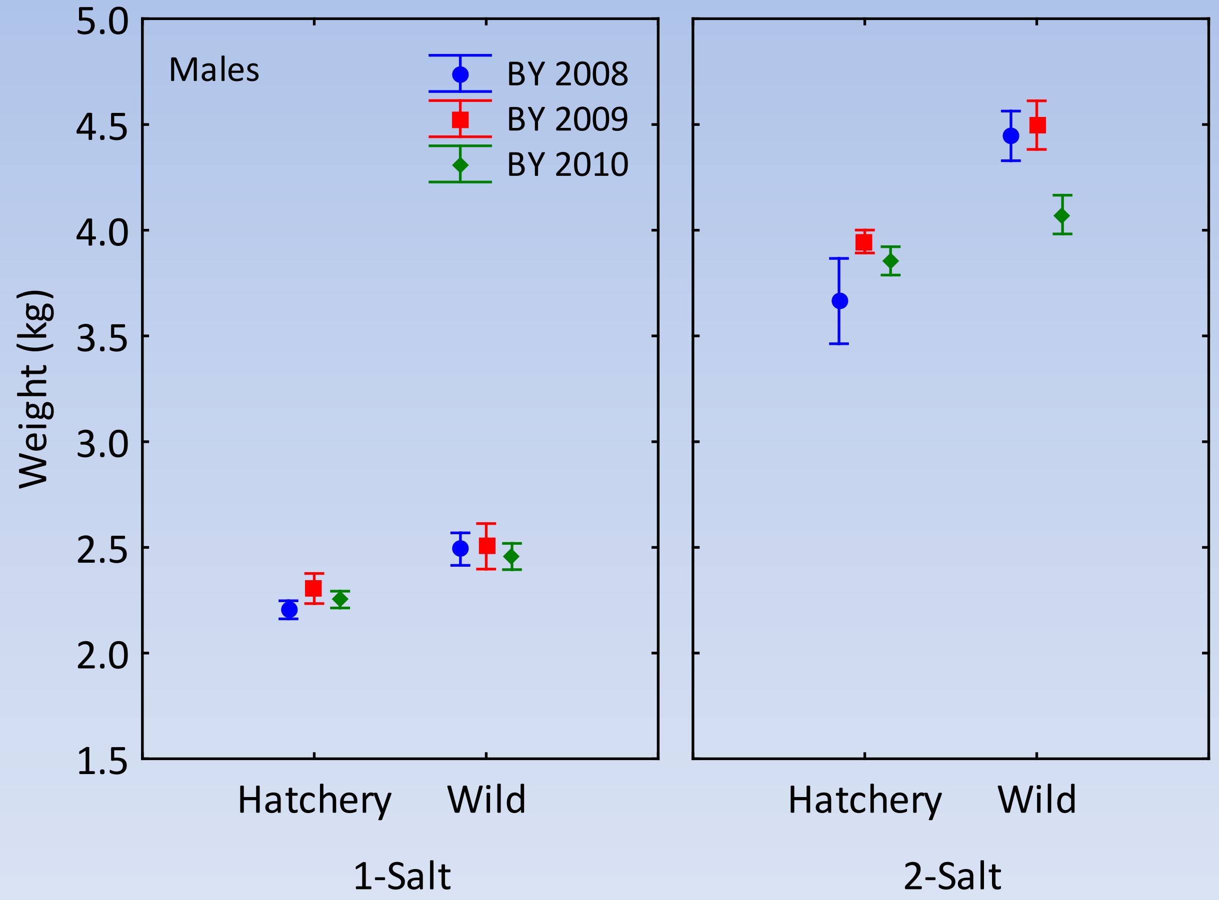
Attachment C

Male fork length at salt age



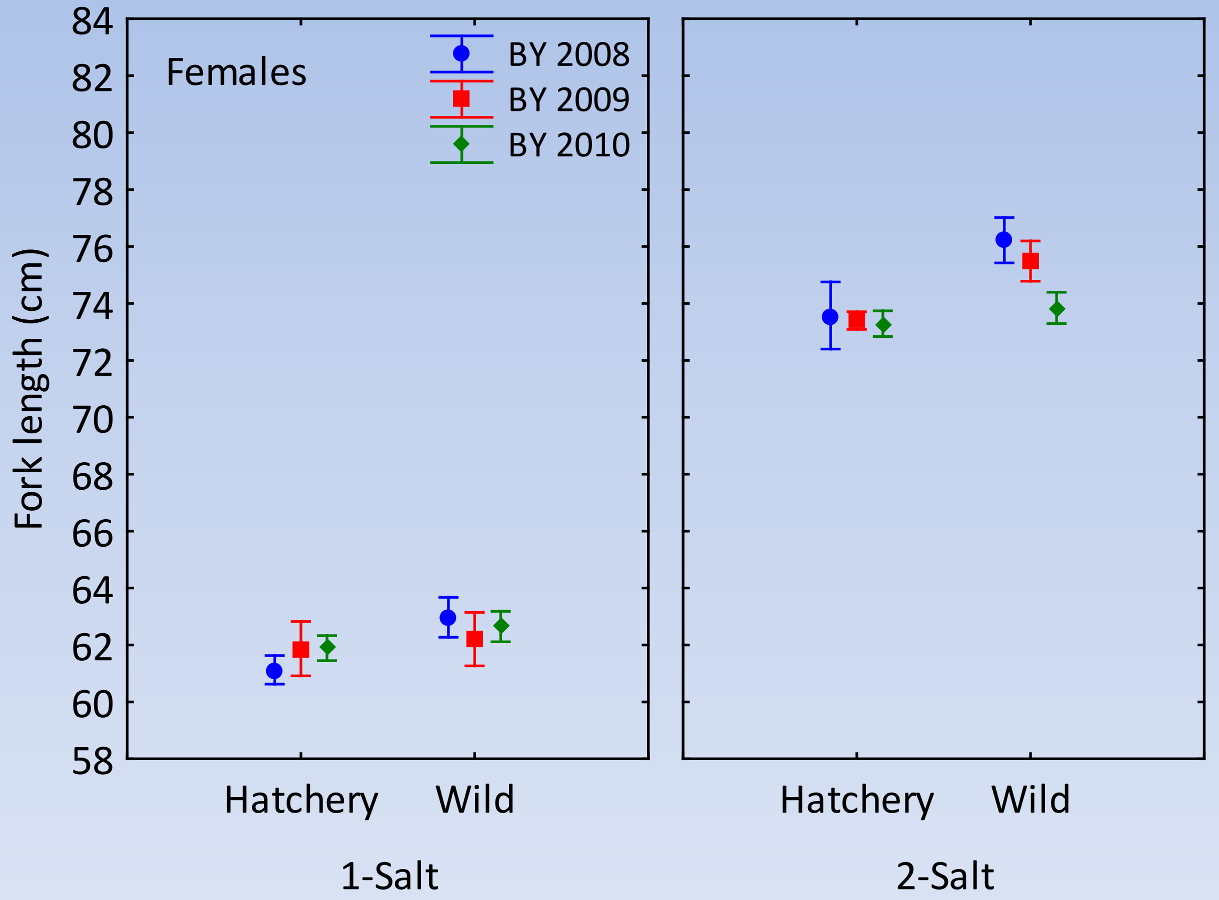
Attachment C

Male weight at salt age



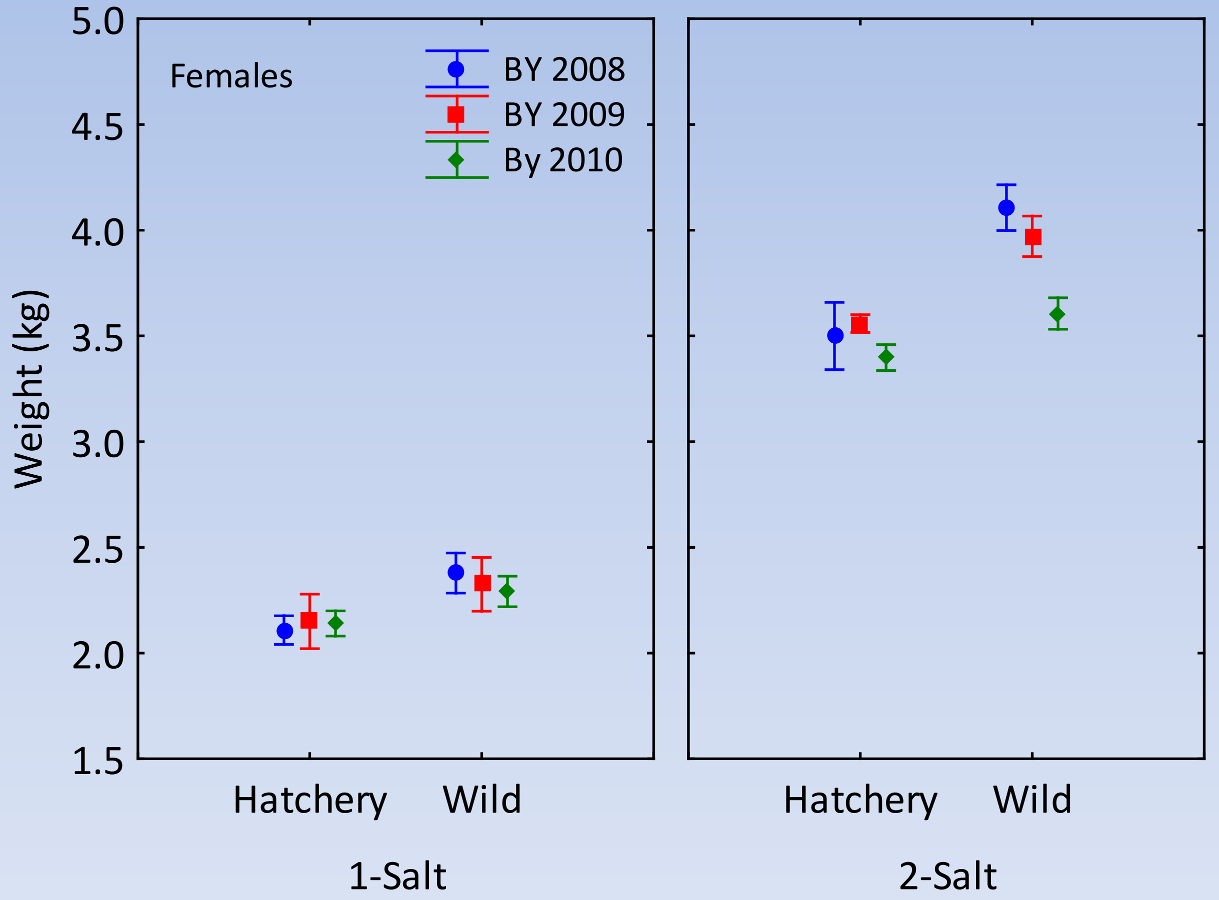
Attachment C

Female fork length at salt age



Attachment C

Female weight at salt age

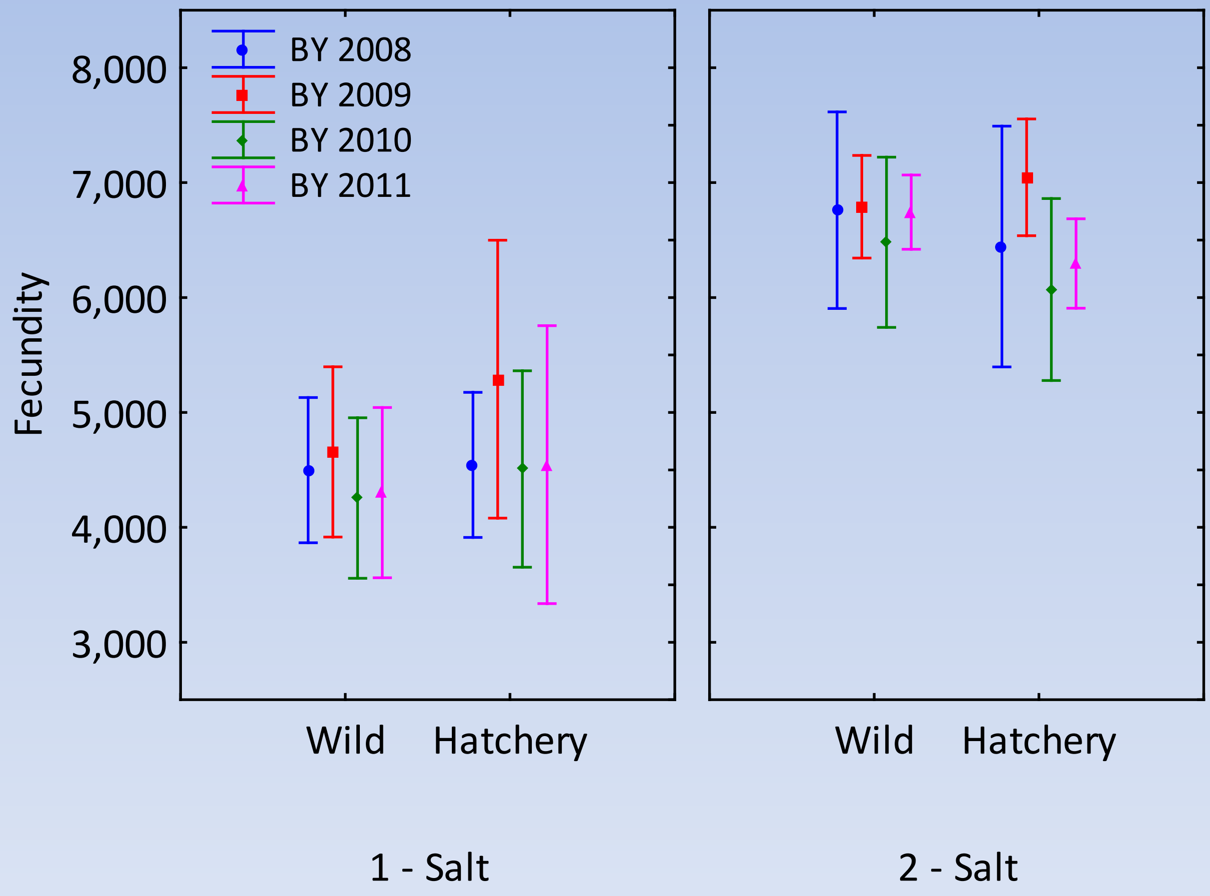


Size at salt age

- Fork length (W > H)
  - 2008 brood (1 and 2 salt)
  - 2009 brood (2 salt)
  - Difference was only 4% greater
- Weight (W > H)
  - 2008 brood (1 and 2 salt)
  - 2009 brood (2 salt)
  - 2010 brood (1 salt males)
  - Difference was variable across years
    - BY 2008 16%; BY 2009 13%; BY 2010 9%

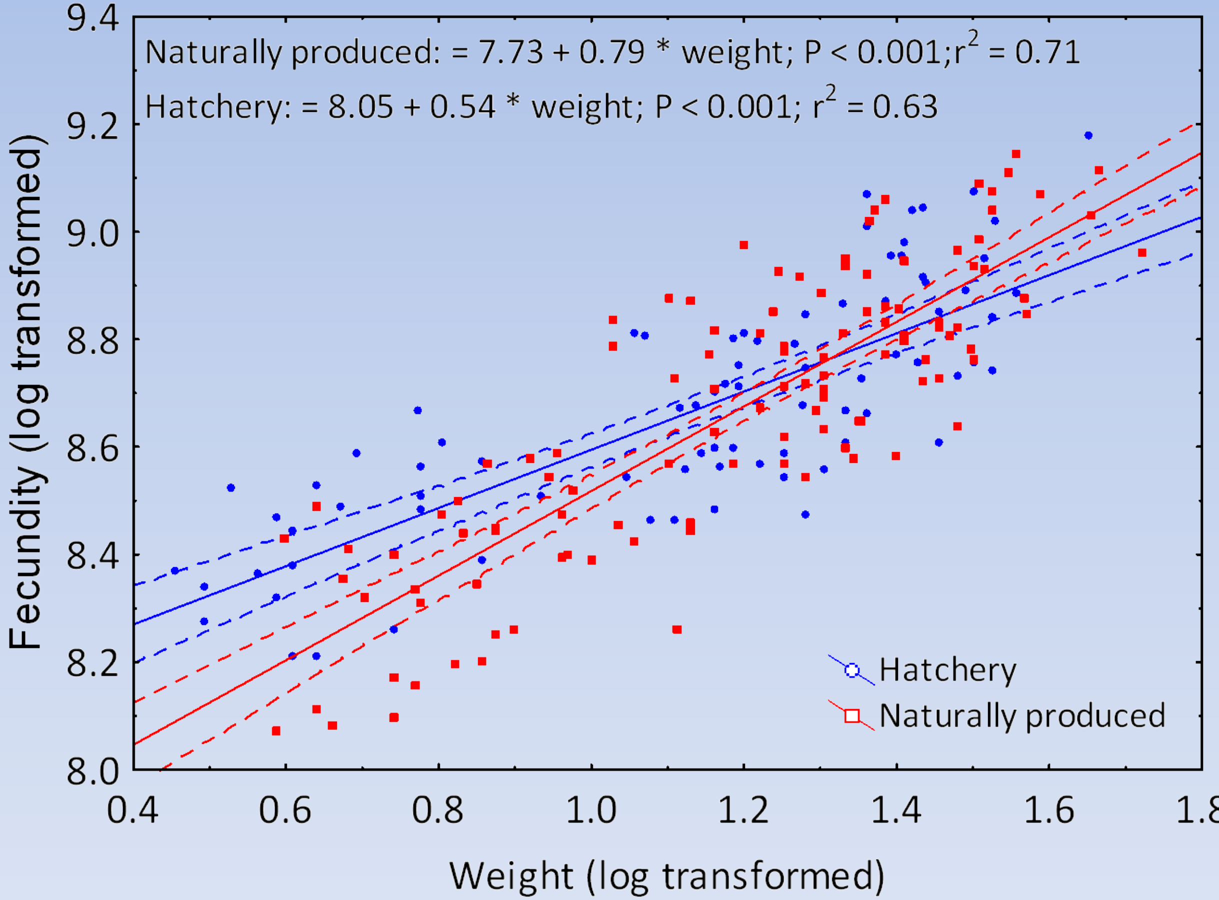
Attachment C

Steelhead broodstock fecundity



Attachment C

Steelhead Results



Attachment C

Female and Potential Egg Deposition Ratios

Brood year	Hatchery	Wild	H/W
Females			
2008	262	202	1.297
2009	647	182	3.555
2010	571	385	1.483
2011	141	486	0.290
Eggs			
2008	998,274	673,088	1.483
2009	2,707,774	624,238	4.338
2010	2,264,976	1,259,966	1.798
2011	591,857	1,728,439	0.342

Parentage results (2007/8 brood)

Table 1 – Summary of assignment success of age-1 progeny to BY2008 parents.

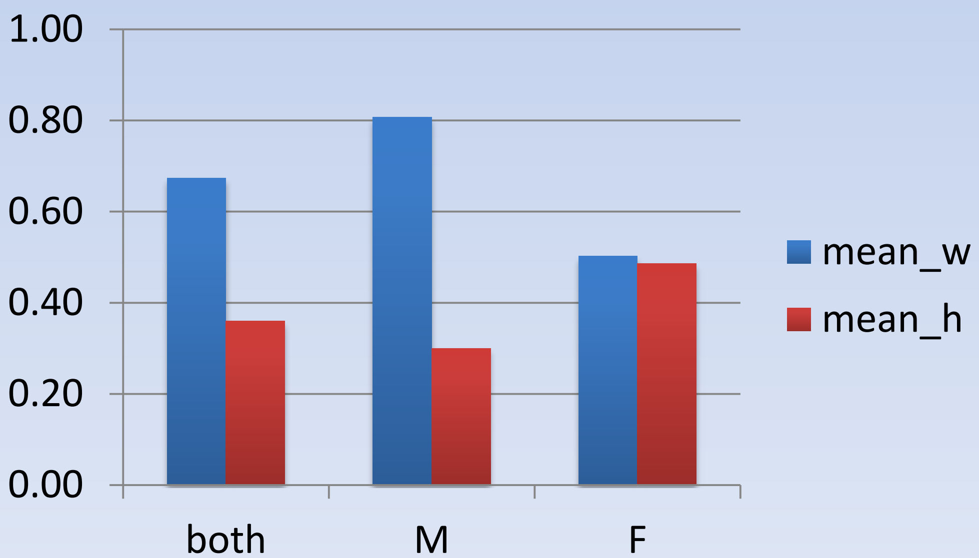
case	Num. assig.	Percent
Mom and dad assigned	487	69%
dad only	50	7%
mom only	64	9%
no parents assigned	31	4%
two dads	65	9%
two moms	7	1%
total	704	100%

Attachment C

Relative reproductive success

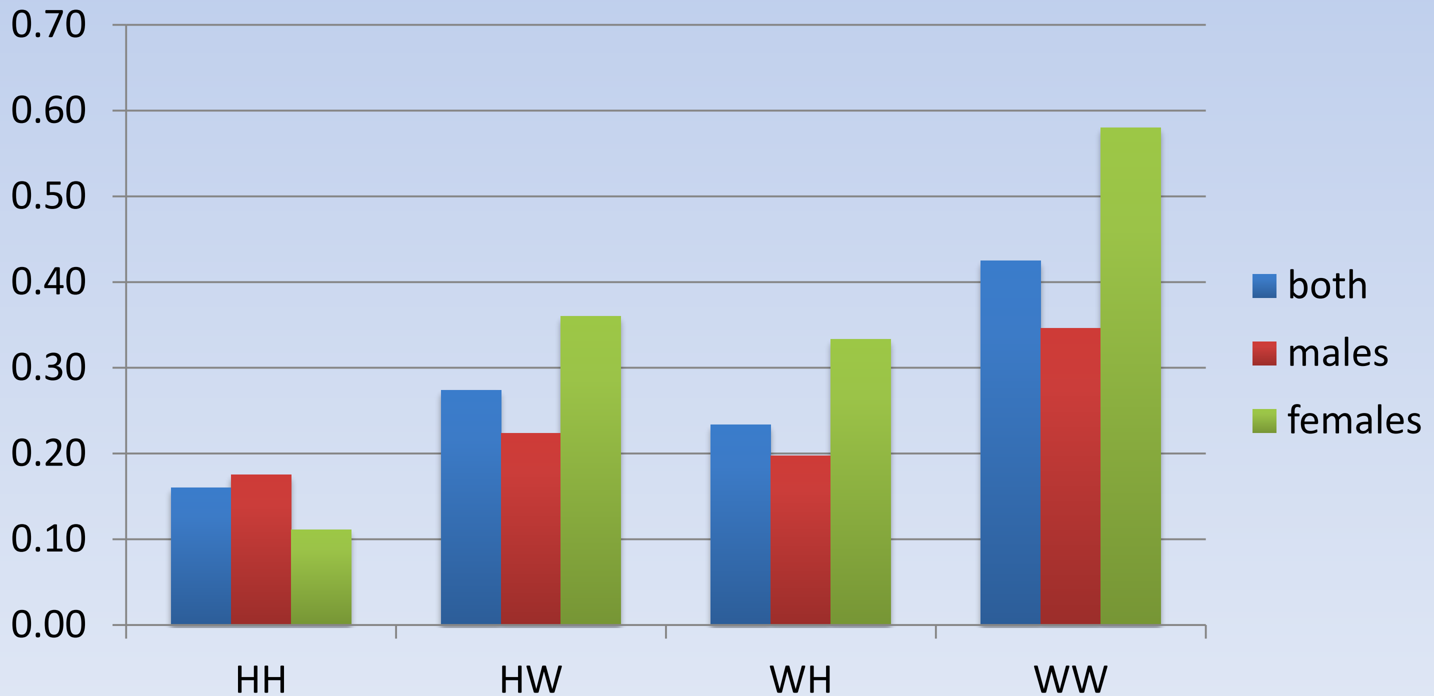
Table 1 – Mean age-1 progeny counts for hatchery and wild steelhead passing Tumwater Dam in 2007/2008. Fish that produced no sampled offspring are included in the mean calculations.

	wild			hatchery				
sex	n	mean	sd	n	mean	sd	H/W	p value
both	515	0.67	1.72	884	0.36	1.02	0.53	< 0.001
M	290	0.81	2.00	600	0.30	0.96	0.37	< 0.001
F	225	0.50	1.26	284	0.49	1.13	0.97	0.88



Effect of degree of hatchery ancestry

	both				males				females			
	HH	HW	WH	WW	HH	HW	WH	WW	HH	HW	WH	WW
n	75	135	107	240	57	85	76	159	18	50	30	81
mean	0.16	0.27	0.23	0.43	0.18	0.22	0.20	0.35	0.11	0.36	0.33	0.58
sd	0.49	0.77	0.89	0.91	0.50	0.62	0.98	0.85	0.47	0.96	0.61	1.00
p-value	NA	0.11	0.28	0.00137	NA	0.54	0.77	0.0483	NA	0.11	0.16	0.02206



Effect of weight and run timing

Table 1 – Coefficients from a GLM (Poisson, log-link) evaluating the effect of weight, run timing and origin on age-1 offspring production.

	both sexes	p	males	p	females	p
(Intercept)	-0.71	<0.001	-0.62	0	-0.87	<0.001
wt	0.39	<0.001	0.42	0	0.27	<0.001
H origin	-0.33	<0.001	-0.56	0	0.01	0.94
rt	0.39	<0.001	0.29	<0.001	0.51	<0.001

Rock Island and Rocky Reach HCP Hatchery Committees

Statement of Agreement

Chelan PUD Hatchery Compensation, Release Years 2014-2023

Approved December 14, 2011

Statement

The Rock Island and Rocky Reach and Rock Island Habitat Conservation Plans' (HCP) Hatchery Committees (HC) approve the recalculated hatchery compensation levels in Table 1 to meet Chelan PUD's No Net Impact and Inundation obligations for release years 2014-2023. Further adjustments in production levels may occur as described in the Rock Island and Rocky Reach HCPs [Section 8.4]. The methodology underlying this Agreement applies to this Agreement only and does not influence the methodologies that may be utilized in future recalculations.

***Table 1**. Rock Island and Rocky Reach HCP recalculated hatchery production objectives, 2014-2023.*

Species	Facility	Chelan smolt production target	Project(s)	Purpose
Spring Chinook	Chief Joseph[1]	115,000 (12.81% of CJH production)	RIS/RRH	NNI
	Chiwawa	144,026	RIS	NNI
	Methow	60,516	RRH	NNI
Summer Chinook	Chief Joseph/Similkameen	166,569 (12.81% of CJH production)	RIS/RRH	NNI
	Chief Joseph (sub-yearling)	94,570 (13.51% of CJH production)	RIS/RRH	NNI
	Carlton[2]	0	-	-
	Chelan Falls	400,000	RRH	Inundation
	Chelan Falls	176,000	RRH	NNI
	Dryden[2]	318,000	RIS	NNI
Steelhead	Chiwawa	165,000	RRH	Inundation
	Chiwawa	22,000	RIS/RRH	NNI
	Chiwawa	60,300	RIS	Species trade[3]
Sockeye	Wenatchee	White/Little Wenatchee M&E	RIS	Species trade[3]
	Penticton Hatchery	Skaha Reintroduction Program	RIS/RRH	NNI
Coho		Yakama Nation Coho Program	RIS/RRH	NNI

[1] Due to delays in construction at Chief Joseph hatchery, releases of spring Chinook will begin in 2015.

[2] Existing capacity is available to implement hatchery sharing agreements. Chelan PUD has agreed to assess the feasibility of Grant PUD modifying Carlton and Dryden acclimation facilities to accommodate overwinter rearing. However, the execution of a feasibility assessment does not obligate Chelan PUD to modify existing facilities or develop new overwinter acclimation at these locations. The development of overwinter rearing at either location requires both PUDs to agree to the terms and conditions of a facility modification contract. In the interim, Chelan PUD will provide existing hatchery capacity to Grant PUD according to the existing Hatchery Sharing Agreement between the two PUDs.

[3] Species trade of the recalculated sockeye production (46,000) for additional steelhead production (60,300) to remain consistent with the 2010 HCP-HC SOA (March 16, 2011) and *US v. OR* agreements to produce a total of up to 247,300 steelhead smolts at Chiwawa utilizing existing infrastructure.

Background

The HC initiated discussion on the first adjustment of hatchery compensation under the HCPs (set for the 2014 releases) during the fall of 2010, and ultimately agreed to a methodology to calculate the adjustments (SOA dated July 20th, 2011). A technical subcommittee of the HCs developed a database in a parallel effort for use in the hatchery compensation adjustment efforts (approved on August 17th, 2011). These methods and associated data were then used to develop ranges of hatchery compensation (i.e., “Sensitivity Analysis”). The Sensitivity Analysis was distributed on August 16th, 2011, and the HC agreed during the August 17th meeting and August 30th, 2011 conference call to use the Sensitivity Analysis ranges of hatchery compensation as the basis for development of an Implementation Plan.

Attachment E

Mid-Columbia summer Chinook rearing study: BYs 2007- 2009 (NWFSC, NOAA Fisheries)

Don Larsen, Brian Beckman, Deb Harstad, Joe Miller, Sam Dilly, Ian Adams, Josh Murauskas

Attachment E

WATER REUSE

Attachment E

TRADITIONAL FLOW-THROUGH RACEWAY

Attachment E

PART 1: SUMMARY OF RESULTS
-BY2007 (Turtle Rock/Chelan Net Pens)
-BY2008 (Chelan Net Pens)

TURTLE ROCK

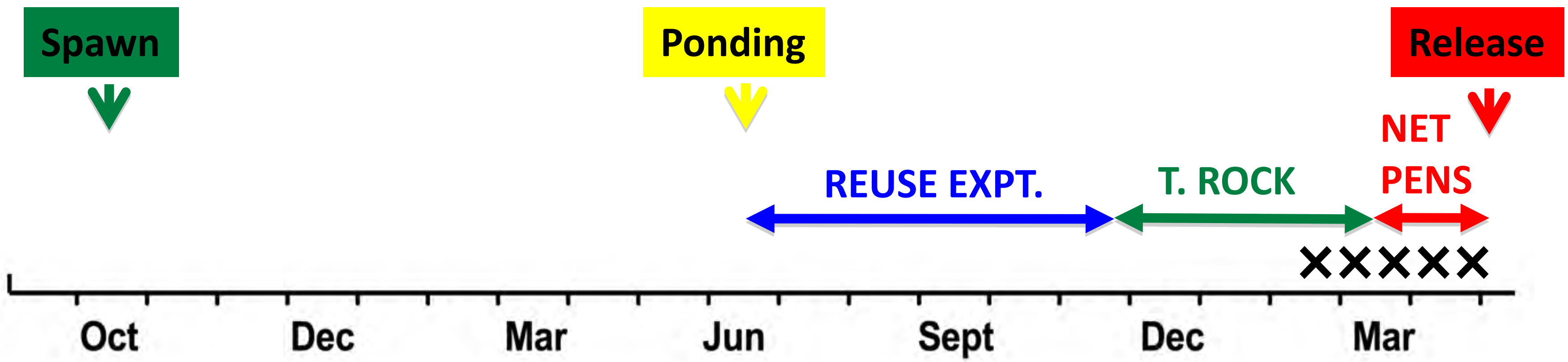
CHELAN NET PENS

Attachment E

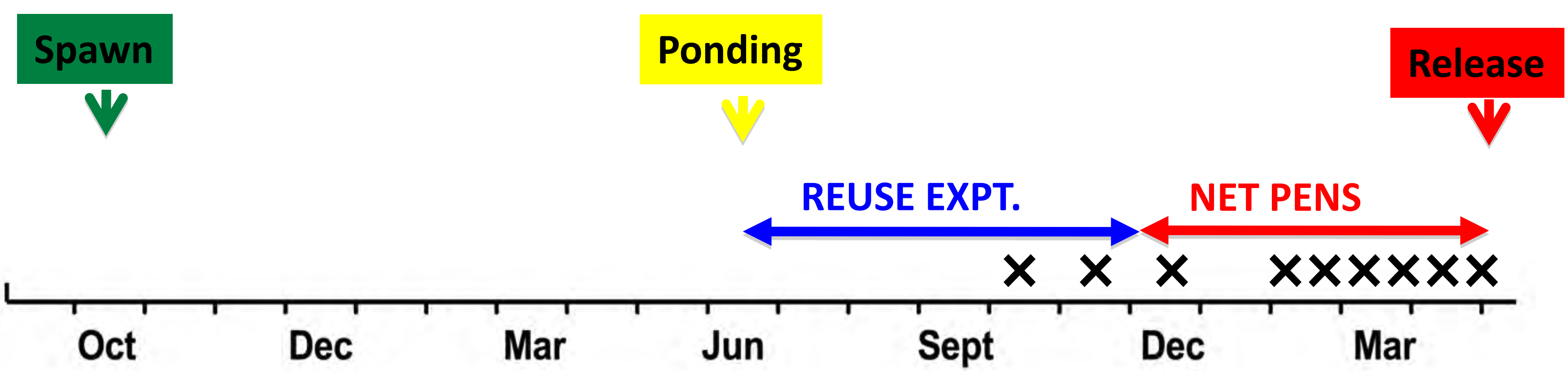
REARING & SAMPLING TIMELINES

A) BY2007*

× = Sample Date



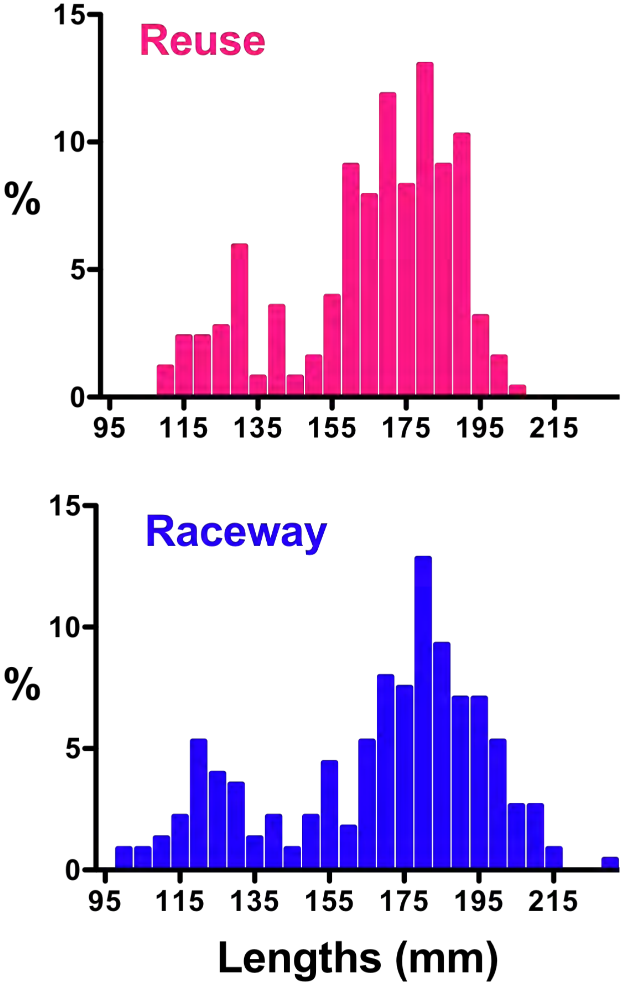
B) BY2008*



*Adults sourced from Wells Dam

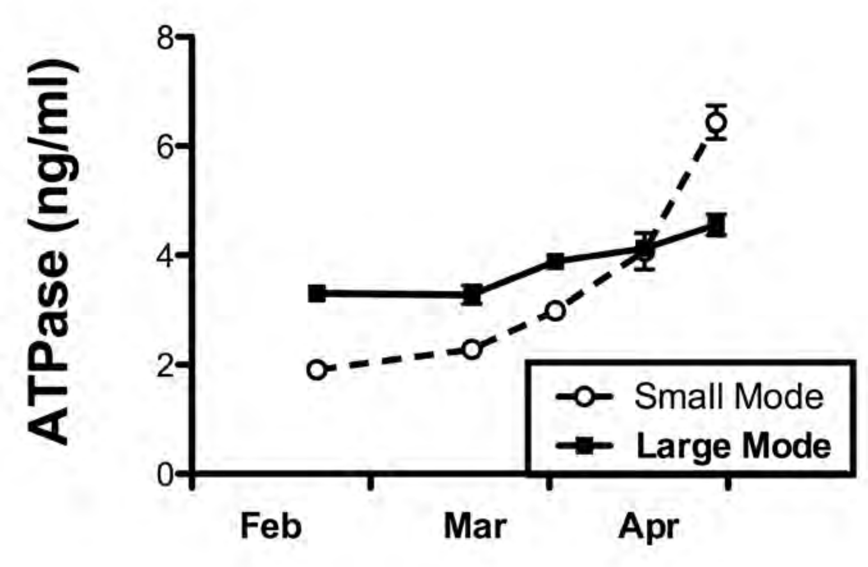
2009 Highlights - BY2007

- Bimodal Size



2009 Highlights - BY2007

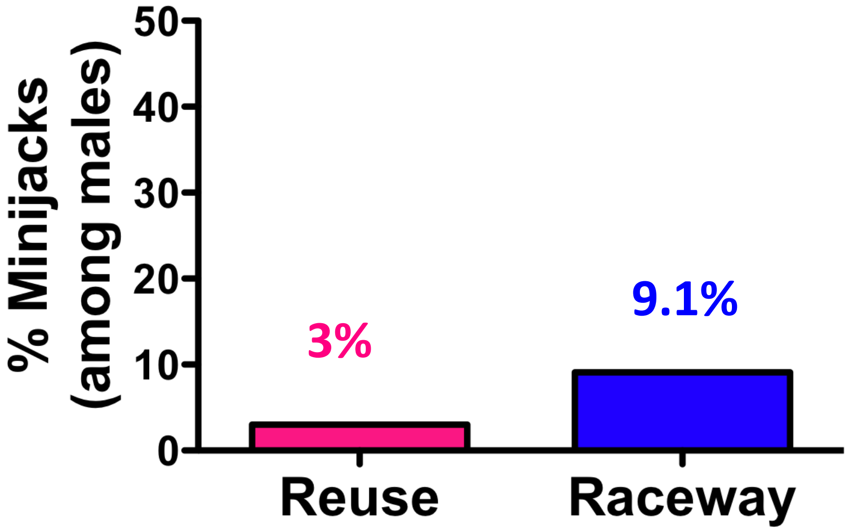
- Bimodal Size
- Smaller Fish had more dynamic increase in Spring ATPase



Attachment E

2009 Highlights - BY2007

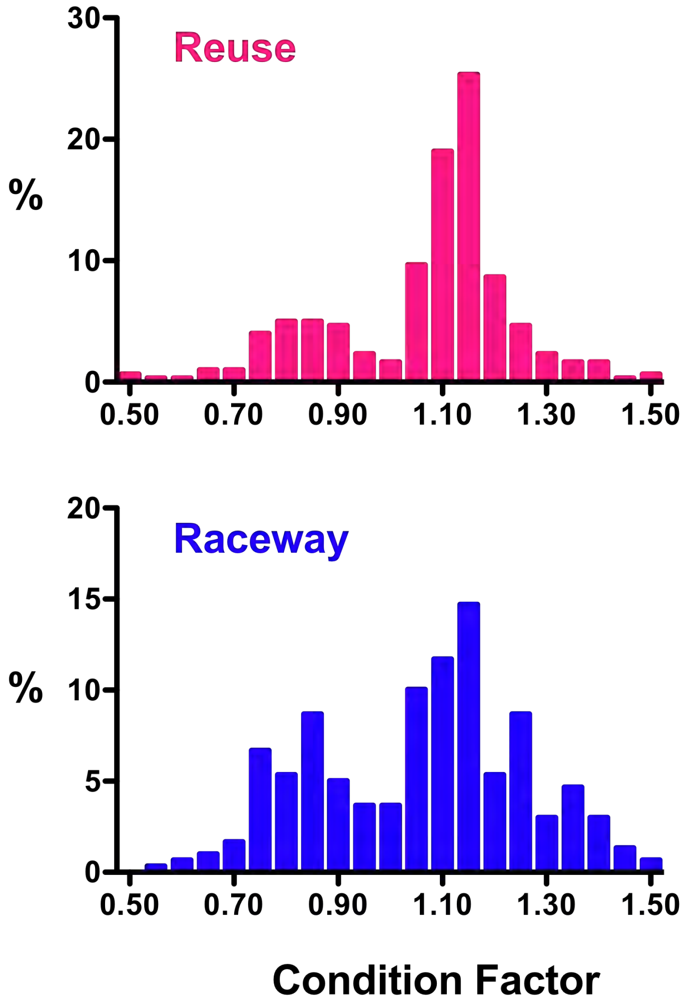
- Bimodal Size
- Smaller Fish had more dynamic increase in Spring ATPase
- Reuse had fewer Minijacks!



Low MJ Rates Overall!

2010 Highlights – BY2008

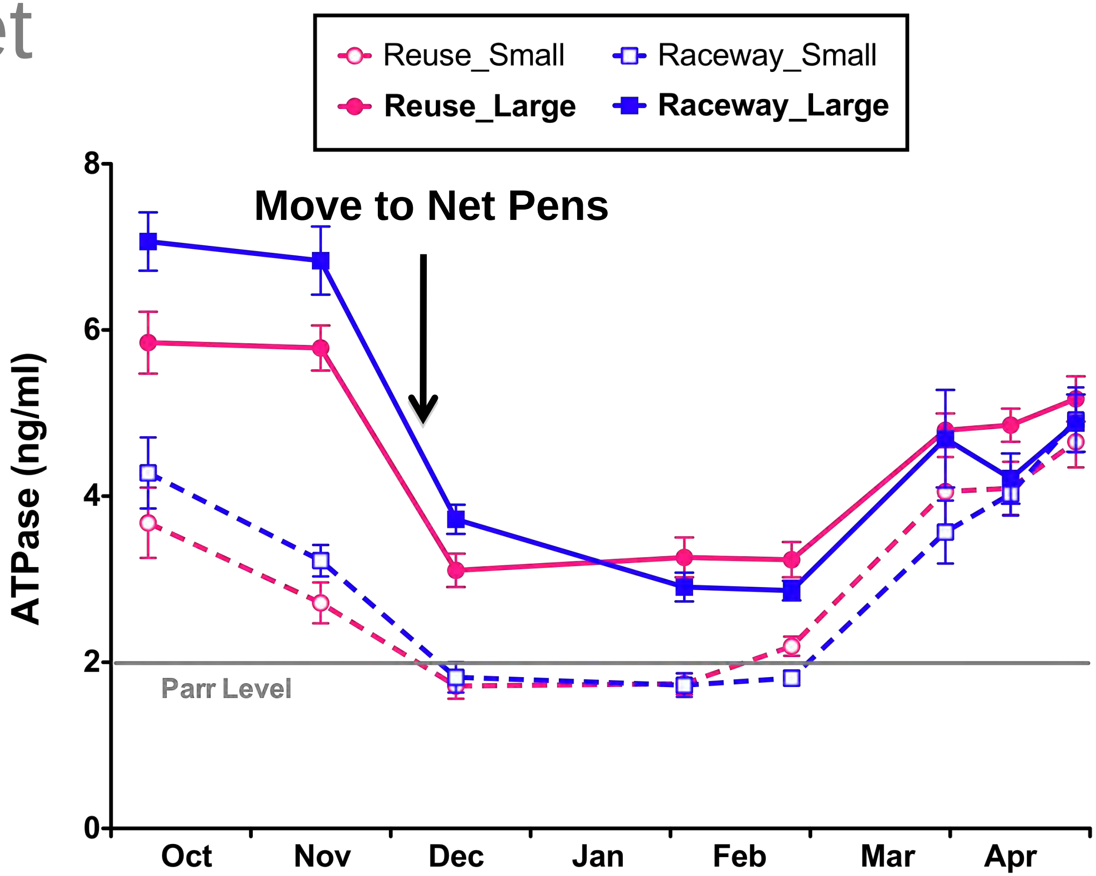
- Bimodal Condition Factor (after net pen rearing)



Attachment E

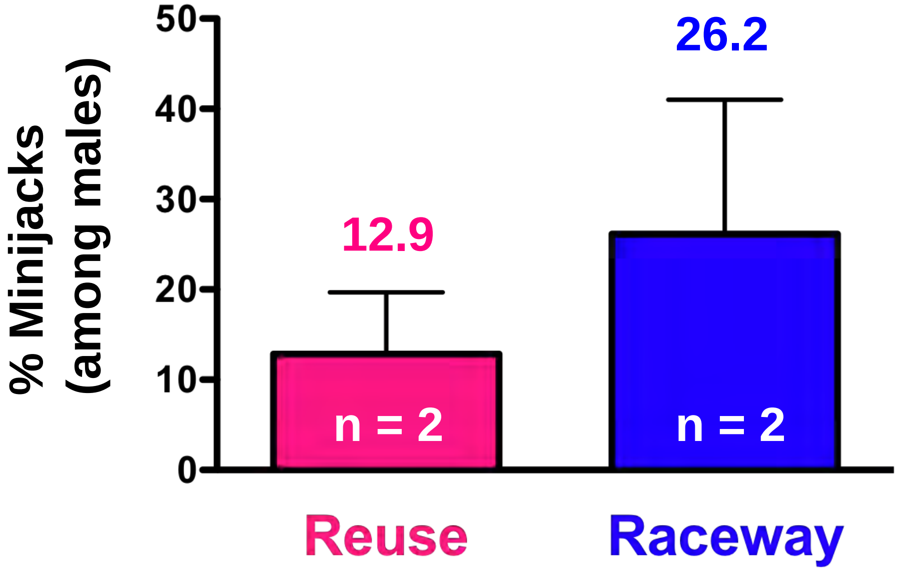
2010 Highlights – BY2008

- Bimodal Condition Factor (after net pen rearing)
- Fall Smolting



2010 Highlights – BY2008

- Bimodal Condition Factor (after net pen rearing)
- Fall Smolting
- Reuse, again, had fewer Minijacks!



Attachment E

2010 Highlights – BY2008

Carlton Pond

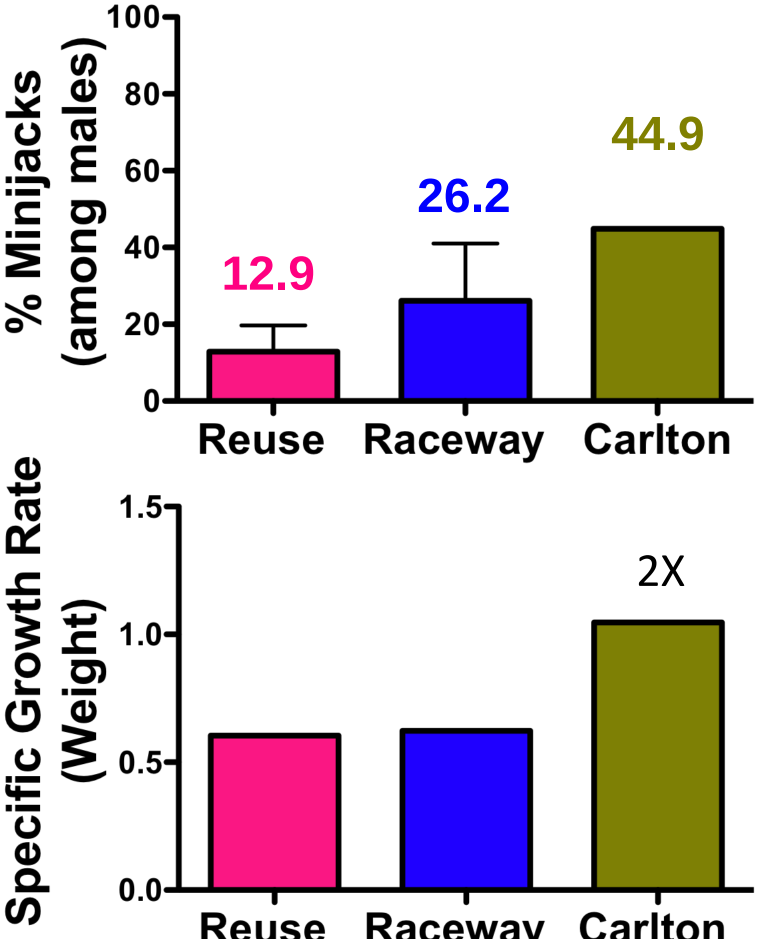
Note:

In addition to Reuse/Raceway fish, We also monitored Carlton Fish (Methow/Okanogan Stock) reared at Eastbank Hatchery

Attachment E

2010 Highlights – BY2008 Carlton

- **High minijack rate and high winter growth rate**



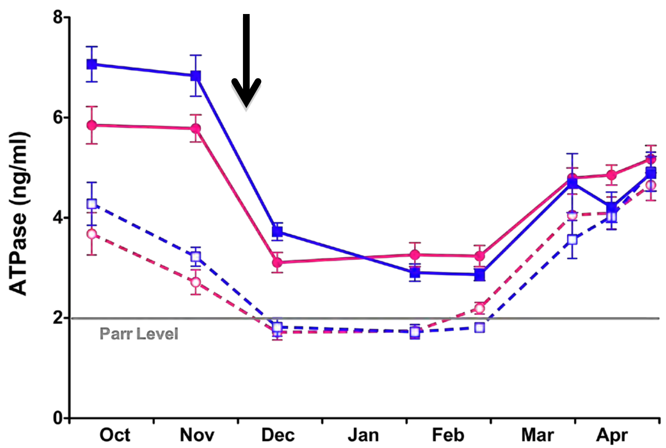
Association between winter growth and MJ Rates previously seen in Yakima R. Spring Chinook

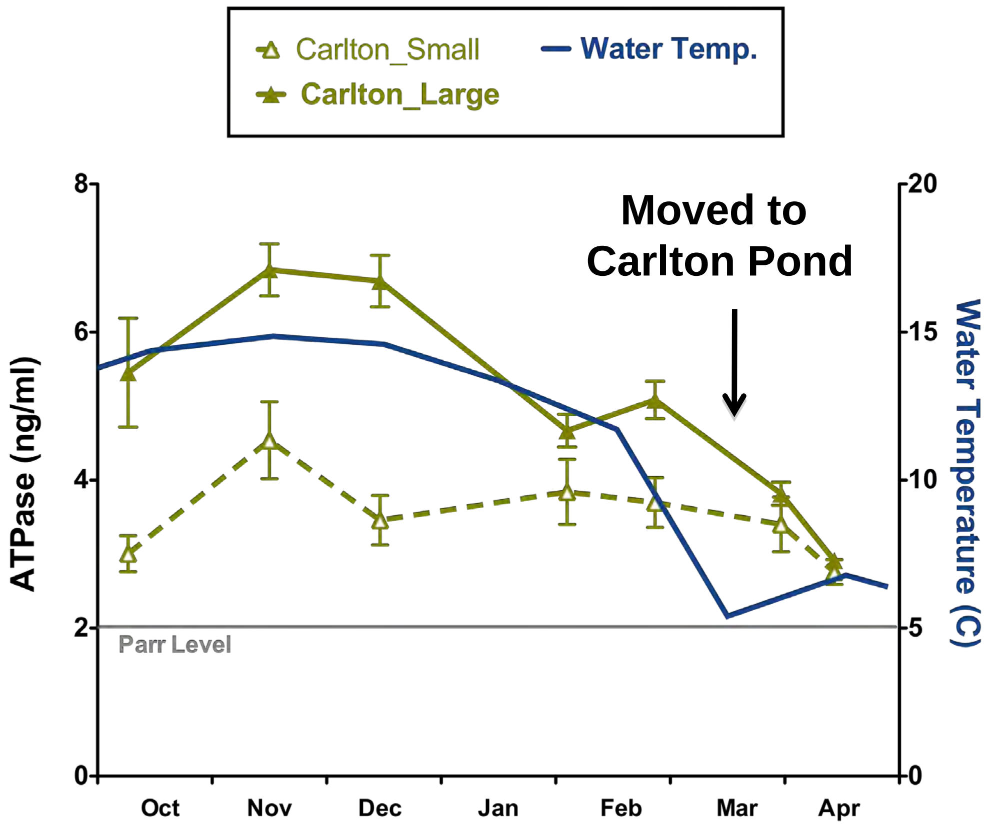
-Larsen et al 2004, 2006

Attachment E

2010 Highlights – BY2008 Carlton

- High minijack rate and high winter growth rate
- **Unexpected ATPase pattern (decreasing in spring)**





PART 2: 2011 (BY2009) RESULTS
NOW USING WENATCHEE STOCK

TURTLE ROCK

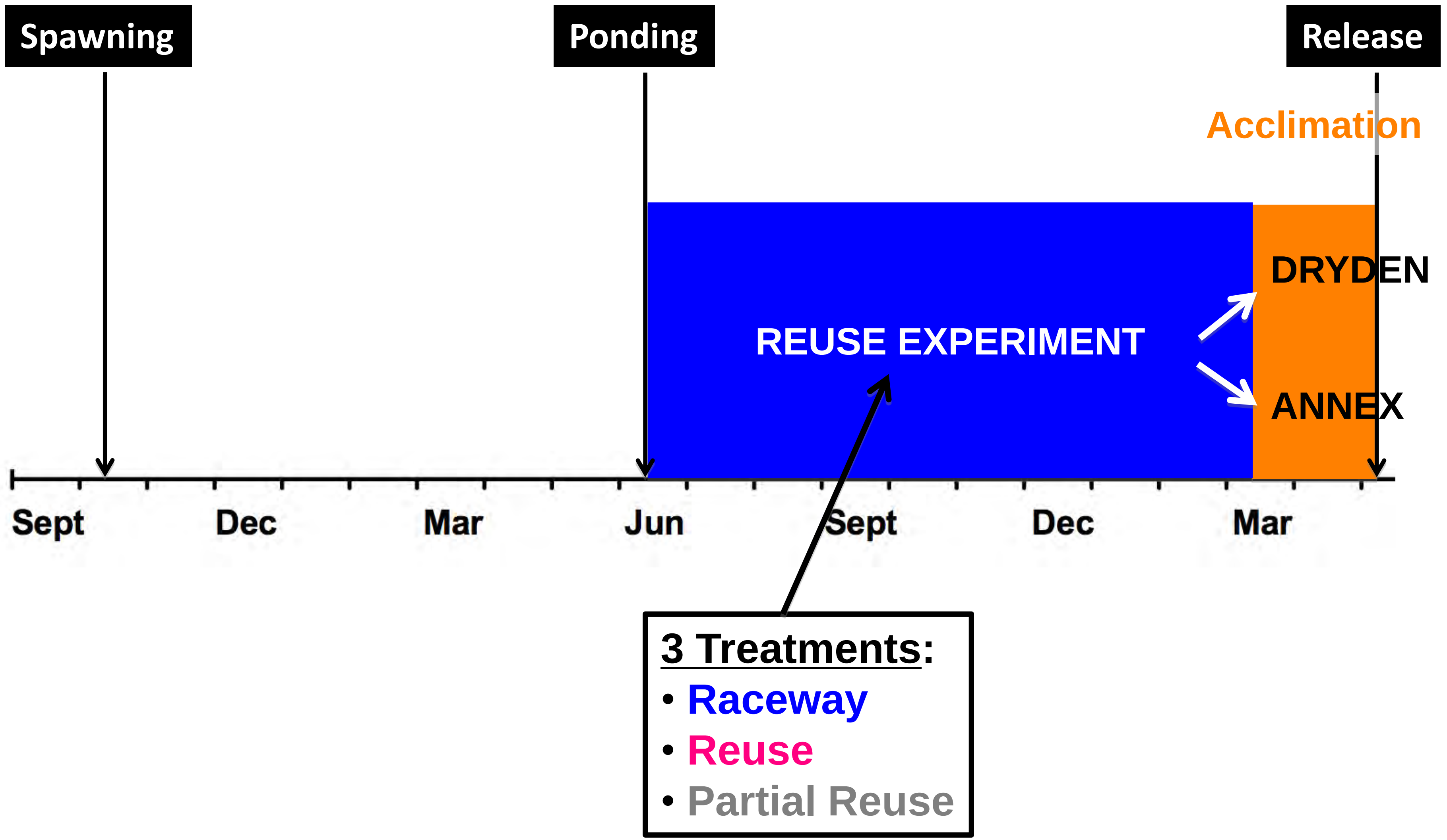
CHELAN NET PENS

DRYDEN POND

Attachment E

REARING & SAMPLING TIMELINES

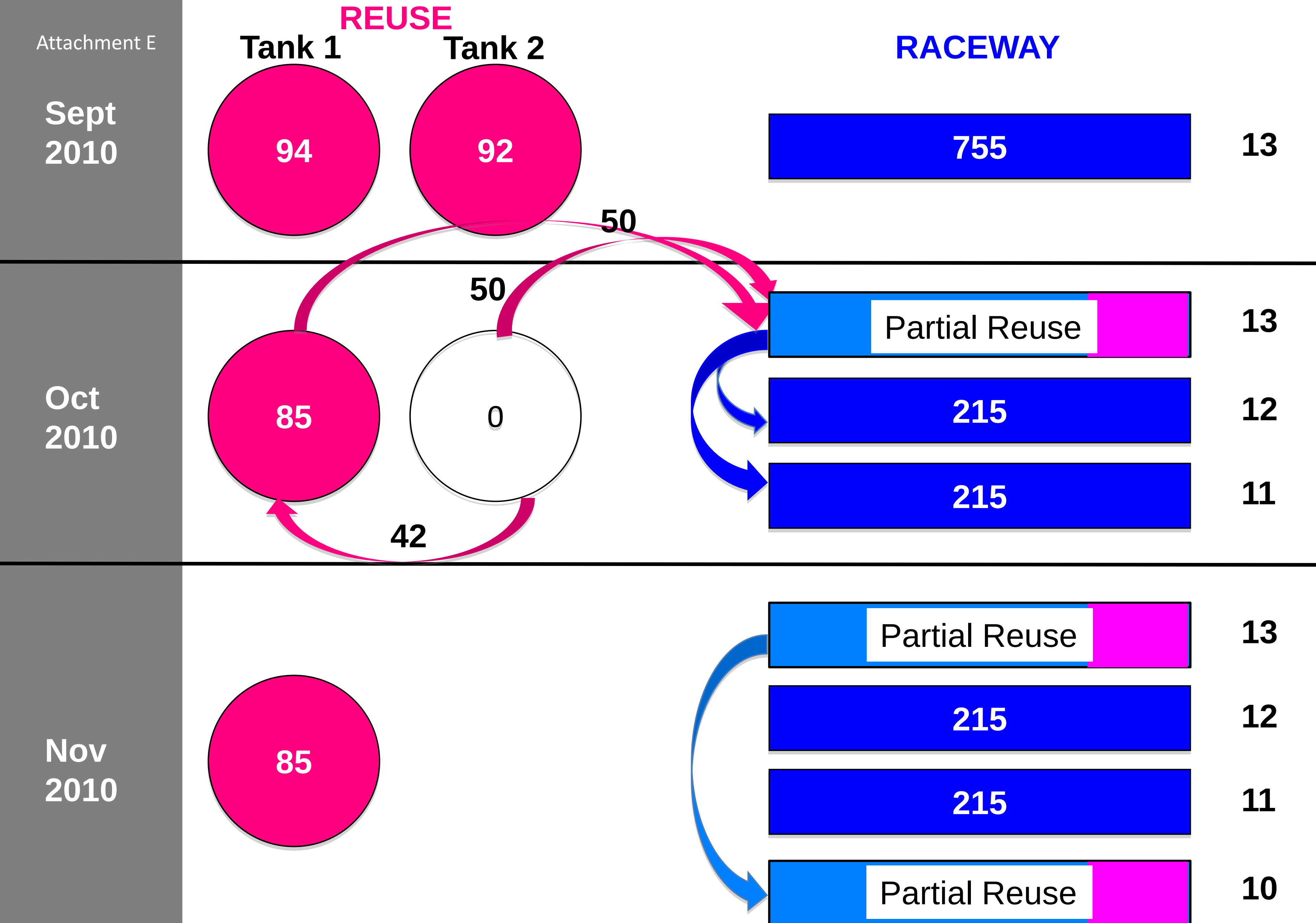
BY2009: WENATCHEE STOCK



Attachment E

Experimental fish reared at Eastbank Annex (3/15/11– 4/28/11) while their counterparts completed rearing at Dryden Pond

Attachment E

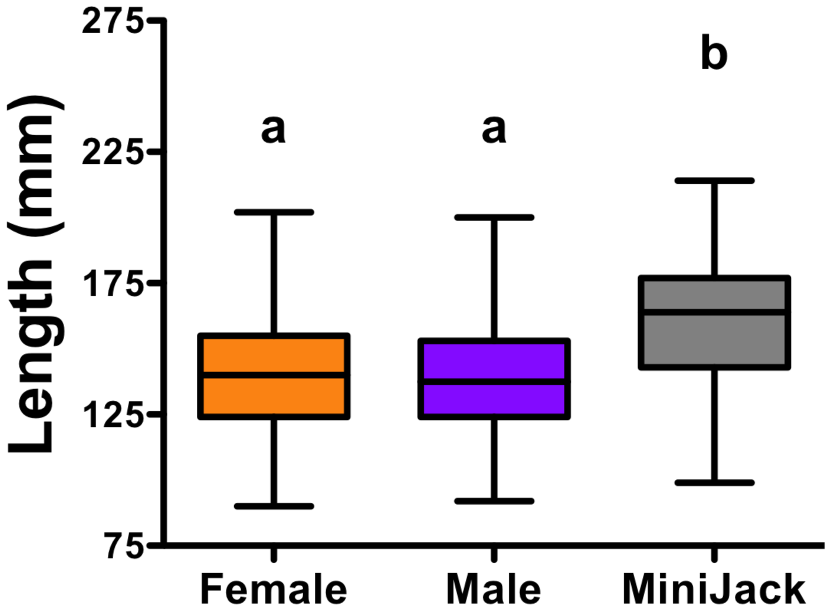


** Numbers are shown in Thousands*

Attachment E

2011 RESULTS – BY2009

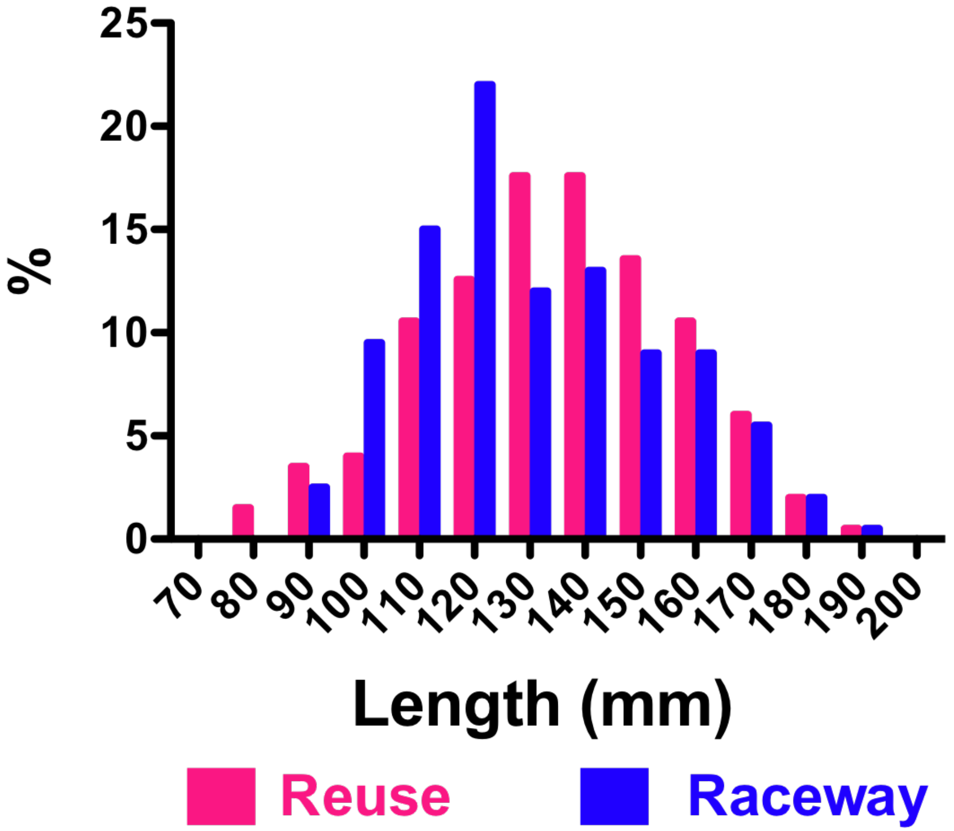
- Maturing Fish are larger



Attachment E

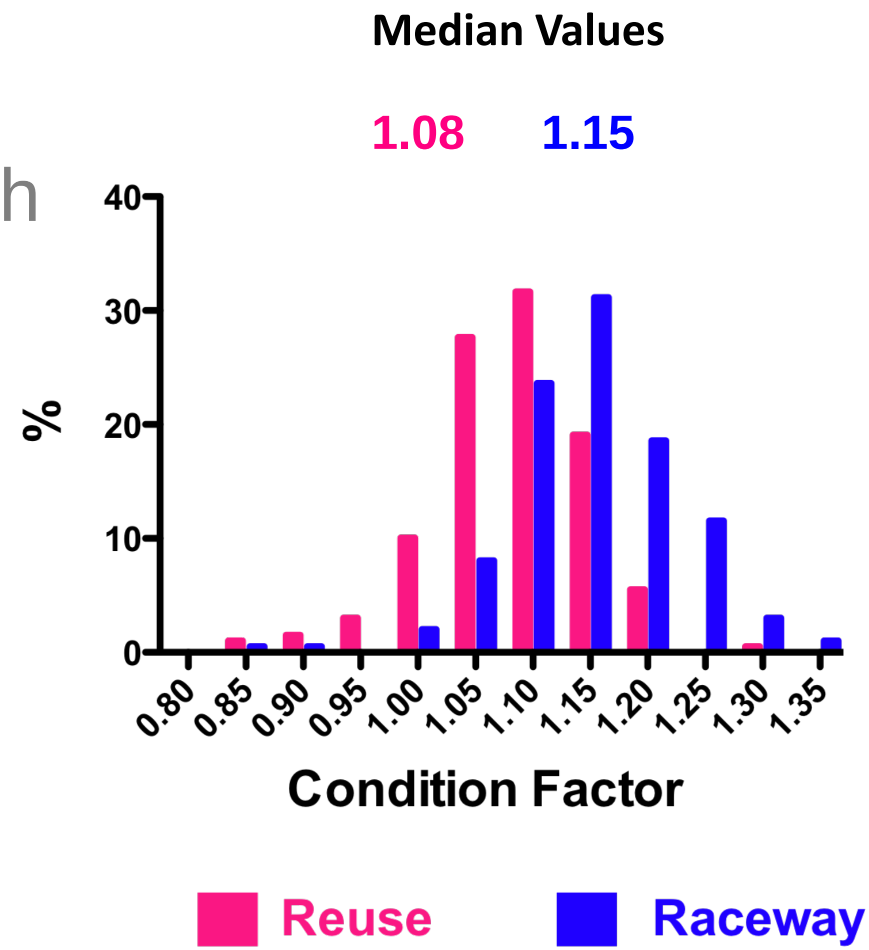
2011 RESULTS – BY2009

- Maturing Fish are larger
- Approx. normal length distributions in 2/11



2011 RESULTS – BY2009

- Maturing Fish are larger
- Approx. normal length distributions in 2/11
- Reuse have thinner body shape (K) in 2/11

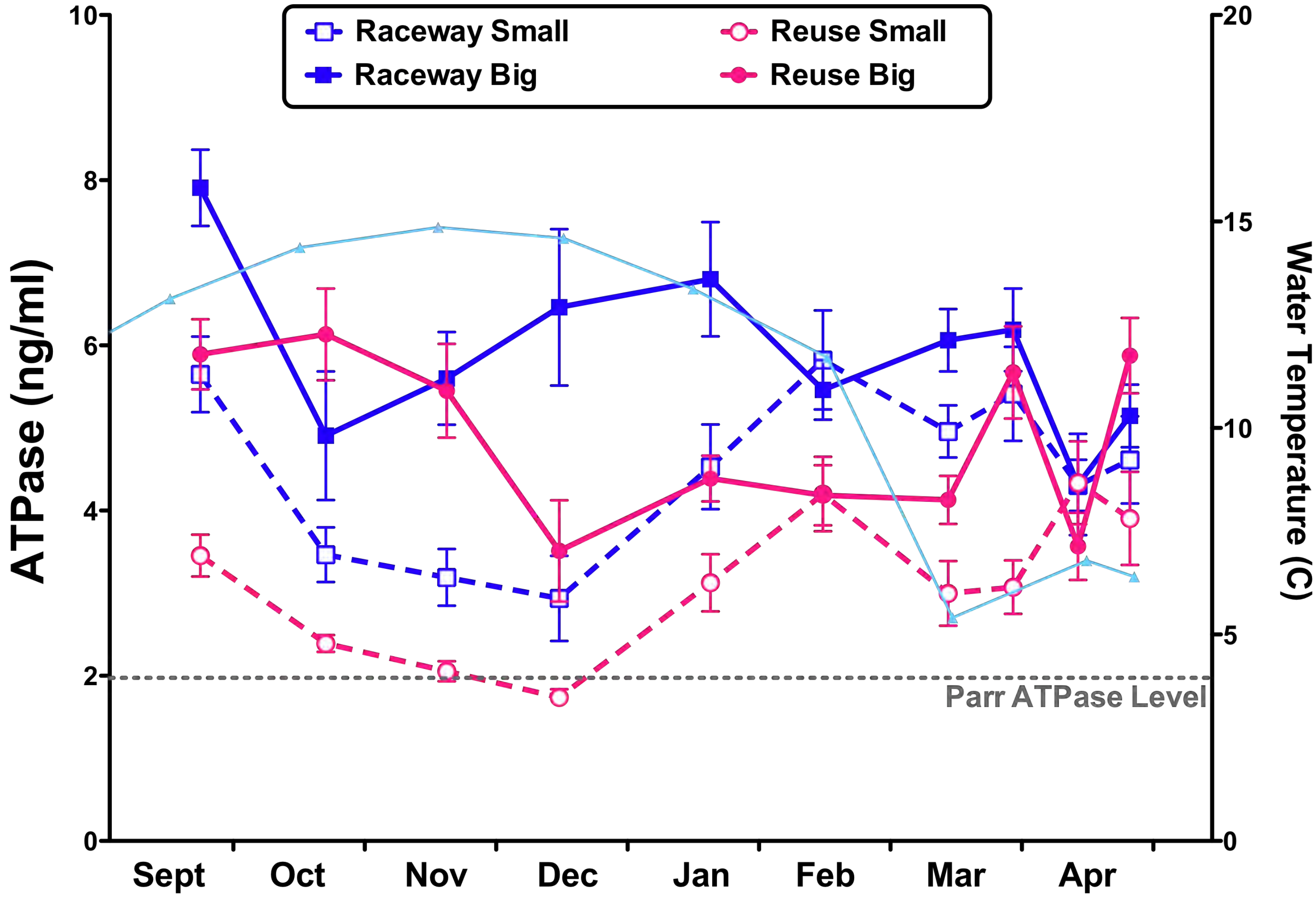


2011 RESULTS – BY2009

- Maturing Fish are larger
- Approx. normal length distributions in 2/11
- Reuse have different body shape (K) in 2/11
- Fish have higher ATPase than parr across dates

Attachment E

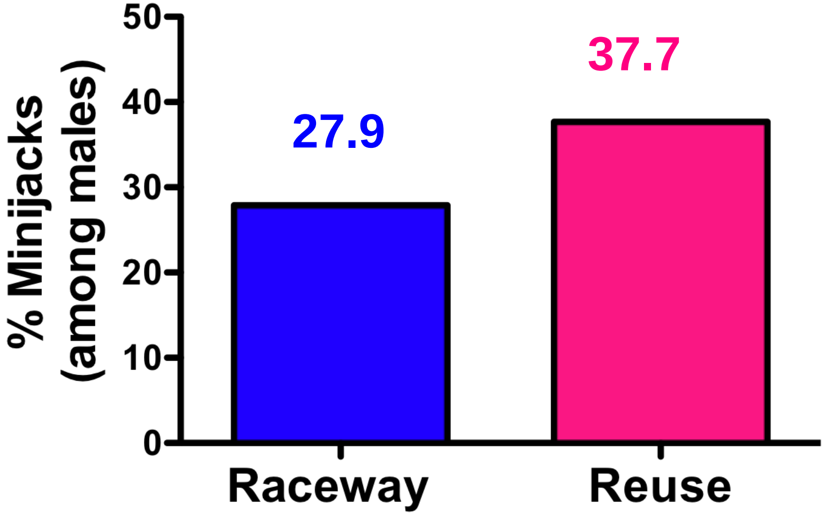
BY 2009:
Fish have higher ATPase than parr across dates



Attachment E

2011 RESULTS – BY2009

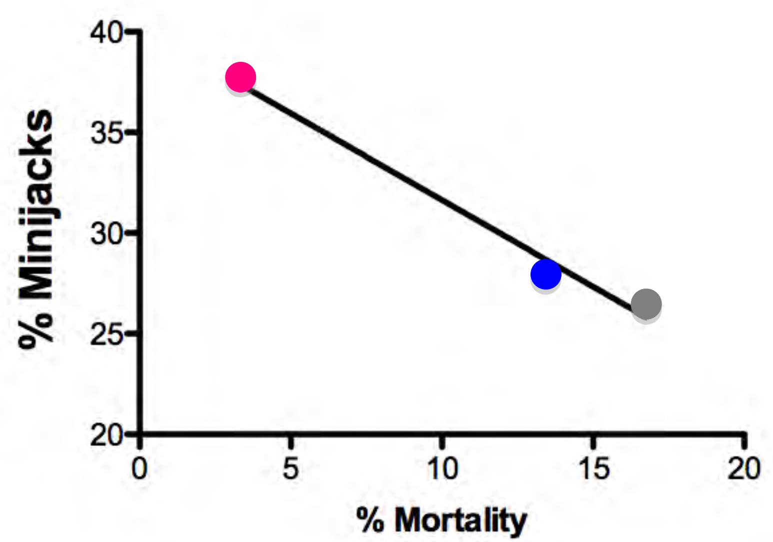
- Maturing Fish are larger
- Approx. normal length distributions in 2/11
- Reuse have different body shape (K) in 2/11
- Fish have higher ATPase than parr across dates
- Reuse had higher minijack rates, BUT…….

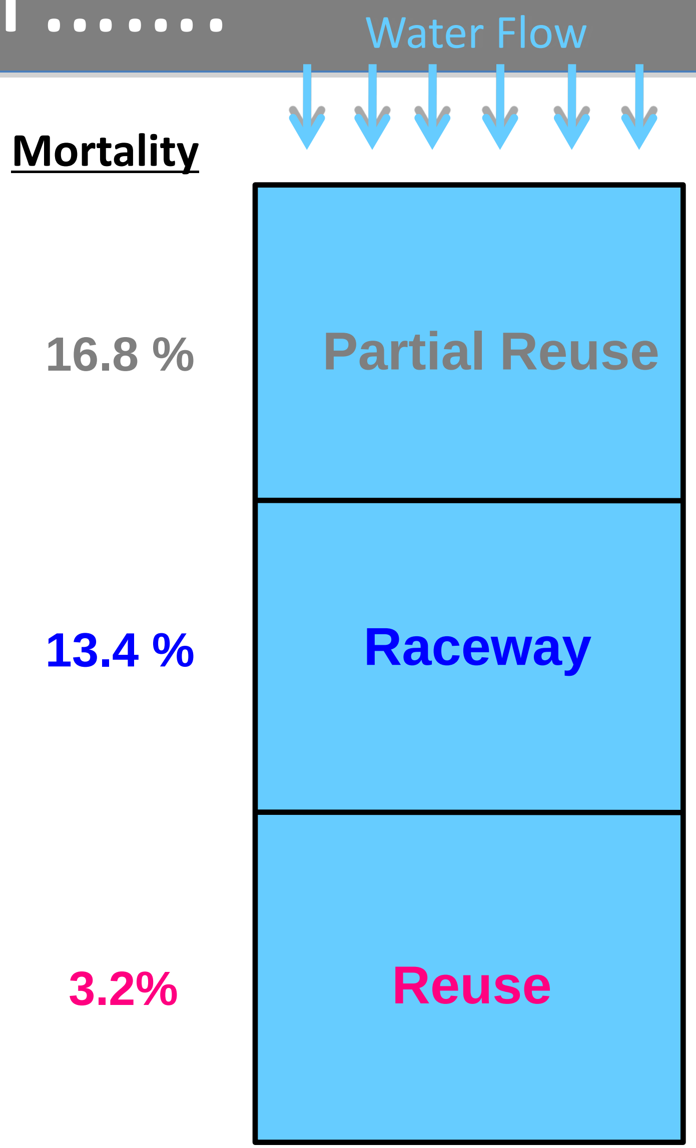


Attachment E

BY2009 - Reuse had higher minijack rates, BUT…….

- Differential Mortality at Annex

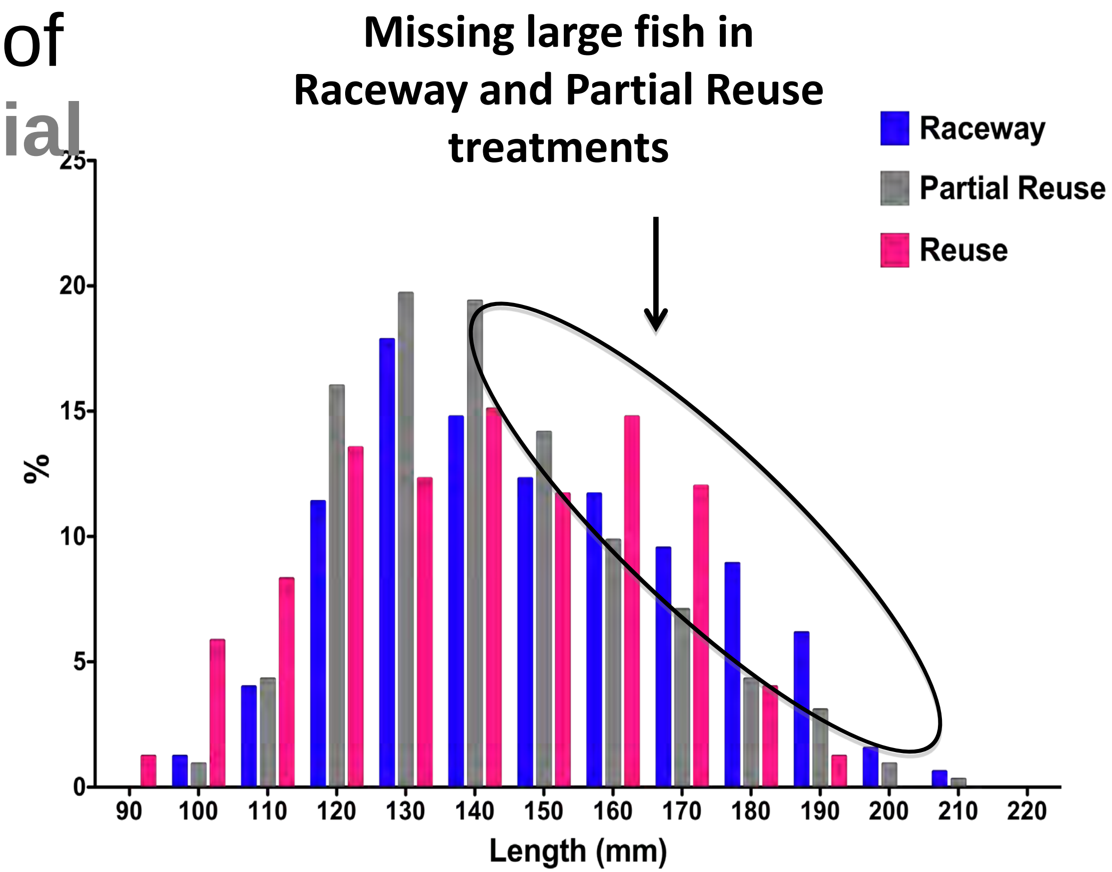




Attachment E

BY2009 - Reuse had higher minijack rates, BUT…….

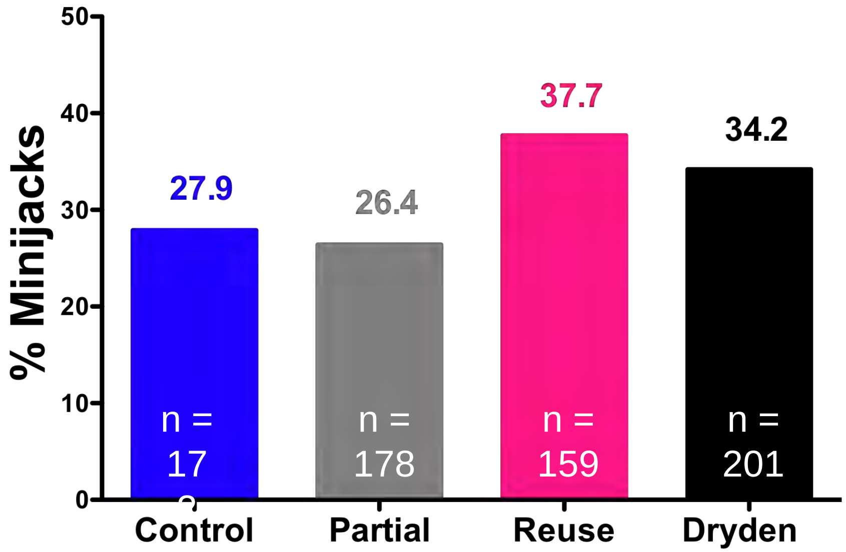
- Differential Mortality at Annex
- Length distribution of **Raceway** and **Partial Reuse** skewed at Annex



Attachment E

BY2009 - Reuse had higher minijack rates, BUT…….

- Differential Mortality at Annex
- Length distribution of Control and Partial Reuse scewed at Annex
- MJ rate at **Dryden** > MJ rate of **Raceway** and **Partial Reuse**

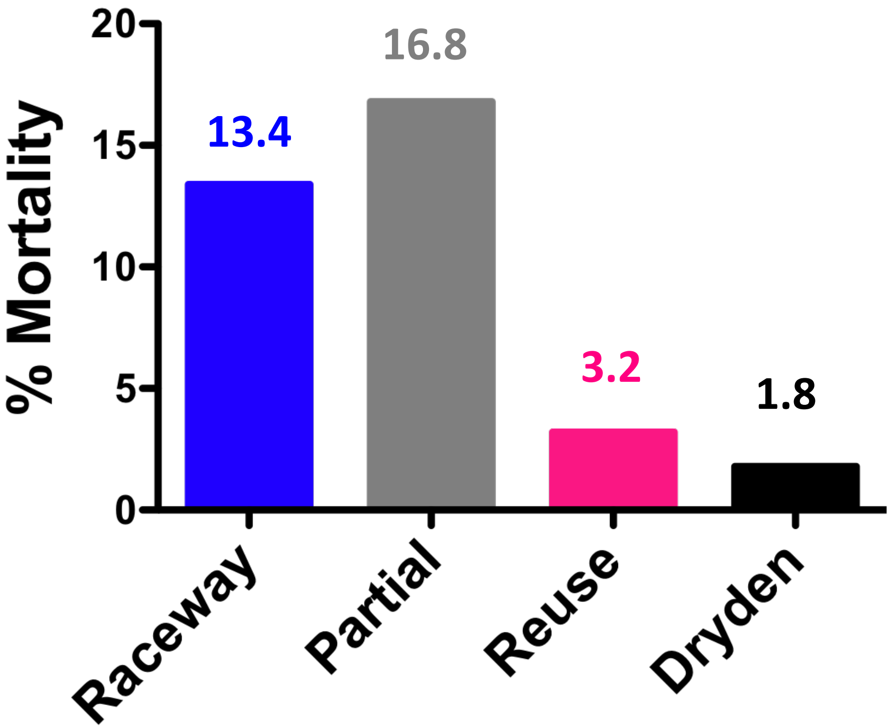


Dryden = 45.5% Raceway + 45.5% Partial + 9% Reuse

Attachment E

BY2009 – Annex ≠ Dryden Rearing

- Length: Fish at Dryden larger and normally distributed
- K: Dryden fish in better body condition
- Mortality Rates higher at Annex



Attachment E

2011 Take Home Lessons:

- No netpen rearing = **unimodal growth** (both treatments)
- Again, **fall smolting** (both treatments)
- **Minijack rates** at Dryden were relatively **high**
- Results post move to **annex hard to interpret**

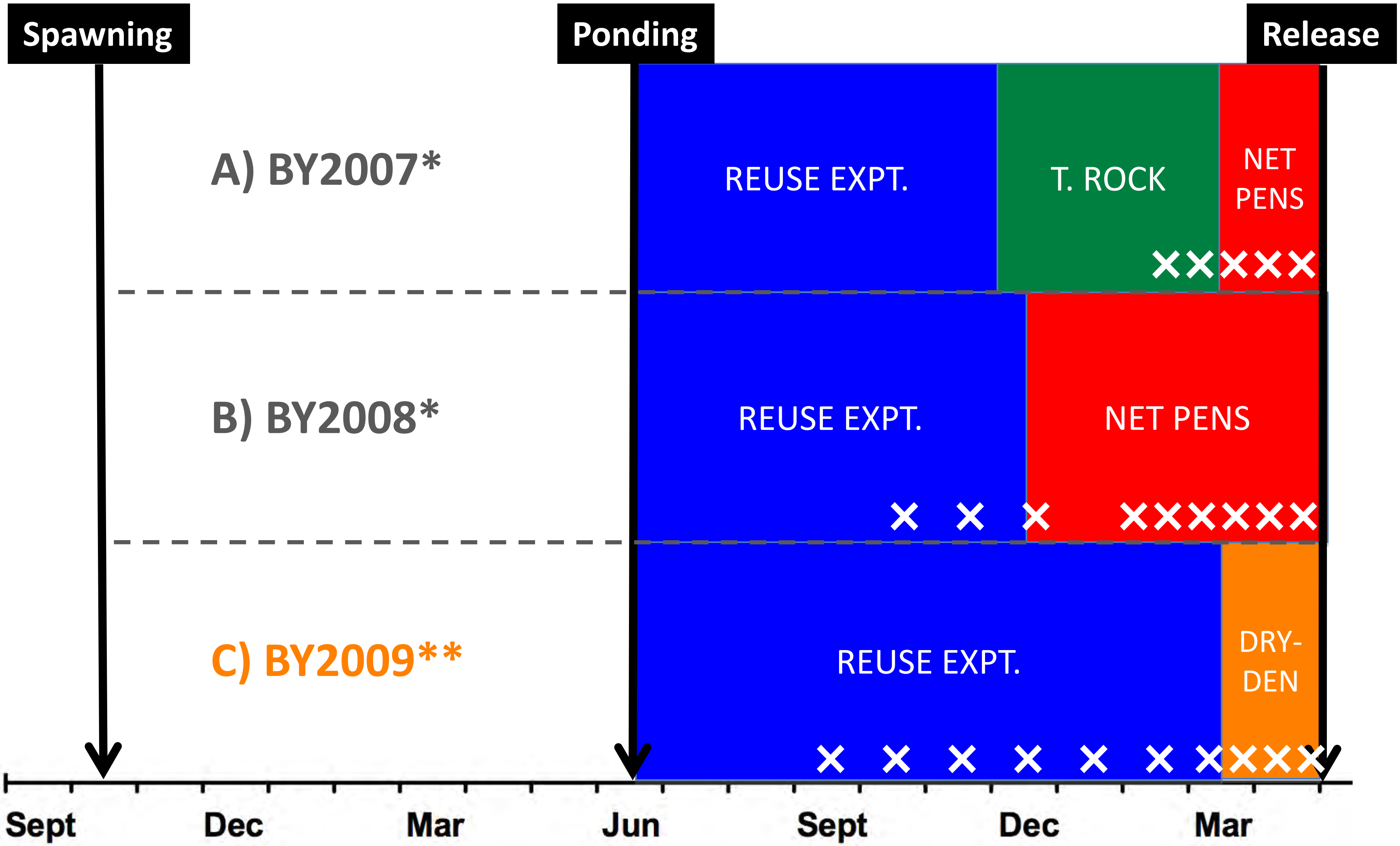
≠

Attachment E

PART 3: ALL YEARS AND OTHER COLUMBIA RIVER SUMMER CHINOOK POPULATIONS

Attachment E

REARING & SAMPLING TIMELINES



* Wells Stock
** Wenatchee Stock

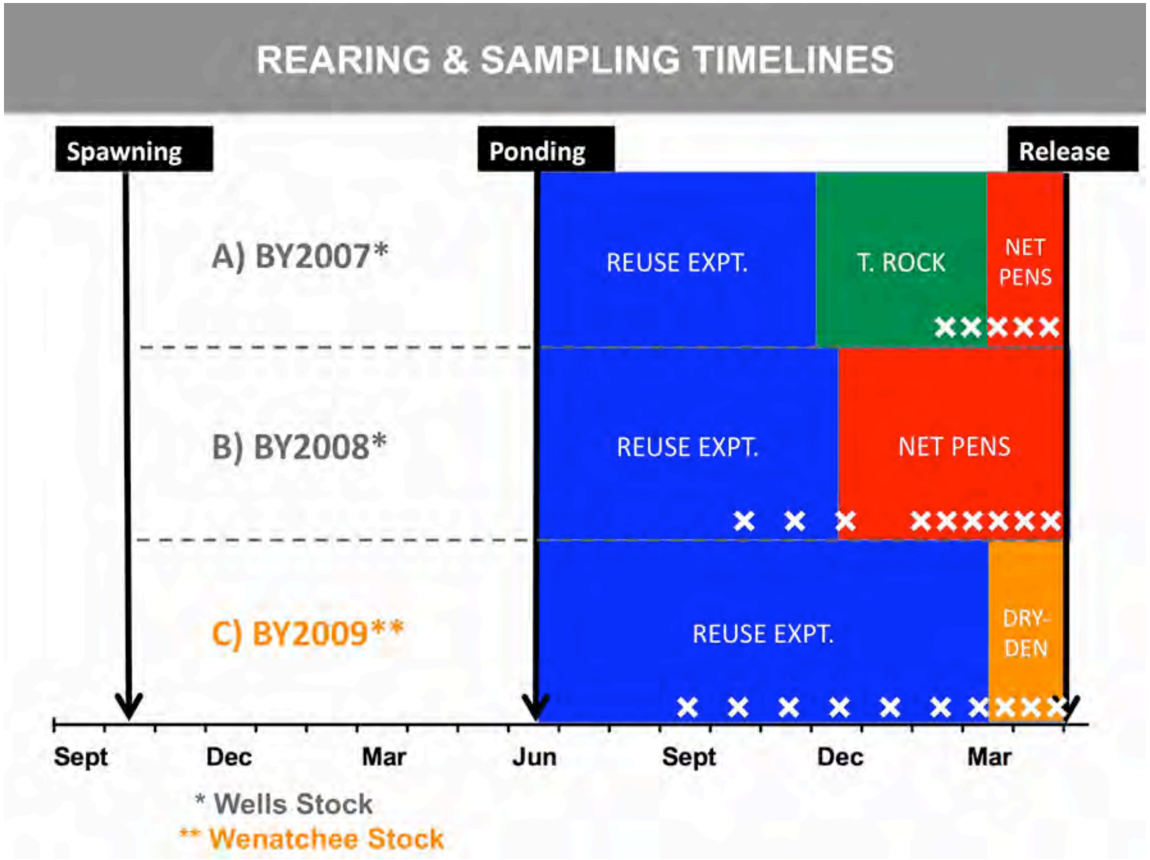
Attachment E

Summary of reuse results: BY07 - BY09
(Comparison of Reuse to Raceway)

	BY07	BY08	BY09
Size	=	=	=
K	=	=	=
MJ Rate	<	<	?
Smolting	=	=	=

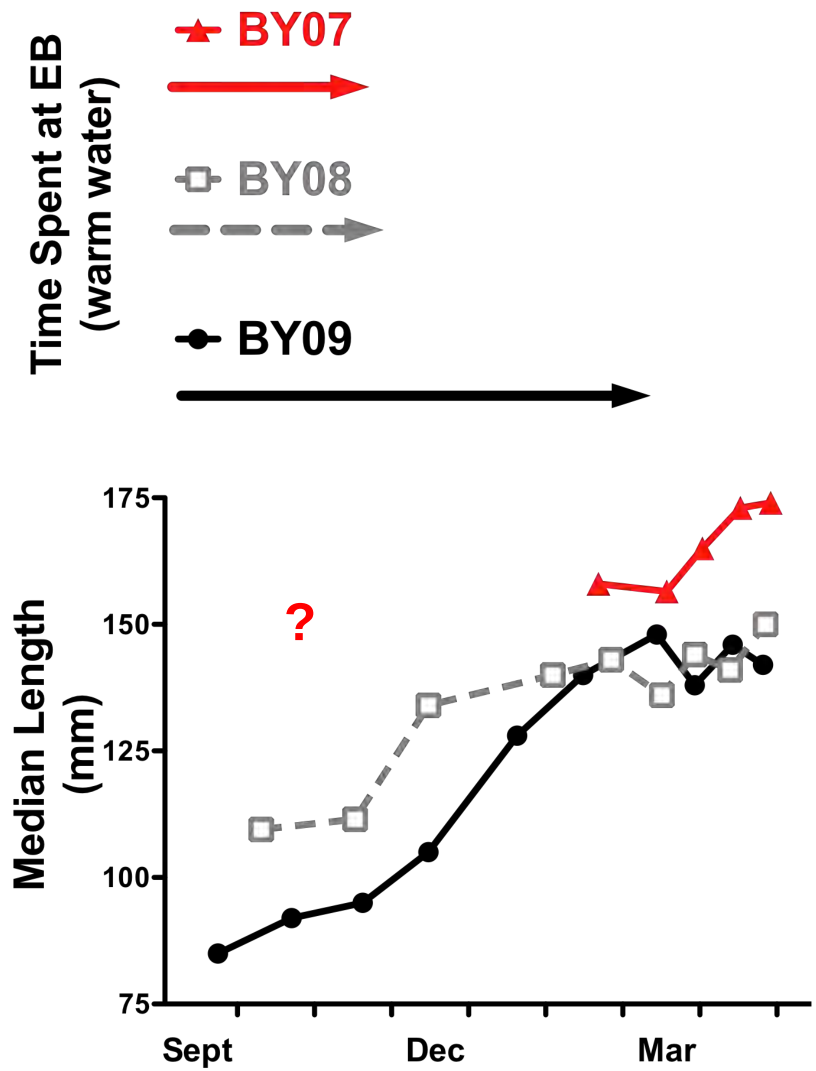
Attachment E

Most differences found between years for reuse experiment



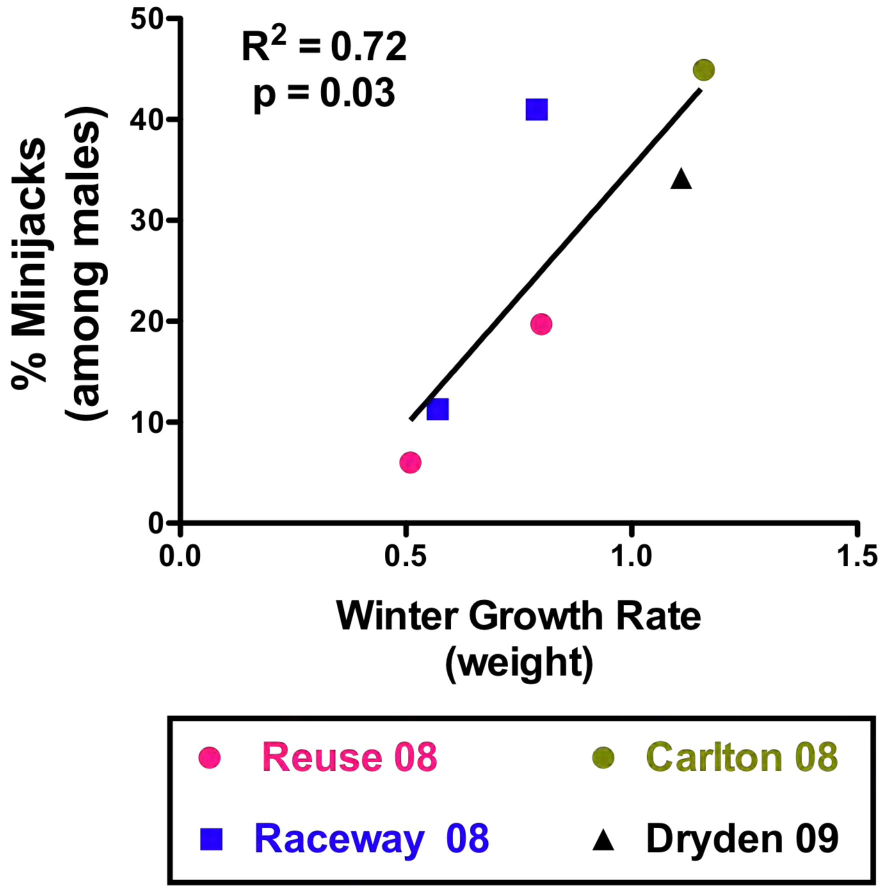
BY2007-2009 Growth Comparison

- Fish were smaller in Fall for BY2009 and had higher growth during the winter



BY2008 vs. BY2009 Growth Comparison

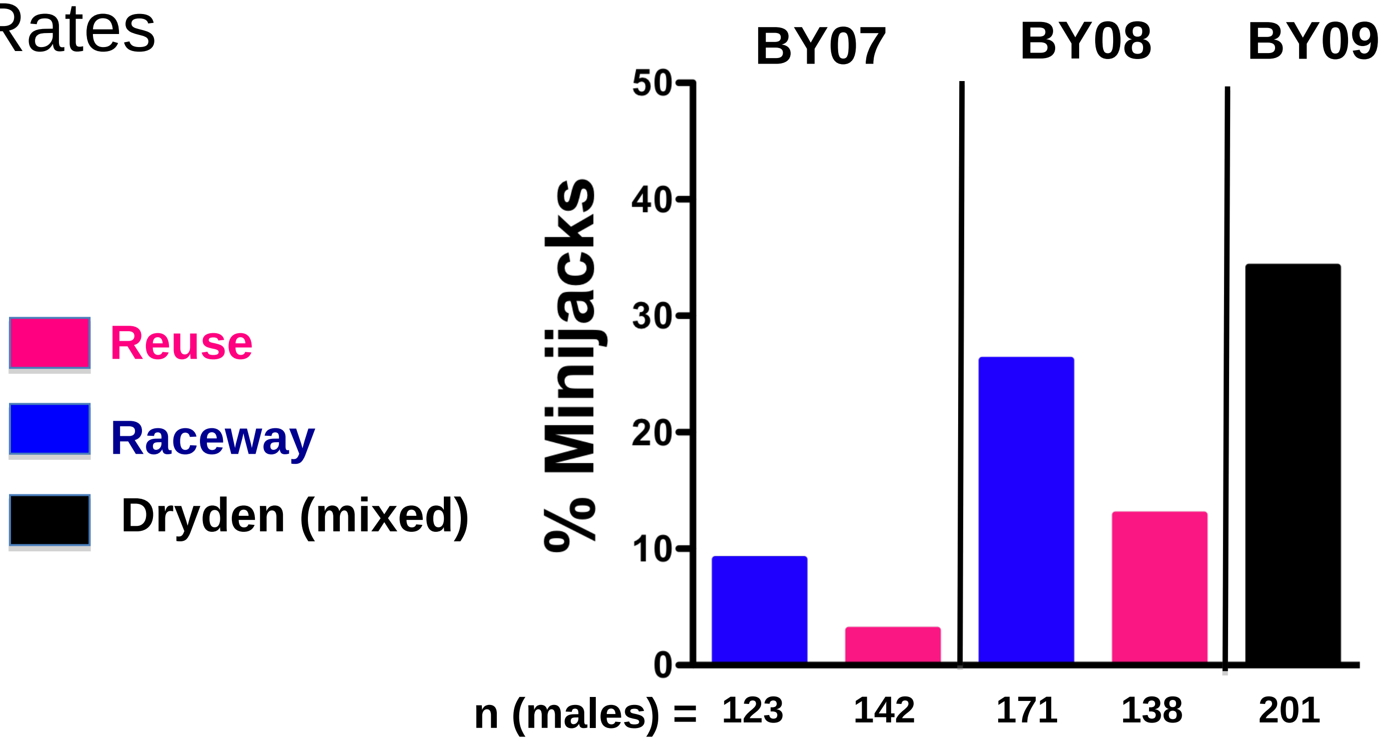
- Fish were smaller in Fall for BY2009 and had higher growth during the winter
- Linear relationship between winter growth and MJ rate



Attachment E

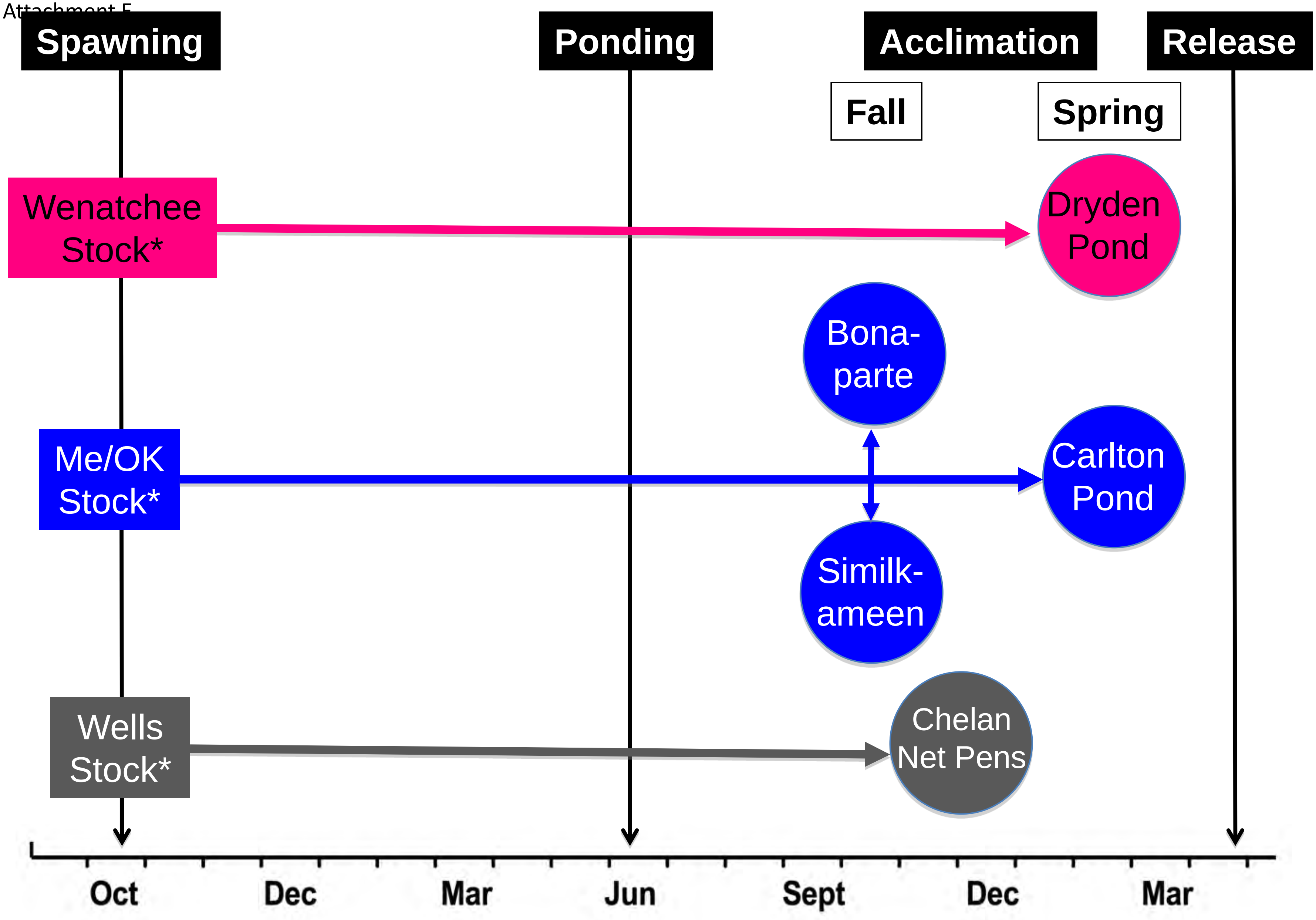
Minijack Rates BY07-09

- Growth effects on Minijack Rates



Differences also seen between other rearing groups

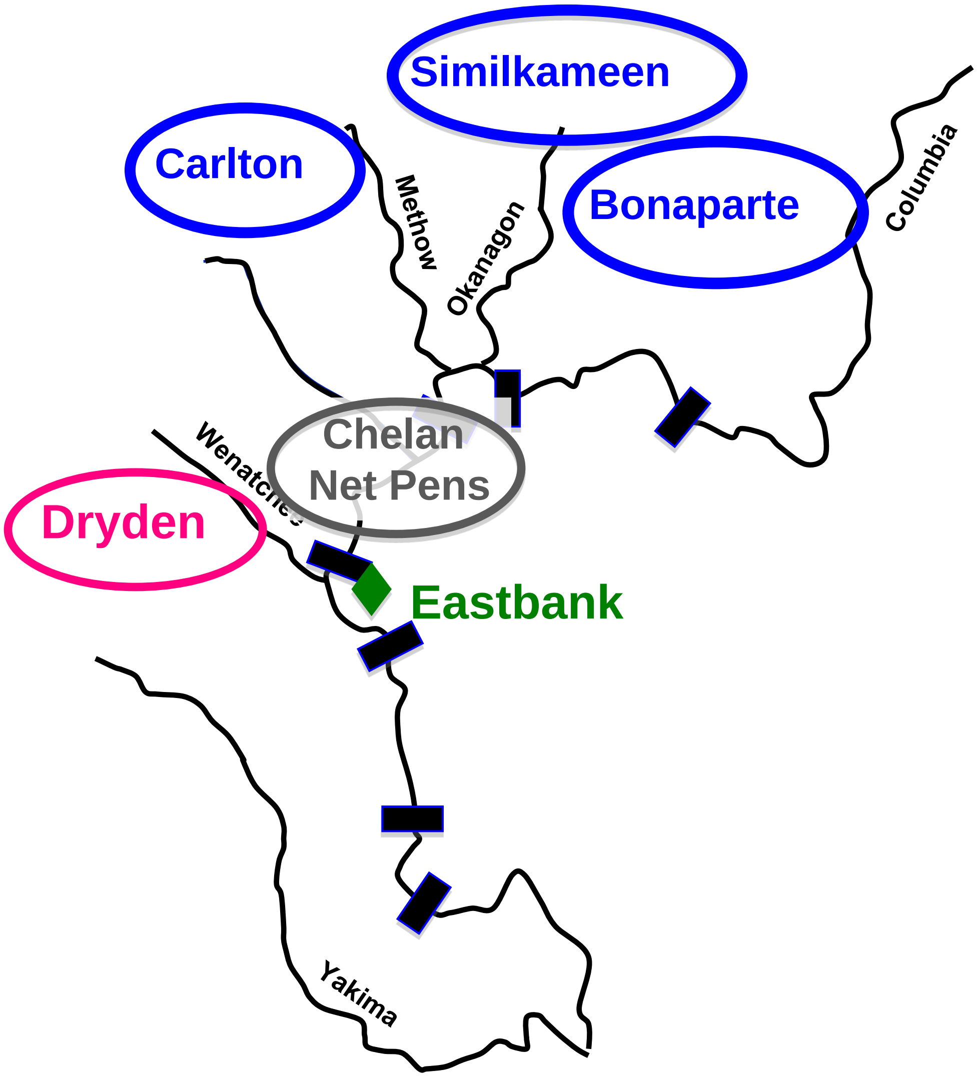
Attachment F



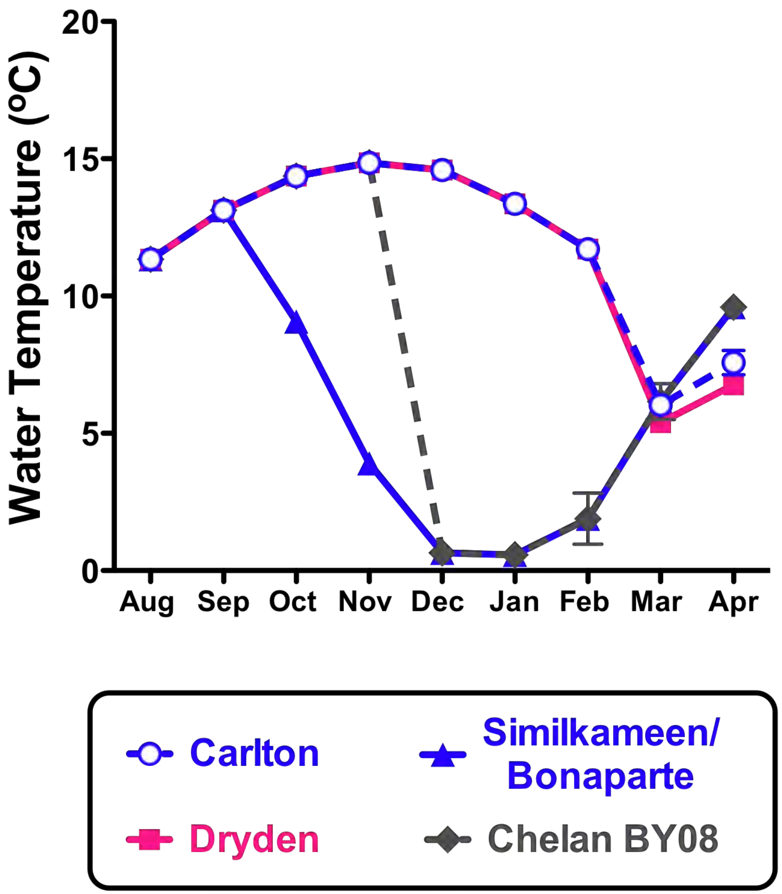
* All stocks spawned and reared at Eastbank Hatchery prior to acclimation

Attachment E

Locations

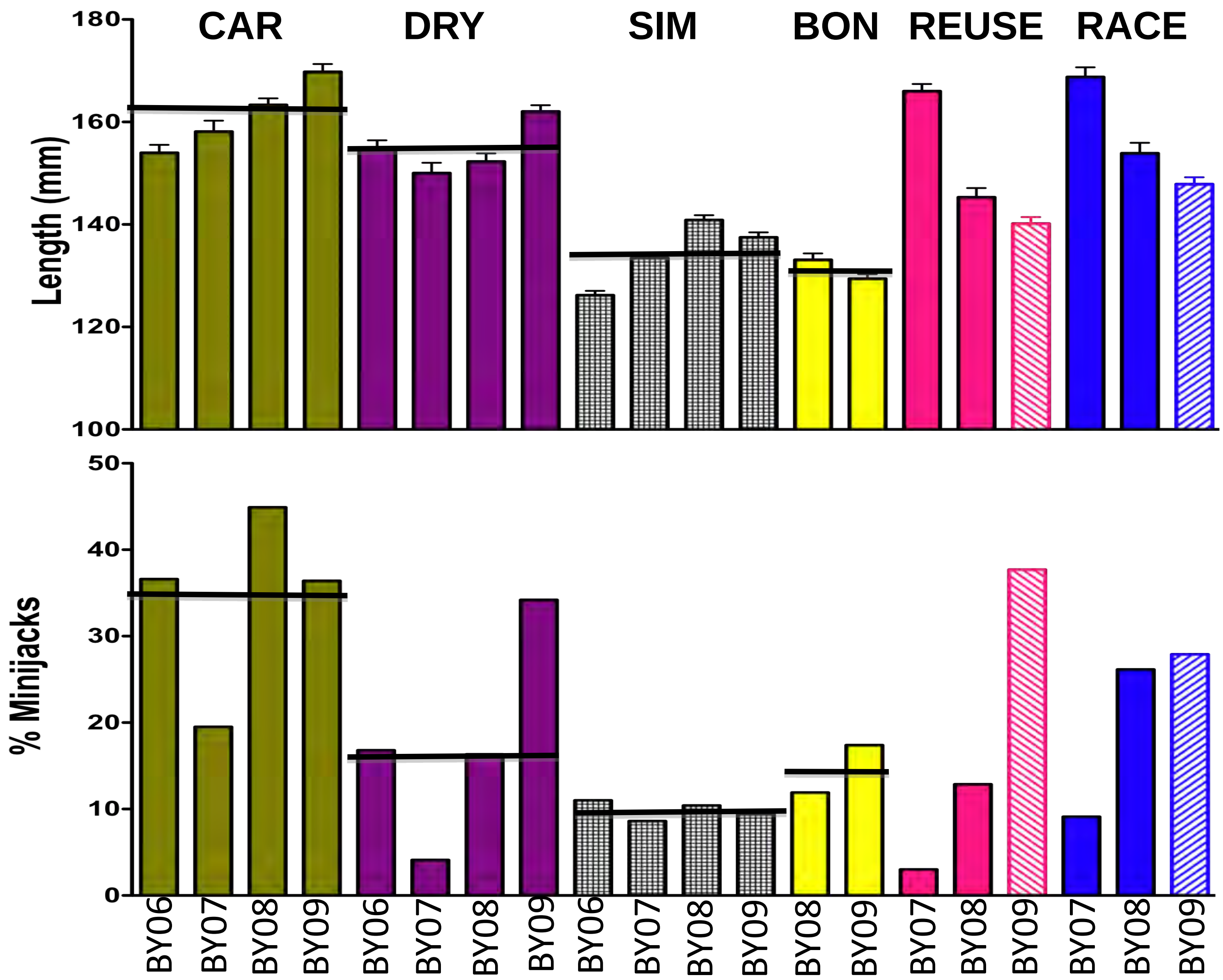


Temperature Regimes

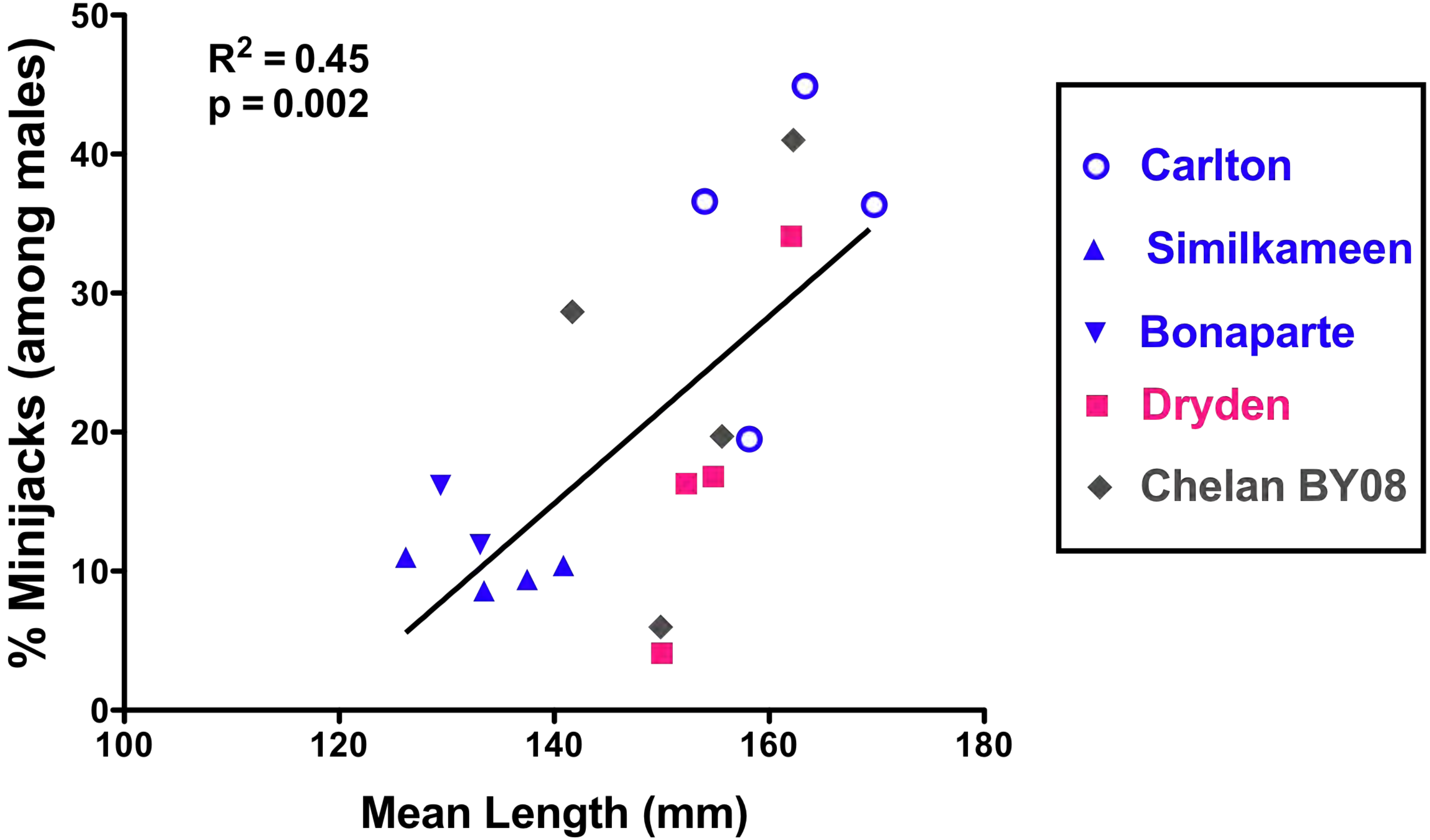


Attachment E

Minijack Rate vs. Length Across Years and Summer Chinook Populations



Linear relationship between size and minijack rate across populations



Take Home:

1. **Smolts from reuse rearing perform at least as well as raceway reared fish and there are some indications that they may do better.**

2. **Reduced growth during winter reduces miniJack rates and may enhance spring smolting.**

   Reduced growth may be achieved by:

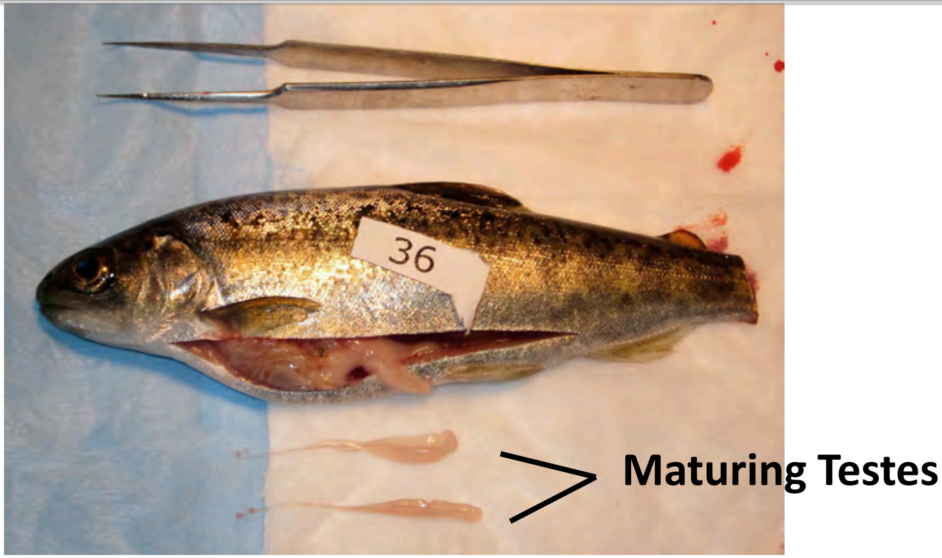
   - **reduced winter feeding**
   - **decreased winter rearing temperatures**

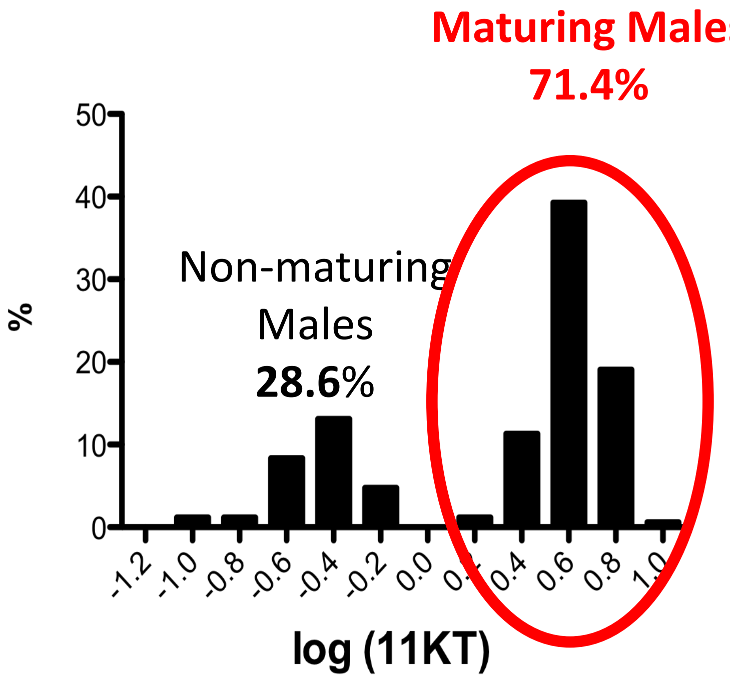
Attachment E

FUN DIVERSION…….

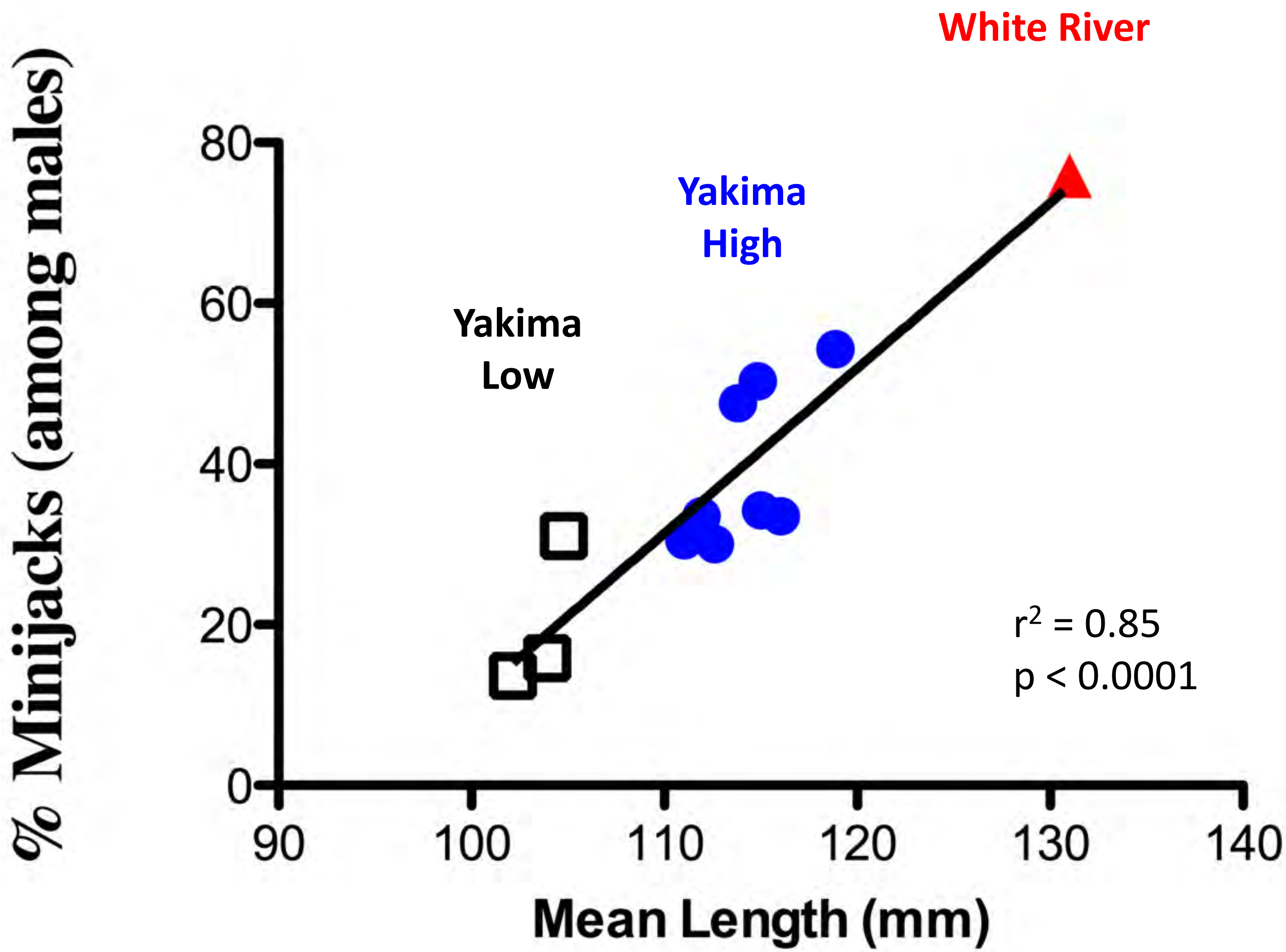
CHECK OUT THE MINIJACK RATES ON THE WHITE RIVER SPRING CHINOOK!

White River Spring Chinook, 2011





White River Spring Chinook, 2011



Proposed manuscripts:

- **Reuse vs raceway rearing (Freshwater Institute)**
- **Smolting patterns in summer Chinook**
- **Male maturation rates of summer Chinook**

Attachment E

ACKNOWLEDGEMENTS

- Funding: Chelan PUD

- John Penny and staff at Eastbank Hatchery

- Staff at Chelan Hatchery

- Field & Lab Assistance:
  Abby Tillotson, Larissa Felli, Elizabeth Smith

Take Home:

1. **Smolts from reuse rearing perform at least as well as raceway reared fish and there are some indications that they may do better.**

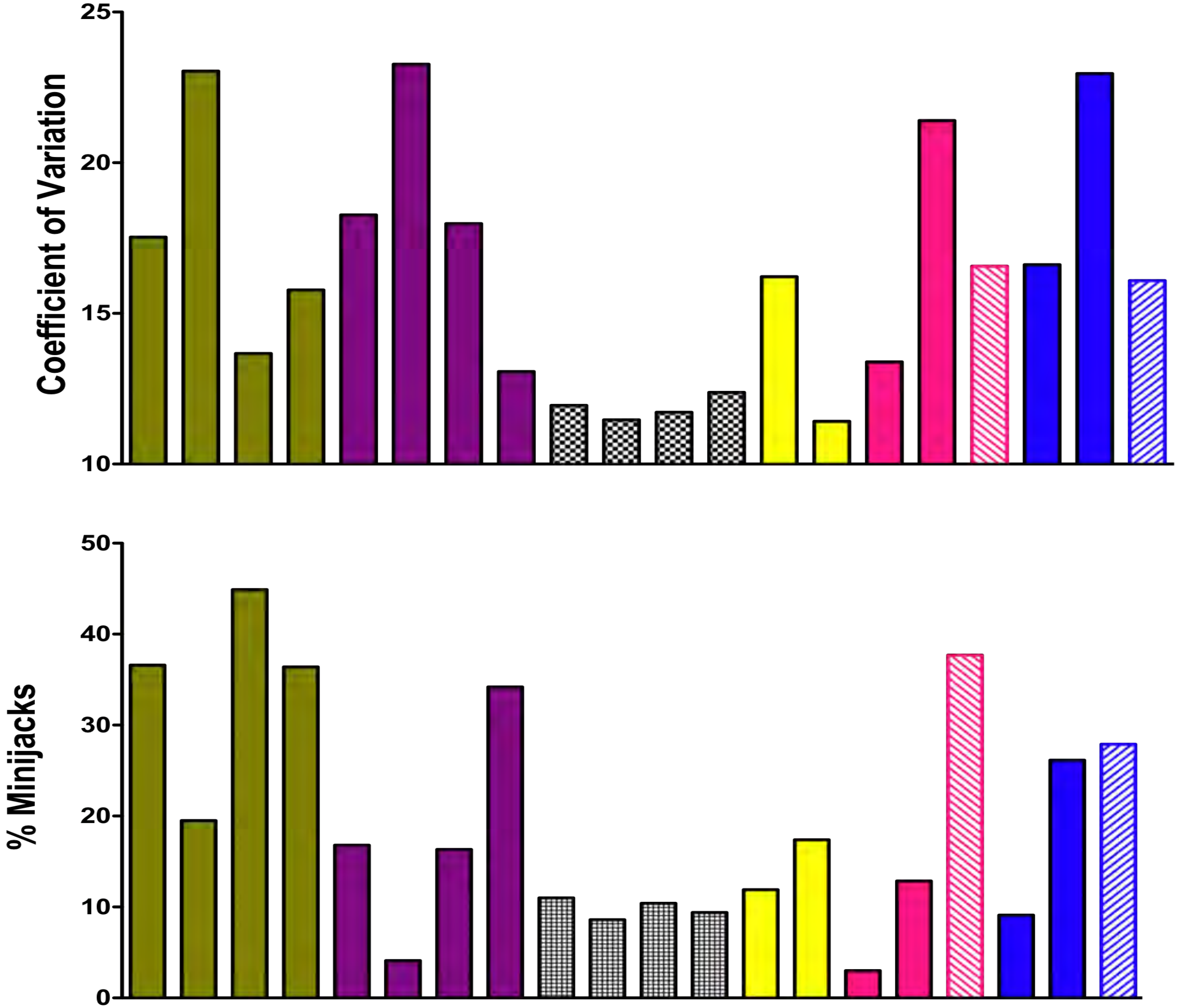
2. **Reduced growth during winter reduces miniJack rates and may enhance spring smolting.**

   Reduced growth may be achieved by:

   - **reduced winter feeding**

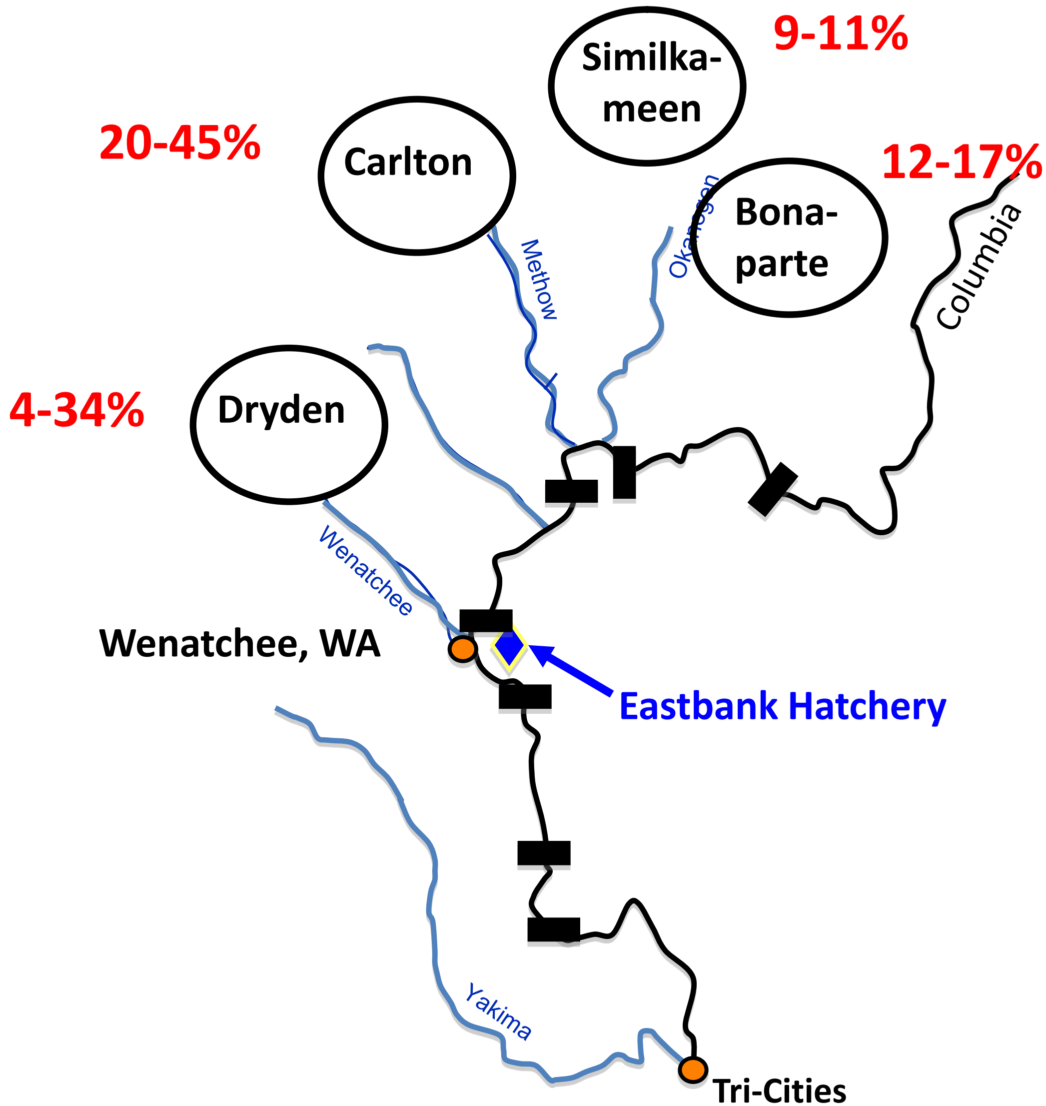
   - **decreased winter rearing temperatures**

Attachment E



Attachment I

Minijack Rates in other Hatchery-reared Summer Chinook, BY2006-2008

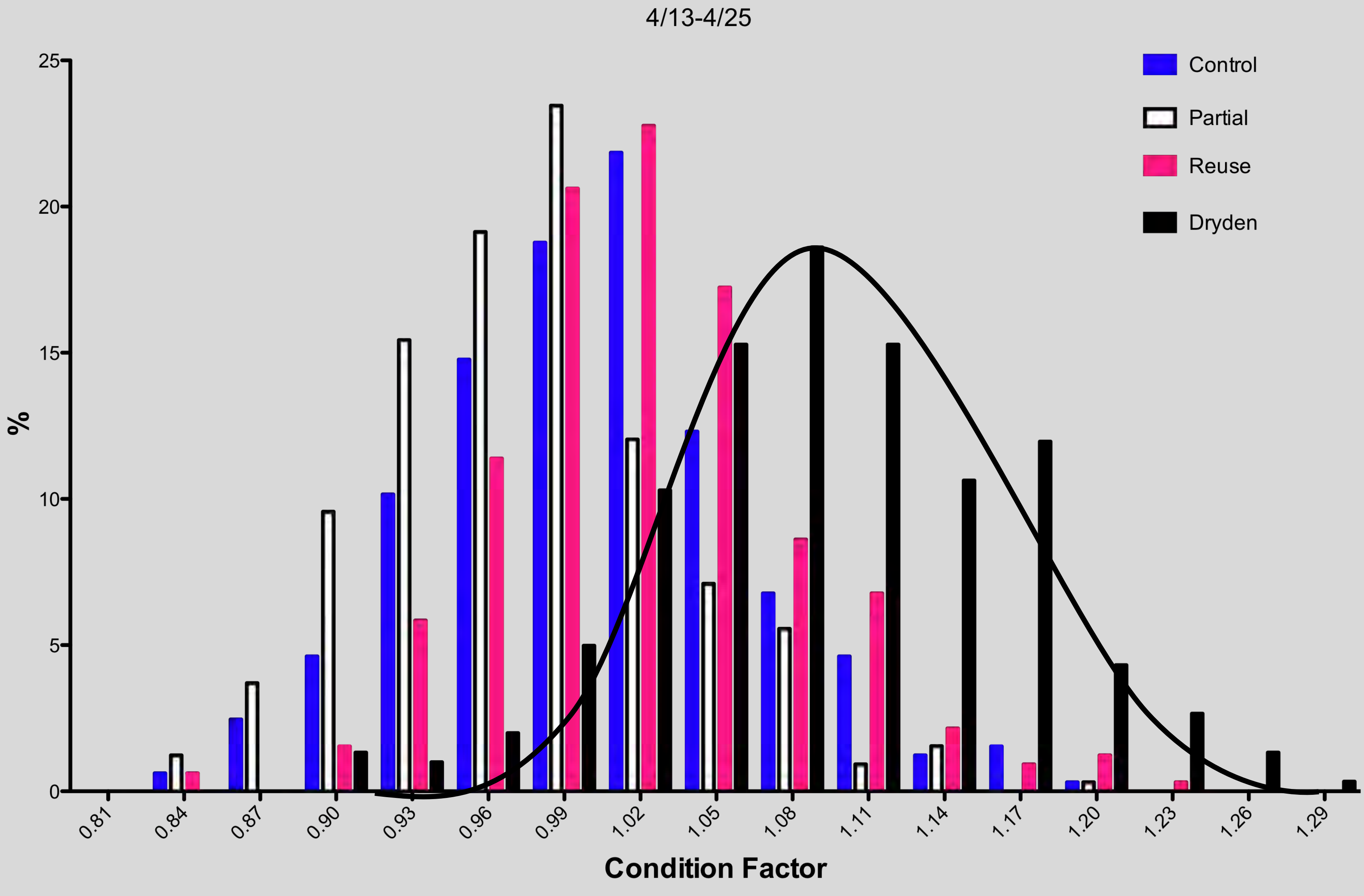


Attachment E

DRYDEN POND

Attachment E

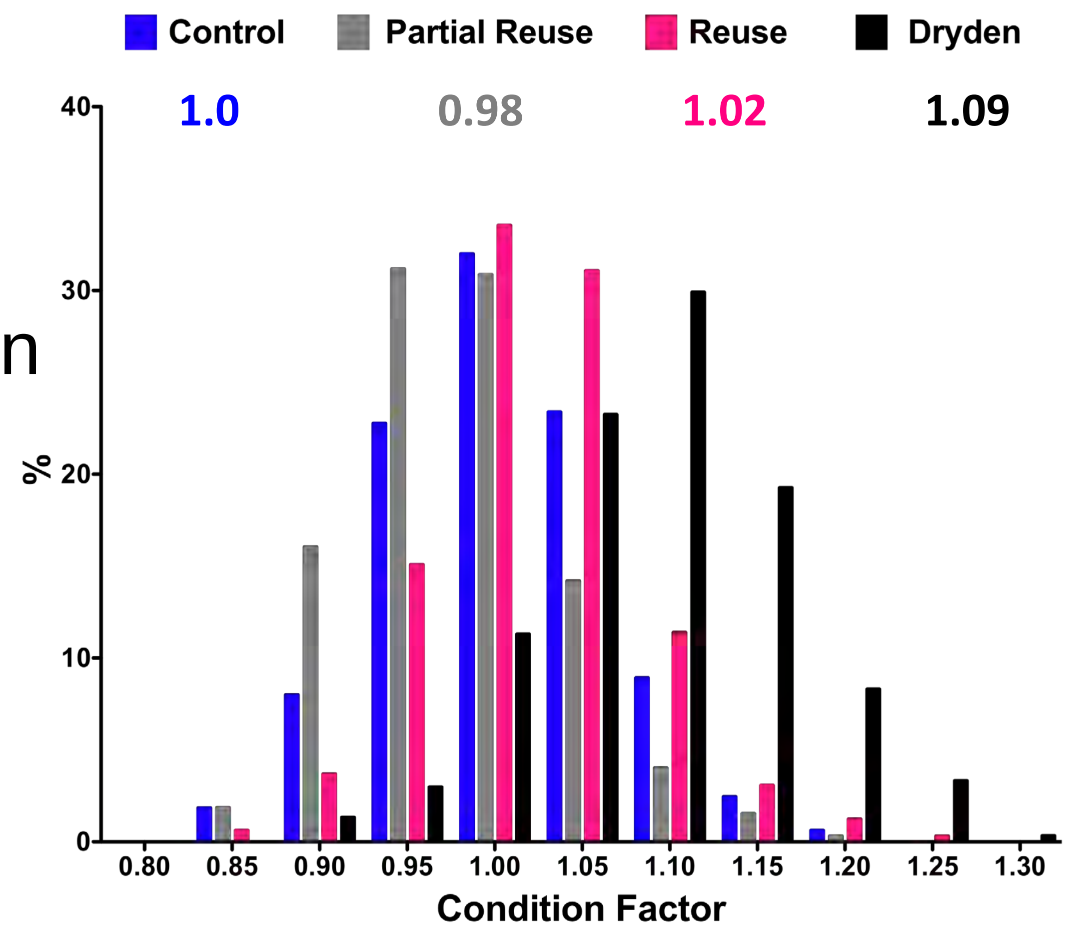
Condition Factors of fish is lower at Annex then at Dryden



Attachment E

BY2009 – Annex ≠ Dryden Rearing

- Length: Fish at Dryden larger and normally distributed
- K: Dryden fish in better body condition

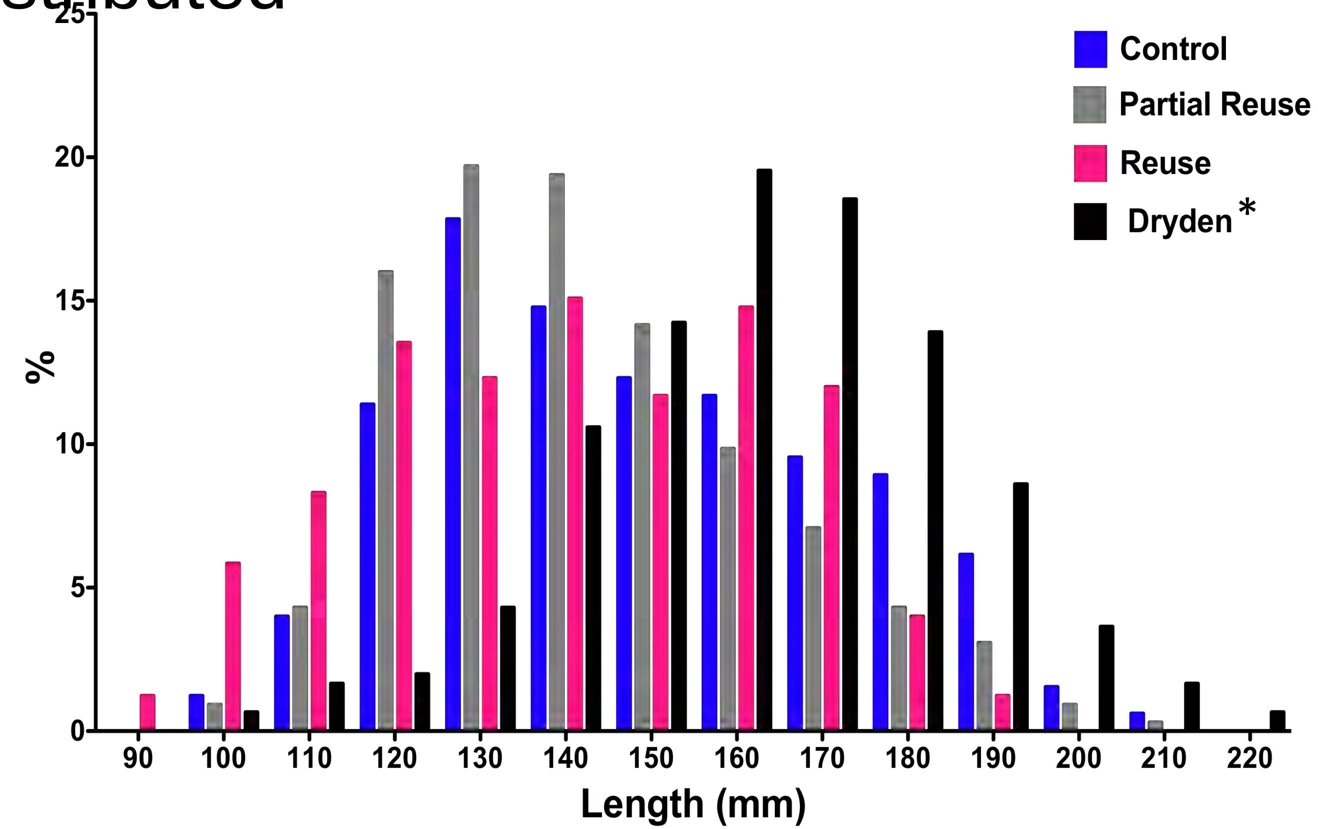


Attachment E

BY2009 – Annex ≠ Dryden Rearing

- Length: Fish at Dryden larger and normally distributed

***Dryden fish sampled 2 weeks earlier!**



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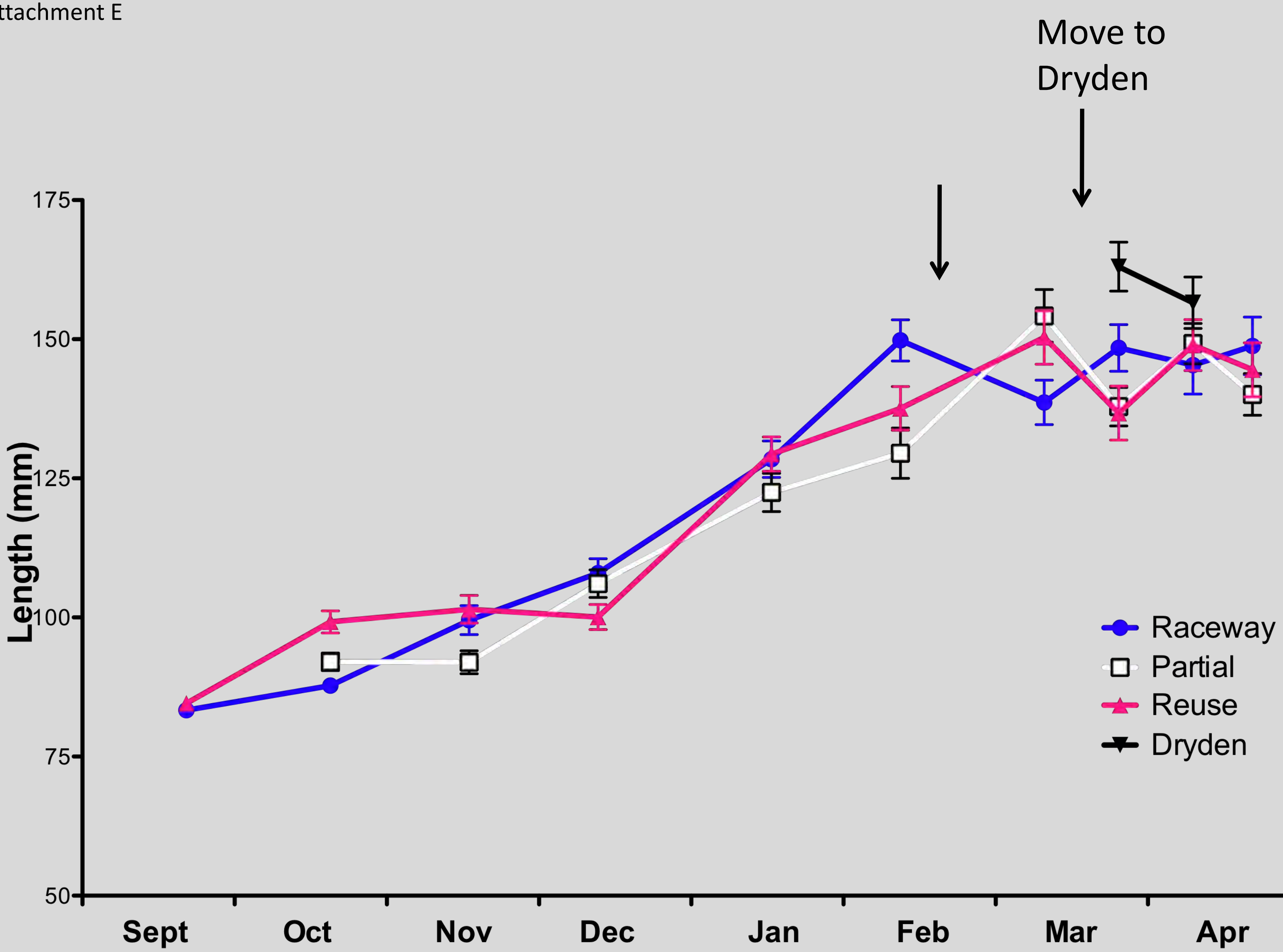


Juvenile Spring Chinook Size, Survival, and Age at Maturity

Josh Murauskas

Chelan PUD Natural Resources Department

December 14, 2011

Introduction

- Chiwawa Ponds
- Size of juveniles
  - Wild smolts ~90-95 mm
  - Hatchery smolts ~140-145 mm (176 mm target)
- Survival
  - CJS model shows a lower smolt survival in wild fish
  - PIT-based SARs show greater adult returns in wild fish
- Age at maturity
  - Larger proportion of hatchery fish return at younger ages

Methods

- Examine PIT returns of adults at Rock Island Dam
  - Determine ocean-age
  - Compare age to length at tagging (logistic regression)
  - Compare groups (wild vs. hatchery)
- Generate CJS survival estimates for smolts
- Divide hatchery releases by median length
  - Compare performance of "large half" to "small half"
  - Compare halves to wild fish performance

Questions

- If the hatchery fish are genetically identical to the wild fish, then why are we observing such a difference in performance?

- Does a larger hatchery smolt provide better performance?

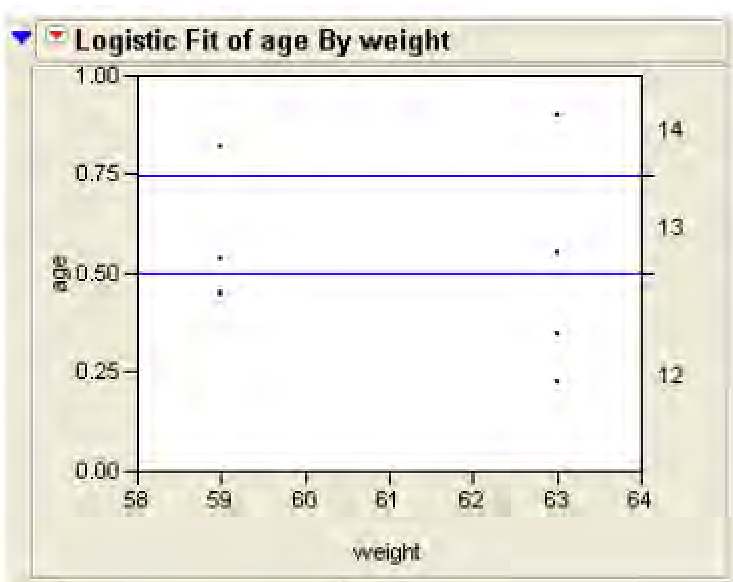
- How do smaller hatchery fish perform compared to wild fish?

Logistic regression

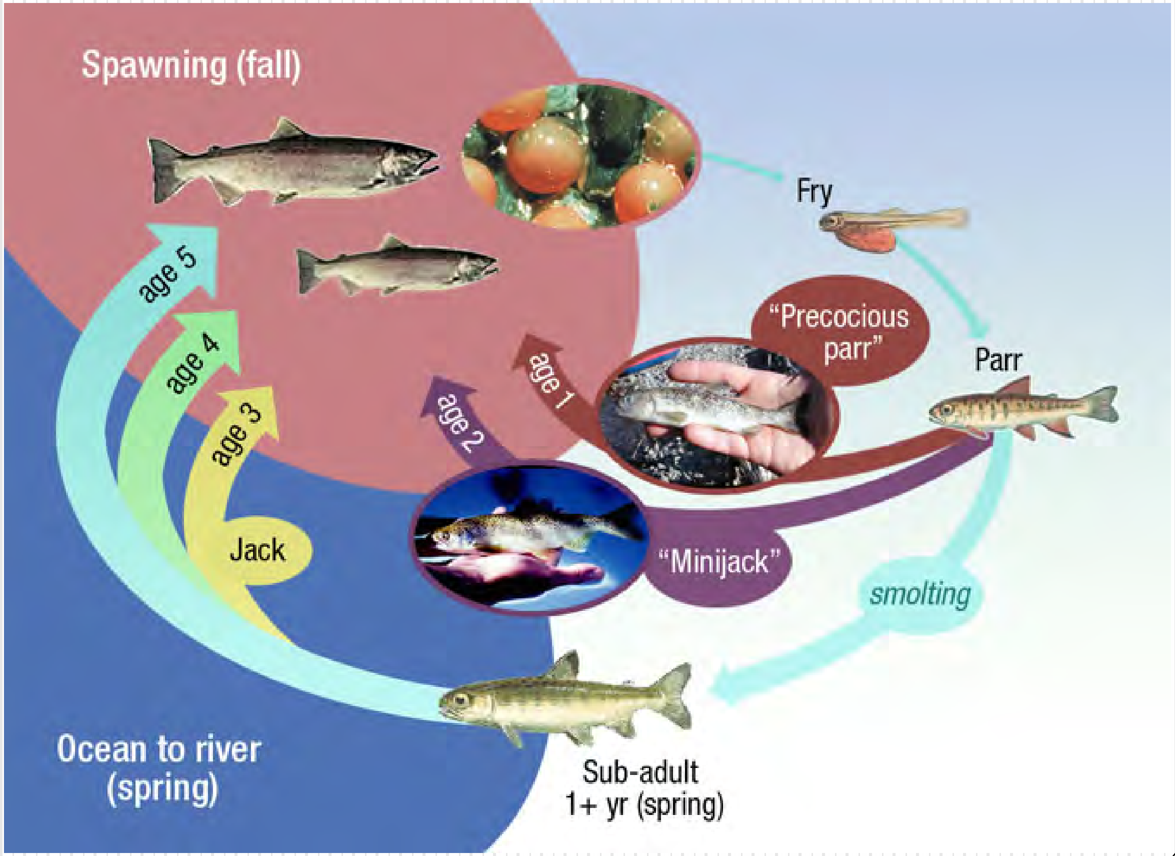
- Estimates the probability of choosing one of the response levels (i.e., age) as a function of the *x* factor (i.e., length)

Logistic regression

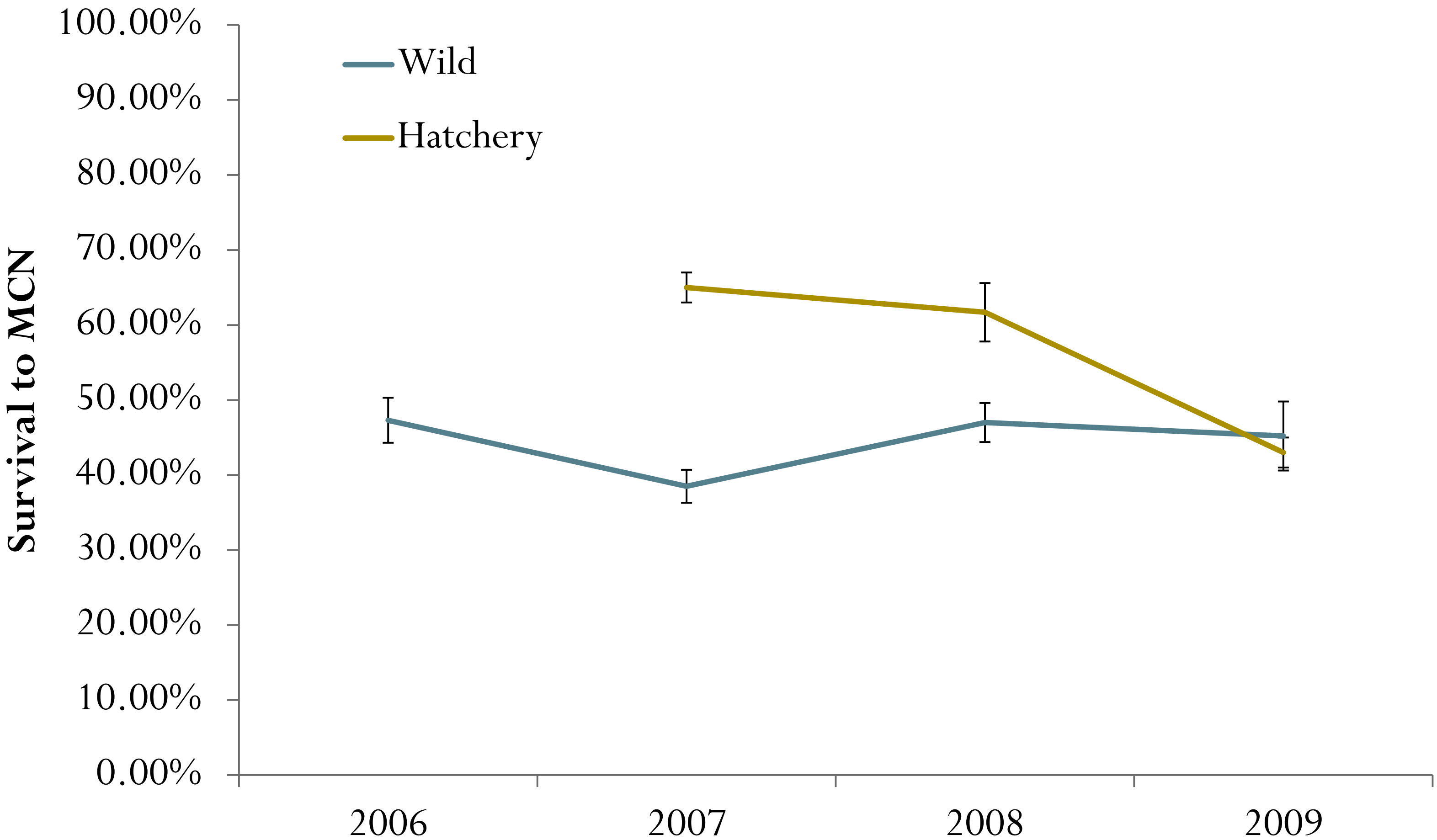
- If the *x*-variable has no effect on the response, then the fitted lines are horizontal and the probabilities are constant.
- If the response is completely predicted by the value of the factor, then the logistic curves are effectively vertical.



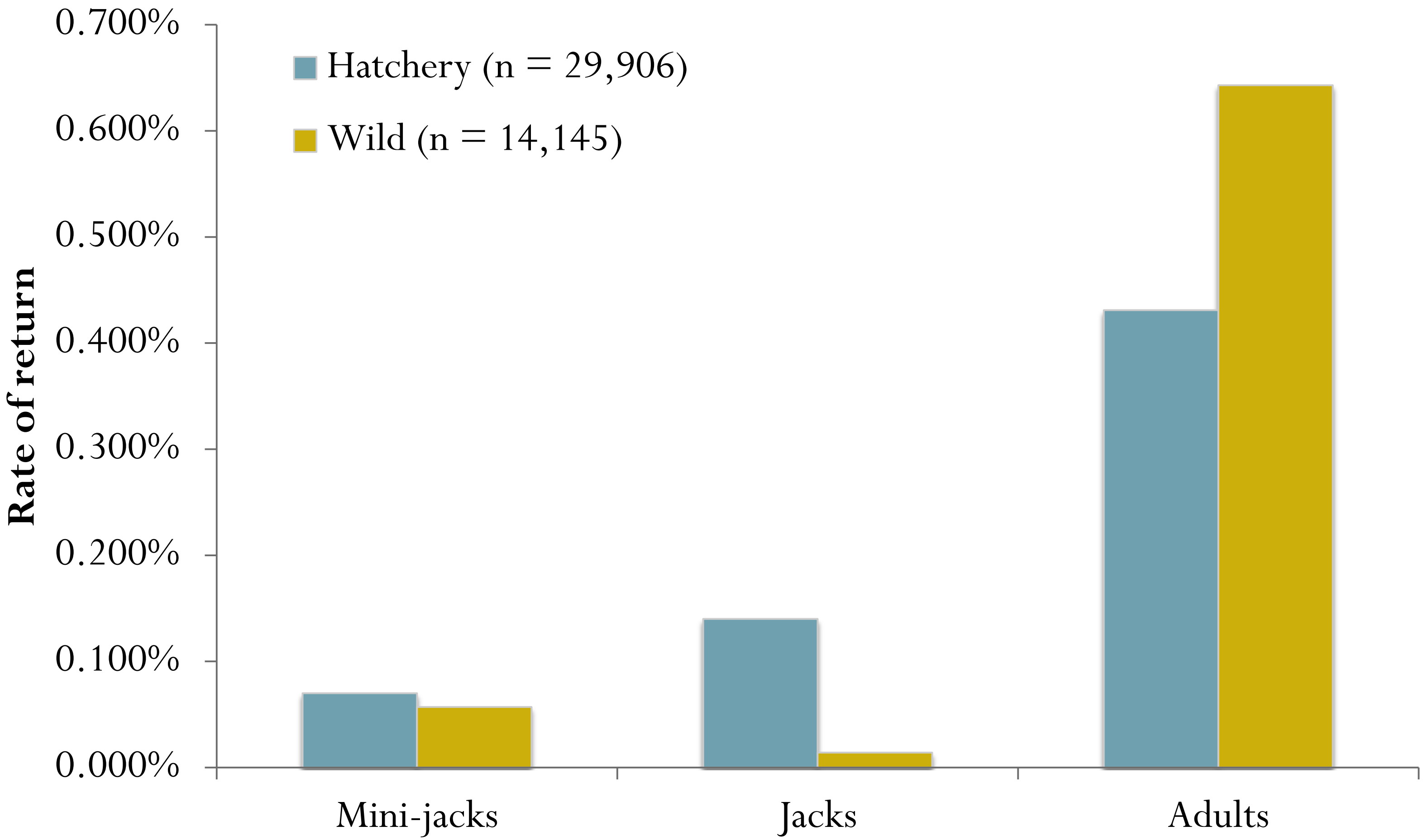
Results


Spawning (fall)
Fry
"Precocious parr"
Parr
age 5
age 4
age 3
age 2
age 1
Jack
"Minijack"
smolting
Ocean to river (spring)
Sub-adult 1+ yr (spring)

Survival to MCN (W vs. H)

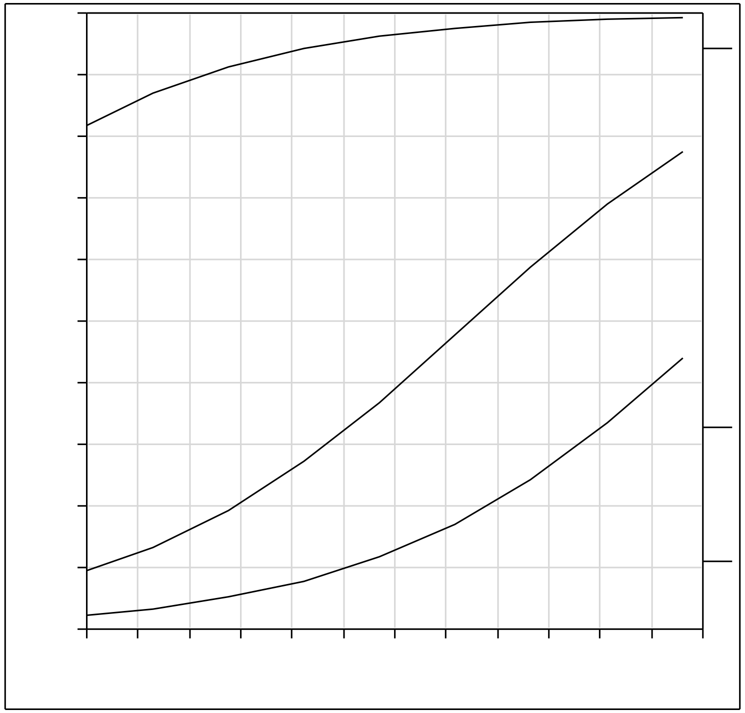


Rate of return to RIS (PIT-based)



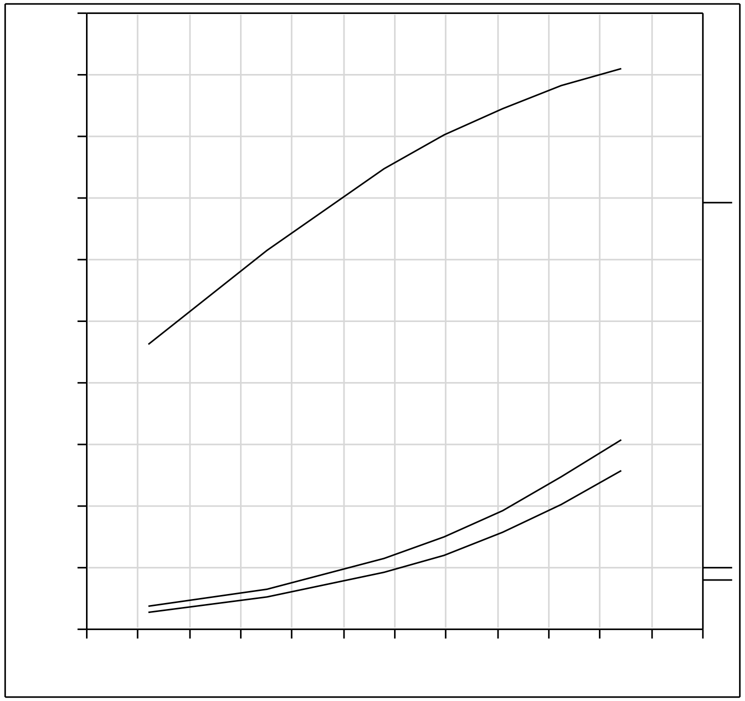
Logistic regression, age & length

Hatchery fish (at tagging)



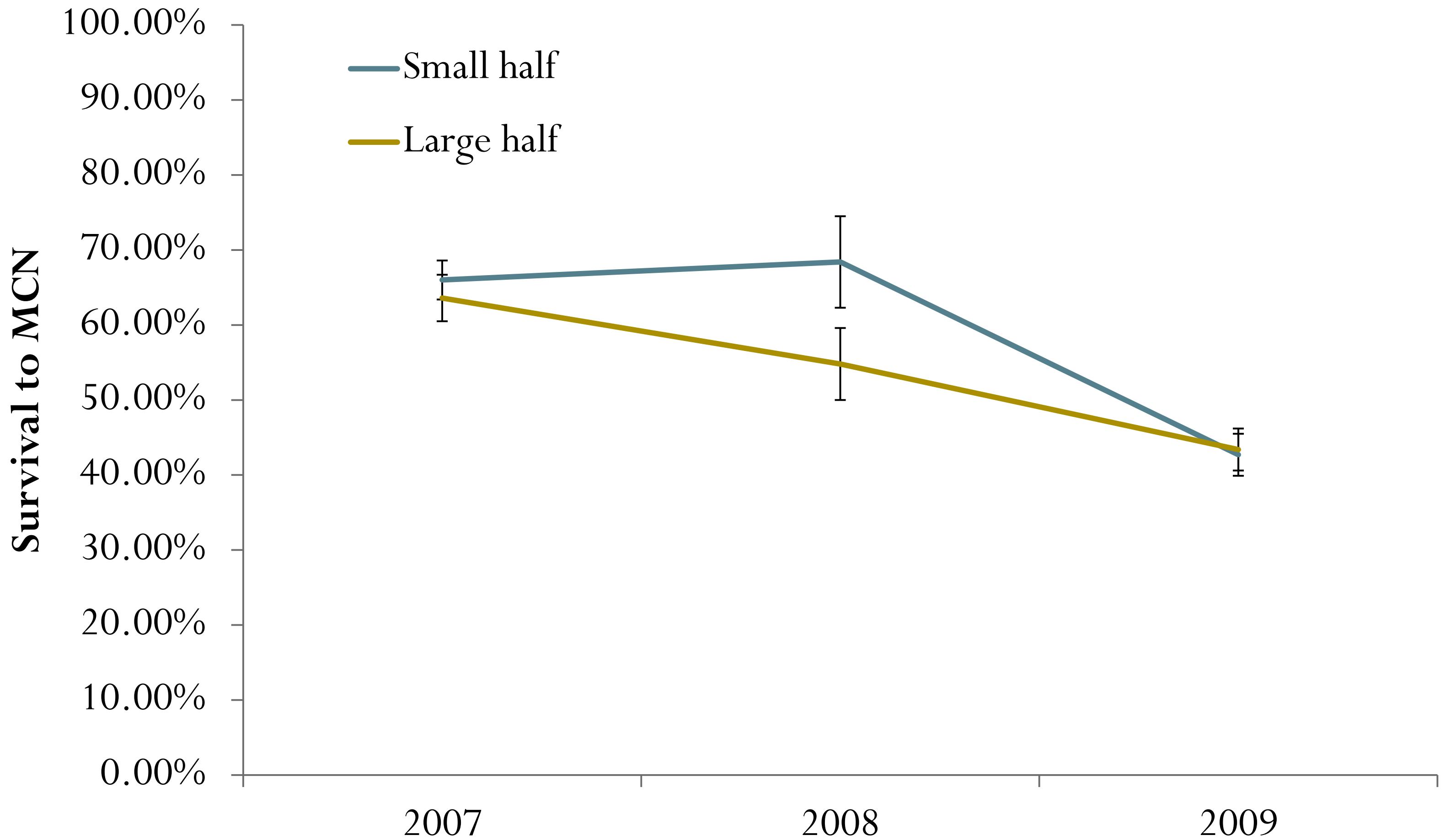
$P < 0.01$

Wild fish

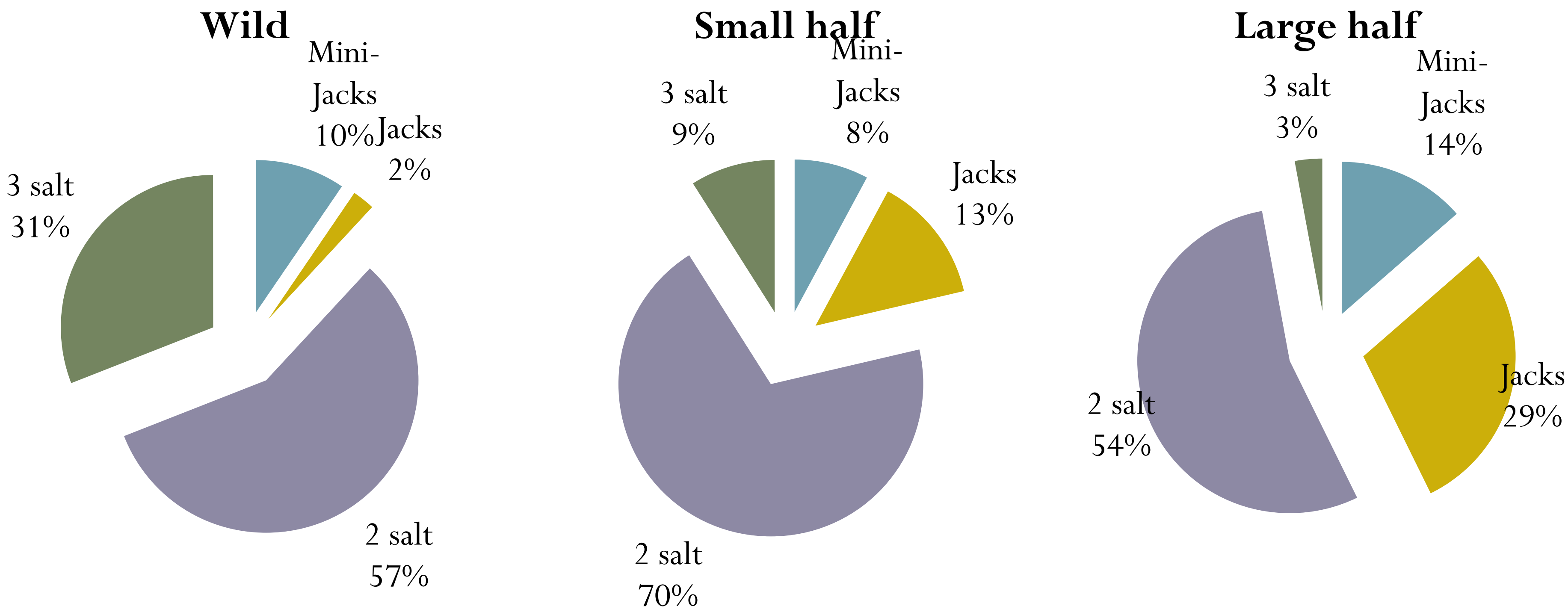


$P = 0.03$

Survival to MCN (S vs. L)

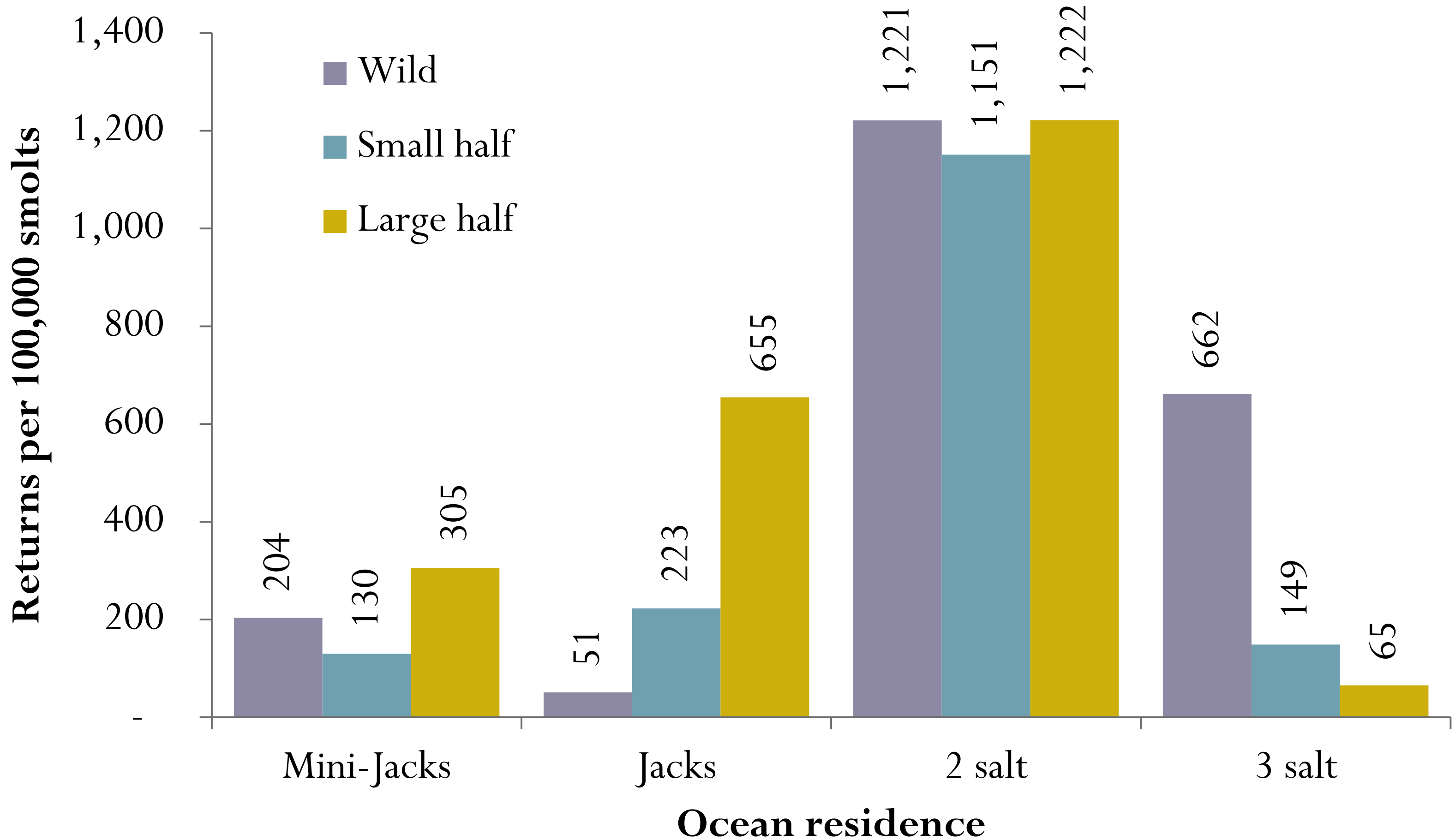


Proportion of age classes by group



12% < 2 salt fish **21% < 2 salt fish** **43% < 2 salt fish**

Expected returns from Chiwawa R.



Conclusions

- No apparent benefit in larger hatchery smolts
- Apparent drawback in larger hatchery smolts
- Smaller hatchery smolts perform more similarly to wild fish

Implications

- Effectiveness of hatchery program
  - Mimic wild populations
  - Maximize adult returns
  - Minimize mini-jacks and jack rates

- PNI goals for the Wenatchee River (2011 example)
  - 4,774 H & 1,289 W (6,063 total) return
  - 193 NORs, 716 HORs (assuming 15% escapement)
  - PNI goal of 40%, pNOB of 50%
  - HGMP obligation = removal of 967 hatchery fish at TUM
    - *3,273 hatchery jacks at TUM in 2011…*
    - *Smaller releases would have negated adult removal obligation*

Next steps

- Next steps?
  - Propose adjusting size targets of Chiwawa program (today)
  - Identify optimum release size with M&E biologists
  - Continue monitoring and evaluation

Questions?

APPENDIX C
HABITAT CONSERVATION PLAN TRIBUTARY COMMITTEES 2011 MEETING MINUTES

Note: The Tributary Committees did not meet in March and October 2011.

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 13 January 2011

Members Present: Dale Bambrick (NOAA Fisheries)[1], Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes)[1], Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator).

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, 13 January 2011 from 10:00 to 11:50 am.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following changes:

- The cultural language discussion will be postponed until February.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 18 November 2010 meeting notes with edits offered by Casey Baldwin.

III. Monthly Update on Ongoing Projects

Becky Gallaher gave an update on funded projects. Most are progressing well or had no salient activity in the past month.

- The Okanagan Nation Alliance will soon submit their final report on the Okanagan River Restoration Project to the Wells Committee.
- Jason Lundgren with Cascade Columbia Fisheries Enhancement Group has contacted different agencies about nutrient enhancement in the Upper Columbia. He would like to update the Committees in February.
- For the Entiat PUD Canal System Conversion Project, contractors completed drilling of the eight test wells. Based on pump tests, it will likely be necessary to use river intakes to meet the water needs of some landowners. The geotechnical engineer will prepare a report that summarizes results from the eight test wells and will include identification and evaluation of alternatives, including cost estimates, for possible scenarios that would meet individual landowner needs.

[1] Dale Bambrick and Chris Fisher called into the meeting.

- Cascadia Conservation District requested a contract extension on the Mission Creek Fish Passage Project. The contract was to be completed by 30 November 2010, but because of delays in obtaining an Army Corps of Engineers permit, Cascadia asked the Rocky Island Tributary Committee to extend the completion date to 30 November 2011. ***The Rock Island Committee agreed to the extension.***

- For the Twisp River Riparian Protection Project, the Buckley property is expected to close in January.

IV. Review of Policies and Procedures Documents

Tracy Hillman asked if the Committees had any changes or edits to the Policies and Procedures for Funding Projects and the Tributary Committee Operating Procedures documents. The Committees had no changes or edits to the Policies and Procedures for Funding Projects document. The Committees directed Tracy Hillman to update the list of voting members in the Operating Procedures document.

V. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in December and January:

   Rock Island Plan Species Account:

   - $19,289.52 to Cascadia Conservation District for well drilling on the Entiat PUD Canal System Conversion Project.
   - $6,270.89 to Chelan County Natural Resource Department for work on the Cashmere Pond Off-Channel Habitat Project. This is the final bill on this project.
   - $874.65 to Chelan PUD for Rock Island project administration/coordination during the fourth quarter, 2010.
   - $180.23 to LeMaster & Daniels for Rock Island project financial management during the fourth quarter, 2010.

   Rocky Reach Plan Species Account:

   - $20,028.25 to Cascadia Conservation District for excavation, clearing, site grading, removal of existing access road, and work on the levees for the Entiat National Fish Hatchery Improvements Project.
   - $48,960 to the Methow Salmon Recovery Foundation for acquisition and transport of 72 pieces of wood for the Methow Subbasin LWD Acquisition and Transport Project.
   - $717.32 to Chelan PUD for Rocky Reach project administration/coordination during the fourth quarter, 2010.
   - $180.22 to LeMaster & Daniels for Rocky Reach project financial management during the fourth quarter, 2010.

   Wells Plan Species Account:

- $363.30 to Chelan PUD for Wells project administration/coordination during the fourth quarter, 2010.

2. Tracy Hillman reported that he received a letter from Ken Berg, Manager of the U.S. Fish and Wildlife Service's Washington Fish and Wildlife Office stating that Kate Terrell will replace David Morgan on the Tributary Committees. Members welcomed Kate to the Committees.

3. Tracy Hillman stated that Chris Johnson of the Methow Salmon Recovery Foundation contacted him about the Methow River Acquisition 2010 MR 41.5 LR Project, which the Committees declined to fund because they did not want to fund the upland component of the acquisition. Chris indicated that he has been working with the landowner and there is a possibility that the landowner will separate the upland parcel from the riparian/off-channel parcel. If the landowner does separate the parcels, Chris would like to know if the Committees would reevaluate the proposal. The Committees agreed to review the proposal if the parcels are separated.

4. Tracy Hillman reported that he has completed Section 2.6 (Tributary Committees and Plan Species Accounts) for the Annual Report of Activities under the Anadromous Fish Agreement and Habitat Conservation Plan for each hydroelectric project. Becky Gallaher will update the Fiscal Management sections for the Rock Island and Rocky Reach plans. Members of the Committees should soon receive the draft reports for their reviews. The final reports will be submitted to the Federal Energy Regulatory Commission in April.

   Tom Kahler shared with the Committees the Wells Plan Species Account financial activity for 2010. The beginning balance of the Wells Plan Species Account on January 1, 2010 was $549,206.40; annual payment from Douglas PUD was $237,455.00; interest accrued during 2010 was $3,206.90; funds disbursed for projects in 2010 totaled $44,001.76; disbursements for administrative costs included $2,685.55 to Chelan PUD for administrative support provided to the Wells Plan Species Account, $2,272.00 to Douglas PUD for account administration during 2010, and $1,416.66 to Cordell, Neher & Company for financial review; resulting in an ending balance of $739,492.33 on December 31, 2010. This information is included in Section 2.6 of the Annual Report.

5. Tracy Hillman asked members for comments/edits on the Douglas PUD 2011 Draft Action Plan for the Wells HCP. The 2011 Draft Action Plan for the Wells Tributary Committee is as follows:

   Plan Species Account Annual Contribution

   - $176,178 in 1998 dollars: January 2011

   Annual Report – Plan Species Account Status

   - Draft to Committee: February 2011
   - Approval Deadline: March 2011
   - Period Covered: January to December 2011

   2011 Funding-Round: General Salmon Habitat Program

   - Request for Project Pre-proposals *To be determined* (March)
   - Pro-proposal to TC *To be determined* (early June)
   - Tours of Proposed Projects *To be determined* (late June)
   - Project Sponsor Presentations to TC *To be determined* (early July)

- Final Project Proposals to TC — *To be determined* (late July)
- RTT Project Rating Decision — *To be determined* (early August)
- Supplemental Sponsor Presentations — *To be determined* (September)
- TC Final Funding Decisions — *To be determined* (December)

Small Projects Program

- Project Review and Funding Decision — Applications accepted anytime

The Wells Tributary Committee accepted the Wells Action Plan for 2011. The Committees will review the Rocky Reach and Rock Island 2011 Draft Action Plans in February.

6. Tracy Hillman indicated that he and Becky Gallaher are updating the funded projects tables for each Plan Species Account. Tracy will provide the tables to the Committees as soon as the PUDs make their annual payments into the Plan Species Accounts.
7. Becky Gallaher reported that funds will be deposited into each of the Plan Species Accounts at the end of January. The amounts deposited will be about $654,000 into the Rock Island Account, $310,000 into the Rocky Reach Account, and $237,000 into the Wells. Exact amounts deposited will be provided during the February meeting.
8. Tracy Hillman reviewed the 2011 meeting schedule with the Committees. The Committees agreed to hold their meetings on the second Thursday of each month.

VI. Next Steps

The next meeting of the Tributary Committees will be on Thursday, 10 February at Chelan PUD in Wenatchee. Jason Lundgren with the Cascade Columbia Fisheries Enhancement Group will update the Committees on the Nutrient Enhancement Evaluation work funded by the Rock Island Committee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 10 February 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Tom Kahler (Douglas PUD)[1].

Others Present: Casey Baldwin (WDFW) and Becky Gallaher (Tributary Project Coordinator). Jason Lundgren (Cascade Columbia Fisheries Enhancement Group) joined the meeting from 10:30-11:00 am.

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 February 2011 from 10:00 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:

- Discussion about the recent Habitat and Fish Modeling Workshop in Portland.
- Update on the ORRI project.
- Update on regional monitoring efforts.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 13 January 2011 meeting notes with edits offered by Tom Kahler.

III. 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.

- For the Entiat PUD Canal System Conversion Project, the geotechnical engineer is preparing a report that summarizes results from the eight test wells and will include identification and evaluation of alternatives, including cost estimates, for possible scenarios that would meet individual landowner needs. The report should be available late spring.

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[1] Tom Kahler provided his vote on decision items following the meeting.

IV. Small Project Application

The Committees received and reviewed a Small Projects Program application from the Methow Conservancy (MC) titled *Christianson Conservation Easement*.

<u>Christianson Conservation Easement</u>

The purpose of this project is to purchase a 1.5-acre parcel along the Twisp River. The parcel is contiguous with the 13-acre Buckley property that the Methow Salmon Recovery Foundation recently purchased for the purpose of restoring and protecting riparian habitat. The 1.5-acre parcel is entirely within the 100-year floodplain and consists of high-quality woodlands. The total cost of the acquisition is $16,350. The sponsor requested $15,000 from HCP Tributary Funds. After careful consideration of the proposal, ***the Rocky Reach Tributary Committee elected to fund this project.***

The Committee discussed the possibility that the MVID may have an easement on the property for staging heavy equipment, which is used to maintain the diversion. The Committee asked that the sponsor confirm if the MVID has an easement on the Buckley and Christianson acquisitions. In addition, the Committee would like to review a draft stewardship plan for the Buckley/Christianson acquisitions as soon as possible.

V. Presentation on Assessing Nutrient Enhancement Logistics within the Upper Columbia

Jason Lundgren with the Cascade Columbia Fisheries Enhancement Group provided the Committees with an update on a project funded by the Rock Island Tributary Committee titled, Assessing Nutrient Enhancement Logistics – Upper Columbia. Jason noted that the purpose of the study is to investigate logistical and technical aspects of nutrient enhancement. Jason reported that he has completed about 25% of the project. So far, he has interviewed personnel at all adult collecting/handling hatcheries, talked with WDOE on TMDL issues in the Wenatchee, interviewed USFWS health specialists in Olympia, talked with analog manufacturers, and discussed the project with the Watershed Action Teams. Jason indicated that hatchery staff are very supportive of the project. However, because most adults are treated with drugs, there are relatively few untreated fish available for nutrient enhancement.

Jason identified the following next steps: (1) continue discussions with WDOE; (2) research pasteurization and analogs; (3) meet with city officials; (4) research adult management, HGMPs, and TMDLs; (5) talk with groups (e.g., Lower Columbia Fisheries Enhancement Group and the Warm Springs Tribes) who are doing nutrient enhancement work; (6) continue to research the USDA mandate not to release inoculated fish; and (7) continue to review the literature. The Committees recommended that Jason also talk with Todd Pearsons, who studied the effects of nutrient enhancement in the Yakima Basin.

VI. Information Updates

The following information updates were provided during the meeting.

1. There were no Payment Requests in January and February.
2. Becky Gallaher reported that money was deposited into each of the Plan Species Accounts at the end of January. The amounts deposited were:
    - Rock Island $655,882

- Rocky Reach $310,638
- Wells $238,153

3. Tracy Hillman informed the Committees that he received from Chelan PUD the 2011 Action Plans for the Rocky Reach and Rock Island HCPs. The 2011 Action Plan for both Rocky Reach and Rock Island Tributary Committees is as follows:
   - Plan Species Account Deposit: January 2011
   - Project solicitation: To be determined (typically March)
   - Project approval deadline: To be determined (typically December)
   - Implementation: Ongoing
4. Tracy Hillman and Casey Baldwin shared with the Committees the proceedings of a Habitat and Fish Modeling Workshop recently held in Portland. The purpose of the workshop was to summarize recent work on habitat and fish modeling and to provide guidance to the Regional Technical Workgroup that will recommend habitat modeling for the 2008 Federal Columbia River Power System Biological Opinion (FCRPS BiOp). There were four sessions of invited papers that (1) addressed the effects of large environmental changes (including climate change) on fish populations; (2) identified the use of models in assessing the effects of habitat treatments on fish populations; (3) identified advances in understanding habitat and fish relationships at the landscape level; and (4) outlined the use of decision support modeling tools in resource planning. The abstracts of most of the presentations are appended as Attachment 1.

   Related to this topic, Dale Bambrick asked if all the monitoring throughout the region is really necessary? The big concern is the large number of ESA-listed fish that are captured, handled, PIT tagged, and then recaptured and handled several times. Dale and others believe that the extensive amount of PIT tagging will have a large effect on the survival and/or growth of the few ESA-listed fish in the region. Tracy Hillman noted that the FCRPS BiOp requires monitoring entities to provide relatively precise estimates of survival changes associated with restoration actions and trend monitoring. To that end, monitoring entities are using mark-recapture methods, because other less invasive methods of estimating abundance are less precise (e.g., snorkeling and snerding). However, Tracy noted that some of the mark-recapture studies may not be related directly to FCRPS BiOp requirements. In addition, efforts to estimate PIT-tag loss (shedding) and mortality associated with PIT tagging and handling will likely need to be addressed with double-marking techniques (similar to those conducted in the Yakima Basin using both PIT tags and CWTs), which could further affect the survival of listed stocks. It is clear that there is a need for precise estimates to meet BiOp requirements; however, the region needs to consider fully the negative effects of capturing, handling, and tagging large numbers of ESA-listed fish. The region is currently developing a regional PIT-tagging plan that will supposedly address this problem.
5. Tracy Hillman and Becky Gallaher shared with the Committees the updated funded projects tables for each Plan Species Account. The tables are appended as Attachment 2.
6. Tracy Hillman and Becky Gallaher shared with the Committees the proposed schedule for proposal development, submission, and review of SRFB/GSHP projects (see Attachment 3). Currently, pre-proposals would be delivered to the Tributary Committees on 9 May (almost a month earlier than last year) and the Committees would review the pre-proposals during their June meeting (9 June). Project tours are scheduled for 23-26 May and pre-proposal presentation would occur on 8 June. Final proposals would be

posted to the Tributary Committees ftp site on 27 June. The Committees would conduct an initial review of the final proposals during their July meeting (14 July) and determine if supplemental tours of selected projects are necessary. Supplemental tours would occur in September and, if necessary, sponsors would be invited to present their projects to the Committees in October. The Committees would make final funding decisions in November or December.

The Committees voiced some concern with the tours occurring during periods of higher flows. Becky and Casey will attend the Regional SRFB/TribCom Debrief Meeting on Friday, 11 February, and share the Committees concern with Derek Van Marter.

7. Becky Gallaher informed the Committees that LeMaster & Daniels PLLC has been retained to continue to conduct financial administration of the Rock Island and Rocky Reach Plan Species Accounts.
8. Casey Baldwin updated the Committees on the Tyee Project in the Entiat. The PRCC Habitat Subcommittee anticipates receiving a proposal to purchase a conservation easement on the property. Restoration work would be funded by BPA. The UCRTT should see a final proposal by the end of the month and will review the proposal during their 9 March meeting.
9. Chris Fisher provided the Committees with a paper copy of the Construction Report for the Okanagan River Restoration Initiative – Phase I. The report was prepared by the Okanagan Nation Alliance. Chris also reported that the ORRI project was named as one of the finalist for the Innovation Excellence Award, which is really cool!

VII. Next Steps

The next meeting of the Tributary Committees is scheduled for Thursday, 10 March at Chelan PUD in Wenatchee. However, if there are no agenda items, the meeting will be postponed until Thursday, 14 April.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1. Abstracts from the Workshop on Habitat and Fish Modeling

Impacts of hatcheries on wild salmon productivity: lessons from long-term modeling
Eric Buhle, Northwest Fisheries Science Center (NWFSC)

Captive breeding is a widely used strategy for buffering rapidly declining populations against short-term extinction risk. In the case of Pacific salmon and other exploited species, captive breeding takes the form of supplementation hatchery programs, which are intended to increase population size while minimizing artificial selection in breeding and rearing practices. Supplementation is an increasingly common tool for Pacific salmon management, but substantial uncertainty remains about its effectiveness and potential impacts on wild populations. Directly measuring these impacts is challenging, in part because of the difficulty of estimating the relative reproductive contributions of wild- and hatchery-reared individuals that breed naturally. To address this, we analyzed time series (14 - 46 yr) of adult density from 23 populations of spring/summer Chinook salmon (*Oncorhynchus tshawytscha*) in the Snake River basin, USA, which have experienced a range of supplementation levels (including no supplementation). We fit models that predict total naturally derived recruitment as the sum of offspring produced by wild- and hatchery-reared adults (these are distinguished in the abundance data). We compared alternative hypotheses about density-dependence or independence and the equivalence of wild- and hatchery-reared fish with respect to two key parameters: productivity at low density and the per-capita strength of density dependence. Using a hierarchical Bayesian framework, we found support for models in which wild- and hatchery-reared fish differ in intrinsic productivity and density-dependent effects. However, the magnitude and direction of these differences varied across populations within the ESU. Some parameters, particularly the intrinsic productivity of hatchery-reared fish, were poorly defined by the data and estimates fell in biologically unrealistic ranges unless constrained by informative prior distributions. These results point to underlying differences in the ecology, behavior, or life history of wild and hatchery-reared salmon, despite the efforts by supplementation programs to minimize such divergence. The introduction of hatchery-reared fish into wild populations may reduce productivity, and thus supplementation programs may face a trade-off between short-term increases in abundance and erosion of the long-term potential for population rebuilding. However, the uncertainty regarding key parameters suggests that even spatially and temporally extensive monitoring may be insufficient to clearly identify the impacts of supplementation, and highlights the need for more powerful adaptive management experiments in the future.

Exploring pathways of energy transfer from spawning coho salmon *Oncorhynchus kisutch* to juvenile steelhead *O. mykiss*: influence of egg consumption on growth and life history trajectories
Russell W. Perry, Jason G. Romine*, Patrick J. Connolly, Sally T. Sauter and Michael A. Newsom

Before the arrival of settlers in the 19th century, large populations of spawning salmon were a major source of nutrients to otherwise oligotrophic watersheds in the Pacific Northwest. Decaying carcasses can increase primary and secondary productivity, thereby increasing available food resources for juvenile salmonids. However, juvenile salmonids also feed directly on salmon eggs, which may be a particularly important energy source for growth just prior to winter. For example, the Methow River once supported a large coho Salmon population, which was extirpated by dam construction in 1915. Efforts are underway to restore salmon populations within this system. Reintroduction of coho salmon to the Methow River began in 2008 through hatchery releases. Our goal was to understand how growth and life history strategies of juvenile *O. mykiss* might shift once coho salmon eggs become available again as a food resource. We modeled the seasonal availability of coho salmon eggs using a simple model of redd deposition where egg availability increased with superimposition. We then used a bioenergetics model to simulate growth in response to the addition of eggs to the diet of juvenile *O. mykiss* under water temperatures observed in Beaver Creek, a tributary to the Methow River. Last, we used a state-dependent decision model to examine the influence of growth trajectories on life history choices (i.e., remain as a resident or emigrate to the ocean). Our next step is to incorporate these processes into a life-cycle model to understand the population-level consequences of shifting diet resources during critical periods in the early life history of *O. mykiss*.

[*] Presenter

Non-native predators in the Columbia and Snake Basin: hotspots of predation

Michael P. Carey[1], Beth L. Sanderson[1], Thomas A. Friesen[2], Katie A. Barnas[1], and Julian D. Olden[3]

Biological invasions are a leading threat to native communities and ecosystems around the world. In the Pacific Northwest (PNW) of the USA, a primary concern is piscivorous fish introduced to create recreational fisheries as these non-indigenous predators consume native salmonids (*Oncorhynchus* spp.). Smallmouth bass (*Micropterus dolomieu*) are the most widespread non-indigenous predator in the PNW and in recent decades they have become a large component of the fish community in many streams, rivers, and lakes. Smallmouth bass thrive in the Pacific Northwest largely due to human modifications of the landscape, such as dam construction and the resulting reservoir habitat. Smallmouth bass consume juvenile salmon in many areas; however, predation estimates vary widely from 0 to 3.89 salmon consumed per smallmouth bass each day across locations in the Columbia River and Snake River basins. A bioenergetics model of smallmouth bass consumption suggests the interaction of outmigration timing and water temperature influences the magnitude of smallmouth predation in the PNW. Future research needs to expand our understanding of smallmouth bass beyond a few site specific studies to inform recreational fishery management and to determine the best strategies for preventing, controlling, or eradicating smallmouth bass impacts on salmonids. Lessons explored for smallmouth bass can be applied to other non-indigenous sportfish in the PNW.

[1]NOAA Fisheries, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112
[2]Oregon Department of Fish and Wildlife, 28655 Highway 34, Corvallis, OR 97333
[3]University of Washington, School of Aquatic and Fishery Sciences, Box 355020; Seattle WA 98195

Replacement of a native salmonid by a nonnative salmonid: changes in trout production and consequences of stream-riparian food webs

J.R. Benjamin, C.V. Baxter, K.D. Fausch, and F. Lepori

Frequently nonnative species invade habitats occupied by a similar, even closely related, native species, but the consequences of these types of invasions are rarely studied. Throughout western North America nonnative brook trout *Salvelinus fontinalis* are assumed to be an "analog" of the native cutthroat trout *Oncorhynchus clarkii* they replace. We tested this assumption by comparing production of brook trout and cutthroat trout and their effects on stream-riparian food webs via a combination of comparative and experimental studies. We hypothesized that brook trout exhibit greater density and production and cause greater depletion of benthic invertebrates, which in turn increases periphyton biomass, reduces the flux of emerging insects, and the abundance of riparian spiders compared to cutthroat trout. In a range-wide comparison, we observed when in allopatry, density was 1.5 times greater and production 1.9 times higher for brook trout than cutthroat trout. To account for environmental factors that may be driving the patterns observed, we conducted a comparison of five paired streams with either brook trout or cutthroat trout in allopatry and observed brook trout exhibited 2.4 times greater density and 2.5 times greater annual production than the cutthroat trout they replace. In a comparative study of twenty paired streams, we observed emerging insects were 24% lower from streams with brook trout and there was a positive relationship between riparian spiders and the emergence insects they prey upon. From these models, we predicted that brook trout replacement would result in a 6-20% reduction in spider counts. Similarly, in a large-scale experiment, brook trout reduced the flux of emerging insects by 58%. However, we did not detect an overall effect of brook trout on benthic insects, periphyton, or riparian spiders. This research represents some of the first tests toward understanding the ecological consequences when brook trout replace cutthroat trout and highlights the need for more studies that examine the broader consequences of a nonnative species replacing a closely related native species.

What does fishing-induced evolution mean for sustainable salmon harvest?
Jeff Hard, NWFSC

Fishing has sometimes had serious demographic consequences for exploited populations. Fishery managers are charged with developing harvest practices that are sustainable, but with few exceptions these efforts do not account for evolutionary effects. Because fishing often targets potential breeders with particular characteristics, it can change a population in ways that affect viability. Some species of Pacific salmon exhibit a wide range of sizes and ages at adulthood, and these fish are exposed to fishing mortality during much of their lives. Fishing can eliminate larger and older individuals from the breeding pool. The effects of selective fishing are not limited to changes in size or growth; fishing may yield a cascade of responses in other traits such as migration timing. How important is fishing mortality as a selective agent, and what are the consequences of fishing-induced phenotypic changes for viability? To address this question, we link evolutionary and PVA models for exploited Chinook salmon populations to assess effects of size-selective fishing on life history and productivity. The models show that under the conditions we examined fish tend to become smaller, age distributions become truncated, and productivity declines. We explore how different fishing practices tend to influence these patterns. Our results support the notion that adaptation to fishing selection can reduce viability, and fishing practices that conserve phenotypic variation are more likely to be sustainable. Accounting for fishing selection’s consequences for viability and future yield will require implementing careful monitoring to detect selection and identify practices that reduce threats to sustainability.

Estimating the magnitude of the effect of environmental change on survival using a life-cycle approach
Bob Lessard, Columbia River Inter-tribal Fish Commission

The Sacramento River winter run Chinook salmon (*Oncorhynchus tshawytscha*) population has declined from around 200,000 in the late 1960’s to barely 8000 in recent years. The cause can be attributed to some combination of overfishing and environmental degradation in past years, but the relative magnitude of those effects has not been determined. We build a population dynamics model of the life history of Sacramento River winter run Chinook salmon through fresh water and ocean stages. Using maximum likelihood techniques to fit the model to empirical data, we find that environmental conditions and anthropogenic effects explain much of the variation in the stage-specific survival rates of the winter run. We find that accurate prediction of past escapements is possible when environmental effects are implemented as forcing variables for productivities and capacities. Environmental variables include: egg rearing temperatures above Red Bluff diversion dam, Bend bridge flow, striped bass (*Morone saxatilis*) abundance, a variation of the central valley harvest index, the number of days Yolo bypass remain open, sea level height, upwelling, October to March average PDO and sea surface temperature. Our model can be used to evaluate alternative management actions aimed at the recovery of this population. We reconstruct the population trends and forecast the abundance of the winter run in 2009 with a deterministic model that uses only the initial escapements from 1967 to 1970, where inter-annual variation in survival is completely driven by environmental effects. Our analysis indicates that under that under the status-quo, the population could recover to 12,000 by 2028, but even conservative policies that combine water resource management and harvest control can improve recovery to over 20,000 in that same time. It appears that recovery to 1960 levels is not possible given the changes in habitat and ocean conditions.

Modeling fish movement, survival and smolt production in a Methow River *O. mykiss* population
Patrick J. Connolly, Russell Perry, and Kyle D. Martens, USGS-CRRL

We tracked the fate of individual juvenile *O. mykiss* (rainbow trout/steelhead) that were captured and PIT tagged in lower Beaver Creek of the Methow River watershed of northcentral Washington. Movements of fish were monitored with the use of a network of downstream traps and PIT tag detectors. Expression of several life history strategies were evident, including one where fish stayed in their natal area 1-3 years or more before smolting, and another where fish moved downstream at age 1 to the mainstem Methow River for an additional year or two of rearing before smolting. We found that that theses differential rearing environments had a substantial influence on survival and smolt age. With the use of a life history model, we assessed the contribution of these life history strategies to smolt production. Information gained form this modeling effort is being used to guide stream restoration actions focused on enhancing habitat connectivity and life history diversity.

Estimating increases in salmon population metrics from habitat actions: how much restoration and how much monitoring is needed to detect change?
George Pess, NWFSC

Using existing data from evaluations of habitat restoration, we estimated the average change in coho salmon *Oncorhynchus kisutch* and steelhead *O. mykiss* parr and smolt densities for common in-channel (culvert removal, large wood placement, boulder placement, and constructed logjams) and floodplain restoration techniques (constructed side channels and reconnected floodplain habitats). We then used these numbers and a Monte Carlo simulation to predict changes in fish numbers in a model watershed for two restoration scenarios: (1) restoration of all accessible habitat within the watershed and (2) restoration of the average amount historically implemented in Puget Sound watersheds (8% of total restorable areas). Mean increases in coho salmon parr or smolt density after restoration ranged from 0.19 to 2.32 parr/m for in-channel techniques and from 0.34 to 1.70 parr/m2 for floodplain techniques. Increases in steelhead parr or smolt density ranged from _0.06 to 0.71 fish/m and from 0.03 to 0.06 fish/m2 for in-channel and floodplain techniques, respectively. Under restoration scenario 1, the predicted mean increase in numbers was 1,459,254 (117%) and 285,302 (140%) for coho salmon parr and smolts and 93,965 (65%) and 28,001 (125%) for steelhead parr and smolts. Under scenario 2, the predicted mean increase in parr and smolts was 59,591 (5%) and 15,022 (7%) for coho salmon and 1,733 (1%) and 1,195 (5%) for steelhead. The percentage of floodplain and in-channel habitat that would have to be restored in the modeled watershed to detect a 25% increase in coho salmon and steelhead smolt production (the minimum level detectable by most monitoring programs) was 20%. However, given the large variability in fish response (changes in density or abundance) to restoration, 100% of the habitat would need to be restored to be 95% certain of achieving a 25% increase in smolt production for either species. Our study demonstrates that considerable restoration is needed to produce measurable changes in fish abundance at a watershed scale.

Change Detection in Land Cover from TM imagery
Robert Kennedy, Oregon State University (OSU)

Changes in type or quality of freshwater habitat are potentially important factors in ESA listed salmonid population health, but systematic mapping work to quantify change in habitat are generally lacking. Consistent and frequent mapping of changes in land cover and land use based on remote sensing will provide key information on broad-scale long time frame status of habitat across the listing areas. Satellite remote sensing data have the potential to aid in this effort, but only recently have data and processing technologies been available that may make the necessary mapping feasible. Imagery from the Landsat sensors is the workhorse of many natural resource change mapping studies because of its large geographic footprint and relatively small pixel size. By recently making the data available free of charge, however, the USGS has allowed researchers to develop fundamentally new approaches to data analysis that take advantage of yearly imagery. For example, these tools are now being used to create maps of land cover change for projects funded by the USDA Forest Service, NASA, the US Department of Energy, and the National Park Service for many areas of the western U.S. Although most current work focused on disturbance mapping within forests, algorithm development has evolved to the point where a new approach to yearly land cover mapping across land cover types is now possible. The primary advance is the construction of yearly images that are stable across time in places where land cover is stable and that change only in places where land cover has changed. This step largely removes the vagaries of atmospheric contamination, sun angle, and phenological state of the vegetation create noise that have precluded consistent yearly mapping in the past. More importantly, the information on land cover change is implicitly carried in the constructed images, which allows for inference of change directly from yearly land cover maps.

An historical template for river restoration in the Columbia basin
T. Beechie, G. Pess, H. Imaki, B. McMillan, M. Liermann, M. Pollock
Northwest Fisheries Science Center, NOAA Fisheries, Seattle, Washington

Identification of restoration targets for riverine and riparian habitats is typically based on locally measured reference conditions. However, no reference sites remain in much of the Columbia River basin, so we define reference conditions based on (1) historical analyses and understanding of landscape processes that define the intrinsic potential of river reaches, (2) natural riparian vegetation potential derived from 19th century surveys, and (3) a comprehensive summary of locations and abundance of salmon prior to widespread river modifications. We use existing topographic and precipitation data to predict channel type across the entire Columbia River basin, based on channel slope, precipitation, and relative sediment transport capacity. Preliminary accuracy assessments suggest we can classify river channel patterns with more the 75% overall accuracy; future data collection will refine our error analysis. Regional geology and post-glacial landscape evolution (over the last 20,000 years) exert a first-order control on the spatial distribution of reference conditions at the scale of river basins, primarily via controls on channel slope and sediment characteristics. Vegetation patterns exert a second order control on intrinsic habitat potential, so a second component of this effort is to map mid-19th century vegetation conditions based on historical survey notes to define riparian reference conditions. We use a combination of complete vegetation mapping in the Walla Walla and Tucannon River basins, mapping of randomly selected vegetation points throughout the Columbia River basin, and simple gap analysis to develop species 'zones' for the Columbia River basin and identify species composition targets for riparian restoration. Finally, a comprehensive survey of salmon records in early explorer journals is used to develop a detailed map of known historical salmon distributions and abundance in the Columbia River basin. Our ultimate aim with these three efforts is to expand the knowledge of natural river potentials for use in defining restoration targets for Columbia basin salmon habitats.

Spatially and temporally explicit, individual-based, life-history and productivity modeling: steelhead in the John Day

Kristina McNyset[1], Jeffrey Falke[1], Allen Brookes[2], Nathan Schumacker[2], and Chris Jordan[3]

Realized life history expression and productivity in salmonid fishes is the result of multiple interacting factors including genetics, habitat, growth potential and condition, and the thermal regime individuals experience, both at critical stages and throughout development. Individual fishes, each with their inherited propensities and characteristics, experience spatially and temporally specific conditions throughout their lives that influence growth, movement, and life history "decisions". Modeling the interaction of these factors at the (potentially) broad spatial and temporal scales at which individuals carry out their life histories is a challenge. HexSim is a spatially-explicit, individual-based, multi-species computer model designed for simulating terrestrial wildlife population dynamics and interactions. We are presenting a modification of HexSim for aquatic populations. The unique spatial constraints of stream system modeling, and modifications to the simulation model necessary for inclusion of relevant aspects of fish biology and behavior, will be discussed. Our initial goal is to predict life history expression and production of steelhead (*Oncorhynchus mykiss*) in the John Day River basin, Oregon. Development of spatially and temporally continuous parameter datasets (e.g. water temperature and food availability) for the John Day will also be presented.

[1]Oregon State University
[2]USEPA
[3]NOAA Fisheries

Landscape-scale classifications of Pacific Northwest watersheds based on natural features and human disturbance

Thomas R. Whittier*, Alan Herlihy, Chris Jordan and Carol Volk

We used data derived from national GIS coverages to develop hierarchical classifications of natural features related to salmon production, and for human disturbance, for the 8,438 sixth-field HUCs in the Pacific Northwest. To develop the natural features classification, we applied principal components analysis (PCA) and clustering techniques of seven climate, land form, geology, and stream form characteristics. PCA showed a clear divide between Eastside and

Westside landscapes. We then used a divisive clustering technique to divide the Eastside into a Mountains class and a Basins class. Thereafter, we used flexible Beta clustering to develop landscape classes within each of these 3 main classes. The final natural features landscape classification had 7 Westside classes, 8 Eastside Basins classes, and 9 Eastside Mountains classes. To develop the human disturbance classification, we determined urban land use, agricultural land use, road density, and impervious surface density in each HUC. A flexible Beta clustering of the scaled measures produced a balanced dendrogram, with the top-level division distinguishing low disturbance from high disturbance HUCs. The final human disturbance classification had 8 classes that formed a continuum from essentially undisturbed to highly disturbed. The first principal component scores of a PCA of the four disturbance variables can be used as an overall disturbance measure, while the disturbance classes describe which of these variables are the primary sources of disturbances in sets of HUCs.

* Presenter

The Okanagan Fish-Water Management Tools (FWMT) decision support system: balancing water regulation objectives to promote sockeye salmon production gains
Kim Hyatt, Fisheries and Oceans, Canada

Water levels on Okanagan Lake are managed to provide a balance between fisheries, flooding, and other interests. Water levels must provide sufficient water to meet target flows for Okanagan Lake kokanee and downstream sockeye salmon populations, and minimize flooding of both lakeshore and downstream properties. Owing to a variety of factors, Okanagan River Sockeye and Steelhead are the only significant remnant stocks of more than a dozen anadromous salmon stocks that historically returned to Canada through the US portions of the Columbia River. The Okanagan Basin Technical Working Group (OBTWG) identified improvements to Okanagan River flow management practices as one means of achieving significant Sockeye production gains. With this goal, the OBTWG oversaw the development of OKFWM, an Internet-accessible software application as the central tool for defining these improved water management practices. OKFWM enables water managers and fisheries scientists to combine best science subsystem models and integrate real-time data to make daily/weekly decisions regarding Okanagan Lake Dam water releases. Using this tool, a comprehensive retrospective analysis was performed for the 1974 to 2003 period. Results showed routine use of OKFWM may yield an average annual increase in Okanagan sockeye smolt abundance by as much as 55% without significantly increasing socio-economic losses associated with other water use interests. This encouraging result owes to improved understanding of fundamental ecological processes controlling juvenile production, the application of real-time data to inform physical and biological parameters, and a heightened awareness of trade-offs – all features seamlessly captured within the OKFWM decision support tool.

Adapting a decision support system to forecast climate impacts on Yakima River salmonid habitat
James Hatten, USGS-CRRL

We evaluated the potential impacts of two climate change scenarios on salmonid habitat in the Yakima River with a watershed model, a two-dimensional (2D) hydrodynamic model, and a geographic information system (GIS). Habitat criteria for four life stages of coho and fall Chinook salmon were provided by an expert panel. The watershed model provided hydrographs in the study reaches for three climate scenarios: a baseline (1981 – 2005), a one-degree C increase in mean air temperature (P1), and a two-degree C increase (P2). We generated steady-state, flow-dependent habitat response curves for each salmonid life stage (i.e., spawning, winter/summer rearing, fry) with cell-based modeling techniques. Lastly, we calculated the amount of habitat that would be available under unsteady state conditions (i.e., a hydrograph) for the baseline, P1 and P2 scenarios. The spatial and temporal patterns in salmonid habitat differed by reach, life stage and climate scenario, but the overall patterns mirrored the shape of the three hydrographs. Specifically, large differences in habitat were observed between the baseline and future scenarios when the hydrographs (i.e., streamflow) diverged, with P2 producing the largest changes. Little difference (<1 SD) was observed in the quantity of spawning habitat for coho or fall Chinook salmon, or for coho rearing habitat. Very large (negative) differences occurred in Chinook summer rearing habitat in both reaches due to decreased streamflows, but only a small decrease in coho summer rearing habitat. Large differences in coho fry habitat were observed in the Gap (positive) and Wapato (negative) reaches, but only small differences in fry Chinook habitat. Our results suggest tradeoffs in salmonid habitat availability depending on the time of year and the geographic location. Of particular concern is the decrease in summer rearing habitat when stream temperatures are predicted to increase, suggesting a habitat bottleneck may result for salmonids during summer months.

Developing integrated decision support tools for local and regional decision makers: a pilot study modeling the impacts of climate change on water management in the Methow River Basin

Karen Jenni, Insight Decisions, Lee Hatcher (Methow Valley Watershed Council), Alec Maule (USGS), Timothy Nieman (Decision Applications, Inc)

USGS has sponsored an effort to develop a model of the impacts of climate change in the Methow River Basin (MRB), and to provide that information in a way that is useful to local and regional decision-makers and stakeholders. This is a “pilot project” being conducted as part of a larger effort focused on developing decision support tools for decision-makers throughout the Columbia River Basin faced with increasing demand and potential changes to water supply that will result from changing climate. In the past year, we held three two-day, on-site meetings and numerous conference calls to (1) gain input to the conceptual model, (2) derive data and parameters with which to populate and link imbedded models, and (3) ensure buy-in by the MRB stakeholders. The result is an integrated model of water supply, water use, and the impacts of water use on quality of life for Methow Valley residents, including economic impacts, social impacts, and environmental impacts. The intent of the model is to provide a tool that partners can use to explore the implications of climate change and the of alternative management decisions on those aspects of quality of life that are of interest and value. We will illustrate the model and its key outputs, and discuss the reactions of the stakeholders to the process and the resulting model.

Attachment 2: Funded Projects by Plan Species Account

Rock Island Habitat Conservation Plan
Tributary Committee

Rock Island Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
05 White River Floodplain & Habitat Protection	Chelan-Douglas Land Trust	General	Protection	$1,986,200	$693,548	$693,548	Complete
05 Nason Creek Off-Channel Habitat Restoration	Chelan County NRD	General	Off-Channel Habitat	$125,034	$18,787	$18,787	Complete
05 Alder Creek Culvert Replacement	Chelan County NRD	General	Fish Passage	$89,804	$89,804	$89,804	Complete
05 McDevitt Diversion Project	Cascadia Conservation District	Small	Fish Passage	$5,278	$5,278	$2,831	Complete
07 LWD Removal and Relocation	Chelan County NRD	Small	Instream Structures	$5,000	$5,000	$871	Complete
07 WRIA's 45/46 Riparian Restoration	Cascadia Conservation District	Small	Administration	$50,000	$25,000	$24,779	Complete
07 Entiat PUD Canal System Conversion	Cascadia Conservation District	General	Instream Flows	$496,584	$99,360	$68,926	In progress
07 Roaring Creek Flow Enhancement	Cascadia Conservation District	General	Instrm Flows/Fish Passage	$147,069	$25,000	$0	In progress
07 Wildhorse Spring Creek Conservation Easement	Colville Confederated Tribes	General	Protection	$67,826	$62,826	$62,850	Complete
08 Twisp River Conservation Acquisition II	Methow Salmon Recovery Found	General	Protection	$481,814	$220,500	$200,500	Complete
08 Twisp River Riparian Protection (Zinn)	Methow Conservancy	General	Protection	$349,988	$104,996	$0	In progress
08 Cashmere Pond Off-Channel Habitat Project	Chelan County NRD	General	Off-Channel Habitat	$914,076	$249,110	$243,139	Complete

Rock Island Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
09 LWD/Rootwad Acquisition and Transport II	Cascadia Conservation District	Small	Instream Structures	$35,000	$35,000	$0	In progress
09 Sleepy Hollow Reserve Protection Feasibility	Chelan County NRD	Small	Assessment	$25,000	$20,000	$16,599	Complete
09 White River Nason View Acquisition	Chelan-Douglas Land Trust	General	Protection	$545,000	$76,635	$5,054	In progress
09 Upper Methow II (Tawlks) Riparian Protection	Methow Conservancy	General	Protection	$411,943	$61,948	$0	In progress
09 Nason Creek UWP Floodplain Reconnection	Chelan County NRD	General	Off-Channel Habitat	$35,000	$5,250	$0	In progress
09 Lower Wenatchee Instream Flow Enhancement	Washington Rivers Conservancy	General	Instream Flows	$4,954,466	$167,500	$0	In progress
10 White River Dally-Wilson Conservation Easement	Chelan-Douglas Land Trust	General	Protection	$194,000	$120,000	$120,000	Complete
10 Mission Creek Fish Passage	Cascadia Conservation District	Small	Fish Passage/Instrm Struct	$50,000	$45,000	$0	In progress
10 Assessing Nutrient Enhancement	UC Fisheries Enhancement Group	Small	Assessment	$9,875	$9,875	$0	In Progress
11 Boat Launch Off-Channel Pond Reconnection	Chelan County NRD	General	Off-Channel Habitat	$136,500	$62,000	$0	In Progress
11 White River Van Dusen Conservation Easement	Chelan-Douglas Land Trust	General	Protection	$440,000	$60,000	$0	In Progress
Total				**$11,555,457**	**$2,262,417**	**$1,547,688**	

Current Rock Island Plan Species Account Balance (unallocated): $414,390
Contribution to the Rock Island Account is made annually (January 31): $485,200 (in 1998 dollars)

Rocky Reach Habitat Conservation Plan
Tributary Committee

Rocky Reach Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
05 Entiat Instream Structure Engineering	Cascadia Conservation District	General	Instream Structures	$59,340	$59,340	$48,659	In progress
05 Twisp River Conservation Acquisition	Methow Salmon Recovery Found	General	Protection	$200,835	$40,000	$40,000	Complete
05 Clees Well and Pump	Okanogan Conservation District	General	Instream Flows	$40,875	$15,000	$14,924	Complete
05 Entiat Instream Habitat Improvements	Chelan County NRD	General	Instream Structures	$250,000	$37,500	$37,500	Complete
06 Entiat PUD Canal Juv Habitat Enhancement	Cascadia Conservation District	Small	Instream Structures	$23,640	$23,640	$3,059	Complete
07 LWD Removal & Relocation	Chelan County NRD	Small	Instream Structures	$5,000	$5,000	$871	Complete
07 LWD/Rootwad Acquisition & Transport	Cascadia Conservation District	Small	Instream Structures	$24,600	$24,600	$8,705	Complete
07 Harrison Side Channel	Chelan County NRD	General	Off-Channel Habitat	$797,300	$90,105	$68,647	Complete
08 Entiat PUD Canal Log-Boom Installation	Cascadia Conservation District	Small	Instream Structures	$10,660	$7,160	$4,526	Complete
08 Twisp River Riparian Protection (Buckley)	Methow Conservancy	General	Protection	$299,418	$89,825	$89,825	Complete
08 Below the Bridge	Cascadia Conservation District	General	Instream Structures	$398,998	$150,000	$114,549	In progress
09 Foreman Floodplain Reconnection	Chelan County NRD	General	Off-Channel Habitat	$208,592	$104,296	$0	In progress
09 Entiat NFH Habitat Improvement Project	Cascadia Conservation District	General	Off-Channel Habitat	$285,886	$61,373	$20,028	In progress
10 Methow Subbasin LWD Acquisition & Stockpile	Methow Salmon Recovery Found	Small	Instream Structures	$50,000	$50,000	$48,960	In progress

Rocky Reach Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
11 Chewuch River Permanent Instream Flow Project	TU – Washington Water Project	General	Instream Flow	$1,200,000	$325,000	$0	In Progress
Total				**$3,855,144**	**$1,082,839**	**$500,253**	

Current Rocky Reach Plan Species Account Balance (unallocated): $1,092,017
Contribution to the Rocky Reach Account is made annually (January 31): $229,800 (in 1998 dollars)

Wells Habitat Conservation Plan
Tributary Committee

Wells Plan Species Account

Project Name	Sponsor	Fund Type	Project Type	Total Cost	Tributary Contribution	Tributary Contribution (actual to date)	Project Status
05 Okanagan River Restoration – Phase III	Okanagan Nation Alliance	General	Instream Structures	$219,121	$219,121	$197,681	Complete
05 Methow Riparian Protection (Heath)	Methow Conservancy	General	Protection			$812,700	Complete
05 Methow Riparian Protection (Prentice)	Methow Conservancy	General	Protection	$2,684,500	$1,177,500	$1,749	Complete
05 Methow Riparian Protection (MacDonald)	Methow Conservancy	General	Protection			$345,400	Complete
07 Lower Beaver Creek Livestock Exclusion	Okanogan Conservation District	Small	Riparian Habitat	$24,670	$18,559	$16,561	Complete
07 Heath Floodplain Restoration	Methow Salmon Recovery Found	Small	Off-Channel Habitat	$48,695	$48,695	$43,915	Complete
07 Okanogan River Restoration – Phase IV	Okanagan Nation Alliance	General	Instream Structures	$1,022,000	$411,000	$411,000	Complete
08 Riparian Regeneration & Restoration Initiative	Methow Conservancy	Small	Riparian Habitat	$22,737	$15,537	$15,537	Complete
08 Fort Thurlow Pump Project	Methow Salmon Recovery Found	Small	Instream Flows	$48,150	$7,000	$7,009	Complete
08 Goodman Livestock Exclusion Project	Okanogan Conservation District	Small	Riparian Habitat	$8,080	$7,980	$6,829	Complete
08 Poorman Creek Barrier Removal	Methow Salmon Recovery Found	General	Fish Passage	$191,579	$53,748	$53,748	Complete
08 Twisp River Riparian Protection (Pampanin)	Methow Conservancy	General	Protection	$119,720	$48,649	$48,649	Complete
08 Twisp River Riparian Protection (Neighbor)	Methow Conservancy	General	Protection	$260,000	$55,000	$55,000	Complete
08 Twisp River Riparian Protection (Speir)	Methow Conservancy	General	Protection	$79,976	$23,993	$23,993	Complete

Wells Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
10 Prevent Fish Entrainment on Inkaneep Creek	Okanogan Nation Alliance	Small	Instream Flows	$24,000	$24,000	$0	In Progress
10 Methow River Acquisition MR 39.5 (Hoffman)	Methow Salmon Recovery Found	General	Protection	$195,048	$74,415	$0	In Progress
10 Methow River Acquisition MR 48.7 (Bird)	Methow Salmon Recovery Found	General	Protection	$244,760	$94,900	$0	In Progress
Total				**$5,193,036**	**$2,280,097**	**$2,039,771**	

Current Wells Plan Species Account Balance (unallocated): $723,057
Contribution to the Wells Account will be made annually beginning in 2010: $176,178 (in 1998 dollars)

Attachment 3: Draft Upper Columbia Process Schedule

2011 UPPER COLUMBIA PROCESS SCHEDULE

SRFB/TRIB/BPA

Project Proposal Development, Submittal, and Review

DATE	ACTIVITY/MILESTONE (MEETING/DEADLINE)
FEBRUARY	
11 February	SRFB/TRIB Debrief of 2010
MARCH	
1 March	IT Funding Coordination Meeting
March (TBA)	SRFB/Tributary Fund cycles announced; SRFB Policy Manual available; Regional Process Guide Revisions
APRIL	
April 6	SRFB/TRIB/BPA Kickoff Meeting for the Region; RCO presentation; RTT Technical criteria presentation; CAC criteria presentation
April	Project Sponsors develop projects and pre-proposal (materials available from http://www.ucsrb.com)
MAY	
9 May	**Pre-proposals due (ftp location TBD) –** delivered to RTT, TRIB (via TRIB ftp site) and SRFB Panel Members (via PRISM)
16 May	Conference Call to discuss project tour logistics (RTT, LEs, Trib and UCSRB)
23-26 May	SRFB/TRIB/BPA project tours • 23rd – Okanogan • 24th – Methow • 25th – Wenatchee • 26th – Entiat
JUNE	
8 June	Pre-proposal Presentation Workshop: review pre-proposals with RTT, TRIB and CAC's
9 June	TRIB internal review of pre-proposals
June	Proposal refinement based on technical feedback. Two weeks after visiting projects, the State Technical Review Panel will post comments in SharePoint for lead entities and grant applicants. Grant applicants should update their applications to address any Review Panel concerns and attach their responses to Review Panel comments in PRISM with their application. The Review Panel will "flag" projects that it believes would benefit from additional review at the regional area project meeting.
27 June	**Final project proposals due to LE Coordinators –** delivered to RTT, TRIB (via TRIB ftp site) and RCO (via PRISM)

JULY	
July	SRP discusses "flagged" projects and update the comment form. Panel will meet either in person or conference call to provide full panel feedback on "flagged" projects.
13 July	RTT Meeting: formal project reviews and technical ranking
14 July	TRIB final review of pre-proposals
21 July	Final comments from TRIB will be via e-mail to LE for distribution to project sponsors
AUGUST	
15 August	RTT ratings delivered to LE/TRIB/BPA
1-5 August	Okanogan and Chelan CAC project rankings
10 August	Regional joint CAC approves final combined ranked list
12 August	**LE submits final project applications and deliverables to RCO/SRFB in PRISM**
SEPTEMBER	
September	TRIB supplemental tours of selected projects (project sponsors will be notified in advance of visit)
15 September	Regional organizations submit their recommendations for funding and responses to the information questionnaire
26-29 September	Regional presentations to State Technical Review Panel
OCTOBER	
October	Project Presentations to TRIB (*if needed*)
6 October	Comment forms available from State Technical Review Panel
26 October	Comments due on State Technical Review Panel draft report
NOVEMBER	
November (TBA)	TRIB makes initial internal decisions
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8-9 December	SRFB makes funding decisions
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Acronyms

CAC Citizen's Advisory Committee
BPA Bonneville Power Administration
IT Implementation Team
LE Lead Entity
RCO Recreation and Conservation Office
SRB State Review Panel
SRFB Salmon Recovery Funding Board
TRIB HCP Tributary Committee

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 14 April 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Chris Fisher (Colville Tribes).

Others Present: Casey Baldwin (WDFW) and Becky Gallaher (Tributary Project Coordinator).

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 April 2011 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:

- Update on Christianson Conservation Easement
- Invitation letters to the Umatilla Tribes and American Rivers.
- Introduction to *RiverRAT*.
- Update on Methow M2 site visit.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 10 February 2011 meeting notes with an edit from Casey Baldwin.

III. 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 stated that the Entiat PUD Canal System Conversion Project has used all their allotted funds from the Tributary Committees (Rock Island Plan Species Account). The geotechnical engineer is preparing a final report that summarizes results from the eight test wells. The report will also include identification and evaluation of alternatives, including cost estimates, for possible scenarios that would meet individual landowner needs. The report should be available late spring. Depending on the information contained in the report, Chelan PUD's project manager may be asked to give a short presentation to the Committees.

- Becky reported that there was money left over from the Entiat National Fish Hatchery Habitat Improvement Project. She stated that the sponsor (Cascadia Conservation District) may change the scope of the project, which would require that a new proposal be submitted to the Tributary Committees.
- For the Roaring Creek Flow Enhancement Project, Casey Baldwin stated that he heard that the landowner may not agree to convert his current water withdrawal to a well. Kate Terrell noted that this project included a land swap with the Entiat National Fish Hatchery.

IV. UCSRB Icicle Fund Proposal

Tracy Hillman reported that he received a request from Kathleen Deason with the Upper Columbia Salmon Recovery Board (UCSRB) asking the Committees to write a letter of support for their proposal, which seeks a $150,000 annual revolving conservation grant from the Icicle Fund. According to the proposal, in an effort to manage a $3.5M fund to implement high-priority biological actions in the Recovery Plan, the UCSRB must secure a no-interest revolving loan to cover reimbursable costs submitted to the UCSRB by contractors. The UCSRB submitted a similar proposal to the Tributary Committees in October 2010. At that time, the Committees concluded that the proposal was not fundable for the following reasons:

1. The Tributary Committees cannot accept Small Project Applications for which the total budget exceeds $50,000, including matches.
2. The Tributary Committees are not clear on how they would report to the FERC that they provided a loan using HCP funds.
3. HCP Tributary Funds are held in interest-bearing accounts. The loss of potential interest on the loan was not appealing to the Committees.
4. The Tributary Committees have no means to oversee or control how the money would be used.
5. The Tributary Committees believe that it is the responsibility of BPA (the source of the $3.5M) to provide the monies needed to implement the Upper Columbia Habitat Programmatic.
6. The UCSRB did not provide a compelling reason why their contractors cannot agree to the 15-day reimbursement timeline imposed by BPA, when such a timeline is within the norm of typical business practices.

After much discussion, the Committees decided it would be inappropriate for them to write a letter of support for this proposal. Members stated that it would be more appropriate for the UCSRB to seek letters of support from the different entities on the Tributary Committees. Dale Bambrick noted that Lynn Hatcher is writing a letter of support on behalf of NOAA Fisheries.

V. SRFB and Tributary Committees Grant Process Kickoff Meeting

Becky Gallaher reported that she and Casey Baldwin attended the regional kick-off meeting for the 2011 Salmon Recovery Funding Board (SRFB) and Tributary Committees grant process. The meeting was on Wednesday, 6 April at the Chelan Fire House in Chelan. The purpose of the meeting was to discuss the regional timeline, Process Guide, technical process, and citizen review process and criteria. In addition, participants talked about the pre-application process, budget development tips, and SRFB Policy manuals and application materials.

Based on notes from the "De-Brief" meeting held on 11 February, some sponsors had concerns about the Tributary Committees' feedback on pre-proposal applications. Specifically, some sponsors noted that if the Tributary Committees do not commit funding to a project, it can threaten the SRFB process because of a lack of funding match that arises near the end of the granting process. Some expressed a strong desire to know for sure after the pre-proposal review step whether the Tributary Committees were interested in seeing a full proposal. In addition, some sponsors noted that it would be helpful to at least know the principal concerns or weaknesses of their proposals following the Tributary Committees' review process.

Tracy Hillman stated that the Committees do identify the concerns and weaknesses of pre-proposals. Indeed, letters from the Tributary Committees to the sponsors indicate whether the sponsors should or should not submit a final proposal. To those who are invited to submit a final proposal, the letter specifically states the concerns or weaknesses that need to be addressed. However, the letter does not say whether the final proposal will be accepted for funding if all the concerns are addressed.

Casey Baldwin stated that the sponsors also asked about how much money they should request from the Tributary Committees. Tracy noted that there is no upper limit on the amount that can be requested from the Committees under the General Salmon Habitat Program. Members indicated that it was up to the sponsor to determine how much money they request from the Committees.

Becky noted that there may be about 13 proposals submitted from Okanogan County Lead Entity and 14 from Chelan County Lead Entity. Several of these may be design-only proposals. Nevertheless, the Committees should expect a large number of proposals this year.

Committees members discussed the process by which BPA selects projects that BPA intends to fund or partially fund with the "leftover" targeted solicitation funds. Casey indicated that in 2010, BPA met with the UCSRB (Derek Van Marter) and then BPA identified which projects they would fund. However, because it was the first year, there was no formal process identified in advance. The Committees noted that they would like a representative to be involved in the meeting with BPA and the UCSRB. This is because the Committees may want to fund or partially fund a project that BPA intends to fund. Last year, for example, BPA funded the Committees' portion of some of the top ranked proposals. Lee Carlson noted that the Tribes with Accords should also be involved in those discussions. **Lee indicated that he will speak with Julie Morgan about improving coordination among the funding entities.** Casey indicated that the Region Technical Team (RTT) should also be involved in the meeting. The Committees believe that Casey should represent the RTT in the meeting and another Committee member (whoever is readily available) could represent the Committees.

Tracy reviewed the process schedule with the Committees (see Attachment 1). Tracy noted that the Committees will receive pre-proposals on 9 May. They will review the pre-proposals during their 12 May meeting to decide which projects they would like to visit. Site visits will occur on the week of 23 May. Sponsors will give pre-proposal presentations on 8 June. The Committees will then meet on 9 June to evaluate the pre-proposals. Final proposals are due on 30 June. The Committees will conduct an initial review of the final proposals during their 14 July meeting and determine if supplemental tours of selected projects are necessary. Supplemental tours would occur in September and, if necessary, sponsors would be invited to present their projects to the Committees in October. The Committees would make final funding decisions in November.

Tracy pointed out that the process schedule has the Tributary Committees providing final comments to the Lead Entities on 21 July. It is not clear what this means. The Committees will provide comments on pre-proposals shortly after their June meeting. The Committees do not provide comments on final proposals to sponsors, unless they ask for supplemental site visits or presentations. **Tracy will talk with Derek Van Marter about the meaning of the final comments.**

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in March and April:

   Rock Island Plan Species Account:

   - $29,934.98 to Cascadia Conservation District for the Entiat PUD Canal System Conversion Project. This is the final bill for this project.
   - $1,037.78 to Chelan PUD for Rock Island project administration/coordination during the first quarter, 2011, and the purchase of a new phone for conference calls.
   - $95.50 to Larson Allen for Rock Island project financial management during the first quarter, 2011.

   Rocky Reach Plan Species Account:

   - $1,118.26 to Chelan PUD for Rocky Reach project administration/coordination during the first quarter, 2011, and the purchase of a new phone for conference calls.
   - $95.50 to Larson Allen for Rocky Reach project financial management during the first quarter, 2011.

   Wells Plan Species Account:

   - $323.83 to Chelan PUD for Wells project administration/coordination during the first quarter, 2011.

2. Casey Baldwin gave a brief update on the BNSF Railroad project in Nason Creek. He noted that the Design Team is working on an upstream connection and that the PRCC and Tributary Committees may be appropriate sources for funding the connection. The lower connection may be funded by the Yakama Nation Accord. By including the upstream connection, one can then do NEPA on the entire project, not just the downstream connection. Casey noted that this would benefit the County, because they would only need to work with the BNSF Railroad once. The upper connection (B+) is likely to be a proposal in this year's SRFB/Trib process, so the Committees will be involved in the review.

3. Tracy Hillman stated that Mike Schiewe (Chair of the HCP Coordinating Committees) sent letters to the Confederated Tribes of the Umatilla Indian Reservation and American Rivers inquiring about their interest in participating in a meeting with members of the HCP Coordinating, Hatchery, and Tributary Committees. These parties were involved in negotiating the HCPs, but elected not to sign the HCPs. This is an opportunity for the Committees to provide them with a progress report on implementation, as well as give them an opportunity to ask questions of the Committees members. The two entities were to provide a formal response to the invitation by 7 March. Mike received no responses.

4. Becky Gallaher indicated that members will receive a web link to the Chelan PUD Rocky Reach and Rock Island HCP Annual Reports. The web link is:

http://www.chelanpud.org/9202.html

Douglas PUD will send each member a copy of the Wells HCP Annual Report on a CD.

5. Tracy Hillman shared with the Committees the feedback he received from Julie Grialou with the Methow Conservancy. During the last meeting, the Committees reviewed and approved the Christianson Conservation Acquisition, which was submitted to the Committees by the Methow Conservancy. In the letter to the Conservancy, the Committees asked if the MVID has an easement on the Buckley and Christianson acquisitions. They also asked if they could review a draft stewardship plan for the Buckley/Christianson acquisitions. In an email to Tracy, Julie stated that the MVID has an easement on the Buckley Acquisition, but not the Christianson Acquisition. She also noted that as soon as the stewardship plan is prepared, they will send a draft to the Committees for review.

6. Tracy Hillman introduced the Committees to new tools recently developed by NOAA Fisheries and the U.S. Fish and Wildlife Service for analyzing stream engineering, management, and restoration projects and proposals. The agencies developed a suite of River Restoration Analysis Tool (*RiverRAT*) resources to guide more efficient, consistent, and comprehensive reviews of stream management and restoration projects. The *RiverRAT* Science Document and its Appendices provide a comprehensive synthesis of science behind stream management and restoration project development. The *RiverRAT* tools and supporting science documents are available at the following link:

   http://www.restorationreview.com/

   Tracy recommended that members download and review the science document, which emphasizes the physical processes related to the formation and maintenance of river system habitats. An overview of the document, including the Project Screening Matrix, is appended to these notes as Attachment 2.

   Tracy indicated that the NOAA Science Center, as part of the Federal Columbia River Power System BiOp and Expert Panel Process, will be providing training on *RiverRAT* throughout the Columbia Basin. Tracy asked if the Committees would like to participate in the training. Members indicated that they would like to participate in the training. **Tracy will work with Julie Morgan and the NOAA Science Center to schedule a *RiverRAT* training date.**

7. The Committees discussed the recent RTT visit to the Middle Methow (M2) Reach 1 Habitat Project site. The purpose of the visit was to update the RTT on the process and schedule, present changes to alternatives, familiarize the RTT with the site layout, and receive feedback on alternatives. Although there are reasonable actions proposed for restoring habitat in the reach, there are some that appear to be "over engineered." This is likely a result of risk aversion. The problem with risk aversion in stream restoration schemes is that it commonly leads to over-design, and hence a greater reliance on engineered structures to ensure an acceptable "factor of safety." These projects may impose unnecessary and undesirable constraints on natural channel adjustment and evolution. Case in point is the equally spaced wood structures proposed along the margins of the channel and the proposed backfill along one of the side channels. Members also questioned the effects of removing the existing dam infrastructure on channel erosion and the possibility that bed scour could preclude water from flowing into the side channel. Casey Baldwin indicated that he would ask the engineers about the potential effects of removing the infrastructure on bed scour. He will also discuss the need to place equally spaced log structures along the river margins. The RTT will review

the proposed alternatives during their next meeting (11 May) and provide comments and recommendations to the engineers.

VII. Next Steps

The next meeting of the Tributary Committees is scheduled for Thursday, 12 May at Chelan PUD in Wenatchee. At that time, the Committees will review General Salmon Habitat Program Pre-Proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1: Upper Columbia Process Schedule

2011 UPPER COLUMBIA PROCESS SCHEDULE

SRFB/TRIB/BPA

Project Proposal Development, Submittal, and Review

DATE	ACTIVITY/MILESTONE (MEETING/DEADLINE)
FEBRUARY	
11 February	SRFB/TRIB Debrief of 2010
MARCH	
1 March	IT Funding Coordination Meeting
March (TBA)	SRFB/Tributary Fund cycles announced; SRFB Policy Manual available; Regional Process Guide Revisions
APRIL	
April 6	SRFB/TRIB/BPA Kickoff Meeting for the Region; RCO presentation; RTT Technical criteria presentation; CAC criteria presentation
April	Project Sponsors develop projects and pre-proposal (materials available from http://www.ucsrb.com)
MAY	
9 May	**Pre-proposals due (ftp location TBD) –** delivered to RTT, TRIB (via TRIB ftp site) and SRFB Panel Members (via PRISM)
16 May	Conference Call to discuss project tour logistics (RTT, LEs, Trib and UCSRB)
23-26 May	SRFB/TRIB/BPA project tours • 23rd – Okanogan • 24th – Methow • 25th – Wenatchee • 26th – Entiat
JUNE	
8 June	Pre-proposal Presentation Workshop: review pre-proposals with RTT, TRIB and CAC's
9 June	TRIB internal review of pre-proposals
June	Proposal refinement based on technical feedback. Two weeks after visiting projects, the State Technical Review Panel will post comments in SharePoint for lead entities and grant applicants. Grant applicants should update their applications to address any Review Panel concerns and attach their responses to Review Panel comments in PRISM with their application. The Review Panel will "flag" projects that it believes would benefit from additional review at the regional area project meeting.
30 June	**Final project proposals due to LE Coordinators –** delivered to RTT, TRIB (via TRIB ftp site) and RCO (via PRISM)

JULY	
July	SRP discusses "flagged" projects and update the comment form. Panel will meet either in person or conference call to provide full panel feedback on "flagged" projects.
13 July	RTT Meeting: formal project reviews and technical ranking
14 July	TRIB final review of proposals
21 July	Final comments from TRIB will be via e-mail to LE for distribution to project sponsors
AUGUST	
1-5 August	Okanogan and Chelan CAC project rankings
10 August	Regional joint CAC approves final combined ranked list
12 August	**LE submits final project applications and deliverables to RCO/SRFB in PRISM (early optional date)**
26 August	**LE submits final project applications and deliverables to RCO/SRFB in PRISM (final due date)**
SEPTEMBER	
September	TRIB supplemental tours of selected projects (project sponsors will be notified in advance of visit)
15 September	Regional organizations submit their recommendations for funding and responses to the information questionnaire
26-29 September	Regional presentations to State Technical Review Panel
OCTOBER	
October	Project Presentations to TRIB (*if needed*)
6 October	Comment forms available from State Technical Review Panel
26 October	Comments due on State Technical Review Panel draft report
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Attachment 2: Overview of *RiverRAT*

RiverRAT: SCIENCE BASE AND TOOLS FOR ANALYZING STREAM ENGINEERING, MANAGEMENT, AND RESTORATION PROPOSALS

Tim Beechie, NOAA Fisheries, Seattle, Washington, tim.beechie@noaa.gov;
Janine Castro, US Fish and Wildlife Service, Portland, Oregon, Janine_M_Castro@fws.gov;
Brian Cluer, NOAA Fisheries, Santa Rosa, California, brian.cluer@noaa.gov;
George Pess, NOAA Fisheries, Seattle, Washington, george.pess@noaa.gov;
Conor Shea, US Fish and Wildlife Service, Arcata, California, Conor_Shea@fws.gov;
Peter Skidmore, Skidmore Restoration Consulting, Bozeman, MT, restoringrivers@yahoo.com;
Colin Thorne, Professor, University of Nottingham, UK, colin.thorne@nottingham.ac.uk

Abstract

Stream management activities, even well intentioned restoration efforts, have all too often degraded aquatic ecosystems. Site- and reach-scale habitat improvement projects have become the default solution to many habitat deficiencies and constraints, and are often planned and implemented without proper consideration of their landscape context, process drivers, or geomorphic fitness. Failure to recognize these broader scale concerns may lead to poor project selection and increased potential for project failure.

To address these issues, we developed a suite of River Restoration Analysis Tool (*RiverRAT*) resources to guide more efficient, consistent, and comprehensive reviews of stream management and restoration proposals. Resources help determine the depth of review required, assure that a project proposal is complete, and guide reviewers through a thorough and scientifically sound project review. The *RiverRAT Science Document* and its *Appendices* provide a comprehensive synthesis of science behind stream management and restoration project development. Training is ongoing for federal and state regulatory agency staff throughout western states.

The ultimate, long-term goals of RiverRAT include:

- Enabling consistent, comprehensive, transparent, and documented project reviews;
- facilitating improved project planning and design;
- encouraging projects that are attuned to their watershed and geomorphic context; and
- improving the science and technology of stream restoration and management.

The *RiverRAT* tools, the supporting *Science Document*, and the detailed technical appendices, are available to the public at **www.restorationreview.com**.

BACKGROUND AND NEED

Management of stream corridors spans a wide range of intended outcomes, including reconstruction/renovation of structural assets, channel rehabilitation, stabilization of eroding streambanks, management or diversion of in-stream and flood flows, sediment management, river restoration and habitat enhancement to promote a species or biodiversity, or for mitigation. However, streams are complex and dynamic systems, and projects undertaken with the best of intentions may still cause unintended outcomes that could pose unacceptable risks to fisheries or habitat, either directly or by imposing additional constraints on natural processes. While implementation may result in short-term impacts, alteration of fluvial processes may result in longer-term, and thus more adverse, effects.

Guidelines and manuals do currently exist for the development of specific elements of stream management projects; however their focus is typically on the engineering or design aspects without provision for a watershed process or management context. No accepted standard of guidance exists for stream management projects; hence all guidelines are limited in scope with respect to the specific needs of the reviewing regulatory agencies.

NOAA's National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) (Services[1]), given Endangered Species Act (ESA) and Essential Fish Habitat (EFH) consultation authorities, and review authority under the Fish and Wildlife Coordination Act FWCA), have a responsibility to evaluate river projects funded, authorized, permitted, conducted, or consulted on in any way by the Federal agencies—in essence, any project in a river environment that may have an impact on protected species or the stream processes, habitat, or ecosystem they depend upon. Other federal and state agencies bear similar responsibilities for evaluating proposed stream projects in a range of specific regulatory contexts. All organizations that fund stream projects have an inherent responsibility to evaluate projects and measure their success relative to stated goals and objectives. Our team has identified a specific need for Services staff to review river management projects in the context of both watershed setting and fluvial geomorphic processes. To this end, we have produced *RiverRAT* (River Restoration and Analysis Tool) and a suite of evaluation tools, supporting science, and training that create a solid scientific foundation for a thorough and comprehensive review of river restoration projects, beginning with problem identification, developing goals and objectives, understanding physical and biological processes in relation to project effects, assessing risks to resources and risks of the project, post-project appraisal, and compliance and effectiveness monitoring.

OVERVIEW OF RiverRAT, APPROACH AND PRODUCTS

Our team produced three products: (1) a widely-vetted and peer-reviewed science document that emphasizes the physical processes related to the formation and maintenance of river system habitats, (2) integrated evaluation tools that provide for a transparent review process, including a

[1] "Services" herein refers primarily to NOAA's National Marine Fisheries Service (NMFS) and USFWS as a primary audience, though not intended to be exclusive of state fish and wildlife agencies. Acknowledging that Services employees are largely trained in biological sciences, these resources emphasize understanding of physical processes that influence stream habitat and that are affected by management actions.

project screening matrix, information checklist, and on-line project analysis tool, and (3) training in the use and application of the science document and tools.

The goals of this joint project were to enable project reviewers to:

- Understand the connections between physical processes and aquatic habitat.
- Understand the connection between common management actions, effects, and associated risks to protected species and habitat.
- Understand alternatives that can minimize project-related risks to protected species and habitat.
- Provide science and understanding that promote the design of sustainable projects, resilient to physical processes and changing environmental conditions.
- Document and streamline project review, and foster consistency among project reviewers.
- Promote effective post-project appraisals, leading to more effective future river management.

While an emphasis on salmonid recovery and ESA context in the Pacific Northwest and California is inherent in this NMFS-led effort, the resources and tools have broader utility and could easily be adapted to other agencies jurisdictions, other geographic regions, and specific ecological resources.

RiverRAT Science Document

The *RiverRAT Science Document* begins with a description of three new tools for project review: a project screening matrix to help determine the depth of review a project might require, a project information checklist to help assure that a proposal includes everything necessary for review, and web-based River Restoration and Analysis Tool itself. The bulk of the *Science Document* is then devoted to a synthesis of the integrated science of fluvial geomorphology as it relates to river habitat, starting with physical watershed controls, and progressing through stream processes and channel forms, thus providing a thorough scientific foundation for evaluating the potential impacts of stream projects. The document presents a logical process for the development of engineering or management actions in rivers, including those intended to improve habitat, such as restoration and stabilization projects. In addition, it provides tools for the evaluation of project proposals. Together, the document and tools provide a sound foundation in fluvial geomorphology and its relevance to river habitat so that proposed projects may be thoroughly evaluated in a timely manner with respect to their potential risks to species and habitat.

To facilitate deeper review of project design and analyses, the science document also includes:

Appendix 1: investigative analyses that form the basis for evaluating existing and proposed conditions.

Appendix 2: design approaches and the application of design criteria to development of specific design elements as well as for developing specific monitoring metrics.

Appendix 3: additional management alternatives.

Appendix 4: annotated bibliography of stream management and restoration design guidelines.

The *Science Document* highlights common approaches to stream management (including restoration) that may not account for temporal or spatial variability or may actually constrain natural channel processes. Projects proposed as restoration, stabilization, and/or remediation often include project elements that are site-specific (e.g. 10's to 100's of meters in stream length), in large part because many constraints to aquatic species are identified at this scale. Many projects are unsuccessful because they address local-scale symptoms without understanding the wider causes of habitat loss or degradation, which are often reach or watershed scale problems. Site-specific actions, such as meander reconstruction, the addition of weirs, installation of large wood structures, and biotechnical bank stabilization, have become the default solution to many habitat problems and constraints, yet they are often planned and implemented without consideration of physical processes that may influence their outcomes or the potentially negative impacts of some project elements.

Application of traditional engineering design standards, such as 'factors of safety' biased towards structural stability, affords certain benefits in terms of professional accountability and rigorous analysis, but also simultaneously tends to increase risk aversion. The inherent problem with risk aversion in 'stream restoration' schemes is that it commonly leads to over-design, and hence a greater reliance on engineered structures to ensure an acceptable 'factor of safety'. The resulting projects often impose unnecessary and undesirable constraints on natural channel adjustment and evolution - limiting long-term habitat value and potentially inhibiting habitat creation and maintenance.

To address these issues, the science document and tools facilitate identification and evaluation of the constraints, uncertainties, and risks associated with proposed projects. To this end, the document and tools discuss and encourage project development and review to include:

- Understanding how engineering and management actions affect the physical stream processes operating at varying scales (e.g., site, reach, and watershed).
- Accepting that uncertainty is inherent to all engineering and management actions in rivers with respect to predicting project outcomes and potential risks to physical processes and the habitats and species they sustain.
- Promoting solutions to identified problems that address the root causes at appropriate scales, rather than simply treating the symptoms of the problem at the site-scale.
- Acknowledging that human influences are fundamental components of all ecosystems, at all scales.

While an emphasis on salmonid recovery and ESA context in the Pacific Northwest and California is inherent in this NMFS-led effort, the resources and tools have broader utility and could easily be adapted to other agencies jurisdictions, other geographic regions, and specific ecological resources.

Tools For Project Review

The *Science Document* provides the scientific basis for the *Project Screening Matrix*, the *Project Information Checklist,* and the *River Restoration Analysis Tool (RiverRAT)*. The *Screening Matrix* is intended to assist reviewers in making an initial analysis of the level of potential impact to resource associated with a proposed project, in order that reviewers may match the depth of review to the level of risk posed by the project should it be permitted; it is also intended to help reviewers decide whether the potential for impact is sufficiently high to merit technical assistance from specialists in associated disciplines. The *Project Information Checklist* is used to determine whether the project proposal contains sufficient information to allow Services' staff to conduct a comprehensive review and highlights any missing information. The checklist reporting function makes clear to project proponents exactly what information will be needed for a review to proceed, so that the information can be provided efficiently, thus speeding up the review process. After receiving all pertinent information, reviewers can use *RiverRAT* to conduct a thorough, comprehensive, transparent, and documented project review.

RiverRAT Project Screening Matrix

Effective and efficient review of stream projects begins with a determination of relative project impact potential. Assuming that project review workloads will always outpace review capacity, it is critical that reviewers allot their limited time to the projects that pose the greatest potential impact to resource. The need for staff to use their time efficiently means that effort cannot be expended over-scrutinizing proposals that pose very little risk of impact. Clearly, a balance must be struck through which the possibility of missing a high impact project is properly set against the need to move proposals through the review system efficiently.

Experienced reviewers are generally able to achieve this balance, and hence allocate the appropriate level of effort to each proposal based on their professional judgment; however, the natural tendency for new reviewers is a precautionary approach, thus leading to long review times. Decision deadlines introduce an additional danger that a high-risk proposal will be overlooked without proper analysis. To help reviewers develop and improve their capability to match the intensity and extent of review to the inherent project risk, a screening tool has been developed (Figure 1). While initially intended for new reviewers, we believe that even experienced reviewers may find it helpful to refer to the screening tool to refine their approach and increase consistency. The screening tool is **not** intended as an alternative to professional judgment. Rather, it is intended as a training aid that can be used in developing and refining that professional judgment, for which there is no viable alternative.

The *RiverRAT Project Screening Matrix* is in the form of a 2-axis matrix in which the X-axis represents Stream Response Potential, and the Y-axis represents Project Impact Potential.

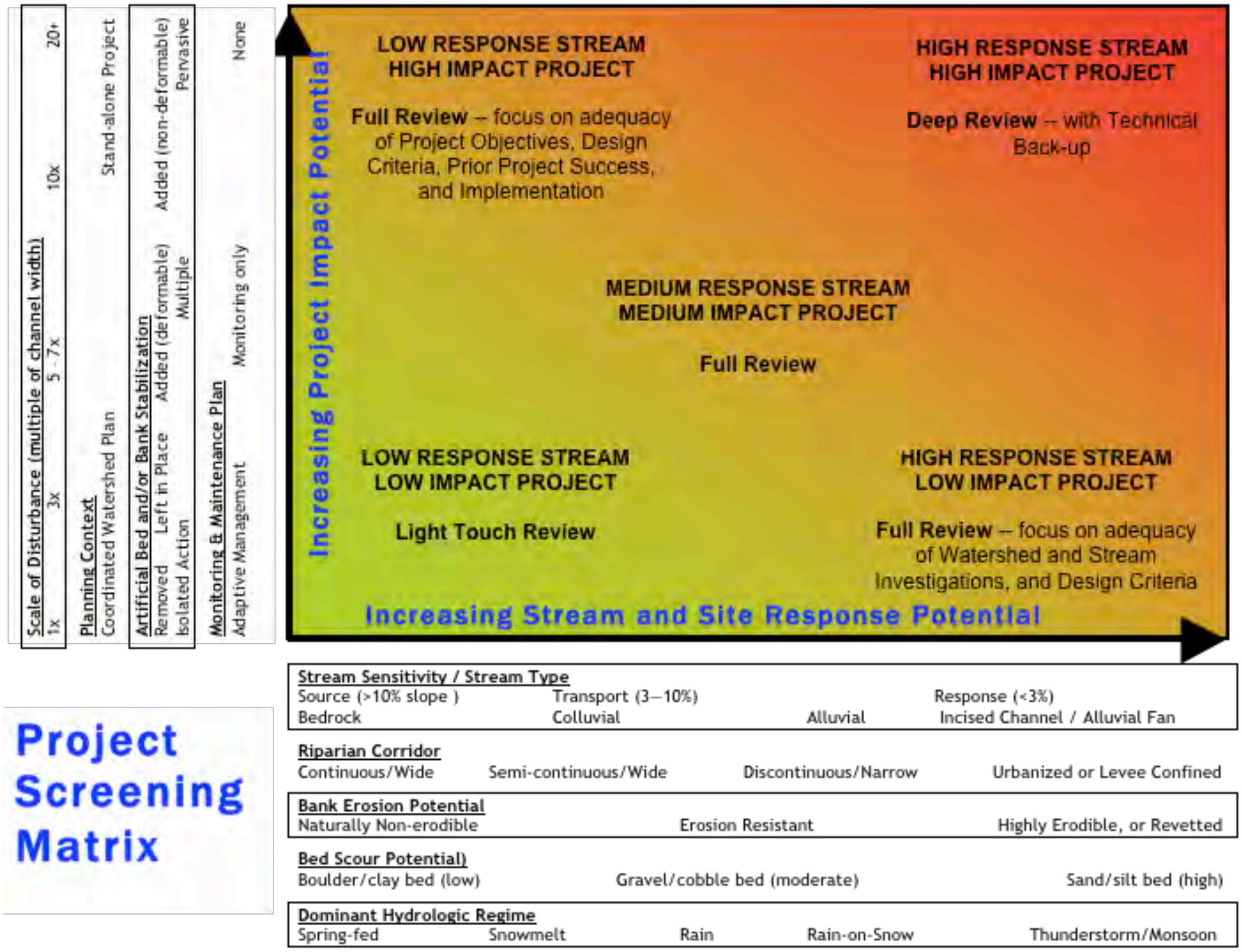

Figure 1. The Project Screening Matrix.

The principle underlying the *Screening Matrix* is that actions and projects should do no lasting harm. Within this principle, reviewers will assess the risk of doing harm to 'resource' within the context of the relevant legislation. For example, in the case of NMFS this will usually center on Section 7 of the Endangered Species Act, and so 'resource' will refer to one or more listed species and their habitat. However, it should be noted that staff with the US Army Corps of Engineers (USACE), who are also operating under Section 404 of the Clean Water Act, would have an expanded definition of 'resource'. The 'resource' in their case is, primarily, water quality in a 'Water of the United States', which is a strictly defined type of water body. USACE staff may also be working under Section 10 of the 1899 Rivers and Harbors Act (as amended), in which case 'resource' would be expanded to include navigability.

The *Screening Matrix* as presented here may be adapted for use by different reviewers/agencies and in different contexts according to their needs. However, it is intended primarily for use by staff with NMFS or the USFWS with emphasis on aquatic species and their habitats.

The ***x-axis*** represents the *stream response potential*, or the inherent sensitivity of the stream and its habitat to natural or anthropogenic disturbance. This axis uses stream attributes, such as gradient, bed and bank material, and localized geomorphic context, to assist reviewers in making an initial assessment of the overall risk to resource stemming from the landscape context, natural system resiliency, and imposed human modifications. Some stream types are naturally sensitive to disturbance, while others may have become sensitized due to land use history and past engineering/management in the river network. The inherent sensitivity of a stream to disturbance depends on numerous factors, but we have narrowed these down to the following five:

1. Landscape setting and associated stream type, such as source, transport, and response reaches;
2. The resilience of the stream system to absorb and adjust to changes in flow and sediment, indicated by floodplain extent and condition of the riparian corridor;
3. The ability for the stream to adjust laterally to changes in flow and sediment as determined by the bank characteristics;
4. The ability for the stream to adjust vertically to changes in flow and sediment as determined by the scour potential of the stream bed; and
5. The frequency and degree of hydrologic disturbance associated with typical hydrologic regimes.

The ***y-axis*** represents *project impact potential*, or the potential for impacts to stream resources and processes associated with the proposed action or project type. Some disturbance to the fluvial system is inevitable when performing actions in or near a stream or undertaking a restoration scheme. This axis, therefore, uses indicators of the project scale, context, cumulative impacts, introduced artificial constraints, and the ability to detect impacts to assist reviewers in making an initial risk assessment of the proposed action or project.

There are numerous risks that stem from project implementation and maintenance, which we have narrowed to four overarching factors:

1. The extent of the proposed disturbance;
2. The watershed planning context, including the quality and scope of planning for the action or project and, particularly, whether the catchment context has been properly established;
3. The degree of artificial lateral and vertical constraints and the capability of the stream to accommodate future changes in the flow and sediment regimes;
4. The level of post-project appraisal and adaptive management to address undesirable morphological responses to the action or project that may impact habitat and species.

The *Screening Matrix* transitions from green in the lower left corner, indicating that a “light touch” project review may be sufficient, to red in the upper right corner indicating that a deep review of the project may be justified or necessary. The matrix indicates an appropriate level of design and review as a function of potential risk to natural resources - it does not mean that a project is either good or bad for habitat. For example, many restoration projects that provide great benefit to habitat and species may also plot in the red zone, due to the level of disturbance necessary to restore or connect valuable habitat.

The axes of the screening matrix presented here purposefully have no scales; similarly, no examples are given of projects that might typify a particular level of impact potential or streams that possess representative levels of response potential. The lack of quantification and examples does not reflect a lack of knowledge or understanding of potential project impact and stream response. Rather, the matrix has not been quantified or populated because there is no cookbook way to assess the risks associated with a proposed action or project *a priori*. Our purpose here is not to tell end-users the answers to difficult questions, but to help them to understand risks and pose the right questions in the first place.

In screening out low risk projects on low risk streams and using the time saved to allow deeper scrutiny of higher risk projects and more sensitive streams, responsibility for balancing expediency against thoroughness rests with the individual making the decisions on a daily basis. In this spirit, the *Screening Matrix* is offered as a training aid with which Services staff who are new to reviewing proposals can quickly and effectively develop and refine their decision making skills. By populating the *Screening Matrix* with their own examples, new reviewers will learn both from more senior colleagues and through their own experience how to recognize project types that pose greater risk to resource, and which streams in their geographical area are more sensitive to disturbance.

Table 1. Selection of treatment based on project impact potential and stream response potential.

Impact & Response Potential	**Level of Review**	**Indicated Treatment**
Low Response Stream Low Impact Project	Light	• Only light review needed • Light touch okay for RiverRAT evaluation

Low Response Stream
High Impact Project
	Full	• Full review needed
		• Particular attention paid to adequacy of:
		  • Project objectives;
		  • Project elements that pose greatest threats;
		  • Design criteria;
		  • Evidence of prior success with similar projects
		  • Implementation plan
		• Since stream risk is low, responses to action may be limited to project and adjacent reaches
		• Lighter touch okay for evaluating wider watershed and stream channel contexts and implications of proposed work

Medium Response Stream Medium Impact Project	Full	• Full review needed • Careful application of RiverRAT recommended

High Response Stream
Low Impact Project
	Full	• Full review needed
		• Particular attention paid to adequacy of:
		  • Watershed and stream investigations;
		  • Design criteria related to preventing project impacts on greater fluvial system;
		  • Plans for post-project monitoring and adaptive management to limit unforeseen impacts within project reach

High Response Stream High Impact Project	Deep	• Full extensive review needed • Proposals may be complicated or groundbreaking, requiring backup from subject specialists to deal with challenging technical aspects • Reviewers should not hesitate to seek assistance where necessary

RiverRAT Project Information Checklist

The *RiverRAT Project Information Checklist* (Figure 2) queries the user regarding information sufficiency and applicability. The user is encouraged to enter comments and print the results, which can be filed for documentation of the review, or shared with a project applicant if appropriate.

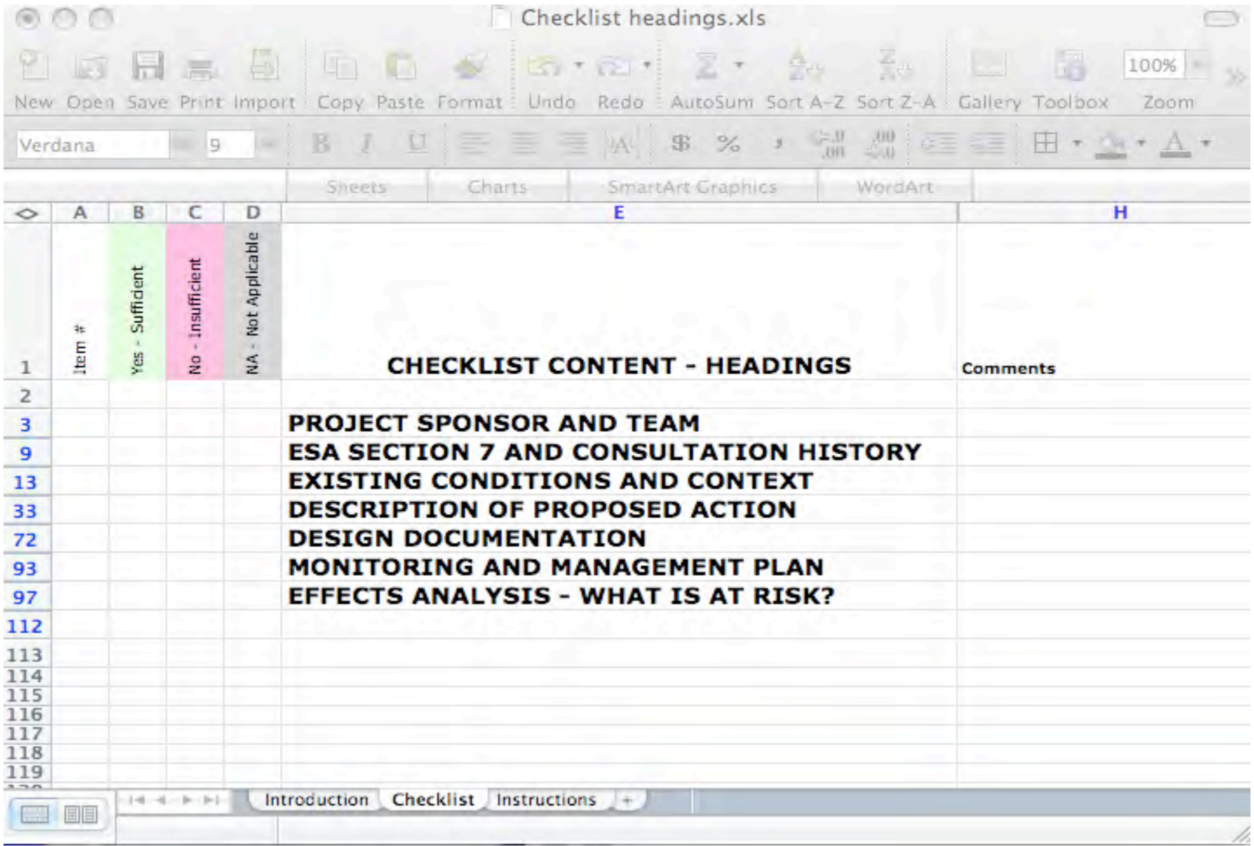

Figure 2. The major information categories in the *Project Information Checklist*.

The *Project Information Checklist* is a comprehensive list of all information that a project proposal could contain for a thorough review by Services' staff and has been developed for use as a template for a Biological Assessment (BA), thus providing a consistent model for the organization and content of a complete BA. The primary purpose of the *Checklist* is to determine if there is sufficient information provided to facilitate the use of *RiverRAT*. However, it may also be used to determine if there is sufficient information to conduct a pre-consultation or pre-application review, or it may be employed during or after evaluation to ensure that the review process has been properly completed.

An excerpt of the detailed questions is provided in Figure 3. By providing all information suggested in the checklist, a project team can avoid delays during the review process, and a reviewer can be reasonably assured that a project team has put in the effort required to develop a well-thought-out project that encompasses appropriate spatial and temporal scales, landscape context, risk, design approach, and adaptive management. Ideally, use of the checklist by both project developers and reviewers will promote time and resource efficiency and will make the review and consultation process more transparent to both parties.

DESIGN DOCUMENTATION

	Y	N	NA	
	Y	**N**	**NA**	***Design team***
57	☐	☐	☐	Name and titles of firms and individuals responsible for design.
58	☐	☐	☐	List of project elements that have been designed by a licensed Professional Engineer.
	Y	**N**	**NA**	***Hydrologic analysis***
59	☐	☐	☐	Description of historic, ongoing, or anticipated impacts to basin hydrologic regime.
60	☐	☐	☐	Summary of hydrologic analyses conducted, including data sources and period of record.
61	☐	☐	☐	List design discharge (Q) and return interval (RI) for each design element.
	Y	**N**	**NA**	***Sediment transport and dynamics analysis***
62	☐	☐	☐	Description of previous or anticipated impacts to basin or reach sediment supply.
63	☐	☐	☐	Summary of sediment supply and transport analyses conducted, including data sources.
64	☐	☐	☐	Describe sediment size gradation used in streambed design.
	Y	**N**	**NA**	***Hydraulic analysis***
65	☐	☐	☐	Summary of hydraulic modeling or analyses conducted and data source.
66	☐	☐	☐	Inundation map for design and flood flows before and after implementation.
	Y	**N**	**NA**	***Vegetation design***
67	☐	☐	☐	Species list, materials sources, and plant form.
68	☐	☐	☐	Planting plan map (distribution and density by species) and irrigation plan.
	Y	**N**	**NA**	***Soils and geotechnical analysis***
69	☐	☐	☐	Summary of geotechnical analyses including stratigraphy and grain size of materials.
70	☐	☐	☐	Groundwater elevation, flow direction and seasonality within floodplain and banks.

Figure 3. An example of details in the *Checklist*, under the design documentation section.

The Project Analysis Tool – *RiverRAT*

RiverRAT is an on-line framework for project evaluation that guides reviewers through a thorough review of a project proposal (Figure 4). The entire project development process is addressed, beginning with problem identification in the planning stages, progressing through the design phase, and culminating with project monitoring. While *RiverRAT* is geared toward answering the question of "what are the potential impacts and risks to resource", it also enables a review of project and design integrity with respect to species or ecosystem recovery. In an ESA context, *RiverRAT* can be used during pre-consultation, in preparation of a Biological Assessment, or in effects analysis for a Biological Opinion. In a FWCA context, *RiverRAT* can also be used for pre-application discussions or evaluation of potential project impacts to the Services trust resources. Access to *RiverRAT* by project sponsors, stakeholders, and specialists will give them insight regarding the review process and will guide them to developing project proposal documents that are both more informative and better tuned to the needs of the Services' staff who must review the proposal.

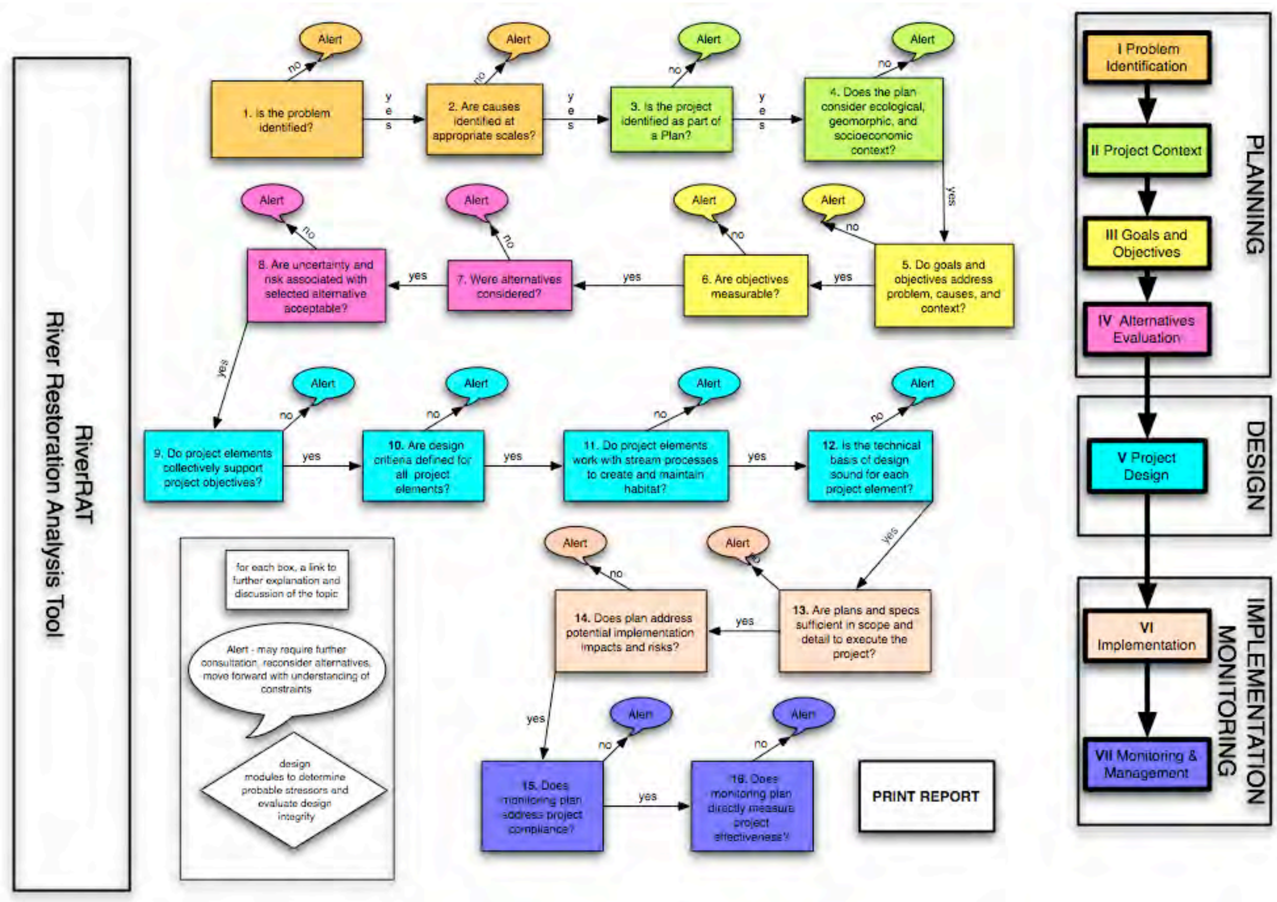

Figure 4. The *RiverRAT* framework.

RiverRAT provides a framework and links to additional technical resources and assistance that may be needed to support in-depth and detailed scientifically based and objective treatment that is justified for projects that carry a high risk to resource. The *RiverRAT* homepage (Figure 5) also provides access to the *Science Document*, its supporting *Appendices*, the *Screening Matrix*, and the *Project Information Checklist*, all anonymously. To gain access to *RiverRAT* through the webpage requires a login with a username and password that are obtained by request via email.

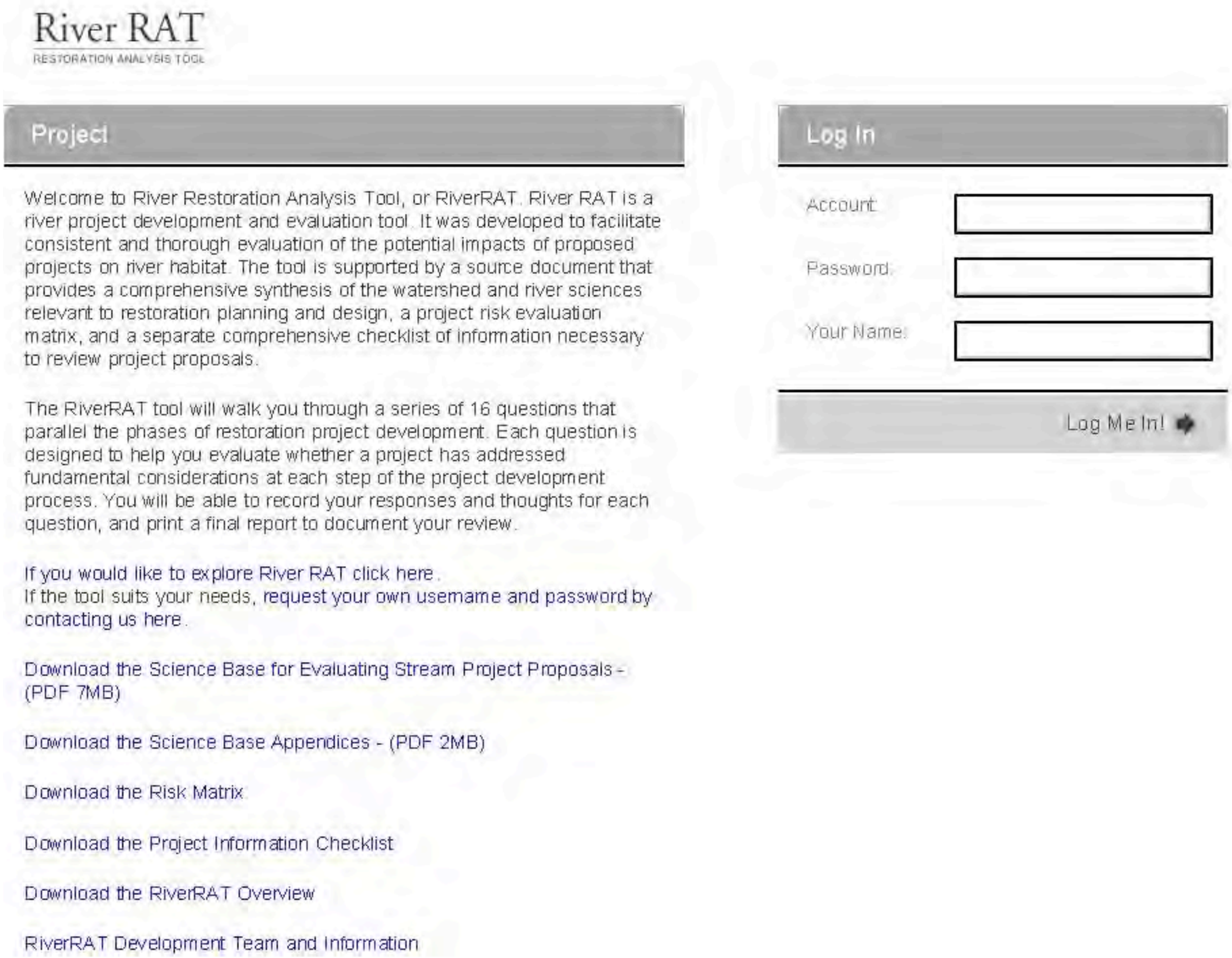

Figure 5. The *RiverRAT* homepage at restorationreview.com.

Once logged in, a user must enter a project name, which can be unique or shared with other users in collaboration. The review tool then steps the user through a series of questions in *yes/no* format. *RiverRAT* is multi-layered in its supporting information to help the user thoroughly evaluate each question in the proper context. Clicking '*need more information'* provides excerpts from the *Science Document* that support the need for the information as well as a reference to the actual supporting document where the topic is thoroughly discussed (Figure 6).

We have found from experience that users gain the most from this evaluation tool by using its reporting capability, which is accomplished by entering comprehensive notes to support answers to the questions. The review session may be saved and accessed later, while the notes are date stamped and user identified. A coordinated review can also be shared with collaborators for a panel of reviews. If used collaboratively, the notes of each user are identified so that each user can view their collaborators responses. Reporting the review and comments is in standard text format for use in any word processor.

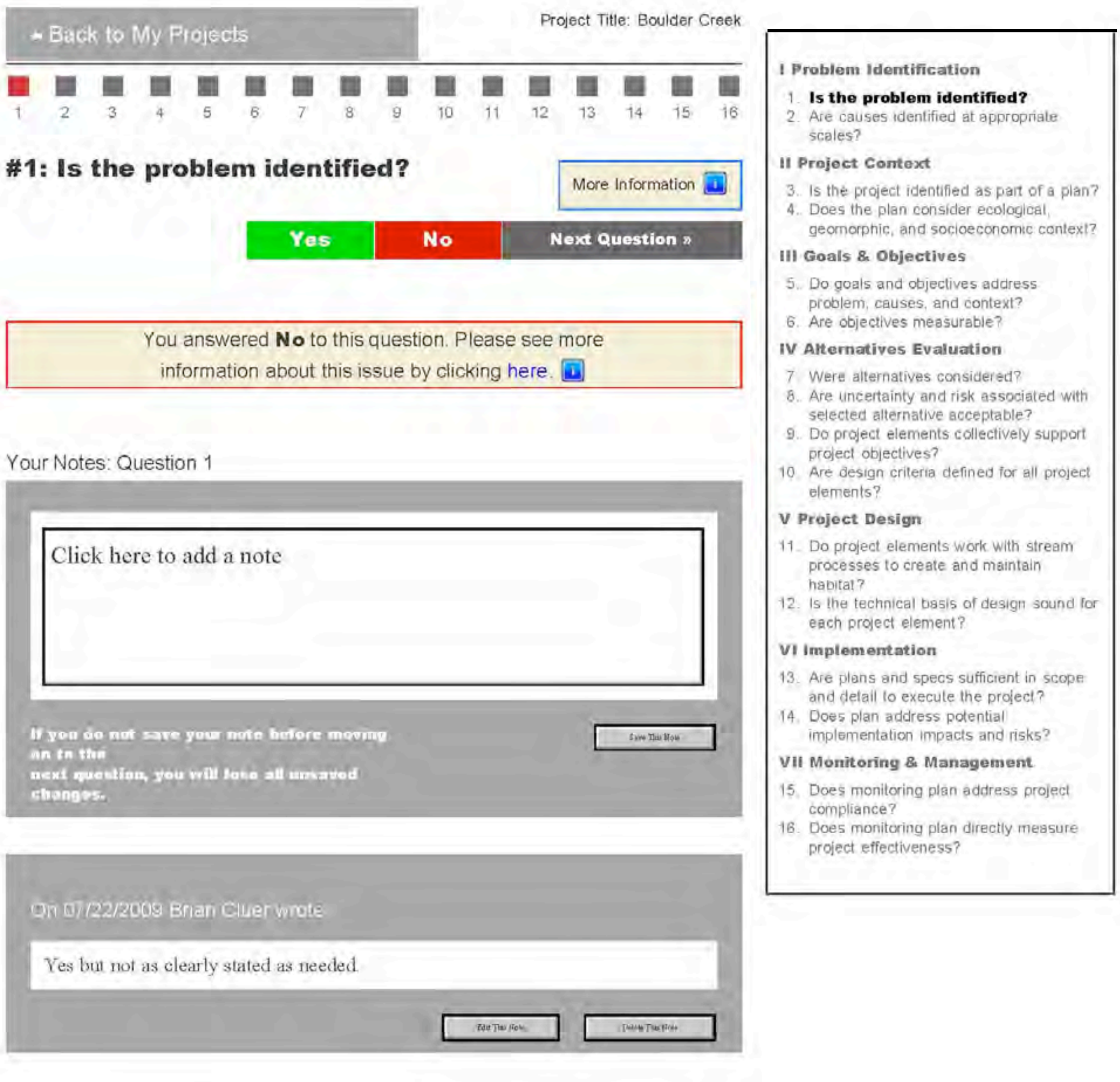

Figure 6. Example of *RiverRAT* structure and function. Each button links to additional information such as what supports a yes or no response, and more information to educate the user in the importance of the question being asked.

SUMMARY

Our Team produced a suite of tools, supported by scientific synthesis, for analyzing river management projects and proposals, including restoration works; collectively called *RiverRAT*. The River Restoration Analysis Tool—and suite of supporting tools and documents enable project reviewers to understand: (1) the connections between physical processes and aquatic habitat, (2) the connection between common management actions, effects, and associated risks to protected species and habitat, and (3) alternatives that can minimize project-related risks to protected species and habitat. Our aim was to provide science and understanding that promote the design of sustainable river management projects, resilient to physical processes and changing environmental conditions. Utilizing the products can aid documentation and streamline project review, foster consistency among project reviewers, and promote effective post-project appraisals, leading to more effective future river management.

RiverRAT and its supporting tools, the *Screening Matrix* and the *Project Information Checklist,* have a common set of information needs and are coordinated so that information is considered in the same sequence; the sequence proceeds in a logical order in which information is considered in general project development. The three tools help determine the depth of review required, assure that a project proposal is complete, and guide reviewers through a thorough and scientifically sound project review. The tools are coordinated with the *RiverRAT Science Document* — the scientific underpinning of the tools — which includes a synthesis of fluvial geomorphology from physical watershed controls to stream processes and channel forms, as well as a synthesis of the project design process from problem identification through project design and post-project appraisal. Utilizing these tools can improve review consistency and transparency, and we believe that there can be a feedback with project development to improve project designs, and most importantly, place problems and solutions in context with physical process drivers and geomorphic controls on aquatic habitat creation and maintenance.

ACKNOWLEDGMENTS

A team of NMFS and USFWS staff, together with their contractors, developed the products described in this paper. In addition to the principal author team, a panel of experts was convened in December of 2007 for brainstorming the project and giving guidance; and who later reviewed drafts of the document. The expert review panel included William Dietrich, University of California Berkeley, Peter Downs, Stillwater Sciences, Matt Kondolf, University of California Berkeley, Greg Koonce, InterFluve, Inc., and Douglas Shields, USDA-ARS National Sedimentation Laboratory. Additionally, interviews with Services managers, and workshops with over 50 potential end users from a wide range state and federal resource agencies were conducted to solicit input, guidance, and feedback on draft products.

For more information and access to the *RiverRAT Science Document, Appendices,* and the associated *tools* discussed in this paper, please refer to **www.restorationreview.com**.

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 12 May 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Lee Carlson (Yakama Nation)[1].

Others Present: Casey Baldwin (WDFW) and Becky Gallaher (Tributary Project Coordinator). The Committees joined the Priest Rapids Coordinating Committee Habitat Subcommittee at 1:00 pm. Those present included Dave Duvall (Grant PUD), Jeff Osborn (Chelan PUD), Denny Rohr (PRCC Habitat Subcommittee facilitator), Mike Kane (Chelan County NRD), Steve Kolk (US Bureau of Reclamation), Mary Jo Sanborn (Chelan County NRD), John Soden (ICF International), and Mike Kaputa (Chelan County NRD).

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, 12 May 2011 from 9:00 am to 2:45 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following additions:

- Review Risley Acquisition Proposal.
- Update on the Nutrient Enhancement Project.
- Update on oil spill at Wells Dam.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 14 April 2011 meeting notes with edits from Kate Terrell, Tom Kahler, and Casey Baldwin.

III. 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.

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[1] Lee Carlson voted on decision items following the meeting.

- Becky stated that the Entiat PUD Canal System Conversion Project has used their allotted funds from the Tributary Committees (Rock Island Plan Species Account). The Committees should receive a final report soon.
- For the Lower Wenatchee Instream Flow Enhancement Project, Becky said that the sponsor has completed the 75% pressurized pump designs and anticipates that the 90% designs will be completed by August. The sponsor has initiated the permitting process and will submit permits by 31 May 2011. Construction has been delayed one year because the sponsor is still trying to secure the remaining 20% of the funding. The plan is to begin construction on the new point of diversion in the summer of 2012. Pipe will be installed following the 2012 irrigation season.
- For the Roaring Creek Flow Enhancement Project, Becky stated that the feedback she is receiving from Cascadia Conservation District is not up-to-date. The updates she receives are about activities that happened 2-3 months ago. She will try to get more recent and accurate updates from the sponsor.
- For the Twisp River Riparian Protection Project (Zinn Property), the sponsor is working with the US Forest Service to facilitate a land trade that will result in an easement configuration that is acceptable to the landowner. The Forest Service is working with their appraisers to come up with a final configuration that will result in an equal value trade.
- Becky indicated that for the Mission Creek Fish Passage Project, an archaeologist is conducting cultural resource surveys. Two of the five sites have been surveyed.
- For the Christianson Conservation Acquisition, the landowner has signed the purchase and sale agreement.
- Becky reported that work is continuing on the Assessing Nutrient Enhancement Project. Tracy Hillman announced that Jason Lundgren, Cascade Columbia Fisheries Enhancement Group, is trying to coordinate a Nutrient Enhancement Stakeholder Meeting for mid-June. The purpose of the meeting is to report initial findings from the feasibility investigation and to identify agency interest and roles in nutrient enhancement. Tracy will forward the doodle pole to the Committees members.
- Becky stated that she received an e-mail from Cascadia Conservation District requesting a change in Scope-of-Work for the Entiat National Fish Hatchery Habitat Improvement Project. The sponsor is proposing to expand riparian and floodplain restoration actions. The actions would include removing about four inches of weed-infested soil and replacing it with 2,000 cubic yards of weed-free sandy loam soil and 600 yards of compost. The "new" soil would be planted with native vegetation and irrigated for two-three growing seasons. The projected cost of the additional work is $54,500, which falls within their existing budget with the SRFB and Tributary Committees. Thus, they are not asking for any additional funds. The SRFB has already approved the revised Scope-of-Work. ***The Rocky Reach Tributary Committee approved the change in Scope-of-Work with no cost increase.***

IV. Methow River Acquisition 2010 MR 41.5 LR (Risley) Proposal

Under the 2010 GSHP solicitation, the Methow Salmon Recovery Foundation requested funding for the Methow River Acquisition 2010 MR 41.5 LR (Risley) Project. The purpose of the project was to acquire about 20 acres along the middle Methow River near RM 41.5. The proposed acquisition included about 13.5 acres of floodplain and riparian habitat, and about 1,500 ft of riverbank. The total cost of the project was $238,760. The sponsor requested $122,404 from HCP Tributary Funds. The Tributary Committees elected not to fund the project because they did not want to fund the upland component of the acquisition. The Committees stated that they would consider funding the project if the upland parcel was removed from the proposal.

The landowner has since agreed to separate the parcels. Therefore, the Methow Salmon Recovery Foundation submitted a revised proposal (letter) requesting funding from the Tributary Committees for the 13.5-acre floodplain/riparian parcel. The total cost of the parcel is $136,353.92. The sponsor requested $31,853.92 from HCP Tributary Funds. ***The Wells Committee approved funding for this project.***

V. Preliminary Review of General Salmon Habitat Program Pre-Proposals

The Committees received 27 General Salmon Habitat Program pre-proposals. The Committees conducted a preliminary review of the pre-proposals with the intent of identifying which projects the Committees would like to visit in the field. In addition, the Committees identified pre-proposals that would have no chance or a low likelihood of receiving funding from the Tributary Committees. The following table summarizes preliminary reviews.

Project Title	Sponsor	General Comments[1]
Entiat Watershed Riparian Restoration Planting Program	Cascadia Conservation District	No site visit necessary.
Nutrient Enhancement Planning – Upper Wenatchee Tributaries	Cascade Columbia Fisheries Enhancement Group	No site visit necessary.
Wolf Creek Ditch and Fish Return Improvement	Cascade Columbia Fisheries Enhancement Group	Yes, visit site.
Driscoll Island Cold Water Refuge	Cascade Columbia Fisheries Enhancement Group	No site visit necessary.
Large Wood Atonement in the White River	Cascade Columbia Fisheries Enhancement Group	No site visit necessary.
Entiat River Stormy Reach Acquisition Phase 2	Chelan-Douglas Land Trust	No site visit necessary.
Nason Creek Lower White Pine Ponds and Flats Acquisition	Chelan-Douglas Land Trust	No site visit necessary.
White River Sears Creek Phase 2 Conservation Easement	Chelan-Douglas Land Trust	No site visit necessary.
Pioneer Side Channel Restoration Project	Chelan County Natural Resources Department	No site visit necessary. The project has a low likelihood of receiving funding from the Tributary Committees. This project is out of sequence. The actions proposed for the side channel cannot proceed until the Lower Wenatchee Instream Flow Enhancement Project is fully implemented, which may be out several years.

Project Title	Sponsor	General Comments[1]
Peshastin Forest Service Road System Improvement	Chelan County Natural Resources Department	No site visit necessary. The project has no chance of receiving funding from the Tributary Committees. The scope of the current pre-proposal is too nebulous and the actions insufficiently specific for the Committees to evaluate whether or not funding would fulfill the objectives of the HCP Tributary Conservation Plans. Additionally, the pre-proposal is out of sequence; the USFS is currently going through a planning process, which should generate a road plan. Once the road plan is complete, the Committees would entertain a proposal on specific road improvement projects. However, the USFS is responsible for management of their road system and there are other funding sources more directly applicable to rectifying the inadequacies of forest roads.
Mill Creek/Mountain Home Ranch Road Fish Passage	Chelan County Natural Resources Department	Yes, visit site.
Old Peshastin Mill Riparian Enhancement Project	Chelan County Natural Resources Department	No site visit necessary. The project has no chance of receiving funding from the Tributary Committees. The Committees generally believe that restoration of riparian habitat is beneficial; however, in this case, the Committees believe this project will have very little biological benefit. The narrow buffer strip will provide little if any canopy cover (note the aspect of the river bank), little bank stability, and little LWD recruitment to the river.
Nason Creek, Lower White Pine, Coulter Creek Barrier Replacements	Chelan County Natural Resources Department	Yes, visit site.
Wenatchee Watershed Riparian Prioritization	Chelan County Natural Resources Department	No site visit necessary. The project has no chance of receiving funding from the Tributary Committees. The Committees are not interested in funding a project to identify and prioritize potential riparian enhancement projects. On the other hand, once riparian areas have been identified for restoration, the Committees would entertain specific project proposals.
Lower Wenatchee Agricultural Riparian Pilot Project	Chelan County Natural Resources Department	No site visit necessary. The project has no chance of receiving funding from the Tributary Committees. The Committees are not interested in funding a pilot project to develop demonstration projects for the establishment of riparian buffer strips. The sponsor should check with WSU to see if they would be willing to provide a cost share for this project.

Project Title	Sponsor	General Comments[1]
Upper Chumstick Barrier Removal	Chelan County Natural Resources Department	No site visit necessary. The project has a low likelihood of receiving funding from the Tributary Committees. The potential benefit from this project is small compared to its cost. The Committees are familiar with other more complicated road-crossing projects that were completed for a fraction of the budget presented in this pre-proposal. The Committees would be willing to review a full proposal if the project includes more cost-effective solutions for correcting these partial barriers. Making this change to the proposal does not guarantee that the Committees will fund it.
Nason Creek LWP Reconnection – B+ Connection Construction	Chelan County Natural Resources Department	Yes, visit site. The project has a low likelihood of receiving funding from the Tributary Committees. Although the Committees believe that this project would benefit listed fish species, there is currently not enough money available in the Rock Island and Rocky Reach accounts to fund this project as currently proposed. Therefore, if the sponsor intends to seek funding from the Tributary Committees, they need to significantly reduce the amount they are requesting from Tributary Funds. The Committees believe the bulk of this project should be funded by SRFB and BPA.
Wenatchee Watershed Knotweed Control and Riparian Restoration	Chelan County Noxious Weed Board	No site visit necessary. The project has no chance of receiving funding from the Tributary Committees. The Committees are not interested in funding a knotweed removal project. The sponsor should check with WSU to see if they would be willing to provide a cost share for this project.
Methow River Acquisition 2011 RM 48.9	Methow Salmon Recovery Foundation	No site visit necessary.
Twisp River Acquisition 2011 RM 0.9	Methow Salmon Recovery Foundation	No site visit necessary. The Committees recommend the removal of Parcel #2 from the proposal.
M2 Large Wood Stockpile	Methow Salmon Recovery Foundation	No site visit necessary. The project has a low likelihood of receiving funding from the Tributary Committees. The Committees are not interested in funding this large wood stockpile project. Because this wood will be used in the M2 reach, the Committees believe that this work should be included in the BPA targeted solicitation.
Fulton Ditch Instream Flow Enhancements (Methow Basin)	Trout Unlimited	No site visit necessary. The Committees recommend that more alternatives be developed to seek a more cost-

Project Title	Sponsor	General Comments[1]
		effective project. Additionally, the project should include securing the water right for instream purposes.
Upper Methow Riparian Protection V (Ege)	Methow Conservancy	Yes, visit site.
Upper Methow Riparian Protection IV (Keith)	Methow Conservancy	Yes, visit site.
Silver Protection	WDFW	Yes, visit site.
Bridge 1 Riparian	WDFW	No site visit necessary. The sponsor needs to remove the uplands from the proposal. The sponsor should consider the Sport Fishing Fund as a possible funding source.
Okanogan River Basin Fish Screen Replacements	Okanogan Conservation District	No site visit necessary.

[1] Comments do not reflect all the discussions that occurred on each project.

Project tours are scheduled for the week of 23 May. Becky Gallaher, Casey Baldwin, and Tracy Hillman will participate on the conference call on Monday, 16 May, to coordinate the project tours. To accommodate members' schedules, the Committees recommend that the tours occur on Wednesday (Wenatchee) and Thursday (Methow). Sponsors will give presentations to the Tributary Committees and RTT on Wednesday, 8 June. The Committees will then meet on Thursday, 9 June to conduct their final evaluation of pre-proposals.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in April and May:

   Rock Island Plan Species Account:

   - $498.03 to Cascadia Conservation District for administration on the Entiat PUD Canal System Conversion Project. This is the final bill for this project.

   Rocky Reach Plan Species Account:

   - $40.00 to Cascadia Conservation District for project materials on the Entiat National Fish Hatchery Habitat Improvement Project.

2. Tracy Hillman stated that he spoke with Julie Morgan (UCSRB Executive Director) about the Committees involvement (representation) in the meeting with BPA and the UCSRB on funding coordination. Julie appreciated the fact that the Committees want to be involved and proposed that the Committees host and chair the meeting. The first coordination meeting would likely occur in late July. Another meeting would likely occur in the fall. The funding coordination meetings would involve the UCSRB, BPA, RTT, Tributary Committees, and the Tribes with Accords. The Committees agreed to host and chair the meetings.

3. Becky Gallaher talked about possible liability concerns in the Upper Columbia, including the concerns that landowners and state agencies have with long-term liability for effects from voluntarily engaging in habitat restoration activities. The concern includes the

potential effects to downstream landowners and consequential loss of property. The UCSRB is currently investigating immunity for landowners and agencies (including the PUDs and other funding entities) from liability for damages resulting from habitat or water quality improvement projects.

VII. Nason Creek LWP Presentation and Discussion

The Committees met with the PRCC Habitat Subcommittee to hear a presentation by Chelan County and ICF International on the Nason Creek Lower White Pine Project (the presentation is appended to these notes as Attachment 1). The focus of the presentation was on the upstream reconnection (B+ Connection). It was reported that the Yakama Nation will fund the downstream connection; a proposal was submitted to the SRFB and Tributary Committees for funding the upstream (B+) connection. Chelan County also provided members with a Draft Alternatives Evaluation Report. The current proposed cost for the upstream reconnection is $2,162,290, which includes a bridge replacement fee of $800,000 and a bridge maintenance fee of $100,000. The County indicated that they are still negotiating these fees with the Railroad.

VIII. Next Steps

The next meeting of the Tributary Committees is scheduled for Thursday, 9 June at Chelan PUD in Wenatchee. At that time, the Committees will conduct their final review of General Salmon Habitat Program Pre-Proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1: Nason Creek LWP Reconnection Project (B+ Connection) Presentation

Attachment 1: Nason Creek LWP Reconnection Project (B+ Connection) Presentation

BNSF Railways- Nason Creek LWP Reconnection Project
B+ Connection
PRCC Meeting – May 12, 2011 Wenatchee, WA

Overview

Timeline

- 2008 -2011 Coordination w BNSF; Alternatives Analysis
- Summer 2011 – B+ Conceptual and 30% Design both sites
- Summer 2011 – Construction Funding Decision for B+
- Fall 2011 – Begin Project Permitting
- Spring 2012 – Final Design Complete

Project Participants

Project Sponsor
- Chelan County NRD

Technical Lead
- Bureau of Reclamation

Primary Landowners
- BNSF
- Yakama Nation
- US Forest Service
- Private landowners

Coordination/Funding
- Reclamation
- Yakama Nation
- BPA
- PRCC/SRFB

Design Team
- Chelan County NRD
- Reclamation
- Yakama Nation
- US Forest Service
- US Fish and Wildlife Service
- WA Dept. of Fish and Wildlife
- Colville Confederated Tribes
- Grant PUD
- CDLT
- RTT
- UCSRB
- BPA

Project Background

Nason Creek: Highest priority Category 2 watershed in the Wenatchee Basin (Biological Strategy)

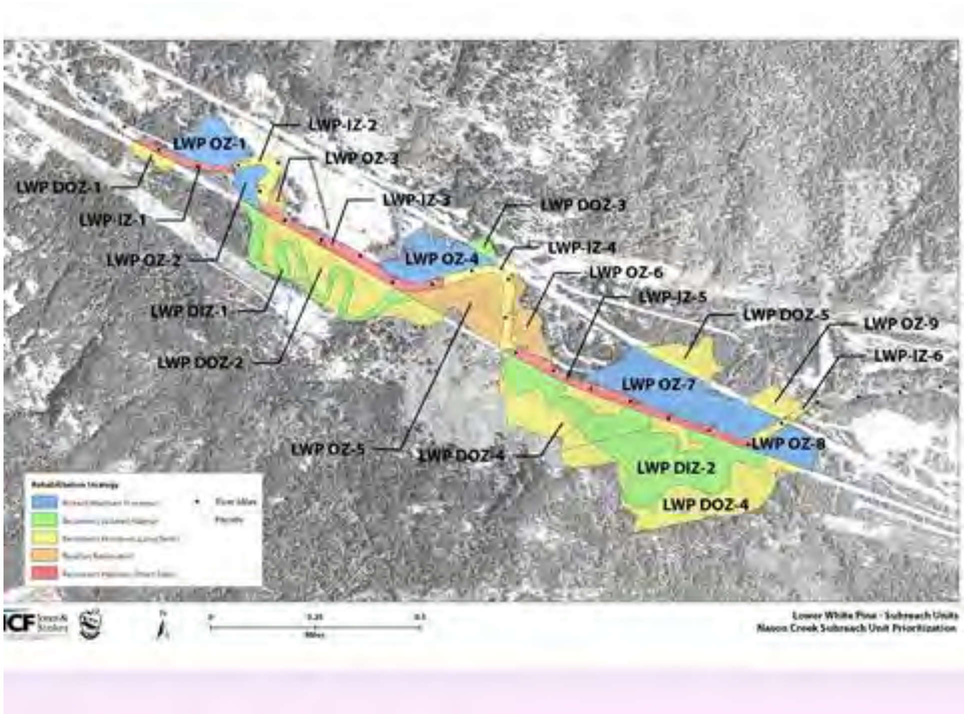
RTT Prioritization 2009: #1 Nason Cr. restore natural channel processes

Nason Tributary and Reach Assessments (USBR 2008 & 2009)

- Identified potential project sites in the Upper and Lower White Pine and Kahler Reaches.

Nason Prioritization (CCNRD -June 2009):

- **Reconnect Isolated Habitat** (Step 1 in Prioritization)
  1. LWP DIZ-1
  2. UWP DIZ-1*
  3. LWP DIZ-2



Project Goals

Guidance provided by the Design Team April 2010:

Reconnect natural channel processes

Maximize biological benefit through addressing biological limiting factors.

- Increase off-channel habitat for juvenile salmonids targeting high-flow refugia and over-wintering habitat.
- Increase floodplain connectivity and capacity.
- Reconnect the Coulter, Roaring, and Gill creek basins to Nason Creek.

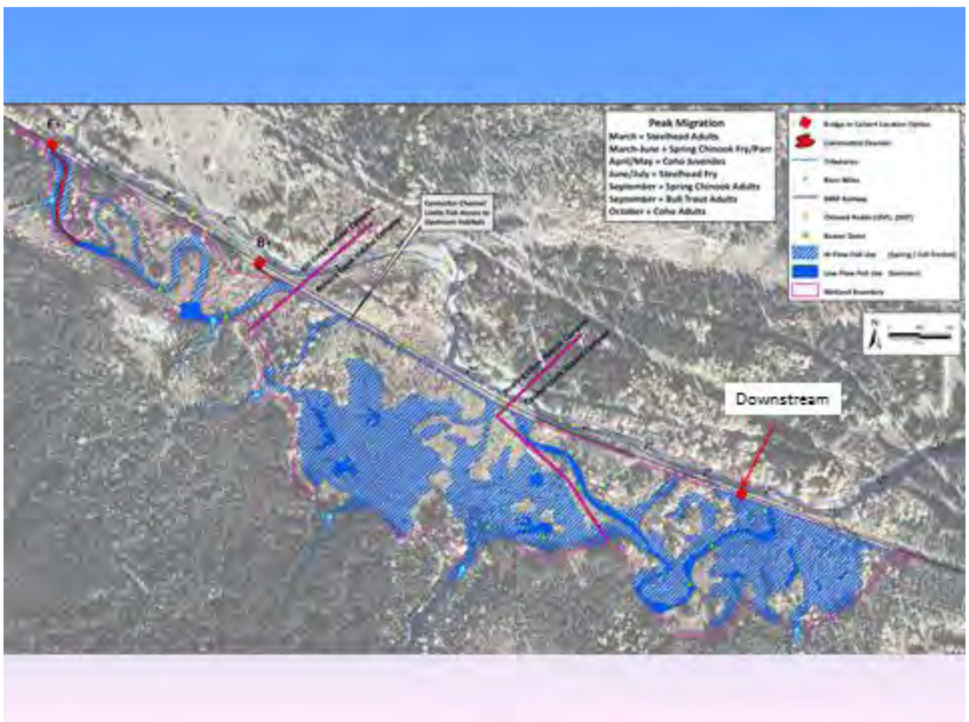
Primary Constraints

BNSF Requirements

- Construction must not interfere with rail traffic
- Parallel structures must be constructed to accommodate potential future line expansion.
- Must provide permanent access to each new structure.
- No structures placed under or within 50' of BPA transmission lines.

Landowners

- Must maintain summer flows in Nason Creek for creekside properties.
- Maintain existing groundwater/wells.
- Maintain existing wetland conditions*.
- Do not increase flood or erosion risks to private property.
- Maintain existing landowner use and access.

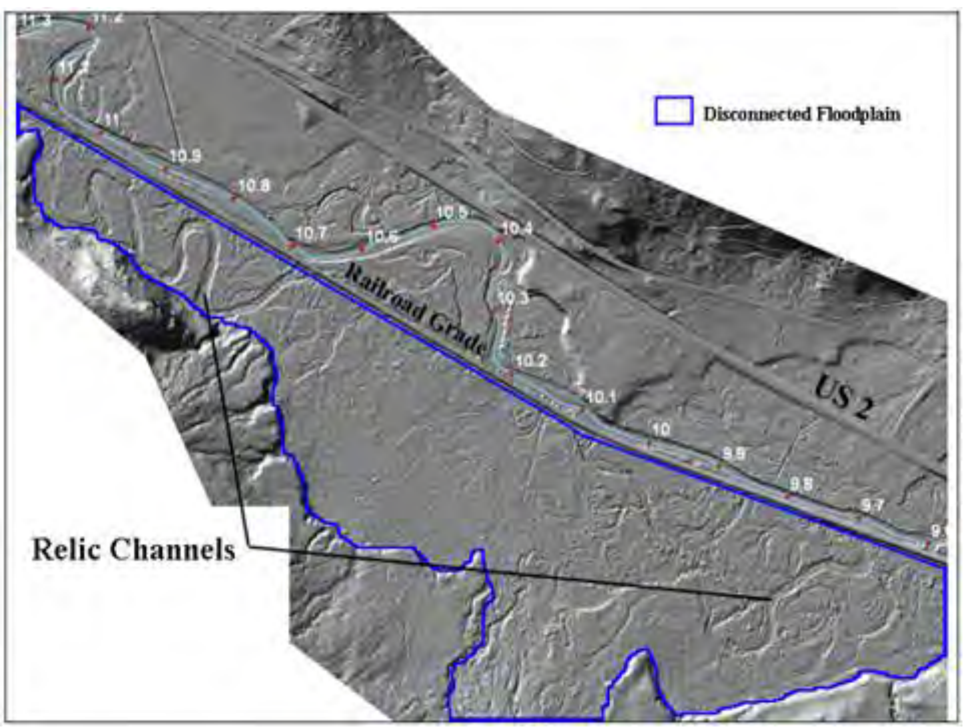


Alternative Analysis

- CCNRD obtains SRFB grant to assess project feasibility and begin working with BNSF. (2008)
- PRCC/SRFB funds AA. CCNRD assembles teams to address project funding, design alternatives, and stakeholder outreach (2010).
- Examined 13 alternatives spanning full creek reconnection to downstream only
- <u>Preferred Alternatives – June 2010</u>

  Downstream Only Bridge

  Flow thru channel with single upstream and downstream connection

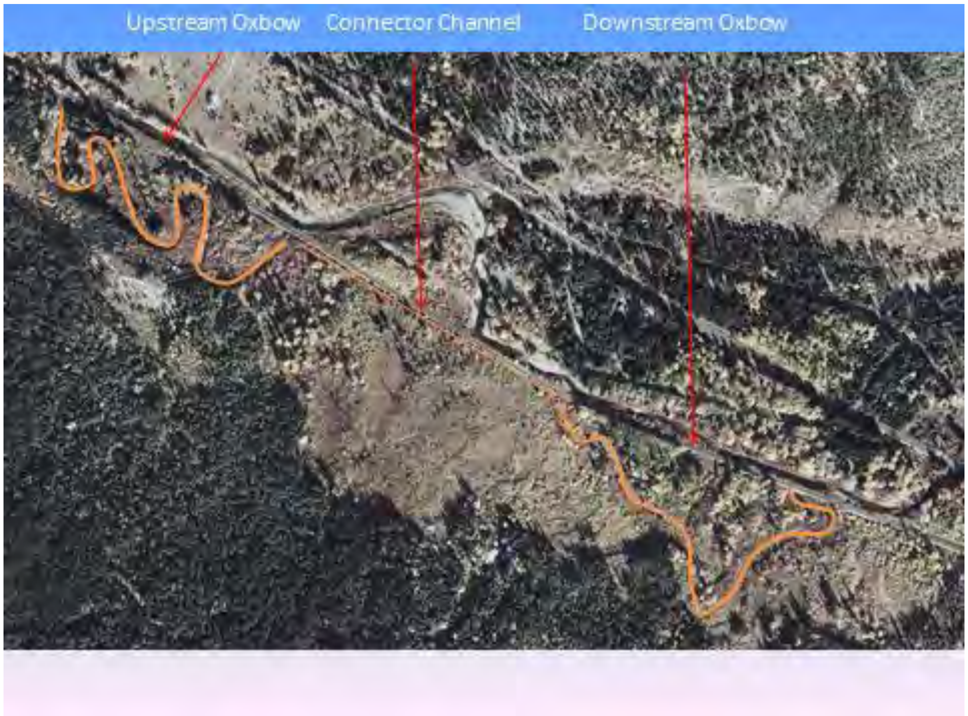


Project Development

Reclamation Analysis – June 2010 - present

- Reclamation Technical Team – Conducts analysis of connection alternatives using 2D hydraulic modeling, habitat surveys, groundwater examination, geotechnical exploration (upcoming).
- Original construction timeline was summer 2011. Due to the project complexity, number of stakeholders, and anticipated cost the construction timeline was moved to 2012.
- Design Team selects the B+ and Downstream Connection as the Preferred Alternative in March 2011.

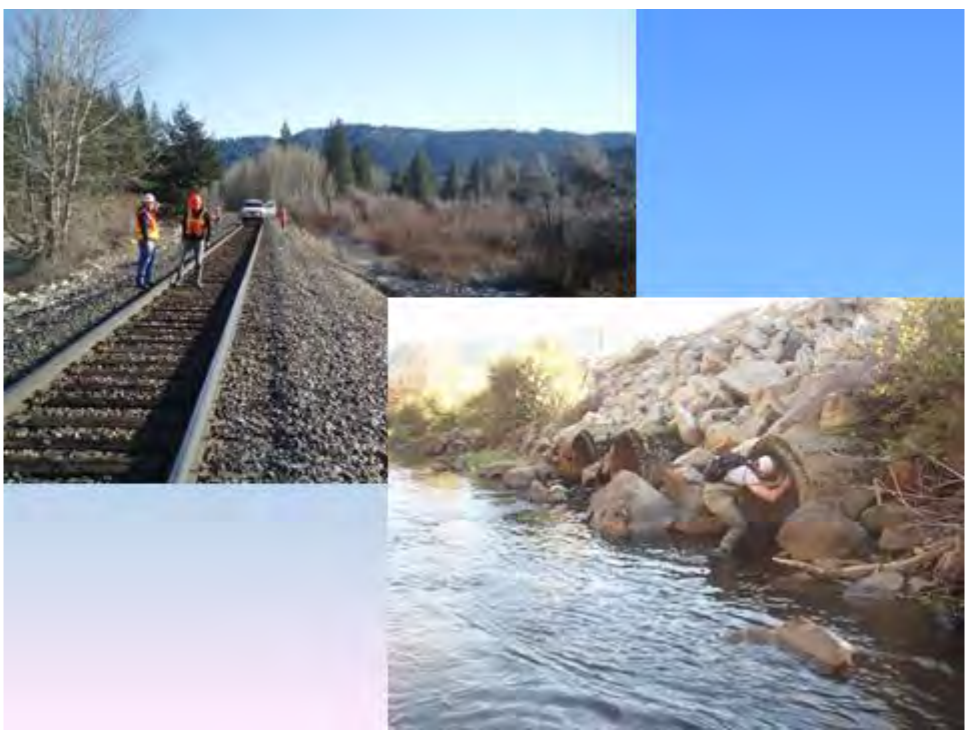
Preferred Alternative Overview



Downstream Connection Objectives

Guidance provided by the Design Team:

- Replace existing fish passage barrier to Coulter and Roaring Creek complexes.
  - Utilize longest-span bridge feasible considering design and construction constraints (89').
- Target connectivity during May-June flows - spring Chinook fry colonization.
- Hydraulically reconnect the Coulter Creek and Roaring Creek basins to Nason Creek.

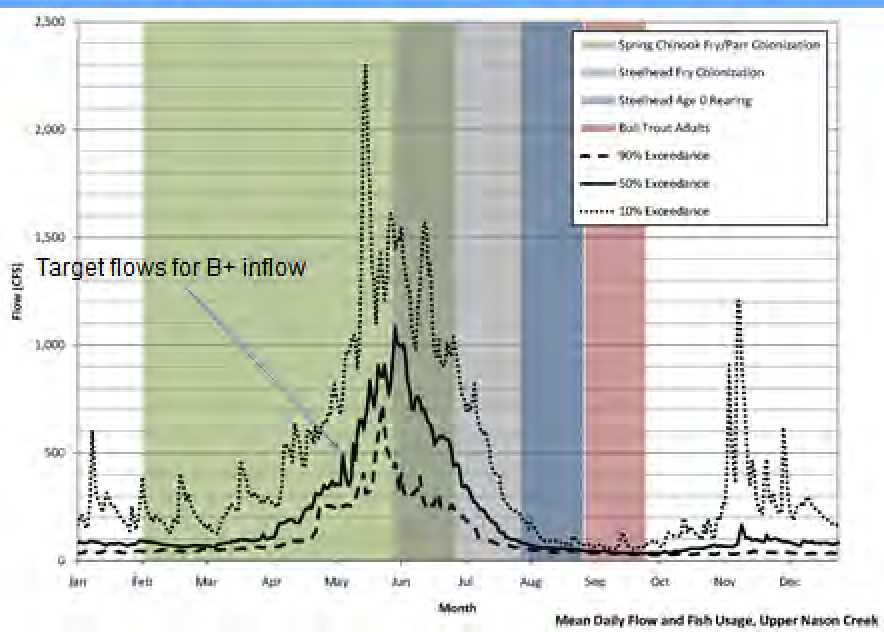


Upstream Connection Goals

Guidance provided by the Design Team:

- Target connectivity during May-June flows to benefit spring Chinook fry colonization.
- Create a connection that provides flow-through habitat to flush juvenile salmonids into the Gill and Roaring Creek Complexes.
- Hydraulically reconnect the Gill Creek and Knutson Creek basins to Nason Creek.

Target Flows for B+ Connection



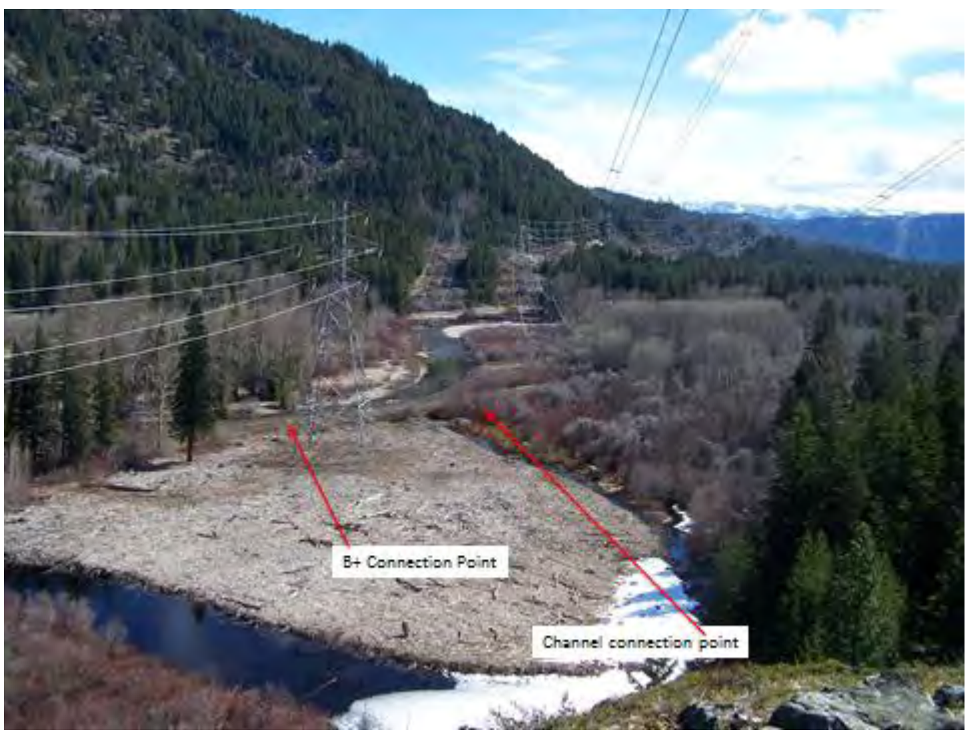

Preferred Alternative Bridge Connection Locations
B+
Existing Connector Channel
Downstream

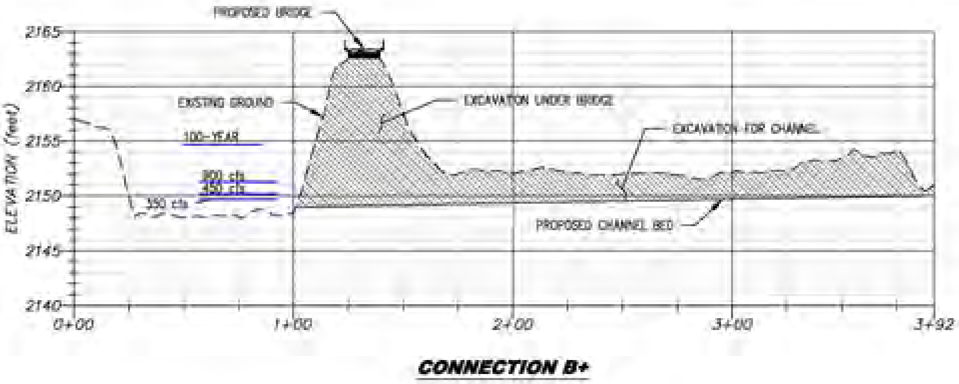

Existing Upstream High Flow Outlet


Upstream to Downstream Area Conveyance

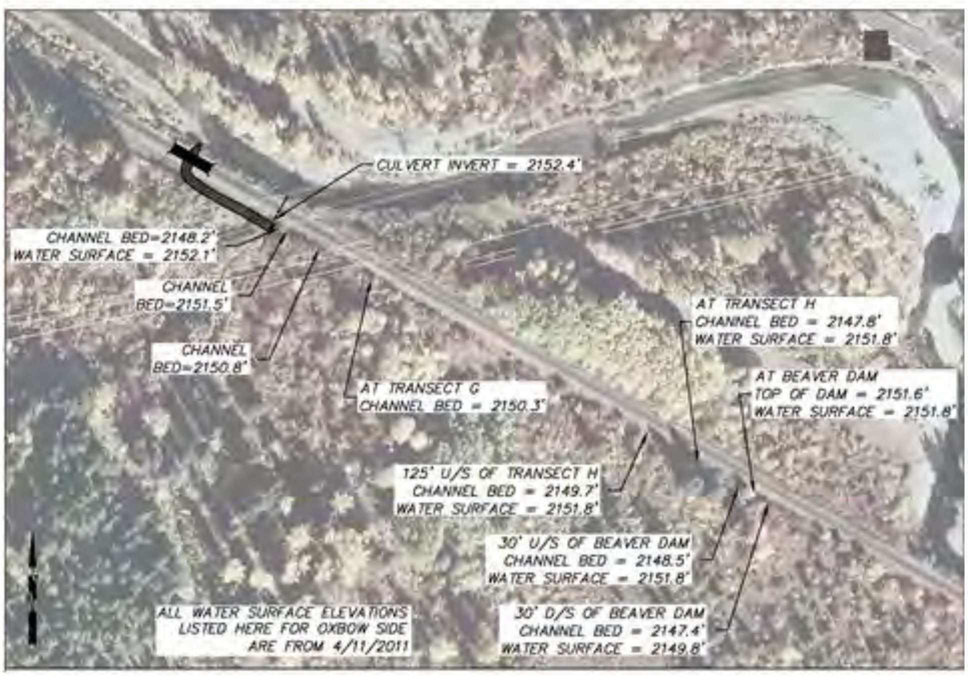

Upstream connections considered
F+
E
C
B+
A
A - REPLACE EXISTING CULVERT
C - POTENTIAL BRIDGE OR CULVERT
E - POTENTIAL BRIDGE OR CULVERT
F+ - POTENTIAL BRIDGE OR CULVERT

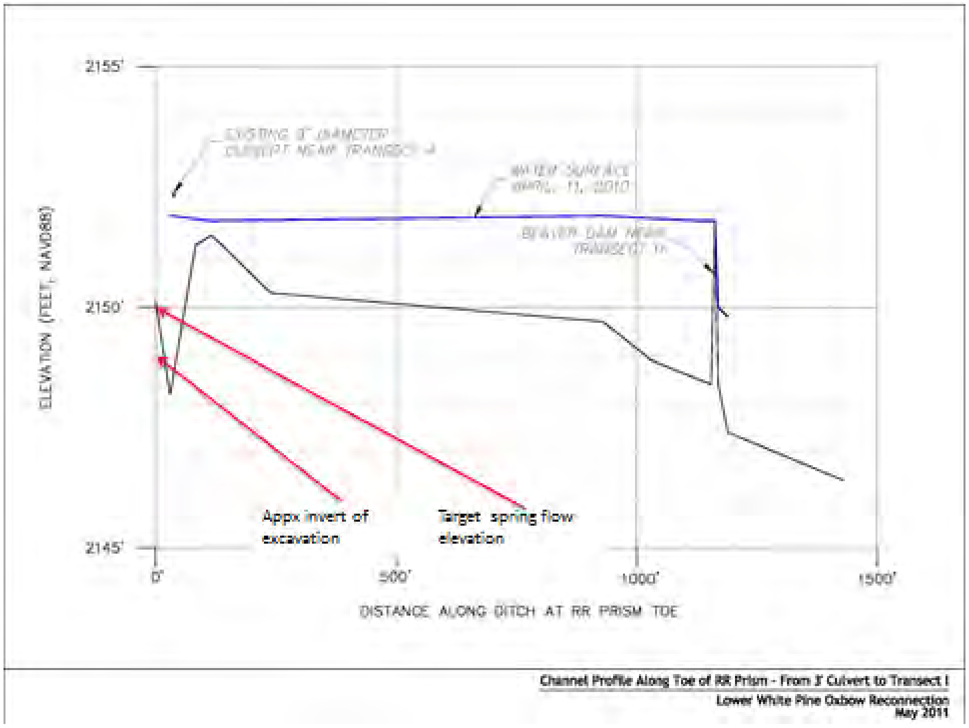

PROPOSED LOCATION FOR
89' LONG BRIDGE (ALT. B+)
EXCAVATION FOR
CHANNEL CONNECTION
20' TOP WIDTH
EXISTING
36" CULVERT

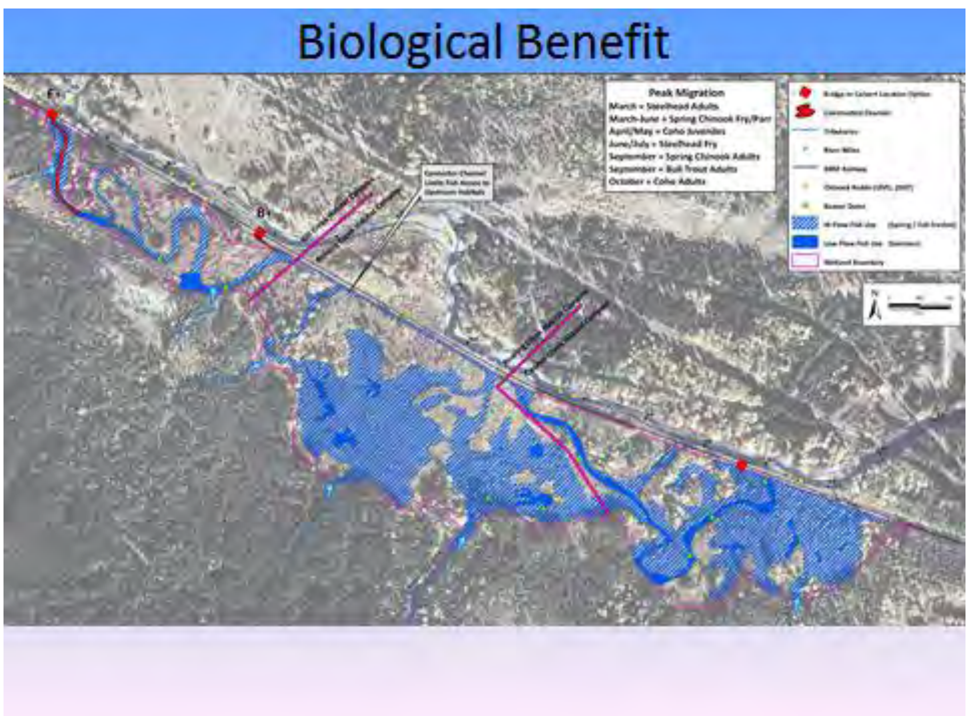

B+ Connection Point
Channel connection point

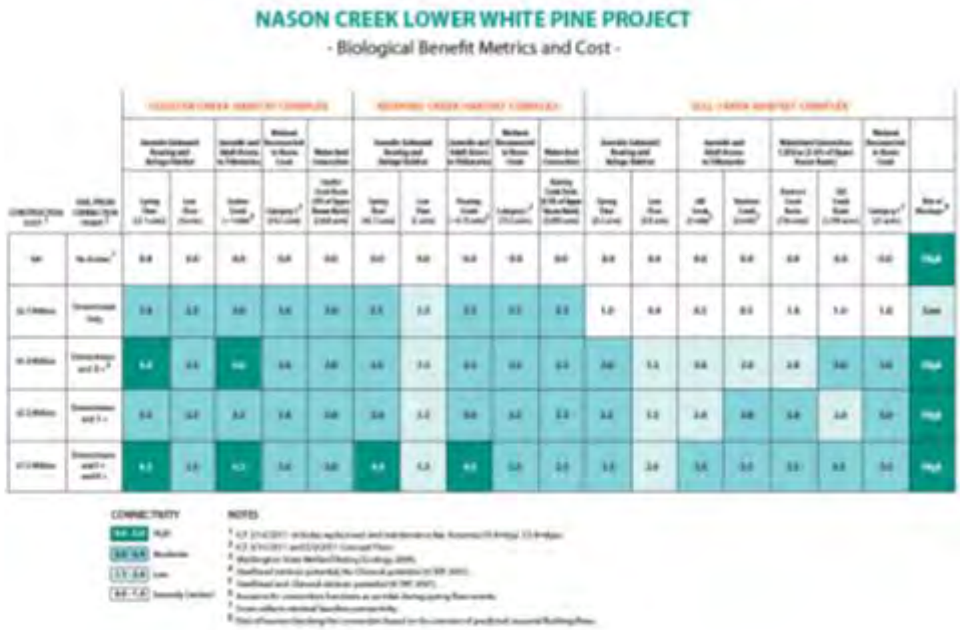


500 cfs ~ Typical May June flows
1000 cfs ~ Typical June peak flows




2155'
2150'
2145'
ELEVATION (FEET, NAVD88)
WATER SURFACE
APRIL 11, 2010
Appx invert of
excavation
Target spring flow
elevation
0'
500'
1000'
1500'
DISTANCE ALONG DITCH AT RR PRISM TOE
Channel Profile Along Toe of RR Prism - From 3' Culvert to Transect I
Lower White Pine Oxbow Reconnection
May 2011


Biological Benefit
Peak Migration
March = Steelhead Adults
March-June = Spring Chinook Fry/Parr
April/May = Coho Juveniles
June/July = Steelhead Fry
September = Spring Chinook Adults
September = Bull Trout Adults
October = Coho Adults



Biological Benefits

Metrics:

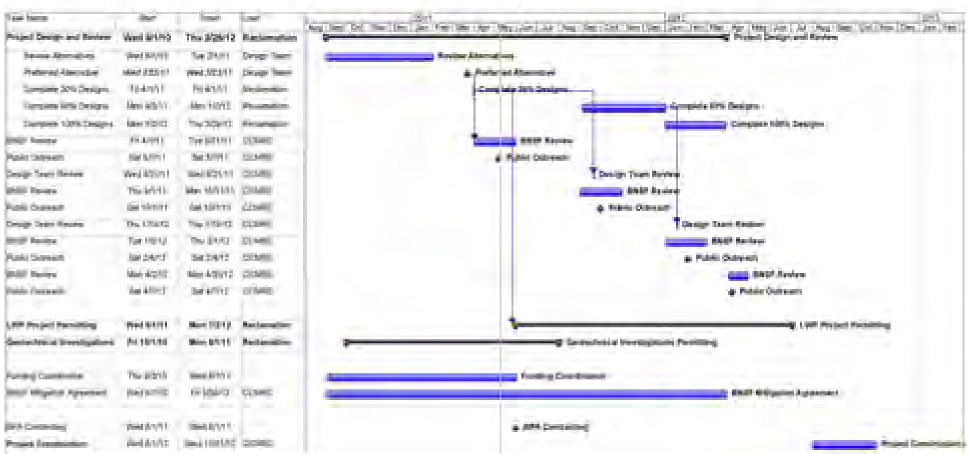
- Hydraulic reconnection of 148 acres of Category 1 wetland.
- Hydraulic reconnection of the Coulter, Roaring, Gill, and Knutson Creek basins. Accounting for a reconnection of 14.9% of the Upper Nason Creek Basin.
- Fish access to 83.1 acres of high flow and 6.8 acres of low flow rearing and refuge habitat.
- Steelhead access to 1 mile of lower Coulter Creek.
- Steelhead and Chinook access to 0.75 mile of lower Roaring Creek.

89' Pre-Cast Concrete Bridge Connection at B+

Description	Units	Quantity	Unit Cost	Item Cost
Improvements to Access Road	Lump Sum	1	25,000	25,000
Bridge (active railroad line)	Each	1	385,000	385,000
Bridge (future expansion)[1]	Each	1	150,000	150,000
Railroad Track Work	Lump Sum	1	150,000	150,000
Excavate RR Embankment at Bridge	Cubic Yard	1300	25	32,500
Excavate Channel RR to Exist Channel	Cubic Yard	600	25	15,000
Riprap at Bridge Abutment Fill Slopes	Cubic Yard	250	75	18,750
Cofferdam & Dewatering	Lump Sum	1	10,000	10,000
Site Restoration (Planting, Seeding, etc.)	Lump Sum	1	20,000	20,000
Contractor Contingencies (15%)				120,938
Sales Tax (8.1%)				75,102
Contractor costs - includes labor, materials, mobilization to site, bid preparation work, pre-construction expenses, Spill Prevention and Control Plan, Temporary Erosion and Sediment Control plans preparation, bonding costs, compliance with prevailing wage rates, pre-bid walk through, hiring employees, purchasing materials.	Lump Sum	1	100,000	100,000
BNSF Flagger	Day	90	1,000	90,000
BNSF Bridge Replacement Fee	Lump Sum	1	800,000	800,000
BNSF Bridge Maintenance Fee	Lump Sum	1	100,000	100,000
Administration: Project management, contract oversite, public meetings, travel to project site, contract preparation, construction inspection, billing invoices, preparing as builts, substantial completion and final acceptance, contract closeout documentation. Coordination with BNFS, contractors, partners (USFS, YN, BPA), landowners, funders, and permit compliance.	Lump Sum	1	70,000	70,000
			Total =	2,162,290

[1] Bridge Abutment/Piers Only

Project Timeline



Additional Actions

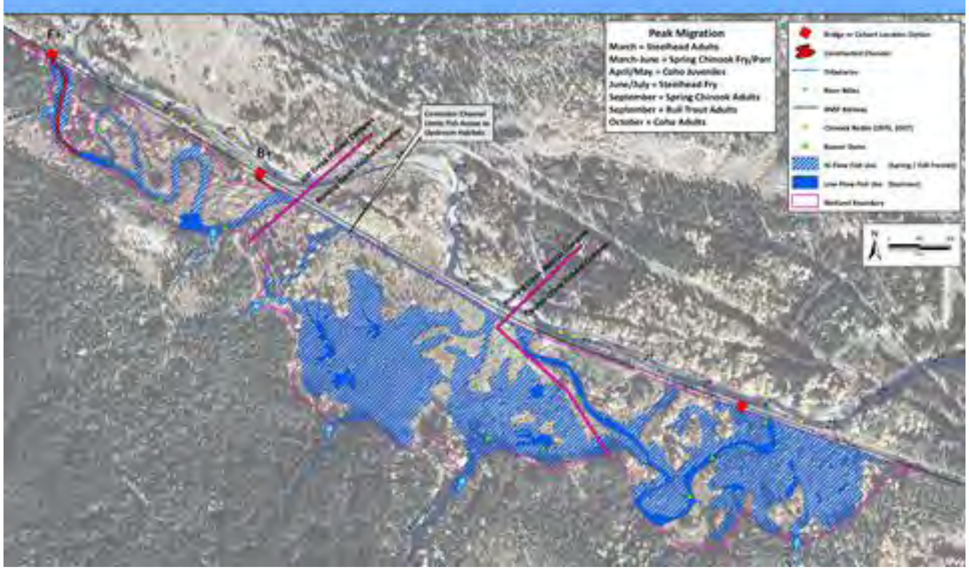
CCNRD:

- Coulter Creek barrier removal (SRFB 2011; construction 2012)
  - Increase steelhead access following reconnection of Coulter Creek via the LWP Reconnection Project.
  - Reconnect 1.6 miles of stream and .32 acres of rearing habitat.
- Installation of a weir structure on the mainstem Nason Creek to raise water surface elevations in the proximity of the B+ connection.
  - This may be necessary to improve seasonal connectivity and to promote flushing flows.

Yakama Nation

- Inner Zone Habitat Structures
  - Increase woody debris complexes on the mainstem Nason Creek within the Lower White Pine Reach.
  - CCNRD is working with YN to coordinate the placement of structures with respect to the reconnection locations.

Q & A



Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 9 June 2011

Members Present: Casey Baldwin (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Dale Bambrick (NOAA Fisheries)[1].

Others Present: Becky Gallaher (Tributary Project Coordinator) and Joe Connor (Bonneville Power Administration). Denny Rohr (PRCC Habitat Subcommittee facilitator) and Dave Duvall (Grant PUD) 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 Auditorium in Wenatchee, Washington, on Thursday, 9 June 2011 from 9:00 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:

- Nutrient Enhancement Stakeholder Meeting.
- Funding Coordination Meeting.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 12 May 2011 meeting notes with edits from Kate Terrell and Casey Baldwin.

III. 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.

- Cascadia Conservation District submitted to the Rock Island Tributary Committee a change in the scope of work on the Roaring Creek Flow Enhancement Project.
- Becky indicated that the sponsor started the expanded site restoration and rehabilitation work on the Entiat National Fish Hatchery Habitat Improvement Project. They have conditioned the soil around the new pond. The upper 2-4 inches of soil were removed and replaced with about 400 cubic yards of new soil. The sponsor added 150 cubic yards of

[1] Dale Bambrick provided his thoughts on decision items before the meeting.

compost, seeded it with grass, and planted native shrubs, trees, and flowers. They also installed a temporary irrigation system. This fall, the sponsor plans to add additional seed and native plants around the pond and the upper and lower floodplain areas.

- For the Bird, Hoffman, and Risley Methow River Acquisitions, Becky is waiting for the sponsor to review and sign the sponsor agreements. The Bird Purchase and Sale Agreement is under review, the Hoffman Purchase and Sale Agreement is being developed, and the Risley Purchase and Sale Agreement has been signed.
- For the Christianson Conservation Acquisition, the landowner has signed the Purchase and Sale Agreement. The acquisition is set to close on 10 June.

IV. Roaring Creek Flow Enhancement Project Statement of Work Change

In 2007, the Rock Island Tributary Committee approved funding for the Roaring Creek Flow Enhancement and Barrier Removal Project. The purpose of the project was to increase instream flows and connectivity in the lower 6,950 feet of Roaring Creek by removing two irrigation diversions and their associated structures. Irrigators would be converted to groundwater wells, which would increase surface flows in Roaring Creek by more than 0.5 cfs (current baseflow is about 1 cfs). The sponsor (Cascadia Conservation District) was unable to implement the project because of the unexpected number of water-right holders who were receiving water from the pipe. In addition, some of the water users were unwilling to convert to wells or did not want to work with the sponsor. Therefore, the sponsor submitted a revised scope of work to the Rock Island Committee for review.

The revised scope of work proposes to upgrade the instream diversion to allow fish passage and improve the bypass channel, install a compliant fish screen, and plant riparian vegetation within the construction area. The estimated cost of the project is $24,000. The sponsor would like to use existing Tributary Funds to pay for this revised scope of work.

After carefully reviewing the scope of work change, the Rock Island Tributary Committee concluded that the scope change was significantly different from the original proposal. The original proposal intended to improve instream flows in Roaring Creek; the revised statement of work will not improve instream flows. Therefore, the Committee recommends that the sponsor pull the project and resubmit a new proposal.

If the sponsor intends to submit a “new” proposal, they need to address the following comments/suggestions:

- Describe the current diversion and why it is a barrier or partial barrier to fish.
- Describe in detail the proposed upgraded diversion structure, bypass channel, and fish screen. The Committee would like to see a design that is fish friendly and requires minimal maintenance.
- Provide a detailed, itemized budget for the project.
- Estimate the potential biological benefit of the proposed project including instream/riparian habitat work.

V. Review of General Salmon Habitat Program Pre-Proposals

The Committees received 27 General Salmon Habitat Program pre-proposals. Chelan County Natural Resources Department withdrew *Lower Wenatchee Agricultural Riparian Pilot Project*;

Methow Salmon Recovery Foundation withdrew *M2 Large Wood Application*; and WDFW withdrew *Bridge 1 Riparian Project*. Thus, the Committees reviewed 24 pre-proposals.

The Committees reviewed each pre-proposal and selected those that they believe warranted a full proposal. Projects that the Committees dismissed were either inconsistent with the intent of the Tributary Fund or did not have strong technical merit. The Committees assigned pre-proposals to one of two categories: Fundable and Not Fundable. Recall that last month the Committees identified nine projects that were not fundable (or had a low probability of being funded by the Committees). It is important to note that these are ratings of pre-proposals and do not reflect ratings of full proposals. 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. Tracy will also notify sponsors with projects that have no chance or a low likelihood of receiving funding from the Tributary Committees.

Pioneer Side Channel Restoration Project (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- This project is out of sequence. The actions proposed for the side channel should not proceed until the Lower Wenatchee Instream Flow Enhancement Project is fully funded.

Peshastin Forest Service Road System Improvement (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- The scope of the current pre-proposal is too nebulous and the actions insufficiently specific for the Committees to evaluate whether or not funding would fulfill the objectives of the HCP Tributary Conservation Plans.
- The Committees believe the USFS is responsible for management of their road system and there are other funding sources more directly applicable to rectifying the inadequacies of forest roads.

Mill Creek/Mountain Home Ranch Road Fish Passage (Fundable)

The Committees recommend that the sponsor (Chelan County Natural Resources Department) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that the cost of this project is excessive. The Committees are familiar with other more complicated road-crossing projects that were completed for a fraction of the budget presented in this pre-proposal (Chris Fisher will provide a budget for similar work in the Okanogan Basin). If the cost of the Mill Creek project is closer to that identified by Chris, the Committees would be willing to review a full proposal.
- The Committees understand that the USFWS has already contributed $115,000 to this project. This should cover all or a significant portion of the total cost regardless of whether a less expensive fix is identified.

Old Peshastin Mill Riparian Enhancement Project (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- The Committees generally believe that restoration of riparian habitat is beneficial; however, in this case, the Committees believe this project will have very little biological benefit. The narrow buffer strip will provide little if any canopy cover (note the aspect of the river bank), little bank stability, limited sediment buffering capacity, and little LWD recruitment to the river.

Nason Creek, Lower White Pine, Coulter Creek Barrier Replacement (Fundable)

The Committees recommend that the sponsor (Chelan County Natural Resources Department) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that the cost of this project is excessive. Based on the cost of other stream-crossing projects in the Okanogan Basin, Chris Fisher will provide a more realistic cost for this project. If the cost of the Coulter Creek project is closer to that identified by Chris, the Committees would be willing to review a full proposal.
- The Committees recommend that the sponsor use a properly sized and specified countersunk culvert. If the culvert is countersunk (at about 20% of the cross-section of the culvert), it would provide the same benefit as a bottomless arch but at a much reduced cost.
- The sponsor should seek funding from the Yakama Nation given the relationship of this project with their reconnection project.

Wenatchee Watershed Riparian Prioritization (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Natural Resources Department, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- The Committees are not interested in funding a project to identify and prioritize potential riparian enhancement projects. On the other hand, once riparian areas have been identified for restoration, the Committees would entertain specific project proposals.

Upper Chumstick Barrier Removal Project (Fundable)

The Committees recommend that the sponsor (Chelan County Natural Resources Department) consider the following comments/suggestions as they develop the full proposal:

- The potential benefit from this project is small compared to its cost. The Committees are familiar with other more complicated road-crossing projects (e.g., road-crossing projects in the Okanogan Basin) that were completed for a fraction of the budget presented in this pre-proposal.
- The Committees would be willing to review a full proposal if the project includes more cost-effective solutions for correcting these partial barriers.

Nason Creek LWP Reconnection – B+ Connection Construction (Fundable)

The Committees recommend that the sponsor (Chelan County Natural Resources Department) consider the following comments/suggestions as they develop the full proposal:

- The current request from the Committees exceeds the money available in the Rock Island and Rocky Reach accounts to fund this project. The Tributary Committees would consider funding up to $250,000 of only construction and material costs.
- The sponsor should seek funding from BPA, the Yakama Nation, and the PRCC Habitat Subcommittee.
- The sponsor should do whatever they can to reduce or eliminate the bridge replacement and maintenance fees ($900,000).

Wenatchee Watershed Knotweed Control and Riparian Restoration (Not Fundable)

The Committees recommend that this project, sponsored by the Chelan County Noxious Weed Board, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- Although the Committees appreciated the information provided by the sponsor during their presentation, the Committees are not interested in funding a knotweed removal project.
- The sponsor may want to check with WSU to see if they would be willing to provide a cost share for this project.

Entiat Watershed Riparian Restoration Planting Program (Not Fundable)

The Committees recommend that this project, sponsored by the Cascadia Conservation District, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- The project is currently too nebulous and does not identify specific locations for riparian treatments. This makes it nearly impossible to estimate biological benefits associated with riparian treatments. In order for this project to be more attractive to the Committees, the Committees would need to know which specific properties would be treated, the current condition of riparian areas on those properties, and the scope of the restoration planting on those properties.
- The cost of the work seems excessive. For example, the Committees believe the proposed costs for permitting ($18,500) and equipment rental ($15,000) are unnecessarily high.
- The Committees recommend that once the sponsor identifies specific properties for treatment, they seek funding for individual treatment actions from the Committees through the Small Projects Program.

Okanogan River Basin Fish Screen Replacements (Fundable)

The Committees recommend that the sponsor (Okanogan Conservation District) consider the following comments/suggestions as they develop the full proposal:

- The Committees understand that the Bonneville Power Administration may fund this project. If for some reason they do not fund the study, the Committees would review a full proposal. If the sponsor submits a full proposal to the Committees, they need to reduce the amount of money they are requesting from the Committees. The current funding available from Tributary Funds is not sufficient to cover all the money requested from the Committees this year.

Upper Methow Riparian Protection V (Ege) (Fundable)

The Committees recommend that the sponsor (Methow Conservancy) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that the cost of the easement is excessively high. The sponsor needs to do whatever is necessary to reduce the cost of the project (e.g., request funds commensurate with current fair market value).
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

Upper Methow Riparian Protection IV (Keith) (Fundable)

The sponsor of this project (Methow Conservancy) requested that the Committees make an early funding decision on this project. The Conservancy proposed this project in 2010 and received SRFB funding. The Committees elected not to fund the match on this project because protecting this site would have little value without also protecting the upstream (Ege) property. The sponsor is currently seeking funding from both the SRFB and Tributary Committees on the upstream (Ege) property.

The Committees were unable to make an early funding decision on the Keith property because not all Committee members were present. Those present, however, asked that the sponsor consider the following comments/suggestions.

- The sponsor needs to provide the Committees with an updated appraisal based on current fair market value for the Keith Property.
- Please see if the landowner is willing to provide all or part of the funding match (i.e., via donation of a portion of the easement value).
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

Methow River Acquisition 2011 RM 48.9 (Fundable)

The Committees recommend that the sponsor (Methow Salmon Recovery Foundation) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that this project has limited biological benefit. Thus, the current total cost of the project ($73,200/acre) does not justify the benefits. The cost for property restoration ($10,000) and project administration ($6,800) seems excessively high. The Committees would review a full proposal if the total land acquisition cost was reduced to less than $15,000 and the landowner is responsible for removing derelict vehicles and other debris (thereby eliminating the restoration cost). Methow Recycles (509-997-0520) offers attractive arrangements for the removal of junk vehicles and scrap metal.
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.

- Please indicate that the management/conservation plan for the property will include provisions for public access.

Twisp River Acquisition 2011 RM 0.9 (Fundable)

The Committees recommend that the sponsor (Methow Salmon Recovery Foundation) consider the following comments/suggestions as they develop the full proposal:

- The Committees have no interest in funding MSRF Twisp River Right Bank (#2). Therefore, the sponsor should segregate or remove this parcel from #1 in the final proposal.
- The Committees believe the cost of this project is excessively high. The cost needs to be reduced to reflect current fair market value.
- The Committees believe that the risk of development on this property is low. The sponsor needs to describe why this property has a high risk of development.
- As part of the full proposal, the sponsor needs to include a statement that the levee will be "removed."
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

Fulton Ditch Instream Flow Enhancements (Methow Basin) (Not Fundable)

The Committees recommend that this project, sponsored by Trout Unlimited, should not be submitted as a full proposal to the Tributary Committees for the following reasons:

- As noted during the presentation, there is no urgency in completing this project.
- There is no guarantee that the water will go into a trust and stay in the river.

Silver Protection (Fundable)

The Committees recommend that the sponsor (Washington Department of Fish and Wildlife) consider the following comments/suggestions as they develop the full proposal:

- The proposal is quite nebulous. The sponsor needs to provide more certainty and clarity as to what specifically is being proposed (i.e., accurately identify what will be acquired and what will be placed under a conservation easement).
- The sponsor needs to remove the uplands from the proposal to the Tributary Committees (exclude the fields).
- The total cost of the proposal seems excessively high. The sponsor needs to provide a cost estimate based on current fair market value.
- The sponsor should reduce the amount they are requesting from the Tributary Committees. The current funding available from Tributary Funds is not sufficient to cover all the money requested from the Committees this year.
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed

appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.

- Please indicate that the management/conservation plan for the property will include provisions for public access.

Nutrient Enhancement Planning – Upper Wenatchee Tributaries (Fundable)

The Committees recommend that the sponsor (Cascade Columbia Fisheries Enhancement Group) consider the following comments/suggestions as they develop the full proposal:

- The sponsor should refocus the study by implementing the assessment within one or two pilot areas. The Committees believe that the Chiwawa Basin and the White River would be the best locations for implementing the assessment. These two basins have extensive amounts of monitoring data that can be used to inform the proposed assessment.
- The current cost of the assessment is high. By refocusing the study as described above and relying on existing monitoring data to the degree possible would significantly reduce the cost of the assessment.
- The sponsor needs to describe what the long-term monitoring plans/obligations would be if the assessment concludes that nutrient enhancement is a reasonable approach to improving population viability (i.e., what would be the scope of monitoring obligations that may accompany future nutrient-enhancement actions).

Wolf Creek Ditch and Fish Return Improvement (Fundable)

The Committees recommend that the sponsor (Cascade Columbia Fisheries Enhancement Group) consider the following comments/suggestions as they develop the full proposal:

- The Committees would like to see more information on the diversion structure, screen, and screen location.
- The sponsor needs to explain why the cost for demolition and excavation is so high ($75,000).
- The sponsor needs to include a screen operation plan with the final proposal.
- The Committees encourage the sponsor to seek some level of funding from the owners of the ditch.

Driscoll Island Cold Water Refuge (Fundable)

The Committees recommend that the sponsor (Cascade Columbia Fisheries Enhancement Group) consider the following comments/suggestions as they develop the full proposal:

- Following the presentation, the Committees understand that the sponsor will change the proposal to a feasibility study. To that end, the Committees would like to review the final proposal.

Large Wood Atonement in the White River (Fundable)

The Committees recommend that the sponsor (Cascade Columbia Fisheries Enhancement Group) consider the following comments/suggestions as they develop the full proposal:

- The Committees questioned whether it is absolutely necessary to use a helicopter. Is it possible to float wood from upstream locations to the treatment site?

- The sponsor needs to show more information on the Chiwawa reference site. Useful information would include fish use as well as location and size of log jams in the Chiwawa reference area.

Entiat River Stormy Reach Acquisition Phase 2 (Fundable)

The Committees recommend that the sponsor (Chelan-Douglas Land Trust) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that the risk of development on this property is low. In the final application, the sponsor needs to justify the claim that this property has a high risk of development.
- The Committees understand that the property is in foreclosure. Therefore, the Committees encourage the sponsor to work with the bank regarding a reduction in the sale price commensurate with their financial burden in retaining a foreclosed property.
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

Nason Creek Lower White Pine Ponds and Flats Acquisition (Fundable)

The Committees recommend that the sponsor (Chelan-Douglas Land Trust) consider the following comments/suggestions as they develop the full proposal:

- The sponsor needs to remove the Flats Acquisition from the proposal.
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

White River Sears Creek Phase 2 Conservation Easement (Fundable)

The Committees recommend that the sponsor (Chelan-Douglas Land Trust) consider the following comments/suggestions as they develop the full proposal:

- The Committees believe that the risk of development on this property is low. The sponsor needs to describe why this property has a high risk of development.
- The sponsor needs to do whatever is possible to reduce the cost of the easement.
- Please indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. In addition, any proposed restoration activities would need to be approved by the Tributary Committees.
- Please indicate that the management/conservation plan for the property will include provisions for public access.

Tracy will share this information with project sponsors on Monday, 13 June. The Committees hope this feedback will help sponsors develop full proposals, which are due on 30 June. The Committees will evaluate final proposals on Thursday, 14 July.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in May and June:

   Rocky Reach Plan Species Account:

   - $15,000.00 to Inland Professional Title Company for the Christianson Conservation Acquisition.

2. Tracy Hillman stated that the Nutrient Enhancement Stakeholder Meeting will be on 22 June from 1:30-4:00 pm at the Chelan PUD Auditorium. The purpose of the meeting is to discuss agency interests and roles in nutrient enhancement. Jason Lundgren with Cascade Columbia Fisheries Enhancement Group will provide initial findings from their nutrient enhancement feasibility investigation.

3. The Committees recommended that the first Funding Coordination Meeting occur on Friday, 15 July, immediately following the RTT and Tributary Committees meetings. Representatives from the tribes with Accords, RTT, Tributary Committees, PRCC Habitat Subcommittee, and BPA are able to meet on that date. Tracy Hillman will check with Derek Van Marter, Associate Director of the Upper Columbia Salmon Recovery Board, to see if he is available on that date. [*Tracy spoke with Derek after the Committees' meeting and Derek indicated that Friday, 15 July would work. Barb Carrillo will be available to take notes.*]

VII. Next Steps

The next meeting of the Tributary Committees is scheduled for Thursday, 14 July at Chelan PUD in Wenatchee. At that time, the Committees will conduct their review of General Salmon Habitat Program Final Proposals.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 14 July 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator), Casey Baldwin (WDFW alternate), and Joe Connor (Bonneville Power Administration).

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 July 2011 from 9:00 am to 12:20 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 19 June 2011 meeting notes with edits from Kate Terrell.

III. 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.

- Recent activities on the Entiat National Fish Hatchery Habitat Improvement Project have included limited weed control. This fall, the sponsor (Cascadia Conservation District) plans to add additional seed and native plants around the pond and on the upper and lower floodplain areas.
- For the Mission Creek Fish Passage Project, the sponsor (Cascadia Conservation District) met with the contractor in June and they expect to finalize a contract in July.
- For the Nason View Acquisition, the sponsor (Chelan-Douglas Land Trust) has been working through some potential impediments to completing the project. The property is currently being appraised and the sponsor expects to close the project at the end of the year.
- The Van Dusen property is currently being appraised for a conservation easement. Chelan-Douglas Land Trust believes this project will close at the end of the year.

- As part of the Nutrient Enhancement Assessment Project, Cascade Columbia Fisheries Enhancement Group hosted a meeting on 22 June to discuss agency interests and roles in nutrient enhancement. Notes from that meeting are appended to these notes as Attachment 1.
- For the Boat Launch Off-Channel Pond Reconnection Project, the sponsor (Chelan County Natural Resource Department) solicited bids from the County's small works roster. They held a pre-bid meeting on 6 July and received bids on 11 July. The County selected Morgan and Son Excavation to do the work, which will begin on 15 August.
- Appraisals and reviews have been completed for the Bird, Hoffman, and Risley Methow River Acquisitions. For the Bird and Risley properties, the landowners have agreed to the appraised values. The sponsor (Methow Salmon Recovery Foundation) is still negotiating with the owners of the Hoffman property. Becky has received copies of the summary appraisal reports.

IV. Review of General Salmon Habitat Program Proposals

The Committees received 11 General Salmon Habitat Program proposals. Before reviewing the proposals, Becky Gallaher reported that currently there is $906,656 in the Rock Island Plan Species Account, $852,403 in the Rocky Reach Plan Species Account, and $761,417 in the Wells Plan Species Account.

Nason Creek Lower White Pine Coulter Creek Barrier Replacement

Chelan County Natural Resource Department is the sponsor of the Coulter Creek Barrier Replacement Project. The purpose of this project is to replace an existing fish passage barrier at RM 0.4 on Coulter Creek with a bottomless arch structure. This action will open about 1.6 miles of Coulter Creek, which will increase rearing habitat for steelhead in Nason Creek. The total cost of the project is $83,126. The sponsor requested $12,468.98 from HCP Tributary Funds. ***The Rocky Reach Committee approved funding for this project.*** The Committee requires that this money be applied to construction and material costs. No more than 15% ($1,870) of this amount can be used for administration costs.

The Committee indicated that this funding is contingent on the successful reconnection of Coulter Creek with Nason Creek. If, for whatever reason, the railroad reconnection project does not occur, the Committee will withdraw their support for this project. In addition, the Committee would like the sponsor to know that they struggled with the cost of the Coulter Creek barrier replacement project. They appreciated the fact that the sponsor significantly reduced the cost of the project based on their comments on the pre-proposal; however, there are several items within the budget that still appear excessive. The Committee believes the costs associated with mobilization, project administration, and permitting and wetland delineation are excessive. In addition, the Committee questioned the magnitude of excavation (136 cubic yards for the structure) and 160 cubic yards of streambed gravels for a stream the size of Coulter Creek. The Committee expects that future proposals from the County will more accurately reflect the cost of doing culvert replacement projects.

Upper Chumstick Barrier Removal

Chelan County Natural Resource Department is the sponsor of the Upper Chumstick Barrier Removal Project. The intent of this project is to replace four fish passage barriers with channel-spanning structures on Chumstick Creek. This work will improve fish passage in the upper portion of Chumstick Creek (RM 7.3-9.8) and will compete an effort to remove over 30 barriers in the stream. The total cost of the project is $439,944. The sponsor requested $65,991 from HCP Tributary Funds.

The Committees recognize that fish would benefit from reconnecting the upper portion of Chumstick Creek. However, the benefits of this project do not justify the costs. The budget treats each barrier as a separate project. There are clear savings by bundling the four barriers as one project. This would greatly reduce the costs associated with mobilization, traffic control and signage, and administration and project management. In addition, the Committees do not believe that it will cost $20,000 for permitting and wetland delineation for the four barriers. Costs of a native seed mix ranges from $10 to $15/lbs. With an application rate of 14 lbs. per acre, the cost to seed two acres should be about one-fourth the amount identified in the budget. Finally, a planting density of 1,200 plants per site seems excessive. The density of riparian plantings should be about one stem per four feet. Based on these concerns, ***the Tributary Committees elected not to fund this project***.

Lower White Pine Upper Connection B+

Chelan County Natural Resource Department is the sponsor of the Lower White Pine Upper Connection B+ Project. The purpose of this project is to reconnect about 14.9% of the upper Nason Creek Basin by the construction of downstream and upstream openings in the BNSF railroad prism and the installation of 89-foot bridges. The proposed project focuses only on the upstream (B+) connection, which will increase spawning and rearing habitat for steelhead and spring Chinook. The total cost of the project is $2,162,290. The sponsor requested $250,000 from HCP Tributary Funds. ***The Rock Island Committee elected to contribute $150,000 to this project.*** The Committee requires that this money be applied to construction and material costs. No more than 15% ($22,500) of this amount can be used for administration costs.

Methow River Acquisition 2011 RM 48.9 (Peters)

The Methow Salmon Recovery Foundation is the sponsor of the Methow River Acquisition 2011 RM 48.9 (Peters) Project. The purpose of this project is to acquire about 1 acre of riparian and alcove habitat adjacent to the middle Methow River near RM 48.9. The total cost of the project is $37,325. The sponsor requested $6,310 from HCP Tributary Funds.

Although the Committees understand the importance of protecting riparian and off-channel habitat, they believe the potential benefits of this acquisition do not justify the cost. Therefore, ***the Tributary Committees elected not to fund this project***.

Twisp River Acquisition 2011 RM 0.9 (Hovee)

The Methow Salmon Recovery Foundation is the sponsor of the Twisp River Acquisition 2011 RM 0.9 (Hovee) Project. The purpose of this project is to acquire about 4.3 acres of riparian habitat adjacent to the Twisp River at RM 0.9. The acquisition would include about 1,200 ft of high quality riparian floodplain. The total cost of the project is $140,700. The sponsor requested $29,000 from HCP Tributary Funds. ***The Wells Committee approved funding for this project.***

The Committee requires that the management/conservation plan for the property include language that the property may receive habitat restoration activities if deemed appropriate. In addition, the Committee must approve any restoration actions on the property. Finally, the Committee recommends that the sponsor remove the levee and riprap.

Silver Protection

The Washington Department of Fish and Wildlife is the sponsor of the Silver Protection Project. The purpose of this project is to protect about 45 acres along the Methow River downstream from the Town of Twisp. The conservation easement/acquisition would include about 3,500 feet of spring-fed, perennial channel. The total cost of the project is $660,000. The sponsor requested

$360,000 from HCP Tributary Funds. ***The Wells and Rocky Reach Committees elected to contribute $250,000 to this project.***

Because the Committees found the proposal lacking in several areas, the contribution from the Committees is contingent on receiving more information. Specifically, the Committees need the following:

1. An example of the management plan for the acquisition and easement.
2. A description of conditions in the easement and of the landowner's intended use of the easement.
3. Indication that the management plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate. Additionally, as a condition of this funding, the Committees must approve any restoration actions on this property.
4. A more detailed and itemized land-management budget (the proposal indicates only that $15,000 is needed for land management, which includes weeds, fencing, etc.). In addition, the sponsor must indicate where and how much fencing is proposed.

The Committees would like to review this additional information in early September. Therefore, they request that the sponsor provide their responses to the Committees by 22 August.

Wenatchee Nutrient Assessment – Treatment Design

Cascade Columbia Fisheries Enhancement Group is the sponsor of the Wenatchee Nutrient Assessment Design Project. The purpose of this project is to determine the need for, and extent of, conducting nutrient enhancement in high priority tributaries in the Wenatchee Basin. The project will evaluate baseline conditions within the anadromous zone, establish goals or budgets for various indicators, develop a treatment and monitoring plan, and secure approval from Washington Department of Ecology for a pilot nutrient enhancement program. The total cost of the project is $240,000. The sponsor requested $120,000 from HCP Tributary Funds. ***The Rock Island Committee elected to contribute $80,000 to this project.***

The Committee found value in this work, but voiced their concern about the possibility that Ecology will not approve the pilot program. As stated by one member of the Committee, "I do not trust that Ecology will do the right thing here!"

Wolf Creek Ditch and Fish Return Improvement

Cascade Columbia Fisheries Enhancement Group is the sponsor of the Wolf Creek Ditch and Fish Return Improvement Project. The purpose of this project is to reduce or eliminate fish entrainment and mortality associated with the operation of the diversion facilities at RM 4.2 on Wolf Creek. The project will upgrade the facilities so that fish will be passed safely back to Wolf Creek. The total cost of the project is $270,000. The sponsor requested $120,000 from HCP Tributary Funds.

Although the Committees understand the importance of preventing entrainment of fish, they found the potential benefits to be minor compared to the cost of the project. The Committees believe that better management of the structure may prevent the entrainment problem. Carefully following WDFW's procedures for dewatering the diversion in the fall should minimize stranding associated with those events. Fish stranding also appears to occur when too much water is diverted and overtops the screen; thus, better regulation of the intake may help prevent future stranding of fish. Additionally, it would be beneficial to consider the installation of a trash rack to prevent debris from entering the intake structure. Therefore, ***the Tributary Committees elected not to fund this project***.

White River Large Wood Atonement

Cascade Columbia Fisheries Enhancement Group is the sponsor of the White River Large Wood Atonement Project. The purpose of this project is to accelerate floodplain recovery and enhance instream function in the lower White River (RM 2.00-5.75). This will be accomplished by installing vertical LWD pieces in specific locations where wood is expected to collect, thereby increasing the retention time of wood. This work should increase the habitat capacity and quality for Chinook salmon, steelhead, and bull trout. The total cost of the project is $352,392. The sponsor requested $147,050 from HCP Tributary Funds. ***The Rock Island Committee elected to contribute $100,000 to this project.***

Entiat Stormy Reach Phase 2 Acquisition (#11-1415A)

The Chelan-Douglas Land Trust is the sponsor of the Entiat Stormy Reach Acquisition Project. The purpose of this project is to acquire riparian habitat along the Entiat River between RM 19.7 and 20.2. The acquisition will protect about 53 acres (with 78% in the floodplain), including 3,380 feet of riverbank. The total cost of the project is $336,000. The sponsor requested $56,000 from HCP Tributary Funds. ***The Rocky Reach Committee approved funding for this project.*** As a condition of this funding, the Committees must approve any restoration actions on the property

Nason Creek Lower White Pine Alcove Acquisition (#11-1372A)

The Chelan-Douglas Land Trust is the sponsor of the Lower White Pine Alcove Acquisition Project. The purpose of this project is to acquire floodplain habitat along Nason Creek between RM 11.2 and 11.5. The acquisition would protect about 18 acres, including 2,500 feet of riverbank and an 850-foot long alcove. The total cost of the project is $294,700. The sponsor requested $44,700 from HCP Tributary Funds. ***The Rocky Reach Committee approved funding for this project.*** As a condition of this funding, the Committees must approve any restoration actions on the property

Summary of Review of 2011 General Salmon Habitat Program Projects.

Project Name	Sponsor[1]	Total Cost	Request from T.C.	T.C. Contribution[2]
Coulter Creek Barrier Replacement	CCNRD	$83,126	$12,469	RR: $12,469
Upper Chumstick Barrier Removal	CCNRD	$439,944	$65,991	$0
Lower White Pine Upper Connection B+	CCNRD	$2,162,290	$250,000	RI: $150,000
Methow River Acquisition (Peters)	MSRF	$37,325	$6,310	$0
Twisp River Acquisition (Hovee)	MSRF	$140,700	$29,000	W: $29,000
Silver Protection	WDFW	$660,000	$360,000	W/RR: $250,000
Wenatchee Nutrient Assessment Design	CCFEG	$240,000	$120,000	RI: $80,000
Wolf Creek Ditch and Fish Return Improvement	CCFEG	$270,000	$120,000	$0
White River Large Wood Atonement	CCFEG	$352,392	$147,050	RI: $100,000
Entiat Stormy Reach Acquisition	CDLT	$336,000	$56,000	RR: $56,000
Nason Creek Lower White Pine Alcove Acquisition	CDLT	$294,700	$44,700	RR: $44,700
Total:		**$5,016,477**	**$1,221,520**	**$722,169**

[1] CDLT = Chelan-Douglas Land Trust; MSRF = Methow Salmon Recovery Foundation, CCNRD = Chelan County Natural Resource Department; CCFEG = Cascade Columbia Fisheries Enhancement Group; WDFW = Washington Department of Fish and Wildlife.

[2] RI = Rock Island Plan Species Account; RR = Rocky Reach Plan Species Account; W = Wells Plan Species Account.

V. Methow Conservancy Conservation Easements

Tracy reported that the letter from the Tributary Committees to the Methow Conservancy requesting additional information on the Upper Methow Riparian Protection IV (Keith) project was not well received. Recall that last month the Conservancy asked the Committees to make an early funding decision on this project. The Conservancy proposed this project in 2010 and received SRFB funding. The Committees elected not to fund the match on this project in 2010 because protecting this site would have little value without also protecting the upstream (Ege) property. The sponsor is currently seeking funding to protect the Ege property. In the letter to the Conservancy, the Committees explained that they could not make an early funding decision on the Keith project and asked the sponsor to:

(1) Provide the Committees with an updated appraisal based on current fair market value;

(2) See if the landowner would be willing to provide all or part of the funding match (i.e., via donation of a portion of the easement value);

(3) Indicate that the management/conservation plan for the property will include language that the property may receive habitat restoration activities if deemed appropriate;

(4) State in the management/conservation plan that any proposed restoration activities must be approved by the Tributary Committees; and

(5) Indicate that the management/conservation plan for the property will include provisions for public access.

Because the Conservancy took exception to three of these requests (i.e., #1 appraisal, #3 restoration, and #5 public access), they withdrew both their applications to the Tributary Committees (Upper Methow Riparian Protection IV and V projects). The Conservancy asked to meet with the Committees to discuss their issues. Because the Committees request the items numbered above from all sponsors seeking funding for conservation easements and acquisitions, and the Conservancy is not willing to agree to these terms, the Committees declined the opportunity to meet with the Conservancy.

VI. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in May and June:

   Rock Island Plan Species Account:

   - $1,117 to Chelan-Douglas Land Trust for site visits and negotiations with landowners on the White River Van Dusen Conservation Easement.
   - $4,227 to Chelan-Douglas Land Trust for site visits and negotiations with landowners on the Nason View Acquisition.
   - $1,069.54 to Chelan County PUD for project coordination during the second quarter of 2011.
   - $490 to Larson-Allen for second quarter bookkeeping and a project report for December and March.

   Rocky Reach Plan Species Account:

   - $6,515.79 to Cascadia Conservation District for the purchase of top soil and native plants for the Entiat National Fish Hatchery Habitat Improvement Project.

- $1,098.72 to Chelan County PUD for project coordination during the second quarter of 2011.
- $490 to Larson-Allen for second quarter bookkeeping and a project report for December and March.

Wells Plan Species Account:

- $1,171.61 to Chelan County PUD for project coordination during the second quarter of 2011.

2. As Becky Gallaher reported under Project Updates, Cascade Columbia Fisheries Enhancement Group hosted a Nutrient Enhancement Workgroup meeting on 22 June to discuss agency interests and roles in nutrient enhancement. Casey Baldwin attended the meeting and gave a very brief summary of the meeting. Notes from the Nutrient Enhancement Workgroup meeting are appended to these notes as Attachment 1.
3. Chris Fisher provided a brief update on the Okanagan River Restoration project in Canada. He noted that the work on the drop structure has been delayed. He also stated that the Okanagan Nation Alliance is planning another site visit in October. The purpose of the tour is to visit restoration projects and sites for possible future projects. Chris will provide more details in a couple months. Becky asked Chris about the status of the Prevent Fish Entrainment Project on Inkaneep Creek. Chris stated that the project has been pulled because the landowner has been talking with a developer. Thus, the $24,000 approved for this project can be returned to the Well Plan Species Account.
4. Tracy Hillman reminded the Committees that their first Funding Coordination Meeting in 2011 will be on Friday, 15 July. The purpose of the meeting, according to Section 2 of the Tributary Fund Policies and Procedures for Funding Projects, is to collaborate with regional, local, state, tribal, and national organizations that fund salmon habitat projects. The Committees invited representatives from the tribes with Accords (Yakama Nation and Colville Tribes), RTT, PRCC Habitat Subcommittee, BPA, and staff of the Upper Columbia Salmon Recovery Board to the coordination meeting. Tracy will Chair the meeting and append the notes from the Coordination meeting to these notes (see Attachment 2).

VII. Next Steps

The next meeting of the Tributary Committees is scheduled for Thursday, 11 August at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1

Notes from the Upper Columbia Nutrient Enhancement Work Group
Chelan PUD Auditorium, Wenatchee
1:30pm – 4pm
June 22, 2011

I. Attendees:

Jason Lundgren, CCFEG, Peter and Theo Burgoon, Water Quality Engineering, Jason Hatch, Trout Unlimited/Washington Water Project, Chuck Peven, PCI, Becky Gallaher, Chelan PUD, John Jorgenson and Cory Kamphaus, Yakama Nation, Russell Langshaw, Grant PUD, Mary Jo Sanborn, Chelan County Natural Resources, Derek Van Marter, UCSRB, Jim Yates, WDOE. Representing WDFW; Ken Bevis, Mike Tonseth, Casey Baldwin, John Kerwin, Jeff Korth, and John Penny. Representing USFWS; Matt Cooper, Dave Carie, Sharon Lutz and Joy Evered.

II. Introductions

Jason briefly discussed some background concerning the CCFEG and the reasons for the formation of this workgroup. The CCFEG has partnered with Trout Unlimited (TU) and Water Quality Engineering to develop a proposal to establish a nutrient enhancement plan in four tributaries of the Upper Wenatchee Basin. CCFEG currently has a small grant from the Tributary Committee to determining the logistical and technical considerations and issues concerning the implementation of a nutrient enhancement (NE) plan in the Upper Columbia.

The main focus of the workshop is to understand the roles and interest of the various stakeholders and to receive input on our two nutrient enhancement projects (logistics and feasibility of NE funded by the Trib. Committee, and the unfunded proposal to develop a nutrient enhancement plan in the Wenatchee).

III. CCFEG/TU Nutrient Enhancement proposal in Wenatchee

Jason Hatch, TU gave a presentation about a grant proposal to the SRFB and Tributary Committee concerning Nutrient Assessment – Treatment Design in Upper Wenatchee tributaries. The goal of this project is to understand the need for and extent of conducting nutrient enhancement in four tributaries in the Upper Wenatchee Basin; Nason Creek, Little Wenatchee, White River, and the Chiwawa River. Baseline water quality and marco invertebrate data would be gathered and analyzed, a prescription and monitoring plan would be developed, and an MOA with WDOE would be created that would ensure adequate protections/assurances to the TMDL.

a. Context – need, recovery plan.

Casey Baldwin (WDFW) discussed the function and focus of the Regional Technical Team (RTT). He discussed in more detail the RTT's response to the proposal to the SRFB from 2010 concerning the implementation of NE, and how the RTT recommended the need for assessment plan, not just beginning implementation without more background information and logistical issues being ironed out.

Casey also discussed the proposed adult management plans for spring Chinook salmon and steelhead in the Wenatchee Basin, and how fish might be available for NE after being captured at Tumwater Dam.

Casey showed an example of an exercise that he had done on the loading effects of placing 10,000 carcasses in one basin (spreadsheet available upon request)..

b. Feasibility/Logistics (10 min)

Jason Lundgren discussed a current award from the HCP Tributary Committee. He discussed the focus of the grant, that it is to understand the logistical end of conducting nutrient enhancement across the Upper Columbia (UC) . Jason has interviewed all of the adult collection hatcheries in the UC and shared a spreadsheet showing the information that he has collected so far.

It doesn't appear that salmon carcasses from hatcheries will be available for NE because most fish are treated with drugs and cannot be released back to the environment. So, other sources will be looked at (such as through adult management actions as discussed by Casey) and carcass analogs.

c. Fish Health

One of the main concerns with NE using carcasses is the spread of disease. Another major concern with using carcasses from hatcheries is that drugs that are used to prevent disease outbreaks in the hatchery environment have long "withdrawal" times (how long it stays in the carcass).

Joy Evered (USFWS) discussed overarching concerns about pathogens and what could be done. Analogs are better in relationship to disease risk.

John Kerwin (WDFW) discussed that WDFW policy is largely based on prevention, although the state's fish health policy does not mention nutrient enhancement.

d. TMDL/Water Quality

Jim Yates (DOE) states are required to comply with EPA water quality standards and have decided to use the TMDL process to do so. The use of the TMDL process is very complicated. Jim suggested that NE should be site-specific, and that the work that was done in Germany Cr in lower Columbia is the only guidance on NE that is available.

Peter Burgoon (Water Quality Engineering) gave a presentation reviewing TMDL info as it pertains to sub-basins (available upon request) in the Wenatchee. Peter called out specific parameters which we'll need to be cognizant of when conducting NE.

e. Example - Methow

John Jorgensen (YN) discussed his program on the Twisp. He is investigating mechanistic causes of nutrients and how it affects endangered fish. He chose the Twisp River, using a BACI design, with a 5 yr pre-treatment period and a 5 yr post treatment period. He is monitoring a whole spectrum of water quality parameters and looking at growth and survival of juvenile salmonids through different life stages.

IV. Questions and Round Table

Mary Jo Sanborn raised an issue that during the watershed planning process, there was a potential disconnect between stakeholders about RTT recommendations (that called for NE in the upper basin) and the TMDL (which is forcing folks to reduce the phosphorous load in the lower basin).

Folks at the workshop acknowledged this as being a concern and thought that public outreach will be very important. There will need to be very clear communication because there will be lots of money spent by some entities to meet the TMDL in the lower basin, while there is a potential to be adding nutrients in the upper basin through a NE program.

There was some discussion that it appeared that the uptake of nutrients appears pretty quick, so the intent of the plan is not to have any phosphorous “travel” downstream of Tumwater Canyon.

Jim Yates noted that a point source change in pH and what is acceptable from a TMDL standpoint (0.1 change). He also noted that the current limits in TMDL are interim, and final limits will be set in 2018.

Note – the standards being set by the TMDL do not consider the historic condition when there were many more salmon affecting nutrient loads in the watershed. Currently, it is based on ground water, which is known to be lower in nutrients.

Point sources are well monitored, but non-point sources are not.

Jim noted that DOE does not have guidance on NE, they are hoping that perhaps this group could help with their development of guidance on NE.

Peter asked whether there’s criteria for distribution of carcasses that could be gleaned from RTT recommendations?

Nope, RTT didn’t get that detailed, but the RTT looked at how well other processes were in the watershed and suggested NE in places where these processes are in place.

RTT might be able to help with criteria to determine exact locations.

Russell Langshaw, Grant PUD, suggests that carcass placement during the study is important, and may differ from the long term because if the study doesn’t demonstrate an effect, then it might “go away.”

Derek mentioned that ultimately, this could be a conversation between NMFS and EPA on how NE could be implemented.

Jason noted that the fish monitoring side of this is tricky and expensive, and asked whether the assessment report should focus solely with monitoring the effects of NE on water quality and primary production. A suggestion was made to try to coordinate with existing fish monitoring, like ISEMP, if some of their sites comport with the criteria for carcass location that will eventually be chosen.

V. Next Steps – Nutrient Enhancement Work Group

Development of subcommittees to help with further implementation. The need would be for guidance and steering, so as the process moves forward, there will need to be feedback so the program can be adaptively managed.

VI. Adjourn

Attachment 2

DRAFT MEETING SUMMARY
HCP Tributary Committees
Funding Coordination Workshop
15 July 2011
Chelan PUD Auditorium

Participants

Casey Baldwin, RTT/TC; Lee Carlson, YN/TC; Joe Connor, BPA; Chris Fisher, CCT/TC; Becky Gallaher, TC; Steve Hays, TC; Tracy Hillman, Chair; Tom Kahler, TC; Russell Langshaw, PRCC-HSC; Kate Terrell, PRCC-HSC/TC; Derek Van Marter, UCSRB; Barb Carrillo, UCSRB; and Julie Morgan, UCSRB.

Welcome, Introductions, and Review Agenda

Tracy Hillman welcomed everyone to the meeting and reviewed the agenda. He indicated that the coordination meeting was a special meeting of the Tributary Committees (T.C.), as directed by Section 2 in their Policies and Procedures for Funding Projects document. He noted that the T.C. made their funding decisions yesterday (Thursday). He said final comments and funding decisions from the T.C. will be sent via letter to the sponsors next week. He then reviewed the SRFB schedule with the participants.

Review and Funding Discussion

Tracy reviewed the RTT and T.C. preliminary funding commitments. He began with the RTT scores. He then reviewed the T.C. decisions regarding funding. Tracy said there are three projects that the T.C. elected not to fund. Of the eight projects the T.C. did identify for funding, the amount funded did not always equal the amount requested (Table 1).

Table 1.

Project Name	Amount Requested from T.C.	Amount Funded
Entiat River Stormy Reach Acquisition Phase 2	$56,000	$56,000
Nason Creek LWP Reconnection B+	$250,000	$150,000
Large Wood Atonement in the White River	$147,050	$100,000
Silver Protection	$360,000	$250,000
Upper Methow Riparian Protection V	-	-
Nason Creek Lower White Pine Ponds and Acquisition	$44,700	$44,700
Twisp River Acquisition 2011 RM .09	$29,000	$29,000
Nutrient Enhancement Planning-Upper Wenatchee Tributaries	$120,000	$80,000
Methow River Acquisition 2011 RM 48.9	$6,310	$0
Upper Chumstick Barrier Removal	$65,991	$0
Driscoll Island Cold Water Refuge Design-Only	-	-
Nason Creek, Lower White Pine, Coulter Creek Barrier Replacement	$12,469	$12,469
Wolf Creek	$120,000	$0
Upper Methow Riparian Projection VI	-	-
Peshastin Forest Service Road System Improvement	-	-

Project Name	Amount Requested from T.C.	Amount Funded
Mill Creek/Mountain Home Ranch Road Fish Passage	-	-
Wenatchee Watershed Knotweed Control and Riparian Restoration	-	-
Pioneer Side Chanel Restoration Project	-	-
Old Peshastin Mill Riparian Enhancement Project	-	-
Wenatchee Watershed Riparian Prioritization	-	-
TOTAL:	$1,211,520	$722,169

Specific Project Coordination

Lower White Pine B+

In addition to T.C. commitments above, Joe Connor said that BPA is committing funding toward the Nason Creek Lower White Pine (LWP) B+ connection project. Kate Terrell said the Priest Rapids Coordinating Committee (PRCC) agreed to fund up to $350K. Casey Baldwin then reviewed some specific numbers (a budget, project components, and available funding) for the project, indicating that if all the pledged money is ultimately available for the project, and the project budget is reduced through eliminating the mitigation components of the project, there would be enough to fund it for implementation in 2012. Lee Carlson said that the LWP Coordination Team will be meeting within the next two weeks with BNSF to determine whether the project can move forward.

Other Projects

Lee Carlson said the Yakama Nation is possibly interested in funding the Large Wood Atonement project for the portion not covered by T.C. (~$47,000). Lee stated that he will discuss the project internally and that he could have an idea of funding commitment early next week. Derek said that the biggest implications of this funding coordination are the SRFB funds. So far, no one has indicated a desire to cover the SRFB request, which would affect where the line lands on the project list.

Tracy asked if there was any desire to get the knotweed project funded. As a result of the RTT discussion earlier in the week, he said that if it does not find any funding through this process, it could come back to the T.C. under a small project review.

Wrap Up and Review

Tracy will send T.C. letters to each of the sponsors next week indicating the amount of funding the T.C. is committing to the respective project. As part of its September meeting, the T.C. will solidify the various funding coordination commitments.

Adjourn

Tracy thanked everyone for attending and adjourned the meeting.

Notes submitted by Barb Carrillo.

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 11 August 2011

Members Present: Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), and Tracy Hillman (Committees Chair).

Members Absent: Dale Bambrick (NOAA Fisheries) and Kate Terrell (USFWS).[1]

Others Present: Becky Gallaher (Tributary Project Coordinator) and Casey Baldwin (WDFW alternate).

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, 11 August 2011 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 addition:

- Review revised budget from Chelan County Natural Resource Department on the Upper Chumstick Barrier Removal Project.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 14 July 2011 meeting notes with edits from Kate Terrell and Tom Kahler.

III. 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.

- Cascadia Conservation District met with the manager of the Entiat National Fish Hatchery to finalize planting and treatment plans for the Entiat National Fish Hatchery Habitat Improvement Project. Planting and rehabilitation activities will resume in the fall.
- Cascade Columbia Fisheries Enhancement Group expects to complete the draft report on the Nutrient Enhancement Assessment Project by the end of September.
- As part of the LWD/Rootwad Acquisition and Transport Project, Cascadia Conservation District has purchased, delivered, and stockpiled 15 pieces of LWD. This wood will be used in the Tyee Habitat Restoration Project.

[1] Kate provided her vote on decision items before the meeting; Dale provided his after the meeting.

- Dan Morgan and Sons will start construction on the Boat Launch project in early September. The project should be completed by the end of September.
- The Risley Property (part of the Methow River Acquisition Project) is expected to close at the end of August 2011.

IV. Okanagan River Restoration Initiative Monitoring

Karilyn Alex, Okanagan Nation Alliance (ONA) Project Biologist, submitted a monitoring report titled, "Aquatic Monitoring of the Okanagan River Restoration Initiative—Post Construction 2010" to the Wells Committee. The Committee reviewed the report and the monitoring proposal/budget and concluded that the monitoring efforts should continue as planned. Thus, ***the Wells Committee directed Douglas PUD to fund the following component for another year: Fish Holding and Rearing for $4,164.*** The Committee directed the sponsor to submit another report and budget at the end of the monitoring year (April 2012). In addition, the Committee directed Tracy to ask ONA if there are any critical monitoring elements that were not currently funded. Finally, Dennis Beich asked if they could provide more detail to the "Conclusions" section in the monitoring report.

V. HCP Directors Meeting

Tracy Hillman reported that there will be an HCPs progress review meeting for signatory directors and committee-level staff on 19 October, 28 October, 1 November, or 15 November in Lacy, Washington. Tracy will let the Committees know which date the directors select. The purpose of the directors meeting is to provide status reports to all HCP parties and to identify any concerns or issues that may need attention before the 2013 check-in. Tracy noted that all members are welcome to attend the directors meeting. Because the meeting will likely be about two hours, the Committees indicated that it was not necessary for Tracy to attend. Tracy will provide a summary of the types of projects that the Committees have funded to Mike Schiewe, who will share the information with the directors.

VI. Chumstick Barrier Replacement Project

In July, the Chelan County Natural Resource Department submitted the Upper Chumstick Barrier Removal Project for funding under the 2011 General Salmon Habitat Program. The intent of the project was to replace four fish passage barriers with channel-spanning structures on Chumstick Creek. The Committees elected not to fund the project because the benefits of the project did not justify the cost (total costs = $439,944). Chelan County revised the budget based on comments from the Committees and asked the Committees to reconsider funding the project. The revised total budget is $391,428. The County requested $58,714 from HCP Tributary Funds.

After carefully reviewing the revised budget, the Committees concluded that the cost of the project still exceeds the benefits. Committees members present believe this project would have a better chance of receiving funding if the project was submitted as a total package (i.e., submit all four barrier replacement projects as one project rather than four separate projects) and if the total cost of the project does not exceed $310,000. In addition, the Committees are sensitive to the public perception of using public funds to support projects in which the costs exceed the benefits. They recalled the following article in the Wenatchee World http://www.wenatcheeworld.com/news/2009/aug/20/chelan-county-a-bridge-too-big/, which raised concerns about the size, cost, and environmental impact of bridges installed on Chumstick Creek.

VII. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in July and August:

   Rock Island Plan Species Account:

   - $2,402.35 to Cascade Columbia Fisheries Enhancement Group for communications with stakeholders, hatchery staff, state and federal pathologists, and representatives from the Yakama Nation, Ecology, and habitat subcommittees on the Nutrient Enhancement Logistics project.
   - $35,000.00 to Cascadia Conservation District for the purchase and transport of large woody debris for the LWD/Rootwad Acquisition and Transport project.
   - $987.44 to Cascadia Conservation District for work on the land swap between the local landowner and the U.S. Fish and Wildlife Service on the Roaring Creek Flow Enhancement project.

   Wells Plan Species Account:

   - $4,373.02 to the Methow Salmon Recovery Foundation for project administration, appraisals, and review of appraisals for the Hoffman, Gretzner, and Ladum properties (part of the Methow River Acquisition project).
   - $2,008.14 to the Methow Salmon Recovery Foundation for project administration, appraisals, and review of appraisals for the Bird property (part of the Methow River Acquisition project).
   - $3,823.14 to the Methow Salmon Recovery Foundation for project administration, appraisals, and review of appraisals for the Risley property (part of the Methow River Acquisition project).
   - $22,588.84 to Inland Title for acquisition and transaction fees for the Risley property (part of the Methow River Acquisition project).

2. Becky Gallaher and Lee Carlson updated the Committees on recent meetings with BNSF Railroad, Chelan County, and various funding entities and agencies. BNSF is willing to talk about funding issues, but they have not removed or reduced the bridge replacement and maintenance fees at this time. They need the 30% design before they can make decisions about reducing fees. ICF is currently preparing the 30% design and they should have it completed by mid-August. Chris Fisher noted that the Railroad believes there is no benefit to them if this project is implemented. Chris indicated that someone (e.g., Chelan County) should explain to the Railroad that increasing floodplain connectivity will reduce the risk that floods will remove the railroad prism. Becky noted that the next meeting will be on 1 September.

3. The Committees talked briefly about identifying possible projects, such as the upper Chumstick reconnection project, and requesting proposals from sponsors. This would allow a more competitive bidding process. Members decided to table the discussion until all members of the Committees were present.

4. Chris Fisher provided a brief update on the Okanagan River Restoration project in Canada. Because of high flows in the Okanagan River, work on the drop structure has been postponed until 2012. Chris will work with ONA on scheduling the next site visit. It is tentatively scheduled for mid-October. The purpose of the tour is to visit restoration projects and sites for possible future projects.

VIII. Next Steps

The next meeting of the Tributary Committees is scheduled for Wednesday afternoon, 14 September at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 14 September 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes; on phone), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Steve Hays (Chelan PUD).

Others Present: Becky Gallaher (Tributary Project Coordinator), Casey Baldwin (WDFW alternate), and Russell Langshaw (Grant PUD). Barb Carrillo (UCSRB), Derek Van Marter (UCSRB), and Joe Connor (BPA) joined the meeting during the Funding Coordination discussion.

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees met at the Chelan PUD Auditorium in Wenatchee, Washington, on Wednesday, 14 September 2011 from 1:30 to 4:00 pm.

I. Review and Adopt Agenda

Tracy Hillman welcomed everyone to the meeting and the Committees adopted the proposed agenda with the following addition:

- Update on Entiat PUD Canal System Conversion Project.

II. Review and Approval of Meeting Minutes

The Committees reviewed and approved the 11 August 2011 meeting notes.

III. 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.

- Cascadia Conservation District may request an amended scope of work for two of the five sites on Mission Creek (Mission Creek Fish Passage Project). The contractor and landowners believe the current design is over-engineered. The sponsor, the Bureau of Reclamation engineer, and the contractor visited the site to discuss possible engineering changes. Three of the five sites will proceed as designed.
- Cascade Columbia Fisheries Enhancement Group expects to complete the draft report on the Nutrient Enhancement Assessment Project by the end of September.
- The LWD/Rootwad Acquisition and Transport Project is complete. Cascadia Conservation District acquired 299 pieces of large wood.

- Dan Morgan and Sons started construction on the Boat Launch project and the work should be completed by 30 September.
- Appraisal and environmental assessments are underway on the White River Nason View Acquisition. Timber value was included in the assessment. The project should close at the end of 2011.
- Appraisal and environmental assessments are underway on the White River Van Dusen Conservation Easement. Timber value may be included in the assessment. The project is expected to close at the end of 2011.

IV. Acclimation Ponds on Protected Properties

Tracy Hillman reported that he received an email from Jason Paulsen, Methow Conservancy, asking the Committees to provide a letter stating whether they support the allowance of the development of acclimation facilities on properties protected with Tributary funds. The Conservancy was reviewing the Draft Environmental Impact Statement for the Mid-Columbia Coho Restoration Program and believed that one of the proposed acclimation sites fell within the boundaries of a conservation easement that was funded in part by the Committees. Tom Kahler reviewed the Draft EIS and believes that the proposed acclimation site does not fall within an easement funded by the Committees. Both the Yakama Nation and Methow Conservancy will provide Tracy with detailed maps showing the locations of proposed acclimation sites.

As directed by the Committees, Tracy provided the following information to the Conservancy:

> *As a general policy, all conservation easements or lands acquired with Tributary Funds must follow the management guidelines identified in Sections 3.8 (Management Guidelines for Conservation Easements/Acquired Lands) and 4.3 (Ineligible Projects and Elements) of the Policies and Procedures for Funding Projects. Section 4.3 specifically singles out remote site incubation systems as being ineligible for Tributary Funds. Section 3.8 includes a series of clauses that are generally incompatible with acclimation. Any proposed change in management actions or uses on the property for which the Committees provided funds for acquisition or conservation easements must be reviewed and approved by the Committees. Thus, if a sponsor or landowner wants to place an acclimation facility or any other project that may contradict Section 3.8 or 4.3 on lands protected with a conservation easement that was funded in any part by the Tributary Committees, the sponsor must submit to the Committees a detailed description of the proposed action. The Committees will then review the action and determine if the action should proceed.*

Tracy asked the Committees if they would like to meet with the Conservancy about restoration actions and public access on easements funded by the Committees. Recall that the Conservancy disapproved of the Committees request to allow public access and habitat restoration actions, if deemed necessary, on easements and acquisitions funded by the Committees. The Committees see no need to meet with the Conservancy and directed Tracy to call Jason Paulsen and discuss with him the position of the Committees.

V. Information Updates

The following information updates were provided during the meeting.

1. There were no Payment Requests in September.

2. Tracy Hillman stated that Chelan County is no longer seeking funding from the Committees on the Upper Chumstick Barrier Removal Project.
3. Casey Baldwin and Kate Terrell shared with the Committees some of the issues surrounding the use of LWD in restoration projects. Apparently, some landowners are concerned that the addition of LWD to the Entiat River may dislodge and remove or damage bridges and other infrastructures. Other concerns associated with LWD that have been identified include property damage from erosion created by the project, flooding, loss of life or injury to river users, and liability issues. Some elected officials have mentioned the possibility of a moratorium on the installation of LWD in Chelan County, similar to what the City of Chelan did regarding the use of wood in Lake Chelan. Recent discussions have considered using an advisory group approach and possibly establishing local guidelines, policy, and best management practices so that politicians, the public, and some wood project implementers can be comfortable that their use of wood is socially acceptable. Chelan County is currently trying to figure out ways to reduce or eliminate liability and how to do more (and better) public outreach and education. A habitat workgroup will meet next week to address the issues associated with LWD. Kate believes that better communication and education will help solve the problem.
4. Tracy Hillman reminded the Committees that the HCPs Directors Meeting will be on Tuesday, 15 November from 1:00 to 4:00 pm in Lacey. The purpose of the directors meeting is to provide status reports to all HCP parties and to identify any concerns or issues that may need attention before the 2013 check-in. Tracy noted that all members are welcome to attend the directors meeting. Tracy will provide a summary of the types of projects that the Committees have funded to members of the Committees, who will share the information with the directors.
5. The Committees briefly discussed project solicitations. Members discussed different projects that may be candidates for a targeted solicitation (e.g., Icicle Assessment). They will continue to identify and discuss possible projects in the future.
6. Becky Gallaher reported that the portion of the Entiat PUD Canal System Conversion Project that was funded by the Committees is complete. However, the sponsor (Cascadia Conservation District) is requesting a contract extension on the project from the Salmon Recovery Funding Board (SRFB). Because of delays in negotiating landowner agreements and the Water Right Change Application, the sponsor is requesting a time extension from 31 December 2011 to 31 December 2012.
7. Chris Fisher reported that the ORRI site visit in October has been canceled, primarily because members of the Priest Rapids Coordinating Committee (PRCC) were unable to attend. Chris will try to schedule a visit next year.

VI. Funding Coordination

The Committees invited other funding entities (SRFB, BPA, PRCC Habitat Subcommittee, and Tribes with Accords) to the meeting to discuss funding coordination. Tracy reviewed the most recent ranking of SRFB/TC projects (see Attachment 1). He noted that the Nutrient Enhancement Planning Project, which was selected to receive funding from the Tributary Committees and the Yakama Nation, fell below the current SRFB funding line. Depending on the final amount of SRFB money available to the Upper Columbia and potential shuffling of funds within and among projects, the Nutrient Enhancement Planning Project may or may not receive any SRFB funding. If it does not, the sponsor will need to seek additional funding from the Tributary Committees and/or the Yakama Nation, or seek funding from other entities such as the PRCC Habitat

Subcommittee. The Committees will wait to see what the final SRFB contribution is before they make any additional funding decisions.

VII. Next Steps

At this time, there is no plan to meet in October. Members of the Committees will join the RTT on a site visit in the Methow Basin on Wednesday, 12 October. The next meeting of the Tributary Committees is scheduled for Thursday, 10 November at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Final Regional Ranked List for SRFB 2011

ID	PROJECT NAME	SPONSOR	LEAD ENTITY	AMOUNT REQUESTED					RTT SCORE			CAC RANK
				SRFB	TRIB	Other	Total	SRFB Cumulative	BB	COS	Total Score	
11-1336	Nason Creek LWP Reconnection - B+ Connection Construction	CCNRD/USBR	Chelan	$ 162,290	$ 150,000	$ 1,850,000	$ 2,162,290	$ 162,290	75	34	109	1
11-1425	Twisp River Acquisition 2011 RM .09	Methow Salmon Recovery Foundation (MSRF)	Okanogan	$ 111,700	$ 29,000	$ -	$ 140,700	$ 273,990	59	29	88	1
11-1460	Large Wood Atonement in the White River	CCFEG/USFWS	Chelan	$ 194,100	$ 100,000	$ 58,292	$ 352,392	$ 468,090	71	35	106	2
11-1426	Methow River Acquisition 2011 RM 48.9	MSRF	Okanogan	$ 31,015	$ -	$ 6,310	$ 37,325	$ 499,105	53	31	84	2
11-1495	Upper Methow Riparian Protection V	Methow Conservancy	Okanogan	$ 84,038	$ -	$ 53,500	$ 137,538	$ 583,143	67	37	104	3
11-1372	Upper Chumstick Barrier Removal	CCNRD	Chelan	$ 332,714	$ -	$ 58,714	$ 391,428	$ 915,857	52	27	79	3
11-1415	Entiat River Stormy Reach Acquisition Phase 2	Chelan-Douglas Land Trust (CDLT)	Chelan	$ 280,000	$ 56,000	$ -	$ 336,000	$ 1,195,857	82	42	124	4
11-1518	Silver Protection	WDFW	Okanogan	$ 300,000	$ 250,000	$ 110,000	$ 660,000	$ 1,495,857	72	32	104	4
11-1240	Driscoll Island Cold Water Refuge Design-Only	CCFEG	Okanogan	$ 42,500	$ -	$ -	$ 42,500	$ 1,538,357	48	31	79	5
11-1469	Nason Creek, Lower White Pine, Coulter Creek Barrier Replacement	CCNRD/USBR	Chelan	$ 70,657	$ 12,469	$ -	$ 83,126	$ 1,609,014	48	30	78	5
11-1441	Nason Creek Lower White Pine Ponds and Flats Acquisition	CDLT	Chelan	$ 250,000	$ 44,700	$ -	$ 294,700	$ 1,859,014	63	37	100	6
11-1495	Upper Methow Riparian Protection VI	Methow Conservancy	Okanogan	$ 202,034	$ -		$ 202,034	$ 2,061,048	43	31	74	6
11-1347	Nutrient Enhancement Planning - Upper Wenatchee Tributaries	CCFEG/TU	Chelan	$ 120,000	$ 80,000	$ 40,000	$ 240,000	$ 2,181,048	53	35	88	7
11-1262	Wolf Creek Ditch and Fish Return Improvement	CCFEG/USFS	Okanogan	$ 190,000	$ -	$ 80,000	$ 270,000	$ 2,371,048	45	33	78	7
11-1442	Pioneer Side Channel Restoration Project	CCNRD	Chelan	$ 123,300	$ -	$ 70,000	$ 193,300	$ 2,494,348	37	23	60	8
11-1444	Peshastin Forest Service Road System Improvement	CCNRD/USFS	Chelan	$ 265,000	$ -	$ 100,000	$ 365,000	$ 2,759,348	45	26	71	9
11-1468	Mill Creek/Mountain Home Ranch Road Fish Passage	CCNRD/USFWS	Chelan	$ 131,922	$ -	$ 154,600	$ 286,522	$ 2,891,270	42	26	68	10
11-1337	Wenatchee Watershed Knotweed Control and Riparian Restoration	Chelan Co Noxious Weed Board	Chelan	$ 43,000	$ -	$ 214,400	$ 257,400	$ 2,934,270	35	27	62	11
11-1446	Wenatchee Watershed Riparian Prioritzation	CCNRD	Chelan	$ 25,000	$ -	$ 4,500	$ 29,500	$ 2,959,270	25	29	54	12
11-1445	Old Peshastin Mill Riparain Enhancement Project	CCNRD	Chelan	$ 77,690	$ -	$ 13,710	$ 91,400	$ 3,036,960	31	23	54	13
			TOTAL	**$ 3,036,960**	**$ 722,169**	**$ 2,814,026**	**$ 6,573,155**					

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 10 November 2011

Members Present: Dale Bambrick (NOAA Fisheries), Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Steve Hays (Chelan PUD), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Others Present: Becky Gallaher (Tributary Project Coordinator). Jeff Osborn (Chelan PUD), Jennifer Goodridge (Chelan County NRD), and Mike Kaputa (Chelan County NRD) joined the meeting for the Upper White Pine discussion. Denny Rohr (PRCC Habitat Subcommittee Facilitator), Dave Duvall (Grant PUD), Derek Van Marter (UCSRB), Joe Connor (BPA), Roy Beaty (BPA, on phone), Mike Kane (Chelan County NRD), John Soden (ICF), Mike Kaputa (Chelan County NRD), and Mary Jo Sanborn (Chelan County NRD) joined the meeting during the Lower White Pine B+ Presentation.

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 November 2011 from 9:00 am to 12:00 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 September 2011 meeting notes with edits from Casey Baldwin.

III. 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.

- For the Mission Creek Fish Passage Project, Cascadia Conservation District received bids for construction at three sites. The bids were all too high (~$264,000). The sponsor is considering building as many passage projects as possible with existing funds and then requesting additional funds from the Committees or other sources to complete the remaining projects. However, the total cost of the project would then exceed the $50,000 limit for small projects. Thus, the sponsor is also considering pulling the project and seeking funds elsewhere (e.g., NOAA Fisheries).

- Cascade Columbia Fisheries Enhancement Group completed the draft report on the Nutrient Enhancement Assessment Project. They should be submitting the final report soon.
- For the Entiat NFH Habitat Improvement project, Cascadia Conservation District has planted and mulched about 200 additional riparian plants along the upper levee and mulched around existing plants along the pond. They also began preparations for work on the access road. Finally, they completed winterizing the temporary irrigation system. One member of the Committees stated that they were not terribly impressed with the plantings. Several of the plants looked to be in poor condition (small size) and there were weeds (knapweed) growing in the new soil. It was recommended that the Committees visit the site.
- For the Methow Subbasin LWD Acquisition and Stockpile project, the Methow Salmon Recovery Foundation has purchased an additional three pieces of large wood. The wood is stockpiled at the WDFW storage site about four miles north of Twisp.
- The Boat Launch Off-Channel Pond Reconnection project is complete. A final report should be available soon.
- The Methow River (Risley) Acquisition is complete. A final report should be available soon.
- Trout Unlimited – Washington Water Project is preparing a scope change for the Chewuch River Permanent Instream Flow project. The Rocky Reach Committee should receive the proposed change in late November.
- Chelan-Douglas Land Trust is having some difficulty getting the appraisal completed for the White River Nason View Acquisition project. The sponsor is considering replacing the appraiser.

IV. Upper White Pine Power Line Alternatives Analysis

Jennifer Goodridge with Chelan County NRD gave a presentation on a proposed change in the scope of work for the Nason Creek UWP Floodplain Reconnection project (see Attachment 1). As background, in 2009, the Rock Island Tributary Committee granted Chelan County $62,316 (cost share with the Salmon Recovery Board) to breach a levee that would reconnect 25 acres of off-channel habitat and floodplain within the Upper White Pine Reach of Nason Creek. Because a Chelan PUD power line corridor parallels the stream and levee, the County needs to evaluate different alternatives for dealing with the power poles in the project area. Therefore, they asked the Rock Island Committee to approve a change in project scope. The County would like to use $52,000 to conduct an alternatives analysis to determine the feasibility of relocating or rebuilding a section of the power line within the project area. The County will likely contract with HDR Engineering to work with Chelan PUD on developing the alternatives. The revised scope of work includes four phases: (1) project initiation and data gathering, (2) identify 8-10 alternatives, (3) develop 2-4 alternatives, and (4) deliverables. By December 2011, the contractor will provide a report identifying 8-10 alternatives. The final report identifying 2-4 alternatives will be provided in March 2012.

After careful consideration, the Rock Island Committee approved the change in scope and recommended that the analyses focus on removing the power line from the channel migration zone. The Committee also stated that the total cost of the study cannot exceed $52,000.

V. Information Updates

The following information updates were provided during the meeting.

1. Approved Payment Requests in October and November:

   Rock Island Plan Species Account:

   - $32,206.65 to Chelan County Treasurer for work on the Boat Launch Off-Channel Pond Reconnection project.
   - $61,948.00 to Inland Professional Title for the Upper Methow II Riparian Protection project (Tawlks Conservation Easement).
   - $2,856.68 to Trout Unlimited for coordination work with the Cascadia Law Group on changing the point of diversion on the water right associated with the Lower Wenatchee Instream Flow Enhancement project.
   - $2,981.37 to Chelan County PUD for project coordination during the third quarter of 2011.
   - $154.00 to Larson-Allen for third-quarter financial management and reporting.

   Rocky Reach Plan Species Account:

   - $954.00 to the Methow Salmon Recovery Foundation for acquiring additional LWD for the Methow Subbasin LWD Acquisition and Stockpile project.
   - $1,071.36 to Chelan County PUD for project coordination during the third quarter of 2011.
   - $154.00 to Larson-Allen for third-quarter financial management and reporting.

   Wells Plan Species Account:

   - $1,642.95 to Chelan County PUD for project coordination during the third quarter of 2011.
   - $2,128.00 to Douglas County PUD for financial management for fiscal year ending 31August 2011.

2. Tracy Hillman informed the Committees that the HCPs Directors-level Meeting will be on Tuesday, 15 November from 1:00 to 4:00 pm in Lacey, WA. The purpose of the meeting is to provide status reports to all HCP parties and to identify any concerns or issues that may need attention before the 2013 check-in. Tracy and Becky provided the Committees with project summary sheets (by Plan Species Account) and figures showing the allocation of funds by species accounts to different types of projects (see Attachment 2). If necessary, these summary sheets and figures can be shared with the participants at the Directors-level Meeting. Both Dennis Beich and Tom Kahler indicated that they would attend the Directors-level Meeting.

3. Tracy Hillman shared with the Committees a letter prepared by Andrus and Gessford, attorneys with Skellenger Brender, that described the legal risks associated with design and construction of engineered log jams (see Attachment 3). The letter was prepared at the request of Chelan County. In short, the letter indicates that landowners and design engineers could be liable for injury or death, loss of property, damage to infrastructure, and flooding associated with ELJs. The letter also identified twelve risk mitigation measures that could be implemented to reduce liability. There will

be a woody debris workshop on 30 Nov. and 1 Dec. in Wenatchee to discuss the importance of wood to fish and liability issues associated with engineered log jams.

VI. Lower White Pine B+ Presentation

The Committees joined the PRCC Habitat Subcommittee for the Lower White Pine B+ presentation. What follows are highlights from the joint meeting. The PRCC Habitat Subcommittee will provide more detailed notes.

John Soden (ICF) and Chelan County NRD gave a brief presentation to the Committees on recent funding developments associated with the BNSF Railways – Nason Creek Lower White Pine B+ Reconnection Project (see Attachment 4). John showed how the cost of the project has changed since February 2011. For example, the construction cost decreased from $1.049 M in February to $1.042 M in June and then to $0.938 M in November. Mitigation costs, which include costs associated with bridge future expansion, bridge replacement, and a bridge maintenance fee, decreased from $1.463 M in February to $1.050 M in June, but then increased to $1.358 M in November.

The Committees are mostly concerned with the mitigation costs. The Committees indicated that they will not support the bridge future expansion or replacement fees (these total $1.183 M). They told the County that they should let BNSF know that the funding entities are ready to fund the construction work, but not the mitigation fees. The funding entities would consider supporting an insurance policy that covers bridge replacement. Kate stated that the Railroad is willing to negotiate mitigation fees. Mike Kaputa said that he will talk with the Railroad about reducing or eliminating the mitigation fees. He will also let the Railroad know that the funding entities are willing to move forward with funding the construction costs. The bottom line is that the B+ Reconnection project may not happen unless the Railroad is willing to significantly reduce or remove the mitigation costs.

VII. Next Steps

If necessary, the next meeting of the Tributary Committees will be on Thursday, 8 December at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

Attachment 1: Upper White Pine CPUD Power Line Relocation Alternatives Analysis Presentation

Upper White Pine
Nason Creek RM 12-14.2
Project Update

- Project History
- Scope of Work
- Project Status
- Revised SOW
- Project Schedule
- Design Team Process

Project History

- USBR Completed RA March 2009
- CCNRD applied for SRFB Funds DOZ-1 2009
- Tributary Committee awards match to SRFB grant request
- SRFB funds awarded to CCNRD to assist USBR with AER in 2010

2009 CCNRD-Tributary Comm. SOW

ATTACHMENT 1

PROJECT NAME: Nason Creek Upper White Pine Reconnection
PROJECT NUMBER: 2009-06 RI
SPONSOR NAME: Chelan County Natural Resource Dept. (herein referred to as "Sponsor")
LANDOWNER NAME: U.S. Forest Service (herein referred to as "Landowner")

DESCRIPTION
Nason Creek is a Category 2 watershed in the Wenatchee subbasin, which contains major spawning areas for ESA listed spring Chinook salmon and steelhead, and is a bull trout core area. The project location is a 0.5 mile long segment of Nason Creek between RM 13.8 and 13.3.

The construction of the BNSF Railway prism moved 2,000 linear feet of the Nason Creek main channel to the north side of the railroad. The construction of this channel included 2,000 linear feet of levee on the north side of the new channel which restricts the migration of the channel and partially disconnects the floodplain to the north. The disconnected floodplain is bounded to the north by the US 2 road prism and a US Forest Service road (White Pine) to the west. A Chelan PUD powerline corridor also parallels the river and levee immediately to the north of the levee. The levee tapers out at the downstream end of the site, allowing a small area of connection between the creek and the wetland at the downstream end.

The project actions shall remove or modify the levee, in combination with re-sloping of the left bank to reconnect existing wetlands and floodplain and reinitiate habitat-forming processes. The reconnection of will connect 25 acres of off-channel habitat and to Nason Creek.

OBJECTIVE
The project objectives are to reconnect historic floodplain and off-channel habitats.

IMPACTED FISH SPECIES
Listed species include, spring Chinook, steelhead, and bull trout

PROJECT DELIVERABLES
The deliverables for this project shall be as follows:
1. Final Report
   a. Complete per requirements of Agreement terms
   b. include an estimated final value of provided match for the project
2. Submittal of all permits
3. Removal of levee (per project design)
4. Channel reconnection (per project design)

BUDGET
Total budget shall not exceed **$62,316**

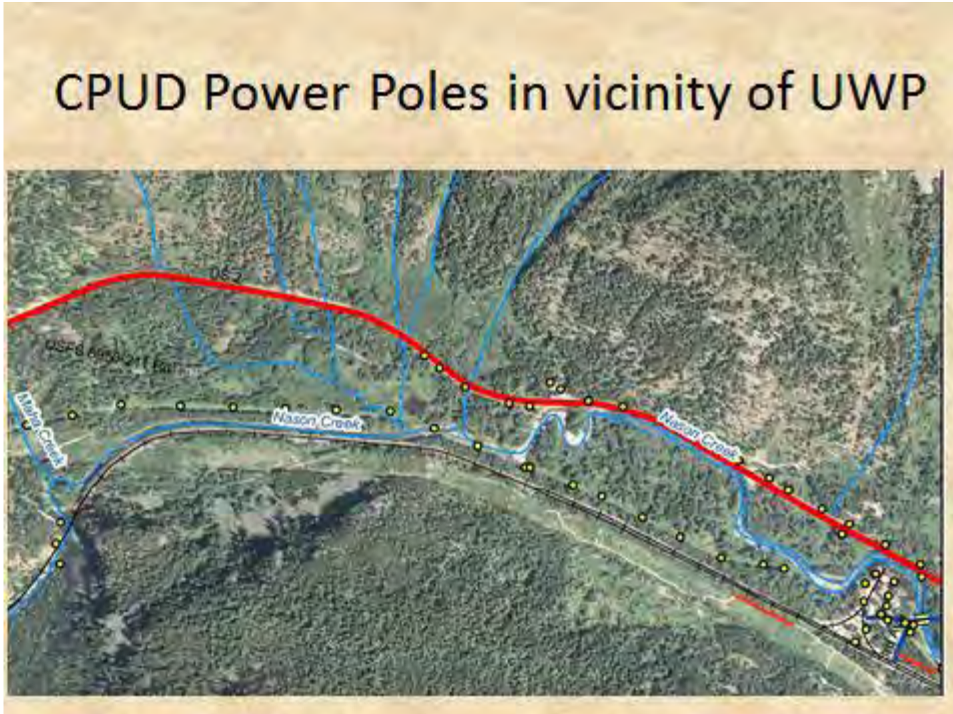
Budget Line Item	Description	Budget
Sponsor Salaries and Benefits		$
Contract Labor		$
Total		$62,316

TIMELINE
The specific project work, outlined in this Attachment, must be complete by 2010.

Activity	Outcome	Date (month/year) subject to change
Prepare permit ready 75% plan set	• Submit plans and JARPA package	September 2009
Receive permits	• Obtain all permits for construction	April 2010
Prepare 100% bid package	• Specs of construction requirements available for prospective contractors	May 2010
Select contractor	• Sponsor awards contract	June 2010
Begin construction	• Excavate pond and channel reconnections	July – Sept 2010
Planting	• Revegetate disturbed areas and improve riparian zone	October 2010
Finish construction	• Final Sponsor inspection	October 2010

Project Status

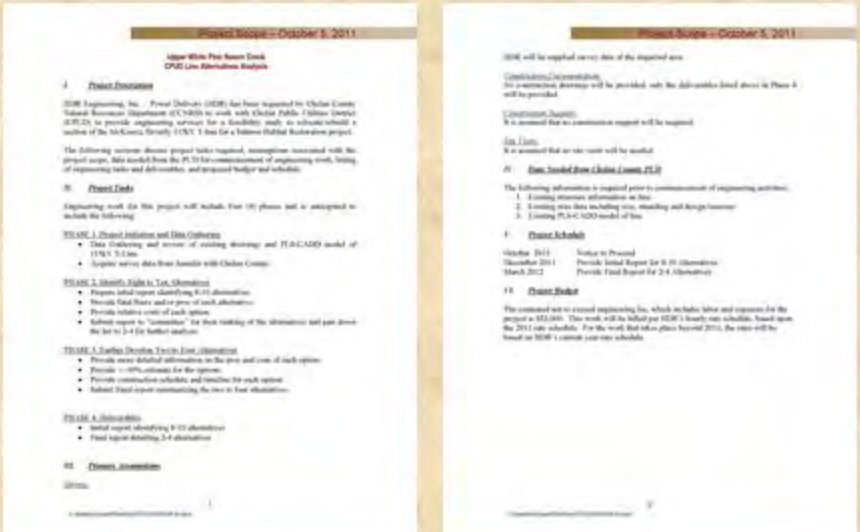
- USBR contracted TEAMS for AER 2010
- CCNRD coordinating with CPUD and other stakeholders
- March 2011 TEAMS presented to WHSC
- April 2011 mtg with sponsors, UCSRB, USFS
- USBR-TEAMS-CCNRD Project areas 1-2 (upstream)
- YN-Interfluve Project areas 3-5 (downstream)
- June and August meetings with CPUD


CPUD Power Poles in vicinity of UWP
Nason Creek
Nason Creek

Goal = Removing the CPUD lines as a constraint to restoration

- Fewer, taller poles
- Build a new type of pole in the water, for example, a steel-concrete hybrid that requires less maintenance
- Re-align south towards BPA
- Re-align north into the Hwy 2 ROW
- Move north to USFS land north of Hwy 2
- Move the line north along the White Pine road
- Something an expert develops

Revised Scope of Work



Project Status

- Completed
  - Summarize processes by project area
  - Prioritize and evaluate restoration/rehabilitation actions
  - Model existing conditions
- November 2011
  - Model proposed conditions
  - WHSC meeting presentation
- December 2011/January 2012
  - RTT meeting presentation
  - Develop recommended actions from feedback

Summary of Processes (Beechie)

Process	Anthropogenic cause of impairment	Ranking by project area (H, M, L)
Hydrology/Hydraulic	Infrastructure	
Sediment	Channelization	
Riparian Veg	Clearing	
Large Wood	Logging	
Large Wood	Channel clearing	

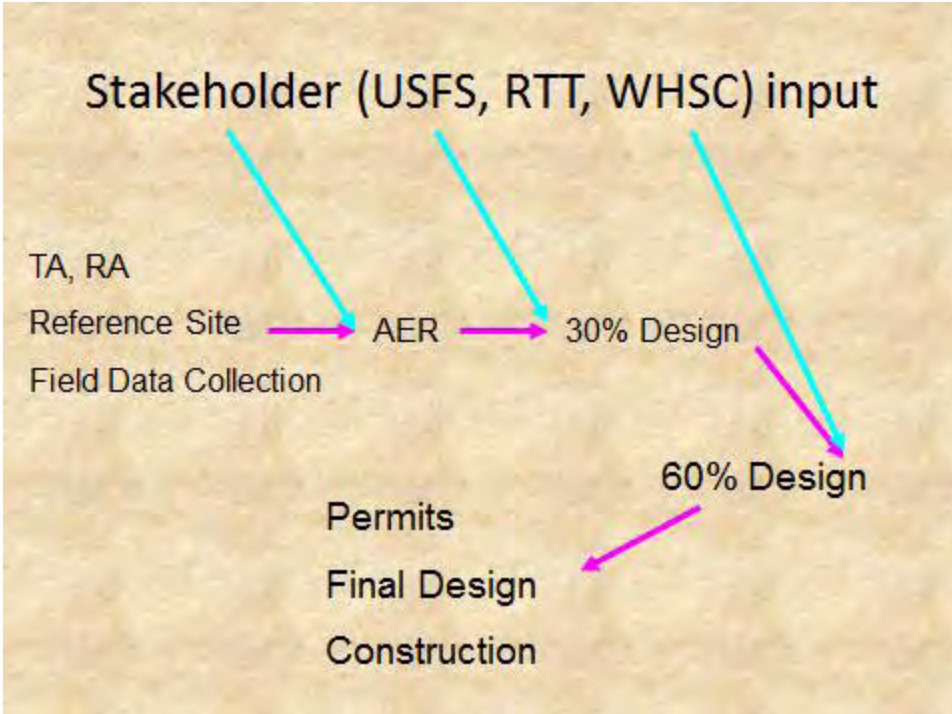
Importance of Restoration Actions (Beechie)

Process	Action	Ranking by project area (H, M, L)
Hydrologic	Culvert replacement	
Hydrologic	Remove levee	
Hydrologic	Restore side channel connection	
Sediment	Adjust cross sectional area	
Sediment	Remove armoring	

Existing Conditions Modeling

Project Schedule

- March 2012
  - Draft AER
- June 2012
  - Final AER
  - Powerlines relocation feasibility study
- Summer 2012
  - Finalize USFS NEPA
- Spring 2013
  - 30% plans
- Fall 2013
  - 60% plans
  - Begin Permitting
- Spring 2014
  - Final Plans
  - Permitting finished
  - Construction Bid
- Summer 2014
  - Construction


Stakeholder (USFS, RTT, WHSC) input
TA, RA
Reference Site
Field Data Collection
AER
30% Design
60% Design
Permits
Final Design
Construction

Attachment 2: Handouts for the Directors Meeting

Rock Island Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
05 White River Floodplain & Habitat Protection	Chelan-Douglas Land Trust	General	Protection	$1,986,200	$693,548	$693,548	Complete
05 Nason Creek Off-Channel Habitat Restoration	Chelan County NRD	General	Off-Channel Habitat	$125,034	$18,787	$18,787	Complete
05 Alder Creek Culvert Replacement	Chelan County NRD	General	Fish Passage	$89,804	$89,804	$89,804	Complete
05 McDevitt Diversion Project	Cascadia Conservation District	Small	Fish Passage	$5,278	$5,278	$2,831	Complete
07 LWD Removal and Relocation	Chelan County NRD	Small	Instream Structures	$5,000	$5,000	$871	Complete
07 WRIA's 45/46 Riparian Restoration	Cascadia Conservation District	Small	Riparian Habitat	$50,000	$25,000	$24,779	Complete
07 Entiat PUD Canal System Conversion	Cascadia Conservation District	General	Instream Flows	$496,584	$99,360	$99,360	Complete
07 Roaring Creek Flow Enhancement	Cascadia Conservation District	General	Instrm Flows/Passage	$147,069	$25,000	$987	Cancelled
07 Wildhorse Spring Creek Conservation Easement	Colville Confederated Tribes	General	Protection	$67,826	$62,826	$62,850	Complete
08 Twisp River Conservation Acquisition II	Methow Salmon Recovery Found	General	Protection	$481,814	$220,500	$200,500	Complete
08 Twisp River Riparian Protection (Zinn)	Methow Conservancy	General	Protection	$349,988	$104,996	$0	In progress
08 Cashmere Pond Off-Channel Habitat Project	Chelan County NRD	General	Off-Channel Habitat	$914,076	$249,110	$240,139	Complete
08 Keystone Canyon Habitat Project	Cascadia Conservation District	General	Off-Channel Habitat	$193,805	$29,100	$0	Cancelled
09 LWD/Rootwad Acquisition and Transport II	Cascadia Conservation District	Small	Instream Structures	$35,000	$35,000	$35,000	Complete
09 Sleepy Hollow Reserve Protection Feasibility	Chelan-Douglas Land Trust	Small	Assessment	$25,000	$20,000	$16,599	Complete
09 White River Nason View Acquisition	Chelan-Douglas Land Trust	General	Protection	$545,000	$76,635	$9,281	In progress
09 Upper Methow II (Tawlks) Riparian Protection	Methow Conservancy	General	Protection	$411,943	$61,948	$61,948	Complete
09 Nason Creek UWP Floodplain Reconnection	Chelan County NRD	General	Off-Channel Habitat	$124,632	$62,316	$0	In progress
09 Lower Wenatchee Instream Flow Enhancement	Washington Rivers Conservancy	General	Instream Flows	$4,954,466	$167,500	$2,857	In progress
10 White River Dally-Wilson Conservation Easement	Chelan-Douglas Land Trust	General	Protection	$194,000	$120,000	$120,000	Complete
10 Mission Creek Fish Passage	Cascadia Conservation District	Small	Instrm Struct/Passage	$50,000	$45,000	$0	In progress
10 Assessing Nutrient Enhancement	CC Fisheries Enhancement Group	Small	Assessment	$9,875	$9,875	$2,402	In Progress

Rock Island Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
11 Boat Launch Off-Channel Pond Reconnection	Chelan County NRD	General	Off-Channel Habitat	$136,500	$62,000	$0	In Progress
11 White River Van Dusen Conservation Easement	Chelan-Douglas Land Trust	General	Protection	$440,000	$60,000	$1,117	In Progress
12 Wenatchee Nutrient Enhancement - Design	CCFEG	General	Assess/Instrm Struct	$240,000	$80,000	$0	
12 White River Large Wood Atonement	CCFEG	General	Instream Structures	$352,392	$100,000	$0	
12 Lower White Pine Upper Connection B+	Chelan County NRD	General	Off-Channel Habitat	$2,162,290	$250,000	$0	
Total				**$14,593,576**	**$2,778,583**	**$1,683,661**	

Current Rock Island Plan Species Account Balance (unallocated): $906,655.73
Contribution to the Rock Island Account is made annually (January 31): $485,200 (in 1998 dollars)

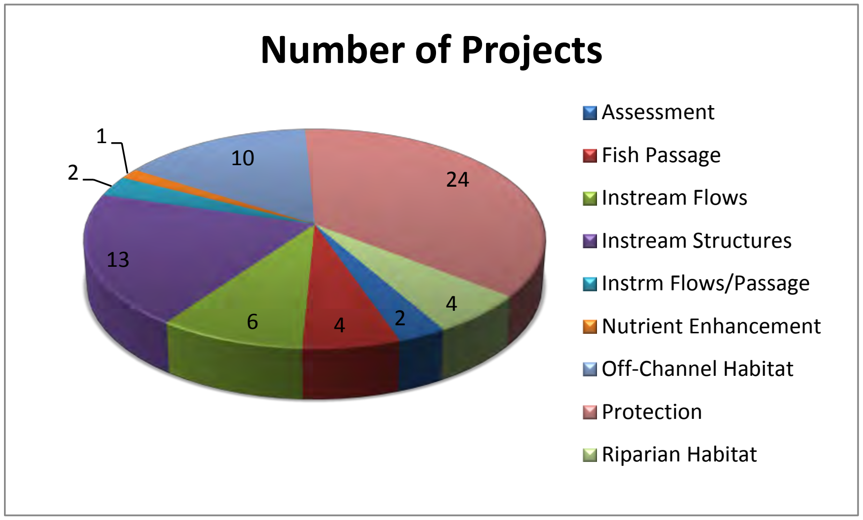
Rocky Reach Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
05 Entiat Instream Structure Engineering	Cascadia Conservation District	General	Instream Structures	$59,340	$59,340	$48,659	Complete
05 Twisp River Conservation Acquisition	Methow Salmon Recovery Found	General	Protection	$200,835	$40,000	$40,000	Complete
05 Clees Well and Pump	Okanogan Conservation District	General	Instream Flows	$40,875	$15,000	$14,924	Complete
05 Entiat Instream Habitat Improvements	Chelan County NRD	General	Instream Structures	$250,000	$37,500	$37,500	Complete
06 Entiat PUD Canal Juv. Habitat Enhancement	Cascadia Conservation District	Small	Instream Structures	$23,640	$23,640	$3,059	Complete
07 LWD Removal & Relocation	Chelan County NRD	Small	Instream Structures	$5,000	$5,000	$871	Complete
07 LWD/Rootwad Acquisition & Transport	Cascadia Conservation District	Small	Instream Structures	$24,600	$24,600	$24,600	Complete
07 Harrison Side Channel	Chelan County NRD	General	Off-Channel Habitat	$797,300	$90,105	$68,647	Complete
08 Entiat PUD Canal Log-Boom Installation	Cascadia Conservation District	Small	Instream Structures	$10,660	$7,160	$4,526	Complete
08 Twisp River Riparian Protection (Buckley)	Methow Conservancy	General	Protection	$299,418	$89,825	$89,825	Complete
08 Below the Bridge	Cascadia Conservation District	General	Instream Structures	$398,998	$150,000	$114,730	In progress
09 Foreman Floodplain Reconnection	Chelan County NRD	General	Off-Channel Habitat	$208,592	$104,296	$0	In progress
09 Entiat NFH Habitat Improvement Project	Cascadia Conservation District	General	Off-Channel Habitat	$285,886	$61,373	$26,543	In progress
10 Methow Subbasin LWD Acquisition & Stockpile	Methow Salmon Recovery Found	Small	Instream Structures	$50,000	$50,000	$48,960	In progress
11 Chewuch River Permanent Instream Flow Project	TU – Washington Water Project	General	Instream Flows	$1,200,000	$325,000	$0	In Progress
11 Christianson Conservation Easement	Methow Conservancy	Small	Protection	$16,350	$15,000	$15,000	Complete
12 Entiat Stormy Reach Phase 2 Acquisition	Chelan-Douglas Land Trust	General	Protection	$336,000	$56,000	$0	
12 Silver Protection (co-funded with Wells account)	WA Dept. of Fish & Wildlife	General	Protection	$660,000	$125,000	$0	
12 Nason LWP Coulter Ck Barrier Replacement	Chelan County NRD	General	Fish Passage	$83,126	$12,469	$0	
Total				**$4,950,620**	**$1,291,308**	**$537,844**	

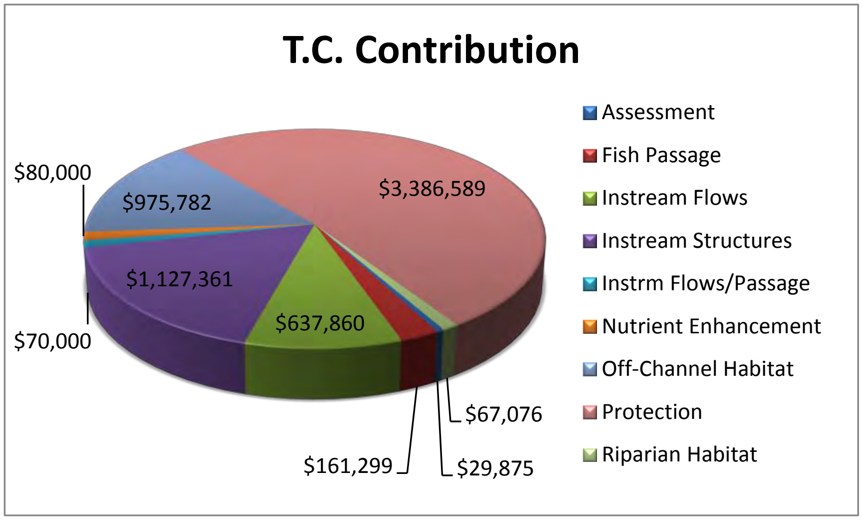
Current Rocky Reach Plan Species Account Balance (unallocated): $852,403
Contribution to the Rocky Reach Account is made annually (January 31): $229,800 (in 1998 dollars)

Wells Plan Species Account							
Project Name	**Sponsor**	**Fund Type**	**Project Type**	**Total Cost**	**Tributary Contribution**	**Tributary Contribution (actual to date)**	**Project Status**
05 Okanagan River Restoration – Phase III	Okanagan Nation Alliance	General	Instream Structures	$219,121	$219,121	$197,681	Complete
05 Methow Riparian Protection (Heath)	Methow Conservancy	General	Protection	$2,684,500	$1,177,500	$812,700	Complete
05 Methow Riparian Protection (Prentice)	Methow Conservancy	General	Protection			$1,749	Complete
05 Methow Riparian Protection (MacDonald)	Methow Conservancy	General	Protection			$345,400	Complete
07 Lower Beaver Creek Livestock Exclusion	Okanogan Conservation District	Small	Riparian Habitat	$24,670	$18,559	$16,561	Complete
07 Heath Floodplain Restoration	Methow Salmon Recovery Found	Small	Off-Channel Habitat	$48,695	$48,695	$43,915	Complete
07 Okanogan River Restoration – Phase IV	Okanagan Nation Alliance	General	Instream Structures	$1,022,000	$411,000	$411,000	Complete
08 Riparian Regeneration & Restoration Initiative	Methow Conservancy	Small	Riparian Habitat	$22,737	$15,537	$15,537	Complete
08 Fort Thurlow Pump Project	Methow Salmon Recovery Found	Small	Instream Flows	$48,150	$7,000	$7,009	Complete
08 Goodman Livestock Exclusion Project	Okanogan Conservation District	Small	Riparian Habitat	$8,080	$7,980	$6,829	Complete
08 Poorman Creek Barrier Removal	Methow Salmon Recovery Found	General	Fish Passage	$191,579	$53,748	$53,748	Complete
08 Twisp River Riparian Protection (Pampanin)	Methow Conservancy	General	Protection	$119,720	$48,649	$48,649	Complete
08 Twisp River Riparian Protection (Neighbor)	Methow Conservancy	General	Protection	$260,000	$55,000	$55,000	Complete
08 Twisp River Riparian Protection (Speir)	Methow Conservancy	General	Protection	$79,976	$23,993	$23,993	Complete
10 Prevent Fish Entrainment on Inkaneep Creek	Okanogan Nation Alliance	Small	Instream Flows	$24,000	$24,000	$0	In Progress
11 Methow River Acquisition MR 39.5 (Hoffman)	Methow Salmon Recovery Found	General	Protection	$195,048	$74,415	$4,373	In Progress
11Methow River Acquisition MR 48.7 (Bird)	Methow Salmon Recovery Found	General	Protection	$244,760	$94,900	$2,008	In Progress
11 Methow River Acquisition MR 41.5 (Risley)	Methow Salmon Recovery Found	General	Protection	$148,210	$31,854	$26,407	In Progress
12 Twisp River Acquisition 2011 (Hovee)	Methow Salmon Recovery Found	General	Protection	$140,700	$29,000	$0	
12 Silver Protection (co-funded with RR account)	WA Dept. of Fish & Wildlife	General	Protection	$660,000	$125,000	$0	
Total				**$6,141,946**	**$2,465,951**	**$2,072,559**	

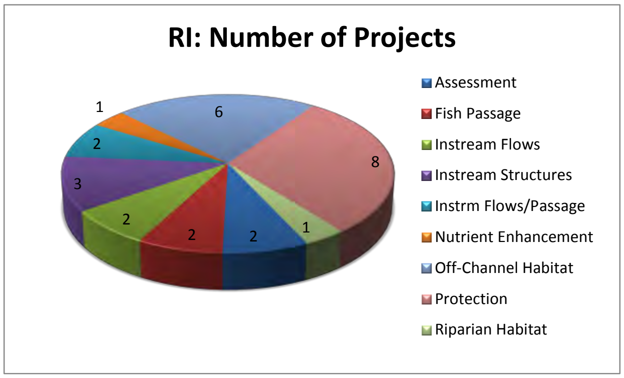
Current Wells Plan Species Account Balance (unallocated): $761,417
Contribution to the Wells Account will be made annually beginning in 2010: $176,178 (in 1998 dollars)

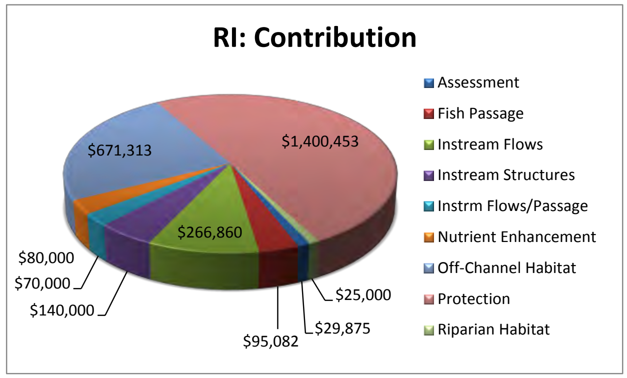
Projects Funded by the Tributary Committees

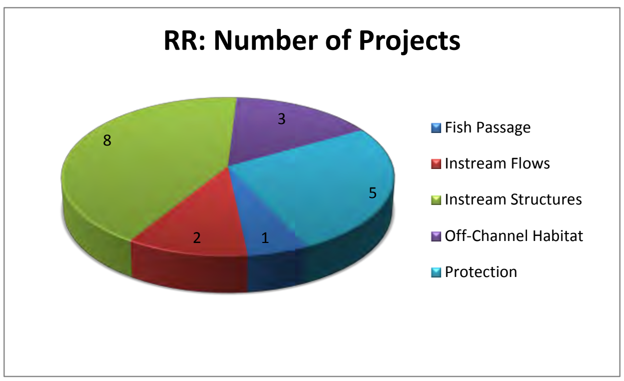


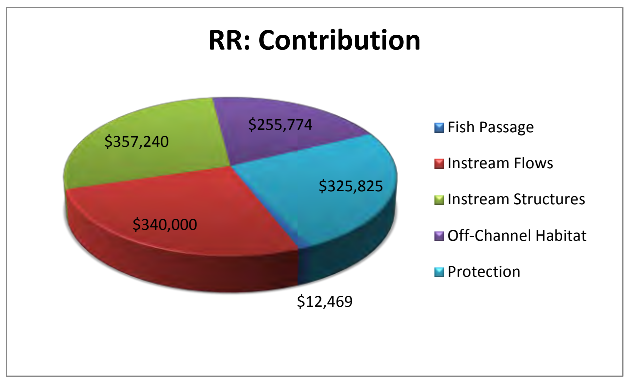


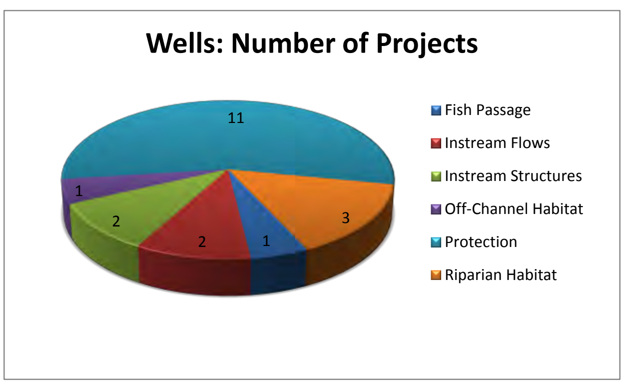
Projects Funded by each Plan Species Account

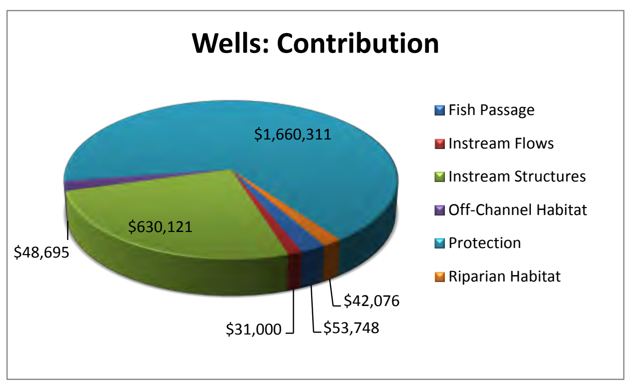












Attachment 3: LWD Liability Issues

skellengerbender

ATTORNEYS

UNDERSTANDING THE LEGAL RISKS ASSOCIATED WITH DESIGN AND CONSTRUCTION OF ENGINEERED LOGJAMS

By
Beth M. Andrus
James L. Gessford, P.E.

I. Introduction

Engineered logjams (ELJs) are a relatively new alternative to traditional bank stabilization methods. Artificial logjams are being designed and installed in streams and rivers to provide multiple ecological and hydraulic benefits, including: (1) improving and restoring aquatic and riparian habitat; (2) providing erosion control; (3) providing flood and grade control; and (4) increasing sediment retention within a channel reach and/or river system. ELJs are designed and constructed as permanent additions to a channel and focus on protecting infrastructure while restoring the natural environment.[1] ELJs have been described as an "emerging technology based upon the premise of applying rigorous scientific and engineering principles to the design and construction of structures to protect infrastructure in a manner that emulates natural systems."[2]

Until recently, the use of large wood to restore habitat was confined to streams, but today ELJs are being used in high energy, large river environments with increasing frequency. Experts predict that this novel approach of combining the "hard" and "soft" sciences will become increasingly popular as a means of providing communities with a cheaper and greener alternative

[1] Jill Treuttel, *Engineered Logjams: Salvation for Salmon*, SEATTLE DAILY JOURNAL OF COMMERCE, July 17, 2003.
[2] CARL WARD, ENGINEERED LOGJAMS: AN ALTERNATIVE BANK-PROTECTION METHOD FOR US 101 ALONG THE HOH RIVER,WASHINGTON, Abstract (2005).

for flood control and stream restoration projects.[3] The anticipated increase in the use of ELJs underscores the need for a set of design and construction standards to mitigate the inherent risks these structures can create for infrastructure and human stream users. While design and construction standards are being developed to address the concerns expressed by owners, project sponsors, and insurers relating to this new technology, engineers participating in the process should understand both the legal framework under which such work will be performed and risks that can arise in this emerging area of work.

This white paper explores the risks associated with engineered logjams, existing legal doctrines that govern liability for such structures, and some recommended risk mitigation measures.

II. Risks Associated with Engineered Logjams

A. Occupational Health and Safety Issues

ELJs are built in the riverine environment. In addition to the occupational health and safety risks inherent in construction generally, working in or around rivers and streams presents a number of water hazards, including deep and swiftly moving water; steep, slippery and unstable slopes; and underwater obstacles such as rocks, trees and debris. Engineers, scientists, and contractors involved in the on-site installation of ELJs need to be aware of the risk of injury or drowning that they or their employees will face if working in or around rivers and streams. In Washington, all employers owe their employees a duty to ensure their safety in any location to which those employees are sent to perform work. RCW 49.17.060(1). Design firms sending employees in the field during construction of an ELJ should adopt an appropriate site safety plan.

Generally, design professionals are immune from suit by third parties injured during a construction project as long as (1) the design professional has not contractually assumed

[3] *See Engineering Logjams*, TECHNOLOGY NEWS, Apr. 6, 2005.

responsibility for site safety and (2) the design professional has not in fact assumed control of the construction site and the means and methods being employed by a contractor or his subcontractors. RCW 51.24.035.

Given that designers of ELJs may work very closely with a contractor in the field, it will be important for the design professional to make it clear, through a contractual disclaimer, and with written notice to the contractor, that the design firm has no responsibility for site safety for anyone other than the firm's own employees and that the owner and contractor need to determine what precautions need to be taken to avoid injury during the construction of an ELJ.

B. Hazard to River Users or Children

ELJs pose safety hazards to river recreationists such as kayakers, rafters, swimmers, and fishermen. By design, ELJs involve the placement of large logs in and adjacent to streambanks, often with their rootwads intact. ELJs, even those that are properly designed and constructed, can capture a recreational user who is unaware of the underwater snag and unable to see it. The risk of an ELJ "snagging" or "pinning" an unsuspecting kayaker, swimmer or fisherman, or puncturing a raft or inner tube is especially great in fast moving rivers or streams.

Similarly, children, inquisitive by nature, and unable to appreciate the inherent risks posed by an ELJ, are likely to be drawn to a pile of wood or to debris sticking out of the water. Both inviting and dangerous, ELJs present an irresistible risk to the curious child who is exploring the river for a place to play.

C. Flooding

ELJs have the potential to increase the roughness of the channel, constrict the channel cross-section through the reach where they are placed, and cause water to back up behind the structure. These effects, either individually or cumulative, can lead to flooding upstream of the ELJ.

D. Structural Failure and Subsequent Damage to Infrastructure and Downstream Property

Improperly anchored ELJs and/or the woody debris that the ELJ is designed to collect are susceptible to being dislodged during large storm events. The dislodged material can subsequently become hung up on or block culverts or bridge openings, and cause pier and abutment scour, channel evulsion, or bridge overtopping. Furthermore, the floating debris has the potential to collide into and cause damage to downstream property, including streambanks, irrigation diversions, storm drainage outfalls, docks, and other bank protection projects.

E. Erosion

ELJs, even those that are properly designed and constructed, will likely result in channel adjustments upstream and downstream of the ELJ structure. Channel erosion can cause the channel grade to become steeper over time, increasing the velocity of the channel and exacerbating many of the previously identified risks of ELJs. Erosion of adjacent streambanks can result in adjacent landowners losing portions of their land. Sediment deposition in response to modified channel hydraulics also can produce shifts in channel position and grade.

III. Legal Doctrines and Statutes Applicable to Engineered Logjams

Because of the risks that ELJs pose to human health and safety, infrastructure, and stream channels and banks, they pose unique liability issues for the individual engineers that design them, for firms that design ELJ structures, and for design firms that lead projects in which ELJs are designed by others. Streambank stabilization and channel restoration work is often only one aspect of a multi-faceted design project such as a culvert or bridge replacement, channel realignment, drainage channel outfall, or roadway embankment. Streambank stabilization and channel restoration work, including the design of ELJs, is now frequently completed by an unlicensed scientist, rather than a registered professional engineer.

What qualifications should an ELJ designer possess? Who can stamp an ELJ design? What analyses should be performed prior to placing logs in a river? What notices of hazards should be posted? What is the risk of legal liability if an ELJ causes physical injury or property damage? These questions can be answered, at least in part, by existing Washington statutes and common law.

A. Recreational Use Immunity Statute

Under RCW 4.24.210, Washington's recreational use immunity statute, landowners are generally immune from liability to recreational users of rivers, lakes and streams:

> (1) Except as otherwise provided in subsection (3) or (4) of this section, any public or private landowners or others in lawful possession and control of any lands whether designated resource, rural, or urban, or water areas or channels and lands adjacent to such areas or channels, who allow members of the public to use them for the purposes of outdoor recreation, which term includes, but is not limited to, . . . *fishing*, camping, picnicking, *swimming*, hiking, . . . clam digging, . . . *boating*, nature study, winter or *water sports*, viewing or enjoying historical, archaeological, scenic, or *scientific sites*, without charging a fee of any kind therefore, shall not be liable for *unintentional* injuries to such users.
>
> (2) Except as otherwise provided in subsection (3) or (4) of this section, any public or private landowner or others in lawful possession and control of any lands whether rural or urban, or water areas or channels and lands adjacent to such areas or channels, who offer or allow such land to be used for purposes of a *fish or wildlife cooperative project*, or allow access to such land for cleanup of litter or other solid waste, shall not be liable for unintentional injuries to any volunteer group or to any other users. . . .[4]

The purpose of the recreational use immunity statute is "to encourage owners of land or others in lawful possession and control of land and water areas or channels to make them available to the public for recreational purposes by limiting their liability toward persons entering thereon and toward persons who may be injured or otherwise damaged by the acts or omissions of persons entering thereon."[5] To this end, "the recreational use immunity statute

[4] RCW 4.24.210 (emphasis added).
[5] RCW 4.24.200.

changed the common law by altering the entrant's status from that of a trespasser, licensee, or invitee to a new statutory classification of recreational user."[6]

While the grant of immunity is relatively broad, a landowner will remain liable for injuries caused by "known dangerous artificial latent conditions" unless he posts a notice to warn recreational users of the hazard. RCW 4.24.210(4) provides:

> Nothing in this section shall prevent the liability of a landowner or others in lawful possession and control for injuries sustained to users by reason of a *known dangerous artificial latent condition* for which warning signs have not been conspicuously posted. . . . *Nothing in RCW 4.24.200 and this section limits or expands in any way the doctrine of attractive nuisance*. . . .

(Emphasis added). The exception to immunity is triggered when all of the requisite elements – *known*, *dangerous*, *artificial* and *latent* – are present in the alleged injury-causing condition.[7] "Each of the elements modifies the term 'condition,' not one another."[8] The landowner's duty to post a sign warning of the potential danger arises when all of these elements are present.[9]

1. Known Condition

For purposes of the statute, "known" refers to landowner's actual, as opposed to constructive, knowledge that a dangerous artificial latent condition exists.[10] Obviously, if a landowner retains an engineer to design an ELJ, that landowner will have actual knowledge of its presence.

2. Dangerous Condition

In the absence of a statutory definition, a condition that poses an unreasonable risk of harm is "dangerous."[11] In *Cultee v. City of Tacoma,* the Washington Court of Appeals found that "water moving in and over the property, combined with uneven, eroding roads" was a

[6] *Davis v. State*, 102 Wn.App. 177, 184, 6 P.3d 1191 (2000), *aff'd*, 144 Wn.2d 612, 30 P.3d 460 (2001).
[7] *Davis*, 102 Wn.App at 185 (citing *Tabak v. State*, 73 Wn.App. 691, 695, 870 P.2d 1014 (1994) (emphasis added)).
[8] *Id.* (citing *Ravenscroft v. Washington Water Power Co.*, 136 Wn.2d 911, 920, 969 P.2d 75 (1998)).
[9] *Ravenscroft*, 136 Wn.2d at 920.
[10] *See Cultee v. City of Tacoma*, 95 Wn.App. 505, 517, 977 P.2d 15 (1999).
[11] *Gaeta v. Seattle City Light*, 54 Wn.App. 603, 609, 774 P.2d 1255 (1989).

dangerous condition.[12] It is thus likely that an ELJ will be viewed by our courts as a dangerous condition.

3. Artificial Condition

An undefined term in a statute should be given its plain and ordinary meaning unless a contrary legislative intent is indicated,[13] and the dictionary defines "artificial" as "humanly contrived often on a natural model; man-made."[14] In *Ravenscroft v. Washington Power Co.*, the Supreme Court of Washington found that a power company created an artificial condition when it cut down trees, left stumps near the middle of the river and then raised the river to a level that concealed the stumps because the condition was created by human effort, not by natural causes.[15] An ELJ, a man-made structure, will probably qualify as an "artificial" condition under the statue.

4. Latent Condition

The term "latent," within the meaning of the recreational use immunity statute, means not readily apparent to the recreational user.[16] To fall within the exception to the recreational use immunity statute, the condition itself, and not simply the danger it poses, must be latent.[17] In *Van Dinter v. City of Kennewick*, the Supreme Court of Washington found that the danger posed by antennae sticking out from the head of a five foot high metal caterpillar-shaped climbing toy was obvious, and as a result the city was immunized from liability with respect to injuries suffered by a park user who struck the antennae.[18] There are no reported cases addressing whether an ELJ will be deemed a "latent" condition for purposes of the recreational use

[12] *Culte*, 95 Wn.App. at 519.
[13] *Ravenscroft*, 136 Wn.2d at 920-21 (citing *Cowiche Canyon Conservancy v. Bosley*, 118 Wn.2d 801, 813, 828 P.2d 549 (1992)).
[14] *See* Merriam Webster's Online Dictionary, *available at* http://www.m-w.com/dictionary.
[15] *Ravenscroft*, 136 Wn.2d at 923-24.
[16] *Van Dinter v. City of Kennewick*, 121 Wn.2d 38, 45, 846 P.2d 522 (1993).
[17] *Chamberlain v. Dept. of Transp.*, 79 Wn.App. 212, 901 P.2d 344 (1995).
[18] *Van Dinter*, 121 Wn.2d at 48.

immunity statute. Common sense, however, suggests that a concealed or partially concealed ELJ will be considered a latent condition by courts when this issue is ultimately considered.

The recreational use immunity statute, by its language, only directly covers landowners or people with control of the land involved. It may thus not extend to designers hired by the landowner. However, if the landowner is sued after an injury, the designer faces the risk of a claim by the landowner of negligence in the design of the ELJ. For that reason, the designer will want to take steps to ensure that the landowner does not lose his immunity. One sensible way to mitigate the risk is for the designer to contractually require the owner to post and to maintain the "conspicuous" signs warning of the hazards that the ELJ presents as required by the recreational use immunity statute. The design firm should also consider requiring a specific indemnification from the owner for any claims in the event the warning signs are not posted or properly maintained for as long as the ELJ remains in the river or stream.

B. Attractive Nuisance Doctrine

Ordinarily, a property owner has no duty to safeguard trespassers from harm. However, many courts, including the Supreme Court of Washington, have carved out an exception for "attractive nuisances," commonly defined as inherently dangerous objects or conditions that can be expected to attract the attention of children who are unable to appreciate the risks they pose. Landowners have been held liable under the attractive nuisance doctrine for injuries children have sustained while playing in or on abandoned cars, swimming pools, trampolines, construction equipment, and piles of dirt and other construction materials. Under the doctrine, the landowner is expected to exercise a heightened standard of care and assumes a duty to take extra precautions to protect against the normal behavior of young, inquisitive children.

In Washington state, application of the attractive nuisance rule requires that: (1) the condition must be dangerous in itself; (2) the condition must be attractive and alluring, or enticing, to young children; (3) an injured child was incapable, by reason of her youth, of comprehending the danger; (4) on the day of an injury, the condition was left unguarded and exposed in a place where children are accustomed to or reasonably expected to be; and, (5) it was reasonably practicable and feasible to prevent the child's access to the condition, or for the owner to render it innocuous, *without obstructing any reasonable purpose or use for which it was intended*.[19]

Depending on where it is installed, the first four requisite factors could be met by a child injured while playing on an ELJ. ELJs are designed to snag woody debris and sediment and as such involve the placement of large logs underwater where they might also easily snag children who are swimming, floating, fishing or playing in or along the river. However, the fifth factor should protect property owners from liability for bodily injuries sustained by children playing on or around an ELJ. The only way to render an ELJ innocuous would be to remove the logs from the river, which would in turn eliminate the very purpose for which the ELJ was intended. There may be ways to limit access to an ELJ site. This issue should be evaluated during the design phase to determine if a feasible and cost effective approach exists. If access restrictions are not possible, then conspicuous signs warning of the danger would again be prudent. Again, the goal should be to ensure that the attractive nuisance doctrine provides a property owner (and by extension the designer working for the property owner) with a defense to liability for an injury or death to a child.

C. Common Enemy Doctrine

The common enemy doctrine has governed Washington surface water law since 1896 and the case of *Cass v. Dicks*.[20] In its strictest form, the common enemy doctrine allows property

[19] *See Ochampaugh v. City of Seattle*, 91 Wn.2d 514, 518, 588 P.2d 1351 (1979) (citing leading case of *Schock v. Ringling Bros. and Barnum & Bailey Combined Shows*, 5 Wn.2d 599, 105 P.2d 838 (1940)) (emphasis added).
[20] 14 Wash. 753 (1896).

owners to dispose of unwanted surface water in any manner they see fit without incurring liability for damaging a neighbor's property. The rationale for the doctrine is that surface water is an enemy against which any landowner can defend himself.[21]

In order to avoid the inequities associated with a strict application of the doctrine, the Supreme Court has adopted several exceptions to the rule.[22] The first exception to the rule is that landowners may not inhibit the flow of a watercourse or a natural drainway.[23] A property owner, or the engineer working for the owner, could arguably be held liable under the first exception to the common enemy doctrine for damage to upstream or downstream property caused by the construction of an ELJ. A downstream property owner could argue that the ELJ inhibited the flow of the stream or river by redirecting the flow, causing a loss of marketable land. An adjacent property owner could argue that the ELJ created a backwater or a diversion that caused flooding resulting in the loss of land.

The second exception to the rule is that landowners may not collect waters and channel them onto their neighbor's lands in quantities greater than or in a manner different from the natural flow.[24] This exception appears inapplicable here unless the ELJ is constructed in conjunction with other structures, such as a dam or weir, which could cause the collection and channeling of water onto a neighbor's land.

In *Currens v. Sleek*,[25] the Supreme Court of Washington joined most jurisdictions that follow the common enemy doctrine by adding a third exception. Under this exception, landowners are free to alter the flow of surface water provided they exercise good faith and avoid

[21] *See Id.*
[22] *See Currens v. Sleek*, 138 Wn.2d 858, 861-62, 983 P.2d 626 (1999).
[23] *See id.* at 862. *See also Island County v. Mackie*, 36 Wn. App. 385, 388, 675 P.2d 607 (1984).
[24] *See id. See also Wilber Dev. Corp. v. Les Rowland Constr. Inc.*, 83 Wn.2d 871, 875, 523 P.2d 186 (1974).
[25] 138 Wn.2d 858, 983 P.2d 626 (1999).

unnecessary damage to adjacent property owners.[26] An impacted landowner could arguably assert a claim under the third exception if he could show that the party who constructed the ELJ, or its engineer, failed to exercise good faith to avoid unnecessary damage to his property. This suggests that the designer should evaluate the potential upstream and downstream impacts of an ELJ during the design process and look for alternatives that will avoid "unnecessary" property damage.

Designers and owners should assume that any new flooding or water damage that could result from an ELJ can give rise to a claim. The best protection is to undertake "worst case" hydraulic modeling to identify potential flooding issues and to evaluate design options for mitigating the risks.

IV. Recommended Risk Mitigation Measures

Based on the current legal framework in Washington, we suggest the following recommendations:

1. Determine what WISHA regulations govern worker safety when you have engineers or other employees working in the riverine environment. Establish site safety protocols for the specific area in which work is being conducted and monitor compliance by your employees;

2. Include language in plans and specs warning construction workers of hazards associated with working in or near deep and fast moving water and on steep, slippery and unstable slopes;

3. Recommend that clients post and maintain conspicuous warning signs dentifying the presence of an ELJ, its location, and the specific hazards the ELJ presents to recreational users of the river or include the signage in the design documents and position the signs in a location where a recreational user is likely to see it;

4. Provide opportunities for recreational users to get out of the water and portage around the ELJ;

5. Recommend that the client distribute pamphlets to nearby residents warning of the danger to children posed by ELJs;

6. Conduct hydrologic and hydraulic analyses of the river system to analyze the

[26] *See Id.* at 863.

impact of ELJs for multiple flood events and recommend measures to mitigate the impacts, including cumulative impacts, of installing one or more ELJs on the river or stream;

7. Conduct geotechnical, structural and corrosion analyses on the channel banks, streambed, logs, cables, anchors, chains, pilings, and other structural elements of the ELJ to determine the forces acting on the individual components, the structure as a whole and the channel banks and bed under multiple loading conditions;

8. Recommend that the client monitor the channel, banks and habitat to ensure that the ELJs are performing as designed;

9. Recommend that the client perform routine maintenance on the ELJs, including replacing, adjusting and removing damaged, malfunctioning or deteriorated components, particularly following storm events equal to or greater in magnitude than the design storm event;

10. Inform clients and owners that ELJs are not necessarily “permanent,” that they will gradually deteriorate with age, and that they may not withstand all major flood events;

11. Do not stamp or sign ELJ design documents that were not completed under your responsible charge and that are not backed up with sufficient analyses to demonstrate that the design will not lead to unnecessary upstream and downstream property damage; and

12. Ask the owner for appropriate indemnification protection in design services agreements, especially for claims relating to an owners failure to post and maintain the warning signs envisioned by the recreational use immunity statute.

Attachment 4: Lower White Pine B+ Presentation

BNSF Railways- Nason Creek LWP Reconnection Project
PRCC/Tributary Fund– November 10, 2011
Wenatchee, WA

Nason LWP Project Costs – February 2011 vs. June 2011

Element	February 2011		June 2011	
	Downstream	B+	Downstream	B+
Bridge Construction (55' span) includes all contingencies and taxes	$727k	$659K	$733k	$660k
BNSF Flagger/Engineering, Easement	$116k	$116k	$110k	$110k
Earthwork (access and grading)	$542k	$274K	$542k	$272k
Construction Subtotal	**$1.385 Million**	**$1.049 million**	**$1.385 Million**	**$1.042 Million**
Bridge Future Expansion	$396k	$347K	$396k	*$150k*
BNSF Bridge Replacement Fee	$992k	$992k	$992k	*$800k*
BNSF Bridge Maintenance Fee	$124k	$124k	$124k	*$100k*
Mitigation Subtotal	**$1.512 Million**	**$1.463 million**	**$1.512 Million**	**$1.050 Million**
CCNRD Admin	-	-	-	$70k
Total	**$2.897 Million**	**$2.512 Million**	**$2.897 Million**	**$2.162 Million**

Nason LWP Project Costs – November 2011 vs. June 2011

Element	November 2011		June 2011	
	Downstream	B+	Downstream (55')	B+ (55')
Bridge Construction (89' span)	$489k	$489k	$733k	$660k
BNSF Flagger/Engineering, Easement	$277k	$277k	$110k	$110k
Earthwork (access and grading)	$348k	$172k	$542k	$272k
Construction Subtotal	**$1.114 Million**	**$0.938 Million**	**$1.385 Million**	**$1.042 Million**
Bridge Future Expansion (BNSF Estimate)	$694k (BNSF 10/31/11)	$694k (BNSF 10/31/11)	$396k	$150k
BNSF Bridge Replacement Fee	$489k	$489k	$992k	$800k
BNSF Bridge Maintenance Fee	$175k	$175k	$124k	$100k
Mitigation Subtotal	**$1.358 Million**	**$1.358 Million**	**$1.512 Million**	**$1.050 Million**
CCNRD Admin	$50k	$50k	-	$70k
Total	**$2.522 Million**	**$2.346 Million**	**$2.897 Million**	**$2.162 Million**

Primary Difference Between June 2011 and November 2011 Costs

Construction

- November bridge construction prices based on BNSF Estimate on Conceptual Bridge Plans returned 10/31/11
- BNSF Survey, Monitoring, and Engineering time added approximately $180k to October estimate.

Mitigation

- Cost for future expansion bridge is for entire structure (Nov), not just piles (June).
- BNSF review of our proposed future expansion bridge costs: BNSF retained original BNSF estimates for track work and bridge spans which resulted in an estimate of $694K; greater than our estimate of $616K but less than their original estimate of $844K.
- Bridge replacement fee reflects BNSF estimate for mainline bridge construction ($489k)
- Maintenance fee ($175k) reflects 75 year time period.

Wells, Rocky Reach, and Rock Island HCP Tributary Committees Notes 8 December 2011

Members Present: Dennis Beich (WDFW), Lee Carlson (Yakama Nation), Chris Fisher (Colville Tribes), Tom Kahler (Douglas PUD), Kate Terrell (USFWS), and Tracy Hillman (Committees Chair).

Members Absent: Dale Bambrick (NOAA Fisheries) and Steve Hays (Chelan PUD). [1]

Others Present: Becky Gallaher (Tributary Project Coordinator).

The Wells, Rocky Reach, and Rock Island Hydroelectric Projects Habitat Conservation Plans Tributary Committees held a conference call on Thursday, 8 December 2011 from 10:00 to 11:30 am.

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 10 November 2011 meeting notes with edits from Tom Kahler.

III. 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.

- Cascade Columbia Fisheries Enhancement Group is completing the final report on the Nutrient Enhancement Assessment Project. They will submit the final report next week.
- For the Entiat NFH Habitat Improvement project, Cascadia Conservation District completed the placement of geotextile fabric and rock for the access road to the well. They have no activities planned in December.
- The Methow Subbasin LWD Acquisition and Stockpile project is complete. The Methow Salmon Recovery Foundation will submit a final report soon.
- The Boat Launch Off-Channel Pond Reconnection project is complete. A final report should be available soon.

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[1] Dale Bambrick voted on decision items following the meeting; Steve Hays provided his votes before the meeting.

- The Methow River (Risley) Acquisition is complete. A final report should be available soon.
- Trout Unlimited – Washington Water Project is preparing a scope change for the Chewuch River Permanent Instream Flow project. The Rocky Reach Committee will review the proposed change in January.

IV. Mission Creek Passage Structures Budget

Cascadia Conservation District provided the Rock Island Tributary Committee with cost estimates from the Bureau of Reclamation engineers for the fish passage structures on Mission Creek (Mission Creek Fish Passage Project). The total cost for the project was $90,403.55, which greatly exceeds the amount approved by the Committee ($45,000). Chris Fisher indicated that Joe Lange, NRCS, was not pleased with the cost estimates from the engineers. In addition, he and the landowners did not support the designs. Therefore, Joe will develop a new design and cost estimate.

Given the issues with the design and cost of the project, the Rock Island Committee recommended that Cascadia Conservation District pull the existing project and submit a new proposal to the Committee for review.

V. Additional Funding Request for the Upper White Pine Power Line Alternatives Analysis

The Rock Island Tributary Committee received a request from HDR Engineering, Inc. and Chelan County NRD for an additional $1,500 for the Upper White Pine Power Line Alternatives Analysis. HDR Engineering needs the additional $1,500 to set up a contract with the County. Thus, the total cost of the project would increase from $52,000 to $53,500.

The Rock Island Committee approved the cost increase and stated that the total cost of the study cannot exceed $53,500.

VI. Additional Funding Request for the Methow River Acquisition MR 48.7 (Bird)

The Wells Tributary Committee received a request from the Methow Salmon Recovery Foundation for an additional $16,780 for the Bird Acquisition. The cost increase reflects the landowner's desire to include additional land in the acquisition. The landowner will reduce their retained property to a single 1.61-acre parcel and forfeit the potential for future subdivision. This increased the floodplain acreage from 16.74 acres to 17.13 acres, and the appraised value of the now-larger conservation easement increased accordingly. Thus, the Wells Committee portion of the total cost would increase from $94,900 to $111,680. The Salmon Recovery Funding Board will contribute $172,220, which is the remainder of the total cost of the acquisition.

After careful consideration, the Wells Committee agreed to increase their portion of the total cost of the project from $94,900 to $111,680.

VII. Budget Amendment for the White River Van Dusen Conservation Easement

The Rock Island Tributary Committee received a budget amendment request from the Chelan-Douglas Land Trust for the White River Van Dusen Conservation Easement. The Land Trust originally budgeted $50,000 for the easement and $10,000 for administration. They would like to transfer $8,000 from administration and apply it to the cost of the easement. Thus, the revised budget would be $58,000 for the easement and $2,000 for administration costs. There is no increase in the total cost of the project.

The Rock Island Committee approved the budget amendment.

VIII. Information Updates

The following information updates were provided during the conference call.

1. Approved Payment Requests in November and December:

   Rock Island Plan Species Account:

   - $58,000.00 to Chelan County Treasurer for the White River Van Dusen conservation easement.

   Rocky Reach Plan Species Account:

   - $8,004.77 to Cascadia Conservation District for contractor and the purchase of native plants for the Entiat National Fish Hatchery Habitat Improvement Project.

2. Dennis Beich reported that the HCPs Directors-level Meeting was a success and a good refresher for the directors. The meeting helped place all HCP efforts in context. Dennis noted that the directors had no recommendations for the Tributary Committees.

3. Kate Terrell stated that there was a good turnout for the LWD Workshop on 30 November and 1 December. She noted that Dr. Tim Abbe did a good job of explaining the importance of LWD for fish. She was not impressed with David Eckberg, attorney, who talked about the legal risks associated with design and construction of engineered log jams. Lee Carlson reported that the Washington Conservation District is writing a resolution to protect landowners. He also noted that the LWD Committee will reconvene in mid-January to discuss next steps.

4. Tracy Hillman reported that the Committees will continue to meet on the second Thursday of each month in 2012. Those dates are:

   - 12 Jan
   - 9 Feb
   - 8 Mar
   - 12 Apr
   - 10 May
   - 14 Jun
   - 12 Jul
   - 9 Aug
   - 13 Sep
   - 11 Oct
   - 8 Nov
   - 13 Dec

5. Chris Fisher talked about a meeting he attended with the Okanagan Nation Alliance (ONA) and others to discuss analysis of sedimentation and sediment mitigation strategies on Shuttleworth Creek. ONA hired a contractor who developed a sediment budget for Shuttleworth Creek, a tributary to the Okanagan River in Canada. Shuttleworth Creek has a large sediment trap near its mouth that blocks about 15 km of spawning and rearing habitat for steelhead and other fish (Figures 1 and 2). Based on the sediment analyses, BC Ministry appears to be okay with removing the large structure and installing smaller, sediment-trapping structures. These smaller structures would allow fish passage.

Figure 1. Sediment trap on Shuttleworth Creek.

Figure 2. Fish barrier on Shuttleworth Creek.

IX. Next Steps

If necessary, the next meeting of the Tributary Committees will be on Thursday, 12 January 2012 at Chelan PUD in Wenatchee.

Meeting notes submitted by Tracy Hillman (tracy.hillman@bioanalysts.net).

APPENDIX D
LIST OF WELLS HCP COMMITTEES MEMBERS

Wells Dam Mid-Columbia HCP Committees, 2011

Coordinating Committee

Name	Organization
Michael Schiewe (Chair)	Anchor QEA, LLC
Jerry Marco	Colville Tribes
Tom Kahler	Douglas PUD
Bryan Nordlund	NOAA Fisheries
Jim Craig	USFWS
Teresa Scott	WDFW
Steve Parker	Yakama Nation

Hatchery Committee

Name	Organization
Michael Schiewe (Chair)	Anchor QEA, LLC
Kirk Truscott	Colville Tribes
Tom Kahler	Douglas PUD
Craig Busack	NOAA Fisheries
Bill Gale	USFWS
Mike Tonseth	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 QEA, LLC
Joe Peone	Colville Tribes
Shane Bickford	Douglas PUD
Keith Kirkendall	NOAA Fisheries
Jessica Gonzales	USFWS
Bill Tweit	WDFW
Steve Parker	Yakama Nation

APPENDIX E
STATEMENTS OF AGREEMENT FOR COORDINATING COMMITTEES

Wells HCP Coordinating Committee
Statement of Agreement to Adjust the Timing of the Annual Initiation and Termination of Bypass Operations at Wells Dam

Date of Approval: July 26, 2011

Statement

The Wells HCP Coordinating Committee (CC) accepts Douglas PUD's recommendation to adjust the initiation and termination dates of annual bypass operations at Wells Dam as follows: bypass operations will commence at 00:00 hours on April 9 and continue until termination at 24:00 hours on August 19. These dates of bypass operations will commence in 2012 and remain in effect annually unless modified as a result of future investigations that demonstrate an inadequacy of these dates at providing bypass passage for 95% of both spring- and summer-migrating Plan Species at Wells Dam. The CC will continue to govern the specifics of bypass operations within the period defined by these dates via approval of a Bypass Operations Plan prepared annually by Douglas PUD.

Background

Annual operation of the bypass system at Wells Dam follows the criteria contained within the Wells Dam Juvenile Dam Passage Survival Plan found in Section 4.3 of the Wells HCP. A primary goal of that plan is to provide bypass operations for at least 95% of both the spring and summer migration of juvenile plan species. The HCP originally directed Douglas to operate the bypass continuously from April 10th to August 15th. Analysis of 21 years of hydroacoustic and 14 years of species-composition information collected on juvenile run patterns at Wells Dam provided the basis for the CC in February 2004 to adjust the timing of bypass operations to begin annually on April 12th and terminate on August 26th.

Section 4.3.2 of the HCP directs Douglas PUD to verify at 10-year intervals whether or not operations established by the CC are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species. In preparation for this 10-year verification, and at the direction of the CC, Douglas PUD retained Columbia Basin Research to analyze passage timing of juvenile spring- and summer-migrating Plan Species at Rocky Reach Dam as a surrogate for the timing of passage through the bypass at Wells Dam. Douglas PUD provided the results of that analysis to the CC at the June 2011 CC meeting. The passage-timing analysis demonstrated that the timing of bypass operations at Wells Dam provided bypass passage for ≥ 95% of spring- and summer-migrating Plan Species in each of the last six years (2005-2010), with the exception of yearling Chinook, for which slightly fewer than 95% of the migrants passed during bypass operations in 2005 (94.7%) and 2007 (94.5%). The analysis demonstrated that, in 2005 and 2007, >95% bypass passage could have been achieved by shifting the initiation of bypass operations from April 12 to April 9. The analysis also demonstrated that in each year the 95% bypass standard could have been achieved with an earlier termination date for bypass operations.

Wells HCP Coordinating Committee
Statement of Agreement to implement 1.0' Fishway-entrance Head-differential for Lamprey from 17:00 to 00:59 daily during the Lamprey Migration Commencing in August and terminating on September 30, 2011

Date of Approval: July 26, 2011

Statement

The Wells HCP Coordinating Committee (CC) approves the request of the Wells Aquatic Settlement Work Group (ASWG) for operating the Wells fishway collection galleries at a 1.0' head differential from 17:00 to 00:59 daily during the 2011 lamprey migration. The 1.0' head differential will commence three days after the day on which the cumulative passage of lamprey at Rocky Reach Dam equals five lamprey, and terminate on September 30. The request of the Wells ASWG is based on the results of studies conducted in 2009 and 2010 (see below) that indicate: (1) operating the Wells fishway collection galleries at a 1.0' head differential from 17:00 to 00:59 daily during the lamprey migration, may improve fishway-entrance success by Pacific lamprey; and (2) the operational strategy described in (1) may not negatively affect the timing and rate of passage by HCP Plan Species. The latter must be verified by comparing passage times between Rocky Reach and Wells adult PIT tag detectors for steelhead and Chinook for fishway entrance operation at 1 foot and 1.5 feet of head. Additionally, Douglas PUD will analyze (post season) the effectiveness of using lamprey counts at Rocky Reach Dam to select the date for the initiation of the 1.0' head differential operations (i.e., how closely did the resultant date correspond with lamprey passage at Wells Dam in 2011).

Background

Douglas PUD and the Aquatic Settlement Work Group are studying ways to improve the ladder entrance efficiency for adult lamprey attempting to pass Wells Dam. Radio-telemetry studies and passive monitoring indicate that normal operating conditions present a velocity impediment to lamprey passage through the fishway entrances. The Wells HCP CC approved studies in 2009 and 2010 at Wells Dam that used Dual Frequency Identification Sonar (DIDSON) technology to observe the behavior of lamprey attempting to pass the fishway entrances under different operating conditions. At the request of the Wells HCP CC, the studies also included observations of salmonid behavior in response to changes in operating conditions. The results of those studies indicate that lamprey entrance efficiency may be enhanced by reducing the collection-gallery-to-tailwater head differential from 1.5' to 1.0' between 5pm and 1am during the peak of the lamprey migration. Post-hoc analyses indicate this is the 8 hour block with the lowest diel salmonid passage activity and highest diel lamprey activity. The CC received a presentation of these study results at the HCP Coordinating Committees meeting on 24 May 2011, and received the 2010 draft report *Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances* on 10 June 2011. Additionally, the CC received a related presentation on fishway entrance velocities at the May Coordinating Committees meeting and the memo *Wells Dam Fishway Entrance Velocity Measurements* was provided on 17 May 2011 (draft) and 25 May 2011 (final).

APPENDIX F
STATEMENTS OF AGREEMENT FOR HATCHERY COMMITTEES

Wells HCP Hatchery Committee
Statement of Agreement
Wells Hatchery Steelhead Hatchery Genetics Management Plan
March 9, 2011

Statement

The Wells HCP Hatchery Committee approves the Hatchery Genetic Management Plan (HGMP) for the Wells Hatchery Summer Steelhead Program, dated March 7, 2011.

The HGMP for the Wells steelhead program includes three components: 1) an integrated hatchery component for the Twisp River to satisfy the No Net Impact (NNI) requirements of the Wells HCP (current production for NNI is 47,571 smolts), 2) a 300,000 smolt component intended to act as a safety-net and support steelhead harvest without negatively affecting the three proposed integrated steelhead programs upstream of Wells Dam (Twisp, Winthrop and Colville), and 3) up to 100,000 smolts for Grant PUD.

Background

The Wells HCP requires Douglas PUD to produce hatchery steelhead toward achieving the NNI goal of the HCP. Steelhead passage survival at Wells has been measured to average 96.3% during four years of survival study (1998, 1999, 2000 and 2010). The new NNI release goal of 47,571 steelhead smolts is mitigation for the unavoidable loss of 3.7% of the juvenile steelhead migrating through the Wells Project.

The Wells HCP also requires Douglas PUD to produce 300,000 steelhead smolts to satisfy fixed hatchery production requirements in the Wells Project license. Currently, all 300,000 of these smolts are released into the Methow and Okanogan rivers.

Grant PUD is required to produce up to 100,000 steelhead smolts toward achievement of current NNI goals for the Priest Rapids Hydroelectric Project. Douglas PUD will rear up to 100,000 steelhead smolts on behalf of Grant PUD under a hatchery sharing agreement.

Smolt release levels in this HGMP will initially transition from the current release levels, and then remain constant thereafter. In 2011 and 2012, Wells Hatchery steelhead releases will be sized to ensure a Methow Basin total release of 350,000 smolts, including Winthrop NFH releases. This will include the 47,571 Twisp integrated release, and a lower Methow release sized to meet the 350,000 Methow Basin smolt target. The remaining up to 200,000 smolts produced at Wells Hatchery will be released directly from Wells Hatchery downstream of Wells Dam. Up to 100,000 of these fish may be released in the Okanogan Basin at the request of the Colville Confederated Tribes.

Beginning with the 2013 release year, 150,000 Wells Hatchery steelhead smolts will be released annually in the Methow Basin. This will include the 47,571-smolt Twisp integrated release, and approximately 100,000 safety-net smolts released in the lower Methow (Methow Hatchery). Assessment of the Lower Methow component will begin in 2012, with a management decision in 2015 regarding acclimation strategy and/or release location. The remaining up to 200,000 safety-net smolts will be released from Wells Hatchery downstream of Wells Dam. At the request of the Colville Confederated Tribes, up to 100,000 of the Wells Hatchery safety-net fish may be released in the Okanogan Basin, or up to 200,000 may be released from acclimation facilities with adult extraction capabilities in the Columbia River upstream of the Okanogan River confluence, provided these facilities are developed by others.

Final 6-09-2011

Wells HCP Hatchery Committee
Statement of Agreement
Regarding Collection of Adult Broodstock for Entiat National Fish Hatchery (USFWS)
15 June 2011

Statement

The Wells HCP Hatchery Committee approves the collection of additional hatchery-origin summer Chinook (up to 124 pair) during broodstock collection efforts at the Wells Hatchery volunteer ladder trap for the 2011 brood year. These additional brood will be transferred to the US Fish and Wildlife Service's (USFWS) Entiat NFH to support their new summer Chinook program. This collection is already described in the Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols. The USFWS agrees to provide staff required for these collection efforts. Currently, this includes one person to sort fish and two people to transfer fish to a transport truck. Should staffing needs increase in the future, USFWS will supply the required additional staff. Transportation of adults from Wells Hatchery to the Entiat NFH will be accomplished by Washington Department of Fish and Wildlife using Wells Hatchery trucks. The USFWS will provide fuel for the transportation and if requested will assist Wells Hatchery staff with spawning summer Chinook at the Wells Fish Hatchery. Spawning and adult holding activities will occur at Entiat NFH and are the responsibility of US Fish and Wildlife Service. This agreement is in effect for only one year.

Background

The USFWS, in conjunction with other parties (Yakama Nation, Confederated Colville Tribes, NOAA, WDFW, BOR) is implementing a new summer Chinook hatchery production program at Entiat NFH. The long-term goal of this program is to provide fish for tribal, commercial, and sport harvest, and to meet tribal trust responsibilities as mitigation for Grand Coulee Dam. A Hatchery and Genetics Management Plan (HGMP) for this program was submitted to NOAA in July of 2009. This HGMP has also been distributed to all of the relevant co-managers.

In 2011 the USFWS anticipates moving to full program at the Entiat NFH with a yearly release goal of 350-400K yearling summer Chinook smolts released into the Entiat River. The USFWS uses volunteer summer Chinook returns at Wells Hatchery as broodstock for the Entiat program. Broodstock collection efforts entailed transfer of eggs in the first year of partial production (BY 2009), and transfer of adults in BY 2010 (and all subsequent years until sufficient returns to Entiat NFH). Full production will require the collection of up to 300 hatchery-origin summer Chinook adults (enough to provide up to 400K eggs). As the progeny of the initial Wells Hatchery collections return as adults (to Entiat NFH), they will be used as broodstock and the number of adults needed from Wells Hatchery will be reduced. It is anticipated that by brood year 2016 the Entiat NFH program will utilize volunteers to that facility for 100% of broodstock needs. Funding for this new program will be the responsibility of the USFWS and BOR.

Broodstock collection will occur concurrent with planned WDFW efforts as detailed in the 2011 Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols developed in conjunction with the HCP-Hatchery Committee.

Rock Island, Rocky Reach, and Wells HCP Hatchery Committees

Final Statement of Agreement (SOA)

Regarding the 2013 No Net Impact (NNI) Recalculation Methodology

Statement

The Rock Island, Rocky Reach, and Wells HCP Hatchery Committees approve the following methodology for the population dynamics "adjustment of hatchery compensation" scheduled to occur in 2013 as described by the Rock Island, Rocky Reach, and Wells HCPs.

Under this methodology, total hatchery compensation will reflect unavoidable project mortality to (1) hatchery-origin smolts and (2) natural-origin smolts where:

Compensation for hatchery-origin smolts will be based upon the 2014-2023 projected annual release targets for those hatchery programs agreed to by the Hatchery Committees that are subject to NNI (i.e., subject hatcheries). Compensation will be determined by multiplying the annual release targets of the subject hatcheries by the unavoidable project mortality for each hydro project.

Compensation for natural-origin smolts at each Project will be determined using the Biological Assessment and Management Plan (BAMP) methodology, where average returns of natural-origin adults to each project will be divided by the respective juvenile project survival rates to represent the number of adults that would have returned to each project absent unavoidable mortality. The difference between this result and the average observed returns will represent the number of adult equivalents required to meet NNI. As the final step, adult equivalents will be converted to hatchery smolt production numbers by dividing the number of adult equivalents by average hatchery-specific smolt-to-adult returns (SARs).

Background

The Rock Island, Rocky Reach, and Wells HCPs require periodic adjustment of NNI hatchery compensation rates to account for population dynamics, unavoidable project losses, and hatchery performance. Initial hatchery production levels expire in 2013, with the recalculated production levels applying to smolt release years 2014 - 2023.

This SOA covers only the overarching methodology of calculating NNI hatchery compensation levels as a necessary prerequisite to a subsequent SOA documenting the selection of data to be used for recalculation, which populations and hatchery programs are subject to NNI, and ultimately what levels of NNI hatchery compensation are required to meet NNI during smolt release years 2014 - 2023. Under the methods proposed herein, natural-origin and hatchery-origin fish contribute to the "populations" that are subject to NNI and receive hatchery compensation.

For hatchery-origin smolts, the population size is not derived but instead relies simply on the projected annual program hatchery release numbers for 2014-2023, for those hatchery programs subject to NNI. The use of projected hatchery release numbers as the hatchery population reflects the contemporary management/conservation objectives and production levels for the subject hatcheries.

For natural-origin fish the "population" is the average number of natural-origin adults passing the individual HCP Projects. Achieving hatchery compensation for the natural-origin population follows the BAMP:

$$\text{average adult returns/average SAR} = \text{smolts}$$

where average adult returns will be the number of additional natural-origin adult returns expected in the absence of a project, and SAR is the average SAR of the hatchery facility that will provide the mitigation.

Wells HCP Hatchery Committee

Final Statement of Agreement (SOA)

Regarding the 2013 No Net Impact (NNI) Recalculation and Implementation Plan

Approved on 14 December 2011

Statement

The Wells HCP Hatchery Committee (HC) approves the implementation of Douglas PUD's hatchery obligations (both recalculated NNI and inundation compensation production) as described in the *Implementation Plan for Wells HCP Plan Species Hatchery Programs: 2013-2023* (Appendix A). The methodology underlying this Agreement applies to this Agreement only and does not influence the methodologies that may be utilized in future recalculations.

Implementation Plan for Douglas PUD HCP Plan Species Hatchery Programs: 2013-2023

The Douglas PUD hatchery compensation adjustment implementation plan for Wells HCP Plan Species is consistent with the terms of the Wells HCP and is based on the Hatchery Recalculation Sensitivity Analysis, the Wells Complex Summer Steelhead Hatchery Genetics Management Plan (HGMP) (submitted to NMFS on April 13, 2011) and the Methow Spring Chinook HGMP (submitted to NMFS on March 12, 2010). Table 1 shows Douglas PUD's recalculated hatchery obligations by species and location.

Implementation of Douglas PUD adjusted hatchery compensation for summer steelhead will follow a stepwise management progression, consistent with the Wells Complex Summer Steelhead HGMP (Table 1). Releases in 2012 will include 247,571 steelhead in the Methow and 100,000 released from Wells Hatchery, as described in the HGMP (Section 1.8.2.1). Releases occurring in 2013-2023 will consist of 8,000 NNI smolts and 300,000 inundation smolts. During any interim between the 2012 releases and the issuance of the NMFS Biological Opinion (BiOp) for the HGMP, releases will include 8,000 NNI smolts plus 40,000 inundation smolts for the Twisp River (Twisp total = 48,000), 100,000 safety-net inundation smolts acclimated at and released from Methow Hatchery (Methow Basin total = 148,000), and 160,000 safety-net inundation smolts released from Wells Hatchery. Once the BiOp is issued, the implementation of the Wells Complex steelhead program will follow the Wells Hatchery Complex HGMP consistent with the terms and conditions of the Wells Complex steelhead BiOp. The Wells Complex Summer Steelhead HGMP (Section 1.8.2.3) describes the adaptive management plan of the Methow safety-net program:

> *"Assessment of the effectiveness of the Lower Methow Component will be based on the management of returning adult hatchery steelhead to the Methow Basin to make reasonable progress towards a PNI of 0.67 and control of straying into the Chewuch River and Methow River upstream of Foghorn Dam. Assessment will begin with the 2012 smolt release cohort acclimated at Methow Hatchery. If straying to these reaches is determined by the HCP HC to be unacceptably high after spring 2015, one or more of the following alternative acclimation and/or release strategies will be implemented: 1) overwinter acclimation at the Methow Hatchery to increase homing fidelity, 2) alternate acclimation sites such as Carlton Pond (Methow River) or the Terry O'Reilly Ponds (Twisp River), and 3) release in a lower Methow Basin tributary(ies) such as Beaver Creek or Gold Creek. The HCP HC will also consider additional measures if the management alternatives described above are not successful in alleviating risk to the Methow steelhead population. These measures may include reduction, termination, or relocation of the Lower Methow Component."*

Species	Facility	Location	Production target	Purpose
Spring Chinook	Chief Joseph[1]	Upper Columbia Mainstem/Okanogan	33,300	NNI
	Methow	Methow Basin	29,123	NNI
Summer Chinook	Chief Joseph (yearling)[2]	Upper Columbia Mainstem/Okanogan	48,100	NNI
	Chief Joseph (sub-yearling)[2]	Upper Columbia Mainstem/Okanogan	49,000	NNI
	Wells (yearling)	Columbia River	320,000	Inundation
	Wells (sub-yearling)	Columbia River	484,000	Inundation
Steelhead	Wells	Twisp River	8,000	NNI
	Wells[3]	Twisp River	40,000	Inundation
	Wells[4]	Methow River	100,000	Inundation
	Wells[5]	Columbia River	160,000	Inundation
Sockeye	NNI met through funding of Fish-Water Management Tool			
Coho	Funding Agreement for the Yakama Nation Coho Reintroduction Program			

[1] Douglas PUD has agreed to provide funding for spring Chinook salmon at Chief Joseph Hatchery. Due to delays in construction at Chief Joseph Hatchery, release of spring Chinook will begin in 2015.

[2] Douglas PUD has agreed to provide funding for summer Chinook salmon at Chief Joseph Hatchery ((54,575 yearlings, or 48,100 yearlings plus 49,000 sub-yearlings).

[3] These are inundation compensation fish representing a portion of the Wells 300,000 inundation steelhead.

[4] This is the Methow steelhead safety-net program to be acclimated and released at Methow Hatchery as per the draft Wells Steelhead HGMP. These fish represent a portion of the Wells 300,000 inundation compensation steelhead. The final distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

[5] A portion of these fish may be released in the Okanogan River, as per the Wells Complex Steelhead HGMP. These fish represent a portion of the Wells 300,000 inundation compensation steelhead. The final distribution of the Douglas PUD inundation production between the Methow and Columbia River mainstem is dependent on levels identified in the Biological Opinion issued for the program upon conclusion of the NOAA consultation on the Wells Complex Steelhead HGMP. Release levels in the respective areas may change; however, the total obligation will remain the same.

APPENDIX G
2011 JUVENILE BYPASS OPERATING PLAN

Commissioners:
T. JAMES DAVIS
LYNN M. HEMINGER
RONALD E. SKAGEN

General Manager:
WILLIAM C. DOBBINS

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Memorandum

TO: Wells HCP Coordinating Committee

FROM: Tom Kahler, Shane Bickford, Douglas PUD

DATE: March 23, 2011

SUBJECT: Wells Dam 2011 Juvenile Bypass Operating Plan

Anticipated Migrants during the 2011 Bypass Period

The 2011 spring and summer outmigration of naturally produced juvenile HCP Plan Species at Wells Dam will consist of offspring of adults that spawned above Wells Dam during brood years (BY) 2009 and 2010 (Table 1). The spring migration will comprise juvenile spring Chinook, coho, sockeye, and steelhead, and summer migrants will be summer/fall Chinook sub-yearlings.

Table 1. Ladder counts at Wells Dam of HCP Plan Species whose progeny are anticipated to migrate through the Wells Project during the 2011 bypass period. Juvenile steelhead migrate predominantly as yearlings from the Okanogan River and as Age-2 fish from the Methow River; thus, both 2008 and 2009 adult counts are included (BY 2009 and 2010, respectively).

Species	Adult Migration Year	Ladder Count	Juvenile Migration
Spring Chinook	2009	8,174	Spring
Summer/Fall Chinook	2010	30,198	Summer
Coho	2009	2,989	Spring
Sockeye	2009	134,937	Spring
Summer Steelhead	2008	9,808	Spring
Summer Steelhead	2009	25,422	Spring

Scheduled hatchery releases above Wells Dam in 2011 include yearling spring Chinook from the Methow Fish Hatchery (550,000), the Winthrop National Fish Hatchery (WNFH; 460,000), and Tonasket Acclimation Pond (150,000). The WNFH also will release 298,000 coho this spring. Summer Chinook yearlings will be released from the Carlton (400,000), Similkameen (520,000) and Bonaparte Ponds (150,000). Hatchery steelhead scheduled for release above Wells Dam are from Wells Hatchery (430,000), WNFH (107,000), and Cassimer Bar Fish Hatchery (30,000). In general, the hatchery yearling Chinook, coho and steelhead are scheduled to be released after April 15th with Winthrop coho and Wells steelhead scheduled to be released after April 20th. By the first week of May, all of the Chinook and coho will have been released. The steelhead releases have historically continued into late May.

2011 Bypass Operations

Operation of the bypass system throughout the 2011 season will follow 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 operations for at least 95% of both the spring and 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 that have been broader than those contained within the Wells HCP Agreement. The HCP Agreement originally directed Douglas PUD 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 HCP 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 more than 95% of both the spring and summer outmigrations.

Historically, initiation of the bypass system on April 12th has provided 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 greater than 95.0% of the summer migration. Similar to the past 7 years and for accounting purposes, the end of the 2010 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.

The Federal Energy Regulatory Commission (FERC) requires Douglas PUD to operate Wells Dam with sufficient automatic-gate-opening capacity in the spillway to pass the flow from a complete load rejection of 200 thousand cubic feet per second (kcfs), in addition to any concurrent flood inflows. The seasonal installation of bypass barriers in the spillway substantially reduces the automatic-gate-opening capacity of Wells Dam. Thus, when inflows to the Wells Project exceed 250 kcfs, Douglas PUD must remove bypass barriers, as per Table 2, to maintain compliance with the FERC requirement for automatic-gate-opening capacity. Decisions to remove bypass barriers for FERC compliance will be made each Monday during the bypass period and will be based on weekly river-flow forecasts from the National Weather Service Northwest River Forecast Center (NWRFC; http://www.nwrfc.noaa.gov/stp/stp.cgi).

Table 2. Schedule for removal of spillway flow-barriers (bypass barriers) to accommodate flood flows and load rejections.

Inflow Forecast (kcfs)	Bypass Barriers Removed
Up to 250	None
250 – 280	Bypass Bay 6
280 – 320	Bypass Bays 6 and 8
320 – 360	Bypass Bays 4, 6, and 8
360 – 400	Bypass Bays 4, 6, 8, and 10
400 - 450	All Bypass Bays

Bypass Contingency Plan

The failure of a gate-hoist cable in a bypass spill-bay at Wells Dam in late August 2010 provided the impetus for the development of a contingency plan for bypass operations during similar events that could occur in the future. This contingency plan prescribes dam operations during two different scenarios:

1) An event that can be quickly repaired,
2) An event requiring a relatively long time to repair

As with the 2010 repair of the gate-hoist cable, in the event of a future failure of a bypass gate or other such accident or unanticipated mechanical failure that renders impossible normal bypass operations, Douglas PUD's initial response would follow the Wells Juvenile Bypass Plan: that is, the shutdown of associated turbine units as prescribed in Section 4.3 of the Wells HCP.

Section 4.3 of the Wells HCP directs the District to shut down the turbine units adjacent to the bypass bay that is not being operated due to either a lack of water or an inability to operate the bypass bay. The associated turbine units would remain inactive until personnel at Wells Dam can determine the cause of the bypass failure and the nature and time requirement of the necessary repair. If it is determined that Scenario 1 applies, turbine units would remain inactive as long as the affected bypass bay(s) remained inoperable. When it is determined that Scenario 2 applies, associated turbine units would be shut down initially, but Douglas PUD may elect to move the bypass barriers from the inoperable bypass spill bay to an adjacent, non-bypass spill bay to obtain the use of an additional turbine unit. The gate for that substitute bypass spill bay would then be set at the standard 1-foot opening for bypass bays and the adjacent turbine unit could be operated without constraints. This configuration would meet the intent of HCP Section 4.3 by providing bypass spill immediately adjacent to every operating turbine unit.

Bypass Operations and TDG Compliance

Seasonal bypass operations generally coincide with the spring freshet, an event during which operators of hydroelectric projects must cope with flows that often exceed the hydraulic capacity of their powerhouses at any given time. When flows exceed the hydraulic capacity of the generating units, water must be passed via the spillway in what is termed "involuntary spill." Involuntary spill increases the concentration of atmospheric gases in the water below hydroelectric projects, and can result in excessive levels of total dissolved gas (TDG) that may produce injuries in fish. To minimize the potential for fish injury, the Washington Department of Ecology (WDOE) imposes TDG standards on operators of hydroelectric projects.

Extensive study of spill operations at Wells Dam and modeling exercises at the University of Iowa provide the basis for the development of annual spill “playbooks” for operations at Wells Dam aimed at achieving the WDOE standards for TDG in the Wells tailrace. From modeling and physical spill studies over the past seven years, Douglas PUD has determined that concentrating spill through the middle of the spillway and supporting that concentrated spill with turbine discharge results in the most effective minimization of TDG in the Wells tailrace. Specifically, the best TDG performance is achieved when concentrating involuntary spill through Spill Bay 5, and allocating additional spill, beyond the capacity of Spill Bay 5, first to Spill Bay 6, then Spill Bay 7.

To accomplish this TDG-minimizing pattern of concentrated spill requires the removal of the bypass barriers from Spill Bay 6 during periods with excessive involuntary spill. Because of the time required to remove the bypass barriers (~8 hours) and the rapid rates of increase in flow volume that typically occur, the bypass barriers in Spill Bay 6 must be removed whenever involuntary spill exceeds 30 kcfs and prolonged (> 8 hours) involuntary spill in excess of 40kcfs is predicted. Once involuntary spill is projected to no longer exceed 40kcfs for the remainder of the bypass season, the bypass barriers would be reinstalled in Spill Bay 6.

APPENDIX H
2011 BROODSTOCK COLLECTION PROTOCOLS

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Wenatchee Research Office
3515 Chelan Hwy 97-A Wenatchee, WA 98801 (509) 664-1227 FAX (509) 662-6606

April 25, 2010

To: Craig Busack, Salmon Recovery Division, NMFS

From: Mike Tonseth, WDFW

Subject: **FINAL 2011 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

The attached protocol was developed for hatchery programs rearing spring Chinook salmon, sockeye salmon, summer Chinook salmon and summer steelhead associated with the mid-Columbia 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 (ACOE funded), 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 due to the overlap in trapping dates and locations.

This protocol is intended to be a guide for 2011 collection of salmon and steelhead broodstocks in the Methow, Okanogan, 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), changes to programs as approved by the HCP-HC, and to comply with ESA permit provisions.

Notable in this years protocols are:

- Implementation of the draft Production Management Plan (Appendix B), for all programs where possible, to ensure mitigation production levels are met and that the permitted production ceiling is not exceeded at release.

- Methow spring Chinook broodstock protocol targeting natural-origin spring Chinook at Wells Dam and at the Twisp River weir.

- Utilization of genetic sampling/assessment to differentiate Twisp River and non-Twisp River natural-origin spring Chinook 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.

- The collection of hatchery-origin spring Chinook for the Methow River Basin program in excess of production requirements, for BKD management.

- Trapping of 100% of the Chiwawa spring Chinook program (hatchery and natural origin adults) at the Chiwawa Weir.

- Collection of 100% of the Wenatchee summer Chinook, Wenatchee sockeye, and Wenatchee steelhead at Dryden Dam to reduce the number of activities that may contribute to delays in fish passage at Tumwater Dam (some adult collections at Tumwater may be necessary if sufficient adults cannot be acquired at Dryden Dam).

- Collection of Wenatchee steelhead adults to meet the HCP-HC adjusted production level for the 2012 brood of up to 247,300 smolts for release to the Wenatchee Basin.

- Collection of summer Chinook adults from the Wells volunteer channel, sufficient to meet a 600K yearling juvenile Chelan Falls (formerly Turtle Rock) program. For 2011 the adults will be held and spawned at Wells FH with gametes being transferred to Eastbank FH.

- Collection of 26-natural origin steelhead at the Twisp Weir in spring 2012. Adults will be transferred to Methow Hatchery for spawning and biosecure, isolated incubation through the eyed-egg stage after which they will be moved to Wells FH for the remainder of rearing.

- The collection of natural-origin summer Chinook adults for the 2011 BY Okanogan summer Chinook program in the Wells Reservoir via purse seine (approximately 311 fish). In 2010, 50% of this program was collected via purse seine with no difference in pre-spawn mortality or incidence of disease observed compared with the West Ladder (Wells Dam) trapped broodstock.

- The collection of Wells summer Chinook to support the USFWS, Entiat NFH summer Chinook programs (requires agreement of the HCP-HC). Transfer may occur as gametes pending agreements between DCPUD and the USFWS.

- The collection of Wells summer Chinook to support the Yakama Nation (YN) summer Chinook re-introduction program in the Yakima River Basin (requires agreement of the HCP Hatchery Committee). Transfer will occur as gametes.

These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and/or other sampling locations. Additional adaptive management actions as they relate to broodstock objectives may be implemented as determined by the HCP-HC or PRCC-HSC and within the boundaries of applicable permits.

Above Wells Dam

Spring Chinook

Inclusion of natural-origin fish in the broodstock will be a priority, with natural-origin fish specifically being targeted. Collections of natural-origin fish will not exceed 33% of the MetComp and Twisp natural-origin run escapement to maximize natural origin fish on the spawning grounds.

To facilitate BKD management, 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 8.6%. 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. Progeny of natural-origin females, with ELISA levels greater than 0.12, will be differentially tagged for evaluation purposes. Annual monitoring and evaluation of the prevalence and level of BKD and the efficacy of culling in returning hatchery- and natural-origin spring Chinook will continue and will be reported in the annual monitoring and evaluation report for this program.

Recent WDFW genetic assessment of natural-origin Methow spring Chinook (Small et al. 2007) indicated that Twisp natural-origin spring Chinook can be distinguished, via genetic analysis, from non-Twisp spring Chinook with a high degree of certainty. The Wells HCP Hatchery Committee accepted that Twisp-origin fish could be genetically assigned with sufficient confidence that natural origin collections can occur at Wells Dam. Scale samples and non-lethal tissue samples (fin clips) for genetic analysis will be obtained from adipose-present, non-CWT, non-ventral-clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam, and origins assigned based on that analysis. Natural-origin fish retained for broodstock will be PIT tagged (dorsal sinus) for cross-referencing tissue samples/genetic analyses. 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 to the Methow Basin. Based on the broodstock-collection schedule (3-day/week, 16 hours/day), extraction of natural-origin spring Chinook is expected to be approximately 33% or less.

Weekly estimates of the passage of Wells Dam by natural-origin spring Chinook will be provided through stock-assessment and broodstock-collection activities. This information will facilitate in-season adjustments to collection composition so that extraction of natural-origin spring Chinook remains less than 33%. Twisp and Methow Composite hatchery-origin spring Chinook will be captured at the Twisp Weir, and Methow FH outfall. Trapping at the Winthrop NFH will be included if needed because of broodstock shortfalls.

Pre-season run-escapement of Methow-origin spring Chinook above Wells Dam during 2011 are estimated at 2,236spring Chinook, including 1,462 hatchery and 774 natural origin spring 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.

The following broodstock collection protocol was developed based on current juvenile rearing capacity at Methow FH, programmed production levels (550,000 smolts), BKD management strategies, projected return for BY 2010 Methow Basin spring Chinook at Wells Dam (Table 1 and Table 2), and assumptions listed in Table 3.

The 2011 Methow spring Chinook broodstock collection will target up to 396 adult spring Chinook. Based on the pre-season run forecast, Twisp fish are expected to represent 6% of the adipose present, CWT tagged hatchery adults and 10% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective of no less than 50% NOR's and to limit extraction to no greater than 33% of the spawning escapement to the Twisp, the 2011 Twisp origin broodstock collection will be predominantly hatchery origin and total 48 fish (24 wild and 24 hatchery), representing 77% of the broodstock necessary to meet Twisp program production of 100,000 smolts. Methow Composite fish are expected to represent 29% of the adipose present CWT tagged hatchery adults and 90% 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 2011 Methow Composite (combined Methow and Chewuch river spawning aggregates) broodstock collection will be predominantly natural origin and total 348 spring Chinook (231 wild and 117 Hatchery). The broodstock collected for the Methow Composite production represents 100% of the broodstock necessary to meet Methow Composite program production of 450,000 smolts (combined Methow and Chewuch production), and sufficient to backfill the expected shortfall of 23,000 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 2006-2008 age class-at-return projection for wild spring Chinook above Wells Dam, 2011.

Brood year	Smolt Estimate		Age-at-return								
			Twisp Basin				Methow Basin				
	Twisp[1/]	Methow Basin[2/]	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	SAR[3/]
2006	18,580	198,400	5	67	**31**	104	55	720	**332**	1,107	0.005581
2007	9,715	99,417	2	**35**	17	54	27	**361**	167	555	0.005581
2008	11,932	56,337	**8**	50	9	67	**7**	227	80	314	0.005581
Estimated 2011 Return			**8**	**35**	**31**	**74**	**7**	**361**	**332**	**700**	

[1/]-Smolt estimate is based on sub-yearling and yearling emigration (Charlie Snow, personal communication).
[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 Chiwawa NOR spring Chinook SAR to the Wenatchee Basin (BY 1998-2003; WDFW unpublished data).

Table 2. Brood year 2006-2008 age class and origin run escapement projection for UCR spring Chinook at Wells Dam, 2011.

	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	97	293	39	**429**	7	361	332	**700**	104	654	371	**1,129**
%Total				29%				90%				51%
Twisp	26	60	3	**89**	8	35	31	**74**	34	95	34	**163**
%Total				6%				10%				6%
Winthrop (MetComp)	102	615	227	**944**					102	615	227	**944**
%Total				65%								43%
Total	225	968	269	**1,462**	15	396	363	**774**	240	1,364	612	**2,236**

Table 3. Assumptions and calculations to determine the number of broodstock needed for BY 2011 production of 550,000 smolts.

Program Assumptions	Standard	Methow FH program
Smolt Release		**550,000**
Fertilization-to-release survival	*84%*	
Total egg take target		**711,072**
Egg take (production)		**654,762**
Cull allowance[1/]	8.6%	**56,310**
Fecundity	*3,780*[2/]	
Female Target		**188**
Female to male ratio	*1:1*	
Broodstock target		**376**
Pre-spawn survival	*95%*	
Total broodstock collection		**396**

[1/]*-Hatchery origin MetComp. component only, and is based on the projected natural origin collection and assumption that all Twisp (hatchery and wild) and wild MetComp. fish will be retained for production.*
[2/]*-Based on historical age-4 fecundities and expected 2011return age structure (Table 1).*

Trapping at Wells Dam will occur at the East and West ladder traps beginning on 02 May, or at such time as the first spring Chinook are observed passing Wells Dam and continue through 24 June 2009. The trapping schedule will consist 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 2011 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 quota). 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 week. 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 or at such time as spring Chinook are observed passing Wells Dam and continuing through 24 August 2011. 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 to maximize pNOS in the Twisp. 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 (including the USFWS steelhead program at Winthrop NFH) 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. In an effort 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 shifted to later in the season and may be a function of these actions. Based on these preliminary evaluations, WDFW proposes to continue the transfer eggs from early spawn hatchery origin steelhead to Ringold FH.

The following broodstock collection protocol was developed based on mitigation program production objectives (Table 4), program assumptions (Table 5), and the probability that sufficient adult steelhead will return in 2011/2012 to meet production objectives absent a preseason forecast at the present time.

Trapping at Wells Dam will selectively retain 327-steelhead (east and west ladder collection) and will be comprised of no greater than 33% natural origin broodstock for the mitigation programs and 100% hatchery origin within the Ringold FH production component. Additionally, in the spring of 2012, 26 wild steelhead will be targeted at the Twisp Weir and transferred to the Methow Hatchery for spawning and incubation to the eyed egg stage after which they will be moved to Wells Hatchery for the balance of rearing. In addition, 16 adult steelhead will be targeted in Omak Creek for a 20K endemic program operated by the CCT and funded by GCPUD as part of their 100K UCR steelhead mitigation obligation. Overall collection for the program will be 353 fish and limited to no more than 33% of the entire run or 33% of the natural origin return. Hatchery and natural origin collections will be consistent with run-timing of hatchery and natural origin steelhead at Wells Dam. 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 will be concurrent with summer Chinook broodstocking efforts through 15 September on the west ladder. If insufficient steelhead adults are encountered on the west ladder, the east ladder trap may be considered. 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. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 4. Adult steelhead collection objectives for programs supported through adult steelhead broodstock collected at Wells Dam, Twisp Weir, and Omak Creek (CCT endemic program).

Program	# Smolts	# Green eggs	% Wild	# Wild	# Hatchery	Total Adults
DCPUD[1/]	300,000	400,000	33%	46	106	152
DCPUD Twisp	48,000	68,904	100%	26	0	26
GCPUD[1/]	80,000	106,667	33%	14	27	41
GCPUD Omak	20,000	40,000				16[2]
USFWS[1/]	50,000	66,667	33%	8	17	25
Sub-total	**498,000**	**682,238**	33%	**94**	**150**	**260**
Ringold	180,000	285,714	0%	0	109	109
Sub-total	**180,000**	**285,714**	**0%**	**0**	**109**	**109**
Grand Total[2/]	**678,000**	**967,952**	**27%**	**94**	**259**	**369**

[1/]-*Above Wells Dam releases. Target HxW parental adults as the hatchery component.*
[2/]- *Broodstock targeted is 16 total (8 male/8 female) of mixed origin composition based upon what is trapped.*
[3/]- *Based on steelhead production consistent with Mid-Columbia HCP's, GCPUD BiOp and Section 10 permit 1395.*

Table 5. Program assumptions used to determine the number of adults required to meet steelhead production objectives for programs above Wells Dam and at Ringold Springs Fish Hatchery.

Program assumptions	Standard
Pre-spawn survival	97%
Female : Male ratio	1.0:1.0
Fecundity	5,400
Propagation survival	
Fertilization-to-eyed egg	87%
Eyed egg-to-yearling release	86%[1/]
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 2011 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2006, 2007 and 2008 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. The following broodstock collection protocol was developed based on initial run expectations of summer Chinook to the Columbia River, program objectives and program assumptions (Table 6).

For 2011, WDFW will retain up to 216 natural-origin summer/fall Chinook at Wells Dam west ladder, including 108 females for the Methow summer Chinook program (this total does not include the balance of the Similkameen program that may not be achieved through the CCT purse seine efforts). Collection will be proportional to return timing between 01 July and 15 September. Trapping may occur up to 3-days/week, 16 hours/day.

Additionally, in collaboration with the Colville Tribes, in 2011 attempts will be made to collect up to 100% (N=311; 156 females) of the natural origin adults needed to meet the Similkameen summer Chinook program through the CCT purse seine efforts as a means to further evaluate the efficacy of collecting and survival to spawn of natural origin adults for broodstock for current and future programs. If logistics or capture efficiency become prohibitive to engaging in this collection activity this season, broodstock collection for the balance will revert back to Wells Dam. In addition, if broodstock collection through the CCT's purse seining efforts falls behind by any more than 25%, the difference between the fish collected to date and what should have been collected, will be made up at Wells Dam west ladder trap. Fish collected through the CCT trapping effort will be uniquely tagged from fish collected at Wells Dam to evaluate relative differences in disease, mortality, spawn timing, among other metrics.

To better assure achieving the appropriate female equivalents for program production, the collection will utilize ultrasonography to determine the sex of each fish retained for broodstock. If the probability of achieving the broodstock goal is reduced based on passage at the west ladder or actual natural-origin escapement levels, broodstock collections may be directed to the east ladder trap and/or origin composition will be adjusted to meet the broodstock collection objective. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project.

Table 6. Assumptions and calculations to determine the number of broodstock needed for summer/fall Chinook production goals in the Methow and Okanogan river basins.

Program Assumptions	**Standard**	**Carlton Pond**	**Similkameen Pond**	**Total**
Smolt release		**400,000**	**576,000**	**976,000**
Fertilization-to-release survival	79.5%			
Eggtake target		**503,145**	**724,528**	**1,227,673**
Fecundity	4,919			
Female target		**102**	**147**	**249**
Female:male ratio	1:1			
Broodstock target		**204**	**294**	**498**
Pre-spawn survival	94.6%			
Total collection target		**216**	**311**	**527**

Coho – Placeholder for YN Methow Coho broodstock plan. This plan will be submitted to NMFS independently by the YN.

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 and the Wells Hatchery volunteer channel. The total production level supported by this collection is 920,000 yearling (320K Wells and 600K Chelan Falls programs) and 484,000 sub-yearling Chinook. Upon agreement in the HCP-HC, the 2011, summer Chinook broodstock collections at Wells FH may also include 345,000 green eggs to support the Yakama Nation (YN) reintroduction of summer Chinook to the Yakima River Basin and up to 240 adults or 510,600 green eggs for the USFWS Entiat program pending agreements between USFWS and DCPUD. If approved by the HCP Hatchery Committee, YN and USFWS eggs will be the last eggs taken and will be the responsibility of staff associated with the YN program. Green eggs for the Entiat program will be transferred to Entiat NFH by USFWS staff (if adults are transferred as in 2010, arrangements will have been made prior to implementation.

Adults returning from the Wells and Chelan Falls (formerly Turtle Rock) programs 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 of CCT concerns about sufficient natural origin fish reaching spawning grounds, incorporation of natural origin fish for the Wells program will be limited to fish collected in the Wells volunteer channel. The following broodstock collection protocol was developed based on mitigation objectives and program assumptions (Table 7).

WDFW will collect 1,382 run-at-large summer Chinook from the volunteer ladder trap at Wells Fish Hatchery outfall. Overall extraction of natural-origin fish to 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 will be completed by 14 September and will be consistent with run timing past Wells Dam. If collection of adults from the east ladder trap is necessary, access will be coordinated with staff at Wells Dam due to the rotor rewind project. Due to fish health concerns associated with the volunteer collection site (warming Columbia River water during late August), the volunteer collection will begin 11 July and terminate by 31 August. The 3-year old “jack” component will be limited to 10 percent of the males collected for broodstock.

Table 7. Assumptions and calculations to determine the number of broodstock needed for summer/fall Chinook production goals for Wells and Turtle Rock Island/Chelan Falls programs.

Program Assumptions	**Standard**		**Wells FH**		**Turtle Rock FH**	**YN**[1/]	**USFWS**[2/]	
	Sub-yearling	**Yearling**	**Sub-yearling**	**Yearling**	**Yearling**	**Green eggs**	**Green eggs**	**Total**
Smolt release			**484,000**	**320,000**	**600,000**			**NA**
Green egg-to-release survival	73%[4/]	78%						NA
Eggtake target			**663,014**	**410,256**	**769,230**	**345,000**	**510,600**	**2,698,100**
Fecundity	4,600	4,600						
Female target			**144**	**89**	**168**	**75**	**111**	**587**
Female:Male ratio	1:1	1:1						
Broodstock target			**288**	**248**[3/]	**336**	**150**	**222**	**1,244**
Pre-spawn survival	90%	90%						
Total collection target			**320**	**276**	**373**	**167**	**248**	**1,382**

[1/]-Green eggs for YN reintroduction program in the Yakima River Basin.
[2/]-Green eggs or adults for USFWS summer Chinook program in the Entiat River Basin.
[3/]- Includes 70 adults collected for the Lake Chelan triploid Chinook program.

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 HCP HC approved program production level target for 2011 is 298,000 smolts, requiring a total broodstock collection of 170 spring Chinook (78 natural and 92 hatchery origin; Table 9).

Table 9. Assumptions and calculations to determine the number of broodstock needed in an anticipated 2011 Chiwawa program release of 298,000 smolts.

Program Assumptions	**Standard**	**Conservation**	**Safety Net**	**Full program**
Smolt Release		**150,000**	**148,000**	**298,000**
Fertilization-to-release survival	*87%*			
Total egg take target				**367,536**
Egg take (production)		172,414	170,115	**342,529**
Cull allowance	*14.7%*		195,122	**25,007**
Fecundity	*4,672 W* *4,333 H*			
Female Target		37	45	**82**
Female to male ratio	*1:1*			
Broodstock target		74W	90H	**164**
Pre-spawn survival	*95.4%W/98.5H*			
Total broodstock collection		**78W**	**92H**	**170**

Inclusion of natural origin fish 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 2011 broodstock collection, will target both hatchery and natural origin Chiwawa spring Chinook at the Chiwawa Weir.

Pre-season estimates project 3,565 spring Chinook are destined for the Chiwawa River, of which 400 (11.2%) and 3,165 fish (88.8%) are expected to be natural and hatchery origin spring Chinook, respectively (Table 10 and 11). Based on the projected 2011 Chiwawa River run-size and origin composition, and provisions in ESA Section 10 Permit 1196, WDFW will retain up to 170 spring Chinook (78 natural origin and 92 hatchery origin) for broodstock purposes, representing 100% of the program broodstock objective. 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 hatchery/wild composition and total broodstock collection, consistent with ESA Section 10 Permit 1196.

Table 10. BY 2006-2008 age class return projection for wild spring Chinook above Tumwater Dam during 2011.

Brood year	**Smolt Estimate[1/]**		**Chiwawa Basin[2/]**				**Wenatchee Basin above Tumwater Dam[2/]**				
	Chiwawa	Wen. Basin	Age-3	Age-4	Age-5	Total	Age-3	Age-4	Age-5	Total	SAR[3/]
2006	86,579	153,918	32	357	**94**	483	56	636	**167**	859	0.005581
2007	65,539	103,460	24	**271**	71	366	38	**427**	112	577	0.005581
2008	91,229	168,630	**35**	384	85	504	**65**	718	159	942	0.005581
Estimated 2011 Return			**35**	**271**	**94**	**400**	**65**	**427**	**167**	**659**	

[1/]-Smolt production estimate for Chiwawa River derived from juvenile smolt data (Hillman et al. 2009); smolt production estimate for Wenatchee Basin is based upon proportional redd disposition between Chiwawa River and Wenatchee River basin and the Chiwawa smolt production estimate.
[2/]-Based upon average age-at-return (return year 2006-2010), for natural origin spring Chinook above Tumwater Dam (WDFW unpublished data).
[3/]-Mean Chiwawa spring Chinook SAR to the Wenatchee Basin (BY 1998-2003; WDFW unpublished data).

Table 11. BY 2006-2008 age class return projection for Chiwawa hatchery spring Chinook above Tumwater Dam during 2011.

Brood	**Smolt Estimate**			**Adult Returns**		
Year	Chiwawa[1/]	Age-3[2/]	Age-4[2/]	Age-5[2/]	Total	SAR[3/]
2006	612,482	1,563	3,528	**176**	5,267	0.0086
2007	305,542	780	**1,760**	88	2,628	0.0086
2008	609,789	**1,229**	2,839	139	4,208	0.0069[4/]
Estimated 2011 Return		**1,229**	**1,760**	**176**	**3,165**	

[1/]-Chiwawa smolt release (Hillman et. al. 2009).

[2/]-Based on average age-at-return for hatchery origin spring Chinook above Tumwater Dam, 2005-2009 (WDFW, unpublished data) and total estimated BY return.

[3/]-Mean Chiwawa hatchery spring Chinook SAR to the Wenatchee Basin (BY 1997-2002).

[4/]-Mean Chiwawa hatchery spring Chinook SAR to the Wenatchee Basin (BY 1998-2003).

Collection at the 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 for broodstock 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% natural origin composition in the broodstock, excess fish will be sampled, killed and either used for nutrient enhancement or disposed of in a landfill depending upon fish health staff recommendations.

Broodstock collection at the Chiwawa Weir will begin 01 June and terminate no later than 11 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 cannot be accomplished with a 4-days up and 3-days down schedule, a 7-day per week schedule may be implemented to facilitate reaching the collection objectives. Under the 7-day per week schedule, no more than 33% (1 in 3) of the fish collected will be retained for broodstock. If the weekly quota is not attained within the trapping period, the shortfall will carry forward to the next week.

All spring Chinook in excess of broodstock needs and all bull trout trapped at the Chiwawa weir will be transported by tank truck and released into a resting/recovery pool at least 16.0 km upstream from the Chiwawa River Weir.

Steelhead

The steelhead mitigation program in the Wenatchee Basin use broodstock collected at Dryden and Tumwater dams located on the Wenatchee River. Per ESA section 10 Permit 1395 provisions, broodstock collection will target adults necessary to meet a 50% natural origin – conservation oriented program and a 50% hatchery origin – safety net program, not to exceed

33% of the natural origin steelhead return 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 130 mixed origin steelhead at Dryden and Tumwater dams, including 104 natural origin and 106 hatchery origin steelhead to meet the HCP-HC approved adjusted program of up to 247,300 smolts. 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 wild and 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. In-season Broodstock collection adjustments may be made based on this monitoring and evaluation. To better assure achieving the appropriate females equivalents for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock.

In the event 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 the subsequent spring to supplement broodstock numbers if the fall trapping effort provides fewer than the required number of adults.

Table 12. Assumptions and calculations to determine the number and origin of Wenatchee summer steelhead broodstock needed for Wenatchee Basin program release of 247,300 smolts.

Program Assumptions	**Standard**	**Wenatchee program**
Smolt Release		**123,650 Conservation** **123,650 Safety net**
Fertilization-to-release survival	*68%*	
Egg take target		**363,676**
Fecundity	*5,580 H* *5,776 W*	
Female Target		**33 H** **31 W**
Female to male ratio	*1:1*	
Broodstock target		**128**
Pre-spawn survival	*98.6%*	
Total broodstock collection		**130**
Natural:Hatchery ratio	1:1	
Natural origin collection total		**64**
Hatchery origin collection total		**66**

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 for BY 2011 is 864,000 smolts.

The TAC 2011 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2006, 2007 and 2008 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% of the summer/fall Chinook destined for the upper Basin (above Tumwater Dam) occurs prior to the end of the first week of July; therefore, the collection will provide 43% 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. With concurrence from NMFS, summer Chinook collections at Dryden Dam may begin up to one week earlier. Collections will be limited to a 33% extraction of the estimated natural-origin escapement to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 13), the following broodstock collection protocol was developed.

WDFW will retain up to 489 natural-origin, summer Chinook at Dryden and Tumwater dams, including 245 females. To better assure achieving the appropriate females equivalents for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock. Trapping at Dryden Dam will begin 01 July and terminate no later than 15 September and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam if needed may begin 15 July and terminate no later than 15 September and operate up to 48 hours per week.

Table 13. Assumptions and calculations to determine the number of Wenatchee summer Chinook salmon broodstock needed for Wenatchee Basin program release of 864,000 smolts.

Program Assumptions	Standard	Wenatchee program
Smolt Release		**864,000**
Fertilization-to-release survival	*76%*	
Egg take target		**1,136,842**
Fecundity	*5,136*	
Female Target		**221**
Female to male ratio	*1:1*	
Broodstock target		**442**
Pre-spawn survival	*90.4%*	
Total broodstock collection		**489**

Sockeye

Sockeye Salmon mitigation in the Wenatchee River Basin historically utilized adult broodstock collections at Tumwater Dam with incubation/rearing at Eastbank Fish Hatchery (FH) and rearing/pre-smolt releases from the net pens in Lake Wenatchee. For 2011, to reduce activities at Tumwater Dam that may contribute to passage delays, the sockeye broodstock will be targeted at Dryden Dam. The total production level for the 2011 BY is 200,000 pre-smolts.

The TAC 2011 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 returns, 100% natural-origin broodstock composition and assumptions listed below (Table 14), the following broodstock collection protocol was developed.

WDFW will retain up to 236 natural origin sockeye, proportional to run timing at Dryden Dam. To better assure achieving the appropriate females equivalents for program production, the collection will implement the draft Production Management Plan, including ultrasonography to determine the sex of each fish retained for broodstock. Trapping may begin on 1 July and terminate by 15 August. Trapping will occur, no more than 5-days/week and will be consistent with summer Chinook broodstock collection at Dryden Dam. If insufficient broodstock are retained at Dryden, additional broodstock will be targeted at Tumwater Dam following a not-to-exceed trap operation of 48 hours per week.

Table 14. Assumptions and calculations to determine the number of Wenatchee sockeye salmon broodstock needed for Wenatchee Basin program release of 200,000 pre-smolts.

Program Assumptions	Standard	Wenatchee program
Smolt Release		**200,000**[1/]
Fertilization-to-release survival	*66%*	
Egg take target		**303,030**
Fecundity	*2,713*	
Female Target		**112**
Female to male ratio	*1:1*	
Broodstock target		**224**
Pre-spawn survival	*95%*	
Total broodstock collection		**236**

1/- Chelan HCP Hatchery Committee has agreed to future production level of 280,000 fish, pending appropriate infrastructure improvements.

Coho – Placeholder for YN Wenatchee Coho broodstock plan. This plan will be submitted to NMFS independently by the YN.

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 (expired) ESA Permit 1592.

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 + 3,500,000 eggs – collection of broodstock for the federal programs are conditional upon having contract in place with the ACOE) mitigation commitments and biological assumptions are detailed in Table 16. Smolt release objectives for Ringold Springs occur as green eggs collected at Priest Rapids FH and incubated at Bonneville prior to eyed egg transfers to Ringold Springs. The Yakama program would be eyed egg transfers from Priest Rapids FH Table 16 (see footnotes for reference). After the new Priest Rapids FH rebuild there will no longer be incubation capacity for programs above GCPUD mitigation obligations. The default trapping location for fall Chinook adults for all programs is the Priest Rapids volunteer trap. For 2011, some portion of the broodstock will be collected at the OLAFT as part of the OLAFT studies to determine the composition of natural origin fish that may be attainable in future years to increase the NOR component of the broodstock. Close coordination between broodstock collections at the volunteer channel and the OLAFT will need to occur so over collection is minimized. OLAFT collected and spawned fish will be prioritized for PRH programs.

Table 16. Assumptions and calculations to determine the number of fall Chinook salmon broodstock needed for the Priest Rapids program release of 6,700,000 sub-yearling fall Chinook.

Program Assumptions	Standard	Program objective
Juvenile Production Level		
Grant PUD Mitigation-PUD Funded		**5,000,000**
John Day Mitigation-Federally Funded		**1,700,000**
John Day Mitigation [1]-Ringold Springs-ACOE funding.		**3,500,000**
John Day Mitigation [2]-Yakama N Request		**500,000**
Total Program Objectives		**10,700,000**
Fertilization-to-release survival	*87%*	
Egg take target		**12,298,851**
Fecundity	*4,300*	
Female Target		**2,860**
Female to male ratio	*2:1*	
Pre-spawn survival	*88%*	
Broodstock target		
Females		**3,250**
Males		**1,625**
Total broodstock collection		**4,875**

[1] As of brood year 2009, Priest Rapids Hatchery is taking 3,500,000 eggs for release at Ringold-Meseberg Hatchery funded by the ACOE – incubation of this program occurs at Bonneville.

[2] The Yakama Nation has requested 500,000 fall Chinook eyed eggs from Priest rapids Hatchery for 2011. This request has been submitted to GCPUD and will be conditional upon agreements between YN and GCPUD.

Appendix A

Columbia River Mouth Fish Returns Actual and Forecasts**

			2010 Forecast	2010 Return	2011 Forecast
Spring Chinook	**Total Spring Chinook**		**559,900**	**470,850**	**331,800**
Willamette			62,700	110,500	104,100
Sandy			3,700	8,100	5,500
Cowlitz*			12,500	8,900	6,600
Kalama*			900	750	600
Lewis*			6,000	2,800	3,400
Select Areas			4,100	24,500	13,200
Lower River total			**89,900**	**155,550**	**133,400**
Wind*			14,000	10,000	4,900
Drano Lake*			28,900	24,400	12,600
Klickitat*			4,500	1,900	2,100
Yakima*			16,600	11,000	10,300
Upper Columbia	Total		57,300	38,100	22,400
Upper Columbia	*Wild*		*5,700*	*3,100*	*2,000*
Snake River Spring/Summer	Total		272,000	169,800	91,100
Snake River	*Wild*		*73,400*	*35,600*	*24,700*
Upriver Total			**470,000**	**315,300**	**198,400**
Summer Chinook - UCR		**Total**	**88,800**	**72,300**	**91,900**
Sockeye					
Wenatchee			14,300	66,300	33,000
Okanogan			110,300	318,900	126,800
Snake River	*Wild*		*600*	*2,600*	*2,100*
Total Sockeye			**125,200**	**387,900**	**161,900**
Steelhead					
Winter	Wild winter steelhead	Wild	20,100	20,000	15,200
Upriver Summer	Upriver Skamania Index	**Total**	**16,400**	**29,300**	**24,100**
(to Bonneville Dam)	*Wild*		*3,300*	*10,400*	*6,400*
Group A-run Index	**Total**		**337,500**	**304,000**	**312,700**
Wild			*107,000*	*120,500*	*92,700*
Group B-run Index	**Total**		**99,100**	**77,100**	**54,100**
Wild			*14,300*	*22,400*	*12,900*
Total Upriver Steelhead	**Total**		**453,000**	**410,400**	**390,900**
Wild			*124,600*	*153,300*	*112,000*

*Return to tributary mouth

**Totals may not sum due to rounding

Updated 1Mar11 - WDFW

DRAFT
Hatchery Production Management Plan

The following management plan is intended to provide life-stage-appropriate management options for Upper Columbia River (UCR) PUD salmon and steelhead mitigation programs. Consistent, significant over-production or under-production risks the PUD's not meeting the production objectives required by FERC and overages in excess of 110% of program release goals violates the terms and conditions set forth for the implementation of programs under ESA and poses potentially significant ecological risks to natural origin salmon communities.
Under RCW 77.95.210 (Appendix A) as established by House Bill 1286, the Washington Department of Fish and Wildlife has limited latitude in disposing of salmon and steelhead eggs/fry/fish. While this RCW speaks more specifically to the sale of fish and/or eggs WDFW takes a broader application of this statute to include any surplus fish and/or eggs irrespective of being sold or transferred.
We propose implementing specific measures during the different life-history stages to both improve the accuracy of production levels and make adjustments if over-production occurs. These measures include (1) Improved Fecundity Estimates, (2) Adult Collection Adjustments, (3) Within-Hatchery Program Adjustments, and (4) Culling.

<u>Improved Fecundity Estimates</u>

A) Develop broodstock collection protocols based upon the most recent 5-year mean in-hatchery performance values for female to spawn, fecundity, Green egg to eye, and green egg to release.

B) Use portable ultrasound units to confirm gender of broodstock collected (broodstock collection protocols assume a 1:1 male-to-female ratio). Ultrsonography, when used by properly trained staff will ensure the 1:1 assumption is met (or that the female equivalents needed to meet production objective are collected). Spawning matrices can be developed such that if broodstock for any given program are male limited sufficient gametes are available to spawn with the females.

<u>Adult Collection Adjustments</u>

C) Make in-season adjustments to adult collections based upon a fecundity-at-length regression model for each population/program and origin composition needs (hatchery/wild). This method is intended to make in-season allowances for the age structure of the return (i.e. age-5 fish are larger and therefore more fecund than age-4 fish), but will also make allowances for age-4 fish that experienced more growth through better ocean conditions compared to an age-5 fish that reared in poorer ocean conditions.

Within-Hatchery Program Adjustments

D) At the eyed egg inventory (first trued inventory), after adjustments have been made for culling to meet BKD management objectives, the over production will be managed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Governmental hatcheries in Washington, Oregon, and Idaho; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

E) At tagging (second inventory correction) fish will be tagged up to 110% of production level at that life stage. If the balance of the population combined with the tagged population amounts to more than 110% of the total release number allowed by Section 10 permits then the excess will be distributed in one or more of the following actions as approved by the HCP-HC:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;

- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Transfer to another resource manager program such as CCT, YN, or USFWS program;
- Governmental hatcheries in Washington, Oregon, and Idaho;
- Placement of fish into a resident fishery (lake) zone, provided disease risks are within acceptable guidelines; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

F) In the event that a production overage occurs after the above actions have been implemented or considered, and deemed non viable for fish health reasons in accordance with agency aquaculture disease control regulations (i.e. either a pathogen is detected in a population that may pose jeopardy to the remaining population or other programs if retained or could introduce a pathogen to a watershed where it had not previously been detected) then culling of those fish may be considered.

All, provisions, distributions, or transfers shall be consistent with the department's egg transfer and aquaculture disease control regulations as now existing or hereafter amended. Prior to department determination that eggs of a salmon stock are surplus and available for sale, the department shall assess the productivity of each watershed that is suitable for receiving eggs.

APPENDIX I
2011 ACTION PLAN: WELLS HCP

FINAL 2011 ACTION PLAN
WELLS HCP

WELLS HCP COORDINATING COMMITTEE

1. **Bypass Operating Plan**
   a. Draft to Coordinating Committee (CC): .... February 2011
   b. Approval Deadline: .... March 2011
   c. Period Covered: .... April to August 2011
   d. Report Deadline: .... October 2011

2. **Bull Trout Monitoring and Management Plan**
   a. Period Covered: .... January – December 2010
   b. Report Deadline: .... March 2011

3. **Predator Control Programs**
   a. Pikeminnow Removal – Wells Project: .... March – August 2011
   b. Draft 2011 Pikeminnow Report to DCPUD: .... December 2011
   c. Avian Predator Hazing at Wells: .... October 2010 – May 2011

4. **Sub-yearling Chinook Life-history Study**
   a. Develop Study Plan: .... January 2011
   b. Tag and Release Study Fish: .... April-June 2011
   c. Monitor Study Fish: .... April 2011-June 2012
   d. Draft Report to Committee: .... August 2012
   e. Final Report: .... October 2012

5. **Fishway Entrance Velocity Testing**
   a. Testing: .... March 2011
   b. Draft Results to DCPUD: .... April 2011
   c. Results to CC: .... June 2011

6. **Juvenile Migration Run-timing Verification**
   a. Skalski Analysis of Index Data from RR: .... February 2011
   b. Draft of Skalski's Report to DCPUD: .... March 2011
   c. Final Report Presented to CC: .... May 2011

7. **Develop Contingency Plan for Emergency Bypass Operations**
   a. Draft to CC: .... February 2011
   b. Approval of Final by CC: .... April 2011

WELLS HCP HATCHERY COMMITTEE

1. Implement 5-year Hatchery Monitoring and Evaluation (M&E) Plan
   a. Ongoing Implementation: ....January – December 2011
   b. Draft Annual Report for 2010 to Douglas PUD: .... April 2011
   c. Draft Annual Report to Hatchery Committee (HC):.. June 2011
   d. Draft 5-year Synthesis/Analysis Report: ....October 2011
   e. Draft 2012 Implementation Plan to HC:..October 2011

2. Update 5-year M&E plan (per Wells HCP §8.5.1)
   a. Draft to HC: ....July 2011
   b. Final to HC:...October 2011

3. HCP Annual Hatchery Production Compliance Report
   a. Period Covered: ....January 2011 – December 2011
   b. Draft to Committee: ....November 2011
   c. Submission Deadline: .... December 2011

4. 2010 Broodstock Collection Protocol
   a. Draft to HC: .... March 2011
   b. Approval Deadline:... April 2011
   c. Implementation: ....May 2011 to April 2012

5. Annual Implementation Report - Sockeye Fish/Water Management Tools
   a. Period Covered: ....Water Year 2010-2011 (October – September)
   b. Draft to HC: ....*to be determined*
   c. Presentation to HC:...August of September 2011

6. HGMP – Methow Spring Chinook
   a. Draft Spring Chinook HGMP to HC: ....November 2009
   b. Final Spring Chinook HGMP to NMFS: .... March 2010
   c. NMFS Approval of spring Chinook HGMP:..*to be determined*

7. HGMP – Wells Steelhead
   a. Draft Steelhead HGMP to HC: .... February 2011
   b. Final Steelhead HGMP to NMFS: .... March 2011
   c. NMFS Approval of Steelhead HGMP:..*to be determined*

8. Methow Steelhead Relative Reproductive Success Study
   a. Implementation: .... March 2010 - December 2021
   b. Interim Reports: .... September 2011
   c. Final Report: 2021/2022

9. Population Dynamics Recalculation of NNI Hatchery Production
   a. Proposal to Committee:.. February 2011
   b. HC Decision on Final Recalculation Methods: ....*to be determined*

WELLS HCP TRIBUTARY COMMITTEE

1. **Plan Species Account Annual Contribution**
   a. $176,178 in 1998 dollars... January 2011

2. **Annual Report - Plan Species Account Status**
   a. Draft to Committee: .... February 2011
   b. Approval Deadline:... March 2011
   c. Period Covered: ....January to December 2010

3. **2011 Funding-round – General Salmon Habitat Program**
   a. Request for Project Pre-proposals:........................... *To be determined* (typically in March)
   b. Pre-proposals to Tributary Committee (TC):..... *To be determined* (typically in early June)
   c. Tours of Proposed Projects: ....*To be determined* (typically in late June)
   d. Project Sponsor Presentations to TC: .... *To be determined* (typically in early July)
   e. Final Project Proposals to TC: .... *To be determined* (typically in late July)
   f. RTT Project Rating Decisions: .... *To be determined* (typically in early August)
   g. Supplemental Sponsor Presentations ....*To be determined* (typically in September)
   h. TC Final Funding Decisions: .... *To be determined* (typically in December)

4. **Small Project Program**
   a. Project Review and Funding Decision................................ Applications accepted any time

APPENDIX J
ANNUAL REPORT OF WELLS PLAN SPECIES ACCOUNT FINANCIAL ACTIVITY FOR THE YEAR ENDED DECEMBER 31, 2011

Annual Report of Wells Plan Species Account Financial Activity
For the Year Ended December 31, 2011

As required by Section 7.3.7.2 of the Wells Hydroelectric Project HCP

Beginning cash and investment balance 01/01/2011			$ 739,492.33
Sources:			
Annual payment from Douglas PUD per Section 7.4 of HCP		$ 238,153.00	
Interest earnings		3,481.71	
	Total Sources		241,634.71
Uses:			
Project #	Description		
1101	Methow River Acquisition - Bird	2,008.14	
1102	Methow River Acquisition - Hoffman	4,373.02	
1103	Methow River Acquisition - Risley	26,407.24	
	Total for Projects	32,788.40	
0699	Chelan PUD	3,501.69	
0699	Douglas PUD	2,128.00	
	Total for Administration	$ 5,629.69	
	Total Uses		38,418.09
Ending cash and investment balance 12/31/2011			$ 942,708.95

Wyatt W. Scheibner, Treasurer
PUD No. 1 of Douglas County

APPENDIX K
MONITORING AND EVALUATION OF WELLS AND METHOW HATCHERY PROGRAMS IN 2010

(Appendix K 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 2010

Prepared for

Douglas County Public Utility District

and

Wells Habitat Conservation Plan
Hatchery Committee

by

Charlie Snow, Charles Frady, and Alex Repp

Washington Department of Fish and Wildlife
Supplementation Research Team
Methow Field Office
Twisp, WA

Andrew Murdoch

Washington Department of Fish and Wildlife
Supplementation Research Team
Wenatchee Field Office
Wenatchee, WA

and

Maureen P. Small, Sarah Bell, and Cheryl Dean
Washington Department of Fish and Wildlife
Conservation Biology Unit, Molecular Genetics Laboratory
Olympia, WA

April 2011

Executive Summary

Chapter 1: 2008 Brood Spring and Summer Chinook Salmon and 2009 Brood Summer Steelhead Reared at Methow and Wells Hatchery Facilities:

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 under the Wells Habitat Conservation Plan and in accordance with protocols governing the number, origin, and timing of adult salmon and steelhead collected for broodstock, thereby affecting the subsequent number and genetic composition of the juveniles released. For the 2008 brood summer Chinook salmon, adult collection achieved 99% of the overall collection goal of 1,393 fish. The 2008 spring Chinook salmon broodstock collection achieved 97% of the overall collection goal of 393 fish, although too few fish were collected to meet specific production targets for the Twisp River program. The 2009 brood steelhead broodstock collection achieved 101% of the collection goal of 376 fish. Pre-spawn survival of broodstock was above the set standards for each program. In general, few statistical differences between the mean fork length of hatchery and wild Chinook salmon of the same sex and age were detected. However, sample sizes of wild fish were small or non-existent for some ages and stocks, affecting our ability to make some comparisons. Wild 1-salt female steelhead had a greater mean fork length than 1-salt hatchery female steelhead, but no other differences were detected between hatchery and wild fish of the same sex and salt age. However, sample sizes were not large enough for meaningful statistical comparisons in all cases (i.e., 2-salt male fish). Age-4 fish were the dominant age class for hatchery summer Chinook salmon, with a mean fecundity of 4,443, while the majority of spring Chinook sampled were age-4 Methow Composite hatchery fish with a mean fecundity of 3,683. No significant differences in fecundity were detected between hatchery and wild spring Chinook of the same stock and age, or between Methow Composite and Twisp fish of the same age regardless of origin. No statistical difference between the mean fecundities of age-4 hatchery and wild summer Chinook was detected, but the wild fish sample size was small. Comparisons between hatchery and wild fish of other ages were not made because sample sizes of wild fish were too low. The 2009 brood steelhead were comprised primarily of 1-salt hatchery fish with a mean fecundity of 5,380, and no significant difference in fecundity between wild and hatchery steelhead was detected between fish of the same salt-age. Evidence of the BKD bacterium in spring and summer Chinook broodstocks as assessed by ELISA sampling was lower than in most recent broods. Juvenile release numbers were within 5% of release goals for the Wells yearling summer Chinook salmon, but were below target levels (<90%) for subyearling summer Chinook salmon and most steelhead releases. Spring Chinook releases were below target values for the Twisp program, and above target values for the Methow Composite program to compensate. Current brood years of salmon and steelhead exhibited hatchery replacement rates great enough to replace parent broods (i.e., $\geq$ 1), with the exception of the subyearling summer Chinook salmon.

Chapter 2: Harvest and Straying of Hatchery Origin Fish Released From Wells Complex Hatchery Facilities:

All stocks of salmon and steelhead covered in this chapter were subject to commercial, sport, or tribal fisheries in ocean and 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. For the current brood examined (2004), harvest of hatchery and wild Methow Basin spring Chinook totaled 7.7% and 7.6% of the total return, respectively. 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. For the most recent broods examined, greater than 5% of the total return of spring Chinook salmon released into the Methow, Twisp, and Chewuch rivers strayed to non-target spawning grounds. Less than 5% of the total brood return of Wells yearling and subyearling summer Chinook were recovered in non-target spawning grounds. For the 2009 return year, Wells summer Chinook salmon comprised less than 5% of other independent populations except the Methow River spawning population, of which 7.2% were fish originating from Wells Hatchery releases. Local creel census was used to monitored harvest in selective (steelhead), and non-selective (summer Chinook salmon) fisheries occurring in the upper Columbia River ESU. An estimated 2,906 summer Chinook salmon, 8,181 hatchery steelhead, and 81 wild steelhead were directly or indirectly removed through sport fisheries in 2010. Overall, Wells Complex hatchery fish provided commercial, recreational, and limited tribal harvest, while meeting escapement requirements in that most spring Chinook salmon were recovered in broodstocks or on spawning grounds, and most summer Chinook salmon were recovered in fisheries.

Chapter 3: Methow River Basin Spring Chinook Salmon and Steelhead Smolt Monitoring in 2010:

The mean number of emigrants produced per redd is a metric used to compare the relative productivity of target species during freshwater rearing. We used salmonid capture data from rotary screw traps and PIT tag interrogation sites to estimate the number of spring Chinook salmon and summer steelhead smolts emigrating from the Twisp River and Methow River basins. We captured 214 wild spring Chinook salmon smolts at the Methow River trap and 979 smolts at the Twisp River trap in 2010. A total of 330 and 472 wild steelhead emigrants were captured at the Methow and Twisp River traps, respectively. The number of fish captured each day was expanded by the estimated trap efficiency based on regression models using the variables discharge (independent variable) and mark/recapture efficiency trials (dependent variable). Using this methodology, we estimated that a total of 9,302 (± 11,901, 95% CI) wild spring Chinook salmon smolts emigrated from the Methow River, including 4,793 (± 57, 95% CI) smolts emigrating from the Twisp River. An estimated 20,110 (± 23,593 95% CI) wild steelhead emigrated from the Methow River, including 5,504 (± 1,010, 95% CI) fish from the Twisp River. To corroborate the smolt trap estimate we used daily PIT tag interrogation data at an in-stream interrogation site in the Twisp River and estimated that 6,034 (± 1,837, 95% CI) wild steelhead smolts emigrated from the Twisp River. During the fall emigration period, we estimated that 3,282 (± 715, 95% CI) spring Chinook salmon parr emigrated past the Twisp

River trap and 1,602 (± 568, 95% CI) spring Chinook salmon parr emigrated past the Methow River trap.

In some years, fish migrate downstream of the Methow trap in the fall/winter time period. Including both spring Chinook that migrated in 2009 and 2010, we estimated for the 2008 brood a total of 12,250 (± 12,846, 95% CI) emigrants. Utilizing data gathered during spring Chinook salmon spawning ground surveys in 2008, we estimated that the number of emigrants produced from each 2008 brood spring Chinook salmon redd in the Twisp River (151) was 150 times greater than the number of emigrants produced in the remainder of the Methow River basin (1). However, differences in trap efficiencies between the two sites that could affect the population estimates may contribute to this large difference. Because steelhead emigrate at multiple age classes, we estimated total brood year abundance using ages derived from scales. After reconstruction of the 2006 brood emigrants, we estimated that 11,625 (± 1,473, 95% CI) and 7,694 (± 492, 95% CI) juvenile steelhead emigrated from the Methow and Twisp rivers, respectively. Steelhead in the Methow Basin and in the Twisp River produced an estimated 14 and 19 emigrants from 2006 brood redds, respectively.

Chapter 4: 2010 Brood Summer Steelhead Spawning Ground Surveys Conducted in the Methow River Basin:

Steelhead spawning ground surveys were performed to estimate the relative abundance, distribution, and timing of spawning within the Methow River basin. Based on surveys conducted between 22 February and 7 June, an estimated minimum of 1,619 steelhead redds were constructed in the Methow Basin in 2010. The greatest numbers of redds were found in the upper and lower Methow River subbasins (N = 505 and 459, respectively). The Twisp River (N = 332) and Chewuch River (N = 323) subbasins had similar numbers of redds. The run-at-large above Wells Dam was composed primarily of hatchery origin steelhead (92.1%). Based on biological sampling of steelhead during broodstock collection at Wells Hatchery, 17.4% of total escapement was composed of out-of-basin stray hatchery fish, primarily from the Wenatchee River. Based on passive integrated transponder (PIT) tag detection at instream antenna arrays, out-of-basin hatchery steelhead may have comprised between 2.6 and 43.0% of the spawning population of some tributaries within the Methow Basin. Based on sampling conducted each Monday during the broodstock collection period, there were no significant differences in migration timing by fish origin or salt age. No significant differences in spawn timing of hatchery and wild female steelhead were observed in the hatchery environment (non-hormone-injected females) or during natural spawning in the Twisp River. Based on run-escapement estimates, the mean natural replacement rate for the nine most recent broods of steelhead spawning above Wells Dam (1996-2004) was 0.26 recruits per adult. For all brood years examined (1996-2004), the hatchery replacement rate was significantly greater than the natural replacement rate.

Chapter 5: 2010 Brood Spring Chinook Salmon Spawning Ground Surveys Conducted in the Methow River Basin:

Spawning ground surveys were conducted to evaluate the spawn timing, spatial distribution, genetic composition, and to estimate the tributary-specific spawning escapement of spring

Chinook salmon within the Methow River basin. Spawning ground surveys were performed on foot between 3 August and 26 September. A total of 1,366 spring Chinook salmon redds were constructed in the Methow River basin in 2010. The Methow River subbasin had the greatest number of redds (N = 935). The Chewuch River subbasin had fewer redds (N = 286) than the mainstem Methow River excluding hatchery outfalls and tributaries (N = 693), and the fewest redds were located in the Twisp River (N = 145). After subtracting fish that were double counted at Wells Dam fish ladders (N = 168) and that moved downstream of Wells Dam without reascending (N = 110), an estimated 8,565 spring Chinook salmon comprised the population above Wells Dam in 2010. After subtracting fish that were collected for hatchery broodstock (N = 773), provided to local tribes (N = 1,851), and those originating from Okanogan River releases (N = 1,059), the estimated run escapement to the Methow River basin was 4,882 fish. There were no significant differences in migration timing between hatchery and wild fish within a given cohort. Redd counts expanded by the male-to-female ratio from sampling at Wells Dam (0.73:1.00) suggest that the Methow River spawning population comprised 2,369 fish, or 48.5% of the estimated run escapement. No estimates of poaching, predation, or pre-spawn mortality were made. Peak spawning occurred between 27 August and 11 September in index areas of all three subbasins. Wild female carcasses were found significantly further upstream than hatchery female carcasses in all subbasins. There were no significant differences in spawn timing between hatchery and wild fish within any subbasin. Wild fish comprised 61.9%, 31.2%, and 17.9% of the estimated spawning escapement in the Twisp, Chewuch, and Methow subbasins, respectively. The natural replacement rate (NRR) for the most recent brood year of spring Chinook salmon with complete recovery data (2004 brood) was highest in the Methow River subbasin (0.27 recruits per spawner). The geometric mean NRR for brood years 1992 to 2004 was less than 1.0 in each subbasin regardless of whether broodyears 1996 through 1998 were omitted (no spawning ground surveys in 1996 and 1998). Hatchery replacement rate (HRR) values have not consistently met the target BAMP HRR values for all release groups in broodyears 1992 through 2004. Of the estimated total of coded-wire-tagged hatchery fish recovered on spawning grounds (N = 1,638), 13.8% were classified as within-basin strays from Methow Hatchery and 1.4% were stray fish from other basins.

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General Introduction

The Public Utility District No. 1 of Douglas County (DCPUD) funds hatchery programs to compensate for inundation of spawning habitat and lost harvest opportunities 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 the fish ladders at Wells Dam. Juvenile spring Chinook salmon are reared on groundwater and Methow River surface water to the pre-smolt stage, and acclimated on surface water in their release basin in acclimation ponds on the Methow, Twisp, and Chewuch rivers 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 2007). This report summarizes activities and presents data collected during 2010 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 2009). 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: 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) the changes in the natural replacement rate (NRR) of the supplemented population are 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.

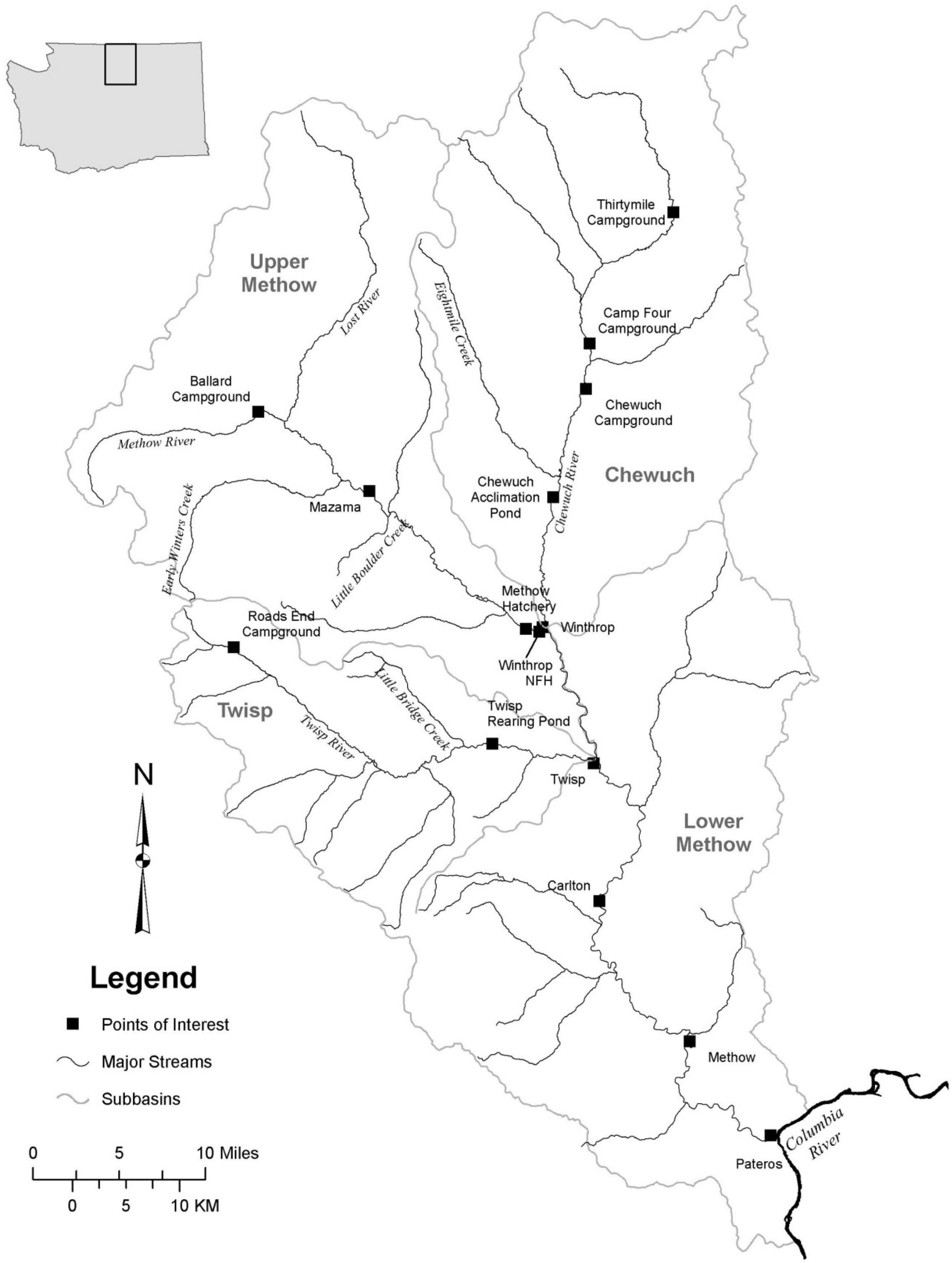

Figure 1. Map of Methow River basin hatchery facilities and rearing ponds.

Chapter 1

2008 Brood Spring and Summer Chinook salmon and 2009 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 under the Wells Habitat Conservation Plan and in accordance with protocols governing the number, origin, and timing of adult salmon and steelhead collected for broodstock, thereby affecting the subsequent number and genetic composition of the juveniles released. For the 2008 brood summer Chinook salmon, adult collection achieved 99% of the overall collection goal of 1,393 fish. The 2008 spring Chinook salmon broodstock collection achieved 97% of the overall collection goal of 393 fish, although too few fish were collected to meet specific production targets for the Twisp River program. The 2009 brood steelhead broodstock collection achieved 101% of the collection goal of 376 fish. Pre-spawn survival of broodstock was above the set standards for each program. In general, few statistical differences between the mean fork length of hatchery and wild Chinook salmon of the same sex and age were detected. However, sample sizes of wild fish were small or non-existent for some ages and stocks, affecting our ability to make some comparisons. Wild 1-salt female steelhead had a greater mean fork length than 1-salt hatchery female steelhead, but no other differences were detected between hatchery and wild fish of the same sex and salt age. However, sample sizes were not large enough for meaningful statistical comparisons in all cases (i.e., 2-salt male fish). Age-4 fish were the dominant age class for hatchery summer Chinook salmon, with a mean fecundity of 4,443, while the majority of spring Chinook sampled were age-4 Methow Composite hatchery fish with a mean fecundity of 3,683. No significant differences in fecundity were detected between hatchery and wild spring Chinook of the same stock and age, or between Methow Composite and Twisp fish of the same age regardless of origin. No statistical difference between the mean fecundities of age-4 hatchery and wild summer Chinook was detected, but the wild fish sample size was small. Comparisons between hatchery and wild fish of other ages were not made because sample sizes of wild fish were too low. The 2009 brood steelhead were comprised primarily of 1-salt hatchery fish with a mean fecundity of 5,380, and no significant difference in fecundity between wild and hatchery steelhead was detected between fish of the same salt-age. Evidence of the BKD bacterium in spring and summer Chinook broodstocks as assessed by ELISA sampling was lower than in most recent broods. Juvenile release numbers were within 5% of release goals for the Wells yearling summer Chinook salmon, but were below target levels (<90%) for subyearling summer Chinook salmon and most steelhead releases. Spring Chinook releases were below target values for the Twisp program, and above target values for the Methow Composite program to compensate. Current brood years of salmon and steelhead exhibited hatchery replacement rates great enough to replace parent broods (i.e., $\geq$ 1), with the exception of the subyearling summer Chinook salmon.

Introduction

To be 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 value for each hatchery program was calculated using this ratio and was listed in the Monitoring and Evaluation Plan (Wells HCP HC 2005). The HRR of hatchery programs must also be greater than the number of naturally produced fish that would have been produced if the broodstock were allowed to spawn naturally. The ratio of the number of naturally produced adults to the number of 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, an assessment of the hatchery program to determine causation may be necessary.

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 a traditional harvest augmentation to supplementation in order to assist in the recovery of the populations upstream of Wells Dam (Wells HCP HC 2005). The survival standards of hatchery fish in harvest augmentation programs are identical to those in supplementation programs. However, since the returning hatchery adults are not intended to spawn naturally, comparisons between HRR and NRR are not applicable.

The Wells HCP outlines the number and size (fish per pound) of fish that are to be released from each hatchery program. The M&E Plan lists target length and weight goals for each program based on the fish per pound size goals in the HCP (Wells HCP HC 2005, Appendix C, Table 5). Modifications to the number of fish released in NNI hatchery compensation or supplementation programs may occur based on the survival studies conducted at each hydroelectric project, or as a result of monitoring and evaluation activities. Monitoring the number and size of fish released is critical in evaluating the hatchery programs and ensuring the conditions of the HCP are being met.

This chapter addresses hatchery activities related to the 2008 brood Wells summer Chinook salmon, 2008 brood Methow spring Chinook salmon, and the 2009 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 $_{\text{Year X}} \geq$ NRR $_{\text{Year X}}$
- Ho: HRR $\geq$ BAMP value (expected)

Objective 6. Determine if hatchery fish were released at the programmed size and number.

- Ho: Hatchery fish $_{\text{Size at release}}$ = Programmed $_{\text{Size at release}}$
- Ho: Hatchery fish $_{\text{Number released}}$ = Programmed $_{\text{Number released}}$

Methods

Broodstock Collection and Spawning

Salmon and steelhead broodstock were collected in accordance with protocols designed to ensure enough fish of a desired genetic composition (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 2008). 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. Spring Chinook salmon were collected at Wells Dam, the Twisp River weir, or on the Methow River at the Methow Hatchery and Winthrop National Fish Hatchery outfalls. In addition to specifying the collection location and target numbers, the collection protocols designated a maximum extraction rate for most hatchery broodstocks. Extraction rates are expressed as a proportion of the escapement that may be retained for hatchery broodstocks.

Run escapement estimates for Wells Hatchery summer Chinook 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 thought to be limited (Hamstreet 2009, 2010; Miller 2006, Miller 2008). Methow spring Chinook salmon run escapement was estimated from spring Chinook counts at Wells Dam by subtracting summer Chinook salmon passing Wells Dam during the spring Chinook salmon migration period (see Chapter 5). 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 internally tagged (i.e., Passive Integrated Transponder [PIT] tag) or 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 all broodstock were used 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 all stocks for DNA analysis. The unique sample number assigned to each fish at spawning allowed for the correlation of health sample (i.e., ELISA), fecundity, and egg mortality data provided by hatchery or WDFW fish health personnel. Differences in size and fecundity by age class of hatchery and wild fish were tested with a T-test or with a non-parametric Kruskal-Wallis analysis of variance (KW ANOVA) test when 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 (i.e., 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 relatively 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 promote adequate spatial distribution of spawners. Juvenile fish at Wells Hatchery were reared on Columbia River water prior to release into the Columbia River (summer Chinook salmon) or transfer to tributary streams (summer steelhead).

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

A 100% inventory of fish on station is possible during marking because all juvenile fish receive either an internal and/or external tag or mark during rearing. 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 estimated from no less than 200 fish randomly sampled immediately prior to release. Fork length was measured to the nearest millimeter and weight was measured to the nearest 0.1 gram. Juvenile weight at release was compared to the target release weight using a one-sample t-test.

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 pre-spawn 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 log 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, 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 broodstock collection. However, because of limited on-station smolt releases from Methow Hatchery and the lack of a collection facility in the Chewuch River, Wells Dam and WNFH were included as primary collection sites for the 2008 brood (Appendix A). Broodstock retention from these sites achieved 97 % of the overall goal. Summer Chinook salmon were collected from the Wells Hatchery volunteer trap (hatchery and wild fish) and from the west fish ladder at Wells Dam (wild fish only), and retention from these sites achieved 99% of the overall collection goal. Summer steelhead were collected from the east and west fish ladders at Wells Dam and broodstock retention achieved 101% of the overall collection goal.

Summer Chinook salmon and steelhead broodstock collections closely reflected the run-at-large passage of those species at Wells Dam during the respective trapping periods (Table 1). Spring Chinook salmon collection was skewed towards the earlier part of the run cycle because protocols specified trapping every third day and the majority of fish were collected during a relatively narrow time period when passage was high. Additionally, too few hatchery and wild fish were collected to meet protocol requirements for the Twisp River program (Table 2). The shortage of Twisp broodstock was compensated for by collecting additional broodstock for the Methow Composite program.

Table 1. Cumulative trapping of selected upper Columbia salmon and steelhead runs at Wells Dam. Wells summer Chinook salmon trapping reflects fish collected from the volunteer channel and the west fish ladder of Wells Dam (MEOK = Methow and Okanogan rivers).

Stock (brood) / trapping dates	Cumulative passage date during trapping period and broodstock retained (%)			
	25%	50%	75%	100%
MEOK summer Chinook salmon (2008)	11-Jul	07-Aug	26-Aug	14-Sep
1 Jul - 14 Sept	11.9	50.1	75.1	100
MEOK spring Chinook salmon (2008)	26-May	31-May	06-Jun	24-Jun
1-May - 30-Jun	42.5	71.3	85.0	100.0
MEOK summer steelhead (2009)	27-Aug	13-Sep	26-Sep	31-Oct
1-Aug - 31-Oct	20.5	38.5	70.6	100

Table 2. Broodstock collection results from Wells Complex hatcheries for steelhead (2009 brood) and Chinook salmon (2008 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. Broodstock goals for spring Chinook salmon were based on the estimated run escapement and a maximum extraction rate for wild fish of 33% of the total escapement.

	Wells summer Chinook		Wells steelhead		Spring Chinook			
					Methow		Twisp	
	H	W	H	W	H	W	H	W
Broodstock goal	1,254	139	289	87	192	119	60	22
Est. run escapement	9,367		8,782	1104	2,194	357	180	66
Extraction rate required	0.149		0.033	0.079	0.088	0.333	0.333	0.333
Actual extraction rate	0.148		0.035	0.064	0.135	0.123	0.172	0.182
Broodstock collected	1,198	187	310	71	296	44	31	12

Age Composition and Size at Maturity

Biological sampling of adult broodstock occurred at spawning. Mean length, age, origin, and fecundity data were used to estimate 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. In general, age-4 Hatchery and wild fish were of similar length, hatchery Chinook salmon were larger than wild fish at age-3, but wild fish typically had a greater mean fork length at age-5. However, sample sizes of wild fish were small or non-existent for some ages and stocks, affecting our ability to make comparisons for all ages of each stock (Table 3; Appendix C). Because of this, comparisons for spring Chinook stocks were also made with carcasses collected during spawning ground surveys (see Chapter 5). Where adequate numbers of hatchery and wild spring Chinook were sampled (age 3-4 Methow Composite males, age 4-5 Methow Composite females, and all age-4 Twisp fish), no significant differences in mean fork length were observed between hatchery and wild fish of the same stock, sex, and age ($P = 0.051 - 0.971$). For summer Chinook salmon subyearling migrants, age-3 hatchery males had a significantly greater mean fork length than age-3 wild males ($P < 0.05$), but no other comparisons between age-4 or age-5 fish of the same sex were significant ($P = 0.348 - 1.0$). Wild 1-salt female steelhead had a greater mean fork length than 1-salt hatchery female steelhead ($P < 0.005$), and no other differences were detected between hatchery and wild fish of the same sex and salt age, although sample sizes were not large enough for meaningful statistical comparisons in all cases (i.e., 2-salt male fish; Table 4).

Table 3. Mean fork length (cm; *N*; SD) by age, sex, and origin of 2008 Chinook salmon broodstocks sampled at Wells Hatchery Complex facilities.

Sex	Age-3		Age-4		Age-5		Age-6		Age-7
	H	W	H	W	H	W	H	W	H
				Methow Composite spring Chinook					
M	57.1 (32; 5.2)	49.5 (2; 3.5)	75.4 (75; 5.9)	74.3 (21; 8.0)	96.0 (1; - -)	102.0 (1; - -)	- -	- -	- -
F	66.0 (1; - -)	- -	76.6 (180; 3.6)	76.2 (16; 3.7)	88.1 (7; 6.0)	90.3 (4; 6.4)	- -	- -	- -
				Twisp spring Chinook					
M	53.3 (4; 1.7)	- -	73.4 (9; 4.5)	73.3 (3; 4.5)	- -	- -	- -	- -	- -
F	- -	- -	76.4 (16; 4.6)	75.2 (9; 3.7)	90.0 (1; - -)	- -	- -	- -	- -
				Wells summer Chinook subyearling					
M	74.7 (103; 6.3)	71.9 (33; 4.2)	87.6 (32; 8.1)	86.4 (65; 7.2)	105.0 (1; - -)	102.4 (5; 5.7)	- -	98.0 (1; - -)	- -
F	74.9 (16; 5.6)	71.7 (3; 2.1)	87.8 (64; 5.6)	88.7 (57; 4.5)	94.2 (6; 2.3)	95.5 (10; 3.3)	- -	104.0 (1; - -)	- -
				Wells summer Chinook yearling					
M	55.2 (25; 5.2)	- -	81.0 (296; 7.1)	69.0 (1; - -)	93.5 (73; 8.5)	- -	103.3 (23; 6.5)	- -	95.0 (1; - -)
F	- -	- -	83.5 (198; 4.6)	- -	91.0 (227; 5.3)	- -	97.9 (58; 5.8)	- -	- -

Table 4. Mean fork length (cm; *N*; SD) by saltwater age, sex, and origin of 2009 steelhead broodstock sampled at Wells Hatchery Complex facilities.

Sex	1-salt		2-salt	
	H	W	H	W
M	63.2 (131; 2.9)	64.6 (31; 4.3)	77.6 (11; 4.3)	74.0 (3;3.4)
F	61.1 (67; 2.7)	62.4 (42; 2.8)	71.8 (58; 3.9)	74.4 (13; 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-4 hatchery fish with a mean fecundity of

4,443. The majority of spring Chinook sampled were age-4 Methow Composite hatchery fish with a mean fecundity of 3,683 (Table 5). No significant difference in fecundity was detected between age-4 hatchery and wild Methow Composite fish, or between age-4 hatchery and wild Twisp fish (T-tests; $P = 0.120 – 0.359$). No significant difference in fecundity was detected between hatchery and wild Methow Composite and Twisp stock fish of the same age, regardless of origin (T-tests; $P = 0.062 – 0.758$). No statistical comparisons between the mean fecundities of age-4 hatchery and wild summer Chinook were performed because the wild fish sample sizes were too low. The 2009 brood steelhead were comprised primarily of 1-salt hatchery fish with a mean fecundity of 5,380 (Table 6). No significant difference in fecundity between wild and hatchery steelhead was detected between fish of the same salt-age (1-salt fish $P = 0.121$; 2-salt fish $P = 0.287$). Mean fecundity values for previous broods of Chinook salmon and steelhead are reported in Appendix D.

Table 5. Mean fecundity (*N*; SD) by total age and origin of 2008 brood Chinook salmon sampled at Wells Complex hatchery facilities.

Chinook stock	Origin	Age-3	Age-4	Age-5	Age-6
Wells summer	H	4,106 (4; 1,157)	4,443 (43; 964)	4,918 (37; 940)	5,000 (12; 821)
Wells summer	W	4,544 (1; - -)	4,104 (3; 1,089)	4,944 (1; - -)	- -
Met Comp spring	H	3,211 (1; - -)	3,683 (175; 697)	4,866 (7; 857)	- -
Met Comp spring	W	- -	3,515 (16; 691)	3,850 (3; 813)	- -
Twisp spring	H	- -	3,537 (17; 701)	4,499 (1; - -)	- -
Twisp spring	W	- -	3,204 (8; 871)	- -	- -

Table 6. Mean fecundity (*N*; SD) by salt-age and origin of 2009 brood summer steelhead sampled at Wells Complex hatchery facilities.

Origin	1-salt	2-salt
H	5,380 (60; 895)	7,206 (51; 1,574)
W	4,971 (21; 1,247)	6,718 (17; 1,466)

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 Bacterial Kidney Disease (BKD) was generally low for the 2008 brood (Table 7). The 2008 brood ELISA results were lower by category than most recent broods (Appendix E), and was generally improved by ELISA management activities. However, two Twisp stock spring Chinook females in the Below-low ELISA category experienced 100% egg mortality which resulted in a greater proportion of overall progeny being derived from females in the Low ELISA category.

Table 7. Percentage of 2008 brood female Chinook salmon within each ELISA category and associated optical density value. For spring Chinook stocks, parenthetical values reflect the broodstock proportion by category after ELISA management (i.e., culling) and females with 100% mortality were removed.

Program	Below-low	Low	Med	High	*N*
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	
Wells summer Chinook	99.6	0.4	0	0	239
Methow spring Chinook	91.0 (98.6)	8.0 (1.4)	1.0 (- -)	0	201 (139)
Twisp spring Chinook	96.0 (95.7)	4.0 (4.3)	0	0	25 (23)

Juvenile Hatchery Survival

Pre-spawn survival of all broodstocks was above the standards outlined in Appendix C of the M&E Plan (Table 8). Survival of all stocks except steelhead exceeded the unfertilized-egg-to-release standard. The Wells steelhead were below the unfertilized-egg-to-release standards for the current brood primarily because survival in the unfertilized egg-to-eyed egg stage was lower than expected. The Wells steelhead program has historically been below unfertilized-egg-to-eyed-egg and eyed-egg-to-ponding survival standards (Appendix F).

Table 8. Life-stage survival rate standards (%) for Wells and Methow Hatcheries, the 5-year mean (SD) and survival achieved for current brood year.

Life stage	Survival standard	Wells steelhead		Wells-1 summer Chinook		Methow spring Chinook		Twisp spring Chinook	
		5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved	5-year mean (SD)	Survival achieved
Collection-to-spawning	90 female	96.4 (2.5)	91.2	97.1 (0.7)	97.0	97.7 (1.1)	97.6	96.6 (6.2)	96.3
Collection-to-spawning	85 male	96.7 (2.4)	93.1	98.2 (0.6)	94.6	97.9 (1.8)	100	95.2 (6.5)	100
Unfertilized egg-to-eyed	92	85.2 (2.6)	79.8	87.2 (3.6)	93.2	93.7(2.4)	95.9	94.3 (2.0)	90.1
Eyed egg-to-ponding	98	94.7 (5.8)	99.1	99.5 (0.7)	97.6	98.4 (2.1)	99.7	98.4 (1.6)	100
30 d after ponding	97	97.2 (2.7)	97.7	99.3 (0.3)	99.8	98.7 (0.9)	99.6	99.3 (0.3)	99.5
100 d after ponding	93	94.6 (3.7)	97.2	99.2 (0.3)	99.4	98.4 (1.0)	97.7	98.9 (0.5)	99.1
Ponding-to-release	90	87.7 (5.7)	88.4	95.4 (2.7)	92.0	91.4 (5.1)	90.2	91.3 (8.0)	95.9
Transport-to-release	95	- -	- -	- -	- -	98.9 (1.5)[a]	99.8[a]	99.8 (0.2)	99.9
Unfertilized egg-to-release	81	70.6 (3.5)	69.9	82.8 (3.9)	83.8	82.3 (4.4)	84.8	84.4 (8.3)	86.5

[a] All data from Chewuch acclimation pond releases.

Number of Juvenile Fish Released

Spring and summer Chinook stocks were within 10% of the release targets overall, but individual programs (i.e., subyearling summer Chinook) or release locations (i.e., Twisp spring Chinook) were below target values (Table 9). Spring Chinook salmon releases differed from target values because too few adult fish were collected for the Twisp program, and the shortage was compensated for by increasing the number of Methow Composite broodstock. Thus, overall spring Chinook salmon releases totaling 98% of program goals closely reflected the adaptive management protocol. Summer steelhead releases were below the 10% release target, but some locations (i.e., Methow River) exceeded release targets because post volitional-migration fish that may include a higher proportion of non-migrant fish were planted in the lower Methow River in an effort to reduce competition between residual hatchery steelhead and wild fish in headwater streams. Annual release numbers for each program are listed in Appendix G.

Table 9. Target and actual release numbers for anadromous fish releases from Wells Complex hatchery facilities in 2010.

Stock/Program	Target	Number released (% of target)	17-year (1992 – 2008 broods)[a]		
			Min.	Max.	Mean
Wells summer Chinook	804,000	764,012 (95)	331,353	923,790	725,485
Yearling	320,000	336,881 (105)	185,200	457,770	331,610
Subyearling	484,000	427,131 (88)	187,382	541,923	418,492
Methow spring Chinook	550,000	540,290 (98)	28,878	611,763	344,156
Methow River	183,334	201,290 (110)	4,477	332,484	150,971
Chewuch River	183,333	260,344 (142)	11,854	284,165	172,189
Twisp River	183,333	78,656 (43)	15,470	116,749	53,267
Wells summer steelhead	450,000	394,417 (88)	328,100	775,272	465,793
Methow River	106,667	125,801 (118)	80,580	392,815	181,698
Chewuch River	106,667	92,760 (87)	78,205	138,300	104,303
Twisp River	106,666	74,766 (70)	84,475	136,680	106,853
Okanogan River	130,000	101,090 (78)	67,500	228,770	122,895

[a] Excludes years of no release: 1995 brood Twisp and 1995 and 1999 broods Chewuch spring Chinook salmon;1994 – 1996 brood steelhead releases in the Twisp and Chewuch rivers.

All juvenile anadromous salmonids released from Wells Complex hatchery facilities were marked or tagged prior to release. 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). Marks or tags used included elastomer (Wells steelhead), adipose fin-clips (Wells steelhead and summer Chinook salmon), CWT (all stocks), 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. 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). A portion of the adipose fin clipped steelhead were also CWT marked prior to release.

Size of Juvenile Fish Released

Target release sizes specified in the M&E Plan were derived from weight-at-release (fish per pound) goals outlined in the Wells HCP. Corresponding length-at-release targets were derived from standardized length/weight relationship tables (Piper et al. 1992). However, Piper et al (1992), cautions that length/weight relationships vary within stocks of the same species, and recommends that this relationship be developed independently for individual hatchery stocks. Thus, we did not statistically compare differences between observed and target fork lengths. Mean weight at release was significantly different than target weights for all stocks (one-sample T-test; $P < 0.001$) except the H x W steelhead released in the Methow Basin and the Chewuch spring Chinook salmon. Wells yearling summer Chinook were heavier at release than target values, and the remaining stocks were below target weights (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 2010 (BY = brood year). Na = not applicable.

Stock/Program (BY)	Target			Actual		
		Weight			Weight	
	Fork length (CV)	Mean (g)	FPP	Fork length (CV)	Mean (g)	FPP
Wells summer Chinook (2008)						
Yearling	176 (9.0)	45.4	10	170 (10.7)	56.0	8.1
Subyearling	140 (9.0)	22.7	20	89 (7.6)	8.6	52.9
Methow spring Chinook (2008)						
Methow River	154 (9.0)	30.2	15	126 (9.7)	24.0	18.9
Chewuch River	154 (9.0)	30.2	15	134 (12.8)	30.2	15.0
Twisp River	154 (9.0)	30.2	15	129 (9.1)	26.8	16.8
Wells summer steelhead (2009)						
Methow River	198 (9.0)	75.6	6	183 (15.9)	74.8	6.1
Chewuch River	198 (9.0)	75.6	6	183 (15.9)	74.8	6.1
Twisp River	198 (9.0)	75.6	6	183 (15.9)	74.8	6.1
Okanogan River	198 (9.0)	75.6	6	173 (16.6)	63.6	7.1

Hatchery Replacement Rate

For the current broods examined, all Wells FH Complex programs returned enough adults to replace the parent brood (i.e., HRR $\geq$1) except for the subyearling summer Chinook (Table 11). The mean HRR for the Wells subyearling summer Chinook salmon was significantly less than the target value ($P < 0.05$), and the mean for the yearling summer Chinook salmon was significantly greater than the target value ($P < 0.05$; Table 12). Mean HRR values for all other stocks did not differ statistically from target HRR values ($P = 0.15 – 0.35$). However, the HRR for Wells steelhead includes steelhead released from Winthrop NFH because fish from both programs were marked similarly (i.e., adipose fin-clip) during the years examined and could not be differentiated as returning adults. The HRR values for the current broods of subyearling summer Chinook and Twisp and Chewuch released spring Chinook salmon did not meet program-specific target values. The current broods of steelhead, summer Chinook yearling, and Methow-released spring Chinook salmon were above target values. Historic HRR data by stock and brood year is listed in Appendix B.

Numerous factors may affect survival rate calculations for hatchery fish released from Wells FH Complex facilities (e.g., poor juvenile survival, smolt survival, ocean survival, low sample rates, or incomplete adult return data). 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 analyses are not the focus of this report.

Table 11. The expected and actual smolt-to-adult (SAR) and HRR or adult-to-adult survival rates for Wells FH Complex programs. Steelhead also include Winthrop NFH releases and returns.

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	2003	144	313,509	0.61	1,924	163	13.4
Subyearling program	Expected	266	484,000	0.12	581	833	2.2
Actual	2003	224	425,271	0.04	152	2,798	0.7
Twisp spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2004	53	71,617	0.24	174	412	3.3
Methow spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2004	53	65,146	0.49	316	206	6.0
Chewuch spring Chinook	Expected	121	183,024	0.30	549	333	4.5
Actual	2004	132	204,906	0.10	194	1,056	1.5
Wells steelhead	Expected	260	509,000	1.00	5,090	100	19.6
Actual	2006	247	592,468	1.33	7,889	75	31.9

Table 12. Summary of expected and achieved HRR values for the 2003 brood Wells Hatchery summer Chinook salmon, 2006 brood summer steelhead, and the 2004 brood Methow Hatchery spring Chinook salmon. Mean and median values include the 1992-2003 broods of yearling and 1993-2003 broods of subyearling summer Chinook salmon, the 1992-2003 broods of Twisp and Chewuch spring Chinook salmon, the 1993-2003 broods of Methow spring Chinook salmon, and the 1996-2005 broods summer steelhead.

Program	HRR			
	Expected	Current brood	Mean	Median
Wells summer Chinook yearling	5.3	13.4	20.6	8.9
Wells summer Chinook subyearling	2.2	0.7	1.3	0.8
Twisp spring Chinook	4.5	3.3	3.4	1.9
Methow spring Chinook	4.5	6.0	5.6	5.1
Chewuch spring Chinook	4.5	1.5	3.1	1.5
Wells summer steelhead	19.6	31.9	24.6	21.8

Discussion

Spring Chinook releases were very close to overall production goals, although releases of Methow Composite fish were much greater than originally proposed in broodstock collection protocols to compensate for a broodstock shortage in the Twisp program. Recent broodstock protocols have included mainstem collection sites (i.e., Wells Dam) in addition to tributary locations to maximize broodstock collection opportunities. However, limitations to trapping duration (i.e., only 3 days per week) and the necessity of using DNA analysis to determine stock origin limits the ability of Wells Dam trapping to achieve numeric objectives, especially where abundance of the target fish is low (i.e., wild Twisp spring Chinook). Genetic analysis of tissue samples currently allows managers to separate collected natural origin fish into Twisp or non-Twisp groups. Wild spring Chinook salmon identified as non-Twisp origin are incorporated into the Methow Composite stock, but this genetic grouping likely includes stray fish from other river basins. Therefore, broodstock collections at Wells Dam may be prone to incorporating fish from other basins, potentially increasing to risk the Methow spring Chinook population. Managers should continue to investigate tributary collection methods and locations for the Methow Composite stock to maintain genetic integrity, represent run timing of local stocks, and assist with meeting numeric collection targets.

Releases of Wells summer Chinook salmon subyearlings were 12% below release targets primarily because of disease issues during early life stages (i.e., bacterial cold water disease and coagulated yolk disease). Bacterial cold water disease routinely affects the subyearling fish but is seldom found in yearling program fish. This is likely due to the fact that yearling fish are incubated on chilled water. Strategies to minimize mortality from cold water disease should be investigated and implemented, and would increase the likelihood of this program meeting annual rearing and release goals. Predation in the dirt ponds at Wells Hatchery may further decrease production levels for summer Chinook and steelhead.

Historical data related to SAR and HRR of all Chinook stocks must be reviewed carefully to ensure the effort to recover and report 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 SAR and 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.

Coded-wire tags are increasingly being used in summer steelhead released above Wells Dam. For the steelhead releases covered in this chapter, calculation of SAR and HRR rates include release and survival information for hatchery programs outside the scope of the DCPUD M&E Plan (i.e., Winthrop National Fish Hatchery releases). This has been necessary because the respective hatchery stocks have historically received the same mark prior to release (i.e., ad-clip). Calculating survival estimates from CWT data may allow, at least for some broods, the development of HRR rates that exclude stocks not covered under the M&E Plan, and should better describe the survival of target stocks because differences in survival that may exist between hatchery programs would be removed.

Mean ELISA values of spring Chinook salmon broodstocks have decreased over time and the net decrease is even greater after culled gametes are removed from the equation. This trend should decrease incidence of BKD at the hatchery and increase survival of juvenile fish. However, determining whether this trend results from management actions (i.e., culling) and whether lower ELISA values contribute to increased juvenile survival are important questions that may require changes to hatchery rearing practices to answer. Developing meaningful relationships between mean ELISA of contributing adults and survival indices such as egg-to-release survival or HRR is confounded when rearing and marking of juvenile fish is independent of ELISA values, or when rearing parameters (i.e., density index) are intentionally manipulated, based on ELISA values, to increase survival. Experiments within the hatchery environment could address some of these management questions if adequate rearing space were available. However, equal effort should be made to monitor disease incidence in the natural environment to determine whether trends observed in the hatchery mimic those in the wild.

Target release lengths specified in the M&E Plan were derived by applying standardized length/weight relationships by species to weight-at-release (fish per pound) goals outlined in the Wells HCP. However, the standardized length/weight relationships used may not adequately describe the length/weight relationship of M&E Plan species. Target release lengths should be developed independently for M&E Plan stocks so that appropriate length targets are used when analyzing M&E Plan objectives. Length-based statistical comparisons are better than weight-based comparisons because of inherent variability in fish weight data due to water weight and feeding regime. A linear regression using pre-release sample data from recent releases of M&E Plan stocks suggests that spring Chinook stocks with a target release weight of 15 FPP should have a corresponding mean length at release of 134 mm, as opposed to the current standard of 154 mm. Steelhead released from Wells Hatchery at a target weight of six FPP should have a corresponding mean length of 195 mm, which is similar to the existing standard of 198 mm. For summer Chinook salmon releases, yearling program fish released at 10 FPP should have a mean length at release of 168 mm, as opposed to the current 176 mm standard, and subyearling releases with a target of 20 FPP should have a mean length at release of 106 mm, as opposed to the current 140 mm standard. However, subyearling releases are now conducted earlier than they were when target release weights were developed in an effort to increase release to adult survival, one consequence of which is that FPP at release is now significantly smaller than the 20 FPP target. As survival and release size are evaluated for this program, new FPP and corresponding length at release targets should be developed.

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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

April 2, 2008

To: Mid-Columbia HCP Hatchery Committee

From: Kirk Truscott

Subject: **DRAFT 2008 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 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 2008 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 Chiwawa hatchery-origin strays in other Wenatchee basin UCR spring Chinook spawning aggregates; (2) Natural origin Chiwawa spring Chinook collection at the Chiwawa Weir, consistent with ESA Section 10

Permit 1196; (3) Methow spring Chinook broodstock protocol targeting 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 to aid in maintaining discrete Twisp and Methow Composite production components; (6) the collection of hatchery origin spring Chinook for the Methow River Basin program in excess of production requirements for BKD management, and (5) 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. These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and other sampling locations.

Above Wells Dam

Spring Chinook

Natural origin fish inclusion into the broodstock will be a priority, with natural origin fish specifically being targeted. 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 26 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.

The 2008 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 2008.

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 (9% and 19%, 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 2008 are 0.66% and 1.04%, 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 2008. Furthermore, it is unlikely that the program in 2008 would result in an unacceptable non-source contribution even if the return of natural origin spring Chinook is substantially larger than projected. Assignment errors comparable to the composite errors presented in Snow et al. (2007) and pNOBs less than or equal to 28.0% and 37% for the Twisp and MetComp programs, respectively would result in a 2.0% or less gene flow within both the Twisp and MetComp programs. Given the relatively low projected escapement of natural origin spring Chinook to the Methow Basin in 2008 (Table 1) and a collection objective to limit natural origin extraction to no greater than 33%, it is unlikely that pNOBs will approach the 28% and 37% levels for the Twisp and MetComp programs where gene flow could exceed 2.0%. Although gene flow between the two hatchery production components is likely, it is expected to be relatively low in 2008 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 (every third day and 16 hours/day), natural origin spring Chinook extraction is expected to be 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 and at the Winthrop NFH 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 2008 are estimated at 2,742 spring Chinook, including 2,592 hatchery and 150 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 2008 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 2008 Methow spring Chinook broodstock collection will target 393 adult spring Chinook. Based on the pre-season run forecast, Twisp fish are expected to represent 8% of the adipose present, CWT tagged hatchery adults and 19% 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 2008 Twisp origin broodstock collection will be predominantly hatchery origin and total 75 fish (10 wild and 65 Hatchery), representing 70% of the broodstock necessary to meet Twisp program production of 183,000 smolts. Methow Composite fish are expected to represent 92% of the adipose present CWT tagged hatchery adults and 81% 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 2008 Methow Composite (combined Methow and Chewuch river spawning aggregates) broodstock collection will be predominantly hatchery origin and total 318 spring Chinook (40 wild and 278 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 54,900 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 2003-2005 age-class return projection for wild spring Chinook Dam above Wells during 2008.

	Smolt Estimate		Age-at-Return								
	Twisp [1/]	Methow Basin [2/]	Twisp				Methow Basin				
BY			**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**SAR [3/]**
2003	723	19,026	0	3	**1**	5	6	79	**37**	122	0.0064
2004	5,873	22,941	2	**24**	11	38	7	**95**	44	147	0.0064
2005	5,372	55,381	**2**	22	10	34	**18**	230	106	354	0.0064
2008 Return Year			**2**	**24**	**1**	**28**	**18**	**95**	**37**	**150**	

[1/]- Smolt estimate based on sub-yearling and yearling emigration (Snow et al. 2007)

[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/]- Median Chiwawa River wild SAR as a surrogate wild SAR for Methow spring Chinook

Table 2. Brood Year 2003-2005 age-class run-escapement projection for Methow Basin hatchery-origin spring Chinook, 2008.

	Smolt release	Projected age-class return				
BY	**Methow FH**	**Age-3**	**Age-4**	**Age-5**	**SAR**	**Total**
2003	48,831	14	119	**20**	0.0031	**153**
2004	65,146	18	**159**	27	0.0031	**204**
2005	156,633	**44**	383	64	0.0031	**491**
2008 Return Year		**44**	**159**	**20**		**223**
BY	Chewuch Accl.	**Age-3**	**Age-4**	**Age-5**	**SAR**	**Total**
2003	127,614	36	312	**52**	0.0031	**400**
2004	204,906	58	**501**	83	0.0031	**642**
2005	232,811	**66**	569	95	0.0031	**729**
2008 Return Year		**66**	**501**	**52**		**618**
BY	Twisp	**Age-3**	**Age-4**	**Age-5**	**SAR**	**Total**
2003	150,440	42	276	**12**	0.0022	**330**
2004	96,461	27	**177**	8	0.0022	**212**
2005	27,658	**8**	51	2	0.0022	**61**
2008 Return Year		**8**	**177**	**12**		**197**
	Winthrop					**1554**
2008 Return Year						**1554**
Basin Total		**118**	**837**	**84**		**2,592**

Table 3. Assumptions and calculations to determine number of broodstock needed for BY 2008 production of 550,00 smolts

Smolt release		**550,000**	**Smolts**
Fertilization-to-release survival	90%		
Egg-take (Production)		611,000	Eggs
26% cull allowance [2/]		134,300	
Total Egg Take		**745,000**	**Eggs**
Fecundity	4,000 [1/]	186	Females spawned
Female to male ratio	1 to 1	374	Total spawned
Pre-spawn survival	**95%**	**393**	**Broodstock collection target**

[1/]- Based on historical program age-4 fecundities and expected 2008 return age structure (Table 1).

[2/-] Hatchery origin component only, and is based on projected natural origin collection.

Trapping at Wells Dam will begin on 01 May and continue through 27 June 2008. 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 2008. All hatchery 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.

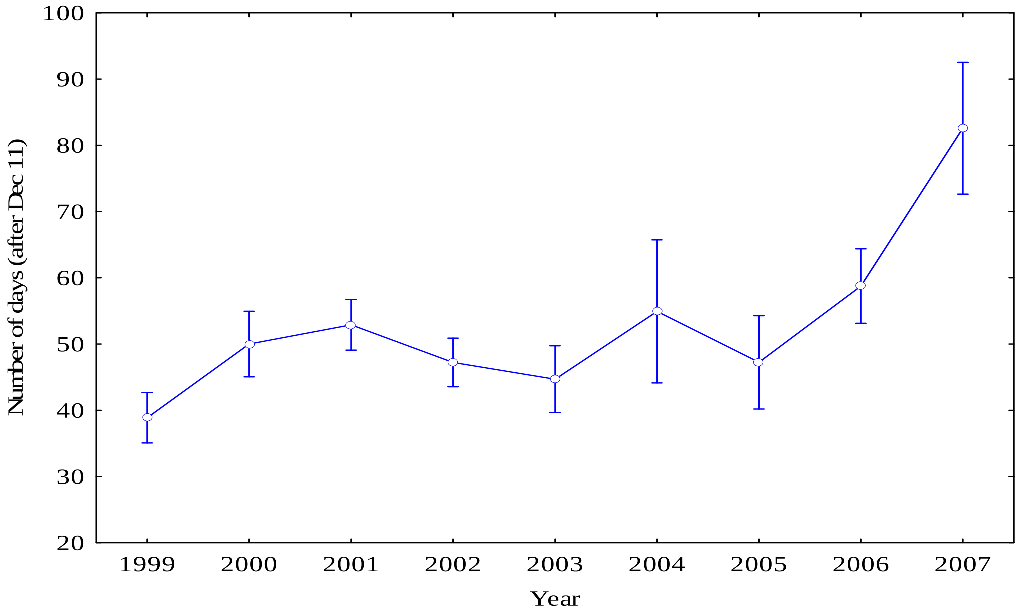

Figure 1. Mean spawn timing of HxH steelhead at Wells FH, BY 1999-2007 (WDFW unpublished Data).

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). 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 2008 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2004, 2005 and 2006 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 ladder, including 278 females. 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. For 2008, summer Chinook broodstock collections at Wells FH will also include 250,000 green eggs to support the Yakama Nation reintroduction of summer Chinook to the Yakima River Basin. The Wells HCP HC tentatively approved the green egg collection for the Yakama Nation summer Chinook reintroduction program.

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 1,393 run-at-large summer Chinook including 1,254 hatchery fish from the volunteer ladder trap at Wells Fish Hatchery outfall and 139 natural-origin fish from the Wells Hatchery outfall, and/or Wells Dam east and west ladders. Overall extraction of natural-origin fish passing Wells Dam (Wells program and above Wells Dam summer/fall Chinook programs) will not exceed 33 percent. West ladder collections will begin 01 July and completed by 14 September and will be consistent with run timing past Wells Dam. Due to fish health concerns associated with the volunteer collection site, the volunteer collection will begin 10 July and terminate by 31 August, or when the summer Chinook broodstock collection objective is met, which ever is earliest. The 3-year old component will be limited to 10 percent of the broodstock collection.

Table 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		Lake [1/] Chelan	[2/] YN	
Program Assumption	Sub-yearling	Yearling	Sub-yearling	Yearling	Sub-yearling	Yearling	eye-egg	green-egg	Total
Smolt release			484,000	320,000	1,078,000	200,000	NA	250,000	NA
Fertilization-to-release survival	81%	78%					NA	NA	NA
Eggtake Target			597,531	410,256	1,330,864	256,410	100,000	250,000	2,945,062
Fecundity	4,700	4,700							
Female target			127	87	283	55	21	53	627
Female to male ratio	1 to 1	1 to 1							
Broodstock target			254	175	566	110	42	106	1,253
Pre-spawn survival	90%	90%							
Total collection target			**282**	**194**	**629**	**122**	**47**	**118**	**1,393**

[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.

[2/]- Green eggs for YN reintroduction program in the Yakima River Basin.

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 includes releases from WNFH and Cassimer Bar Hatchery.

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	51.0
1999	176	312,098	1,544	0.495	202	8.8
2000	175	343,423	8,300	2.417	41	47.4
2001	248	185,200	2,700	1.458	69	10.9
2002	182	306,810	3,677	1.198	83	20.2
2003	144	313,509	1,924	0.614	163	13.4
			Wells subyearling summer Chinook salmon			
1993	173	187,382	40	0.021	4,685	173
1994	255	450,935	15	0.003	30,062	255
1995	221	408,000	128	0.031	3,188	221
1996	336	473,000	704	0.149	672	336
1997	274	541,923	240	0.044	2,258	274
1998	179	370,617	376	0.101	986	179
1999	212	363,600	524	0.144	694	212
2000	257	498,500	185	0.037	2,695	257
2001	210	376,027	776	0.206	485	210
2002	265	473,100	126	0.027	3,755	265
2003	224	425,271	152	0.036	2,798	0.7
			Twisp spring Chinook salmon			
1992	18	35,853	21	0.059	1,707	1.2
1993	42	116,749	27	0.023	4,324	0.6
1994	5	19,835	5	0.025	3,967	1.0
1995	-	-	-	-	-	-
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	0.091	1,105	1.9
2000	64	74,717	173	0.232	432	2.7
2001	30	51,652	44	0.085	1,174	1.5

Appendix B, continued.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
2002	9	20,541	120	0.589	170	13.3
2003	33	50,627	49	0.097	1,033	1.5
2004	53	71,617	174	0.243	412	3.3
			Methow spring Chinook salmon			
1993	91	210,849	192	0.091	1,098	2.1
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	946	0.284	352	5.1
1998[a]	161	435,670	2,300	0.528	189	14.3
1999	90	180,775	145	0.080	1,247	1.6
2000[a]	147	266,392	852	0.320	313	5.8
2001	69	130,787	508	0.388	257	7.4
2002	81	181,235	599	0.331	303	7.4
2003	30	48,831	57	0.117	857	1.9
2004	53	65,146	316	0.485	206	6.0
			Chewuch spring Chinook salmon			
1992	21	40,881	39	0.095	1,048	1.9
1993	103	284,165	116	0.041	2,450	1.1
1994	12	11,854	2	0.017	5,927	0.2
1995	-	-	-	-	-	-
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	738	0.282	354	8.7
2002	123	254,238	699	0.275	364	5.7
2003	60	127,614	61	0.048	2,092	1.0
2004	132	204,906	194	0.095	1,056	1.5
			Wells summer steelhead			
1996	207	531,798	2,779	0.523	191	13.4
1997	316	543,028	4,702	0.866	115	14.9
1998	377	888,180	14,076	1.585	63	37.3
1999	310	712,822	14,691	2.061	49	47.4
2000	277	653,874	1,752	0.268	373	6.3

Appendix B, continued.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
2001	277	541,453	11,218	2.072	48	40.5
2002	288	580,498	4,577	0.788	127	15.9
2003	228	468,538	6,129	1.308	76	26.9
2004	272	467,266	4,878	1.044	96	17.9
2005	273	576,027	7,001	1.215	82	25.6
2006	247	592,468	7,889	1.332	75	31.9

[a] Mixed MetComp group.

Appendix C. Mean fork length (cm; *N*; SD) by age, sex, and brood of Wells Hatchery complex broodstocks.

Brood	Sex	Age-3		Age-4		Age-5		Age-6		Age-7
		H	W	H	W	H	W	H	W	H
					Wells summer Chinook-yearling migrants					
2008	M	55.2 (25; 5.2)	- -	81.0 (296; 7.1)	69.0 (1; - -)	93.5 (73; 8.5)	- -	103.3 (23; 6.5)	- -	95.0 (1; - -)
2008	F	- -	- -	83.5 (198; 4.6)	- -	91.0 (227; 5.3)	- -	97.9 (58; 5.8)	- -	- -
2007	M	63.9 (21; 3.5)	- -	76.8 (132; 5.9)	- -	93.1 (255; 7.5)	- -	95.4 (14; 10.3)	- -	79.0 (1; - -)
2007	F	74.0 (1; - -)	- -	80.0 (70; 5.8)	- -	91.4 (408; 4.9)	89.0 (1; - -)	93.3 (37; 5.4)	- -	88.9 (7; 7.7)
2006	M	- -	- -	79.4 (171; 6.1)	- -	91.4 (105; 6.8)	83.5 (4; 8.2)	91.3 (50; 8.4)	- -	92.0 (1; - -)
2006	F	- -	- -	82.7 (62; 5.0)	81.0 (1; - -)	92.0 (178; 5.2)	- -	93.9 (99; 7.0)	- -	- -
2005	M	- -	- -	80.5 (137; 5.9)	80.5 (7; 4.2)	88.9 (295; 6.7)	96.7 (3; 7.1)	91.6 (5; 4.9)	- -	97.0 (1; - -)
2005	F	- -	- -	81.1 (55; 4.5)	88.0 (1; - -)	89.8 (385; 4.9)	95.2 (6; 2.8)	95.5 (23; 5.0)	- -	- -
2004	M	55.0 (1; - -)	- -	79.3 (247; 5.0)	77.2 (5; 5.8)	88.1 (104; 7.1)	94.8 (6; 8.7)	100.0 (36; 10.0)	- -	- -
2004	F	- -	- -	79.7 (90; 4.8)	85.7 (3; 2.1)	89.0 (124; 4.6)	91.9 (14; 3.9)	97.1 (101; 5.5)	- -	76.0 (1; - -)
2003	M	59.1 (9; 5.7)	- -	76.6 (32; 5.8)	74.5 (2; 16.3)	92.4 (343; 7.8)	94.0 (2; 24.0)	97.7 (6; 14.7)	- -	- -
2003	F	- -	- -	80.2 (18; 4.3)	- -	92.4 (488; 4.7)	- -	97.4 (23; 4.2)	- -	- -
2002	M	51.5 (6; 3.3)	- -	80.1 (266; 6.1)	- -	95.4 (278; 7.2)	- -	99.5 (6; 5.9)	- -	- -
2002	F	- -	- -	84.3 (66; 4.5)	- -	94.3 (519; 4.8)	- -	100.0 (10; 2.8)	- -	- -
2001	M	54.9 (12; 3.8)	- -	81.0 (437; 6.4)	84.0 (1; - -)	94.6 (84; 8.0)	97.7 (16; 8.3)	99.5 (2; 7.8)	- -	- -
2001	F	- -	- -	82.7 (302; 4.6)	- -	93.9 (179; 5.3)	98.7 (3; 1.5)	98.5 (12; 6.1)	92.0 (1; - -)	- -
2000	M	53.2 (63; 5.1)	68.0 (1, - -)	75.9 (303; 6.6)	81.9 (13; 8.7)	91.6 (130; 8.0)	97.8 (12; 6.4)	109.0 (1; - -)	- -	- -
2000	F	- -	- -	81.7 (68; 5.3)	85.5 (4; 4.2)	92.1 (208; 5.0)	95.1 (30; 4.5)	98.1 (8; 11.5)	- -	- -
1999	M	51.8 (42; 6.9)	- -	76.8 (172; 7.9)	81.6 (26; 8.7)	93.8 (80; 8.5)	99.6 (8; 6.9)	99.1 (16; 8.7)	- -	- -
1999	F	- -	- -	81.5 (79; 6.1)	84.0 (12; 4.6)	91.4 (169; 5.5)	94.5 (29; 4.6)	98.0 (58; 6.4)	- -	89.5 (2; 2.1)
1998	M	55.7 (30; 5.9)	61.0 (2; 2.8)	74.7 (125; 8.9)	83.0 (19; 6.2)	94.9 (213; 10.1)	100 5 (2; 2.1)	101.0 (19; 9.9)	- -	- -
1998	F	- -	- -	79.4 (30; 5.2)	86.0 (5; 4.2)	95.2 (418; 5.4)	97.6 (8; 5)	97.9 (32; 8.7)	- -	101.0 (1; - -)
1997	M	47.0 (2; 0.0)	68.0 (1; - -)	78.7 (46; 6.4)	79.5 (2; 4.9)	91.3 (43; 9.6)	98.0 (18; 5.6)	108.0 (3; 6.8)	109.0 (1; - -)	- -
1997	F	- -	- -	81.2 (26; 5.5)	87.5 (4; 3.7)	92.1 (96; 4.9)	96.2 (9; 5.7)	98.0 (10; 8.5)	- -	- -

Appendix C, continued.

Brood	Sex	Age-3 H	Age-3 W	Age-4 H	Age-4 W	Age-5 H	Age-5 W	Age-6 H	Age-6 W	Age-7 H
1996	M	49.3 (9; 5.4)	57.3 (4; 6.6)	76.4 (87; 7.0)	81.0 (19; 7.5)	90.4 (49; 7.5)	94.9 (24; 6.6)	98.4 (10; 8.1)	102.3 (3; 11.6)	- -
1996	F	- -	- -	80.6 (40; 4.0)	86.9 (10; 3.2)	89.4 (68; 4.5)	94.7 (26; 3.6)	96.3 (39; 7.4)	- -	92.7 (3; 5.9)
1995	M	53.4 (19; 4.4)	62.0 (3; 5.6)	73.1 (71; 8.2)	84.4 (12; 7.3)	90.2 (115; 7.7)	107.0 (1; - -)	98.3 (130; 8.2)	96.0 (1; - -)	- -
1995	F	71.0 (1; - -)	- -	81.9 (22; 6.4)	84.5 (2; 7.8)	90.7 (126; 5.2)	94.7 (65; 4.4)	96.6 (333; 5.8)	- -	- -
1994	M	- -	- -	77.1 (16; 7.9)	- -	89.6 (104; 6.6)	- -	- -	- -	- -
1994	F	- -	- -	71.3 (3; 2.3)	- -	89.7 (137; 5.3)	91.3 (4; 10.2)	- -	- -	- -
Wells summer Chinook-subyearling migrants										
2008	M	74.7 (103; 6.3)	71.9 (33; 4.2)	87.6 (32; 8.1)	86.4 (65; 7.2)	105.0 (1; - -)	102.4 (5; 5.7)	- -	98.0 (1; - -)	- -
2008	F	74.9 (16; 5.6)	71.7 (3; 2.1)	87.8 (64; 5.6)	88.7 (57; 4.5)	94.2 (6; 2.3)	95.5 (10; 3.3)	- -	104.0 (1; - -)	- -
2007	M	73.2 (40; 4.6)	68.2 (18; 5.4)	84.2 (18: 6.8)	86.4 (8; 9.4)	- -	94.3 (6; 6.7)	94.0 (1; - -)	- -	- -
2007	F	74.6 (10; 2.9)	70.3 (3; 2.8)	85.4 (18: 5.3)	78.7 (3; 4.1)	92.1 (7; 4.6)	95.6 (14; 3.9)	91.5 (2; 2.1)	- -	- -
2006	M	81.0 (1; - -)	76.0 (2, 4.2)	83.4 (5; 4.3)	90.4 (15; 5.8)	93.1 (14; 5.3)	95.4 (13; 6.5)	- -	- -	- -
2006	F	- -	- -	85.3 (7; 3.0)	90.0 (8; 6.7)	92.2 (35; 3.9)	96.0 (22; 5.9)	- -	- -	- -
2005	M	78.0 (1; - -)	71.8 (6; 7.2)	85.1 (32; 6.0)	82.6 (23; 6.0)	94.0 (3; 6.9)	98.6 (5; 4.0)	105.0 (1; - -)	- -	- -
2005	F	- -	74.0 (1; - -)	84.2 (55; 4.1)	84.4 (26; 4.4)	88.8 (13; 5.6)	91.8 (4; 2.1)	92.0 (2; 7.1)	100.0 (1; - -)	- -
2004	M	73.4 (9; 4.5)	72.3 (3; 9.9)	84.5 (12; 4.5)	84.0 (11; 1.9)	92.2 (18; 7.0)	98.7 (24; 7.4)	- -	- -	- -
2004	F	68.0 (1; - -)	65.0 (1; - -)	84.0 (11; 6.4)	84.2 (5; 1.1)	90.7 (67; 4.0)	93.9 (61; 5.1)	- -	- -	- -
2003	M	63.0 (5; 4.7)	65.0 (1; - -)	83.0 (29; 6.5)	83.6 (18; 4.2)	- -	98.7 (3; 11.0)	- -	- -	- -
2003	F	- -	- -	84.7 (53; 4.7)	86.4 (11; 4.2)	90.0 (6; 5.5)	95.0 (2; 7.1)	- -	- -	- -
2002	M	67.6 (7; 5.9)	70.5 (2; 4.9)	86.3 (15; 9.3)	73.0 (2; 19.8)	- -	- -	- -	119.0 (1; - -)	- -
2002	F	78.0 (2; 7.1)	- -	88.3 (15; 3.5)	81.0 (1; - -)	90.8 (5; 5.2)	- -	- -	- -	- -
2001	M	74.1 (8; 6.3)	- -	85.4 (19; 7.8)	91.7 (10; 8.8)	99.0 (1; - -)	99.6 (10; 8.7)	- -	- -	- -
2001	F	- -	- -	87.6 (14; 5.1)	88.0 (6; 6.5)	97.7 (19; 4.4)	98.0 (1; - -)	- -	- -	- -
2000	M	65.5 (4; 9.6)	72.4 (14; 3.5)	82.8 (60; 6.8)	86.1 (27; 5.9)	109.0 (2; 2.1)	101 0 (11; 8.5)	- -	- -	- -
2000	F	72.0 (1; - -)	- -	87.5 (146; 4.7)	87.8 (32; 5.9)	92.1 (19; 6.1)	94.3 (29; 4.4)	- -	- -	- -

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5		Age-6		Age-7
		H	W	H	W	H	W	H	W	H
1999	M	68.0 (73; 7.0)	69.6 (18; 6.3)	81.6 (30; 9.6)	85.2 (37; 5.9)	102.0 (6; 5.1)	97.7 (3; 2.1)	84.0 (1; - -)	- -	- -
1999	F	74.1 (20; 6.1)	66.5 (2; 0.7)	85.5 (41; 4.7)	84.7 (52; 5.8)	89.3 (3; 9.5)	96.0 (13; 4.0)	- -	- -	- -
1998	M	67.3 (9; 4.5)	66.1 (9; 3.9)	81.4 (5; 11.9)	89.3 (10; 6.2)	96.0 (3; 7.5)	102 5 (4; 6.0)	- -	- -	- -
1998	F	- -	- -	83.3 (4; 5.6)	85.2 (13; 7.4)	93.8 (6; 5.8)	98.0 (1; - -)	- -	- -	- -
1997	M	- -	- -	90.0 (1; - -)	96.8 (4; 8.4)	- -	101 5 (2; 3.5)	- -	- -	- -
1997	F	- -	- -	85.0 (1; - -)	87.7 (6; 6.0)	- -	100 4 (5; 4.7)	- -	- -	- -
1996	M	59.0 (1; - -)	68.3 (6; 2.7)	80.0 (1; - -)	82.8 (12; 8.5)	- -	103 4 (46; 5.9)	- -	- -	- -
1996	F	- -	- -	- -	87.3 (16; 5.2)	92.0 (1; - -)	94.5 (6; 4.7)	- -	- -	- -
1995	M	- -	69.5 (11; 5.8)	- -	90.1 (8; 8.0)	104.0 (2; 2.1)	99.7 (12; 7.8)	- -	101.5 (2; 2.1)	- -
1995	F	72.0 (1; - -)	63.0 (1; - -)	- -	92.9 (8; 6.3)	97.8 (4; 4.1)	96.2 (102; 4.6)	- -	99.0 (1; - -)	- -
1994	M	- -	- -	75.0 (2; 8.5)	87.3 (7; 8.4)	89.5 (4; 11.3)	- -	- -	- -	- -

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							
2008	63.2 (131; 2.9)	64.6 (31; 4.3)	77.6 (11; 4.3)	74.0 (3;3.4)	61.1 (67; 2.7)	62.4 (42; 2.8)	71.8 (58; 3.9)	74.4 (13; 3.3)
2007	62.0 (130; 2.9)	63.3 (13; 4.8)	74.6 (10; 4.9)	76.8 (5; 4.6)	60.1 (137; 2.5)	63.3 (10; 3.5)	71.7 (54; 5.4)	73.0 (16; 5.1)
2006	60.3 (98; 3.3)	65.2 (21; 4.5)	75.6 (58; 4)	77.4 (16; 3.5)	59.7 (22; 4.3)	61.4 (8; 4.9)	70.9 (123; 4.2)	72.7 (42; 3.3)
2005	60.4 (93; 3.2)	62.1 (15; 3.2)	74.0 (53; 3.2)	75.6 (9; 2.5)	59.4 (31; 2.4)	62.5 (15; 2.5)	71.8 (138; 3.5)	73.4 (27; 4.1)
2004	60.9 (183; 2.8)	64.2 (53; 3.4)	73.0 (3; 6.6)	- -	60.1 (118; 2.6)	62.2 (55; 3.5)	67.5 (6; 3.4)	73.4 (9; 6.2)
2003	61.9 (30; 3.8)	- -	78.6 (89; 4.9)	81.6 (9; 3.7)	60.4 (17; 3.7)	- -	74.7 (133; 3.9)	75.8 (18; 3.7)
2002	64.3 (106; 3.1)	63.7 (3; 2.9)	78.3 (68; 3.3)	76.0 (1; - -)	62.9 (50; 2.3)	63.8 (5; 5.1)	73.6 (150; 3.5)	74.7 (9; 4.8)
2001	61.2 (120; 3.4)	60.9 (14; 3.7)	76.1 (27; 5.1)	82.5 (2; 4.9)	60.2 (66; 2.5)	59.4 (7; 3.0)	72.9 (106; 3.4)	73.3 (3; 2.5)
2000	63.4 (113; 2.9)	62.9 (13; 3.4)	77.8 (28; 5.0)	76.0 (4; 10.7)	61.4 (87; 2.4)	62.5 (13; 2.4)	73.8 (98; 3.6)	76.8 (11; 7.8)
1999	63.3 (123; 2.9)	64.0 (5; 2.9)	80.0 (41; 2.8)	80.8 (4; 7.4)	62.3 (66; 2.4)	61.8 (5; 2.4)	74.3 (141; 3.6)	73.8 (13; 2.9)
1998	64.8 (122; 3.7)	65.6 (5; 3.0)	79.3 (64; 4.8)	- -	62.1 (78; 3.1)	64.0 (4; 1.4)	75.3 (169; 3.6)	74.3 (3; 0.6)
1997	64.2 (145; 3.1)	63.8 (18; 3.5)	76.6 (20; 3.6)	74.5 (10; 8.0)	62.3 (94; 3.3)	61.6 (14; 2.3)	71.9 (53; 4.5)	74.3 (15; 5.7)
1996	- -	- -	- -	- -	- -	- -	- -	- -
1995	66.0 (1; - -)	64.3 (8; 4.2)	80.0 (1; - -)	77.6 (5; 3.8)	60.3 (9; 2.6)	63.8 (12; 4.4)	74.8 (16; 4.1)	74.2 (11; 5.8)

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5	
		H	W	H	W	H	W
Methow / Methow Composite spring Chinook salmon							
2008	M	57.1 (32; 5.2)	49.5 (2; 3.5)	75.4 (75; 5.9)	74.3 (21; 8.0)	96.0 (1; - -)	102.0 (1; - -)
2008	F	66.0 (1; - -)	- -	76.6 (180; 3.6)	76.2 (16; 3.7)	88.1 (7; 6.0)	90.3 (4; 6.4)
2007	M	51.6 (16; 4.4)	48.0 (1; - -)	70.2 (40; 6.5)	71.6 (6; 6.9)	92.9 (14; 5.2)	96.0 (3; 3.6)
2007	F	- -	- -	74.1 (43; 4.7)	- -	88.0 (21; 3.5)	90.3 (9; 2.2)
2006	M	45.0 (3; 3.6)	50.0 (1; - -)	76.3 (110; 5.0)	75.6 (3; 1.1)	90.5 (2; 7.7)	95.0 (1; - -)
2006	F	- -	- -	74.3 (121; 3.7)	77.2 (4; 2.2)	82.8 (7; 4.9)	92.0 (1; - -)
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	51.2 (40; 4.2)	- -	73.0 (59; 6.7)	- -	- -	- -
2000	F	- -	- -	74.5 (74; 3.4)	- -	- -	- -
1999	M	- -	- -	- -	- -	- -	- -
1999	F	- -	- -	78.0 (27; 3.1)	77.6 (13; 5.1)	- -	86.5 (4; 6.6)
1998	M	- -	- -	- -	- -	- -	- -
1998	F	- -	- -	76.3 (8; 3.7)	76.1 (27; 3.5)	84.9 (23; 8.7)	88.9 (42; 6.2)
Twisp spring Chinook salmon							
2008	M	53.3 (4; 1.7)	- -	73.4 (9; 4.5)	73.3 (3; 4.5)	- -	- -
2008	F	- -	- -	76.4 (16; 4.6)	75.2 (9; 3.7)	90.0 (1; - -)	- -
2007	M	48.1 (7; 4.3)	48.0 (1; - -)	70.4 (10; 5.4)	- -	- -	- -
2007	F	- -	- -	74.0 (16; 5.3)	73.0 (1; - -)	- -	93.0 (2; 2.8)
2006	M	49.5 (2; 2.1)	- -	66.2 (10; 10.1)	- -	- -	- -
2006	F	- -	- -	72.1 (15; 3.7)	- -	85.0 (1; - -)	- -
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	- -	45.0 (1; - -)	- -	- -	- -	98.0 (2; 1.4)

Appendix C, continued.

Brood	Sex	Age-3		Age-4		Age-5	
		H	W	H	W	H	W
2000	F	- -	- -	75.1 (38; 3.6)	- -	- -	91.0 (3; 1)
1999	M	- -	- -	- -	- -	- -	- -
1999	F	- -	- -	- -	78.5 (13; 3.1)	- -	89.3 (3; 2.1)
1998	M	- -	- -	- -	- -	- -	- -
1998	F	- -	- -	77.0 (2; 1.4)	- -	76.5 (4; 16.3)	- -
				Chewuch spring Chinook salmon			
1996	F	- -	- -	76.4 (5; 2.9)	- -	- -	- -
1994	M	- -	- -	- -	80.0 (1; - -)	- -	- -
1994	F	- -	- -	- -	74.0 (1; - -)	- -	80.5 (4; 2.6)

Appendix D. Mean fecundity (*N*; SD) of Wells Complex hatchery broodstocks by total age and origin.

Brood	Age-3		Age-4		Age-5		Age-6	Brood total
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	
Wells summer Chinook salmon								
2008	4,106 (4; 1,157)	4,544 (1; - -)	4,443 (43; 964)	4,104 (3; 1,089)	4,918 (37; 940)	4,944 (1; - -)	5,000 (12; 821)	4,666 (101; 963)
2007	3,137 (1; - -)	2,906 (1; - -)	4,016 (10; 900)	- -	4,708 (66; 949)	- -	4,595 (6; 602)	4,616 (87; 963)
2006	- -	- -	3,877 (11; 672)	- -	4,412 (55; 898)	4,154 (4; 641)	4,959 (10; 1,071)	4,420 (87; 967)
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								
2008	- -	- -	3,537 (17; 701)	3,204 (8; 871)	4,499 (1; - -)	- -	- -	3,471 (26; 771)
2007	- -	- -	3,298 (16; 685)	2,860 (1; - -)	- -	5,097 (2; 1,515)	- -	3,464 (19; 927)
2006	- -	- -	3,301 (15; 621)	- -	- -	- -	- -	3,301 (15; 621)
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)	4,617 (6; 534)	4,941 (1; - -)	4,902 (2; 612)	- -	4,369 (16; 657)
2000	- -	- -	3,820 (38; 698)	- -	- -	5,292 (3; 997)	- -	3,927 (41; 807)
Methow Composite spring Chinook salmon								
2008	3,211 (1; - -)	- -	3,683 (175; 697)	3,515 (16; 691)	4,866 (7; 857)	3,850 (3; 813)	- -	3,711 (202; 733)
2007	- -	- -	3,341 (43; 792)	- -	4,461 (21; 919)	4,853 (9; 605)	- -	3,850 (73; 1,015)
2006	- -	- -	3,428 (159; 781)	3,894 (3; 661)	4,061 (8; 721)	4,707 (1; - -)	- -	3,481 (173; 789)
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)

Appendix D, continued.

Brood	Age-3		Age-4		Age-5		Age-6	Brood total
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	Hatchery	
2002	- -	- -	3,905 (125; 682)	- -	3,318 (4; 342)	- -	- -	3,887 (129; 681)
2001	- -	- -	3,938 (90; 764)	3,753 (10; 706)	- -	- -	- -	3,920 (100; 758)
2000	- -	- -	3,759 (74; 678)	- -	- -	- -	- -	3,759 (74; 678)

Appendix D, continued.

Brood	1-salt		2-salt		Brood total
	Hatchery	Wild	Hatchery	Wild	
			Wells Hatchery summer steelhead		
2009	5,380 (60; 895)	4,971 (21; 1,247)	7,206 (51; 1,574)	6,718 (17; 1,466)	6,102 (150; 1,562)
2008	5,526 (66; 980)	5,434 (41; 1,099)	6,682 (57; 1,319)	6,171 (13; 1,135)	5,946 (180; 1,264)
2007	4,715 (125; 849)	4,881 (10; 888)	5,868 (46; 1,598)	6,116 (4; 1,748)	5,107 (198; 1,274)
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 that fell within that category for each brood, excluding captive brood and non-viable females. For spring Chinook stocks, the percent of females by category after culling is listed in parenthesis.

Brood	Below-low	Low	Med	High	Total
	<0.099	0.099 - 0.199	0.20 - 0.449	> 0.450	number
		Wells summer Chinook salmon			
2008	99.6	0.4	0	0	239
2007	98.2	1.8	0.0	0.0	166
2006	100.0	0.0	0.0	0.0	167
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			
2008	91.0 (98.6)	8.0 (1.4)	1.0 (- -)	0.0	201 (139)
2007	93.2 (93.2)	4.1 (4.1)	1.4 (1.4)	1.3 (1.3)	73 (73)
2006	73.8 (88.1)	24.0 (11.9)	0.0	2.2 (- -)	179 (143)
2005	89.8 (89.8)	6.3 (6.3)	0.0	3.9 (3.9)	128 (128)
2004	45.6 (67.0)	13.6 (20.0)	10.9 (13.0)	29.9 (- -)	147 (100)
2003	39.5 (34.1)	32.9 (34.0)	6.6 (6.4)	21.0 (25.5)	76 (47)
2002	51.6 (74.8)	37.8 (25.2)	2.4 (- -)	8.2 (- -)	328 (119)
2001	66.7 (76.9)	13.0 (10.5)	2.8 (2.1)	17.5 (10.5)	177 (95)
2000	87.5 (78.3)	9.2 (18.9)	1.1 (1.4)	2.2 (1.4)	185 (74)
1999	78.8 (70.4)	15.3 (20.5)	1.7 (2.3)	4.2 (6.8)	118 (44)
1998	73.6 (73.1)	9.8 (7.7)	3.1 (3.8)	13.5 (15.4)	163 (104)
		Methow spring Chinook salmon			
1997	29.4 (28.7)	51.4 (55.7)	11.3 (15.6)	7.9 (- -)	177 (122)
1996	83.9 (83.6)	10.7 (10.9)	0.0	5.4 (5.5)	56 (55)
1995	14.3 (14.3)	42.8 (42.8)	14.3 (14.3)	28.6 (28.6)	7 (7)
1994	44.5 (100.0)	44.4 (- -)	0.0	11.1 (- -)	9 (1)
1993	38.8 (38.8)	46.9 (46.9)	4.1 (4.1)	10.2 (10.2)	49 (49)
		Twisp spring Chinook salmon			
2008	96.0 (95.7)	4.0 (4.3)	0.0	0.0	25 (23)
2007	94.1 (94.1)	0.0	5.9 (5.9)	0.0	17 (17)
2006	80.0 (80.0)	13.3 (13.3)	0.0	6.7 (6.7)	15 (15)

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			
2005	83.3 (83.3)	16.7 (16.7)	0.0	0.0	6 (6)
2004	64.9 (64.9)	21.6 (21.6)	10.8 (10.8)	2.7 (2.7)	37 (37)
2003	52.9 (52.9)	29.4 (29.4)	5.9 (5.9)	11.8 (11.8)	17 (17)
2002	80.0 (80.0)	20.0 (20.0)	0.0	0.0	5 (5)
2001	93.3 (93.3)	0.0	0.0	6.7 (6.7)	15 (15)
2000	82.9 (82.9)	17.1 (17.1)	0.0	0.0	41 (41)
1999	81.2 (81.2)	6.3 (6.3)	0.0	12.5 (12.5)	16 (16)
1998	50.0 (50.0)	33.3 (33.3)	0.0	16.7 (16.7)	6 (6)
1997	36.3 (36.3)	36.4 (36.4)	18.2 (18.2)	9.1 (9.1)	11 (11)
1996	68.2 (68.2)	18.2 (18.2)	4.5 (4.5)	9.1 (9.1)	22 (22)
1995	0.0	0.0	0.0	0.0	0.0
1994	25.0 (25.0)	50.0 (50.0)	0.0	25.0 (25.0)	4 (4)
1993	4.3 (4.3)	52.2 (52.2)	26.1 (26.1)	17.4 (17.4)	23 (23)
1992	0.0	77.8 (77.8)	11.1 (11.1)	11.1 (11.1)	9 (9)
		Chewuch spring Chinook salmon			
1997	35.9 (36.0)	28.2 (27.8)	28.2 (30.6)	7.7 (5.6)	39 (36)
1996	71.9 (71.9)	15.6 (15.6)	3.1 (3.1)	9.4 (9.4)	32 (32)
1995	0.0	0.0	0.0	0.0	0.0
1994	33.3 (33.3)	50.0 (50.0)	0.0	16.7 (16.7)	6 (6)
1993	30.5 (31.0)	33.9 (34.5)	6.8 (6.9)	28.8 (27.6)	59 (58)
1992	8.3 (8.3)	83.4 (83.4)	0.0	8.3 (8.3)	12 (12)

Appendix F. Hatchery life stage survival-rate standards and level achieved (%) by stock and broodyear. Pre-spawn survival of adult summer Chinook is listed under the yearling life history stage category.

Brood	Collection to spawning		Unfertilized egg to eyed	Eyed egg to ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg to release
	90.0 female	85.0 male	92.0	98.0	97.0	93.0	90.0	95.0	81.0
				Wells summer Chinook salmon yearling					
2008	97.0	94.6	93.2	97.6	99.8	99.4	92.0	- -	83.8
2007	97.2	98.2	87.9	98.3	99.9	99.7	93.0	- -	80.4
2006	96.4	97.3	82.0	99.3	99.4	99.2	97.8	- -	79.7
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					
2008	- -	- -	95.0	84.2	99.4	94.3	94.1	- -	75.3
2007	- -	- -	91.7	86.5	99.5	99.1	98.3	- -	78.0
2006	- -	- -	90.0	100.0	94.3	80.5	78.6	- -	70.8
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					
2009	91.2	93.1	79.8	99.1	97.7	97.2	88.4	- -	69.9
2008	98.9	96.6	85.2	85.2	99.3	99.5	92.9	- -	67.5
2007	92.8	95.8	80.8	99.0	97.8	96.2	85.6	- -	68.4
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

Appendix F, continued.

Brood	Collection to spawning[a]		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
	Methow Composite spring Chinook salmon								
2008	97.6	100.0	95.9	99.7	99.6	97.7	90.2	99.8	84.8
2007	98.6	98.8	92.9	96.0	98.8	98.2	94.5	99.1	84.2
2006	96.8	95.1	94.8	100.0	97.2	97.0	83.0	96.2	77.6
2005	99.0	99.1	96.1	100.0	99.6	99.5	90.4	99.6	87.7
2004	97.7	99.2	94.8	96.2	99.2	99.1	96.1	99.8	84.2
2003	96.3	97.2	90.0	100.0	98.8	98.3	93.0	99.8	77.9
2002	97.7	95.1	93.6	100.0	98.6	98.6	96.5	98.5	92.7
2001	98.9	97.3	96.1	100.0	99.3	99.1	97.0	99.8	90.8
2000	96.2	97.2	96.5	100.0	99.6	99.4	99.0	99.9	92.7
1999	96.0	96.3	97.4	100.0	99.5	99.5	99.2	N/A	92.5
	Twisp spring Chinook salmon								
2008	96.3	100.0	90.1	99.5	99.9	99.5	96.3	99.9	86.5
2007	100.0	100.0	92.4	96.0	99.4	98.4	88.6	99.7	78.6
2006	85.7	100.0	95.9	100.0	99.6	99.3	94.2	99.7	90.4
2005	100.0	100.0	95.7	98.2	99.6	99.5	99.2	99.9	93.2
2004	97.4	87.9	95.5	97.8	99.1	98.8	78.7	99.5	73.3
2003	100.0	88.2	91.8	99.8	98.8	98.5	95.9	100.0	86.4
2002	100.0	66.7	97.9	100.0	99.3	99.1	98.5	99.9	96.4
2001	93.8	88.2	91.1	100.0	99.0	95.7	90.1	100.0	81.2
2000	96.4	92.9	97.1	100.0	99.6	99.5	47.3	23.9	46.0
1999	100.0	95.7	94.3	100.0	99.2	99.0	98.0	99.7	92.3

[a] Collection to spawning survival includes all fish trapped for Methow Composite and Twisp programs at WDFW trapping locations (including Wells Dam); does not include captive brood programs.

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. Twisp River spring Chinook only include yearling progeny of anadromous adults.

Brood	Release location						Wells summer Chinook salmon		
	Methow	Twisp	Chewuch	Okanogan	Columbia R.	Total	Subyearling	Yearling	Total
	Wells Hatchery steelhead								
2009	125,801	74,766	92,760	101,090	- -	394,417	471,286	- -	471,286
2008	103,236	104,903	100,373	146,633	- -	455,145	427,131	336,881	764,012
2007	99,464	100,446	92,670	147,782	- -	440,362	402,527	310,063	712,590
2006	96,219	111,770	107,545	135,547	- -	451,081	396,538	311,880	708,418
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								
2008	201,290	78,656	260,344	- -	- -	540,290			
2007	119,407	54,096	126,055	- -	- -	299,558			
2006	249,504	45,892	154,381	- -	- -	449,777			
2005	156,633	27,658	232,811	- -	- -	417,102			
2004	65,146	96,617	204,906	- -	- -	366,669			
2003	48,831	43,734	127,614	- -	- -	220,179			
2002	181,235	20,541	254,238	- -	- -	456,014			
2001	148,128	51,652	244,043	- -	- -	443,823			
2000	66,454	74,717	199,938	- -	- -	341,109			
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 indicates that a single tag code was used for more than one release site and 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 steelhead					
2009	H x H	14-Apr-10		Ad-clip	635083	55,530	45,560	0.5493	101,090
2007	H x W	21-Apr-08		Ad-clip	633398	117,030	175,550	0.3999	292,580
2005	H x W	01-May-06		Ad-clip	632895	228,355	6,772	0.9712	235,127
				Wells summer Chinook salmon					
2008	Subyearling	11-May-09	21	Ad-clip	634876	415,104	12,027	0.9718	427,131
2007	Subyearling	13-May-08	0	Ad-clip	633872	155,376	3,420	0.9784	158,796
2007	Subyearling	16-Jun-08	0	Ad-clip	633871	242,123	2,360	0.9903	244,483
2006	Subyearling	16-May-07	0	Ad-clip	633385	202,950	1,575	0.9922	204,525
2006	Subyearling	13-Jun-07	0	Ad-clip	633386	190,669	1,344	0.993	192,013
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
2008	Yearling	16-Apr-10	124	Ad-clip	635092	169,091	2,718	0.9841	171,809
2008	Yearling	16-Apr-10	124	Ad-clip	635093	162,461	2,611	0.9841	165,072
2007	Yearling	15-Apr-09	125	Ad-clip	634390	173,218	2,181	0.9875	175,399
2007	Yearling	15-Apr-09	125	Ad-clip	634287	132,990	1,674	0.9875	134,664
2006	Yearling	06-Apr-08	97	Ad-clip	633799	310,106	1,774	0.9943	311,880
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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
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
Chewuch River spring Chinook salmon									
2008	MC Chewuch	15-Apr-10	38	None	635099	258,052	2,292	0.9911	260,344
2007	MC Chewuch	21-Apr-09	29	None	634294	99,242	760	0.992	100,002
2007	MC Chewuch	21-Apr-09	29	None	634471	25,852	201	0.992	26,053
2006	MC Chewuch	17-Apr-08	31	None	633884	151,046	3,335	0.979	154,381
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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
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									
2008	MC Methow	15-Apr-10	137	None	634866	174,353	1,346	0.9923	175,699
2007	MC Methow	21-Apr-09	152	None	634293	104,510	960	0.991	105,470
2007	MC Methow HE	21-Apr-09	152	None	634674	13,773	438	0.968	14,211
2006	MC Methow	16-Apr-08	168	None	633866	208,689	3,028	0.986	211,717
2006	MC Methow	23-Dec-06	13	Otolith	None	37,787	0	1	37,787
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	25-Apr-05	0	None	632694	42,252	0	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
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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
1993	Methow HE	15-Apr-95	227	Ad-clip	635410	20,758	360	0.983	21,118
			Twisp River spring Chinook salmon						
2008	Twisp	15-Apr-10	43	None	635085	77,066	1,590	0.9797	78,656
2007	Twisp	25-Apr-09	10	None	634673	52,276	300	0.9943	52,576
2007	Twisp HE	25-Apr-09	10	None	634675	1,498	22	0.9857	1,520
2006	Twisp	21-Apr-08	41	None	633687	39,206	1,183	0.971	40,389
2006	Twisp HE	21-Apr-08	41	None	634068	5,292	211	0.962	5,503
2005	Twisp	16-Apr-07	34	None	633483	26,552	1,106	0.96	27,658
2004	Twisp	02-Apr-05	6	None	631508	3,643	0	1	3,643
2004	Twisp	22-Apr-06	28	None	632878	69,717	1,900	0.976	71,617
2004	Twisp HE	22-Apr-06	28	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
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

Appendix H, continued.

Brood	Program	Release date	Days acclimated	Mark code		Mark release (*N*)			Total
				Hatchery	CWT	Marked	No mark	Rate	
1992	Twisp	15-Apr-94	3	Ad-clip	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 summer Chinook salmon				
2008	170.0	18.2	10.7	56.0	15.5	27.7	8.1
2007	173.0	9.9	5.7	52.3	9.4	18.0	8.6
2006	153.8	11.1	7.2	41.1	8.6	20.9	11.0
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 summer Chinook salmon				
2008	88.5	6.75	7.62	8.57	2.28	26.7	52.9
2007	108.1	7.3	6.7	13.5	- -	- -	33.5
2006	111.0	10.3	9.3	14.9	- -	- -	30.4
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				
2009	172.5	28.6	16.6	63.6	32.5	51.1	7.1
2008	185.7	24.5	13.1	69.0	26.8	38.9	6.5
2007	181.4	15.3	8.4	67.3	16.6	24.7	6.7
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				
2009	183.4	29.2	15.9	74.8	35.7	47.7	6.1
2008	189.7	22.4	11.8	77.0	27.2	35.3	5.8
2007	178.3	16.1	9.0	63.5	17.4	27.4	7.1
2006	181.5	20.4	11.2	68.8	23.1	33.1	6.5

Appendix I, continued.

Brood	Fork length			Weight			
	Mean	SD	CV	Mean	SD	CV	FPP
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
Twisp River spring Chinook salmon							
2008	128.7	11.8	9.1	26.8	7.8	29.1	16.8
2007	127.5	13.6	10.6	24.9	9.3	37.4	18.2
2006	134.0	11.1	8.3	29.6	8.3	28.1	15.3
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							
2008	125.9	12.2	9.7	24.0	7	29.5	18.9
2007	130.8	14.0	10.7	27.0	9.3	34.4	16.8
2006	127.6	15.8	12.4	25.3	12.0	47.6	17.9
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

Appendix I, continued.

Brood	Fork length			Weight			
	Mean	SD	CV	Mean	SD	CV	FPP
1993	134.8	- -	- -	28.5	- -	- -	15.9
1992	na	na	na	na	na	na	Na
Chewuch River spring Chinook salmon							
2008	133.8	17.1	12.8	30.3	12.2	40.3	15.0
2007	145.5	29.0	20.0	43.3	28.8	66.5	10.4
2006	115.7	10.9	9.4	19.2	6.2	32.3	23.7
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 Straying of Hatchery Origin Fish Released From Wells Complex Hatchery Facilities.

Abstract

All stocks of salmon and steelhead covered in this chapter were subject to commercial, sport, or tribal fisheries in ocean and 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. For the current brood examined (2004), harvest of hatchery and wild Methow Basin spring Chinook totaled 7.7% and 7.6% of the total return, respectively. 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. For the most recent broods examined, greater than 5% of the total return of spring Chinook salmon released into the Methow, Twisp, and Chewuch rivers strayed to non-target spawning grounds. Less than 5% of the total brood return of Wells yearling and subyearling summer Chinook were recovered in non-target spawning grounds. For the 2009 return year, Wells summer Chinook salmon comprised less than 5% of other independent populations except the Methow River spawning population, of which 7.2% were fish originating from Wells Hatchery releases. Local creel census was used to monitored harvest in selective (steelhead), and non-selective (summer Chinook salmon) fisheries occurring in the upper Columbia River ESU. An estimated 2,906 summer Chinook salmon, 8,181 hatchery steelhead, and 81 wild steelhead were directly or indirectly removed through sport fisheries in 2010. Overall, Wells Complex hatchery fish provided commercial, recreational, and limited tribal harvest, while meeting escapement requirements in that most spring Chinook salmon were recovered in broodstocks or on spawning grounds, and most summer Chinook salmon were recovered in fisheries.

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, and steelhead released for inundation compensation). However, hatchery fish can stray into other populations, potentially creating genetic and/or ecological risks to recipient populations. Some hatchery fish released from Wells Complex facilities are heavily exploited in marine areas along the Pacific coast from Washington to Alaska by 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 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 population

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Wells Chinook salmon).

- Ho: Harvest rate ≤ Maximum level to meet program goals
- Ho: Escapement ≤ 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 salmon 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 (i.e., selective fisheries). 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 portions 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 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 are 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 (see Chapter 5 for a more in depth assessment of straying). 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 impact of fisheries, both direct and indirect (i.e., hooking mortality), on wild fish is challenging. 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 total mortality of fisheries on wild stocks is necessary to make survival comparisons between hatchery and wild fish, and to better understand the risk associated with specific fisheries.

Methods

Hatchery Chinook Salmon

Fishery extraction and 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 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 streams 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 stock fish that were not uniquely tagged by release site. Thus, returning adults from these broods could not be identified by release site.

Wells summer Chinook 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 of hatchery summer Chinook were considered to be in non-target areas. For hatchery Chinook salmon stocks, observed stray rates were compared to target values using a one-sample t-test at a significance level of 0.05. Because the stray rate for a population may be related to the distance from Wells Hatchery, the proportion of each spawning population comprised of Wells summer Chinook based on spawning ground recoveries was transformed (arcsine square root) and compared to the distance from Wells Hatchery.

Wild and Hatchery Spring 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 fisheries). 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, assuming both components of the population are similarly exposed to the open fishery (i.e., same migration timing and spatial distribution).

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 post-release mortality. Estimates of post-release mortality were calculated by multiplying the proportion of hatchery fish harvested in a specific fishery by the indirect mortality rate calculated for each fishery type. Indirect mortality rates 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	40.0 %

Summer Chinook Salmon Sport Fishery

A non-selective sport fishery on summer Chinook salmon upstream of Priest Rapids Dam began in 2001, and harvest was monitored through catch record card data. Starting in 2004, creel surveys were conducted for this summer Chinook sport fishery to:

1) Estimate sport harvest of summer Chinook and sockeye salmon.

2) Estimate rates of incidental catch and release of steelhead and Coho salmon.

3) Assist in the evaluation of the summer Chinook salmon hatchery programs.

We used a two-stage non-uniform probability sampling as described in 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).

Table 2. River section descriptions used for summer Chinook salmon creel surveys.

River section code	River section description
537	Priest Rapids Dam to Wanapum Dam
539	Wanapum Dam to Rock Island Dam
541	Rock Island Dam to 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 Malvestuto et al. (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 (CPU) 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 CPU for each fishery location.

Results

Hatchery Chinook Salmon

Fishery contribution rates for individual broodyears were combined for hatchery spring (1992 – 2004) and summer Chinook salmon (1992 – 2003). Most hatchery Chinook salmon from these broods, regardless of race, were adipose fin-clipped and received a CWT prior to release (Chapter 1). Starting with the 2000 brood, spring Chinook salmon releases have been tagged with a CWT, but have not been marked with an adipose fin-clip. Thus, prior to the 2000 brood, most fish intended for supplementation did not receive any protection from fishery extraction afforded by selective fisheries. Tag 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 most recent completed brood year 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 2004 brood were not adipose fin-clipped, few of these fish were recovered in fisheries. However, harvest and indirect mortality derived using a surrogate stock (2004 brood Chiwawa spring Chinook), indicates Methow spring Chinook salmon were impacted primarily in freshwater selective sport fisheries.

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 tagged with a CWT. This 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 salmon release covered in this report in which the adipose fin was not clipped. This change in marking strategy resulted in a decrease in the overall proportion of spring Chinook salmon recovered in fisheries from 26.7% (1992 – 1999 broods) to 8.2% (2000 – 2004 broods). For the current brood of hatchery spring Chinook examined (2004), 7.7% were harvested in fisheries.

Stray Rates by Brood Year

For the current brood examined (2004), greater than 5% of the total return of spring Chinook salmon released into the Methow, Twisp, and Chewuch rivers strayed into non-target spawning grounds (Table 3). Mean stray rates to non-target spawning grounds for historic broods were not significantly different than the 5% target for Methow releases ($P = 0.058$), but were significantly greater than the 5% target for Twisp ($P < 0.05$) and Chewuch releases ($P < 0.05$; Table 4; Appendix B).

Table 3. Percent of total hatchery Chinook recoveries by race and recovery location for 2004 brood year spring Chinook salmon and 2003 brood year summer Chinook salmon. Recoveries are expanded by mark rate and sample rate for each category and adjusted for indirect mortality associated with selective fisheries.

Recovery category	Hatchery release group				
	Methow spring	Twisp spring	Chewuch spring	Wells summer-year	Wells summer-sub
Total recoveries (*N*)	305	172	198	1,923	151
Broodstock target stream	28.9	12.2	0.0	- -	- -
Broodstock non-target stream	12.9	3.3	17.2	0.0	0.0
Broodstock from Wells Dam	1.6	2.8	2.0	29.3	43.7
Spawning ground target stream	34.6	53.9	37.4	NA	NA
Spawning ground non-target stream	10.4	15.0	34.5	2.2	2.0
Ocean fishery-commercial	0.0	0.0	0.0	29.0	21.9
Ocean fishery-sport	0.0	0.0	0.0	7.1	10.6
Ocean fishery-tribal	0.0	0.0	0.0	2.4	0.7
Freshwater fishery-commercial	3.6	4.1	3.0	18.2	13.2
Freshwater fishery-sport	4.3	4.7	3.5	11.0	6.6
Freshwater fishery-tribal	0.3	0.0	0.0	0.6	1.3

NA = Not applicable.

Table 4. Percent of total hatchery Chinook recoveries by race and recovery category. Methow spring Chinook include the 1993 – 1997, 1999, and 2001 – 2004 broods. Twisp spring Chinook include the 1992 – 2004 broods and Chewuch spring Chinook include the 1992 –1997, and 2001 – 2004 broods. Summer Chinook include the 1992 –2003 broods. Recoveries were expanded by mark rate and sample rate for each category and adjusted for indirect mortality associated with selective fisheries.

Recovery category	Hatchery release group				
	Methow spring	Twisp spring	Chewuch spring	Wells summer Chinook	
				Yearling	Subyearling
Total recoveries (*N*)	3,457	1,148	2,214	45,893	3,331
Broodstock target stream	40.9	7.3	3.9	- -	- -
Broodstock non-target stream	1.4	15.5	11.5	1.3	1.0
Broodstock from Wells Dam	10.4	8.7	10.0	22.0	30.0
Spawning ground target stream	24.8	40.0	26.7	NA	NA
Spawning ground non-target stream	2.8	16.7	33.6	7.5	6.5
Ocean fishery-commercial	0.5	0.4	0.9	46.9	43.0
Ocean fishery-sport	0.0	0.0	0.0	7.8	6.2
Ocean fishery-tribal	0.0	0.0	0.0	1.7	1.0
Freshwater fishery-commercial	9.4	5.1	3.1	5.1	6.0
Freshwater fishery-sport	8.0	4.7	9.3	6.9	5.5
Freshwater fishery-tribal	1.1	1.0	1.0	0.6	0.7

NA = Not applicable.

Adult returns of hatchery summer Chinook salmon were great enough to provide fish for broodstock and harvest. Harvest of summer Chinook salmon occurred primarily in ocean fisheries and yearling releases have provided 93.2% of all recoveries (broodstock and harvest combined) of summer Chinook salmon from the 1992-2003 broods (Table 4). Because Wells summer Chinook salmon are intended for harvest, no target stream was designated. Consequently, all spawning ground recoveries were considered to be in non-target areas, but stray rates for the current brood examined did not exceed the 5% target. Mean stray rates to non-target spawning grounds for the 1992-2003 broods were not significantly different from the 5% target value for either the Wells yearling (P = 0.37) or subyearling (P = 0.79) releases (Figure 1; Appendix C1).

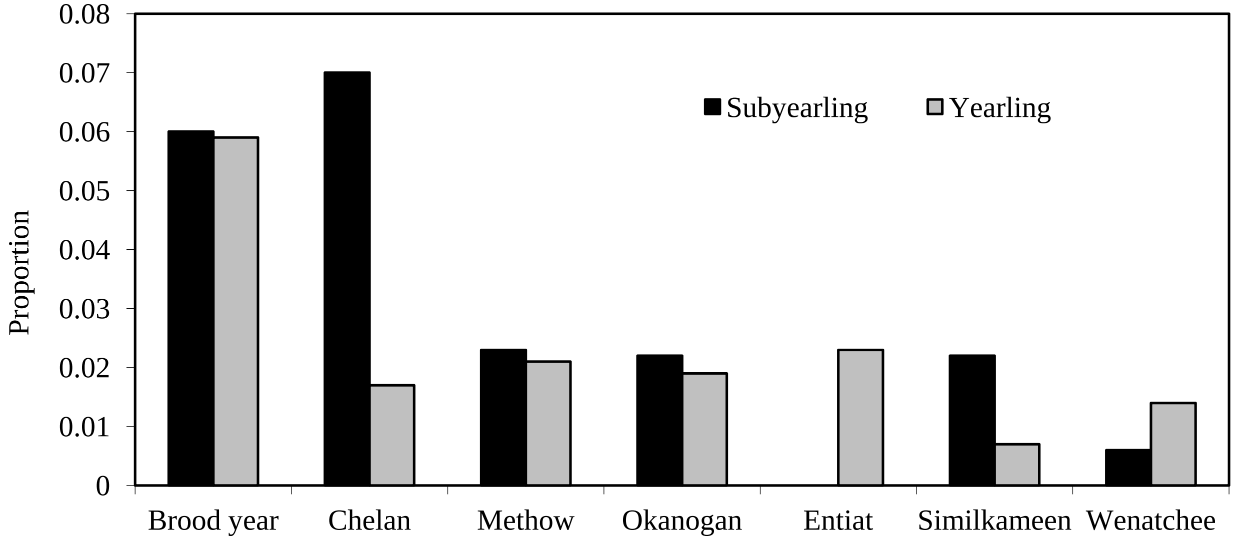

Figure 1. Mean proportion of Wells summer Chinook salmon hatchery adults from yearling (1992-2003 broods) and subyearling (1995-2003 broods) programs that strayed to spawning areas within the Upper Columbia River ESU (1997-2008).

Stray Rates by Return Year

Summer Chinook salmon are known to spawn in the Columbia River downstream of Wells Dam (Miller, T. 2006; Miller, M. 2008), but redds in this area are difficult to quantify and few 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 5% of other independent spawning populations in the Upper Columbia ESU in recent years. However, greater than 5% of the 2009 spawning escapement in the Methow River consisted of Wells Hatchery summer Chinook. 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 5).

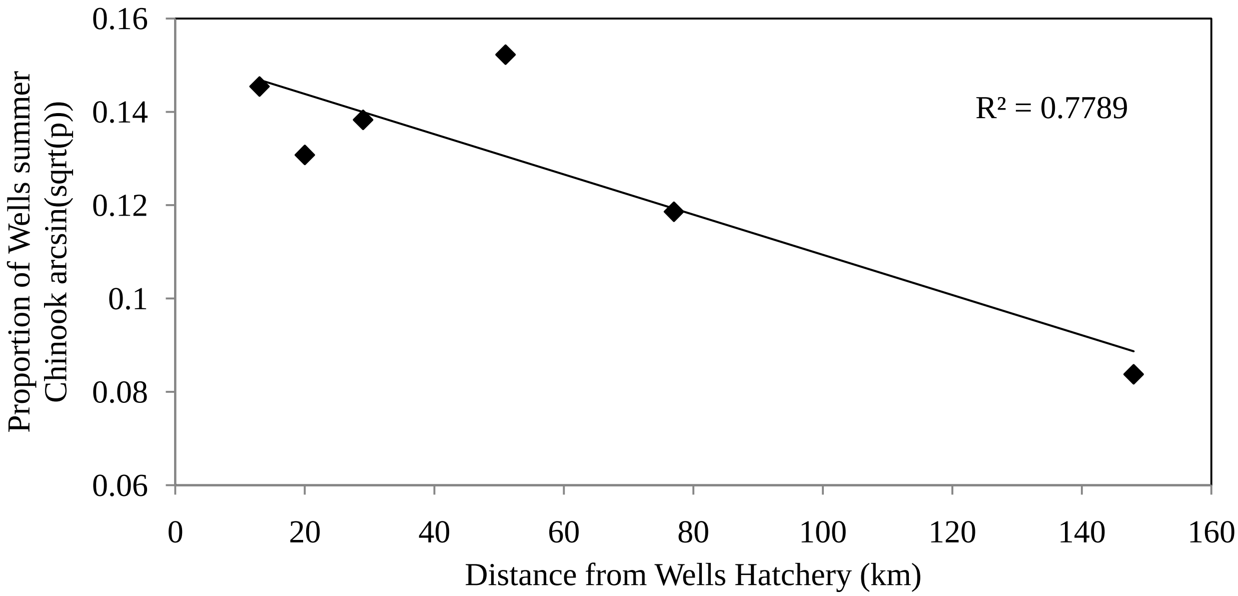

Figure 2. Relationship between the proportion of Wells summer Chinook salmon (yearling program) found on the spawning grounds and the distance from Wells Hatchery in 2009.

Table 5. Percent of summer Chinook spawning population by return year comprised of hatchery summer Chinook salmon originating from 1992-2004 brood releases of Wells subyearling and yearling program fish.

Return year	Spawning location (river)					
	Entiat	Methow	Okanogan	Similkameen	Wenatchee	Chelan
1997	- -	- -	11.2	- -	- -	- -
1998	- -	6.2	4.5	- -	0.1	- -
1999	- -	0.6	0.0	- -	0.0	10.8
2000	- -	3.3	8.2	- -	0.2	26.4
2001	- -	18.4	7.2	0.3	0.0	33.8
2002	8.6	11.6	5.1	0.0	0.1	29.7
2003	9.4	3.7	1.0	0.1	0.1	20.8
2004	0.0	2.1	1.6	0.2	0.1	6.0
2005	3.0	3.2	1.4	0.2	0.2	15.8
2006	0.0	1.8	0.2	0.0	0.0	7.9
2007	1.2	3.4	0.1	0.0	0.0	12.2
2008	3.4	3.0	1.7	0.2	0.1	8.8
2009	1.2	7.2	1.8	0.0	0.0	0.4

Wild Spring Chinook Salmon

Wells Hatchery summer Chinook are a production program with no corresponding wild stock, thus no estimate of wild summer Chinook harvest was appropriate. Harvest of wild spring Chinook salmon was estimated for the Methow River basin using Leavenworth National Fish Hatchery (LNFH) as a surrogate for brood years prior to 1996, and for 2000 – 2002 because hatchery releases from Methow Hatchery (MH) included too few fish, or did not include adipose fin-clipped fish. For the 2003 and 2004 broods, spring Chinook released from the Chiwawa Ponds were used as a surrogate. The percent of wild fish harvested from the 1992 – 2004 broods ranged from 2.63% to 22.07% (Table 6).

Table 6. Summary of spring Chinook salmon selective (S) and non-selective (NS) fisheries by broodyear. Harvest rate is based on harvest of local hatchery stocks determined through CWT analysis (LNFH = Leavenworth NFH; MH = Methow Hatchery; CH = Chiwawa 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	5.55	LNFH
1993	NS	NS	NS	NS	NS	NS	NS	NS	NS	3.25	LNFH
1994	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.68	LNFH
1995	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.31	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	15.53	MH
1999	S	S	S	S	S	S	NS	NS	NS	2.63	MH
2000	S	S	S	S	S	S	NS	NS	NS	6.13	LNFH
2001	S	S	S	S	S	S	NS	NS	NS	4.19	LNFH
2002	S	S	S	S	S	S	NS	NS	NS	7.13	LNFH
2003	S	S	S	S	S	S	NS	NS	NS	4.79	CH
2004	S	S	S	S	S	S	NS	NS	NS	7.65	CH

Based on the harvest rates of local hatchery stocks, an estimated 1,089 wild spring Chinook were harvested from the 1992 – 2004 broods (Table 7), with harvest of the current brood (2004) totaling 4.0%. Because the 2004 brood hatchery fish were not adipose fin-clipped, harvest rates of hatchery and wild fish were assumed to be equal. When adipose fin-clipped hatchery fish were used as surrogates (i.e., 2000-2004 broods), recoveries of hatchery fish were expanded by fishery-specific mortality rates, to estimate mortality of wild fish. The 1997 brood provided the majority of wild fish harvested (76.2%). Although escapement of wild spring Chinook in most recent run years has been low, the addition of harvested fish to the run escapement would have been unlikely to result in escapements meeting tributary-specific escapement goals (Chapter 5).

Table 7. Total adult return and number of wild spring Chinook salmon harvested by population and brood year.

Brood	Methow R.		Twisp R.		Chewuch R.		Lost R.		Total	
	Total	Harvest	Total	Harvest	Total	Harvest	Total	Harvest	Return	Harvest
1992	69	4	96	5	45	3	26	1	236	13
1993	120	4	53	2	95	3	5	0	273	9
1994	26	1	25	1	19	0	8	0	78	2
1995	71	4	39	2	34	2	6	0	150	8
1996	125	4	69	2	102	3	143	4	439	13
1997	879	194	1,237	273	1,563	345	33	7	3,712	819
1998	86	13	195	30	89	14	0	0	370	57
1999	5	0	8	0	2	0	0	0	15	0
2000	317	19	441	27	91	6	17	1	866	53
2001	254	11	156	7	321	13	26	1	757	32
2002	148	11	115	8	214	15	119	9	596	43
2003	95	5	1	0	54	3	1	0	151	8
2004	202	15	76	6	93	7	50	4	421	32
Total	2,397	285	2,511	363	2,722	414	434	27	8,064	1,089

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 typically been in the upper river sections, with a total of 2,906 fish harvested during 2010 fisheries (Table 8). Coded-wire tag analysis from the 2010 fishery are currently not available (Appendix A).

Table 8. Summary of summer Chinook salmon harvest based on creel surveys conducted during sport fisheries in the upper Columbia River. Harvest data for 2008-2010 was expanded to account for indirect mortality of Chinook salmon released during the fishery.

Year	Area											
	545		543		541		539		537		627/629	
	Harvest	CPU	Harvest	CPU	Harvest	CPU	Harvest	CPU	Harvest	CPU	Harvest	CPU
2004	2,803	0.073	2,139	0.075	907	0.038	NA	NA	NA	NA	NA	NA
2005	1,419	0.068	411	0.054	362	0.024	NA	NA	NA	NA	NA	NA
2006	1,973	0.048	1,444	0.071	446	0.027	1	0.001	NA	NA	145	0.128
2007	1,774	0.055	1,255	0.066	132	0.016	- -	0.000	739	0.060	29	0.042
2008	1,486	0.063	345	0.038	40	0.006	31	0.039	714	0.105	184	0.220
2009	869	0.041	593	0.076	157	0.017	6	0.007	834	0.092	195	0.102
2010	885	0.040	437	0.040	119	0.010	9	0.010	1,315	0.113	142	0.030

Summer Steelhead

Upper Columbia River summer steelhead return during the summer and fall prior to spawning the following spring (i.e., brood year). Thus, the typical steelhead fishery period occurring between October and March encompasses two calendar years, but targets fish from a single brood year. Steelhead returns met abundance and composition requirements necessary to conduct local sport fisheries on the 2002 – 2010 broods of returning adults. The number of hatchery fish harvested and the indirect mortality rate for both hatchery and wild fish was estimated by creel census. Based on creel surveys, an estimated 8,181 hatchery origin and 81 wild origin steelhead were lethally removed (adipose clipped hatchery fish) or were considered to be unintentional mortalities (unmarked hatchery and wild fish) during sport fisheries targeting the 2010 brood (Table 9). Most steelhead were harvested in the Methow and Okanogan River fisheries, and overall harvest increased greatly from previous years. Harvest of hatchery steelhead was 37.1% of the 2010 brood hatchery fish above Wells Dam (see Chapter 4) which is about 12 % greater than the mean harvest rate experienced by the previous two broods. Increased harvest was due to record returns of adult steelhead over Wells Dam in 2009 (2010 brood), and the adoption of fishery regulations allowing an increased bag limit (4 hatchery fish per day) and the stipulation that retention of hatchery fish was mandatory. 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 ceased. 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. As in many previous years, retention of hatchery steelhead may have been greater if more juvenile hatchery fish were adipose fin-clipped prior to release.

Table 9. Total number of steelhead removed in upper Columbia River sport fisheries by fishery location and brood. The total CPU 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	CPU	H	W	CPU	H	W	CPU	H	W	CPU	H	W	CPU
2010	4,002	48	0.101	2,269	11	0.191	842	5	0.280	1,068	17	0.049	8,181	81	0.107
2009	635	11	0.077	409	4	0.232	37	1	0.124	921	10	0.060	2,002	26	0.113
2008	470	9	0.095	225	4	0.244	63	3	0.120	872	8	0.177	1,630	24	0.129
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, tribal, 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 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 from those broods 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 from 26% (1992 – 1999 broods) to 8.9% (2000 – 2004 broods) and an increase in spawning ground recoveries of these broods from 19% to 61%.

Stray rates for the current brood of hatchery spring Chinook released into the Methow, Twisp, and Chewuch rivers exceeded the 5% of total brood return threshold. The mean stray rate for all broods released in the Twisp and Chewuch rivers was significantly greater than the target value, but was below the target value for Methow River releases. Releases directly from Methow Hatchery are typically below the 5% target value, likely due to the extended acclimation time that these fish receive and the strong attraction of the Methow Hatchery outfall. Although releases in the Twisp and Chewuch basins were accomplished through the use of acclimation ponds, acclimation time is short primarily because environmental conditions (freezing) prevent transfer to the ponds before about 1 March. Longer acclimation may not be possible without acquisition of ground water to prevent freezing. Because of their low overall abundance, adequate broodstock for the Twisp River program has seldom been achieved, and decreasing the stray rates for Twisp River releases would assist the hatchery program in meeting production goals by increasing the number of fish available for collection at the Twisp River weir.

Wells summer Chinook salmon stray rates are generally less than the 5% of the total brood return target, primarily because a high proportion of recoveries of these fish occurs in sport and commercial fisheries. However, when returns from yearling and subyearling releases are combined, they have often comprised greater than 5% of the spawning escapement of other populations. This escapement level was routine prior to the 2003 return year, and has declined somewhat since that time. Recent broodstock protocols have targeted a minimum wild component of 10% for the Wells summer Chinook broodstock to increase genetic diversity and thereby minimize risks associated with straying of this program. Most evaluations of Wells summer Chinook programs deal with subyearling and yearling releases separately. However, because fish within each release group are not different genetically, stray rate calculations should pool these groups together for analyses. It is unlikely that this would significantly change contribution rates to other populations for the current broods examined given the low survival of subyearling releases. However, changes in rearing and release strategies that result in increased survival of subyearling fish may require that this analysis be reexamined.

For the brood years examined, an estimated 4.6 million subyearling and 4.0 million yearling summer Chinook salmon were released. Despite similar release numbers, yearling fish returned approximately 14 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 most subyearling fish. These factors may influence survival of hatchery fish in the Columbia River system. Studies initiated with recent broods of subyearling summer Chinook salmon have indicated that earlier release (i.e., mid-May instead of mid-June) improves release-to-adult survival, and Wells Hatchery has adopted mid-May as the release date for all subyearling summer Chinook.

Steelhead fisheries targeting Wells stock steelhead have occurred locally since 2003. These fisheries are monitored via creel census to determine harvest and mortality of hatchery and wild fish. The accuracy of these estimates has not historically been quantified, and an estimate of accuracy would be a valuable tool for fishery managers in monitoring and evaluating the creel census program. Stray rates for hatchery steelhead have not been calculated primarily because carcasses are seldom recovered during spawning ground surveys. With the increased use of coded-wire and PIT tags in steelhead, local creel census and the increasing prevalence of PIT tag monitoring arrays may begin to address harvest and straying of specific stocks.

Steelhead fisheries conducted on the 2010 brood of returning adults removed considerably more hatchery origin fish than had been removed during sport fisheries in recent years. Fisheries targeting the 2008-2009 broods removed 25.2% of the estimated run of hatchery origin fish, while the 2010 brood fishery removed 37.1% of the hatchery fish returning above Wells Dam. This was due in part to a record number of steelhead adults returning above Wells Dam in 2009

(> 25,000). However, new rules that increased the daily limit to four hatchery fish per day, and made retention of hatchery fish mandatory were also responsible. These types of regulation changes may play an ever-increasing role in the management of hatchery stocks where controlling the proportion of hatchery fish on the spawning grounds is of primary concern.

Historically, steelhead fisheries in the Methow Basin have not impacted broodstock collection activities because fisheries occurred after potential broodstock had already passed the collection location (Wells Dam). However, future management plans for Methow Basin steelhead call for spring collection of broodstock at the Twisp Weir, Methow Hatchery and Winthrop National Fish Hatchery volunteer channels, and by hook-and-line angling if necessary to meet program objectives (Draft Wells and WNFH steelhead Hatchery and Genetic Management Plans). Conservation fisheries will need to be assessed and conducted to ensure that adequate broodstock are available at these spring collection sites.

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Appendix A

<u>2010 Upper Columbia, Okanogan and Similkameen River Summer Chinook and Sockeye Creel Survey</u>

<u>Location and Dates</u>

From July 1st, 2010 through October 15th, 2010 the Washington Department of Fish and Wildlife managed a salmon sport fishery in the upper Columbia River from Priest Rapids Dam upriver to Chief Joseph Dam. In addition, from July 1st, 2010 through September 15th, 2010 both the Okanogan and Similkameen Rivers were open for salmon fishing.

<u>Creel Methods</u>

A creel survey was conducted throughout the duration of the fishery to estimate catch and harvest of summer Chinook and sockeye and to record any incidental encounters of ESA-listed steelhead. Angler interviews and effort counts were conducted five days per week on a Thursday through Monday schedule. Efforts counts were randomly selected and included both AM and PM time periods. All anglers encountered were interviewed as to the number of fish caught, number of fish released, species and origin, and the number of hours fished. Incidental encounters of ESA-listed fish were also recorded and an estimated "take" made for each species based on a 10% hook and release mortality. Snouts were taken from all adipose clipped coded wire tagged (CWT) fish encountered.

<u>Creel Results</u>

An estimated 17,420 anglers fished 62,699 hours and caught 3,285 summer Chinook, of which 2,868 were retained and 417 were released (Table1). Approximately 40% of the Chinook catch was of hatchery origin. An additional 10,702 sockeye were caught during the fishery, of which 10,662 were retained and 40 were released (Table 1). Catch per unit effort was 0.0524 for chinook and 0.1707 for sockeye.

Table 1. Estimated fishing effort and catch for upper Columbia River summer Chinook and sockeye fishery, 2010.

River Sections[1]	Fishing Effort		Chinook Catch			Sockeye Catch		
	Anglers	Angler Hours	Retained	Released	Total	Retained	Released	Total
537	1,758	11,586	1,294	214	1,508	60	0	60
539	275	1,789	9	0	9	0	0	0
541	2,577	9,160	119	32	151	0	0	0
543	2,535	10,989	427	96	523	674	15	689
545	8,666	24,560	881	39	920	9,864	25	9,889
627	700	1,866	85	0	85	64	0	64
629	909	2,749	53	36	89	0	0	0
Total	17,420	62,699	2,868	417	3,285	10,662	40	10,702

[1] 537-Priest Rapids to Wanapum, 539-Wanapum to Rock Island, 541-Rock Island to Rocky Reach, 543-Rocky Reach to Wells, 545-Wells to Chief Joseph, 627-Okanogan, 629-Similkameen

Incidental Impacts on steelhead

There were an estimated 44 steelhead caught and released during the summer Chinook fishery within the upper Columbia River. Applying a 10% hook and release mortality, an estimated 4.4 steelhead died as a result of the fishery, which represents 44% of the maximum steelhead impacts (10) as outlined in Permit 1554 with NOAA Fisheries.

Appendix B. Coded wire tag recoveries from the RMIS database by broodyear and stock expanded by sample rate and tag rate.

Brood	Broodstock			Spawning ground		Ocean fishery			Freshwater fishery		
	Target	Non-target	Wells	Target	Non-target	Comm.	Sport	Tribal	Comm.	Sport	Tribal
Wells summer Chinook salmon yearling											
1992	359	9	- -	NA	40	81	37	6	0	4	16
1993	1,141	346	- -	NA	56	645	54	2	14	16	50
1994	89	5	- -	NA	2	30	6	0	0	0	9
1995	392	23	- -	NA	183	332	122	19	22	44	5
1996	501	28	- -	NA	308	593	182	6	2	32	0
1997	1,412	125	- -	NA	1,731	6,088	1,039	308	89	317	63
1998	1,195	43	- -	NA	564	6,863	948	141	219	481	74
1999	164	13	- -	NA	68	826	135	50	100	261	11
2000	2,198	2	- -	NA	345	3,379	490	133	785	988	36
2001	900	0	- -	NA	40	1,033	120	44	269	338	6
2002	1,203	0	- -	NA	62	1,103	311	40	512	480	14
2003	564	0	- -	NA	43	558	137	47	350	212	12
Wells summer Chinook salmon subyearling											
1993	19	2	- -	NA	0	15	0	0	3	0	0
1994	9	0	- -	NA	0	3	0	0	0	0	3
1995	62	4	- -	NA	2	42	6	6	3	1	0
1996	267	21	- -	NA	78	266	54	5	2	8	3
1997	44	3	- -	NA	30	117	11	3	7	29	0
1998	44	0	- -	NA	40	236	14	1	7	25	4
1999	94	2	- -	NA	33	297	38	8	32	30	8
2000	63	1	- -	NA	8	78	10	2	23	5	0
2001	295	0	- -	NA	23	310	41	8	81	61	4
2002	37	0	- -	NA	0	35	16	0	23	15	0
2003	66	0	- -	NA	3	33	16	1	20	10	2
Methow spring Chinook salmon											
1993	43	0	134	6	1	0	0	0	0	4	3
1994	0	0	1	0	0	0	0	0	0	0	0
1995	3	0	114	3	0	2	0	0	0	0	0
1996	200	0	58	221	8	0	0	0	2	0	11
1997	422	0	3	16	1	3	0	0	280	209	12
1998	- -	- -	- -	- -	- -	3	0	0	462	428	30
1999	93	0	- -	35	7	1	0	0	3	6	0

NA = Not applicable.

Appendix B, continued.

Brood	Broodstock			Spawning ground		Ocean fishery			Freshwater fishery		
	Target	Non-target	Wells	Target	Non-target	Comm.	Sport	Tribal	Comm.	Sport	Tribal
2000	- -	- -	- -	- -	- -	5	0	0	21	6	0
2001	289	0	5	182	23	3	0	0	0	0	0
2002	245	2	37	287	26	9	0	0	22	28	13
2003	37	6	5	4	0	1	0	0	2	2	0
2004	92	41	5	110	33	0	0	0	11	13	0
				Twisp spring Chinook salmon							
1992	0	0	21	0	0	0	0	0	0	0	0
1993	0	3	18	1	1	0	0	0	0	4	0
1994	0	0	4	0	0	0	0	0	0	0	0
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	4	58	40	151	17	0	0	0	1	0	6
1997	21	6	- -	14	0	0	0	0	14	9	1
1998	1	8	- -	0	2	0	0	0	11	0	0
1999	3	25	- -	8	20	1	0	0	4	0	0
2000	22	12	- -	67	40	0	0	0	7	0	0
2001	2	0	1	33	7	0	0	0	0	0	0
2002	7	59	6	70	66	3	0	0	8	10	4
2003	2	2	6	21	13	1	0	0	2	2	0
2004	22	6	5	97	27	0	0	0	7	8	0
				Chewuch spring Chinook salmon							
1992	0	1	38	0	0	0	0	0	0	0	0
1993	0	19	79	8	3	5	0	0	0	0	1
1994	0	0	3	0	0	0	0	0	0	0	0
1995	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1996	- -	15	15	0	4	0	0	0	6	0	1
1997	54	44	14	4	27	2	0	0	24	144	7
2001	15	46	2	323	321	0	0	0	2	0	0
2002	2	92	58	174	299	9	0	0	23	29	13
2003	15	3	8	7	22	2	0	0	2	2	0
2004	0	35	4	76	70	0	0	0	6	7	0

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	0.071	0.042	0.001	0.035	0.003	0.000
1998	0.022	0.009	0.000	0.013	0.007	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	0.008	0.000	0.000
2002	0.011	0.000	0.000	0.004	0.001	0.000
2003	0.004	0.005	0.000	0.008	0.004	0.000
2004	0.015	0.013	0.000	0.005	0.002	0.002
2005	0.008	0.003	0.000	0.000	0.000	0.000
2006	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	0.040	0.054	0.000	0.011	0.000	0.000
1999	0.015	0.028	0.000	0.018	0.000	0.000
2000	0.042	0.000	0.000	0.000	0.000	0.000
2001	0.016	0.012	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.000
2003	0.000	0.020	0.000	0.000	0.000	0.000
2004	0.054	0.023	0.004	0.007	0.000	0.000
2005	0.040	0.032	0.001	0.005	0.000	0.000
2006	0.010	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	0.065	0.000	0.000	0.000	0.000
1998	0.039	0.011	0.000	0.000	0.000	0.003
1999	0.005	0.000	0.000	0.019	0.000	0.000
2000	0.013	0.032	0.000	0.054	0.000	0.002
2001	0.072	0.048	0.005	0.050	0.000	0.000
2002	0.054	0.029	0.000	0.017	0.004	0.001
2003	0.027	0.005	0.000	0.015	0.012	0.002
2004	0.009	0.009	0.001	0.006	0.000	0.001
2005	0.012	0.009	0.001	0.013	0.002	0.002
2006	0.009	0.003	0.000	0.008	0.000	0.000
2007	0.013	0.000	0.000	0.007	0.001	0.000
2008	0.004	0.012	0.000	0.008	0.004	0.002
2009	0.025	0.010	0.000	0.001	0.002	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	0.007	0.000	0.000	0.000	0.000	0.000
2000	0.025	0.084	0.000	0.021	0.000	0.006
2001	0.104	0.045	0.017	0.000	0.000	0.000
2002	0.029	0.075	0.000	0.021	0.000	0.000
2003	0.003	0.000	0.000	0.016	0.000	0.000
2004	0.021	0.019	0.000	0.000	0.000	0.000
2005	0.014	0.017	0.000	0.000	0.000	0.000
2006	0.040	0.000	0.000	0.000	0.000	0.000
2007	0.000	0.006	0.000	0.000	0.000	0.000
2008	0.034	0.019	0.005	0.012	0.000	0.000
2009	0.061	0.047	0.000	0.000	0.000	0.000

Chapter 3

Methow River Basin Spring Chinook Salmon and Steelhead Smolt Monitoring in 2010

Abstract

The mean number of emigrants produced per redd is a metric used to compare the relative productivity of target species during freshwater rearing. We used salmonid capture data from rotary screw traps and PIT tag interrogation sites to estimate the number of spring Chinook salmon and summer steelhead smolts emigrating from the Twisp River and Methow River basins. We captured 214 wild spring Chinook salmon smolts at the Methow River trap and 979 smolts at the Twisp River trap in 2010. A total of 330 and 472 wild steelhead emigrants were captured at the Methow and Twisp River traps, respectively. The number of fish captured each day was expanded by the estimated trap efficiency based on a regression models using the variables discharge (independent variable) and mark/recapture efficiency trials (dependent variable). Using this methodology, we estimated that a total of 9,302 (± 11,901, 95% CI) wild spring Chinook salmon smolts emigrated from the Methow River, including 4,793 (± 57, 95% CI) smolts emigrating from the Twisp River. An estimated 20,110 (± 23,593 95% CI) wild steelhead emigrated from the Methow River, including 5,504 (± 1,010, 95% CI) fish from the Twisp River. To corroborate the smolt trap estimate, we used daily PIT tag interrogation data at an in-stream interrogation site in the Twisp River and estimated that 6,034 (± 1,837, 95% CI) wild steelhead smolts emigrated from the Twisp River. During the fall emigration period, we estimated that 3,282 (± 715, 95% CI) spring Chinook salmon parr emigrated past the Twisp River trap and 1,602 (± 568, 95% CI) spring Chinook salmon parr emigrated past the Methow River trap.

In some years, fish migrate downstream of the Methow trap in the fall/winter time period. Including both spring Chinook that migrate in 2009 and 2010, we estimated for the 2008 brood a total of 12,250 (± 12,846, 95% CI) emigrants. Utilizing data gathered during spring Chinook salmon spawning ground surveys in 2008, we estimated that the number of emigrants produced from each 2008 brood spring Chinook salmon redd in the Twisp River (151) was 150 times greater than the number of emigrants produced in the remainder of the Methow River basin (1). However, differences in trap efficiencies between the two sites that could affect the population estimates may contribute to this large difference. Because steelhead emigrate at multiple age classes, we estimated total brood year abundance using ages derived from scales. After reconstruction of the 2006 brood emigrants, we estimated that 11,625 (± 1,473, 95% CI) and 7,694 (± 492, 95% CI) juvenile steelhead emigrated from the Methow/Chewuch and Twisp rivers, respectively. Steelhead in the Methow Basin and in the Twisp River produced an estimated 14 and 19 emigrants from 2006 brood redds, respectively.

Introduction

An important component of both past and present hatchery monitoring and evaluation programs has been estimating 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 in other river systems (Thedinga et al.1994; Murdoch et al. 2001), limited information exists on smolt production in the Methow Basin because smolt-monitoring efforts were not implemented annually or with consistency of methods or sampling locations. Screw traps were operated sporadically on the upper Methow and Chewuch rivers prior to 2004 (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 2007), 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 2007). 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, although analyses to identify reference populations is underway, and this lack of suitable controls represents a significant data gap with respect to evaluating the impact of hatchery fish on 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 2007).

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 two 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. The tandem traps were operated approximately 30 m upstream of the low position (i.e., 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 was removed from the catch box 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; therefore, 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, and all PIT tagging information was uploaded to a regional PIT tag database (PTAGIS) maintained by the Pacific States Marine Fish Commission. Non-salmonids were counted by species or by family if they were too small to identify to species (e.g., *Catostomidae*).

We used age, trap location, and DNA analysis 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 Chinook 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 subyearling spring and summer Chinook salmon in the total catch, we collected tissue samples (i.e., fin clips) of emigrating subyearling Chinook salmon captured 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 at least 50 juvenile salmonids were used for trap efficiency trials whenever possible. However, low abundance of target species and low trap efficiency required the use of some groups with fewer than 50 fish. Mark/recapture fish were marked using a top or bottom caudal fin-clip, PIT tag, or were stained with Bismarck brown dye. Fish used in trap efficiency trials were anesthetized prior to marking and then held in an auxiliary live box for up to three days, 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. Fish were divided into two equal groups and released on both stream banks to increase the likelihood that marked fish were uniformly mixed with unmarked fish and therefore representative of the population when recaptured. Releases of marked fish occurred 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 trap 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 = $\mathrm{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \dfrac{\mathrm{MSE}\left(1 + \dfrac{1}{n} + \dfrac{(X_i - \overline{X})^2}{(n-1)s_X^2}\right)}{\hat{e}_i^2}$

Where X_i is the discharge for time period i, and n is the sample size (number of mark recapture trials used in model). 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 = $\mathrm{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \dfrac{E_p(1-E_p)/\sum M}{E_p^2}$

The total emigration estimate and confidence interval were calculated using the following formulas:

Total emigration estimate = $\sum \hat{N}_i$

95% confidence interval = $1.96 \times \sqrt{\sum \mathrm{var}[\hat{N}_i]}$

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. Marked individuals were randomly dispersed in the population before recapture.
4. All marked fish recaptured were identified.
5. Marks were not lost between the time of release and recapture.

Ideally, a species-specific discharge/capture efficiency model (i.e., flow model) was developed at each trap site within each year for each trap position used. When this was not possible, we used the following protocols in order of priority to determine the methodology used to develop production estimates for each trap site and species:

1. Flow model using target species within current year.
2. Flow model using target species over multiple years.
3. Flow model using target and surrogate species within current year.
4. Flow model using target and surrogate species over multiple years.
5. Flow model using surrogate species within current year.
6. Flow model using surrogate species over multiple years.
7. Pooled efficiency estimate using target species within current year.
8. Pooled efficiency estimate from previous year.

The number of wild summer steelhead emigrating from the Twisp River was also estimated using an in-stream PIT tag interrogation site (PTAGIS site code = TWR) located immediately downstream of the Twisp River smolt trap. We developed a discharge/interrogation-efficiency relationship for this site using discrete groups of PIT tagged hatchery steelhead released from Wells Hatchery, or hatchery spring Chinook released for smolt trap efficiency trials. From each group, we used only those PIT tag codes that were recorded at the Rocky Reach Juvenile Bypass interrogation site downstream (PTAGIS site code = RRJ) to determine the number of marked fish released. This ensured that only fish known to have emigrated past the TWR site were used to estimate efficiency. The number of recaptures from each group was thus calculated as the number of PIT tagged fish recorded at RRJ that were also recorded at TWR, and we used the mean discharge during the evening period immediately following release of each group to correlate capture efficiency. To determine the daily emigration of wild steelhead, we expanded the number of unique PIT tags recorded each day at the TWR site by the overall PIT tag mark rate of wild steelhead captured at the Twisp River smolt trap. This daily emigration estimate was then expanded using the discharge/interrogation-efficiency model as described for smolt traps to develop a total production estimate, variance, and 95% CI. Similar estimates were not conducted for emigrating spring Chinook at the TWR site because too few fish emigrated past the site with existing PIT tags.

Juveniles Per Redd

Production estimates for each age class by trapping location were 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 emigrant 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 annual emigration estimate at each trap location was multiplied by the proportion of migrants from each brood determined through scale pattern analysis. The total number of migrants 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 brood year emigrant production estimate by the total number of redds in that brood year estimated through spawning ground surveys.

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 (carcass) surveys. For summer steelhead, egg deposition values were derived by multiplying the total number of redds in each basin by mean fecundity values according to 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 the populations, 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 emigration estimates were calculated by adding the estimated number of emigrants produced downstream of the trap to the estimate of emigrants produced upstream of the trap location.

Results

Smolt Trap Operation

Trapping in the Methow River basin in 2010 began at the Methow River site on 19 February and at the Twisp River site on 5 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, ice). Discharge was above annual mean values for much of the year (Figures 1-2), and exceeded safe trap operation ranges at both sites during spring runoff. River discharge in the fall was near or above mean values at both sites.

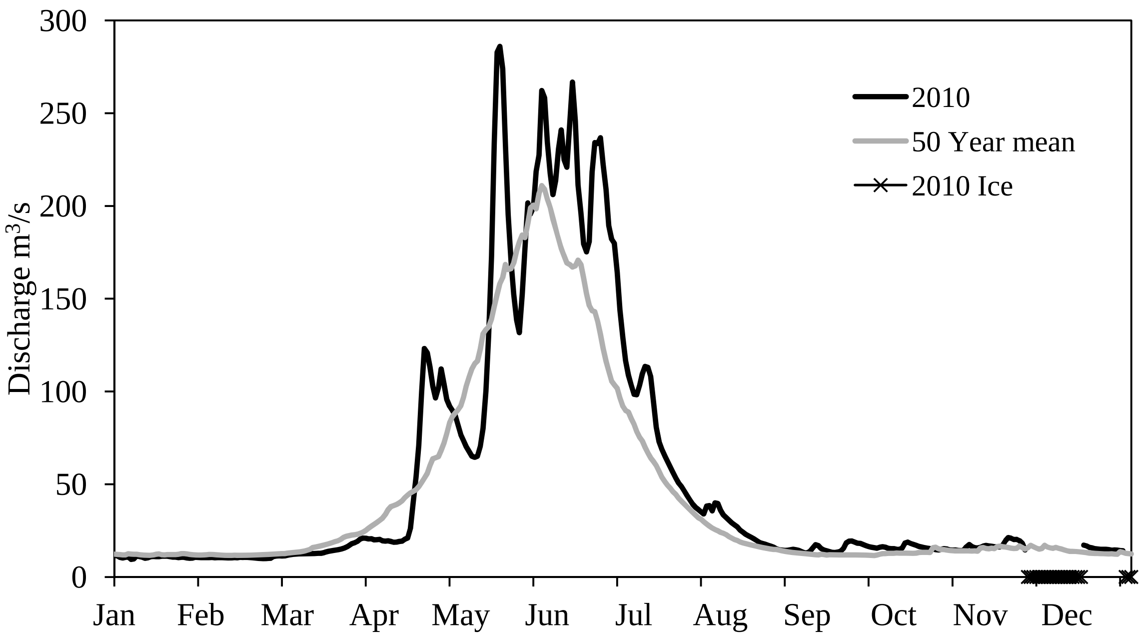

Figure 1. Methow River 2010 daily discharge and 50-year mean as measured at the USGS gauging station No. 12449950 (Methow River near Pateros, Washington).

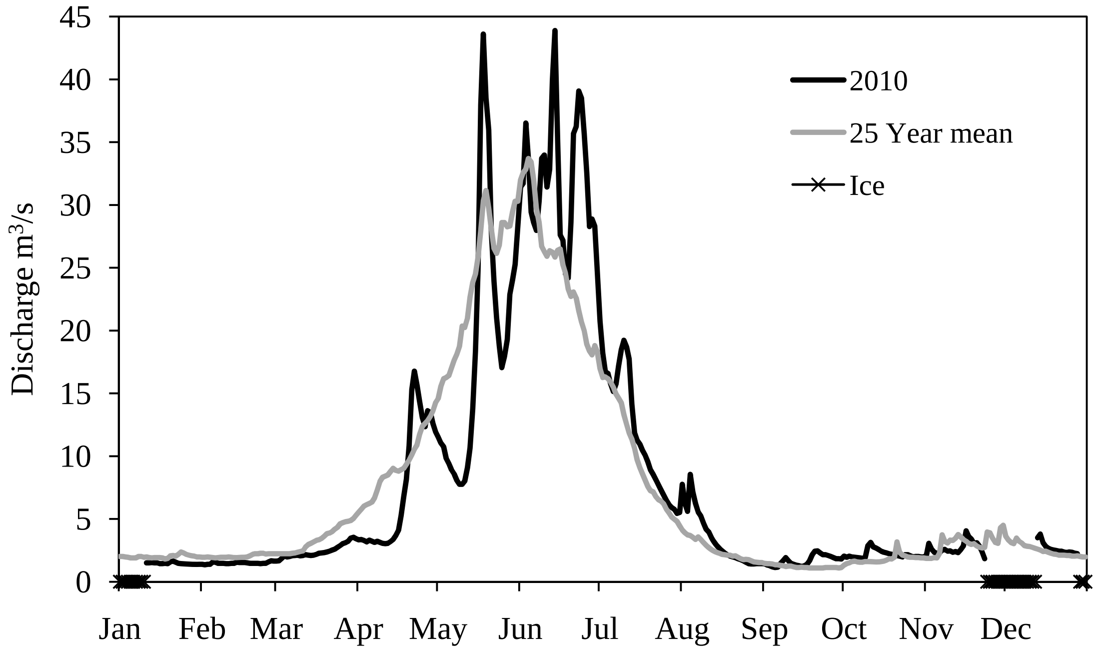

Figure 2. Twisp River 2010 daily discharge and 25-year mean as measured at the USGS gauging station No.12448998 (Twisp River near Twisp, Washington).

Daily Captures and Biological Sampling

Methow River Trap

2008 Brood Chinook Salmon

A total of 214 wild yearling Chinook salmon emigrants were captured between 19 February and 30 June (Appendix A1). Peak capture (*N* = 26) occurred on 19 April (Figure 3). We implanted PIT tags into 199 wild smolts, all of which were released without mortality or tag shedding (Appendix B1). We also implanted PIT tags into 1,092 of the 12,160 adipose present and coded-wire tagged hatchery Chinook salmon captured for trap efficiency mark- recapture trials. These fish were assumed to be spring Chinook salmon, but specific stock or hatchery of origin (i.e., WNFH or MH) could not be determined. Thirteen mortalities and one shed occurred, resulting in 1,078 fish released with PIT tags. Five additional hatchery Chinook mortalities occurred prior to tagging. Mortalities of hatchery Chinook salmon smolts totaled 0.15% (*N* = 18) of the hatchery smolts captured. Wild spring Chinook salmon smolts had a mean fork length (*N*; SD) of 96.4 mm (210; 10.3) and a mean weight (*N*; SD) of 10.2 g (206; 3.0). Hatchery smolts had a significantly greater mean fork length (*N*; SD) of 135.3 mm (1,080; 13.3; Table 1) than wild Chinook smolts (Mann-Whitney U-test: $P < 0.001$).

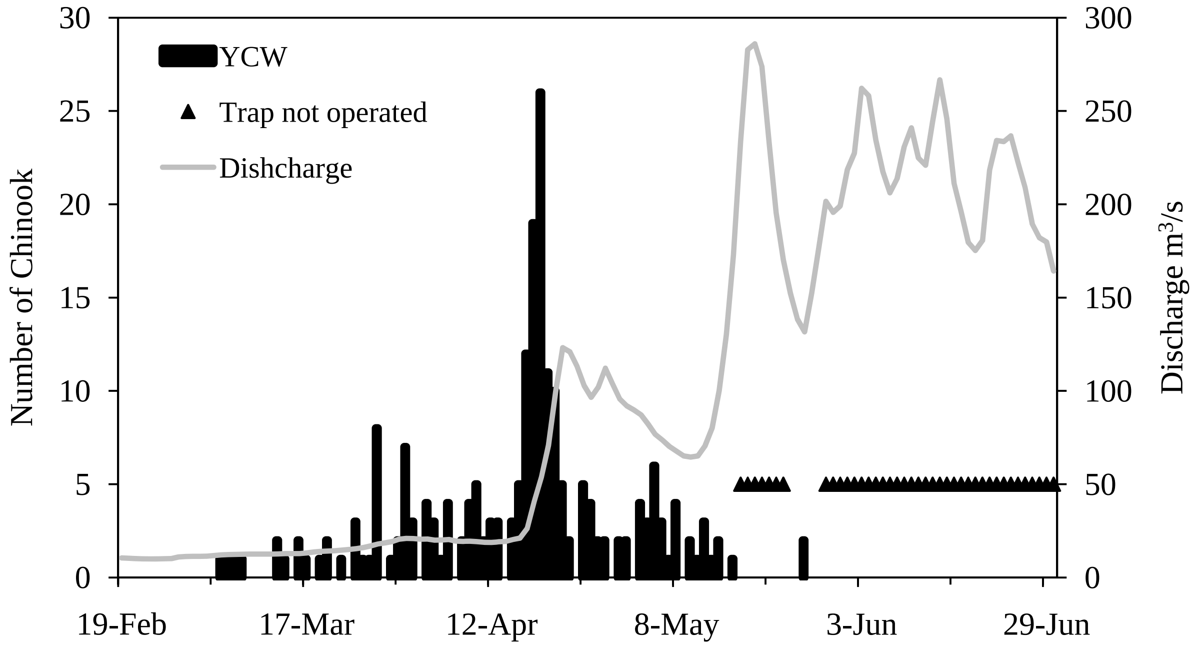

Figure 3. Daily capture of wild Chinook salmon smolts (YCW) at the Methow River smolt trap during 2010.

<u>*2009 Brood Chinook Salmon*</u>

Subyearling Chinook salmon fry (*N* = 4,599) and parr (*N* = 697) captured at the Methow trap between 19 February and 30 September had mean fork lengths of 38.7 mm and 67.8 mm, respectively (Table 1). Mortality during this period totaled 1 fry (0.02%) and 6 parr (0.86%). Genetic analysis of tissue samples collected from Chinook salmon fry captured during spring trapping (*N* = 202) indicated that 11 (5.4%) were spring Chinook salmon and 202 (94.6%) were summer Chinook salmon (Appendix C). We inserted PIT tags into 19 parr, but three died prior to release (Appendix B2). An additional 43 emigrant Chinook salmon parr were captured during the fall trapping period between 1 October and 19 November. The mean fork length of Chinook salmon parr during this period was 92.2 mm (Table 1), and peak capture occurred on 5 November (*N* = 5; Figure 4). We inserted PIT tags into 41 (Appendix B2) of the 43 Chinook salmon parr captured during the fall period and no mortality occurred. We estimated that one additional migrant Chinook would have been captured if the trap had operated without interruption. Genetic analysis of tissue samples collected from Chinook salmon parr captured during fall trapping indicated that 34 (83%) were spring Chinook salmon and 7 (17%) were summer Chinook salmon (Appendix C).

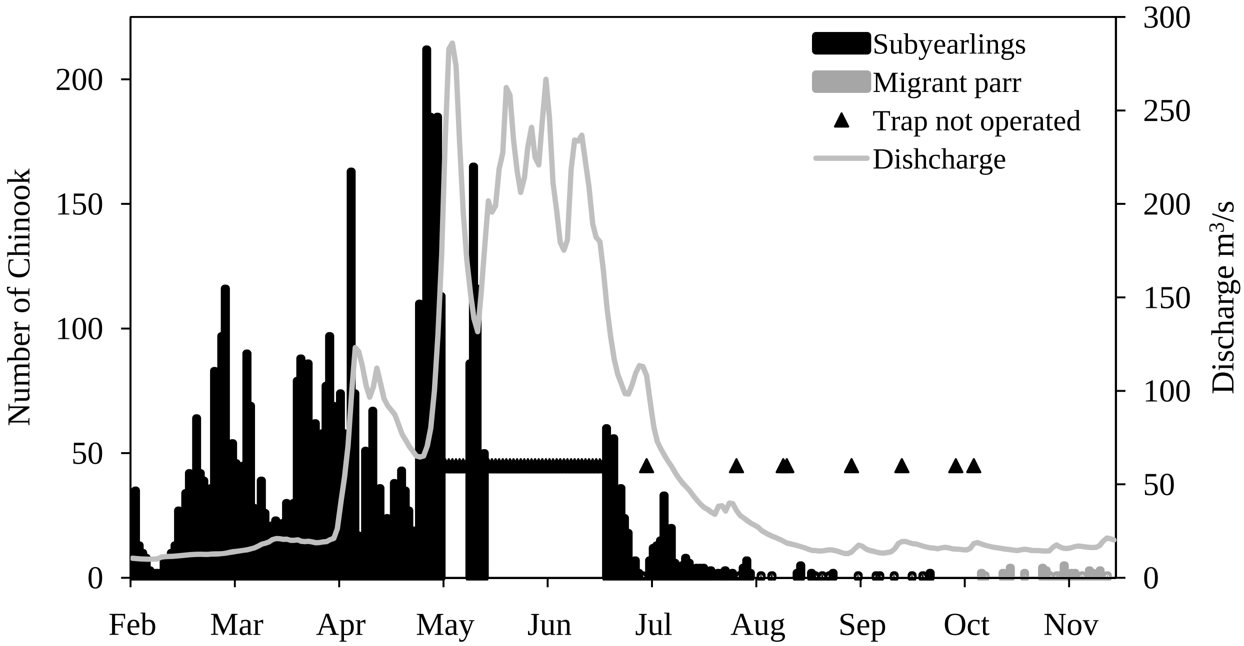

Figure 4. Daily capture of wild subyearling Chinook salmon parr at the Methow River smolt trap in 2010.

Table 1. Summary of length and weight sampling of Chinook salmon captured at the Methow River smolt trap in 2010.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2009	Wild fry	38.7	657	3.2	--	--	--	--
2009	Wild parr (Feb-Sep)	67.8	221	14.7	5.0	148	3.3	1.6
2009	Wild parr (Oct-Nov)	92.2	42	8.3	8.7	42	2.9	1.1
2008	Wild smolt	96.4	210	10.3	10.2	206	3.0	1.1
2008	Hatchery smolt	135.3	1,080	13.3	--	--	--	--

Summer Steelhead

We captured 330 wild summer steelhead emigrants (smolt and transitional) between 19 February and 30 June in the Methow River trap, with peak capture on 21 April (*N* = 51; Figure 5). We estimated an additional 15 steelhead would have been captured if the traps had operated during the entire period (Appendix A3). We PIT tagged 306 wild steelhead emigrants, and released 303 with PIT tags after shed tags (*N* = 2) and one mortality were subtracted (Appendix B3). Most wild summer steelhead migrants were age-2 fish (58.5%) with a mean fork length (*N*; SD) of 164.9 mm (148; 19.9; Table 2). These fish had a significantly smaller mean fork length than hatchery summer steelhead migrants captured at the trap during the same period (t-test: *P* <0.001).

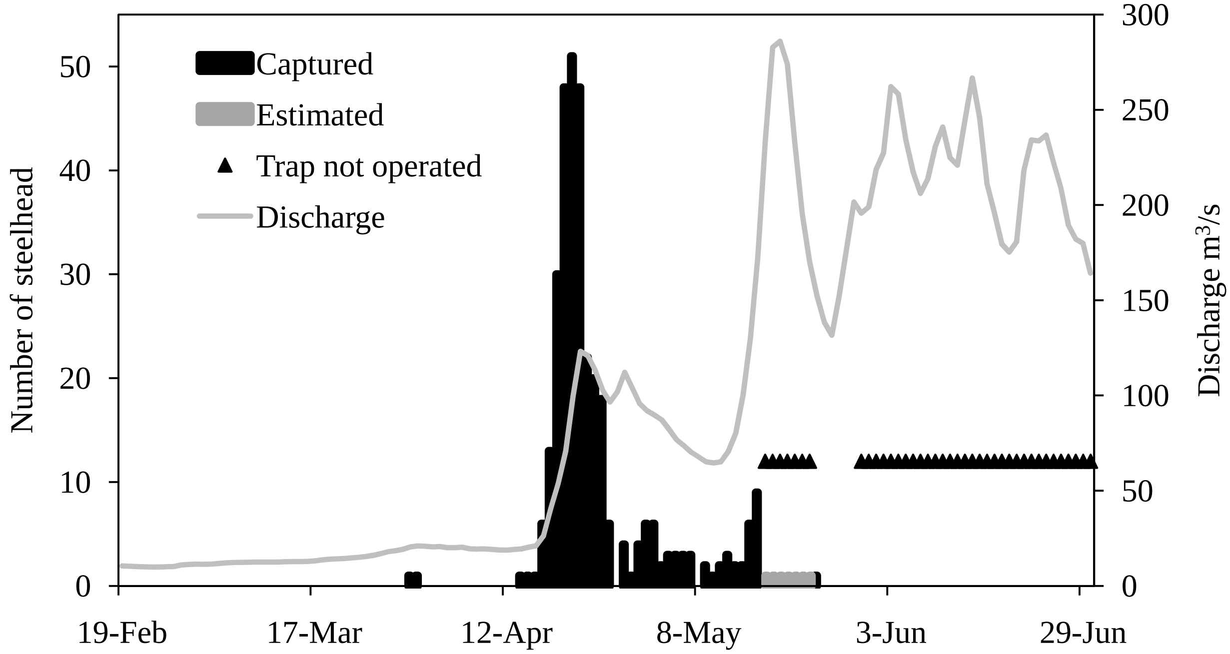

Figure 5. Daily capture of wild steelhead smolt and transitional migrants at the Methow River smolt trap in 2010.

We captured 125 wild fry and 97 wild summer steelhead parr between 19 February and 19 November. Steelhead parr greater than 55 mm and in good physical condition were PIT tagged (*N* = 92) prior to release (Appendix B4). Wild steelhead parr had a mean fork length (*N*; SD) of 90.8 mm (97; 28.0) and mean weight of 11.2 g (94; 13.8). There was no mortality of steelhead fry or parr or shed tags prior to release.

Table 2. Mean length, weight and condition factor by age class of wild transitional and smolt summer steelhead emigrants captured at the Methow River trap in 2010.

Age	*N* (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
1	42 (16.6)	129.7	42	19.2	25.1	42	10.2	1.2
2	148 (58.5)	164.9	148	19.9	47.1	148	17.2	1.1
3	59 (23.3)	171.1	59	19.8	52.0	59	15.0	1.0
4	4 (1.6)	186.5	4	9.4	58.8	4	7.4	0.9

Twisp River Trap

<u>*2008 Brood Spring Chinook Salmon*</u>

The Twisp River trap captured 979 wild yearling spring Chinook salmon smolts between 5 March and 30 June. Peak captures occurred on 18 April (*N* = 90; Figure 6). We estimated 43 additional smolts would have been captured had the trap operated without interruption during the entire period (Appendix A4). We inserted PIT tags into 957 of the captured fish, and released

952 tagged smolts after subtracting five mortalities (Appendix B5). Wild spring Chinook salmon had a mean fork length (*N*; SD) of 92.0 mm (977; 8.1), and a condition factor of 1.1 (Table 3). We inserted PIT tags into 330 of the 22,040 hatchery spring Chinook salmon captured for use in mark/recapture trials. We released 325 hatchery spring Chinook after subtracting five mortalities. Hatchery spring Chinook salmon had a significantly greater mean fork length (*N*; SD) of 127.6 mm (329; 16.1; Table 3) than wild Chinook smolts (Mann-Whitney U-test: $P < 0.001$).

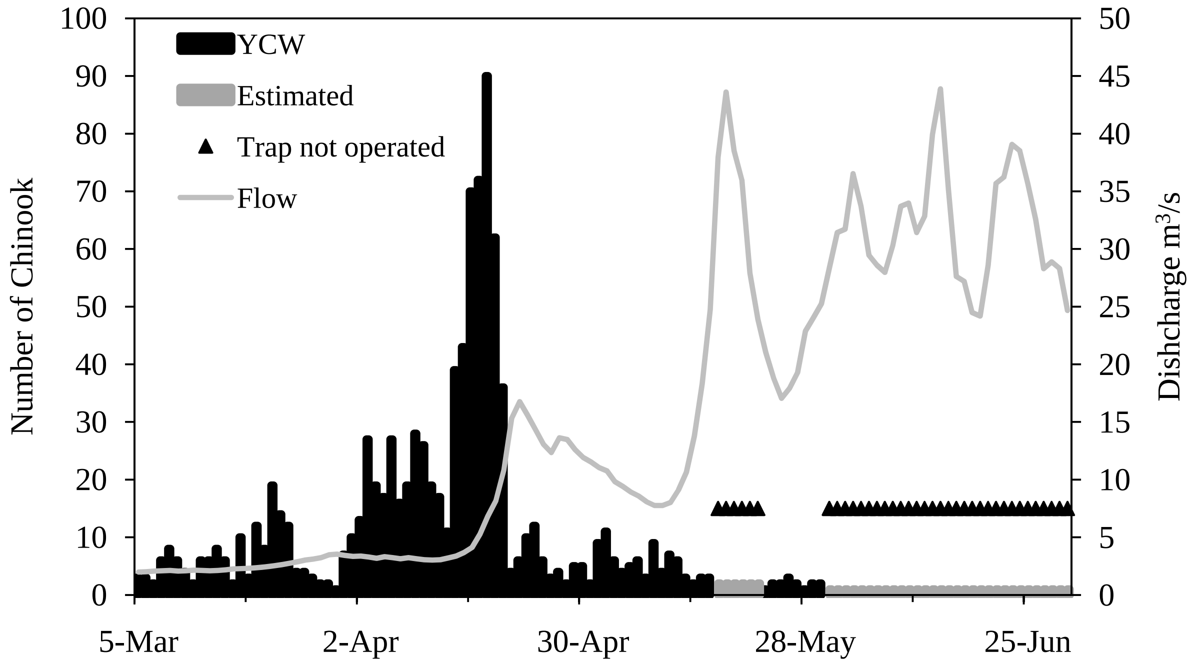

Figure 6. Daily capture of wild spring Chinook salmon smolts at the Twisp River smolt trap in 2010.

Table 3. Summary of length and weight sampling conducted on Chinook salmon captured at the Twisp River smolt trap in 2010.

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2008	Wild smolt	92.0	977	8.1	8.5	977	2.0	1.1
2008	Hatchery smolt	127.6	329	16.1	--	--	--	--
2009	Wild fall parr	93.3	268	9.1	9.2	266	2.7	1.1

2009 Brood Spring Chinook Salmon

We captured 170 subyearling spring Chinook salmon between 5 March and 31 August, of which one (0.6%) fish were recorded as mortalities. An additional 269 migrant parr were captured between 1 September and 19 November, four of which were recorded as a mortalities (1.5%). Peak capture of migrant spring Chinook salmon parr occurred 2 November (*N* = 17; Figure 7). We estimated 8 additional spring Chinook salmon parr would have been captured had the trap operated during the entire fall emigration period (Appendix A5). We implanted 45 PIT tags into subyearling parr between 1 July and 31 August, and implanted 247 tags into migrant parr between 1 September and 19 November, but only 291 were released with tags after one mortality was subtracted (Appendix B6). Fall migrant parr had a mean fork length of 93.3 mm (Table 3).

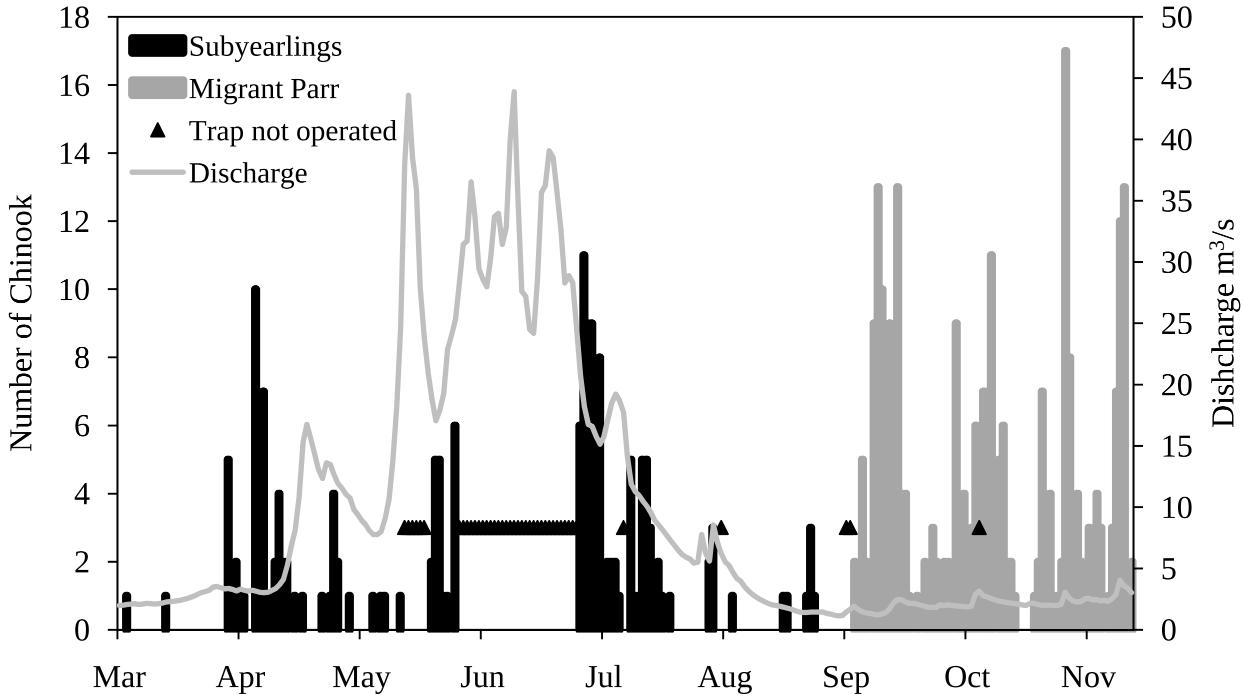

Figure 7. Daily capture of subyearling wild spring Chinook salmon (Mar – Aug) and migrant parr (Sep – Dec) at the Twisp River smolt trap in 2010.

Summer Steelhead

We captured 472 wild summer steelhead emigrants (smolt and transitional) between 5 March and 30 June. Peak capture occurred on 18 April (N = 99; Figure 8). We estimated an additional 16 steelhead would have been captured if the trap had operated without interruption (Appendix A6). Wild emigrants had a mean fork length (N; SD) of 168.1mm (465; 19.2). Most wild summer steelhead migrants were age-3 fish (51.1%; Table 4). Hatchery steelhead captured at the Twisp River trap had a mean fork length (N; SD) of 193.0 mm (592; 20.5) and were significantly larger than wild summer steelhead captured at the trap (Mann-Whitney U-test: $P < 0.001$). No mortality of wild summer steelhead migrants occurred in 2010 at the Twisp River trap. We inserted PIT tags into 442 wild steelhead emigrants, but released only 441 tagged fish after a shed tag (N = 1) was subtracted (Appendix B7). We implanted PIT tags into 589 of 4,825 hatchery origin steelhead captured at the trap to conduct mark recapture trials. We released 585 hatchery steelhead after subtracting mortalities (N = 4). Hatchery summer steelhead mortalities were 0.08% (N = 4) of all hatchery summer steelhead captured in 2010.

Non-migrant summer steelhead captured at the trap included 49 wild fry and 471 wild parr captured between 5 March and 19 November (Figure 9). Steelhead parr greater than 55 mm and in good condition were PIT tagged prior to release (N = 454), two shed tags and two tagging-related mortalities occurred, resulting in the release of 250 tagged parr (Appendix B8). Wild summer steelhead parr had a mean fork length (*N*; SD) of 88.1 mm (471; 28.4), and mean weight of 10.3 g (469; 14.7). Mortalities of wild summer steelhead fry and parr were 0.6 % (*N* = 3) of the fry and parr captured.

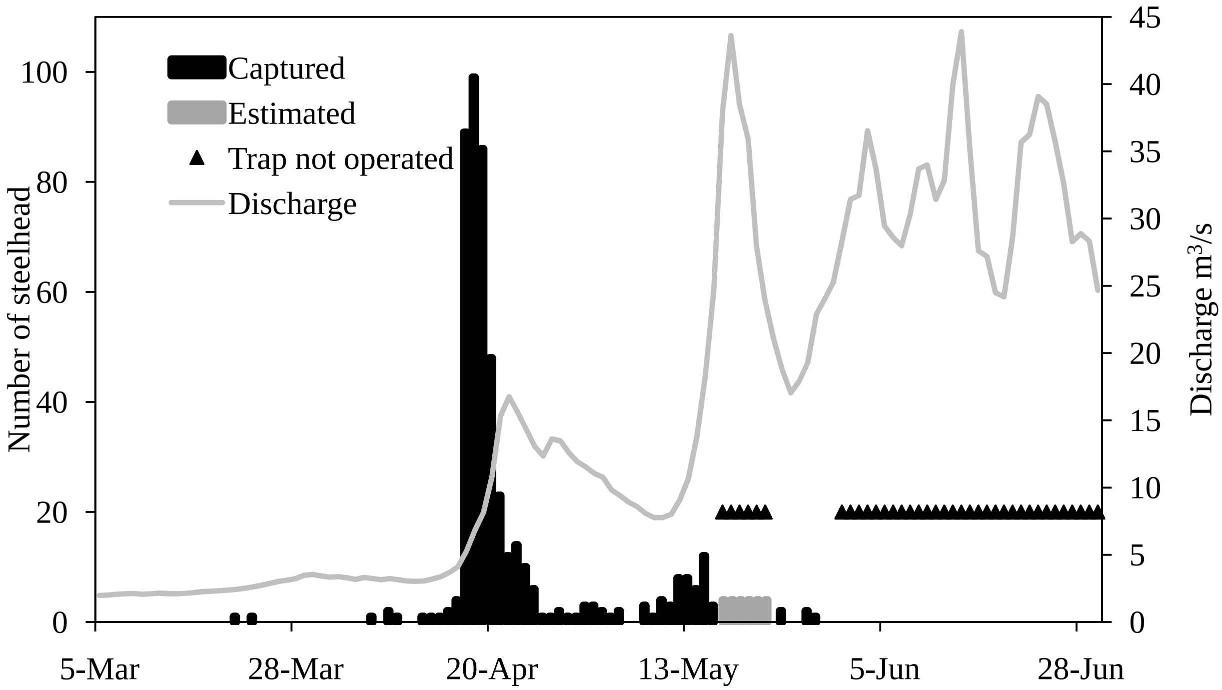

Figure 8. Daily capture of wild steelhead smolt and transitional migrants at the Twisp River smolt trap in 2010.

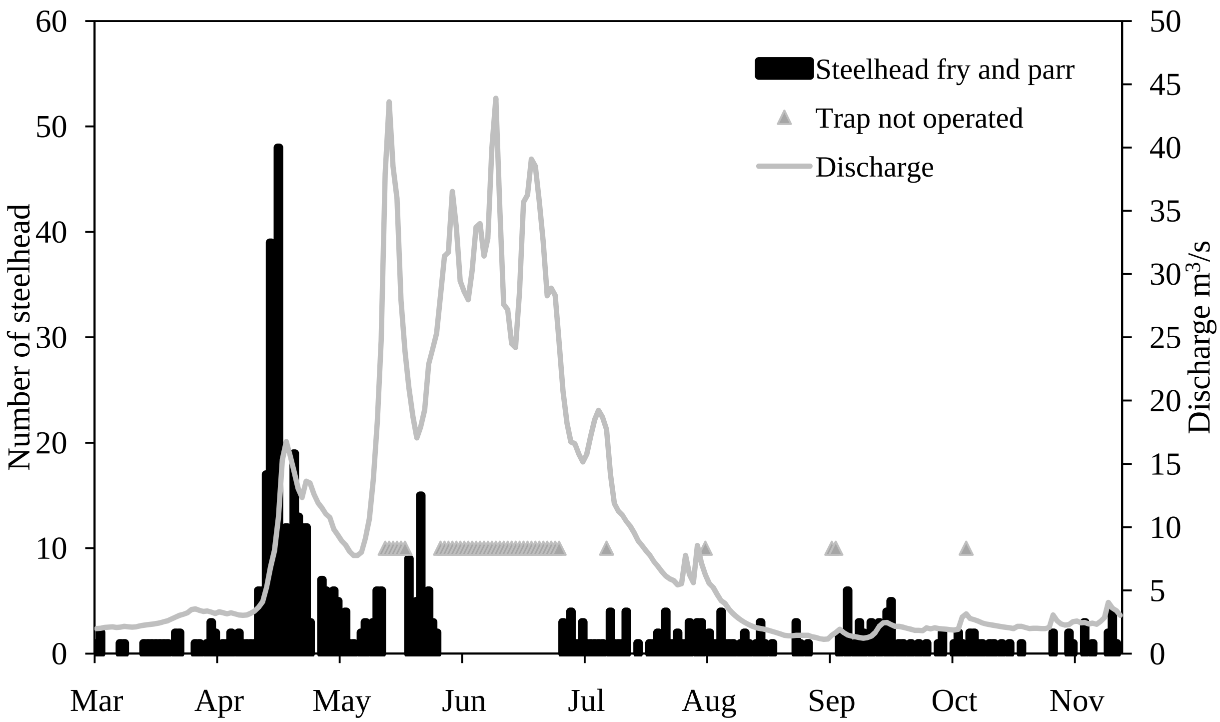

Figure 9. Daily capture of wild steelhead fry and parr at the Twisp River smolt trap in 2010.

Table 4. Mean length at migration age of wild transitional and smolt summer steelhead captured at the Twisp River trap in 2010.

Age	*N* (%)	Fork (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
1	4 (1.1)	129.3	4	18.8	22.8	4	8.1	1.1
2	157 (41.7)	157.8	157	16.3	39.4	157	12.0	1.0
3	192 (51.1)	174.4	192	18.2	53.7	192	17.6	1.0
4	23 (6.1)	172.0	23	18.4	51.8	23	16.5	1.0

Population Estimates

Methow River Basin

2008 Brood Chinook Salmon

Mark/recapture efficiency trials for estimating wild spring Chinook salmon smolt production should be conducted with wild Chinook salmon. However, no mark/recapture efficiency trials were conducted with wild spring Chinook smolts because we captured too few wild fish to provide the necessary sample size. We therefore used hatchery spring Chinook salmon and hatchery coho as surrogates for wild spring Chinook. Nevertheless, no significant regression model was developed for the low position using mark/recapture efficiency trials conducted with hatchery coho and spring Chinook (P = 0.08, r^2 = 0.38) in the spring of 2010; therefore the model from 2008 was used (P = 0.018, r^2 = 0.56). For the upper trapping position, we including a 2010 hatchery spring Chinook mark/recapture trial with the 2007 flow model because the trapping position was the same, and it increased the model significance. This combined flow model for the upper position was significant and explained an adequate portion of the variation in trap efficiency (P = 0.027, r^2 = 0.59; Table 5). Using these flow models, the estimated number of yearling spring Chinook salmon emigrants was 9,302 (± 11,901, 95% CI). When combined with the estimate of parr that emigrated in 2009 (2,948 ± 945, 95% CI), we estimated that 12,250 (± 12,846, 95% CI) 2008 brood wild spring Chinook salmon migrated from the Methow River basin between 16 October 2009 and 30 June 2010 (Snow et al. 2009).

Table 5. Mark and recapture efficiency trials used to estimate emigration of 2008 brood spring Chinook salmon (YCH = yearling Chinook salmon hatchery origin, YCW = yearling Chinook salmon wild origin, SBC = sub yearling Chinook salmon wild origin, and COH= yearling Coho salmon hatchery origin).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC	18-Nov-08	Low	55	2	3.63	26.7
SBC	25-Nov-08	Low	19	0	0	21.2
SBC	03-Dec-08	Low	13	0	0	18.8
	Pooled		87	2	2.3	
YCW	13-Apr-08	Low	47	2	4.26	18.7
YCW	17-Apr-08	Low	189	3	1.59	30.4
YCW	20-Apr-08	Low	90	3	3.33	32.3
YCW	25-Apr-08	Low	46	1	2.17	27.4
YCW	29-Apr-08	Low	70	1	1.43	40.2
	Flow model		442	10	2.26	
YCW, COH	06-Apr-07	Upper	109	3	2.75	71.9
YCH	12-Apr-07	Upper	448	9	2.01	119
YCH, YCW	14-Apr-07	Upper	224	3	1.34	105.8
YCH	18-Apr-07	Upper	361	10	2.77	95.1
YCH	20-Apr-07	Upper	305	8	2.62	89.9
COH	25-Apr-07	Upper	373	4	1.07	108.2
COH	30-Apr-07	Upper	600	3	0.5	123.0
YCH	22-Apr-10	Upper	525	7	1.3	119.9
	Flow model		2,945	47	1.59	

2009 Brood Chinook salmon

We could not obtain sufficient numbers of fish to conduct mark/recapture trials in the fall of 2010. All captured fish were released upstream in an attempt to generate a pooled efficiency estimate but no recaptures occurred. Hence, a pooled trap efficiency estimate from 2008 was used to estimate the number of emigrant parr during the fall trapping period. Tissue samples were collected from 42 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, 34 parr captured in the fall were spring Chinook and seven were summer Chinook salmon. One additional sample was not usable because the DNA failed to amplify properly (Appendix C). Based on the DNA assignment results, we estimated 1,602 (± 568, 95% CI) spring Chinook salmon parr (Appendix A2) emigrated past the Methow River trap during fall 2010 trapping.

Table 6. Mark and recapture efficiency trials used to estimate emigration of 2007 brood Chinook salmon parr at the Methow River smolt trap in 2009 (SBC Parr = wild subyearling Chinook salmon).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SBC Parr	18-Nov-08	Low	55	2	3.63	26.7
SBC Parr	25-Nov-08	Low	19	0	0	21.2
SBC Parr	03-Dec-08	Low	13	0	0	18.8
	Pooled		87	2	2.3	

Summer Steelhead

One mark/recapture trial was conducted for the upper trap position with wild steelhead in 2010. Because no significant regression model in the upper position exists, and only a single recapture occurred from 2010 mark/recapture trials in the upper position, we used the yearling Chinook flow model from 2010 to estimate steelhead production for each position (see Table 5). Combining estimates from all positions, we calculated that an estimated 20,110 (± 23,593, 95% CI) summer steelhead emigrated from the Methow River basin in 2010. Most migrants were age-2 fish from the 2008 brood (Table 7). We estimated the entire 2006 brood migration to be 11,625 (± 1,473, 95% CI) fish. We summed the 2006 brood cohort from previous years estimates (2007-2010) and included 532 migrants that were estimated to have been produced from redds (N=38) located downstream of the trap in 2006. We used the egg-to-emigrant ratio calculated for redds deposited upstream of the trap in 2006, to estimate the number of migrant steelhead that were produced from those redds located downstream of the trap.

Table 7. Estimated number of steelhead emigrants from the Methow River basin in 2010 by age and brood.

Age	Brood	Percent of emigrants	Number
1	2009	16.6	3,338
2	2008	58.5	11,764
3	2007	23.3	4,686
4	2006	1.6	322
Total		100.0	20,110

Twisp River

2008 Brood Spring Chinook salmon

Capture efficiency in the low position of wild spring Chinook salmon smolts was significantly related to discharge (P = 0.02, r^2 = 0.96) at the Twisp River trapping site in 2010 (Table 8). Using a flow model regression derived from 2010 efficiency trials, we estimated that 4,793 (± 57, 95% CI) smolts emigrated from the Twisp River between 5 March and 30 June 2010. No redds were identified downstream of the Twisp trap in 2008, so estimating production downstream of the trap site was unnecessary. Snow et al. (2010) estimated that 7,139 (± 1,482, 95% CI) 2008 brood spring Chinook salmon parr emigrated from the Twisp River between 1 July and 2 December 2009. Thus the total emigration estimate for this brood is 11,932 (± 1,539, 95% CI). Preliminary comparisons between recapture rates of hatchery and wild Chinook released in paired mark-recapture trials at the Twisp River trap have not indicated that significant differences exist (Chi-square, P = 0.42). However, the number of paired trials was low (N = 4), and we could not test for capture efficiencies over a wide range of discharges.

Table 8. Mark/recapture efficiency trials used to estimate the 2010 emigration of wild spring Chinook salmon smolts from the Twisp River (YCW = yearling Chinook salmon wild origin; YCH = hatchery origin spring Chinook).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
YCW	5-Apr-10	Low	63	14	22.2	3.3
YCW	8-Apr-10	Low	61	14	23.0	3.1
YCW	18-Apr-10	Low	157	31	19.7	7.5
YCH	18-Apr-10	Low	168	32	19.0	7.5
	Flow model		376	91		

2009 Brood Spring Chinook salmon

We were unable to develop a significant flow model for the 2009 brood spring Chinook salmon parr because too few fish were captured to conduct sufficient mark/recapture efficiency trials. However, a flow model incorporating 2009 mark/recapture trials with trials from previous years was significantly related to discharge (Table 9; P = 0.003, r^2 = 0.64), and we used this flow model to estimate that 3,282 (± 715, 95% CI) 2009 brood spring Chinook salmon parr emigrated from the Twisp River between 1 July and 19 November 2010. Stream surveyors located no spring Chinook salmon redds downstream of the Twisp smolt trap in 2009, so estimating production downstream of the trap was unnecessary.

Table 9. Mark and recapture efficiency trials used to estimate emigration of 2009 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-06	Low	164	40	24.4	7.6
SBC	18-Nov-06	Low	56	8	14.3	6.3
SBC	21-Nov-06	Low	53	13	24.5	5.8
SBC	22-Oct-07	Low	45	2	4.4	1.5
SBC	31-Oct-07	Low	60	4	6.6	1.8
SBC	10-Nov-08	Low	52	4	7.7	2.3
SBC	17-Nov-08	Low	222	44	19.8	5.5
SBC	25-Nov-08	Low	69	13	18.8	3.7
SBC	02-Nov-09	Low	221	31	14.0	4.0
SBC	05-Nov-09	Low	53	6	11.3	3.2
SBC	08-Nov-09	Low	53	10	18.9	2.8
	Flow model		1,048	175		

Summer Steelhead smolt trap

We were not able to develop a flow efficiency relationship for steelhead in 2010 because we were only able to conduct two mark/efficiency trials with steelhead during the spring period. We therefore used flow model regression (P = 0.005, r^2 = 0.89) from six mark groups to estimate the 2010 migration of summer steelhead (Table 10). We estimated that 5,504 (± 1,010, 95% CI) wild summer steelhead migrated from the Twisp River basin between 5 March and 30 June 2010. Most migrants were age-3 fish from the 2007 brood (Table 11). We estimated the entire 2006 brood migration to be 7,694(± 492, 95% CI) fish. We summed the 2006 brood cohort from previous years (2007-2010) estimates and included 342 migrants that were estimated to have been produced from redds (N=18) located downstream of the trap in 2006. We used the egg-to-emigrant ratio calculated for redds deposited upstream of the trap in 2006, to estimate the number of migrant steelhead that were produced from those redds located downstream of the trap.

Table 10. Mark/recapture efficiency trials used to estimate emigration of wild summer steelhead migrants from the Twisp River (SHR = natural origin steelhead; SHH = hatchery origin steelhead).

Species	Date	Position	Released	Recaptured	Efficiency (%)	Discharge (m^3/s)
SHR	15-Apr-08	Low	92	14	15.2	4.4
SHR	05-May-08	Low	173	10	5.8	10.6
SHR	22-Apr-09	Low	267	15	5.6	13.0
SHR	25-Apr-09	Low	129	11	8.5	10.9
SHR	18-Apr-10	Low	180	17	9.4	7.5
SHH	26-Apr-10	Low	189	10	5.3	13.0
	Flow model		1,030	77		

Table 11. Estimated number of steelhead emigrants from the Twisp River in 2010 by age and brood.

Age	Brood	% of total emigrants	Number
1	2009	1.06	61
2	2008	41.76	2,295
3	2007	51.06	2,812
4	2006	6.12	336
Total		100.0	5,504

Twisp PIT Tag Interrogation Site

We were able to develop a discharge/interrogation-efficiency relationship for steelhead at the Twisp River PIT tag interrogation site (TWR) using seven distinct groups of fish released into the Twisp River and recaptured at the Rocky Reach Dam juvenile bypass (RRJ) interrogation site (Table 12; P = 0.005, r^2 = 0.82). We assumed that capture efficiency at TWR was the same for wild summer steelhead emigrants and the species we used to estimate efficiency, regardless of flow, and that fish recaptured at RRJ were representative of all fish from that group. Using this model, we estimated that 6,034 (± 1,837, 95% CI) wild summer steelhead migrated from the Twisp River Basin between 1 February and 16 May (Appendix A7).

Table 12. Mark/recapture efficiency trials used to estimate emigration of wild summer steelhead migrants from the Twisp River (SHH = hatchery origin steelhead YCH= Hatchery origin Chinook).

Species	Date	Released	Recaptured at RRJ	Recaptured at RRJ and at TWR	Efficiency (%)	Discharge (m^3/s)
YCH	16-Apr-10	156	35	27	77.1	4.1
SHH	20-Apr-10	263	106	48	45.3	9.4
SHH	23-Apr-10	1,143	458	109	23.8	16.4
SHH	27-Apr-10	552	164	27	16.5	13.0
SHH	29-Apr-10	482	184	33	17.9	13.0
SHH	04-May-10	343	120	46	38.3	10.2
SHH	07-May-10	341	108	45	41.7	8.7
	Total	3,449	1,223	346		

Smolts Per Redd

2008 Brood Spring Chinook salmon

The number of emigrants per redd for the 2008 brood spring Chinook salmon in the Twisp River was greater than that for Methow Basin emigrants (Table 13). When Twisp River production was excluded from the estimate of Methow Basin production, we estimated that 150 times more emigrants were produced per redd in the Twisp River than were produced in the rest of the Methow River basin for the 2008 brood. However, Twisp production estimates began with parr migrating in July, while Methow productions estimates did not begin until October. This likely imparts an apparent survival advantage to Twisp fish because mortality experienced by parr between July and October is reflected in the Methow estimate, but not the Twisp estimate. Age-1 smolts accounted for 40.2% of all 2008 brood emigrants from the Twisp River, and 75.9% of all emigrants from the rest of the Methow River basin.

Table 13. Estimated emigrant-per-redd and egg-to-emigrant survival for Methow Basin spring Chinook salmon. Methow Basin and Twisp River estimates are for redds deposited upstream of the respective 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 (2005-2007), 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	2009	24	100,694	3,282	--	--	3.3	--
Twisp	2008	79	268,711	7,139	4,793	11,932	4.4	151
Twisp	2007	30	128,182	4,168	5,547	9,715	7.6	324
Twisp	2006	84	288,372	5,645	15,660	21,305	7.4	254
Twisp	2005	54	233,874	6,974	3,532	10,506	4.5	195
Twisp	2004	135	496,530	1,323	5,092	6,415	1.3	48
Twisp	2003	18	81,558	DNOT	723	723	0.9	40
Methow	2009	461	1,823,944	1,602	--	--	0.1	--
Methow	2008	373	1,365,130	2,948	9,302	12,250	0.9	33
Methow	2007	293	1,182,195	4,083	5,163	9,246	0.8	32
Methow	2006	922	3,362,156	2,913	28,857	31,770	0.9	34
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

Since juvenile steelhead may emigrate as age-4 fish, the complete Methow Basin emigration has been estimated for the 2003-2006 broods (Table 14). The 2006 brood produced an estimated 14 emigrants from each redd in the Methow River basin (including Twisp River production) and 19 emigrants from each redd in the Twisp River basin. Excluding Twisp River production, Methow Basin steelhead produced an estimated 9 emigrants per redd for 2006 brood steelhead.

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	Redds	Estimated eggs	Number of emigrants					Egg to emigrant (%)	Emigrant per redd
				Age-1	Age-2	Age-3	Age-4	Total		
Twisp	2009	352	2,147,200	61	--	--	--	61	0.003	--
Twisp	2008	182	1,078,350	76	2,295	--	--	2,371	0.22	--
Twisp	2007	82	418,774	42	10,217	2,812	--	13,071	3.12	--
Twisp	2006	384	2,452,992	81	4,712	2,223	336	7,352	0.30	19
Twisp	2005	452	2,806,016	292	2,686	2,102	113	5,193	0.19	11
Twisp	2004	254	1,166,876	79	3,192	500	198	3,969	0.34	16
Twisp	2003	606	3,849,312	DNOT	1,787	1,357	58	3,202	0.08	5
Methow	2009	1,030	6,283,000	3,338	--	--	--	3,338	0.05	--
Methow	2008	867	5,136,975	1,238	11,764	--	--	13,002	0.25	--
Methow	2007	740	3,779,180	3,194	25,135	4,686	--	33,015	0.87	--
Methow	2006	785	5,013,795	639	6,313	3,819	322	11,093	0.22	14
Methow	2005	1,685	10,460,480	2,030	12,775	868	1,064	16,737	0.16	10
Methow	2004	947	4,350,518	1,883	9,082	1,277	343	12,585	0.29	13
Methow	2003	2,019	12,824,688	1,596	4,872	2,459	106	9,033	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 11 wild coho smolts from the 2008 brood in 2010. Utilizing the same mark/recapture efficiency trial data used at the Methow and Twisp rivers sites for spring Chinook salmon, we estimate that 1,009 (± 1,266, 95% CI) wild coho emigrated from the Methow River in 2010, including 14 (± 1, 95% CI) from the Twisp River. We also estimated 838,989 (± 2,010,329, 95% CI) summer Chinook emigrated past the Methow trap. 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 2010.

Species	Captured	Fork length (mm)			Weight (g)		
		Mean	*N*	SD	Mean	*N*	SD
Methow River trap							
Pacific lamprey (*Lampetra tridentata*)	6,519	134.5	70	10.6	3.9	60	1.4
Summer Chinook (*O. tshawytscha*)	5,286	45.9	865	14.6	4.7	151	2.8
Hatchery coho (*O. kisutch*)	1,745	135.7	50	10.9	- -	- -	- -
Longnose dace (*Rhinichthys cataractae*)	156	68.3	54	34.5	12.4	28	6.4
Wild coho fry (*O. kisutch*)	113	35.5	13	5.0	- -	- -	- -
Whitefish (*Prosopium williamsoni*)	61	46.6	5	10.4	1.1	1	- -
Sculpin (*Cottus spp.*)	56	54.2	17	21.9	9.1	6	14.4
Sockeye fry (*O. nerka*)	30	25.8	16	3.0	- -	- -	- -
Wild coho parr (*O. kisutch*)	21	84.6	5	26.1	13.5	2	1.9
Sucker (*Catostomus spp.*)	21	55.8	5	14.6	3.2	3	0.2
Bridge lip sucker (*Catostomus columbianus*)	19	71.3	6	8.0	3.9	5	1.6
Wild coho smolt (*O. kisutch*)	11	111.4	5	5.9	14.7	5	2.4
Redside shiner (*Richardsonius balteatus*)	9	69.0	4	42.5	19.2	2	2.6
Brown bullhead (*Ictalurus nebulosus*)	4	106.0	2	25.5	21.9	2	14.1
Cutthroat trout (*O. clarki*)	3	158.7	3	23.7	41.0	3	17.9
Twisp River trap							
Longnose dace (*Rhinichthys cataractae*)	958	95.3	235	18.3	12.9	228	8.8
Sculpin (*Cottus spp.*)	92	57.0	56	27.9	11.3	24	10.1
Whitefish (*Prosopium williamsoni*)	36	40.3	15	10.8	3.0	1	- -
Bull trout (*Salvelinus confluentus*)	29	171.8	28	31.2	52.4	28	28.3
Cutthroat trout (*O. clarki*)	16	195.3	15	26.0	78.9	15	25.5
Bridge lip sucker (*Catostomus columbianus*)	11	132.7	6	48.4	42.8	6	52.6
Wild coho smolt (*O. kisutch*)	3	103.3	3	16.1	12.0	3	3.6
Brown bullhead (*Ictalurus nebulosus*)	1	115.0	1	- -	26.7	1	- -
Wild coho fry (*O. kisutch*)	1	42.0	1	- -	- -	- -	- -
Eastern brook trout (*Salvelinus fontinalis*)	1	216.0	1	- -	104.0	1	- -

Discussion

High river discharge and low juvenile abundance limited smolt trap operation and the ability to conduct trap efficiency trials over a broad range of river conditions in 2010. As a result, inadequate trap efficiency-to-discharge regression models forced the use of pooled trap efficiencies in some 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 limited the number and size of trials that could be conducted using wild fish. 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. Preliminary comparisons between recapture rates of hatchery and wild fish released in paired mark-recapture trials at the Twisp River trap have not indicated that significant differences exist (Chi-square, P = 0.42). However, the number of paired trials was low (N = 4), and we could not test for capture efficiencies over a wide range of discharges.

Developing life-stage survival estimates and models for threatened or endangered salmonids 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. Establishing the relationship between trap efficiency and discharge may be accomplished in a single year provided abundance of the target species is adequate with an appropriate range of flow conditions. 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. Statisticians with WDFW are currently reviewing all methodologies used to estimate juvenile abundance. From this effort we expect recommendations that address both bias and precision in order to better understand the status and trends of these populations.

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 captured 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 spring 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. Analysis of samples collected during 2007 and 2008 from yearling Chinook salmon at the Methow trap indicated that few of the yearling fish were summer Chinook salmon (0.87% and 1.7%, respectively). Because of this, we assumed that the majority of the yearling Chinook migrants at the Methow River trap in 2010 were spring Chinook.

Tissue samples (i.e., fin clips) were taken from subyearling Chinook captured at the Methow River trap in 2010 to determine the proportion of subyearling fish that were spring Chinook salmon. Spring Chinook salmon accounted for 5.4% of fish sampled during the spring trapping period and 80.5% of the fish sampled during the fall trapping period. We produce emigration estimates for spring Chinook salmon during the fall trapping period at the Methow River trap site and remove those fish identified as summer Chinook salmon. However, we do not produce emigration estimates for spring Chinook salmon that may emigrate before the fall period as subyearling fish. Therefore, spring Chinook production estimates for the Methow Basin underestimate production by the portion of spring Chinook salmon emigrating as subyearling fish in the spring, assuming that those fish do not move back upstream of the trap after initial capture in the spring

We used brood-specific fecundity values, excluded dewatered redds, and included the estimated production from redds downstream from each trap site to calculate egg-to-emigrant and emigrant-per-redd estimates in 2010. The low freshwater production of yearling Chinook salmon and steelhead may suggest severe density dependent mortality, low reproductive success, or another limiting factor 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 may underestimate actual deposition because of environmental factors affecting surveys (i.e., high water discharge, poor water clarity), potentially reducing already low productivity estimates. An observer efficiency study was started during the 2010 spring Chinook spawning survey to try to estimate a variance estimate around redd counts. A similar study for steelhead in the Methow Basin will begin in 2012.

Preliminary comparisons between the Twisp and Methow/Chewuch rivers suggest the Twisp River spring Chinook salmon are more productive per capita than the Methow/Chewuch population, but some of the apparent productivity difference is attributable to the disparity in precision between production estimates from the two trapping sites. The production estimate for yearling spring Chinook in the Twisp River; 4,793 (± 57, 95% CI) was more precise than the estimate for the entire Methow Basin 9,302 (± 11,901, 95% CI). This can be explained in part by differences in the strength of the correlation relationships of the flow models (Twisp r^2 = 0.96, Methow upper position r^2 =0.59 and low position r^2 =0.56). Differences in trap efficiencies also help explain differences in precision of the estimates, where lower efficiencies are susceptible to greater error due to random effects on the efficiency estimates. Furthermore, Methow trap efficiencies are much lower than at the Twisp trap resulting in fewer fish available to conduct mark/recapture trials to develop robust trap efficiency models. Trap efficiency models at the Methow River trapping site should improve over time as mark/recapture trials with target species and life stages are conducted. An evaluation of trap efficiency estimations strategies should be undertaken to develop a systematic approach for further developing the trap efficiency models, and to assess the efficacy of the Methow trapping site.

Summer steelhead productivity may be similar in both the Twisp and Methow/Chewuch, based solely on estimates of smolt production and egg-to-emigrant estimates. Causation of differences in productivity between populations and the overall low level of juvenile production is unknown. Estimating the proportion of hatchery fish that contribute to the spawning population in each subbasin may also provide important insight in determining why productivity is relatively low. Additional research is necessary to better understand the reproductive success and carrying capacity of spring Chinook salmon and steelhead in the Methow Basin. In 2010, a long-term study of steelhead reproductive success was initiated on the Twisp River. This study should provide insight into the role of reproductive success as it pertains to hatchery and wild fish. The study may also provide insight into carrying capacity in the Twisp River.

The instream PIT tag detection array in the Twisp River provided an additional method of estimating production of emigrating steelhead in 2010. The use of in-stream PIT tag antenna arrays to monitor and evaluate salmonid populations is an emerging technology where methodologies for producing population estimates are still being developed. Using a discharge/interrogation-efficiency model developed with PIT tagged hatchery fish, we estimated that 6,034 (± 1,837 95% CI) wild steelhead emigrated from the Twisp River, similar to the estimate derived from the Twisp River smolt trap of 5,504 fish (± 1,010 95% CI). The PIT tag estimate was based on daily observations of PIT tags recorded at the array, and required an estimate of the PIT tag rate of emigrating wild steelhead that was obtained using the Twisp rotary screw trap. This rate was relatively low in 2010 (3.8%), but should increase in 2011 and beyond as the result of a greater tagging effort employed to meet the requirements of an on-going relative reproductive success study in the Twisp River. In-stream arrays can provide an estimate of emigration during periods when smolt traps are not deployed, are damaged, or when flows are too great to operate. The PIT tag estimate included fish emigrating about a month earlier (early February) than were observed at the smolt trap because the smolt trap is typically not installed until March because of poor environmental conditions (ice).

The similarity between the PIT tag derived estimate and the smolt trap derived estimate is encouraging and further refinement of the methods to derive such estimates should increase the utility of in-stream interrogation sites. As with smolt traps capture efficiencies, developing a good detection efficiency model is important to generating a precise production estimate at PIT tag interrogation sites. Although the antenna configuration at the Twisp site should be the same each year, the overall detection efficiency model will be unique each year as equipment, such as the six antennas, are repaired or upgraded, the morphology of the stream channel changes, and the flow regimes change within and between years.

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Appendix A1. Daily capture of wild spring Chinook smolts emigrating from the Methow River, 19 February through 30 June 2010. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation. Estimated trap efficiency and emigration estimate are a rounded values.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
02/19/10	0	0.0384	0	03/24/10	3	0.0384	78
02/20/10	0	0.0384	0	03/25/10	1	0.0384	26
02/21/10	0	0.0384	0	03/26/10	1	0.0384	26
02/22/10	0	0.0384	0	03/27/10	8	0.0384	208
02/23/10	0	0.0384	0	03/28/10	0	0.0384	0
02/24/10	0	0.0384	0	03/29/10	1	0.0384	26
02/25/10	0	0.0384	0	03/30/10	2	0.0384	52
02/26/10	0	0.0384	0	03/31/10	7	0.0376	186
02/27/10	0	0.0384	0	04/01/10	3	0.0375	80
02/28/10	0	0.0384	0	04/02/10	0	0.0379	0
03/01/10	0	0.0384	0	04/03/10	4	0.0368	109
03/02/10	0	0.0384	0	04/04/10	3	0.0373	80
03/03/10	0	0.0384	0	04/05/10	1	0.0379	26
03/04/10	0	0.0384	0	04/06/10	4	0.0372	107
03/05/10	1	0.0384	26	04/07/10	0	0.0380	0
03/06/10	1	0.0384	26	04/08/10	2	0.0387	52
03/07/10	1	0.0384	26	04/09/10	4	0.0385	104
03/08/10	1	0.0384	26	04/10/10	5	0.0386	129
03/09/10	0	0.0384	0	04/11/10	2	0.0392	51
03/10/10	0	0.0384	0	04/12/10	3	0.0394	76
03/11/10	0	0.0384	0	04/13/10	3	0.0394	76
03/12/10	0	0.0384	0	04/14/10	0	0.0377	0
03/13/10	2	0.0384	52	04/15/10	3	0.0362	83
03/14/10	1	0.0384	26	04/16/10	5	0.0354	141
03/15/10	0	0.0384	0	04/17/10	12	0.0212	565
03/16/10	2	0.0384	52	04/18/10	19	0.0143	1,324
03/17/10	1	0.0384	26	04/19/10	26	0.0143	1,812
03/18/10	0	0.0384	0	04/20/10	11	0.0319	344
03/19/10	1	0.0384	26	04/21/10	10	0.0275	364
03/20/10	2	0.0384	52	04/22/10	5	0.0129	386
03/21/10	0	0.0384	0	04/23/10	2	0.0111	179
03/22/10	1	0.0384	26	04/24/10	0	0.0136	0
03/23/10	0	0.0384	0	04/25/10	5	0.0163	306

Appendix A1, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
04/26/10	4	0.0204	196	**06/01/10**	**0**	**0.0102**	**0**
04/27/10	2	0.0214	93	**06/02/10**	**0**	**0.0102**	**0**
04/28/10	2	0.0149	134	**06/03/10**	**0**	**0.0102**	**0**
04/29/10	0	0.0163	0	**06/04/10**	**0**	**0.0102**	**0**
04/30/10	2	0.0189	106	**06/05/10**	**0**	**0.0102**	**0**
05/01/10	2	0.0229	87	**06/06/10**	**0**	**0.0102**	**0**
05/02/10	0	0.0238	0	**06/07/10**	**0**	**0.0102**	**0**
05/03/10	4	0.0249	161	**06/08/10**	**0**	**0.0102**	**0**
05/04/10	3	0.0258	116	**06/09/10**	**0**	**0.0102**	**0**
05/05/10	6	0.0295	203	**06/10/10**	**0**	**0.0102**	**0**
05/06/10	3	0.0309	97	**06/11/10**	**0**	**0.0102**	**0**
05/07/10	1	0.0319	31	**06/12/10**	**0**	**0.0102**	**0**
05/08/10	4	0.0319	125	**06/13/10**	**0**	**0.0102**	**0**
05/09/10	0	0.0319	0	**06/14/10**	**0**	**0.0102**	**0**
05/10/10	2	0.0319	63	**06/15/10**	**0**	**0.0102**	**0**
05/11/10	1	0.0319	31	**06/16/10**	**0**	**0.0102**	**0**
05/12/10	3	0.0319	94	**06/17/10**	**0**	**0.0102**	**0**
05/13/10	1	0.0314	32	**06/18/10**	**0**	**0.0102**	**0**
05/14/10	2	0.0253	79	**06/19/10**	**0**	**0.0102**	**0**
05/15/10	0	0.0148	0	**06/20/10**	**0**	**0.0102**	**0**
05/16/10	1	0.0102	98	**06/21/10**	**0**	**0.0102**	**0**
05/17/10	**0**	**0.0102**	**0**	**06/22/10**	**0**	**0.0102**	**0**
05/18/10	**0**	**0.0102**	**0**	**06/23/10**	**0**	**0.0102**	**0**
05/19/10	**0**	**0.0102**	**0**	**06/24/10**	**0**	**0.0102**	**0**
05/20/10	**0**	**0.0102**	**0**	**06/25/10**	**0**	**0.0102**	**0**
05/21/10	**0**	**0.0102**	**0**	**06/26/10**	**0**	**0.0102**	**0**
05/22/10	**0**	**0.0102**	**0**	**06/27/10**	**0**	**0.0102**	**0**
05/23/10	**0**	**0.0102**	**0**	**06/28/10**	**0**	**0.0102**	**0**
05/24/10	0	0.0102	0	**06/29/10**	**0**	**0.0102**	**0**
05/25/10	0	0.0102	0	**06/30/10**	**0**	**0.0102**	**0**
05/26/10	2	0.0102	196				
05/27/10	0	0.0102	0				
05/28/10	0	0.0102	0				
05/29/10	**0**	**0.0102**	**0**				
05/30/10	**0**	**0.0102**	**0**				
05/31/10	**0**	**0.0102**	**0**				

Appendix A2. Daily capture of wild spring Chinook parr emigrating from the Methow River, 1 October through 19 November 2010. Estimated number of Chinook captured when the trap was not operating (bold) were calculated from the average captures two days preceding and after the break in operation. Race of captured Chinook was determined through DNA analysis.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
10/01/10	0	0.023	0	11/02/10	0	0.023	0
10/02/10	0	0.023	0	11/03/10	1	0.023	43
10/03/10	0	0.023	0	11/04/10	1	0.023	43
10/04/10	0	0.023	0	11/05/10	5	0.023	217
10/05/10	0	0.023	0	11/06/10	1	0.023	43
10/06/10	0	0.023	0	11/07/10	2	0.023	87
10/07/10	0	0.023	0	11/08/10	2	0.023	87
10/08/10	0	0.023	0	11/09/10	0	0.023	0
10/09/10	0	0.023	0	11/10/10	1	0.023	43
10/10/10	0	0.023	0	11/11/10	0	0.023	0
10/11/10	1	0.023	43	11/12/10	3	0.023	130
10/12/10	0	0.023	0	11/13/10	2	0.023	87
10/13/10	2	0.023	87	11/14/10	1	0.023	43
10/14/10	1	0.023	43	11/15/10	3	0.023	130
10/15/10	0	0.023	0	11/16/10	0	0.023	0
10/16/10	0	0.023	0	11/17/10	1	0.023	43
10/17/10	0	0.023	0	11/18/10	0	0.023	0
10/18/10	0	0.023	0	11/19/10	0	0.023	0
10/19/10	2	0.023	87				
10/20/10	1	0.023	43				
10/21/10	4	0.023	174				
10/22/10	0	0.023	0				
10/23/10	0	0.023	0				
10/24/10	0	0.023	0				
10/25/10	2	0.023	87				
10/26/10	0	0.023	0				
10/27/10	0	0.023	0				
10/28/10	0	0.023	0				
10/29/10	0	0.023	0				
10/30/10	4	0.023	174				
10/31/10	3	0.023	130				
11/01/10	1	0.023	43				

Appendix A3. Daily capture of wild steelhead smolt and transitional fish emigrating from the Methow River, 19 February to 30 June 2010. 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. Estimated trap efficiency and daily estimate are rounded values.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
02/19/10	0	0.0384	0	03/24/10	0	0.0384	0
02/20/10	0	0.0384	0	03/25/10	0	0.0384	0
02/21/10	0	0.0384	0	03/26/10	0	0.0384	0
02/22/10	0	0.0384	0	03/27/10	0	0.0384	0
02/23/10	0	0.0384	0	03/28/10	0	0.0384	0
02/24/10	0	0.0384	0	03/29/10	0	0.0384	0
02/25/10	0	0.0384	0	03/30/10	1	0.0384	26
02/26/10	0	0.0384	0	03/31/10	1	0.0376	27
02/27/10	0	0.0384	0	04/01/10	0	0.0375	0
02/28/10	0	0.0384	0	04/02/10	0	0.0379	0
03/01/10	0	0.0384	0	04/03/10	0	0.0368	0
03/02/10	0	0.0384	0	04/04/10	0	0.0373	0
03/03/10	0	0.0384	0	04/05/10	0	0.0379	0
03/04/10	0	0.0384	0	04/06/10	0	0.0372	0
03/05/10	0	0.0384	0	04/07/10	0	0.038	0
03/06/10	0	0.0384	0	04/08/10	0	0.0387	0
03/07/10	0	0.0384	0	04/09/10	0	0.0385	0
03/08/10	0	0.0384	0	04/10/10	0	0.0386	0
03/09/10	0	0.0384	0	04/11/10	0	0.0392	0
03/10/10	0	0.0384	0	04/12/10	0	0.0394	0
03/11/10	0	0.0384	0	04/13/10	0	0.0394	0
03/12/10	0	0.0384	0	04/14/10	1	0.0377	27
03/13/10	0	0.0384	0	04/15/10	1	0.0362	28
03/14/10	0	0.0384	0	04/16/10	1	0.0354	28
03/15/10	0	0.0384	0	04/17/10	6	0.0212	282
03/16/10	0	0.0384	0	04/18/10	13	0.0143	906
03/17/10	0	0.0384	0	04/19/10	30	0.0143	2,091
03/18/10	0	0.0384	0	04/20/10	48	0.0319	1,502
03/19/10	0	0.0384	0	04/21/10	51	0.0275	1,855
03/20/10	0	0.0384	0	04/22/10	48	0.0129	3,708
03/21/10	0	0.0384	0	04/23/10	22	0.0111	1,974
03/22/10	0	0.0384	0	04/24/10	20	0.0136	1,469
03/23/10	0	0.0384	0	04/25/10	18	0.0163	1,103

Appendix A3, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
04/26/10	6	0.0204	294	**05/31/10**	**0**	**0.0102**	**0**
04/27/10	0	0.0214	0	**06/01/10**	**0**	**0.0102**	**0**
04/28/10	4	0.0149	269	**06/02/10**	**0**	**0.0102**	**0**
04/29/10	1	0.0163	61	**06/03/10**	**0**	**0.0102**	**0**
04/30/10	4	0.0189	211	**06/04/10**	**0**	**0.0102**	**0**
05/01/10	6	0.0229	262	**06/05/10**	**0**	**0.0102**	**0**
05/02/10	6	0.0238	253	**06/06/10**	**0**	**0.0102**	**0**
05/03/10	2	0.0249	80	**06/07/10**	**0**	**0.0102**	**0**
05/04/10	3	0.0258	116	**06/08/10**	**0**	**0.0102**	**0**
05/05/10	3	0.0295	102	**06/09/10**	**0**	**0.0102**	**0**
05/06/10	3	0.0309	97	**06/10/10**	**0**	**0.0102**	**0**
05/07/10	3	0.0319	94	**06/11/10**	**0**	**0.0102**	**0**
05/08/10	0	0.0319	0	**06/12/10**	**0**	**0.0102**	**0**
05/09/10	2	0.0319	63	**06/13/10**	**0**	**0.0102**	**0**
05/10/10	1	0.0319	31	**06/14/10**	**0**	**0.0102**	**0**
05/11/10	2	0.0319	63	**06/15/10**	**0**	**0.0102**	**0**
05/12/10	3	0.0319	94	**06/16/10**	**0**	**0.0102**	**0**
05/13/10	2	0.0314	64	**06/17/10**	**0**	**0.0102**	**0**
05/14/10	2	0.0253	79	**06/18/10**	**0**	**0.0102**	**0**
05/15/10	6	0.0148	405	**06/19/10**	**0**	**0.0102**	**0**
05/16/10	9	0.0102	880	**06/20/10**	**0**	**0.0102**	**0**
05/17/10	**4**	**0.0102**	**391**	**06/21/10**	**0**	**0.0102**	**0**
05/18/10	**4**	**0.0102**	**391**	**06/22/10**	**0**	**0.0102**	**0**
05/19/10	**2**	**0.0102**	**196**	**06/23/10**	**0**	**0.0102**	**0**
05/20/10	**2**	**0.0102**	**196**	**06/24/10**	**0**	**0.0102**	**0**
05/21/10	**1**	**0.0102**	**98**	**06/25/10**	**0**	**0.0102**	**0**
05/22/10	**1**	**0.0102**	**98**	**06/26/10**	**0**	**0.0102**	**0**
05/23/10	**1**	**0.0102**	**98**	**06/27/10**	**0**	**0.0102**	**0**
05/24/10	1	0.0102	98	**06/28/10**	**0**	**0.0102**	**0**
05/25/10	0	0.0102	0	**06/29/10**	**0**	**0.0102**	**0**
05/26/10	0	0.0102	0	**06/30/10**	**0**	**0.0102**	**0**
05/27/10	0	0.0102	0				
05/28/10	0	0.0102	0				
05/29/10	**0**	**0.0102**	**0**				
05/30/10	**0**	**0.0102**	**0**				

Appendix A4. Daily capture of wild spring Chinook smolts emigrating from the Twisp River, 5 March to 30 June 2010. Estimated number of Chinook captured when the trap was not operating (bold) was calculated from the average captures two days preceding and after the break in operation.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
03/05/10	3	0.2266	13	04/07/10	16	0.2264	71
03/06/10	3	0.2266	13	04/08/10	19	0.2266	84
03/07/10	2	0.2266	9	04/09/10	28	0.2262	124
03/08/10	6	0.2266	26	04/10/10	26	0.2266	115
03/09/10	8	0.2266	35	04/11/10	19	0.2266	84
03/10/10	6	0.2266	26	04/12/10	17	0.2266	75
03/11/10	4	0.2266	18	04/13/10	11	0.2266	49
03/12/10	2	0.2266	9	04/14/10	39	0.2262	172
03/13/10	6	0.2266	26	04/15/10	43	0.2247	191
03/14/10	6	0.2266	26	04/16/10	70	0.2221	315
03/15/10	8	0.2266	35	04/17/10	72	0.2157	334
03/16/10	6	0.2266	26	04/18/10	90	0.2033	443
03/17/10	2	0.2266	9	04/19/10	62	0.1942	319
03/18/10	10	0.2266	44	04/20/10	36	0.1938	186
03/19/10	3	0.2266	13	04/21/10	4	0.1938	21
03/20/10	12	0.2266	53	04/22/10	6	0.1938	31
03/21/10	8	0.2266	35	04/23/10	10	0.1938	52
03/22/10	19	0.2266	84	04/24/10	12	0.1938	62
03/23/10	14	0.2266	62	04/25/10	6	0.1938	31
03/24/10	12	0.2266	53	04/26/10	3	0.1938	15
03/25/10	4	0.2266	18	04/27/10	4	0.1938	21
03/26/10	4	0.2266	18	04/28/10	2	0.1938	10
03/27/10	3	0.2266	13	04/29/10	5	0.1938	26
03/28/10	2	0.2266	9	04/30/10	5	0.1938	26
03/29/10	2	0.2253	9	05/01/10	2	0.1938	10
03/30/10	1	0.2231	4	05/02/10	9	0.1938	47
03/31/10	7	0.2240	31	05/03/10	11	0.1938	57
04/01/10	10	0.2244	45	05/04/10	6	0.1938	31
04/02/10	13	0.2253	58	05/05/10	4	0.1938	21
04/03/10	27	0.2244	120	05/06/10	5	0.1938	26
04/04/10	19	0.2255	84	05/07/10	6	0.1938	31
04/05/10	17	0.2264	75	05/08/10	3	0.1938	15
04/06/10	27	0.2249	120	05/09/10	9	0.1938	46

Appendix A4, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
05/10/10	4	0.1938	21	**06/14/10**	**1**	**0.1938**	**5**
05/11/10	7	0.1938	36	**06/15/10**	**1**	**0.1938**	**5**
05/12/10	6	0.1938	31	**06/16/10**	**1**	**0.1938**	**5**
05/13/10	3	0.1938	15	**06/17/10**	**1**	**0.1938**	**5**
05/14/10	2	0.1938	10	**06/18/10**	**1**	**0.1938**	**5**
05/15/10	3	0.1938	15	**06/19/10**	**1**	**0.1938**	**5**
05/16/10	3	0.1938	15	**06/20/10**	**1**	**0.1938**	**5**
05/17/10	**2**	**0.1938**	**10**	**06/21/10**	**1**	**0.1938**	**5**
05/18/10	**2**	**0.1938**	**10**	**06/22/10**	**1**	**0.1938**	**5**
05/19/10	**2**	**0.1938**	**10**	**06/23/10**	**1**	**0.1938**	**5**
05/20/10	**2**	**0.1938**	**10**	**06/24/10**	**1**	**0.1938**	**5**
05/21/10	**2**	**0.1938**	**10**	**06/25/10**	**1**	**0.1938**	**5**
05/22/10	**2**	**0.1938**	**10**	**06/26/10**	**1**	**0.1938**	**5**
05/23/10	1	0.1938	5	**06/27/10**	**1**	**0.1938**	**5**
05/24/10	2	0.1938	10	**06/28/10**	**1**	**0.1938**	**5**
05/25/10	2	0.1938	10	**06/29/10**	**1**	**0.1938**	**5**
05/26/10	3	0.1938	15	**06/30/10**	**1**	**0.1938**	**5**
05/27/10	2	0.1938	10				
05/28/10	1	0.1938	5				
05/29/10	2	0.1938	10				
05/30/10	2	0.1938	10				
05/31/10	**1**	**0.1938**	**5**				
06/01/10	**1**	**0.1938**	**5**				
06/02/10	**1**	**0.1938**	**5**				
06/03/10	**1**	**0.1938**	**5**				
06/04/10	**1**	**0.1938**	**5**				
06/05/10	**1**	**0.1938**	**5**				
06/06/10	**1**	**0.1938**	**5**				
06/07/10	**1**	**0.1938**	**5**				
06/08/10	**1**	**0.1938**	**5**				
06/09/10	**1**	**0.1938**	**5**				
06/10/10	**1**	**0.1938**	**5**				
06/11/10	**1**	**0.1938**	**5**				
06/12/10	**1**	**0.1938**	**5**				
06/13/10	**1**	**0.1938**	**5**				

Appendix A5. Daily capture of wild spring Chinook parr emigrating from the Twisp River, 1 July to 19 November 2010. Estimated numbers of Chinook 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
07/01/10	3	0.2599	12	08/04/10	2	0.2339	9
07/02/10	11	0.2599	42	08/05/10	0	0.2458	0
07/03/10	3	0.2599	12	**08/06/10**	**1**	**0.2165**	**5**
07/04/10	4	0.2599	15	08/07/10	0	0.2023	0
07/05/10	3	0.2599	12	08/08/10	0	0.1968	0
07/06/10	6	0.2599	23	08/09/10	1	0.1849	5
07/07/10	1	0.2599	4	08/10/10	0	0.1716	0
07/08/10	1	0.2599	4	08/11/10	0	0.1638	0
07/09/10	0	0.2599	0	08/12/10	0	0.1553	0
07/10/10	1	0.2599	4	08/13/10	0	0.1445	0
07/11/10	0	0.2599	0	08/14/10	0	0.1373	0
07/12/10	**2**	**0.2599**	**8**	08/15/10	0	0.1317	0
07/13/10	0	0.2599	0	08/16/10	0	0.1263	0
07/14/10	5	0.2599	19	08/17/10	0	0.1217	0
07/15/10	1	0.2599	4	08/18/10	0	0.1164	0
07/16/10	1	0.2599	4	08/19/10	0	0.1120	0
07/17/10	2	0.2599	8	08/20/10	0	0.1077	0
07/18/10	2	0.2599	8	08/21/10	0	0.1069	0
07/19/10	1	0.2599	4	08/22/10	1	0.1048	10
07/20/10	1	0.2599	4	08/23/10	1	0.1013	10
07/21/10	1	0.2599	4	08/24/10	0	0.0992	0
07/22/10	1	0.2599	4	08/25/10	0	0.0958	0
07/23/10	0	0.2599	0	08/26/10	0	0.0944	0
07/24/10	1	0.2579	4	08/27/10	0	0.0904	0
07/25/10	0	0.2399	0	08/28/10	1	0.0897	11
07/26/10	0	0.2271	0	08/29/10	3	0.0897	33
07/27/10	0	0.2136	0	08/30/10	1	0.0910	11
07/28/10	0	0.2042	0	08/31/10	0	0.0904	0
07/29/10	0	0.1986	0	09/01/10	2	0.0781	26
07/30/10	0	0.1913	0	09/02/10	1	0.0781	13
07/31/10	0	0.1804	0	09/03/10	0	0.0781	0
08/01/10	0	0.2203	0	09/04/10	1	0.0781	13
08/02/10	0	0.2448	0	09/05/10	0	0.0781	0
08/03/10	2	0.2023	10	09/06/10	2	0.0781	26

Appendix A5, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
09/07/10	**1**	**0.0781**	**13**	10/12/10	7	0.1098	64
09/08/10	**1**	**0.0825**	**12**	10/13/10	7	0.1077	65
09/09/10	2	0.0845	24	10/14/10	11	0.1048	105
09/10/10	1	0.0877	11	10/15/10	0	0.1020	0
09/11/10	5	0.0806	62	10/16/10	5	0.0985	51
09/12/10	2	0.0781	26	10/17/10	6	0.0971	62
09/13/10	0	0.0781	0	10/18/10	2	0.0958	21
09/14/10	9	0.0781	115	10/19/10	2	0.0944	21
09/15/10	13	0.0781	166	10/20/10	1	0.0930	11
09/16/10	10	0.0781	128	10/21/10	0	0.0917	0
09/17/10	3	0.0781	38	10/22/10	0	0.0910	0
09/18/10	9	0.0787	114	10/23/10	0	0.0897	0
09/19/10	7	0.0930	75	10/24/10	0	0.0897	0
09/20/10	13	0.0985	132	10/25/10	1	0.0937	11
09/21/10	4	0.0992	40	10/26/10	2	0.0917	22
09/22/10	4	0.0992	40	10/27/10	7	0.0904	77
09/23/10	1	0.0944	11	10/28/10	3	0.0890	34
09/24/10	0	0.0930	0	10/29/10	4	0.0904	44
09/25/10	1	0.0930	11	10/30/10	1	0.0890	11
09/26/10	0	0.0904	0	10/31/10	1	0.0890	11
09/27/10	2	0.0890	22	11/01/10	2	0.0890	22
09/28/10	1	0.0871	11	11/02/10	17	0.1006	169
09/29/10	3	0.0851	35	11/03/10	8	0.1142	70
09/30/10	2	0.0851	23	11/04/10	3	0.1006	30
10/01/10	1	0.0851	12	11/05/10	4	0.0964	41
10/02/10	2	0.0845	24	11/06/10	2	0.0951	21
10/03/10	2	0.091	22	11/07/10	1	0.0985	10
10/04/10	0	0.0904	0	11/08/10	3	0.1041	29
10/05/10	9	0.0890	101	11/09/10	1	0.1020	10
10/06/10	2	0.0877	23	11/10/10	4	0.0992	40
10/07/10	4	0.0877	46	11/11/10	3	0.1006	30
10/08/10	1	0.0871	11	11/12/10	0	0.0978	0
10/09/10	3	0.0864	35	11/13/10	1	0.0978	10
10/10/10	6	0.0937	64	11/14/10	3	0.0971	31
10/11/10	**6**	**0.1217**	**49**	11/15/10	7	0.1069	65

Appendix A5, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate
11/16/2010	12	0.1209	99
11/17/2010	13	0.1413	92
11/18/2010	1	0.1278	8
11/19/2010	2	0.1209	17

Appendix A6. Daily capture of wild steelhead smolt and transitional fish emigrating from the Twisp River, 5 March to 30 June 2010. 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
03/05/10	0	0.1420	0	04/08/10	2	0.1420	14
03/06/10	0	0.1420	0	04/09/10	1	0.1420	7
03/07/10	0	0.1420	0	04/10/10	0	0.1420	0
03/08/10	0	0.1420	0	04/11/10	0	0.1420	0
03/09/10	0	0.1420	0	04/12/10	1	0.1420	7
03/10/10	0	0.1420	0	04/13/10	1	0.1420	7
03/11/10	0	0.1420	0	04/14/10	1	0.1420	7
03/12/10	0	0.1420	0	04/15/10	2	0.1420	14
03/13/10	0	0.1420	0	04/16/10	4	0.1420	28
03/14/10	0	0.1420	0	04/17/10	89	0.1405	633
03/15/10	0	0.1420	0	04/18/10	99	0.1201	824
03/16/10	0	0.1420	0	04/19/10	86	0.1058	813
03/17/10	0	0.1420	0	04/20/10	48	0.0856	561
03/18/10	0	0.1420	0	04/21/10	23	0.0522	440
03/19/10	0	0.1420	0	04/22/10	12	0.0522	230
03/20/10	0	0.1420	0	04/23/10	14	0.0522	268
03/21/10	1	0.1420	7	04/24/10	10	0.0522	191
03/22/10	0	0.1420	0	04/25/10	6	0.0522	115
03/23/10	1	0.1420	7	04/26/10	1	0.0562	18
03/24/10	0	0.1420	0	04/27/10	1	0.0527	19
03/25/10	0	0.1420	0	04/28/10	2	0.0449	45
03/26/10	0	0.1420	0	04/29/10	1	0.0522	19
03/27/10	0	0.1420	0	04/30/10	1	0.0591	17
03/28/10	0	0.1420	0	05/01/10	3	0.0625	48
03/29/10	0	0.1420	0	05/02/10	3	0.0670	45
03/30/10	0	0.1420	0	05/03/10	2	0.0715	28
03/31/10	0	0.1420	0	05/04/10	1	0.0774	13
04/01/10	0	0.1420	0	05/05/10	2	0.0841	24
04/02/10	0	0.1420	0	05/06/10	0	0.0876	0
04/03/10	0	0.1420	0	05/07/10	0	0.0926	0
04/04/10	0	0.1420	0	05/08/10	3	0.0962	31
04/05/10	0	0.1420	0	05/09/10	1	0.1020	10
04/06/10	1	0.1420	7	05/10/10	4	0.1030	39
04/07/10	0	0.1420	0	05/11/10	3	0.1024	29

Appendix A6, continued.

Date	Captured	Estimated trap efficiency	Daily emigration estimate	Date	Captured	Estimated trap efficiency	Daily emigration estimate
05/12/10	8	0.0935	86	**06/16/10**	**0**	**0.0522**	**0**
05/13/10	8	0.0807	99	**06/17/10**	**0**	**0.0522**	**0**
05/14/10	6	0.0569	105	**06/18/10**	**0**	**0.0522**	**0**
05/15/10	12	0.0522	230	**06/19/10**	**0**	**0.0522**	**0**
05/16/10	3	0.0522	57	**06/20/10**	**0**	**0.0522**	**0**
05/17/10	**4**	**0.0522**	**77**	**06/21/10**	**0**	**0.0522**	**0**
05/18/10	**4**	**0.0522**	**38**	**06/22/10**	**0**	**0.0522**	**0**
05/19/10	**2**	**0.0522**	**38**	**06/23/10**	**0**	**0.0522**	**0**
05/20/10	**2**	**0.0522**	**38**	**06/24/10**	**0**	**0.0522**	**0**
05/21/10	**2**	**0.0522**	**38**	**06/25/10**	**0**	**0.0522**	**0**
05/22/10	**2**	**0.0522**	**38**	**06/26/10**	**0**	**0.0522**	**0**
05/23/10	0	0.0522	0	**06/27/10**	**0**	**0.0522**	**0**
05/24/10	2	0.0522	38	**06/28/10**	**0**	**0.0522**	**0**
05/25/10	0	0.0522	0	**06/29/10**	**0**	**0.0522**	**0**
05/26/10	0	0.0522	0	**06/30/10**	**0**	**0.0522**	**0**
05/27/10	2	0.0522	38				
05/28/10	1	0.0522	19				
05/29/10	0	0.0522	0				
05/30/10	0	0.0522	0				
05/31/10	**0**	**0.0522**	**0**				
06/01/10	**0**	**0.0522**	**0**				
06/02/10	**0**	**0.0522**	**0**				
06/03/10	**0**	**0.0522**	**0**				
06/04/10	**0**	**0.0522**	**0**				
06/05/10	**0**	**0.0522**	**0**				
06/06/10	**0**	**0.0522**	**0**				
06/07/10	**0**	**0.0522**	**0**				
06/08/10	**0**	**0.0522**	**0**				
06/09/10	**0**	**0.0522**	**0**				
06/10/10	**0**	**0.0522**	**0**				
06/11/10	**0**	**0.0522**	**0**				
06/12/10	**0**	**0.0522**	**0**				
06/13/10	**0**	**0.0522**	**0**				
06/14/10	**0**	**0.0522**	**0**				
06/15/10	**0**	**0.0522**	**0**				

Appendix A7. Daily detection of wild steelhead emigrating from the Twisp River at the Twisp river antenna array site 1 February to 16 May 2010.

Date	Number of steelhead detected	Number detected expanded by tag rate	Estimated antenna array efficiency	Daily emigration estimate
02/01/10	1	26	0.7016	37
02/04/10	1	26	0.7016	37
02/05/10	1	26	0.7016	37
03/13/10	1	26	0.7016	37
03/27/10	1	26	0.7016	37
04/06/10	1	26	0.7016	37
04/07/10	2	52	0.7016	75
04/08/10	1	26	0.7016	37
04/10/10	1	26	0.7016	37
04/13/10	2	52	0.7016	75
04/14/10	7	184	0.7016	262
04/15/10	5	131	0.7016	187
04/16/10	14	367	0.7016	523
04/17/10	31	813	0.6452	1,260
04/18/10	12	315	0.5662	556
04/19/10	4	105	0.4973	211
04/20/10	11	288	0.3610	799
04/21/10	6	157	0.1595	987
04/22/10	1	26	0.1198	219
04/23/10	1	26	0.1489	176
05/13/10	1	26	0.3695	71
05/14/10	1	26	0.2217	118
05/16/10	1	26	0.1198	219

Appendix B1. Loss of PIT tags inserted into wild (YCW) and hatchery (YCH) spring Chinook smolts (S) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10064.KAG	YCW	S	1	0	0	1
CGS10067.KAG	YCW	S	3	0	0	3
CGS10074.KAG	YCW	S	3	0	0	3
CGS10075.KAD	YCW	S	2	0	0	2
CGS10076.KAG	YCW	S	1	0	0	1
CGS10078.KAD	YCW	S	1	0	0	1
CGS10081.KAG	YCW	S	3	0	0	3
CGS10083.KAG	YCW	S	3	0	0	3
CGS10084.KAG	YCW	S	1	0	0	1
CGS10085.KAD	YCW	S	1	0	0	1
CGS10087.KAD	YCW	S	8	0	0	8
CGS10088.KAG	YCW	S	1	0	0	1
CGS10089.KAD	YCW	S	2	0	0	2
CGS10090.KAD	YCW	S	6	0	0	6
CGS10091.KAD	YCW	S	3	0	0	3
CGS10096.KAG	YCW	S	12	0	0	12
CGS10098.KAG	YCW	S	1	0	0	1
CGS10099.KAG	YCW	S	3	0	0	3
CGS10100.KAG	YCW	S	5	0	0	5
CGS10101.KAG	YCW	S	2	0	0	2
CGS10102.KAG	YCW	S	3	0	0	3
CGS10103.KAG	YCW	S	4	0	0	4
CGS10105.KAD	YCW	S	3	0	0	3
CGS10106.KAD	YCW	S	1	0	0	1
CGS10107.KAD	YCW	S	12	0	0	12
CGS10108.KAD	YCW	S	19	0	0	19
CGS10109.KAG	YCW	S	23	0	0	23
CGS10110.KAD	YCW	S	11	0	0	11
CGS10111.KAD	YCW	S	7	0	0	7
CGS10112.KAD	YCW	S	5	0	0	5
CGS10113.KAD	YCW	S	3	0	0	3
CGS10115.KAD	YCW	S	4	0	0	4
CGS10116.KAD	YCW	S	4	0	0	4
CGS10117.KAD	YCW	S	2	0	0	2
CGS10118.KAD	YCW	S	1	0	0	1
CGS10120.KAD	YCW	S	2	0	0	2
CGS10121.KAD	YCW	S	2	0	0	2

Appendix B1, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10123.KAD	YCW	S	4	0	0	4
CGS10124.KAD	YCW	S	3	0	0	3
CGS10125.KAD	YCW	S	6	0	0	6
CGS10126.KAD	YCW	S	3	0	0	3
CGS10127.KAD	YCW	S	1	0	0	1
CGS10128.KAD	YCW	S	2	0	0	2
CGS10130.KAD	YCW	S	2	0	0	2
CGS10131.KAD	YCW	S	1	0	0	1
CGS10132.KAD	YCW	S	3	0	0	3
CGS10133.KAD	YCW	S	1	0	0	1
CGS10134.KAD	YCW	S	2	0	0	2
CGS10136.KAD	YCW	S	1	0	0	1
CGS10146.KAD	YCW	S	2	0	0	2
	Total		199	0	0	199
CGS10107.KAA	YCH		551	0	0	551
CGS10111.KAC	YCH		541	13	1	527
	Total		1,092	13	1	1,078
	Grand total		1,291	13	1	1,277

Appendix B2. Loss of PIT tags inserted into wild Chinook (SBC) parr (P) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10200.KAD	SBC	P	4	0	0	4
CGS10239.KAD	SBC	P	3	0	0	3
CGS10244.KAA	SBC	P	1	1	0	0
CGS10245.KAG	SBC	P	2	1	0	1
CGS10252.KAD	SBC	P	2	0	0	2
CGS10258.KAA	SBC	P	1	1	0	0
CGS10262.KAA	SBC	P	1	0	0	1
CGS10267.KAA	SBC	P	1	0	0	1
CGS10270.KAD	SBC	P	2	0	0	2
CGS10272.KAG	SBC	P	2	0	0	2
CGS10286.KAG	SBC	P	1	0	0	1
CGS10287.KAD	SBC	P	1	0	0	1
CGS10292.KAD	SBC	P	2	0	0	2
CGS10293.KAG	SBC	P	1	0	0	1
CGS10294.KAG	SBC	P	4	0	0	4
CGS10298.KAD	SBC	P	2	0	0	2
CGS10304.KAG	SBC	P	7	0	0	7
CGS10305.KAG	SBC	P	1	0	0	1
CGS10308.KAD	SBC	P	2	0	0	2
CGS10309.KAG	SBC	P	5	0	0	5
CGS10312.KAD	SBC	P	6	0	0	6
CGS10316.KAG	SBC	P	3	0	0	3
CGS10319.KAD	SBC	P	5	0	0	5
CGS10321.KAA	SBC	P	1	0	0	1
		Grand total	60	3	0	57

Appendix B3. Loss of PIT tags inserted into wild (SHR) steelhead migrants at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10089.KAD	SHR	Migratory	1	0	0	1
CGS10090.KAD	SHR	Migratory	1	0	0	1
CGS10104.KAH	SHR	Migratory	1	0	0	1
CGS10105.KAD	SHR	Migratory	1	0	0	1
CGS10106.KAD	SHR	Migratory	1	0	0	1
CGS10107.KAD	SHR	Migratory	6	0	0	6
CGS10108.KAD	SHR	Migratory	12	0	0	12
CGS10109.KAH	SHR	Migratory	28	0	0	28
CGS10110.KAD	SHR	Migratory	43	0	0	43
CGS10111.KAD	SHR	Migratory	39	0	2	37
CGS10112.KAD	SHR	Migratory	46	0	0	46
CGS10113.KAD	SHR	Migratory	22	0	0	22
CGS10114.KAD	SHR	Migratory	19	0	0	19
CGS10115.KAD	SHR	Migratory	18	0	0	18
CGS10116.KAD	SHR	Migratory	6	0	0	6
CGS10118.KAD	SHR	Migratory	4	0	0	4
CGS10119.KAH	SHR	Migratory	1	0	0	1
CGS10120.KAD	SHR	Migratory	4	0	0	4
CGS10121.KAD	SHR	Migratory	6	0	0	6
CGS10122.KAD	SHR	Migratory	6	0	0	6
CGS10123.KAD	SHR	Migratory	2	0	0	2
CGS10124.KAD	SHR	Migratory	3	0	0	3
CGS10125.KAD	SHR	Migratory	3	0	0	3
CGS10126.KAD	SHR	Migratory	2	1	0	1
CGS10127.KAD	SHR	Migratory	3	0	0	3
CGS10129.KAH	SHR	Migratory	2	0	0	2
CGS10130.KAD	SHR	Migratory	1	0	0	1
CGS10131.KAD	SHR	Migratory	2	0	0	2
CGS10132.KAD	SHR	Migratory	3	0	0	3
CGS10133.KAD	SHR	Migratory	2	0	0	2
CGS10134.KAD	SHR	Migratory	2	0	0	2
CGS10135.KAD	SHR	Migratory	6	0	0	6
CGS10136.KAD	SHR	Migratory	9	0	0	9
CGS10144.KAD	SHR	Migratory	1	0	0	1
		Grand total	306	1	2	303

Appendix B4. Loss of PIT tags inserted into wild steelhead (SHR) parr (P) at the Methow River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10087.KAD	SHR	P	2	0	0	2
CGS10090.KAD	SHR	P	1	0	0	1
CGS10110.KAD	SHR	P	15	0	0	15
CGS10111.KAD	SHR	P	15	0	0	15
CGS10112.KAD	SHR	P	3	0	0	3
CGS10113.KAD	SHR	P	2	0	0	2
CGS10114.KAD	SHR	P	7	0	0	7
CGS10115.KAD	SHR	P	4	0	0	4
CGS10116.KAD	SHR	P	5	0	0	5
CGS10117.KAD	SHR	P	3	0	0	3
CGS10118.KAD	SHR	P	1	0	0	1
CGS10120.KAD	SHR	P	1	0	0	1
CGS10121.KAD	SHR	P	2	0	0	2
CGS10122.KAD	SHR	P	2	0	0	2
CGS10123.KAD	SHR	P	2	0	0	2
CGS10124.KAD	SHR	P	1	0	0	1
CGS10126.KAD	SHR	P	4	0	0	4
CGS10127.KAD	SHR	P	1	0	0	1
CGS10128.KAD	SHR	P	2	0	0	2
CGS10131.KAD	SHR	P	1	0	0	1
CGS10144.KAD	SHR	P	5	0	0	5
CGS10145.KAD	SHR	P	1	0	0	1
CGS10146.KAD	SHR	P	1	0	0	1
CGS10148.KAH	SHR	P	1	0	0	1
CGS10228.KAH	SHR	P	1	0	0	1
CGS10246.KAB	SHR	P	1	0	0	1
CGS10251.KAH	SHR	P	1	0	0	1
CGS10256.KAB	SHR	P	1	0	0	1
CGS10319.KAD	SHR	P	6	0	0	6
	Grand total		92	0	0	92

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	Tagged	Mortalities	Shed	Released
CGS10064.LAD	YCW	S	3	0	0	3
CGS10066.LAD	YCW	S	5	1	0	4
CGS10067.LAG	YCW	S	6	0	0	6
CGS10068.LAD	YCW	S	8	0	0	8
CGS10069.LAG	YCW	S	6	0	0	6
CGS10070.LAD	YCW	S	4	0	0	4
CGS10071.LAD	YCW	S	2	0	0	2
CGS10074.LAG	YCW	S	19	0	0	19
CGS10075.LAD	YCW	S	7	0	0	7
CGS10076.LAD	YCW	S	2	0	0	2
CGS10077.LAD	YCW	S	9	0	0	9
CGS10078.LAD	YCW	S	3	0	0	3
CGS10081.LAD	YCW	S	37	0	0	37
CGS10082.LAD	YCW	S	14	0	0	14
CGS10083.LAD	YCW	S	10	0	0	10
CGS10084.LAD	YCW	S	4	0	0	4
CGS10085.LAD	YCW	S	4	0	0	4
CGS10088.LAD	YCW	S	6	0	0	6
CGS10089.LAD	YCW	S	1	0	0	1
CGS10090.LAD	YCW	S	7	0	0	7
CGS10091.LAD	YCW	S	11	0	0	11
CGS10092.LAD	YCW	S	12	0	0	12
CGS10094.LAD	YCW	S	46	0	0	46
CGS10095.LAA	YCW	S	17	0	0	17
CGS10096.LAA	YCW	S	26	0	0	26
CGS10097.LAA	YCW	S	16	0	0	16
CGS10098.LAG	YCW	S	19	0	0	19
CGS10099.LAA	YCW	S	27	0	0	27
CGS10100.LAD	YCW	S	26	0	0	26
CGS10101.LAD	YCW	S	19	0	0	19
CGS10102.LAD	YCW	S	17	0	0	17
CGS10103.LAD	YCW	S	9	0	0	9
CGS10104.LAD	YCW	S	39	0	0	39
CGS10105.LAD	YCW	S	42	0	0	42
CGS10106.LAA	YCW	S	69	0	0	69
CGS10107.LAC	YCW	S	69	0	0	69
CGS10108.LAC	YCW	S	89	2	0	87
CGS10109.LAC	YCW	S	62	1	0	61

Appendix B5, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10110.LAC	YCW	S	34	0	0	34
CGS10111.LAC	YCW	S	4	0	0	4
CGS10112.LAC	YCW	S	6	0	0	6
CGS10113.LAC	YCW	S	9	0	0	9
CGS10113.LAC	YCW	S	1	0	0	1
CGS10114.LAC	YCW	S	12	0	0	12
CGS10115.LAC	YCW	S	6	0	0	6
CGS10116.LAD	YCW	S	3	0	0	3
CGS10117.LAD	YCW	S	3	0	0	3
CGS10118.LAD	YCW	S	2	0	0	2
CGS10119.LAD	YCW	S	5	0	0	5
CGS10120.LAD	YCW	S	5	1	0	4
CGS10121.LAD	YCW	S	2	0	0	2
CGS10122.LAD	YCW	S	9	0	0	9
CGS10123.LAD	YCW	S	11	0	0	11
CGS10124.LAD	YCW	S	6	0	0	6
CGS10125.LAD	YCW	S	4	0	0	4
CGS10126.LAD	YCW	S	5	0	0	5
CGS10127.LAD	YCW	S	6	0	0	6
CGS10128.LAD	YCW	S	2	0	0	2
CGS10129.LAD	YCW	S	7	0	0	7
CGS10130.LAD	YCW	S	4	0	0	4
CGS10131.LAD	YCW	S	7	0	0	7
CGS10132.LAD	YCW	S	6	0	0	6
CGS10133.LAD	YCW	S	3	0	0	3
CGS10134.LAD	YCW	S	2	0	0	2
CGS10135.LAD	YCW	S	3	0	0	3
CGS10136.LAD	YCW	S	3	0	0	3
CGS10143.LAD	YCW	S	1	0	0	1
CGS10144.LAD	YCW	S	2	0	0	2
CGS10145.LAD	YCW	S	2	0	0	2
CGS10146.LAD	YCW	S	3	0	0	3
CGS10147.LAD	YCW	S	2	0	0	2
CGS10148.LAD	YCW	S	1	0	0	1
CGS10151.LAD	YCW	S	4	0	0	4
	Total		957	5	0	952
CGS10106.LAB	YCH	S	160	4	0	156
CGS10108.LAA	YCH	S	170	1	0	169
	Total		330	5	0	325

Appendix B6. Loss of PIT tags inserted into wild spring Chinook (SBC) parr (P) at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10145.LAD	SBC	P	6	0	0	6
CGS10182.LAD	SBC	P	4	0	0	4
CGS10183.LAD	SBC	P	9	0	0	9
CGS10187.LAD	SBC	P	5	0	0	5
CGS10188.LAD	SBC	P	2	0	0	2
CGS10195.LAD	SBC	P	4	0	0	4
CGS10196.LAD	SBC	P	1	0	0	1
CGS10197.LAD	SBC	P	1	0	0	1
CGS10200.LAD	SBC	P	2	0	0	2
CGS10201.LAD	SBC	P	1	0	0	1
CGS10203.LAD	SBC	P	1	0	0	1
CGS10215.LAD	SBC	P	2	0	0	2
CGS10216.LAD	SBC	P	2	1	0	1
CGS10221.LAD	SBC	P	1	0	0	1
CGS10234.LAD	SBC	P	1	0	0	1
CGS10235.LAD	SBC	P	1	0	0	1
CGS10242.LAD	SBC	P	2	0	0	2
CGS10253.LAA	SBC	P	1	0	0	1
CGS10255.LAC	SBC	P	2	0	0	2
CGS10259.LAH	SBC	P	10	0	0	10
CGS10260.LAH	SBC	P	6	0	0	6
CGS10261.LAA	SBC	P	9	0	0	9
CGS10262.LAC	SBC	P	9	0	0	9
CGS10263.LAH	SBC	P	12	0	0	12
CGS10264.LAH	SBC	P	7	0	0	7
CGS10266.LAD	SBC	P	1	0	0	1
CGS10268.LAD	SBC	P	2	0	0	2
CGS10270.LAD	SBC	P	3	0	0	3
CGS10271.LAD	SBC	P	1	0	0	1
CGS10272.LAD	SBC	P	4	0	0	4
CGS10273.LAD	SBC	P	2	0	0	2
CGS10274.LAD	SBC	P	2	0	0	2
CGS10276.LAA	SBC	P	4	0	0	4
CGS10279.LAD	SBC	P	2	0	0	2
CGS10280.LAD	SBC	P	3	0	0	3
CGS10283.LAD	SBC	P	10	0	0	10
CGS10286.LAD	SBC	P	9	0	0	9
CGS10287.LAD	SBC	P	12	0	0	12

Appendix B6, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10290.LAA	SBC	P	5	0	0	5
CGS10290.LAD	SBC	P	7	0	0	7
CGS10291.LAD	SBC	P	3	0	0	3
CGS10292.LAD	SBC	P	2	0	0	2
CGS10293.LAG	SBC	P	1	0	0	1
CGS10298.LAD	SBC	P	2	0	0	2
CGS10299.LAG	SBC	P	2	0	0	2
CGS10300.LAG	SBC	P	7	0	0	7
CGS10301.LAD	SBC	P	3	0	0	3
CGS10302.LAG	SBC	P	4	0	0	4
CGS10304.LAD	SBC	P	2	0	0	2
CGS10305.LAD	SBC	P	2	0	0	2
CGS10308.LAD	SBC	P	29	0	0	29
CGS10309.LAG	SBC	P	4	0	0	4
CGS10312.LAD	SBC	P	8	0	0	8
CGS10313.LAG	SBC	P	1	0	0	1
CGS10314.LAD	SBC	P	7	0	0	7
CGS10316.LAD	SBC	P	4	0	0	4
CGS10319.LAD	SBC	P	10	0	0	10
CGS10320.LAD	SBC	P	14	0	0	14
CGS10321.LAD	SBC	P	17	0	0	17
CGS10323.LAG	SBC	P	2	0	0	2
	Total		292	1	0	291

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	Tagged	Mortalities	Shed	Released
CGS10081.LAD	SHR	Migratory	1	0	0	1
CGS10082.LAD	SHR	Migratory	1	0	0	1
CGS10098.LAG	SHR	Migratory	2	0	0	2
CGS10099.LAA	SHR	Migratory	1	0	0	1
CGS10102.LAD	SHR	Migratory	1	0	0	1
CGS10103.LAD	SHR	Migratory	1	0	0	1
CGS10104.LAD	SHR	Migratory	1	0	0	1
CGS10105.LAD	SHR	Migratory	2	0	0	2
CGS10106.LAA	SHR	Migratory	4	0	0	4
CGS10107.LAC	SHR	Migratory	75	0	0	75
CGS10108.LAC	SHR	Migratory	96	0	0	96
CGS10109.LAC	SHR	Migratory	81	0	0	81
CGS10110.LAC	SHR	Migratory	45	0	0	45
CGS10111.LAC	SHR	Migratory	23	0	1	22
CGS10112.LAC	SHR	Migratory	12	0	0	12
CGS10113.LAC	SHR	Migratory	14	0	0	14
CGS10114.LAC	SHR	Migratory	10	0	0	10
CGS10115.LAC	SHR	Migratory	4	0	0	4
CGS10116.LAD	SHR	Migratory	1	0	0	1
CGS10117.LAD	SHR	Migratory	1	0	0	1
CGS10118.LAD	SHR	Migratory	2	0	0	2
CGS10119.LAD	SHR	Migratory	1	0	0	1
CGS10120.LAD	SHR	Migratory	1	0	0	1
CGS10121.LAD	SHR	Migratory	3	0	0	3
CGS10122.LAD	SHR	Migratory	3	0	0	3
CGS10123.LAD	SHR	Migratory	2	0	0	2
CGS10124.LAD	SHR	Migratory	1	0	0	1
CGS10125.LAD	SHR	Migratory	2	0	0	2
CGS10128.LAD	SHR	Migratory	3	0	0	3
CGS10129.LAD	SHR	Migratory	1	0	0	1
CGS10130.LAD	SHR	Migratory	4	0	0	4
CGS10131.LAD	SHR	Migratory	3	0	0	3
CGS10132.LAD	SHR	Migratory	8	0	0	8
CGS10133.LAD	SHR	Migratory	8	0	0	8
CGS10134.LAD	SHR	Migratory	6	0	0	6
CGS10135.LAD	SHR	Migratory	9	0	0	9
CGS10136.LAD	SHR	Migratory	3	0	0	3
CGS10144.LAD	SHR	Migratory	2	0	0	2

Appendix B7, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10147.LAD	SHR	Migratory	2	0	0	2
CGS10148.LAD	SHR	Migratory	1	0	0	1
CGS10196.LAD	SHR	Migratory	1	0	0	1
		Total	442	0	1	441
CGS10116.LAB	SHH	Migratory	191	1	0	190
CGS10119.LAB	SHH	Migratory	198	1	0	197
CGS10126.LAB	SHH	Migratory	200	2	0	198
		Total	589	4	0	585
		Grand total	1,031	4	1	1,026

Appendix B8. Loss of PIT tags inserted into wild steelhead (SHR) parr (P) at the Twisp River smolt trap by tag file.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10064.LAD	SHR	P	1	0	0	1
CGS10066.LAD	SHR	P	2	0	0	2
CGS10071.LAD	SHR	P	1	0	0	1
CGS10076.LAD	SHR	P	1	0	0	1
CGS10077.LAD	SHR	P	1	0	0	1
CGS10078.LAD	SHR	P	1	0	0	1
CGS10081.LAD	SHR	P	3	0	0	3
CGS10082.LAD	SHR	P	1	0	0	1
CGS10084.LAD	SHR	P	2	0	0	2
CGS10085.LAD	SHR	P	2	0	0	2
CGS10089.LAD	SHR	P	1	0	0	1
CGS10090.LAD	SHR	P	1	0	0	1
CGS10092.LAD	SHR	P	1	0	0	1
CGS10094.LAD	SHR	P	4	0	0	4
CGS10096.LAA	SHR	P	1	0	0	1
CGS10097.LAA	SHR	P	1	0	1	0
CGS10098.LAG	SHR	P	2	0	0	2
CGS10100.LAD	SHR	P	2	0	0	2
CGS10101.LAD	SHR	P	1	0	0	1
CGS10102.LAD	SHR	P	1	0	0	1
CGS10103.LAD	SHR	P	1	0	0	1
CGS10104.LAD	SHR	P	1	0	0	1
CGS10105.LAD	SHR	P	6	0	0	6
CGS10106.LAA	SHR	P	6	0	0	6
CGS10107.LAC	SHR	P	17	0	0	17
CGS10108.LAC	SHR	P	33	0	0	33
CGS10109.LAC	SHR	P	31	0	0	31
CGS10110.LAC	SHR	P	48	0	0	48
CGS10111.LAC	SHR	P	9	0	0	9
CGS10112.LAC	SHR	P	12	0	0	12
CGS10113.LAC	SHR	P	9	0	0	9
CGS10114.LAC	SHR	P	19	0	0	19
CGS10115.LAC	SHR	P	11	0	0	11
CGS10116.LAD	SHR	P	12	0	0	12
CGS10117.LAD	SHR	P	12	0	0	12
CGS10118.LAD	SHR	P	3	0	0	3
CGS10119.LAD	SHR	P	2	0	0	2
CGS10121.LAD	SHR	P	7	0	0	7

Appendix B8, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10122.LAD	SHR	P	6	0	0	6
CGS10123.LAD	SHR	P	3	0	0	3
CGS10124.LAD	SHR	P	6	0	0	6
CGS10125.LAD	SHR	P	5	0	0	5
CGS10126.LAD	SHR	P	1	0	0	1
CGS10127.LAD	SHR	P	4	0	0	4
CGS10128.LAD	SHR	P	1	0	0	1
CGS10129.LAD	SHR	P	1	0	0	1
CGS10131.LAD	SHR	P	2	0	0	2
CGS10132.LAD	SHR	P	3	0	0	3
CGS10134.LAD	SHR	P	2	0	0	2
CGS10135.LAD	SHR	P	6	0	0	6
CGS10136.LAD	SHR	P	6	0	0	6
CGS10143.LAD	SHR	P	9	0	0	9
CGS10144.LAD	SHR	P	4	0	0	4
CGS10146.LAD	SHR	P	15	1	0	14
CGS10147.LAD	SHR	P	1	0	0	1
CGS10148.LAD	SHR	P	6	0	0	6
CGS10151.LAD	SHR	P	5	0	0	5
CGS10186.LAD	SHR	P	12	0	0	12
CGS10190.LAD	SHR	P	1	0	0	1
CGS10201.LAD	SHR	P	1	0	0	1
CGS10204.LAH	SHR	P	1	0	0	1
CGS10207.LAD	SHR	P	1	0	0	1
CGS10217.LAD	SHR	P	3	1	0	2
CGS10228.LAH	SHR	P	1	0	0	1
CGS10232.LAH	SHR	P	1	0	0	1
CGS10241.LAD	SHR	P	3	0	0	3
CGS10252.LAD	SHR	P	4	0	0	4
CGS10254.LAC	SHR	P	10	0	1	9
CGS10256.LAB	SHR	P	1	0	0	1
CGS10257.LAC	SHR	P	12	0	0	12
CGS10258.LAH	SHR	P	15	0	0	15
CGS10265.LAC	SHR	P	7	0	0	7
CGS10267.LAD	SHR	P	1	0	0	1
CGS10278.LAD	SHR	P	11	0	0	11
CGS10281.LAD	SHR	P	2	0	0	2
CGS10285.LAD	SHR	P	9	0	0	9

Appendix B8, continued.

Tag file	Species	Stage	Tagged	Mortalities	Shed	Released
CGS10288.LAD	SHR	P	1	0	0	1
CGS10295.LAD	SHR	P	1	0	0	1
CGS10322.LAH	SHR	P	1	0	0	1
	Total		454	2	2	450

Appendix C

2011 Methow Chinook salmon juvenile assignments

Maureen P. Small, Sarah Bell and Cheryl Dean
Conservation Biology Unit, Molecular Genetics Lab, WDFW
Final report, March 4, 2011

Summary
In fall 2010 emigrating natural-origin sub-yearling Chinook salmon were collected in the Methow River smolt trap. Since two genetically distinct types of Chinook salmon, a spring-run and summer-run, spawn in the Methow River, the juveniles could be from either or both run types. Further, the spring Chinook salmon population in the Twisp River, a tributary upstream of the smolt trap in the Methow River, is genetically distinct from Methow/Chewuch spring Chinook salmon population (Small et al. 2007) and juveniles may have originated in the Twisp spring Chinook salmon population. We investigated the genetic identity of the juvenile Chinook salmon through comparisons to adult spring and summer Chinook salmon collections from the Methow River and adult spring Chinook salmon from the Twisp River. We found that the 84% of the juveniles were summer type. Roughly 20% of the spring type originated in the Twisp population and less than 4% appeared to have mixed spring-summer ancestry.

Methods
We genotyped 392 juvenile Chinook salmon (WDFW collection code 10DY, Table 1) at the 13 standardized GAPS loci as described in Small et al. (2007) and compared them to Twisp River spring Chinook, and Methow River spring and summer Chinook salmon genotyped at the same loci. All genetic lab procedures were the same for the 10DY juveniles with the exception that the polymerase chain reaction protocol was changed to a “touch-down” where in the first three PCR cycles the annealing temperature drops one degree each cycle from an initial temperature of 60ºC, then follow 36 cycles with an annealing temperature of 50ºC. The summer-run Methow River Chinook salmon collection genotypes were from the GAPS v2.1 database archive (Scott Blankenship, WDFW, personal communication).

Juvenile identities were examined from three perspectives. In the first examination, individuals were plotted in a factorial correspondence analysis (FCA) plot using the program GENETIX (Belkhir et al. 2004). This analysis constructs composite axes based upon allele frequencies that best describe the variation in the data set and plots individuals within the allelic space based upon their individual genotype. Individuals that are similar genetically plot near each other and individuals that are different genetically plot far from each other. The next analysis examined individual ancestry using a Bayesian analysis implemented in STRUCTURE (Pritchard et al. 2000). In this analysis, we hypothesized that there were two groups in the data set, spring and summer Chinook salmon, and estimated individual ancestry in two groups. Without knowledge of the identity of individuals the program sorts the data set in order to achieve Hardy-Weinberg equilibrium and minimize linkage disequilibrium in each hypothesized group. To further identify juvenile origins, we used assignment tests implemented in GENECLASS (Piry et al.

2004) with the Rannala and Mountain algorithm (Rannala and Mountain 1997) to calculate the likelihood that the juvenile came from the Methow spring or summer Chinook salmon collection or the Twisp summer Chinook salmon collection based on the genotype of the individual and the allele frequencies of the baseline collections.

Results and discussion

Four juveniles were eliminated from the analysis because the DNA failed to amplify or amplified at fewer than eight loci, preventing definitive assignment, leaving 388 juveniles for the analysis. In the FCA, most juveniles plotted on the right side of axis 1 in the space occupied by the Methow adult summer Chinook salmon (Figure 1) suggesting that the majority of the smolts were produced by summer Chinook salmon. Sixty-three juveniles plotted on the left side of axis 1 and in the space occupied by the adult spring Chinook salmon. Of these fish, some clustered with the Methow spring Chinook salmon and some clustered with the Twisp spring Chinook salmon, and some plotted in the space between the spring and summer clusters, suggesting possible hybrid status. The cluster pattern of the putative spring Chinook salmon smolts suggested that the smolts arose from two spring Chinook salmon populations.

The STRUCTURE analysis divided the adult spring and summer Chinook salmon into two distinct clusters (Figure 2). Fifty-six juveniles had 90% or greater ancestry in the summer Chinook salmon cluster (Table 2) and these individuals also plotted in the summer Chinook salmon space in the FCA (data not shown for individuals). Ten individuals had roughly 60 to 89% ancestry in the summer Chinook salmon cluster suggesting that they were backcrossed or a hybrid beyond the first generation (F1). Two individuals had roughly equal in the summer and spring Chinook salmon clusters suggesting that they were first generation hybrids (Table 2). Note: we included only Methow River spring and summer collections in the STRUCTURE analysis to decrease the complexity of the analysis since genetic variance between Twisp and Methow spring Chinook salmon populations is below the resolving power of STRUCTURE.

Results from GENECLASS paralleled the FCA and STRUCTURE analyses and provided further resolution (Figure 3 and Table 3). We plotted the negative log likelihood assignment values for the juveniles and for the adult spring and summer Chinook salmon collections (Figure 3). The plot shows that the adult spring and summer Chinook salmon assigned well to their respective groups, with the spring Chinook salmon plots overlapping. The distinction and overlap indicated high power for distinguishing genetically between run groups and lower power for distinguishing between spring populations because of lower differentiation between spring Chinook salmon collections. The plot also shows that the majority of juveniles assigned to the summer collection and a minority to the spring collections.

We used a 90% posterior probability of assignment for a positive assignment in GENECLASS. The posterior probability, or relative likelihood, is calculated by dividing the highest likelihood value by the sum of the likelihood values and multiplying by 100. Ambiguity arises when highest and next highest assignment likelihoods are similar such that the posterior probability is < 90% and the fish is considered unassigned by our criteria. With the >90% criterion, GENECLASS assigned 9 juveniles to the Twisp spring Chinook salmon collection, 35 juveniles to the Methow spring Chinook salmon collection and 284 juveniles to the Methow summer Chinook salmon collection. Twelve out of 13 juveniles were unassigned because they had nearly equal likelihoods of assignment to Twisp and Methow spring Chinook salmon collections and were thus spring Chinook salmon of undetermined origin (Table 3). The 56 spring Chinook salmon juveniles had over 90% ancestry in the spring cluster in the STRUCTURE analysis. Most spring Chinook salmon juveniles occurred at the end of the dataset (Table 2 and Table 3). If samples were collected in a time series this would indicate that the spring Chinook salmon sub-yearlings out-migrated later than the summer Chinook salmon smolts. Most spring Chinook salmon juveniles (44/56) identified by STRUCTURE were unambiguously assigned by GENECLASS to a spring Chinook salmon population, either Twisp or Methow. Twelve out of 56 spring Chinook salmon juveniles were ambiguous in the GENECLASS analysis yet had over 90% ancestry in the spring cluster. These were clearly spring Chinook salmon but the individuals had alleles in their genotypes that were common in both spring Chinook salmon populations in the baseline and GENECLASS calculated similar assignment likelihoods to both collections such that their relative likelihood of assignment was low for a single collection. The Methow and Twisp spring Chinook salmon populations are distinct from each other but they are more similar to each other than to the Methow fall Chinook salmon population so that individuals may assign with similar likelihoods to both spring Chinook salmon collections.

The 13 fish that STRUCTURE identified with mixed ancestry assigned with >90% relative likelihood to the summer Chinook salmon collection (see Table 2 and Table 3). Their ancestry was primarily summer Chinook salmon, which is very distinct from spring Chinook salmon. Although they had some alleles that STRUCTURE detected as spring Chinook salmon alleles, the majority of their alleles were from summer Chinook salmon such that GENECLASS assigned them with high likelihood to the summer Chinook salmon baseline population. The allele pool for the STRUCTURE analysis was different from the GENECLASS analysis since Twisp spring Chinook salmon were absent from the STRUCTURE analysis. This may have contributed to slight differences between analyses.

Two hundred and eighty four smolts assigned with > 90% relative likelihood to the Methow summer Chinook salmon collection. These smolts also had over 90% ancestry in the cluster occupied by summer Chinook salmon in the STRUCTURE analysis and plotted with the summer Chinook salmon in the FCA. Smolts collected in 2006 and 2007 in the Methow River smolt trap were mainly spring Chinook salmon (Small and Von Bargen 2009). If the timing of smolt trapping differed between collection years, this would support different out-migration times for smolts from the different run groups.

Conclusions

The different genetic perspectives offered congruent results: 16% of the emigrating juvenile Chinook salmon were offspring of spring Chinook salmon and 84% were offspring of summer Chinook salmon.

Acknowledgments

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Figure 1. Factorial correspondence analysis plot from GENETIX. Each individual in plotted along the first two axes in the analysis, these axes describe a maximum amount of genetic variance in the dataset. Individuals plotting near each other are more similar genetically.

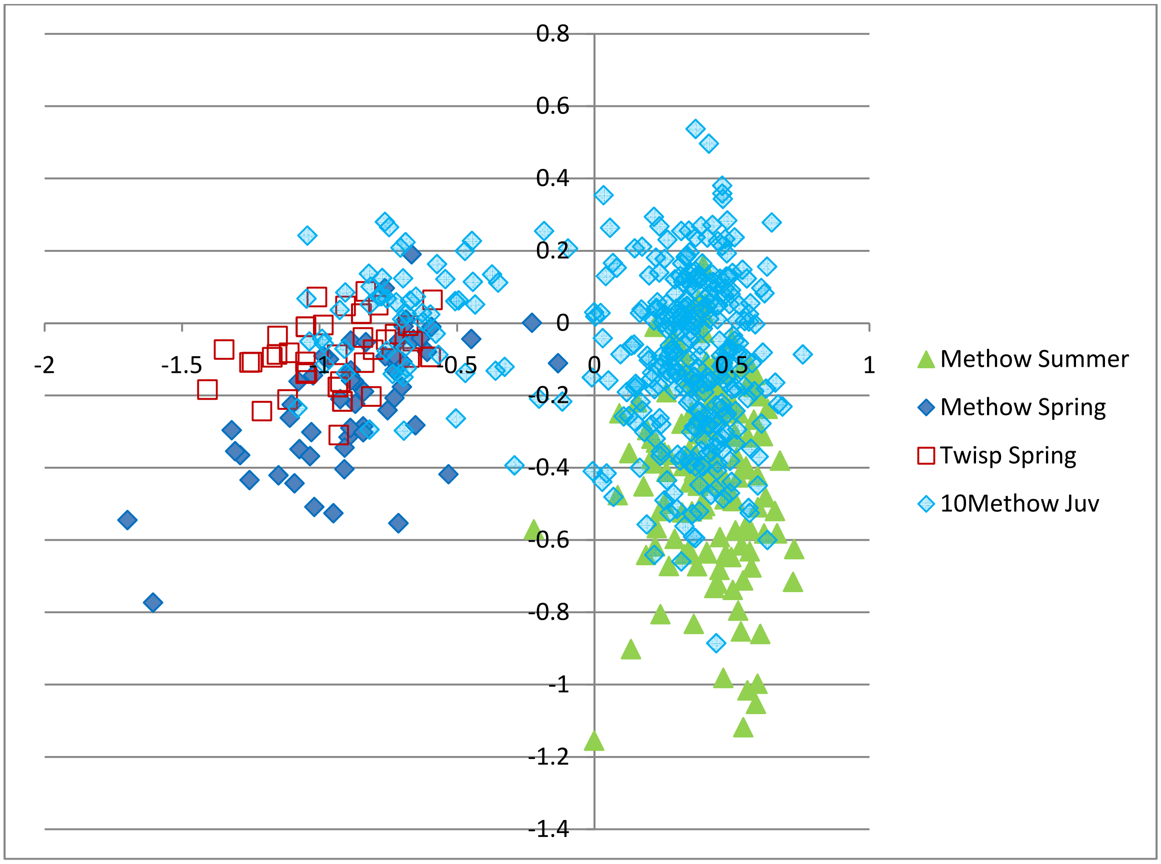

Figure 2. Ancestry values for individual fish calculated in STRUCTURE. Each fish is represented by a bar of color with red corresponding to summer Chinook salmon ancestry and green corresponding to spring Chinook salmon ancestry. Individuals with “pure” ancestry have a single color in their bar and individuals with “mixed” ancestry have two colors in their bar. Individuals are in order of the collection code number so juveniles with spring ancestry can be compared with STRUCTURE ancestry values in Table 2 and GENECLASS assignments in Table 3**.** Most of the spring Chinook salmon smolts were the last in the number series (see Table 3 for individual sample numbers).

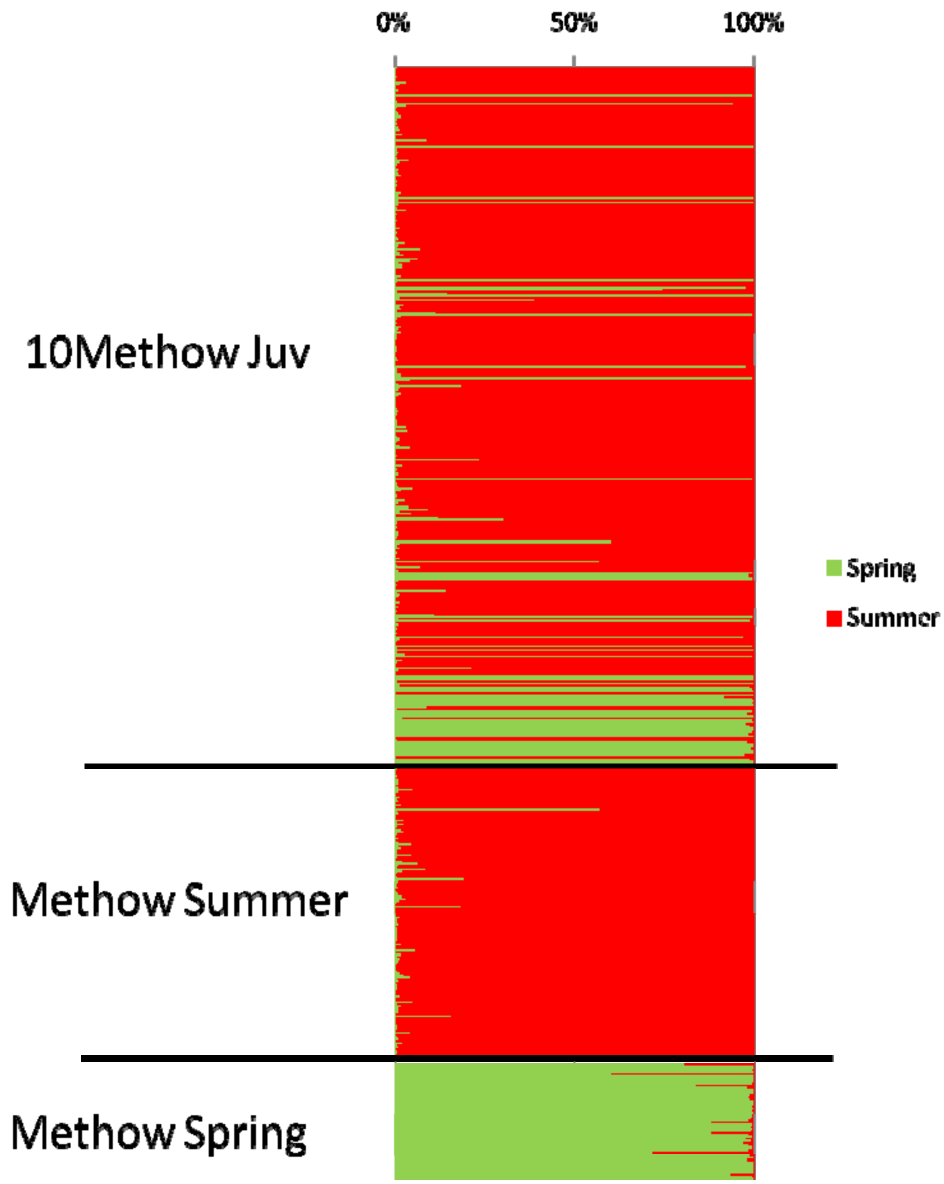

Figure 3. Graph of negative log likelihood assignment scores from GENECLASS. Methow juveniles (blue triangles) are abbreviated Juv.

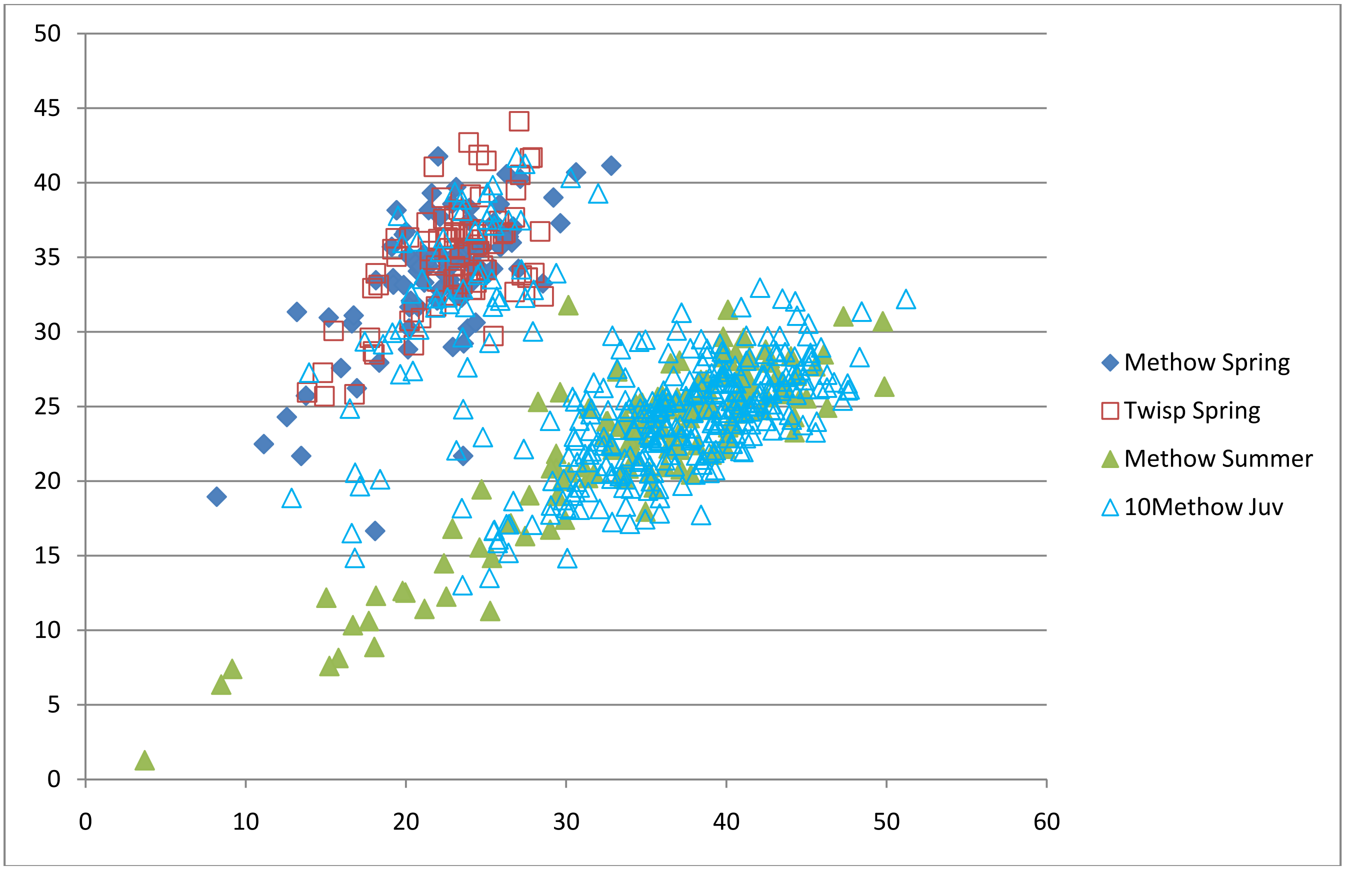

Table 1. List of samples used in the 10Methow Chinook salmon juvenile assignment tests. For the Methow juveniles 392 were processed but only 388 had enough genotypic data (at least eight loci) to include in the study.

Code	Name	N
10DY	Methow juveniles - 2010	388/392
05HW	Methow spring	42
06DA	Methow spring	33
05HX	Twisp spring	42
06DA	Twisp spring	45
93EC	GAPS Methow summer	143

Table 2. Juvenile ancestry values from STRUCTURE. Only the spring Chinook salmon ancestry and mixed ancestry individual data are shown, the others are summer Chinook salmon. See Figure 2 for graphic STRUCTURE data – percentage of ancestry in the two clusters (here spring and summer) is shown as percentage of colors in color bar in Figure 2.

	Clusters				Clusters		
sample	Spring	Summer	status	sample	Spring	Summer	status
10DY0062	0.993	0.007	spring	10DY0349	0.994	0.006	spring
10DY0066	0.940	0.060	spring	10DY0351	0.995	0.005	spring
10DY0087	0.997	0.003	spring	10DY0353	0.985	0.015	spring
10DY0112	0.995	0.005	spring	10DY0354	0.992	0.008	spring
10DY0114	0.997	0.003	spring	10DY0355	0.994	0.006	spring
10DY0153	0.995	0.005	spring	10DY0357	0.995	0.005	spring
10DY0158	0.974	0.026	spring	10DY0358	0.913	0.087	spring
10DY0159	0.742	0.258	backcross	10DY0359	0.993	0.007	spring
10DY0161	0.147	0.853	backcross	10DY0360	0.995	0.005	spring
10DY0162	0.996	0.004	spring	10DY0361	0.992	0.008	spring
10DY0164	0.387	0.613	backcross	10DY0362	0.996	0.004	spring
10DY0170	0.115	0.885	backcross	10DY0365	0.993	0.007	spring
10DY0171	0.990	0.010	spring	10DY0366	0.977	0.023	spring
10DY0197	0.975	0.025	spring	10DY0367	0.995	0.005	spring
10DY0202	0.990	0.010	spring	10DY0370	0.990	0.010	spring
10DY0206	0.185	0.815	backcross	10DY0371	0.994	0.006	spring
10DY0242	0.234	0.766	backcross	10DY0372	0.974	0.026	spring
10DY0251	0.990	0.010	spring	10DY0373	0.983	0.017	spring
10DY0270	0.120	0.880	backcross	10DY0374	0.995	0.005	spring
10DY0271	0.303	0.697	backcross	10DY0375	0.994	0.006	spring
10DY0282	0.599	0.401	F1	10DY0376	0.993	0.007	spring
10DY0292	0.567	0.433	F1	10DY0377	0.982	0.018	spring
10DY0298	0.995	0.005	spring	10DY0378	0.994	0.006	spring
10DY0299	0.984	0.016	spring	10DY0381	0.976	0.024	spring
10DY0300	0.996	0.004	spring	10DY0382	0.996	0.004	spring
10DY0306	0.142	0.858	backcross	10DY0383	0.994	0.006	spring
10DY0318	0.109	0.891	backcross	10DY0384	0.989	0.011	spring
10DY0319	0.994	0.006	spring	10DY0385	0.996	0.004	spring
10DY0321	0.987	0.013	spring	10DY0386	0.995	0.005	spring
10DY0329	0.968	0.032	spring	10DY0387	0.971	0.029	spring
10DY0333	0.991	0.009	spring	10DY0389	0.984	0.016	spring
10DY0335	0.995	0.005	spring	10DY0390	0.994	0.006	spring
10DY0338	0.993	0.007	spring	10DY0391	0.994	0.006	spring
10DY0344	0.214	0.786	backcross	10DY0392	0.975	0.025	spring
10DY0348	0.996	0.004	spring				

Table 3. Juvenile assignment data from GENECLASS. Baseline categories are labeled MetSum (yellow) for Methow summer, MetSpr (blue) for Methow spring and TwispSpr (green) for Twisp spring. Assign 1 are assignments with the highest likelihood (all fish had a highest assignment likelihood to a single collection) and “Assign >90” are assignments with greater than 90% relative likelihood (highest likelihood/sum of likelihoods); values over 90% are in red. “Unassigned” fish had <90% relative likelihood and thus similar assignment likelihoods to two collections. Table at top is a summary of assignments to baseline collections. Assign > 90 is a sum of assignments with over 90% relative likelihood and “Assign 1” is a sum of all Assign 1 assignments.

	Methow	Methow	Twisp	unass
>90%	284	35	9	13
Assign 1	286	44	12	

sample	Assign 1	Rel Like	Assign >90
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSpring	99.31	MetSpri
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSpring	99.31	MetSpri
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	98.88	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum

sample	Assign 1	Rel Like	Assign >90
10DY016	MetSum	100.00	MetSum
10DY016	MetSum	100.00	MetSum
10DY016	MetSum	100.00	MetSum
10DY016	MetSum	100.00	MetSum
10DY016	MetSum	100.00	MetSum
10DY016	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	TwispS	68.52	unassign
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY017	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY018	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY019	MetSpri	98.21	MetSprin
10DY019	MetSum	100.00	MetSum
10DY019	MetSum	100.00	MetSum
10DY020	MetSum	100.00	MetSum
10DY020	MetSum	100.00	MetSum
10DY020	MetSpri	100.00	MetSprin

sample	Assign 1	Rel Like	Assign >90
10DY027	MetSum	100.00	MetSum
10DY027	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	99.93	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY028	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	99.94	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSum	100.00	MetSum
10DY029	MetSpri	100.00	MetSprin
10DY029	MetSpri	99.78	MetSprin
10DY030	MetSpri	99.92	MetSprin
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY030	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum
10DY031	MetSum	100.00	MetSum

10DY00	MetSpring	99.97	MetSpri	10DY020	MetSum	100.00	MetSum	10DY031	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY031	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY031	MetSpri	99.98	MetSprin
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY032	TwispS	99.95	TwispSp
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY020	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	MetSum	100.00	MetSum
10DY00	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY032	TwispS	90.57	TwispSp
10DY01	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY021	MetSum	100.00	MetSum	10DY033	MetSpri	99.94	MetSprin
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSpri	100.00	MetSprin
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSpri	100.00	MetSprin
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY033	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	TwispSpr	99.63	TwispS	10DY022	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY022	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSpring	51.64	unassign	10DY023	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY034	MetSum	100.00	MetSum
10DY01	MetSum	98.61	MetSum	10DY023	MetSum	100.00	MetSum	10DY034	MetSpri	100.00	MetSprin
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY034	MetSpri	62.79	unassign
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY035	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY035	MetSpri	60.02	unassign
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY035	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY023	MetSum	100.00	MetSum	10DY035	MetSpri	99.65	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSpri	89.44	unassign
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSpri	99.93	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSpri	99.99	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSpri	60.19	unassign
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY035	MetSpri	99.99	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY036	MetSpri	100.00	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY036	MetSpri	86.33	unassign
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY036	MetSpri	99.52	MetSprin
10DY01	MetSum	100.00	MetSum	10DY024	MetSum	100.00	MetSum	10DY036	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY036	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY025	MetSpri	99.97	MetSprin	10DY036	MetSpri	100.00	MetSprin
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY036	MetSpri	95.91	MetSprin
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY036	TwispS	99.91	TwispSp
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY036	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY037	TwispS	99.96	TwispSp
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY037	MetSpri	99.88	MetSprin
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY037	MetSpri	93.31	MetSprin
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY037	TwispS	59.28	unassign
10DY01	MetSum	100.00	MetSum	10DY025	MetSum	100.00	MetSum	10DY037	TwispS	98.52	TwispSp
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY037	MetSpri	68.33	unassign
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY037	TwispS	100.00	TwispSp

10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY037	MetSpri	91.41	MetSprin
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY037	MetSpri	99.95	MetSprin
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY037	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	92.36	MetSum	10DY038	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY038	MetSpri	99.41	MetSprin
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY038	MetSpri	99.93	MetSprin
10DY01	MetSpring	100.00	MetSpri	10DY026	MetSum	100.00	MetSum	10DY038	MetSpri	99.98	MetSprin
10DY01	MetSum	100.00	MetSum	10DY026	MetSum	100.00	MetSum	10DY038	TwispS	99.75	TwispSp
10DY01	MetSum	100.00	MetSum	10DY027	MetSum	100.00	MetSum	10DY038	TwispS	90.46	TwispSp
10DY01	MetSum	100.00	MetSum	10DY027	MetSum	100.00	MetSum	10DY038	MetSpri	60.60	unassign
10DY01	MetSpring	100.00	MetSpri	10DY027	MetSum	100.00	MetSum	10DY038	MetSpri	99.95	MetSprin
10DY01	MetSum	55.21	unassign	10DY027	MetSum	100.00	MetSum	10DY038	MetSum	100.00	MetSum
10DY01	MetSum	100.00	MetSum	10DY027	MetSum	100.00	MetSum	10DY038	MetSpri	99.98	MetSprin
10DY01	MetSum	100.00	MetSum	10DY027	MetSum	100.00	MetSum	10DY039	MetSpri	99.87	MetSprin
10DY01	MetSpring	73.94	unassign	10DY027	MetSum	100.00	MetSum	10DY039	MetSpri	99.94	MetSprin
10DY01	MetSum	100.00	MetSum	10DY027	MetSum	100.00	MetSum	10DY039	TwispS	82.95	unassign

Chapter 4

2010 Brood Summer Steelhead Spawning Ground Surveys Conducted in the Methow River Basin

Abstract

Steelhead spawning ground surveys were performed to estimate the relative abundance, distribution, and timing of spawning within the Methow River basin. Based on surveys conducted between 22 February and 7 June, an estimated minimum of 1,720 steelhead redds were constructed in the Methow Basin in 2010. The greatest numbers of redds were found in the lower and upper Methow River subbasins (N = 559 and 505, respectively). The Twisp River (N = 332) and Chewuch River (N = 324) subbasins had similar numbers of redds. The run-at-large above Wells Dam was composed primarily of hatchery origin steelhead (92.1%). Based on biological sampling of steelhead during broodstock collection at Wells Hatchery, 17.4% of total escapement was composed of out-of-basin stray hatchery fish, primarily from the Wenatchee River. Based on passive integrated transponder (PIT) tag detection at instream antenna arrays, out-of-basin hatchery steelhead may have comprised between 2.6 and 43.0% of the spawning population of some tributaries within the Methow Basin. Based on sampling conducted each Monday during the broodstock collection period, there were no significant differences in migration timing by fish origin or salt age. No significant differences in spawn timing of hatchery and wild female steelhead were observed in the hatchery environment (non-hormone-injected females) or during natural spawning in the Twisp River. Based on run-escapement estimates, the mean natural replacement rate for the nine most recent broods of steelhead spawning above Wells Dam (1996-2004) was 0.26 recruits per adult. For all brood years examined (1996-2004), the hatchery replacement rate was significantly greater than the natural replacement rate.

Introduction

Summer steelhead are propagated at Wells Hatchery and used to supplement the natural spawning populations in the Methow and Okanogan rivers. 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 analyses, but also for assessing freshwater smolt production. Knowledge of both the productivity of the population (i.e., recruits per spawner), as related to the 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 is also helpful in explaining observed levels of productivity.

The implementation of the Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs (Hays et al. 2007) as proposed by Murdoch and Snow (2009) 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 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 are conducted in the Okanogan Basin by the Colville Confederated Tribes and those activities are reported separately (see Miller et. al, 2011) unless specifically relevant to Methow Basin activities. This chapter addresses activities related to steelhead spawning ground surveys in 2010 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 $_{\text{Supplemented population}} \geq \Delta$ 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 expected value (BAMP 1998).

- Ho: HRR $_{\text{Year x}} \geq$ 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 $_{\text{Hatchery fish}} \leq$ 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 at Wells Dam from a composite of both the Methow and Okanogan populations. 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 (Truscott 2009). All trapped steelhead were sampled for hatchery marks, and scale samples were collected from all unmarked fish to determine origin (i.e., hatchery or wild). Additionally, scale samples were collected from fish trapped each Monday to determine origin and age composition of the entire run. Migration timing of local hatchery (i.e., Wells stock) and wild fish was calculated using all trapped fish for which age and origin could be determined. Dam passage date (day of the year) was categorized by fish salt-age and origin.

Steelhead passing Wells Dam were subjected to local selective fisheries, and creel surveys were used to estimate the number of steelhead removed from the Methow, Columbia, Okanogan, and Similkameen River basins (see Chapter 2). Run escapement estimates were calculated for the Methow and Okanogan rivers by applying the proportion of fish that migrated to each basin based on results of local radio-telemetry studies (English et al. 2001, 2003) to the estimated number of hatchery and wild steelhead passing Wells Dam. Basin-specific fishery removal and indirect mortality (5%) estimates were then subtracted from the estimated escapement to each basin to determine the number of steelhead available for natural spawning. Dam fallback and double counting of fish at Wells Dam were estimated using data from passive integrated transponder (PIT) tag detections at Columbia River hydroelectric facilities or within tributaries. Fish that were detected at dams or within tributaries downstream of Wells Dam after their last detection at Wells Dam were considered fallbacks; fish were not considered fallbacks if downstream detection (e.g., Rocky Reach juvenile bypass) was consistent with likely kelt migration timing. Total fallback was calculated by expanding the estimated fallback proportion to the run-at-large passing Wells Dam. Further, PIT tag records were reviewed to determine if fish migrated through fish ladders more than once; these events cause overestimation of the total count at Wells Dam; the total number of double counted fish was also expanded to the run-at-large. No estimates were made of pre-spawn mortality or illegal removal (i.e., poaching).

Migration timing to the Twisp River was evaluated using PIT tag interrogation at the Twisp River instream array (rkm 68.7). Upstream migration timing in the Twisp River was calculated as the number of days between last interrogation at the instream array and first capture at the Twisp weir. Kelt emigration timing was calculated as the number of days from last observation at Twisp weir to first interrogation at the instream array.

Spawn Timing and Redd Distribution

Spawn timing within the hatchery environment was assessed during normal spawning operations at Wells Hatchery. Although spawning typically occurs much earlier in the hatchery than in the natural environment, any relative differences observed in the broodstock may also be present in the natural environment.

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 date, redd number, and location recorded on each flag. Each redd was also recorded with hand-held global positioning system (GPS) devices for subsequent mapping. When spawning was perceived to be near peak, non-index areas were surveyed to obtain 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:total proportion of redds from index area counts. Index area surveys continued after peak spawning, and additional expansions were made in non-index areas based on the proportion of additional redds found within index areas after peak spawning. 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 2007).

Table 1. Upper Methow River subbasin survey reaches (index reaches in bold).

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Upper Methow	Ballard CG. - Lost River Confluence	M15	120.8	116.8	4.0
	Lost River Confluence - Gate Creek	M14	116.8	112.0	4.8
	Gate Creek - Early Winters Creek	M13	112.0	107.8	4.2
	Early Winters Creek - Mazama Bridge	M12	107.8	104.6	3.2
	Mazama Bridge - Suspension Bridge	**M11**	**104.6**	**100.6**	**4.0**
	Suspension Bridge - Weeman Bridge	**M10**	**100.6**	**95.4**	**5.2**
	Weeman Bridge - Along Hwy 20	M9	95.4	86.4	9.0
	Along Highway 20 - Wolf Creek	M8	86.4	84.2	2.2
	Wolf Creek - Foghorn Dam	M7	84.2	82.4	1.8
	Foghorn Dam - Winthrop Bridge	M6	82.4	79.7	2.7
Lost River	Sunset Creek - Eureka Creek	L3	11.2	6.6	4.6
	Eureka Creek - Lost River Bridge	L2	6.6	0.8	5.8
	Lost River Bridge - Confluence	**L1**	**0.8**	**0.0**	**0.8**
Early Winters Cr.	Klipchuck CG. - Early Winters Bridge	EW5	7.2	5.8	1.4
	Early Winters Bridge - Hwy 20 Bridge	EW4	5.8	3.7	2.1
	Highway 20 Bridge – Diversion dam	EW3	3.7	0.8	2.9
	Diversion dam - Hwy 20 Bridge	**EW2**	**0.8**	**0.5**	**0.3**
	Hwy 20 Bridge - Confluence	**EW1**	**0.5**	**0.0**	**0.5**
Suspension Creek	100m above fork - Confluence	Susp1	0.3	0.0	0.3
Little Susp. Creek	50m above fork - Confluence	Lsusp1	0.1	0.0	0.1
Hancock Cr.	Springs - Wolf Creek Road	HA2	1.1	0.2	0.9
	Wolf Creek Road - Confluence	HA1	0.2	0.0	0.2
Gate Creek	Culvert - Confluence	GA1	0.3	0.0	0.3
MH Outfall[1]	Hatchery to Methow River	MH1	0.4	0.0	0.4
WNFH Outfall[2]	Hatchery to Methow River	WN1	0.4	0.0	0.4

[1]Methow State Fish Hatchery outfall.
[2]Winthrop National Fish Hatchery outfall.

Table 2. Lower Methow River subbasin survey reaches (index reaches in bold).

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Lower Methow	Winthrop Bridge - MVID Dam	M5	80.1	72.1	8.0
	MVID - Twisp Confluence	M4	72.1	64.9	7.2
	Twisp Confluence - Carlton Bridge	M3	64.9	43.8	21.1
	Carlton Bridge - Upper Burma Br.	**M2**	**43.8**	**20.1**	**23.7**
	Upper Burma Bridge - Pateros	M1	20.1	0	20.1
Beaver Creek	Lester Hill Road - Balky Hill Road	BV3	14.2	9.3	4.9
	Balky Hill Road - 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 (index reaches in bold).

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Twisp River	Road's End CG. - South Creek Bridge	T10	46.4	41.8	4.6
	South Cr. Bridge - Poplar Flats CG.	T9	41.8	38.6	3.2
	Poplar Flats CG. - Mystery Bridge	T8	38.6	35.4	3.2
	Mystery Bridge - War Creek Bridge	T7	35.4	28.5	6.9
	War Creek Bridge - Buttermilk Bridge	T6	28.5	21.1	7.4
	Buttermilk Br. - Little Bridge Cr.	**T5**	**21.1**	**15.2**	**5.9**
	Little Bridge Creek - Twisp Weir	**T4**	**15.2**	**11.4**	**3.8**
	Twisp Weir - Upper Poorman Bridge	T3	11.4	7.8	3.6
	Up. Poorman Br. - Low. Poorman Br.	T2	7.8	2.9	4.9
	Lower Poorman Bridge - Confluence	T1	2.9	0.0	2.9
Little Bridge Creek	Road’s End - Vetch Creek	LBC4	9.1	7.8	1.3
	Vetch Creek - Upper Culvert	LBC3	7.8	4.8	3.0
	Upper Culvert - Lower Culvert	LBC2	4.8	2.4	2.4
	Lower Culvert - 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 (index reaches in bold).

Stream	Section	Code	Section length (rkm)		
			Begin	End	Total
Chewuch River	Chewuch Falls - 30 Mile Bridge	C13	54.4	50.2	4.2
	30 Mile Bridge - Road Side Camp	C12	50.2	45.6	4.6
	Road Side Camp - Andrews Creek	C11	45.6	41.3	4.3
	Andrews Creek - Lake Creek	C10	41.3	37.3	4.0
	Lake Creek - Buck Creek	C9	37.3	35.0	2.3
	Buck Creek - Camp 4 C.G.	C8	35.0	32.6	2.4
	Camp 4 C.G. - Chewuch CG.	C7	32.6	27.5	5.1
	Chewuch CG. - Falls Creek CG.	C6	27.5	21.8	5.7
	Falls Creek CG. - Eightmile Creek	C5	21.8	18.1	3.7
	Eightmile Creek - Boulder Creek	**C4**	**18.1**	**14.4**	**3.7**
	Boulder Creek - Chewuch Bridge	C3	14.4	12.6	1.8
	Chewuch Bridge - WDFW Land	C2	12.6	5.1	7.5
	WDFW Land - Confluence	C1	5.1	0.0	5.1
Cub Creek	W. Chewuch Road - Confluence	CU1	1.0	0.0	1.0
Eightmile Creek	**300m above diversion - Bridge**	**EM2**	**1.1**	**0.6**	**0.5**
	Bridge - Confluence	**EM1**	**0.6**	**0.0**	**0.6**

The logistical challenges of systematically sampling numerous low-order tributaries in the Methow Basin precluded the use of annual index areas for each tributary. Therefore, a rotating panel methodology was used to estimate redd abundance in smaller streams without annual index areas. 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. The length of suitable steelhead spawning was field-verified and adjusted based on data from the previous studies (LFA 2000).

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 - Confluence)	2004, 2008	LBO1	0.2
Wolf Creek (Rd 5505 access – Footbridge)	2005, 2009	W2	1.9
Wolf Creek (Footbridge – Confluence)	2005, 2009	W1	0.5
Goat Creek (FR 52 Bridge - Confluence)	2006, 2010	GT1	2.2
Lower Methow subbasin			
Gold Creek Upper N.F. (10.0 rkm – 6.3 rkm)[a]	2005, 2008	GDN4	3.7[a]
Gold Creek Middle N.F. (6.3 rkm - N.F. Bridge)	2005, 2008	GDN3	0.9
Gold Cr. Mid. N.F. (N.F. Br. - Whispering Pines)	2005, 2008	GDN2	1.5
Gold Cr. Lower N.F. (Whispering Pines - 2nd Br.)	2005, 2008	GDN1	1.4
Gold Creek S.F. (1st Culvert - 1.7 rkm)	2005, 2008	GDS3	4.4
Gold Creek S.F. (1.7 rkm - 0.6 rkm)	2005, 2008	GDS2	1.1
Gold Creek S.F. (0.6 rkm – Confluence)	2005, 2008	GDS1	0.6
Gold Creek Mainstem (2nd Bridge - Private Land)	2005, 2008	GDM2	1.2
Gold Creek Mainstem (Private Land - Confluence)	2005, 2008	GDM1	1.3
Foggy Dew Creek (FR 200 - Confluence)	2005, 2008	FD1	4.2
Libby Creek (Lower Public Land)	2006, 2009	LB4	1.0
Libby Creek (Lower Public Land - Realty Land)	2006, 2009	LB3	1.1
Libby Creek (Realty Land)	2006, 2009	LB2	0.3
Libby Creek (Realty Land - Confluence)	2006, 2009	LB1	1.0
Black Canyon Creek (1st Culvert - 0.8 rkm)	2007, 2010	BC2	1.0
Black Canyon Creek (0.8 rkm - Confluence)	2007, 2010	BC1	0.8
Twisp subbasin			
Eagle Creek (FR 4430 Culvert - Confluence)	2004, 2008	EA1	0.5
War Creek (FR 4430 - Confluence)	2005, 2009	WR1	1.0
Buttermilk Creek (Fork - Cattle Guard)	2006, 2010	BM2	2.1
Buttermilk Creek (Cattle Guard - Confluence)	2006, 2010	BM1	2.0
South Creek (Falls - Confluence)	2007	SO1	0.6
Chewuch subbasin			
Andrews Creek (Little Andrews Creek – 1st Br.)	2004, 2008	AN2	0.3
Andrews Creek (1st Bridge - Confluence)	2004, 2008	AN1	0.2
Boulder Creek (Falls - 1st Bridge)	2005, 2006, 2010	BD2	0.8
Boulder Creek (1st Bridge - Confluence)	2005, 2006, 2010	BD1	0.8
Lake Creek (Black Lake - 1st Bridge)	2009	LK2	11.3
Lake Creek (1st Bridge - Confluence)	2009	LK1	0.8
Twentymile Creek (Falls – FR 5010)	2007	TW2	0.9
Twentymile Creek (FR 5010 - Confluence)	2007	TW1	0.1

[a] Distance surveyed since 2009.

In 2010, redd counts derived from existing survey methodologies were compared with total redd counts derived from weekly surveys in the Twisp River subbasin and rotating panel streams throughout the Methow Basin. All rotating panel stream reaches were surveyed multiple times during the spawning season. Redd estimates derived from total counts were compared to those derived from index-area expansions to examine potential differences between the two methodologies.

An evaluation of spawn timing and redd distribution in the natural environment was conducted on the Twisp River. Adult steelhead on their upstream spawning migration were trapped at the Twisp Weir and sampled for hatchery marks, sex, and origin. All naturally produced fish were sampled, tagged and released upstream from the weir. Hatchery fish were also sampled, tagged, and released upstream of the weir consistent with escapement goals. Initial escapement goals for the Twisp River steelhead comprise equal proportions of naturally produced and hatchery fish. When carrying capacity estimates are developed, based on empirical data, the annual proportion of hatchery fish could be adjusted accordingly. All excess hatchery steelhead were lethally removed from the spawning population. All female steelhead released upstream received uniquely colored anchor tags that represented their origin and hatchery mark type (orange = wild female, blue = ad-clipped hatchery female, yellow = ad-present, yellow elastomer-only hatchery female). These tags were used to assess the spawn timing and location of hatchery and wild fish. Female steelhead that were not already PIT-tagged were PIT-tagged in the body cavity to increase the likelihood of the PIT tag being expelled into the redd during spawning. All male steelhead released upstream were PIT-tagged in the pelvic girdle. During surveys, redds were scanned with PIT tag readers to document tag deposition. While observations of anchor tagged fish on redds were used for spawn timing analyses, both anchor tag observations and PIT tag detections from redds were used to determine redd distribution.

Natural Replacement Rate (NRR) and Stray Rates

To estimate run escapement (parent broods) to the Methow Basin, steelhead returning to Wells Dam were apportioned to the Methow Basin based on radio-telemetry data (English et al. 2001, 2003). The NRR for each brood was calculated by adding the number of recruits (*r*), based on total age determined from scales, 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:

$$\mathrm{NRR} = (r_{i+1} + r_{i+2} + r_{i+3} + \ldots)/S$$

Estimated spawning escapement of parent broods (*S*) are apportioned to the Methow and Okanogan basins based on radio telemetry data applied to run-at-large sampling totals at Wells Dam. Fish collected for broodstock and incidental mortality as a result of the local fishery were excluded from escapement totals. Recently, PIT tags have provided the ability to estimate fallback and the total number of double counted fish at Wells Dam fish ladders.

Population-specific stray rates are currently unavailable for the Methow and Okanogan populations because too few carcasses are recovered during spawning ground surveys, and most summer steelhead released are not marked to identify tributary of release. However, PIT tags can be used to identify migration patterns if instream antenna arrays are present. Currently, antenna arrays are located in numerous tributaries in the Methow Basin as well as Omak Creek in the Okanogan Basin. Array observations during 2005-2008 spawning periods were used to assess non-target straying from the 2002-2004 Wells Hatchery steelhead brood releases (see Marsh et al. 2007).

All returning Wenatchee Basin hatchery steelhead were elastomer-tagged prior to release and the contribution of these fish to the stray hatchery steelhead to the Methow and Okanogan populations was assessed at Wells Dam. Unmarked hatchery fish (identified through scale analysis) were apportioned to local or stray elastomer-only marked populations based on proportions of elastomer-tagged fish in the weekly collections. Detections of PIT-tagged steelhead at Methow Basin antenna arrays were used to estimate the contribution of stray steelhead to the overall population spawning in 2010. Total estimated escapement of stray hatchery steelhead was determined by expanding observed detections by release-specific tag rates. Interrogation records were included if fish were recorded in spawning tributaries between 1 February and 31 May 2010 or in the Methow Basin (detection at the lower river array) after 1 September 2009. Estimated escapement was derived from spawning ground surveys and run evaluation of the 2010 brood.

Statistical Analyses

For all comparisons of hatchery and wild fish (including migration timing at Wells Dam, but not Twisp River arrival dates), only known, or assumed local hatchery fish were used (hatchery marks: LYE, RYE, Ad-only, Ad+CWT). Data were tested for normality using Shapiro-Wilk's *W*-tests and homogeneity of variances using Levene's tests. Data were transformed using standard statistical procedures to achieve normal distributions when necessary. Nonparametric tests were used when normal distributions could not be achieved and variance was unequal between groups. All statistical tests were performed at a significance level of 0.05 (i.e., a 5% chance of erroneously rejecting a null hypothesis). Mean passage date (to Wells Dam) was analyzed using Kruskal-Wallis (KW) ANOVA because assumptions regarding equal variance could not be met; Monday sample data was used to reduce the influence of trap avoidance. Post-hoc multiple comparisons were made for all run-timing groups. Mean arrival date (at the Twisp River in-stream PIT tag array), travel days (from the array to the Twisp weir), and kelt-emigration timing were analyzed using factorial ANOVA; the assumption of equal variances among groups was met, and ANOVA is robust to non-normality (Zar 1999). Mean arrival date and travels days compared salt age and origin. Post-spawning emigration timing (kelts) included comparisons of gender, origin, and salt-age. Mean spawn timing in the hatchery based on fish parentage (genetic cross) was analyzed using KW ANOVA because assumptions regarding equal variance could not be met. Post-hoc multiple comparisons were made for all genetic-cross groups. Mean spawn timing in the Twisp River was analyzed with a one-sample t-test because data were normally distributed. Redd distributions based on origin (Twisp River) and comparisons of NRR and HRR by subbasin were analyzed using a Mann-Whitney U-test because normality could not be achieved through log transformations. Abundance and productivity comparisons with non-supplemented reference populations (i.e., Objective 1) could not be completed because reference populations are currently being investigated and once identified, similar data for those populations will be included in future reports.

Results

Migration Timing and Spawner Composition

Stock assessment and collection of the 2010 brood Wells Hatchery steelhead broodstock occurred at Wells Dam between 13 July and 26 October 2009. During that time, a total of 24,828 steelhead passed Wells Dam (Table 6). Of those fish, 1,265 (12.1%) were sampled for hatchery marks or were scale sampled to determine origin. Of the sampled fish, 279 hatchery and 88 wild steelhead were retained for broodstock purposes. The remaining 872 hatchery and 26 wild steelhead were released upstream of Wells Dam (trapped on west ladder) or into the east ladder upstream of the trap. Based on Monday sampling results, no significant differences in migration timing (local hatchery vs. wild fish) based on fish origin or salt age were detected (Figure 1; KW ANOVA: $P = 0.29$).

Table 6. Migration of hatchery and wild steelhead to Wells Dam between 13 July and 26 October 2009. Totals include stray hatchery steelhead.

Origin	*N*	Cumulative migration date			
		25%	50%	75%	100%
Hatchery	22,876	2-Sept	10-Sept	22-Sept	26-Oct
Wild	1,952	28-Aug	11-Sept	26-Sept	26-Oct

Figure 1. Mean passage date of summer steelhead passing Wells Dam between 13 July and 26 October. Error bars are 95% confidence intervals.

After removing the Wells Hatchery broodstock, the number of fish estimated to have been double-counted at Wells Dam, and the number of fish estimated to have fallen back below Wells Dam and failed to re-ascend, the net run escapement upstream of Wells Dam for the 2010 brood was 23,901 (Table 7). Analysis of scale samples and observations of hatchery marks indicated that wild fish comprised 7.9% of the steelhead run to Wells Dam (92.1% hatchery origin). Based on biological sampling of steelhead during broodstock collection at Wells Hatchery, 17.4% of total escapement was composed of out-of-basin stray hatchery fish, primarily from the Wenatchee River. The abundance and relative proportion of wild steelhead in the 2010 brood return was great enough to allow a selective sport fishery in the Methow, Okanogan, and Similkameen rivers, as well as the mainstem Columbia River (see Chapter 2). Creel censuses conducted during these fisheries estimated 7,987 adipose fin-clipped steelhead were retained (total hatchery fish mortality = 8,180; Table 8; Jateff et al. 2010). Indirect mortality of steelhead captured and released during the fisheries was assumed to be 5% and resulted in estimated mortality of 81 wild steelhead (Table 8). Remaining steelhead were assigned to the Okanogan and Methow Basins based on results of radio-telemetry studies (see Table 7; English et al. 2001, 2003). An estimated 358 and 1,258 wild fish were available for natural spawning in the Okanogan and Methow River basins, respectively (see Table 7). Historic steelhead passage, mortality, and escapement data is presented in Appendix A.

Table 7. Escapement and disposition of the 2010 brood summer steelhead passing Wells Dam. Hatchery (*N* = 279) and wild (*N* = 88) 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 hatchery and wild escapement, respectively. Dam count includes passage from 15 June 2009 through 14 June 2010.

Area	Description	(Variable)	Number
Wells Dam	Wells Dam fish count (DCPUD data)	(A)	25,844
	Estimated double counted fish	(B)	633
	Estimated fallback fish	(C)	1,310
	Adjusted Wells Dam fish count	(D = A-B-C)	23,901
Above Wells Dam	Local Hatchery fish	(E)	17,868
	Stray hatchery fish	(F)	4,154
	Hatchery fish removed in fishery	(G)	1,068
	Above Wells Hatchery run estimate	(H = (E + F) - G)	20,954
	Wild fish	(I)	1,879
	Wild fish removed in fishery	(J)	17
	Above Wells Wild run estimate	(K = I - J)	1,862
Okanogan Basin	Hatchery run escapement estimate	(L = H * 0.324)	6,789
	Hatchery fish removed in fishery	(M)	3,110
	Hatchery fish collected for broodstock	(N)	4
	Wild run escapement estimate	(O = K * 0.208)	387
	Wild fish removed in fishery	(P)	16
	Wild fish collected for broodstock	(Q)	13
	Maximum spawning escapement estimate	(R = L-M-N+O-P-Q)	4,033
Methow Basin	Hatchery run escapement estimate	(S = H * 0.580)	12,153
	Hatchery fish removed in fishery	(T)	4,002
	Hatchery fish collected for broodstock	(U)	12
	Wild run escapement estimate	(V = K * 0.708)	1,318
	Wild fish removed in fishery	(W)	48
	Wild fish collected for broodstock	(X)	12
	Maximum spawning escapement estimate	(Y = S-T-U+V-W-X)	9,397

Table 8. Estimated number of steelhead caught, retained, released, and mortalities from expanded creel census above Wells Dam during the 2009-2010 fishery.

Origin/disposition	Columbia	Methow	Okanogan	Similkameen	Total
Est. total steelhead caught	2,237	7,139	2,969	1,150	13,495
Est. hatchery steelhead retained (ad -)	1,025	3,887	2,244	831	7,987
Est. hatchery steelhead released (ad -)	55	71	4	0	130
Est. hatchery steelhead released (ad +)	810	2,227	504	224	3,765
Est. wild steelhead released	347	954	217	95	1,613
Est. hatchery steelhead hook mortality	43	115	24	11	193
Est. wild steelhead hook mortality	17	48	11	5	81

Based on radio-telemetry data (English et al. 2001, 2003), an estimated 58.0% of the hatchery fish passing Wells Dam were destined for the Methow Basin. After broodstock and fishery removal, an estimated 8,139 hatchery and 1,258 wild steelhead were available for natural spawning in the Methow River basin (see Table 7). The maximum estimated spawning escapement to the Okanogan River basin (N = 3,920) was greater than the range of estimated spawning escapement of 3,236 to 3,596 fish calculated from expanded redd counts in 2010 (Miller et. al, 2011).

Twisp River Migration Timing

Steelhead migration timing in the Twisp River was evaluated using an in-stream PIT tag antenna array. Tagged steelhead were detected between 6 March and 4 May as they ascended the Twisp River to spawn. Wild steelhead, regardless of salt age, were detected at the Twisp River in-stream PIT tag array seven days earlier than hatchery steelhead (ANOVA: $P < 0.01$). However, no differences in arrival date among salt age classes were detected at the Twisp River array (Figure 2; $P = 0.63$). Migration timing from the Twisp River array to the Twisp River weir ranged from 1 to 36 days. Regardless of origin, 2-salt steelhead migrated on average 2.5 days earlier than 1-salt steelhead (ANOVA: $P < 0.01$). No differences in migration timing were detected based on origin and salt age (Figure 3; ANOVA: $P < 0.01$). Based on PIT tag detections at the Twisp River array and weir, an estimated 933 steelhead migrated above the Twisp array. A total of 603 steelhead were sampled at the Twisp weir. Array efficiency was 98.9 percent based on detections of fish that were subsequently captured at the Twisp Weir. Post-spawning emigration, calculated as the number of days from last observation at the Twisp Weir to first subsequent detection at the Twisp River array, ranged from two to 52 days. After back-calculating transformed data (log(x)), female steelhead emigrated on average 10 days earlier than male steelhead (Figure 4; factorial ANOVA: $P < 0.01$); there were no differences in kelt timing by fish origin or salt age.

Figure 2. Mean arrival date of summer steelhead at the Twisp River in-stream PIT tag array between 6 March and 4 May. Error bars are 95% confidence intervals.

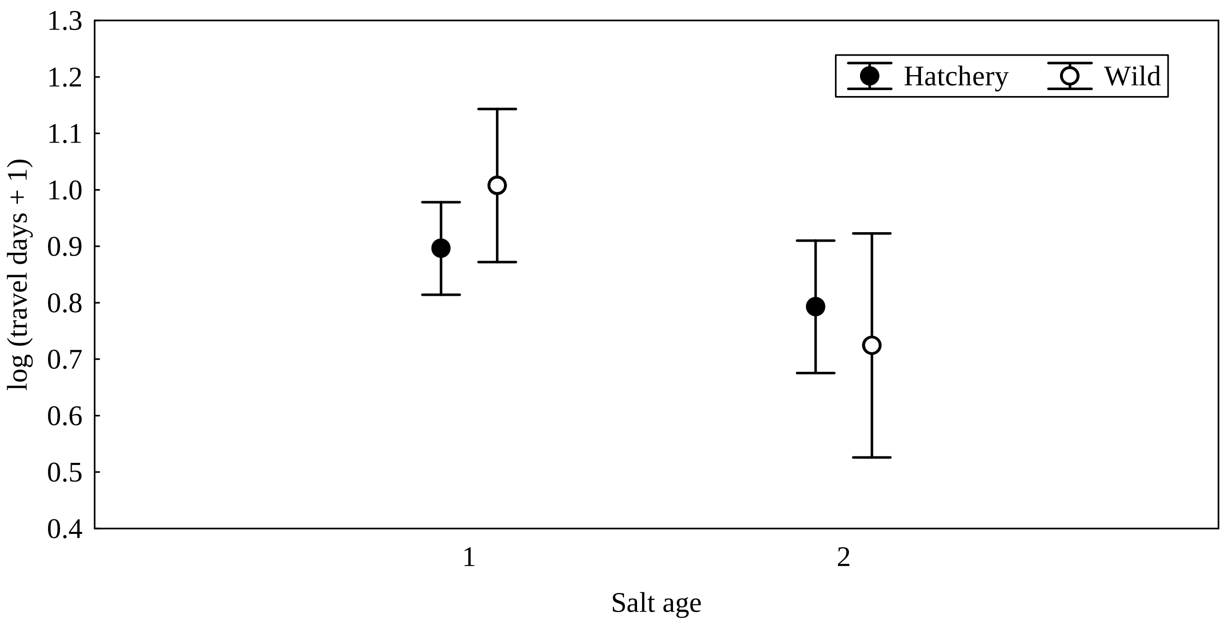

Figure 3. Mean travel days (log(x+1)) of summer steelhead from the Twisp River in-stream PIT tag array to the Twisp weir. Error bars are 95% confidence intervals.

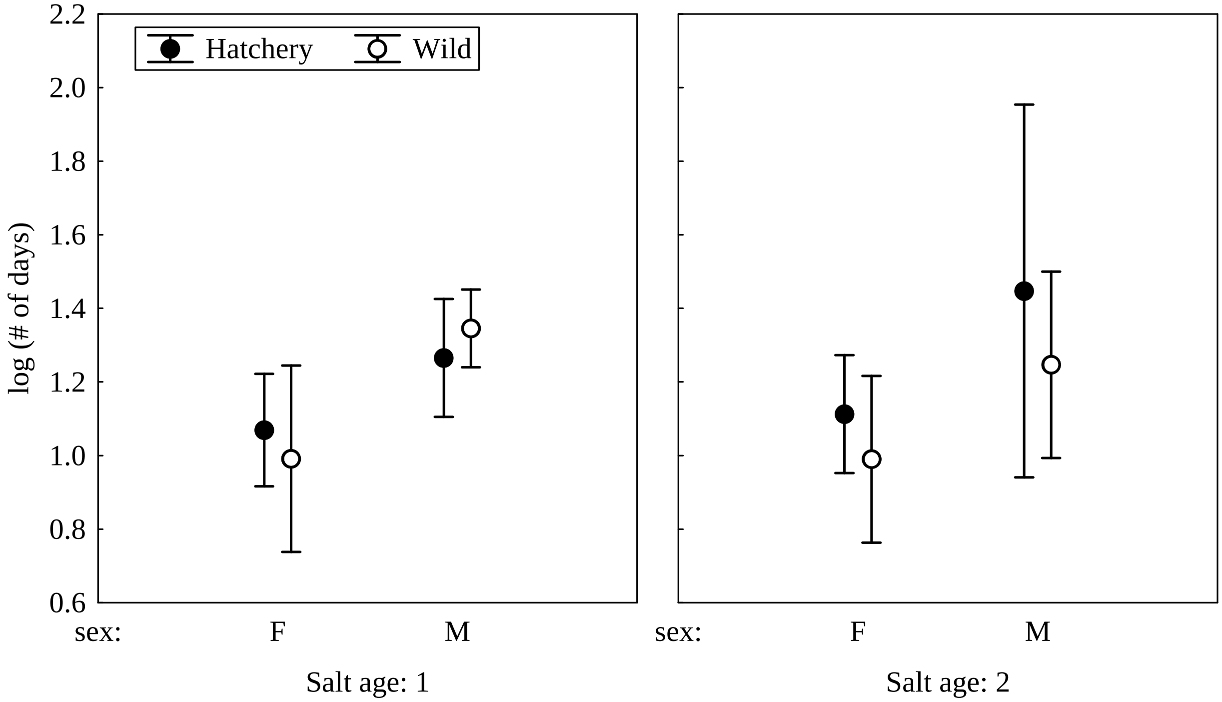

Figure 4. Mean travel days (kelt timing) of summer steelhead from last observation at the Twisp weir to first detection at the Twisp River in-stream PIT tag array. Error bars are 95% confidence intervals.

Spawn Timing and Redd Distribution

In the hatchery, some wild female steelhead (*N* = 7; 26.9% of the wild total) were injected with hormones to increase maturation timing and facilitate matings of wild and hatchery fish. Statistical tests included both females that were not injected with hormones and those that were. When hormone-injected fish were excluded, no significant differences in female spawn timing within the hatchery environment based on parentage were detected (Figure 5). Wild females without hormones and H x W females had mean spawn dates of 3 March and 26 February, respectively. The mean spawn date of H x H females within the hatchery was 4 March. Wild females injected with hormones had a mean spawn date of 20 March and spawned, on average 22 days later than H x W females (Figure 5; KW ANOVA: $P < 0.01$). Hormone injections targeted the latest spawning fish so it is expected that injected females had later spawn timing than non-injected females of the same genetic origin.

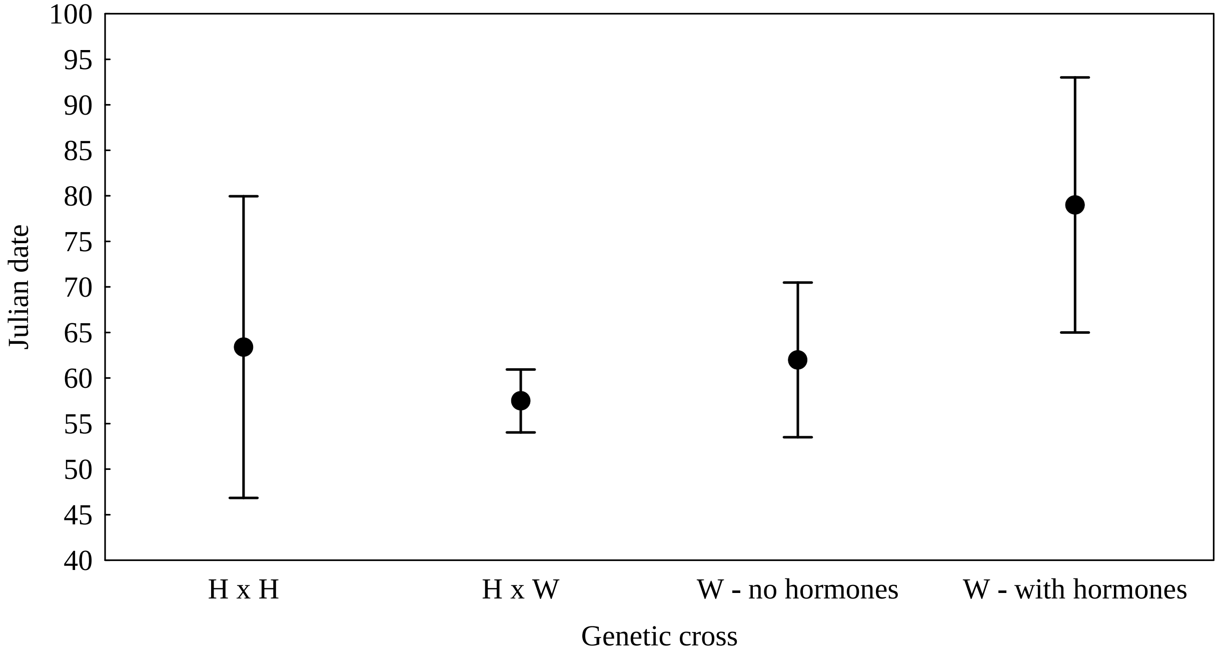

Figure 5. Spawn timing of 2010 brood female steelhead at Wells Hatchery by genetic cross. Error bars are 95% confidence intervals.

In the natural environment, local hatchery (Ad+CWT, Ad-only, LYE, and RYE marks) and wild fish were sampled and tagged at the Twisp River weir prior to spawning. An estimated 27.9% (N = 168) of the steelhead sampled at the Twisp River weir were wild (Table 9). The proportion of wild steelhead in the population sampled at the Twisp weir was approximately 14% greater than the estimated proportion of wild steelhead in the Methow Basin (see Table 7). Colored anchor tags allowed surveyors to document spawn timing of hatchery and wild female steelhead. A total of 41 females with anchor tags were observed actively spawning or holding on redds above the weir. Based on recaptured fish (females) at the Twisp weir (N = 37), no anchor tags were lost during spawning and no females were missed during trapping; tag retention and trap efficiency were very high (both approaching 100%). There were no significant differences in female spawn timing based on fish origin (Figure 6; two-sample t-test: P = 0.24). In contrast to spawning in the hatchery environment, hatchery and wild fish in the Twisp River had mean spawn dates of 19 April and 22 April, respectively. Observed spawn timing based on the weekly number of new redds within other index areas in the Methow Basin suggested peak spawn timing occurred mid-to-late April (Table 10). Distribution of redds above the Twisp Weir was determined through PIT tags deposited in redds and anchor tag observations. Completed redds were scanned prior to the spring freshet, and a total of 22 PIT tags were located in steelhead redds above the Twisp Weir (Table 11). Recovery rate of PIT tags from female steelhead released above the Twisp weir was 12.2% (180 total females tagged in the body cavity); recovery rate for PIT tags is based on intensive survey redd counts only. No significant difference in spatial distribution of redds based on female origin (Figure 7; Mann-Whitney U test: P = 0.15) was detected.

Table 9. Summary of steelhead sampled at the Twisp weir. All potentially wild fish were released upstream from the weir.

Origin	Sex	Mark	Month				Total	Released upstream
			March	April	May	June		
Wild	F	None	8	63	3	1	75	75
	M	None	20	68	5	0	93	93
Hatchery	F	Ad+CWT	2	19	2	0	23	12
		Ad-only	3	49	4	1	57	38
		HFN	1	14	3	0	18	1
		LGE	0	1	0	0	1	0
		LYE	2	40	1	0	43	29
		RYE	1	68	3	0	72	33
	M	Ad+CWT	2	21	0	0	23	6
		Ad-only	4	23	3	0	30	15
		CWTO	0	1	0	0	1	0
		HFN	4	54	1	0	59	1
		LGE	0	2	0	0	2	0
		LYE	1	9	0	0	10	4
		RPE	0	1	0	0	1	0
		RYE	7	87	1	0	95	34
Total			55	520	26	2	603	341

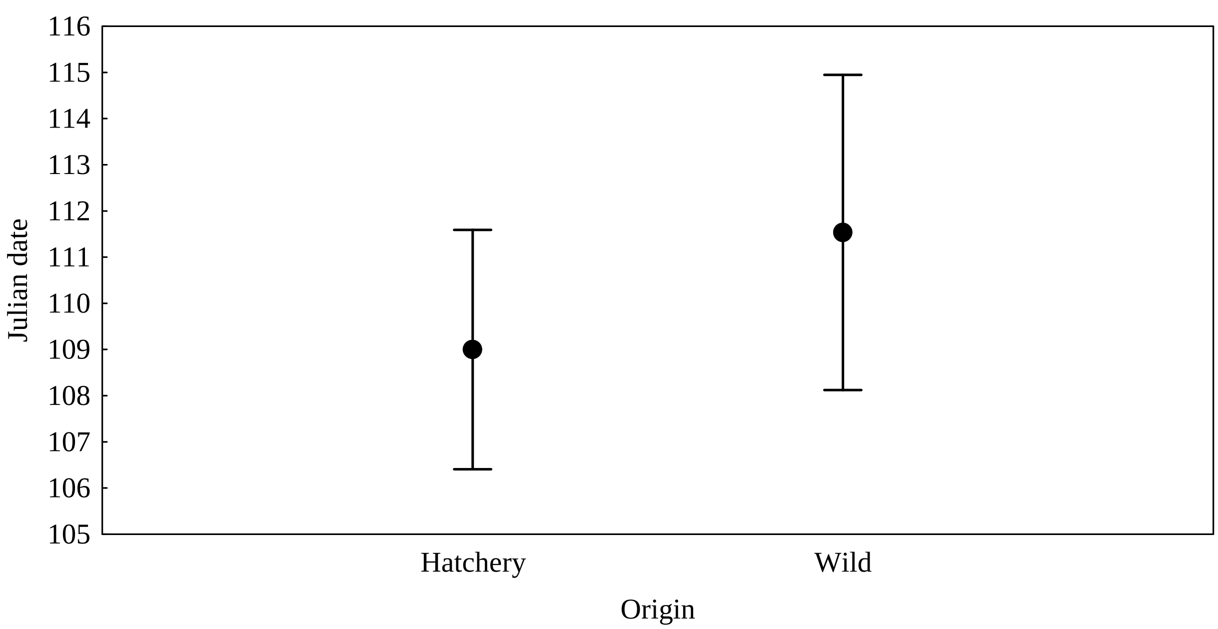

Figure 6. Spawn timing of female steelhead in the Twisp River upstream of the weir in 2010. Error bars are 95% confidence intervals.

Table 10. Methow River mainstem index reach and selected stream weekly redd counts by subbasin and week beginning (ns = not surveyed). No surveys were performed the week of 30 May. Mainstem index reaches are in bold.

Stream	Survey reach	Code	March			April				May				Total
			14	21	28	4	11	18	25	2	9	16	23	
			Upper Methow subbasin											
Methow	Mazama Br.-Susp. Br.	**M11**	0	0	6	2	8	ns	6	5	ns	ns	ns	27
Methow	Susp. Br.-Weeman Br.	**M10**	0	0	5	7	16	ns	13	14	ns	ns	ns	55
E. Winters	Div. Dam -Hwy 20 Br.	EW2	0	0	0	ns	1	ns	0	0	0	ns	0	1
E. Winters	Hwy 20 Br.-Conf.	EW1	0	0	0	0	0	ns	0	ns	0	ns	0	0
Lost	Lost River Br.-Conf.	L1	0	0	0	0	2	1	2	ns	ns	ns	ns	5
Suspension	Entire length	Susp1	0	0	2	10	7	ns	15	9	ns	0	ns	43
Little Susp.	Entire length	LSP1	0	0	0	0	0	ns	11	0	ns	0	ns	11
Hancock	Spring - Wolf Cr. Rd.	HA2	ns	0	0	0	0	4	2	6	ns	0	ns	12
Hancock	Wolf Cr. Rd. - Conf.	HA1	ns	0	0	0	0	1	1	0	ns	0	ns	2
MH outfall	Entire length	MH1	0	0	2	0	0	0	2	2	ns	ns	ns	6
WNFH outfall	Entire length	WN1	1	1	11	5	ns	1	3	2	ns	ns	ns	24
	Subbasin subtotal		1	1	26	24	34	7	55	38	0	0	0	186
			Lower Methow subbasin											
Methow	Carlton-Up. Burma Br.	**M2**	4	6	5	7	11	ns	ns	ns	6	ns	ns	39
Beaver	Hwy 20-Confluence	BV1	1	4	0	12	ns	ns	ns	ns	ns	ns	ns	17
	Subbasin subtotal		5	10	5	19	11	ns	ns	ns	6	ns	ns	56
			Twisp subbasin											
Twisp	B'milk Br.-Lit. Br. Cr.	**T5**	0	0	0	1	15	14	8	10	0	ns	0	48
Twisp	Little Br. Cr.-Weir	**T4**	0	0	0	1	13	ns	8	ns	5	ns	0	27
Little Bridge	Lower Br. - Conf.	LBC1	ns	0	0	0	0	ns	0	0	1	ns	3	4
	Subbasin subtotal		0	0	0	2	28	14	16	10	6	ns	3	79
			Chewuch subbasin											
Chewuch	8 Mile Cr.-Boulder Cr.	**C4**	2	1	5	4	8	ns	5	9	ns	ns	ns	34
Eightmile	Bridge - Confluence	EM1	0	0	0	0	1	ns	ns	0	0	0	ns	1
	Subbasin subtotal		2	1	5	4	9	ns	5	9	0	0	ns	35

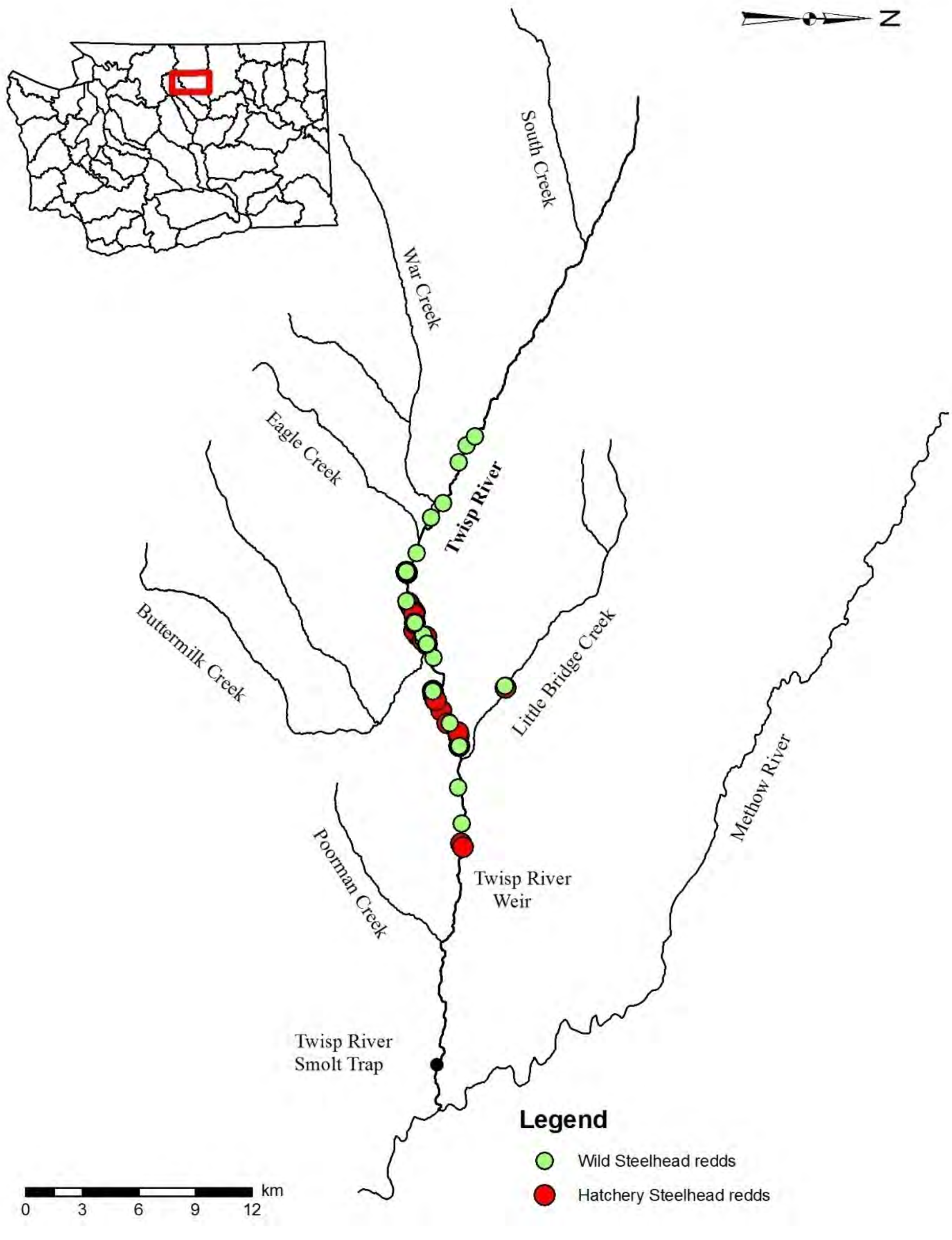

Figure 7. Spatial distribution of steelhead redds in the Twisp River subbasin based on PIT tag detections and anchor tag observations during 2010 surveys.

Table 11. Detection of PIT tags in redds located above the Twisp weir. Total redd numbers are non-expanded counts from intensive survey methods only; total redd counts differ from those reported in Table 14 and Appendix B3 which are both based on index-area-expansion counts. Additionally, two PIT tags were located in redds constructed by cutthroat trout (one in both EA1 and T4).

Stream	Reach	Hatchery mark				Wild	Total	Total redds	Redds scanned	% PITs
		Ad+CWT	Ad-only	LYE	RYE					
Twisp River	T9	0	0	0	0	0	0	3	1	0.0
	T8	0	0	0	0	0	0	4	2	0.0
	T7	0	0	0	0	0	0	18	5	0.0
	T6	1	1	4	1	5	12	96	79	15.2
	T5	2	0	3	0	2	7	52	52	13.5
	T4	0	0	1	0	1	2	25	21	9.5
L. Br. Creek	LBC3	0	0	0	0	0	0	1	0	n/a
	LBC2	0	0	0	1	0	1	3	3	33.3
	LBC1	0	0	0	0	0	0	4	2	0.0
B'milk Creek	BM2	0	0	0	0	0	0	3	2	0.0
B'milk Creek	BM1	0	0	0	0	0	0	1	1	0.0
MSRF outfalls	MSRF1	0	0	0	0	0	0	1	1	0.0
Total		3	1	8	2	8	22	211	169	13.0

Based on expanded redd counts, an estimated 1,720 steelhead redds were created in the Methow River basin in 2010 between 22 February and 7 June (Figures 8-11, Tables 12-15). The greatest numbers of redds were found in the lower and upper Methow River subbasins (*N* = 559 and 505, respectively). The Twisp River (*N* = 332) and Chewuch River (*N* = 324) subbasins had similar numbers of redds. Redd density within mainstem index areas (grouped by subbasin) was greatest in the Chewuch and Upper Methow subbasins (8.9 and 8.8 per km, respectively). The density of redds in the Twisp River was 7.7 per km. Based on the male-to-female ratio of hatchery (1.16) and wild (0.89) steelhead calculated during broodstock collection activities and the assumption that a female constructed only one redd, the total redd count represents 3,681 fish, or 39.2% of the maximum estimated spawning escapement to the Methow River basin of 9,397 fish. Historic redd counts for each of the subbasins surveyed are listed in Appendices B1-B4.

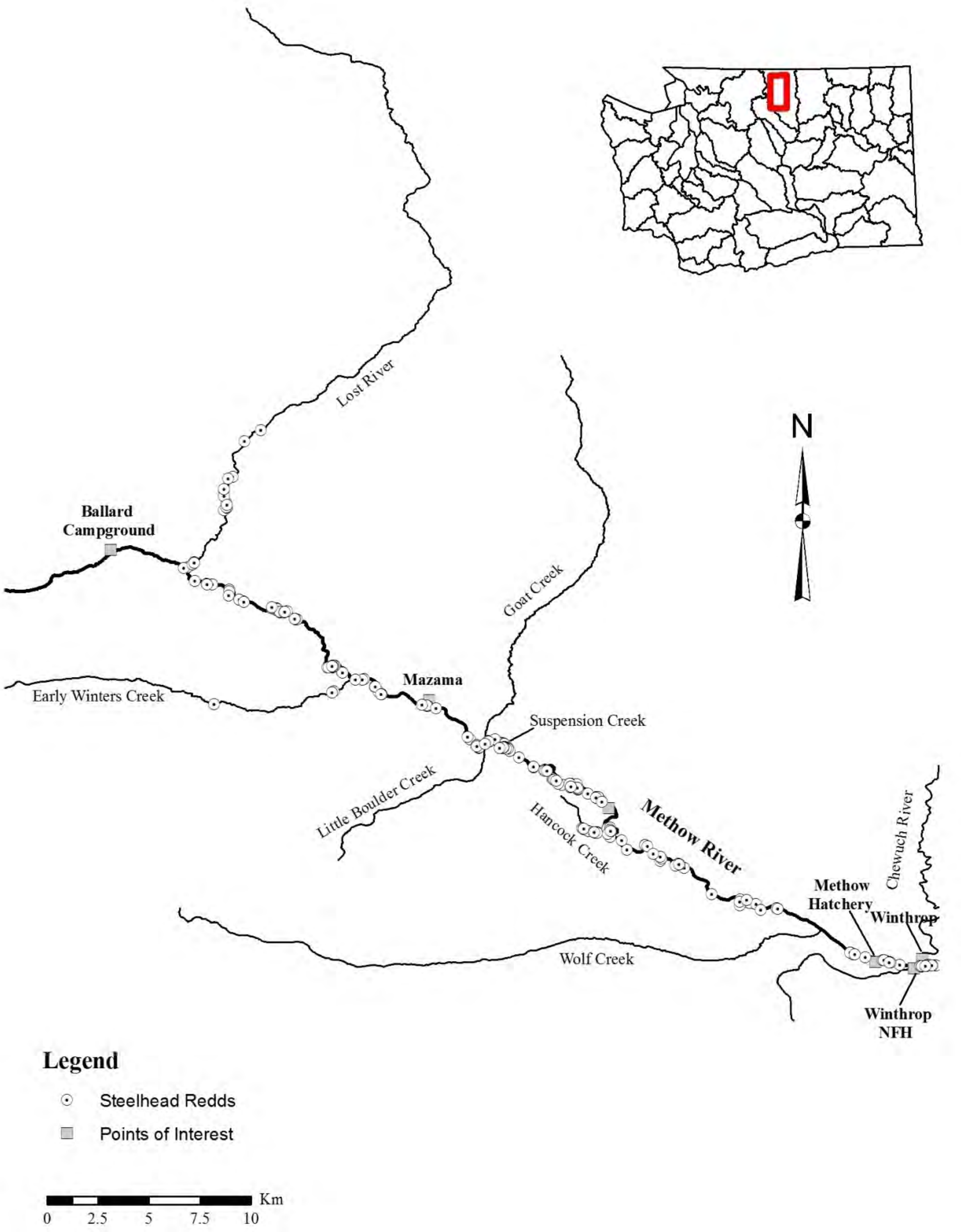

Figure 8. Spatial distribution of observed steelhead redds in the upper Methow River subbasin based on GPS waypoints collected during 2010 surveys. Does not include expanded redds.

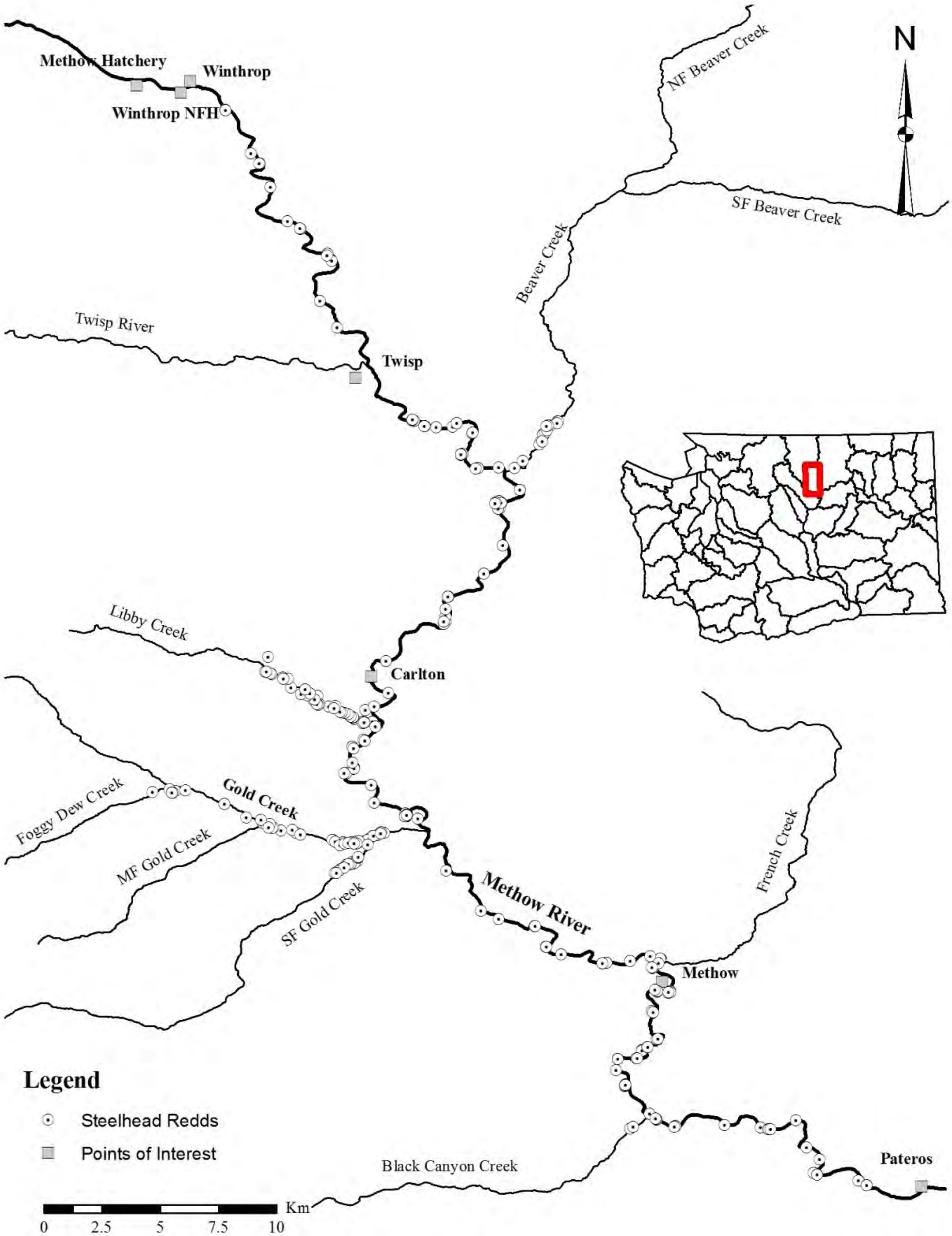

Figure 9. Spatial distribution of observed steelhead redds in the lower Methow River subbasin based on GPS waypoints collected during 2010 surveys. Does not include expanded redds.

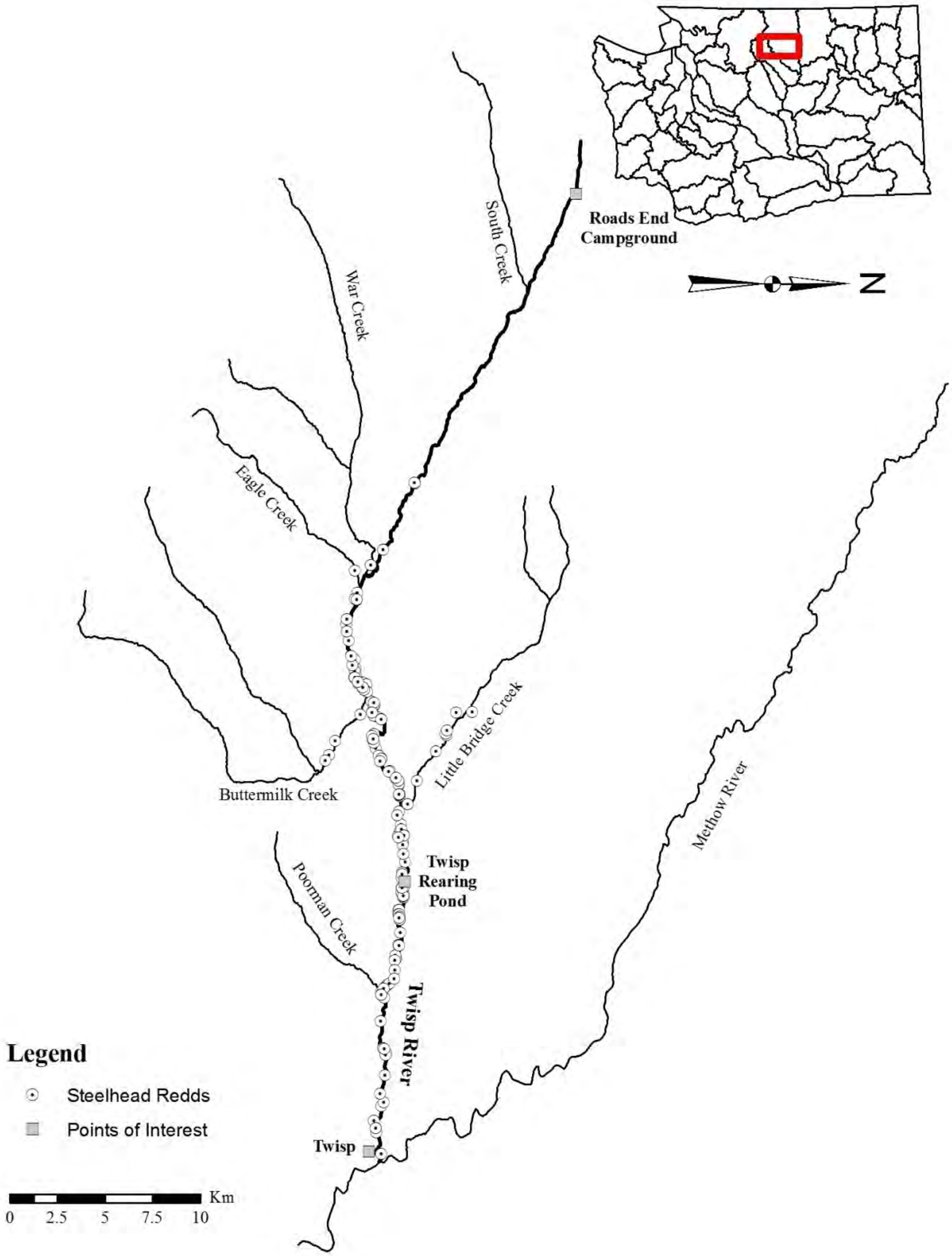

Figure 10. Spatial distribution of observed steelhead redds in the Twisp River subbasin based on GPS waypoints collected during 2010 surveys. Does not include expanded redds.

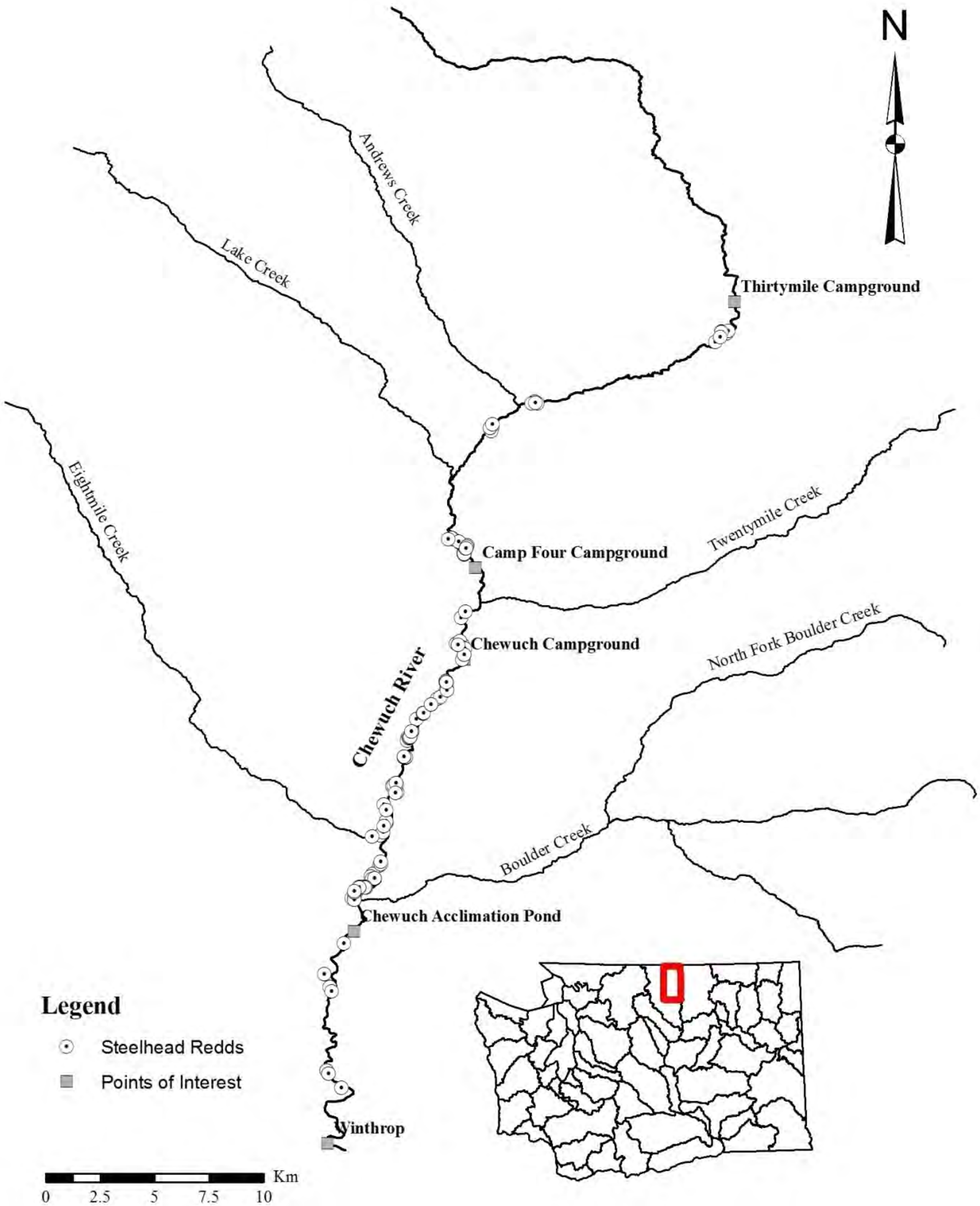

Figure 11. Spatial distribution of observed steelhead redds in the Chewuch River subbasin based on GPS waypoints collected during 2010 surveys. Does not include expanded redds.

Table 12. Upper Methow River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed). Expand rates for non-rotating panel reaches are based on visible:total redd ratios during peak counts. Expand rates for rotating panel reaches are based on # of redds per km in surveyed reaches.

Stream reach	Code	Length (km)	2007	2008	2009	2010	
						Exp. rate	Redds
Upper Methow River mainstem							
Ballard Campground - Lost River	M15	4.0	2	6	5	none	0
Lost River - Gate Creek	M14	4.8	19	25	16	0.37	65
Gate Creek - Early Winters Creek	M13	4.2	11	19	11	0.37	65
Early Winters Creek - Mazama Bridge	M12	3.2	5	25	8	0.37	27
Mazama Bridge - Suspension Bridge	M11	4.0	24	27	5	index	27
Suspension Bridge - Weeman Bridge	M10	5.3	56	21	25	index	55
Weeman Bridge - Along Highway 20	M9	9.0	14	34	94	0.33	123
Along Highway 20 - Wolf Creek	M8	2.2	1	1	0	none	0
Wolf Creek - Foghorn Dam	M7	1.8	0	10	10	0.33	15
Foghorn Dam - Winthrop Bridge	M6	2.7	0	10	2	0.33	6
Upper Methow River mainstem total		41.2	132	178	176		383
Upper Methow River tributaries							
Lost River (Sunset Creek - Eureka Creek)	L3	4.6	ns	ns	ns	- -	2
Lost River (Eureka Creek - Lost River Bridge)	L2	5.8	ns	ns	11	- -	12
Lost River (Lost River Bridge - Confluence)	L1	0.8	10	3	6	- -	5
Early Winters Cr. (Klipchuck C.G. - Bridge)	EW5	1.4	ns	ns	0	- -	0
Early Winters Cr. (Bridge - Hwy 20)	EW4	2.1	ns	ns	2	- -	1
Early Winters Cr. (Highway 20 - Div. Dam)	EW3	2.9	4	0	0	- -	2
Early Winters Cr. (Div. Dam - Hwy 20 Br.)	EW2	0.3	2	0	2	- -	1
Early Winters Cr. (Hwy 20 Br. - Confluence)	EW1	0.5	0	0	0	- -	0
Suspension Creek (Entire length)	Susp1	0.3	49	37	32	- -	43
Little Suspension Creek (Entire length)	Lsusp1	0.3	29	4	1	- -	11
Methow Hatchery Outfall (Entire length)	MH1	0.4	25	9	12	- -	6
Winthrop NFH Outfall (Entire length)	WN1	1.0	68	27	37	- -	24
Hancock Creek (Kumm Rd. - Wolf Cr. Rd.)	HA2	0.9	21	9	7	- -	12
Hancock Creek (Wolf Cr. Rd. - Conf.)	HA1	0.2	2	4	1	- -	2
Gate Creek (Culvert – Confluence)	GA1	0.3	0[a]	0[a]	0[a]	- -	1
RP-Wolf Creek (Rd 5505 access - footbridge)	W2	1.9	ns	ns	0	direct	0
RP-Wolf Creek (footbridge - Confluence)	W1	0.5	1	0	0	direct	0
RP-Little Boulder Creek (Hwy 20 – Conf.)	LBO1	0.2	0	0	0	direct	0
RP-Goat Creek (FR 52 Bridge - Confluence)	GT1	2.2	0	0	0	direct	0
Upper Methow River tributary total		26.6	211	93	111		122

[a] Historically surveyed as part of M13.

Table 13. Lower Methow River mainstem and tributary expanded redd counts by section number. Rotating panel creeks are designated RP (ns = not surveyed). Expand rates for non-rotating panel reaches are based on visible:total redd ratios during peak counts. Expand rates for rotating panel reaches are based on the number of redds per km in surveyed reaches.

Stream reach	Code	Length (km)	2007	2008	2009	2010	
						Exp. rate	Redds
Lower Methow River mainstem							
Winthrop Bridge - MVID Dam	M5	8.0	0	0	23	0.41	24
MVID Dam - Twisp Confluence	M4	7.2	4	0	23	0.41	29
Twisp Confluence - Carlton	M3	21.1	0	5	24	0.41	132
Carlton - Upper Burma Bridge	M2	23.7	1	27	15	index	39
Upper Burma Bridge - Mouth	M1	20.1	2	86	17	0.41	180
Lower Methow River mainstem total		80.1	7	118	102		404
Lower Methow River tributaries							
Beaver Creek (Lester Rd. Br. - Balky Hill Rd.)	BV3	5.0	9	0	0	- -	0
Beaver Creek (Balky Hill Rd. - Highway 20)	BV2	5.8	ns	15	23	- -	0
Beaver Creek (Highway 20 - Confluence)	BV1	3.4	9	38	26	index	17
RP-Gold Cr. Upper N.F. (10.0 rkm – 6.3 rkm)[a]	GDN4	3.7[a]	36	7	0	direct	4
RP-Gold Cr. Mid. N.F. (6.3 rkm - N.F. Br.)	GDN3	0.9	5	1	7	direct	8
RP-Gold Cr. Mid. N.F. (N.F. Br. - W. Pines)	GDN2	1.5	6	0	6	direct	4
RP-Gold Cr. Lower N.F. (W. Pines - 2nd Br.)	GDN1	1.4	6	1	5	direct	14
RP-Gold Cr. S.F. (1st Bridge - 1.7 rkm)	GDS3	0.7	25	0[b]	5	direct	8
RP-Gold Cr. S.F. (1.7 rkm - 0.6 rkm)	GDS2	1.1	6	9	4	direct	13
RP-Gold Cr. S.F. (0.6 rkm - Confluence)	GDS1	0.6	3	0[b]	1	direct	1
RP-Gold Cr. Mainstem (2nd Br. - Private Land)	GDM2	1.2	5	11	15	direct	14
RP-Gold Cr. Mainstem (Private Land - Conf.)	GDM1	1.3	6	12	16	11.7	15
RP-Foggy Dew Creek (FR 200 - Confluence)	FD1	1.8	24	2	2	direct	6
RP-Black Canyon Cr. (1st Culvert - 0.8 rkm)	BC2	1.0	5	2	2	direct	4
RP-Black Canyon Cr. (0.8 rkm - Confluence)	BC1	0.8	5	2	0	direct	1
RP-Libby Creek (Hornet Draw - L.P. Land)	LB5	4.6	ns	ns	ns	direct	8
RP-Libby Creek (Lower Public Land)	LB4	1.0	6	2	ns[c]	direct	8
RP-Libby Creek (L.P. Land - Realty Land)	LB3	1.1	6	2	ns[c]	direct	14
RP-Libby Creek (Realty Land)	LB2	0.3	2	1	0	direct	7
RP-Libby Creek (Realty Land - Confluence)	LB1	1.0	6	2	5	direct	9
Lower Methow tributary total		38.2	170	107	117		155

[a] Distance surveyed since 2009.
[b] No expansion due to possible unsuitable habitat.
[c] Beaver dam considered as barrier to upstream migration in 2009.

Table 14. Twisp River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed). Expand rates for non-rotating panel reaches are based on visible:total redd ratios during peak counts. Expand rates for rotating panel reaches are based on the number of redds per km in surveyed reaches.

Stream reach	Code	Length (km)	2007	2008	2009	2010	
						Exp. rate	Redds
		Twisp River mainstem					
Road's End C.G. - South Creek Bridge	T10	4.6	ns	ns	0	none	0
South Creek Bridge - Poplar Flats C.G.	T9	3.2	ns	ns	0	none	0
Poplar Flats C.G. - Mystery Bridge	T8	3.2	ns	0	0	none	0
Mystery Bridge - War Creek Bridge	T7	6.9	ns	6	22	0.48	6
War Creek Bridge - Buttermilk Bridge	T6	7.4	ns	42	109	0.48	79
Buttermilk Bridge - Little Bridge Creek	T5	5.9	60	59	71	index	48
Little Bridge Creek - Twisp Weir	T4	3.8	13	30	22	index	27
Twisp Weir - Upper Poorman Bridge	T3	3.5	5	18	47	0.33	78
Up. Poorman Br. - Lower Poorman Br.	T2	5.0	ns	16	47	0.33	54
Lower Poorman Bridge - Confluence	T1	2.9	ns	6	10	0.33	27
Twisp River mainstem total		46.4	78	177	328		319
		Twisp River tributaries					
Little Br. Cr. (Road's End – Vetch Cr.)	LBC4	1.3	0	ns	ns	- -	0
Little Br. Cr. (Vetch Cr. – 2nd Culvert)	LBC3	3.0	1	0	0	- -	1
Little Br. Cr. (2nd Culvert – 1st Culvert)	LBC2	2.4	0	2	1	- -	3
Little Br. Cr. (1st Culvert - Confluence)	LBC1	2.4	2	2	17	- -	4
MSRF pond outfalls[1]	MSRF1	0.1	1	0	0	- -	1
RP-War Creek (log jam barrier - Conf.)	WR1	0.5	0	0	2	direct	0
RP-Eagle Creek (Rd 4430 - Confluence)	EA1	0.3	0	0	2	direct	0
RP-Buttermilk Cr. (Fork - Cattle Guard)	BM2	2.1	0	1	0	direct	3
RP-Buttermilk Cr. (Cattle Guard - Conf.)	BM1	2.0	0	0	2	direct	1
RP-South Creek (Falls - Confluence)	SO1	0.6	0	0	0	direct	0
Twisp River tributary total		14.7	4	5	24		13

[1] Methow Salmon Recovery Foundation pond outfall.

Table 15. Chewuch River mainstem and tributary expanded redd counts by section number and survey year. Rotating panel creeks are designated RP (ns = not surveyed). Expand rates for non-rotating panel reaches are based on visible to non-visible redd ratios during peak counts. Expand rates for rotating panel reaches are based on the number of redds per km in surveyed reaches.

Stream reach	Code	Length (km)	2007	2008	2009	2010	
						Exp. rate	Redds
Chewuch River mainstem							
Chewuch Falls - 30 Mile Bridge	C13	4.2	ns	ns	0	none	0
30 Mile Bridge - Road Side Camp	C12	4.6	ns	ns	4	0.47	19
Road Side Camp - Andrews Creek	C11	4.3	ns	ns	2	0.47	9
Andrews Creek - Lake Creek	C10	4.0	ns	ns	4	0.47	13
Lake Creek - Buck Creek	C9	2.2	ns	ns	0	none	ns
Buck Creek - Camp 4 C.G.	C8	2.4	ns	ns	34	0.47	60
Camp 4 C.G. - Chewuch Campground	C7	5.1	16	13	9	0.47	32
Chewuch C.G. - Falls Creek C.G.	C6	5.8	21	30	30	0.47	87
Falls Creek C.G. - Eightmile Creek	C5	3.7	7	22	11	0.47	51
Eightmile Creek - Boulder Creek	C4	3.7	19	55	28	index	34
Boulder Creek - Chewuch Bridge	C3	1.8	0	4	2	none	0
Chewuch Bridge - WDFW Land	C2	7.5	3	37	24	0.47	15
WDFW Land - Confluence	C1	5.1	0	25	7	0.47	2
Chewuch River mainstem total		54.4	66	186	155		322
Chewuch River tributaries							
Eightmile Creek (300m abv. div. - Bridge)	EM2	0.3	0	3	0	- -	0
Eightmile Creek (Bridge - Conf.)	EM1	0.5	1	0	2	- -	1
Cub Creek (W. Chewuch Rd. - Conf.)	CU1	1.0	ns	ns	ns	- -	1
RP-Boulder Creek (Falls - 1st Bridge)	BD2	0.8	4	0	1	direct	0
RP-Boulder Creek (1st Bridge - Conf.)	BD1	0.8	4	0	0	direct	0
RP-Lake Creek (Black Lk. - 1st Bridge)	LK2	10.1	51	0	13	direct	0
RP-Lake Creek (1st Bridge – Conf.)	LK1	0.8	4	0	1	direct	0
RP-Andrews Creek (L. And. Cr. – 1st Br.)	AN2	0.3	2	ns	0	- -	ns
RP-Andrews Creek (1st Bridge - Conf.)	AN1	0.2	1	0	0	direct	0
RP-Twentymile Creek (Falls - FR 5010)	TW2	0.9	0	0	0	direct	0
RP-Twentymile Creek (FR 5010 - Conf.)	TW1	0.1	5	0	0	direct	0
Chewuch River tributary total		15.8	72	3	17		2

The Twisp River mainstem was surveyed weekly (intensive) in all accessible reaches to generate a total redd count to compare with redd counts generated from existing methodologies utilizing expanded index area surveys. Index area redd counts were expanded when spawning was near completion and river conditions were favorable. The total number of redds estimated for the Twisp River was nearly identical to count generated from intensive surveys (Table 16); however, the spatial distribution of redds among reaches shifted between methodologies.

Based on biological sampling of the 2010 broodstock during trapping, the majority of both hatchery and wild-origin steelhead were 1-salt fish (74.9% and 76.1%, respectively). Using expanded redd counts by tributary, and the mean fecundity from Wells Hatchery broodstock by salt age and origin, an estimated 10,022,440 eggs were deposited in the Methow Basin (Table 17; see Chapter 1 for historic fecundities).

Table 16. Comparison of survey methods in Twisp River mainstem reaches for steelhead spawning surveys at the time of non-index surveys. Redd totals are final counts for both survey methodologies.

Reach	Intensive surveys	Expanded surveys	
	Redds	Expansion rate	Redds
T10	0	none	0
T9	3	none	0
T8	4	none	0
T7	18	0.48	6
T6	96	0.48	79
T5	52	index	48
T4	25	index	27
T3	70	0.33	78
T2	35	0.33	54
T1	13	0.33	27
Total	316		319

Table 17. Expanded 2010 steelhead redds and estimated egg deposition in the Methow Basin based on 2010 Wells Hatchery broodstock mean fecundities and origin-by-age proportions (mean; %): hatchery 1-salt (4,979; 31.17), hatchery 2-salt (6,502; 52.60), wild 1-salt (4,283; 7.14), wild 2-salt (6,046; 9.09).

Area	Exp. redds	% of redds	Estimated egg deposition				
			2006	2007	2008	2009	2010
U. Methow	505	29.4%	1,092,348	1,751,701	1,605,675	1,750,700	2,942,635
Chewuch	324	18.8%	427,996	704,766	1,119,825	1,049,200	1,887,948
Twisp	332	19.3%	2,484,932	418,774	1,078,350	2,147,200	1,934,564
L. Methow	559	32.5%	1,156,228	903,939	1,333,125	1,335,900	3,257,293
Methow Basin	1,720	100.0%	5,161,504	3,779,180	5,136,975	6,283,000	10,022,440

Natural Replacement Rate (NRR)

A total of 1,267 steelhead were trapped and sampled at Wells Dam, of which 115 were determined to be wild. The total number of wild fish observed on the first trapping day of the week was expanded to the run-at-large to estimate the total number of wild fish returning to Wells Dam (N = 2,070). Expanded return at age was based on scale analysis of wild fish sampled during trapping, resulting in a total of 1,466 wild steelhead recruits returning to the Methow Basin prior to broodstock collection (N = 88) and Columbia River fishery-related mortality (N = 17; Table 8). The HRR of hatchery steelhead was significantly greater than the NRR for brood years 1996-2004 (Mann-Whitney U test: P < 0.01; see Chapter 1 for HRR values). The NRR of the Methow Basin steelhead population (mean = 0.26 recruits per spawner) was less than the value necessary to replace the parent population (i.e., 1.0) in each of the nine brood years examined (see Table 19). 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).

Table 18. Wild steelhead sampling at Wells Hatchery and expanded age composition by brood year of Methow Basin recruits (70.8% of wild returns to Wells Dam). Brood year totals exclude the estimated number of double counted fish in 2009 and 2010.

Brood year	Wild fish (at Wells Dam)			Expanded return at age (Methow Basin)				Total
	Total	Sampled	Sample rate	1.1	1.2, 2.1	1.3, 3.1, 2.2	2.3, 3.2	
2010	2,070	115	0.0556	59	762	601	44	1,466
2009	1,217	127	0.1044	72	471	283	36	862
2008	1,283	132	0.1029	15	679	192	22	908
2007	631	52	0.0824	0	214	204	29	447
2006	765	124	0.1621	6	159	332	45	542
2005	861	104	0.1208	10	276	324	0	610
2004	1,161	116	0.0999	14	642	159	7	822
2003	821	27	0.0329	0	0	511	70	581
2002	900	18	0.0200	35	212	319	71	637
2001	553	26	0.0470	15	302	75	0	392
2000	435	41	0.0943	24	166	102	16	308
1999	242	29	0.1198	7	55	109	0	171

Table 19. Run escapement and NRR of Methow Basin steelhead populations calculated from broodstock sampling at Wells Hatchery with corresponding HRR values from Wells Hatchery returns. Escapement values and recruits produced were derived from radio-telemetry data (English et al. 2001, 2003).

Parent brood	Spawning escapement	Brood at age				Adults produced	NRR
		1.1	1.2, 2.1	1.3, 3.1, 2.2	2.3, 3.2		
1996	566	1999	2000	2001	2002	319	0.5636
1997	2,443	2000	2001	2002	2003	715	0.2927
1998	2,378	2001	2002	2003	2004	745	0.3133
1999	1,025	2002	2003	2004	2005	194	0.1893
2000	2,085	2003	2004	2005	2006	1,011	0.4849
2001	3,763	2004	2005	2006	2007	651	0.1730
2002	10,987	2005	2006	2007	2008	395	0.0360
2003	5,064	2006	2007	2008	2009	448	0.0885
2004	5,472	2007	2008	2009	2010	1,006	0.1838

Straying of Wells Hatchery Steelhead

Based on PIT tag recoveries of Wells Hatchery releases (brood years 2002-2004), hatchery steelhead have strayed into non-target tributaries in both the Methow and Okanogan basins. By brood year, Wells Hatchery steelhead identified in non-target locations was below the 5% standard (Table 20). However, since recovery locations and detection efforts were limited, reported stray rates should be considered minimum values.

Table 20. Stray rates by brood year of Wells Hatchery steelhead (broods 2002-2004) based on PIT tag observations during steelhead spawning periods (March-June) and expanded by release-group-specific tag rates.

Brood	# of strays	Expanded stray total	Adult returns	Stray rate (%)
2002	25	59	4,577	1.29
2003	30	59	6,129	0.96
2004	82	135	4,878	2.77

Straying of Out-of-basin Hatchery Steelhead

During the 2010 brood spawning period, a number of PIT-tagged out of-basin hatchery origin steelhead (fish that originated outside of the Methow Basin) were detected at instream PIT tag antenna arrays. These fish, if contributing to the spawning population, comprised substantial proportions of total spawning escapement in some areas (Table 21). As a proportion of estimated spawning escapement, out-of-basin stray hatchery steelhead comprised large numbers of fish in Gold Creek (43.0%) and Libby Creek (35.7%). There were no out-of-basin strays detected during the spawning period in Beaver, Wolf, or Eightmile Creeks. As a whole, PIT tag detections in the Methow Basin were comprised of 24.4% out-of-basin strays originating primarily from the Wenatchee Basin. Based on data collected during Wells Dam trapping, the estimated proportion of out-of-basin stray steelhead in the population was 17.4%.

Table 21. Expanded totals and stray rates of out-of-basin hatchery origin steelhead in the Methow Basin in 2010 based on instream PIT tag antenna array interrogation. Methow Basin totals include all other tributary subtotals. Estimated escapement was calculated from redd-based expansions assuming each female fish constructs one redd. Array efficiencies are not currently available for all detection sites therefore expanded totals should be considered minimum values.

Release stream (River)	Brood year	# of fish	Total tagged	Total released	Tag rate	Expanded total	Estimated escapement	% strays
Chewuch River subtotal								
Big Sheep Creek (Imnaha)	2007	1	5,670	103,220	0.055	18	691	2.60
Twisp River subtotal								
Nason Creek (Wenatchee)	2006	1	7,383	92,999	0.079	13	710	1.83
Nason Creek (Wenatchee)	2007	2	8,152	94,794	0.086	23	710	3.24
Libby Creek subtotal								
Chiwawa River (Wenatchee)	2006	2	4,215	7,500	0.562	4	98	4.08
Little Sheep Creek (Imnaha)	2007	1	9,207	171,545	0.054	19	98	19.39
Wenatchee River	2006	1	16,783	199,438	0.084	12	98	12.24
Gold Creek subtotal								
Little Sheep Creek (Imnaha)	2007	1	9,207	171,545	0.054	19	186	10.22
Nason Creek (Wenatchee)	2006	1	7,383	92,999	0.079	13	186	6.99
Wenatchee River	2006	1	16,783	199,438	0.084	12	186	6.45
Wenatchee River	2007	4	18,044	161,859	0.111	36	186	19.35
Methow Basin total								
Big Sheep Creek (Imnaha)	2007	2	5,670	103,220	0.055	36	3,681	0.98
Chiwawa River (Wenatchee)	2006	4	4,215	7,500	0.562	7	3,681	0.19
Chiwawa River (Wenatchee)	2007	8	3,704	50,037	0.074	95	3,681	2.58
Little Sheep Creek (Imnaha)	2007	1	9,207	171,545	0.054	19	3,681	0.52
Nason Creek (Wenatchee)	2006	6	7,383	92,999	0.079	63	3,681	1.71
Nason Creek (Wenatchee)	2007	13	8,152	94,794	0.086	105	3,681	2.85
Touchet River (Walla Walla)	2007	1	11,419	48,298	0.236	4	3,681	0.11
Tucannon River	2007	1	14,999	57,230	0.262	4	3,681	0.11
Wenatchee River	2006	10	16,783	199,438	0.084	107	3,681	2.91
Wenatchee River	2007	51	18,044	161,859	0.111	457	3,681	12.42
Grand total		97				897	3,681	24.38

Discussion

After accounting for Wells Dam fallback, fish that were counted twice in Wells Dam fish ladders, and fishery harvest, total estimated redd-based spawning escapement in the Methow Basin in 2010 (N = 3,681), as a proportion of estimated run escapement (N = 9,397), was similar to previous years (2010 = 39.2%; 2006-2009 mean = 39.6%). Preliminary data collected by the WDFW Supplementation Research Team (Wenatchee Office) suggests that increasing survey frequency roughly two-fold resulted in an approximate two-fold increase in the number of redds detected (A. Murdoch, personal communication). A comparison of survey methodologies in the Twisp River subbasin in 2010 suggested that index-expanded redd counts were similar to counts produced from weekly surveys. Since environmental conditions can change rapidly during the spawning period, some steelhead redds may be evident and readily identifiable for less than four days (WDFW, unpublished data). Though the Wenatchee and Methow Basins tend to differ with respect to overall density and distribution of spawning steelhead, an increase in survey frequency in the Methow Basin will likely provide more accurate estimates of total spawning escapement. In 2011, surveys will be conducted every four days in all mainstem index reaches as well as all reaches in the Twisp subbasin. Furthermore, an evaluation of surveyor efficiency was initiated in the Wenatchee Basin in 2010 and is scheduled to begin in the Methow Basin in 2012. The results from this study will provide estimates of variance for overall spawning escapement and relate redd count data to environmental covariates.

Total estimated escapement at Wells Dam for the 2010 brood was the highest ever on record. Retention of ad-clipped hatchery fish during the 2009-2010 upper Columbia River fishery was estimated at 7,987 fish. The conservation fishery is an important tool in managing adult returns comprised primarily of hatchery fish. Coupling recreational harvest of hatchery steelhead with management practices that limit the proportion of hatchery fish in the run-at-large (e.g., culling surplus hatchery fish) should provide local biologists measures by which to control the total number of hatchery fish on the spawning grounds. These measures have been initiated at the Twisp weir consistent with the objectives of the reproductive success study and should be implemented at other collection sites in the Upper Columbia (i.e., Wells Dam, Winthrop NFH, Methow Hatchery).

In 2010, spawn timing and distribution of hatchery and wild spawners was estimated through a combination of anchor tag observations and PIT tag detections during spawner surveys. Prior to 2009, comparisons of spawn timing in the natural environment was lacking; fish origin could not be determined visually since many hatchery fish were not adipose fin-clipped. Though differences in spawn timing between hatchery and wild fish are typically present in the hatchery setting, there were no significant differences in the Twisp River reaches above the weir. Increasing survey frequency in all Twisp subbasin reaches will provide surveyors more opportunities to observe anchor-tagged fish. A total of 22 PIT tags from fish sampled at the Twisp River weir were detected in redds (13%). Though redds were often scanned shortly after construction, and scan frequency increased in 2010, fewer tags were detected than in 2009. Since steelhead tend to spawn in the same areas each year, tag collision could prevent surveyors from detecting tags deposited in redds. Other confounding factors include variability in tag placement, incomplete egg expulsion, and redd scour.

Current methodologies for estimating redd-based spawning escapement rely on the premise that each female steelhead constructs only one redd. Total redd counts above the Twisp weir estimated by two survey methodologies ranged from 172 to 210 redds, and the total number of female steelhead released above the Twisp weir was 188. Methow Research Team and Methow Hatchery personnel actively adjusted weir panels as needed to increase weir efficiency during trapping. Redd survey counts suggests weir efficiency may have been less than 100%. However, if the Twisp weir was 100 percent efficient, and cutthroat redds were not mistaken as steelhead redds, redds per female above the Twisp weir ranged from 0.91 to 1.12. The actual number of redds per female may range between one and four (Susac and Jacobs 1999, Gallagher and Gallagher 2005). A total of 54 unique female cutthroat were released above the Twisp weir, 11 of which had fork lengths equal to or greater than 50 cm. Only two redds in reaches above the weir were positively identified as cutthroat trout redds through visual observation of spawners or detection of expelled PIT tags. It is plausible that some redds attributed to steelhead were actually cutthroat redds. Alternatively, cutthroat may typically spawn in areas currently not surveyed (e.g., above Road’s end CG). A temporary mainstem PIT array will be installed in 2011 near the upper stream boundary of the current steelhead spawning survey area to assist in delimiting the spawning distribution of steelhead and cutthroat trout in upper survey reaches.

Natural Replacement Rate (NRR) of wild steelhead broods have consistently been below the value required to replace the parent population (1.0) for parent broods 1996-2004. Hatchery Replacement Rates (HRR) have been significantly greater during this period (~25 recruits per spawner). Since hatchery fish are returning at much higher rates than wild fish, implementation of measures to remove excess returning adult hatchery fish is imperative. The Wells Hatchery steelhead program has been successful in meeting the programmatic objectives with regards to replacement of the parent population with the intent to supplement spawning in the natural environment. However, current run-at-large management of returning adults should take into account maximum adult escapement (hatchery and wild fish) needed to effectively seed the available habitat and reduce the likelihood of density-dependent mortality of juvenile steelhead.

The number of out-of-basin stray hatchery steelhead (i.e., Wenatchee Basin fish), estimated from run-at-large sampling prior to fishery harvest, upstream of Wells Dam was estimated to be 4,154 (2010 brood). The total number of stray hatchery steelhead has increased in number each year since 2006. The proportion of total run escapement prior to fishery harvest that stray hatchery steelhead comprised was less in the 2009 run year (2010 brood) than in previous years (17.4%). However, based on detections at the lower Methow River PIT tag array, stray hatchery fish may have comprised 24.4% of overall redd-based spawning escapement. In some smaller tributaries, stray hatchery steelhead may have equaled more than a third of the spawning population. Though it is likely that fish detected in tributaries contributed to spawning, detection at the lower river array indicates presence, but not necessarily residence until spawning, especially when fishery-related removal is considered. The addition of a second, lower river array will allow for directionality of movement and should help refine population escapement estimates.

As PIT tag technology increases in application and extent, researchers can begin to address questions that have previously been too difficult or costly to answer. In 2010, we used PIT tags to determine dam fallback, the number of fish that ascended through dam ladders more than once (double counts), and the estimated contribution of stray steelhead in the Methow Basin. We also used them to determine arrival timing and overall escapement in the Twisp subbasin, and the distribution of hatchery and wild spawners. In 2011, deployment of additional arrays will provide further information regarding presence/absence and timing of steelhead in areas historically challenging to survey.

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Appendix A. Summer steelhead run escapement, broodstock collection, fishery-related mortality, and maximum spawning escapement estimates at and 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 hatchery and wild escapement upstream of Wells Dam, respectively. Total count at Wells Dam includes passage from 15 June (run year) to 14 June (spawn year) for brood years 2003 to present; total Wells Dam count for previous years includes the total reported for the run year (prior to spawn). Ladder counts are based on DCPUD raw data for brood years 2000-2010; data for brood year 1999 was based on data from FPC.org. For brood years 2007-2009, proportion of hatchery and wild fish at Wells Dam was estimated through run-at-large sampling; in previous years, proportions were calculated from broodstock trapping records. Estimated double counts and fallback were based on expanded PIT tag interrogation data. Estimated fishery mortality in the Columbia River, brood year 2004, includes fishery-related mortality in the Wells Dam tailrace; all other fishery mortality in the Columbia River occurred in the section between Wells Dam and Chief Joseph Dam.

Brood year	Total count at Wells Dam based on trapping data and ladder counts from DCPUD		Wells Hatchery broodstock retained		Estimated double counts at Wells Dam		Estimated fallback below Wells Dam		Estimated fishery mortality		Estimated run escapement (using radio-telemetry data)				Estimated fishery mortality				Local broodstock retained				Estimated maximum spawning escapement (using radio-telemetry data)			
									Columbia		Methow		Okanogan		Met.		Okan.		Met.		Okan.		Met.		Okan.	
	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W
1999	2,943	242	383	29	- -	- -	- -	- -	- -	- -	1,485	151	829	44	- -	- -	- -	- -	- -	- -	- -	- -	1,485	151	829	44
2000	3,448	435	334	41	- -	- -	- -	- -	- -	- -	1,806	279	1,009	82	- -	- -	- -	- -	- -	- -	- -	- -	1,806	279	1,009	82
2001	6,167	553	323	26	- -	- -	- -	- -	- -	- -	3,390	373	1,893	110	- -	- -	- -	- -	- -	- -	- -	- -	3,390	373	1,893	110
2002	18,241	900	374	18	- -	- -	- -	- -	- -	- -	10,363	624	5,789	183	- -	- -	- -	- -	- -	- -	- -	- -	10,363	624	5,789	183
2003	8,962	821	274	27	- -	- -	- -	- -	455	9	4,775	556	2,668	163	254	13	120	2	- -	- -	1	4	4,521	543	2,547	157
2004	9,388	1,161	325	120	- -	- -	- -	- -	298	4	5,084	734	2,840	216	336	10	385	1	- -	- -	11	5	4,748	724	2,444	210
2005	9,098	861	346	69	- -	- -	- -	- -	426	5	4,829	557	2,698	164	679	9	528	3	- -	- -	15	3	4,150	548	2,155	158
2006	6,901	765	324	91	- -	- -	- -	- -	437	4	3,561	474	1,989	139	683	8	486	5	- -	- -	10	3	2,878	466	1,493	131
2007	6,702	631	345	46	- -	- -	- -	- -	523	2	3,384	413	1,890	121	- -	- -	- -	- -	- -	- -	4	7	3,384	413	1,886	114
2008	7,033	1,283	289	90	- -	- -	- -	- -	872	8	3,406	839	1,902	247	470	9	288	7	14	0	5	3	2,922	830	1,609	237
2009	9,148	1,236	300	75	148	19	409	54	444	5	4,551	767	2,542	225	636	11	446	5	8	8	5	11	3,907	748	2,091	209
2010	24,091	2,120	279	88	583	50	1,207	103	1,068	17	12,153	1,318	6,789	387	4,002	48	3,110	16	12	12	4	13	8,139	1,258	3,675	358

Appendix B1. Upper Methow River subbasin steelhead redd counts by section and survey year. Section descriptions in bold indicate rotating panel tributaries. Ns = not surveyed.

River/section	Code	2002	2003	2004	2005	2006	2007	2008	2009	2010
Upper Methow River										
Ballard C.G. - Lost River	M15	ns	15	27	17	3	2	6	5	0
Lost River - Gate Creek	M14	ns		10	51	0	19	25	16	65
Gate Creek - Early Winters Creek	M13	ns	215[a]	23	60	15	11	19	11	65
Early Winters Creek - Mazama Bridge	M12	ns		0	43	3	5	25	8	27
Mazama Bridge - Suspension Bridge	M11	70	44[a]	12	25	9	24	27	5	27
Suspension Bridge - Weeman Bridge	M10	156		8	52	26	56	21	25	55
Weeman Bridge - Along Highway 20	M9	ns		93	180	30	14	34	94	123
Along Highway 20 - Wolf Creek	M8	ns	325[a]	0	9	0	1	1	0	0
Wolf Creek - Foghorn Dam	M7	ns		0	9	5	0	10	10	15
Foghorn Dam - Winthrop Bridge	M6	ns		0	34	0	0	10	2	6
Upper Methow River mainstem total		226	599	173	480	91	132	178	176	383
Lost River										
Sunset Creek - Eureka Creek	L3	ns	ns	17	6	ns	ns	ns	ns	2
Eureka Creek - Lost River Bridge	L2	10	25	11	7	ns	ns	ns	11	12
Lost River Bridge - Confluence	L1	1	0	3	7	2	10	3	6	5
Early Winters Creek										
Klipchuck C,G. - Early Winters Bridge	EW5	ns	ns	0	0	ns	ns	ns	0	0
Early Winters Bridge - Highway 20 Bridge	EW4	ns	ns	0	0	ns	ns	ns	2	1
Highway 20 Bridge - Diversion dam	EW3	ns	ns	23	6	ns	4	0	0	2
Diversion dam - Highway 20 Bridge	EW2	ns	ns	0	0	3	2	0	2	1
Highway 20 Bridge - Confluence	EW1	ns	ns	1	0	1	0	0	0	0
Methow River tributaries										
Suspension Creek (Entire length)	Susp1	ns	ns	43	37	31	49	37	32	43
Little Suspension Creek (Entire length)	Lsusp1	ns	ns	ns[b]	ns[b]	ns[b]	29	4	1	11
Methow Hatchery Outfall (Entire length)	MH1	15	ns	18	15	14	25	9	12	6
Winthrop NFH Outfall (Entire length)	WN1	171	61	113	83	29	68	27	37	24
Hancock Cr. (Kumm Rd. to Wolf Cr. Rd.)	HA2	ns	ns	ns	ns	ns	21	9	7	12
Hancock Cr. (Wolf Cr. Rd. to Confluence)	HA1	ns	ns	3	0	0	2	4	1	2
Gate Creek (Culvert – Confluence)	GA1	ns	0[c]	0[c]	0[c]	0[c]	0[c]	0[c]	0[c]	1
Wolf Creek (Rd 5505 access - footbridge)	**W2**	ns	ns	29	0	0	ns	ns	0	0
Wolf Creek (footbridge - Confluence)	**W1**	ns	ns	8	0	0	1	0	0	0
Little Boulder Creek (Hwy 20 – Conf.)	**LBO1**	ns	ns	3	3	0	0	0	0	0
Goat Creek (FR 52 Bridge - Confluence)	**GT1**	ns	ns	33	4	0	0	0	0	0
Upper Methow River subbasin total		423	685	478	648	171	343	271	287	505

[a] Reaches M12-M14, M10 and M11, and M6-M9 were combined in 2003.
[b] Believed to be unsuitable habitat 2004 and 2006.
[c] Historically surveyed as part of M13.

Appendix B2. Lower Methow River subbasin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries. Ns = not surveyed.

River/section	Code	2002	2003	2004	2005	2006	2007	2008	2009	2010
				Lower Methow River						
Winthrop Bridge - MVID Dam	M5	ns	89[a]	14	44	15	0	0	23	24
MVID - Twisp Confluence	M4	ns		24	50	0	4	0	23	29
Twisp Confluence - Carlton	M3	ns	69	38	123	44	0	5	24	132
Carlton - Upper Burma Bridge	M2	ns	99	33	79	28	1	27	15	39
Upper Burma Bridge - Mouth	M1	ns	58	42	67	10	2	86	17	180
Lower Methow River mainstem total		ns	315	151	363	97	7	118	102	404
				Beaver Creek						
Beaver Cr. (Lester Rd. Br. - Balky Hill Rd.)	BV3	ns	ns	16[b]	2	ns	9[c]	0	0	0
Beaver Cr. (Balky Hill Rd. - Highway 20)	BV2	ns	ns		14	ns	ns	15	23	0
Beaver Creek (Highway 20 - Confluence)	BV1	70	15	21	39	21	9	38	26	17
				Lower Methow River tributaries						
Gold Cr. Up. N.F. (10.0 rkm – 6.3 rkm)[d]	**GDN4**	ns	ns	0	22	15	36	7	0	4
Gold Cr. Mid. N.F. (6.3 rkm - N.F. Br.)	**GDN3**	ns	ns	0	3	2	5	1	7	8
Gold Cr. Mid. N.F. (N.F. Br. - W. Pines)	**GDN2**	ns	ns	0	16	3	6	0	6	4
Gold Cr. Lower N.F. (W. Pines - 2nd Br.)	**GDN1**	ns	ns	0	15	2	6	1	5	14
Gold Cr. S.F. (1st Bridge - 1.7 rkm)	**GDS3**	ns	ns	0	30	10	25	0[e]	5	8
Gold Cr. S.F. (1.7 rkm - 0.6 rkm)	**GDS2**	ns	ns	0	8	3	6	9	4	13
Gold Cr. S.F. (0.6 rkm - Confluence)	**GDS1**	ns	ns	0	4	1	3	0[e]	1	1
Gold Cr. Mainstem (2nd Br. – Priv. Land)	**GDM2**	ns	ns	0	12	2	5	11	15	14
Gold Cr. Mainstem (Priv. Land - Conf.)	**GDM1**	ns	2	0	15	3	6	12	16	15
Foggy Dew Creek (FR 200 - Confluence)	**FD1**	ns	ns	0	14	10	24	2	2	6
Black Canyon Cr. (1st Culvert - 0.8 rkm)	**BC2**	ns	ns	0	7	2	5	2	2	4
Black Canyon Cr. (0.8 rkm - Confluence)	**BC1**	ns	ns	0	6	2	5	2	0	1
Libby Creek (Hornet Draw - L.P. Land)	**LB5**	ns	ns	ns	ns	ns	ns	ns	ns	8
Libby Creek (Lower Public Land)	**LB4**	ns	ns	0	7	2	6	2	ns[f]	8
Libby Creek (L.P. Land - Realty Land)	**LB3**	ns	ns	0	8	2	6	2	ns[f]	14
Libby Creek (Realty Land)	**LB2**	ns	ns	0	2	1	2	1	0	7
Libby Creek (Realty Land - Confluence)	**LB1**	ns	ns	0	7	3	6	2	5	9
Lower Methow River subbasin total		70	332	188	594	181	177	225	219	559

[a] Reaches M5 and M4 were combined in 2003.
[b] Reaches BV2 and BV3 were combined in 2004.
[c] Partial survey.
[d] Distance surveyed since 2009.
[e] No expansion due to possible unsuitable habitat.
[f] Beaver dam considered as barrier to upstream migration in 2009.

Appendix B3. Twisp River subbasin steelhead redd counts by section and survey year. Section descriptions in bold indicate rotating panel tributaries. Ns = not surveyed.

River/section	Code	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					Twisp River						
Road's End C.G. - South Creek Bridge	T10	ns	ns	33	15	9	ns	ns[b]	ns	0	0
South Creek Bridge - Poplar Flats C.G.	T9	ns	ns	5	9	6	4	ns[b]	ns	0	0
Poplar Flats C.G. - Mystery Bridge	T8	ns	ns	17	2	17	29	ns[b]	0	0	0
Mystery Bridge - War Creek Bridge	T7	2	ns	36	88	112	47	ns[b]	6	22	6
War Creek Bridge - Buttermilk Bridge	T6	40	ns	91	9	78	70	ns[b]	42	109	79
Buttermilk Bridge - Little Bridge Cr.	T5	47	156	322[a]	22	87	130	60	59	71	48
Little Bridge Creek - Twisp Weir	T4	100	194		94	25	34	13	30	22	27
Twisp Weir - Upper Poorman Bridge	T3	48	ns	88	3	32	32	5	18	47	78
Up. Poorman Br. - Lower Poorman Br.	T2	46	ns	14	1	29	18	ns[b]	16	47	54
Lower Poorman Bridge - Confluence	T1	29	ns	90	0	20	5	ns[b]	6	10	27
Twisp River mainstem total		312	350	696	243	415	369	78	177	328	319
					Twisp River tributaries						
Little Br. Cr. (Road's End – Vetch Cr.)	LBC4	ns	ns	ns	ns	ns	ns	0	ns	ns	0
Little Br. Cr. (Vetch Cr. – 2nd Culvert)	LBC3	ns	ns	ns	ns	3	0	1	0	0	1
Little Br. Cr. (2nd Culvert – 1st Culvert)	LBC2	ns	ns	ns	ns	4	1	0	2	1	3
Little Br. Cr. (1st Culvert - Confluence)	LBC1	ns	ns	ns	11	20	3	2	2	17	4
MSRF pond outfalls[1]	MSRF1	ns	ns	ns	2	11	0	1	0	0	1
War Creek (log jam barrier - Conf.)	**WR1**	ns	0	0	0	2	3	0	0	2	0
Eagle Creek (Rd 4430 - Confluence)	**EA1**	ns	ns	ns	0	2	1	0	0	2	0
Buttermilk Cr. (Fork - Cattle Guard)	**BM2**	ns	ns	ns	0	13	5	0	1	0	3
Buttermilk Cr. (Cattle Guard - Conf.)	**BM1**	ns	4	0	0	13	5	0	0	2	1
RP-South Creek (Falls - Confluence)	**SO1**	ns	ns	ns	0	1	2	0	0	0	0
Twisp River subbasin total		312	354	696	256	484	389	82	182	352	332

[a] Reaches T4 and T5 were combined in 2003.
[b] Not surveyed due to prolonged high flow.

Appendix B4. Chewuch River subbasin steelhead redd counts by section and survey year. Sections descriptions in bold indicate rotating panel tributaries. Ns = not surveyed.

River/section	Code	2002	2003	2004	2005	2006	2007	2008	2009	2010
					Chewuch River					
Chewuch Falls - 30 Mile Bridge	C13	ns	ns	0	ns	ns	ns	ns	0	0
30 Mile Bridge - Road Side Camp	C12	ns	14	3	ns	ns	ns	ns	4	19
Road Side Camp - Andrews Creek	C11	ns	3	8	ns	ns	ns	ns	2	9
Andrews Creek - Lake Creek	C10	ns	8	23	ns	ns	ns	ns	4	13
Lake Creek - Buck Creek	C9	ns	9	0	ns	ns	ns	ns	0	ns
Buck Creek - Camp 4 C.G.	C8	ns	3	3	ns	ns	ns	ns	34	60
Camp 4 C.G. - Chewuch Campground	C7	ns	6	10	ns	ns	16	13	9	32
Chewuch C.G. - Falls Creek C.G.	C6	ns	26	3	0	ns	21	30	30	87
Falls Creek C.G. - Eightmile Creek	C5	ns	44	8	0	ns	7	22	11	51
Eightmile Creek - Boulder Creek	C4	105	134	5	20	2	19	55	28	34
Boulder Creek - Chewuch Bridge	C3	ns	0	0	ns	ns	0	4	2	0
Chewuch Bridge - WDFW Land	C2	ns	35	8	ns	ns	3	37	24	15
WDFW Land - Confluence	C1	ns	3	3	ns	ns	0	25	7	2
Chewuch River mainstem total		105	285	74	20	2	66	186	155	322
					Chewuch River tributaries					
Eightmile Creek (300m abv. div. - Bridge)	EM2	5[a]	20[a]	0	11	0	0	3	0	0
Eightmile Creek (Bridge - Conf.)	EM1			1	17	4	1	0	2	1
Cub Creek (W. Chewuch Rd. - Conf.)	CU1	ns	ns	ns	ns	ns	ns	ns	ns	1
Boulder Creek (Falls - 1st Bridge)	**BD2**	ns	0	0	5	6	4	0	1	0
Boulder Creek (1st Bridge - Conf.)	**BD1**	4	0	0	2	1	4	0	0	0
Lake Creek (Black Lk. - 1st Bridge)	**LK2**	ns	ns	0	0	44	51	0	13	0
Lake Creek (1st Bridge – Conf.)	**LK1**	1	1	0	0	4	4	0	1	0
Andrews Creek (L. And. Cr. – 1st Br.)	**AN2**	ns	ns	0	1	1	2	0	0	ns
Andrews Creek (1st Bridge - Conf.)	**AN1**	ns	ns	0	1	1	1	0	0	0
Twentymile Creek (Falls - FR 5010)	**TW2**	ns	ns	0[b]	1[b]	4[b]	0	0	0	0
Twentymile Creek (FR 5010 - Conf.)	**TW1**	ns	ns				5	0	0	0
Chewuch River subbasin total		115	306	75	58	67	138	189	172	324

[a] Reaches EM2 and EM1 combined 2002 and 2003.
[b] Reaches TW2 and TW1 combined 2004 to 2006.

Chapter 5

2010 Brood Spring Chinook Salmon Spawning Ground Surveys Conducted in the Methow River Basin

Abstract

Spawning ground surveys were conducted to evaluate the spawn timing, spatial distribution, genetic composition, and to estimate the tributary-specific spawning escapement of spring Chinook salmon within the Methow River basin. Spawning ground surveys were performed on foot between 3 August and 26 September. A total of 1,366 spring Chinook salmon redds were constructed in the Methow River basin in 2010. The Methow River subbasin had the greatest number of redds (*N* = 935). The Chewuch River subbasin had fewer redds (*N* = 286) than the mainstem Methow River excluding hatchery outfalls and tributaries (*N* = 693), and the fewest redds were located in the Twisp River (*N* = 145). After subtracting fish that were double counted at Wells Dam fish ladders (*N* = 168) and that moved downstream of Wells Dam without reascending (*N* = 110), an estimated 8,565 spring Chinook salmon comprised the population above Wells Dam in 2010. After subtracting fish that were collected for hatchery broodstock (*N* = 773), provided to local tribes (*N* = 1,851), and those originating from Okanogan River releases (*N* = 1,059), the estimated run escapement to the Methow River basin was 4,882 fish. There were no significant differences in migration timing between hatchery and wild fish within a given cohort. Redd counts expanded by the male-to-female ratio from sampling at Wells Dam (0.73:1.00) suggest that the Methow River spawning population comprised 2,369 fish, or 48.5% of the estimated run escapement. No estimates of poaching, predation, or pre-spawn mortality were made. Peak spawning occurred between 27 August and 11 September in index areas of all three subbasins. Wild female carcasses were found significantly further upstream than hatchery female carcasses in all subbasins. There were no significant differences in spawn timing between hatchery and wild fish within any subbasin. Wild fish comprised 61.9%, 31.2%, and 17.9% of the estimated spawning escapement in the Twisp, Chewuch, and Methow subbasins, respectively. The natural replacement rate (NRR) for the most recent brood year of spring Chinook salmon with complete recovery data (2004 brood) was highest in the Methow River subbasin (0.27 recruits per spawner). The geometric mean NRR for brood years 1992 to 2004 was less than 1.0 in each subbasin regardless of whether broodyears 1996 through 1998 were omitted (no spawning ground surveys in 1996 and 1998). Hatchery replacement rate (HRR) values have not consistently met the target BAMP HRR values for all release groups in broodyears 1992 through 2004. Of the estimated total of coded-wire-tagged hatchery fish recovered on spawning grounds (*N* = 1,638), 13.8% were classified as within-basin strays from Methow Hatchery and 1.4% were stray fish from other basins.

Introduction

Spring Chinook salmon spawning ground surveys were used to evaluate spawn timing, spatial distribution, spawner demographics, and to estimate tributary-specific spawning escapement within the Methow River basin. Spring Chinook propagated at Methow Hatchery (MH) are used to supplement natural spawning populations in the Methow, Twisp, and Chewuch rivers. Returning hatchery adults should have migration timing, spawn timing, and redd distributions similar to those of naturally produced fish. Most spring Chinook salmon reared at MH were tagged with unique coded-wire tags (CWT) based on their subbasin of release. In some cases, individual families, progeny from adults with elevated ELISA values, or juveniles released as subyearlings were also tagged with unique CWT codes. Recovery of CWTs from spawning ground surveys provides the data necessary to estimate hatchery stray rates and the composition of spawners in 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 Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs (Hays et al. 2007) as proposed by Murdoch and Snow (2009) 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 2010 and data were collected that specifically address 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 $_{\text{Supplemented population}}$ ≥ Δ NOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho: Δ NRR $_{\text{Supplemented population}}$ ≥ Δ NRR $_{\text{Non-supplemented population}}$

Objective 2: Determine if run timing, spawn timing, and spawning distribution of both natural and hatchery components of the target population are similar.

- Ho: Migration timing $_{\text{Hatchery age X}}$ = 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 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.

- Ho: Size (length) at maturity $_{\text{Hatchery age X and Gender Y}}$ = Size (length) at maturity $_{\text{Naturally produced age X and Gender Y}}$
- Ho: Age at maturity $_{\text{Hatchery}}$ = Age at maturity $_{\text{Naturally produced}}$

Objective 4: Determine if hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than 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: $HRR_{\text{Year x}} \geq NRR_{\text{Year x}}$
- Ho: HRR $\geq$ BAMP value (preferred)

Objective 5: Determine if stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

- Ho: Stray rate $_{\text{Hatchery fish}} \leq 5\%$ 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 Run Composition

Adult spring Chinook salmon were trapped and sampled at Wells Dam to assess migration timing, origin composition, and to collect broodstock for MH (Tonseth 2010). All trapped fish were sampled for hatchery marks (fin-clips) and tags (CWT). Scale samples, sex, and fork length data were collected from all suspected wild fish, and wild fish retained for broodstock were also tissue sampled for DNA analysis to determine genetic origin (i.e., Twisp or non-Twisp). All hatchery fish were sampled for scales, sex, and length, and passive integrated transponder (PIT) tags were inserted in the pelvic girdle of all released fish (hatchery and wild) to assess sex ratio of the 2010 brood and to examine the influence of size on carcass recovery rates. Adipose fin-clipped hatchery spring Chinook salmon were expected to return to the Methow and the Okanogan river basins. The Winthrop National Fish Hatchery (NFH) expected returns of age-3 and age-5 ad-clipped fish from the 2005 and 2007 broods. Colville Confederated Tribes (CCT) expected returns of age-4 ad-clipped fish from the 2006 brood. Scale age was used to estimate escapement of adipose fin-clipped fish to the Methow and Okanogan basins. Adipose fin-clipped fish exposed to anesthetic (MS-222) were marked with an anchor tag near the dorsal fin to allow exclusion from consumptive fisheries. Gender was determined using ultrasound. All trapped fish were either transported to MH as broodstock, placed back in the fish ladder upstream of the trap (east ladder only), or were released into the Columbia River upstream of Wells Dam.

Digital video records of fish passage at Wells Dam between 13 June and 3 July for the east ladder and 6 June through 3 July for the west ladder were reviewed to exclude summer Chinook salmon from the spring Chinook salmon count and vice versa. In general, we reviewed the three busiest hours of passage per ladder per day during these periods. Additionally, west ladder summer Chinook trapping data between 1 July and 16 July were used to estimate the number of spring Chinook after the video review period. Summer Chinook salmon were distinguished from spring Chinook salmon based on body color and shape. The number of fish that were double counted (i.e., re-ascensions) or fell back (i.e., fell below without re-ascending) were estimated based on PIT-tag detections at instream interrogation sites and mainstem Columbia and Snake River dams. Proportions of fish detected at locations downstream of Wells Dam and records of fish migrating through Wells Dam multiple times were expanded to the estimated run-at-large at Wells Dam. No estimates of predation, pre-spawn mortality or illegal removal (i.e., poaching) were made.

Redd Distribution and Spawn Timing

The Methow River basin was divided into three geographic subbasins: Methow River (upstream of Twisp), 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 marked with flagging tape that included 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 analyses. Most mainstem reaches were surveyed weekly during the spawning season (August and September). A total of five census reaches were surveyed about every four days consistent with the objectives of BPA project 201003400; Upper Columbia Spring Chinook and Steelhead Juvenile and Adult Abundance, Productivity, and Spatial Structure Monitoring. To assess the length of time that redds are detectable (redd life), existing redds were rated weekly (non-census reaches) or every four days (census reaches) with one of three descriptions: measurable (defined margins), identifiable (redd from the current season but not measurable), or undetectable. To compare redd life among subbasins, redds that were constructed prior to 31 August and were evaluated through at least 17 September were used to standardize the evaluation period. Redds located in both hatchery outfalls were not included in redd life analyses due to the level of superimposition observed. Female carcass locations (river kilometers [rkm]) were used as surrogates for spatial redd distribution by origin of fish because most hatchery fish in the Methow Basin lack externally visible marks, greatly limiting the ability to determine the origin of actively spawning fish.

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 possible. Tissue samples were collected from wild fish, and a small number of hatchery fish for genetic analyses; most DNA samples from hatchery fish were collected at Methow Hatchery during spawning activities. Carcass locations were recorded using hand-held GPS devices and all carcasses were sampled for CWTs using hand-held electronic detection wands. Most spring Chinook salmon released from Methow Basin hatcheries in recent years have been tagged with a CWT but not been externally marked, thus requiring the use of electronic detectors. Most other hatchery fish released in the Upper Columbia are externally marked with an adipose fin-clip in addition to the CWT 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 detectable hatchery mark or tag (i.e., wild).

Egg retention was determined for female carcasses with an intact abdomen by counting the number of eggs present. The percentage of eggs retained was determined by dividing the number of eggs counted by the mean fecundity for the fish's specific age and origin derived from 2010 MH broodstock (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 pre-spawn mortalities. Estimated egg deposition was calculated using mean fecundities from MH broodstock (i.e., MetComp stock for Methow and Chewuch subbasins, Twisp stock for Twisp subbasin) and adjusted for mean egg-retention rates.

Natural Replacement Rate

The natural replacement rate (NRR) for each brood was calculated by adding the number of recruits (r) from successive return years that originated from the same brood year (i), and dividing the sum by the number of spawners (S) for that brood year calculated from expanded spawning ground surveys, as follows:

$$\mathrm{NRR} = (r_{\mathrm{i+1}} + r_{\mathrm{i+2}} + r_{\mathrm{i+3}} + \ldots)/S$$

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). Since 2006, fish-per-redd values have been calculated using the male-to-female sex ratio from run-at-large sampling at Wells Dam. In 2010, fish-per-redd values were calculated on the population remaining after broodstock collection and removal of fish from the Winthrop NFH outfall (tribal excess). 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, and associated stray rates were determined by expanding all CWT recoveries by the code-specific tag-retention rates and stream-specific sampling rates from spawning ground surveys. Hatchery fish were assigned to one of four categories depending on release and recovery location (local, Winthrop NFH, within-basin stray, or out-of-basin stray). Local fish were composed of Methow Hatchery fish recovered in the stream or subbasin from which they were released. Fish released from Winthrop NFH were expected to return to the Methow River but their within-basin stray rates were not addressed. All MH fish recovered in a stream or subbasin in the Methow River basin from which they were not released were considered within-basin strays. Out-of-basin strays included all fish recovered that originated from hatchery releases outside the Methow River basin.

Statistical Analyses

For all comparisons of hatchery and wild fish (except migration timing), only local hatchery fish were used within specific tributary release locations (i.e., Chewuch River recoveries that were released into the Chewuch River, etc.). Data were tested for normality using Kolmogorov-Smirnov one-sample tests and homogeneity of variances using Levene's tests. Data were transformed to achieve normal distributions when necessary. Nonparametric tests were used when normal distributions could not be achieved and variance was unequal between groups. All statistical tests were performed at a significance level of 0.05 (i.e., a 5% chance of erroneously rejecting a null hypothesis). 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. Redd life among subbasins was compared using ANOVA. 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. Spatial redd distribution of hatchery and wild fish within subbasins was compared using Mann-Whitney U-tests. Differences in spawn timing between hatchery and wild females within each subbasin were tested using analysis of covariance (ANCOVA) with elevation as the covariate. Length at maturity was compared using one-sample t-tests and Wilcoxon tests. Age at maturity was compared using Chi-square. Comparisons of NRR and HRR by subbasin were tested using two-sample t-tests. Stray rates were tested using one-sample t-tests. Statistical tests for strays by brood year were conducted including fish removed in fisheries (i.e., harvest), because inclusion of harvested fish did not influence results of the analyses. Data transformations (e.g., square root) often will not normalize data sets that include many null values and few values greater than one. However, transformed data were used if transformations produced normal data. Objective 1 of the M&E Plan requires the use of spatial reference populations. Reference populations are currently being investigated and if identified, similar data for those populations will be included in future reports.

Results

Migration Timing and Run Composition

The 2010 spring Chinook salmon migration to Wells Dam was monitored between 3 May and 30 June. During this period, the majority (94.8%) of fish migrated between 10 May and 15 June (days 130 and 166, respectively; Figure 1). Hatchery 4 and 5-year olds and wild 4-year olds migrated to Wells Dam earlier than hatchery 3-year olds (KW ANOVA multiple comparisons: $P \leq 0.01$ in all cases; Figure 2).

Based on PIT tag detections at Wells Dam fish ladders, an estimated 168 fish were double counted and 110 fish fell below Wells Dam after being counted and did not re-ascend; excluding these totals, the estimated spring Chinook salmon run above Wells Dam (including broodstock) was 8,565 fish (Table 1). The run was composed primarily of hatchery fish (86.6%), the majority of which were not adipose fin-clipped. Wild fish comprised an estimated 13.4% of the run at Wells Dam. Based on spawning ground and broodstock recoveries of PIT-tagged fish, initial gender determination at Wells Dam was 94.8% accurate for adult female fish, 93.2%

accurate for adult male fish, 100.0% accurate for age-3 male fish (i.e., jacks), and 25.0% accurate for age-3 female fish (i.e., jills; 7 fish sampled, 4 fish recovered). After correcting for sex determination errors and accounting for fish retained for broodstock, the male (including jacks) to female ratio of fish sampled at Wells Dam was 0.73 to 1.00. This equates to a fish-per-redd value of 1.73 assuming females only construct a single redd. After removing fish bound for the Okanogan River (*N* = 1,059), fish collected for hatchery broodstock (*N* = 773), and fish distributed to local tribes (*N* = 1,851), the estimated run escapement to the Methow River was 4,882 fish.

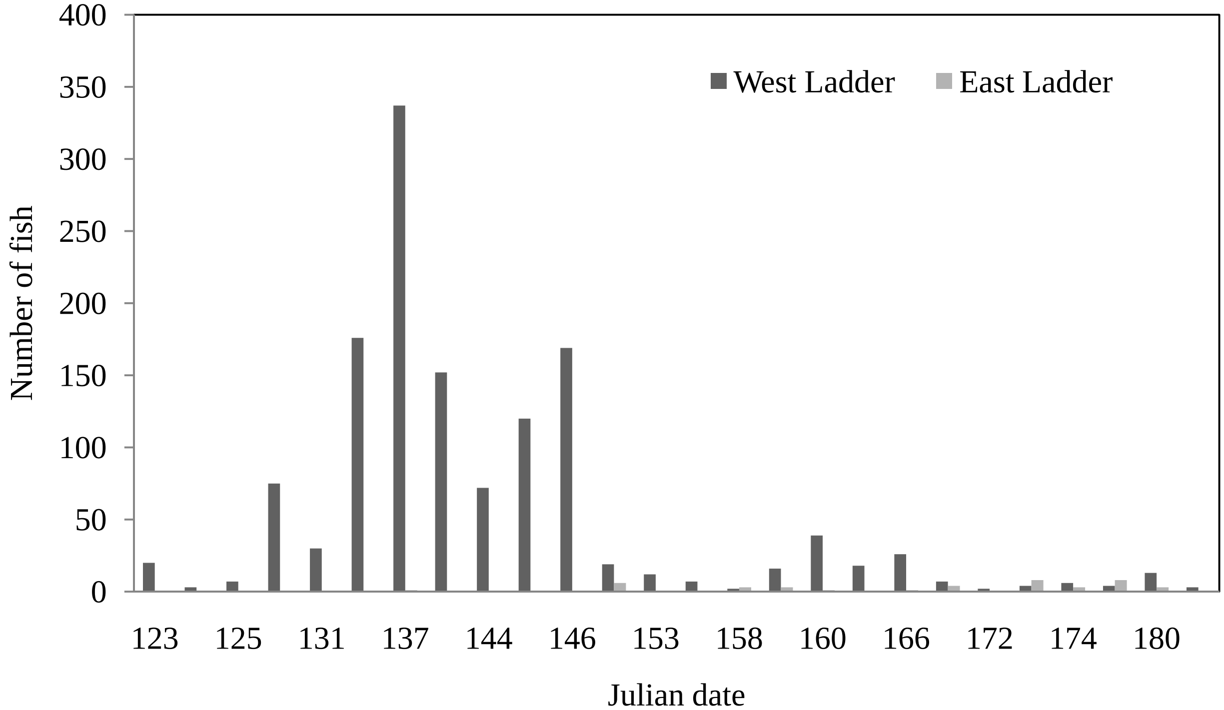

Figure 1. 2010 spring Chinook salmon migration timing to Wells Dam by ladder. All fish sampled during trapping operations are included.

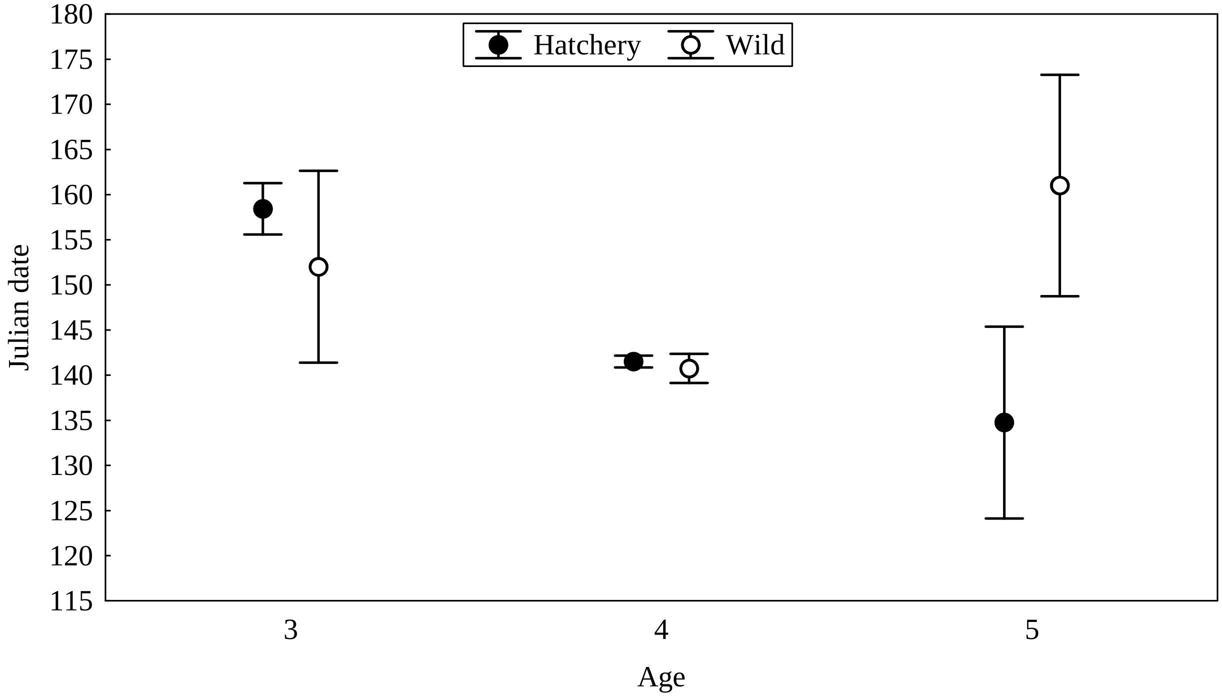

Figure 2. Mean migration timing (Julian date) to Wells Dam by age of hatchery and wild origin spring Chinook salmon in 2010. Error bars represent 95% confidence intervals.

Table 1. Estimated 2010 spring Chinook salmon run composition at Wells Dam based on trapping three consecutive days per week. Okanogan River returns from CCT hatchery releases were based on estimated age of adipose fin-clipped fish (age-4). Estimated run at Wells Dam includes fish collected for broodstock (*N* = 773).

Origin	Mark	Adults		Age-3 fish	
		%	*N*	%	*N*
Hatchery	Coded wire tag only	70.6	5,619	71.7	434
	Ad-clip only (CCT)	11.4	911	- -	- -
	None	2.4	192	1.0	6
	Ad-clip + CWT (CCT)	1.9	148	- -	- -
	Ad-clip only	0.1	5	- -	- -
	Ad-clip + CWT	- -	- -	16.4	99
Wild	None	13.6	1,085	10.9	66
Total		100.0	7,960	100.0	605

Redd Distribution and Spawn Timing

Spawning ground surveys were performed on foot between 3 August and 26 September. A total of 1,366 spring Chinook redds were constructed in the Methow basin in 2010. The majority of redds (68.4%; *N* = 935) 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 = 332). A total of 242 redds were found in Methow River tributaries (Table 2). The Chewuch River subbasin had 286 redds (Table 3; Figure 4) and 145 redds were found in the Twisp subbasin (Table 4; Figure 5). Additionally, some redds were found in the Methow River downstream of the Twisp River confluence (Table 2; Figure 6).

Most spring Chinook salmon redds constructed in 2010 were identifiable throughout the survey season. With the exception of the week of 19 September when only incomplete surveys were accomplished (i.e., spot-checks), at least 91% of redds in each subbasin were identifiable as 2010 spring Chinook salmon redds each week of surveys (Table 5). Since most redds were visible at the end of surveys, mean redd life should be considered minimum values and could be greater than values reported. Superimposition was the typical reason why redds became unidentifiable during the survey period. Redd life (minimum days visible) was on average three days shorter in the Methow subbasin than in the Chewuch subbasin (ANOVA: $P = 0.02$). Mean redd life (minimum days visible) ranged between 23 and 26 days (Chewuch: mean = 26, SD = 6.1; Methow: mean = 23, SD = 6.9; Twisp: mean = 24, SD = 6.7). On average, wild female carcasses were found further upstream than hatchery female carcasses in all subbasins, and the differences were significant in all basins (Figure 7; Mann-Whitney U-tests: Chewuch $P < 0.001$, Methow $P < 0.001$, and Twisp $P < 0.05$).

Peak spawning occurred between 27 August and 11 September in index areas of all three subbasins. After adjusting for elevation, no significant differences in spawn timing (Julian date) between hatchery and wild females were detected within any subbasin (Figure 8; ANCOVA: Methow $P = 0.09$, Chewuch $P = 0.82$, Twisp $P = 0.62$).

Table 2. 2010 spring Chinook salmon redd distribution, estimated spawning escapement, and carcass recoveries in the Methow River subbasin.

Reach	Redds		Estimated spawning escapement	Carcasses				
				Recoveries			Expanded count	
	Count	Subbasin Propor. (%)		H	W	Total	H	W
			Methow River mainstem					
M15	8	0.9	14	5	4	9	8	6
M14	32	3.4	55	15	11	26	32	23
M13	34	3.6	59	14	4	18	46	13
M12	14	1.5	24	8	3	11	17	7
M11	50	5.3	87	31	12	44[a]	63	24
M10	63	6.7	109	36	14	50	78	31
M9	332	35.5	574	198	55	256[a]	471	117
M8	8	0.9	14	23	0	23		
M7	67	7.2	116	56	2	58		
M6	71	7.6	123	166	5	171	256	7
M5,4[b]	10	1.1	17	26	0	26		
M3,2[b]	4	0.4	7	0	0	0		
Total	693	74.1	1,199	578	110	692[a]	971	228
			Lost River					
L2	12	1.3	21	0	2	2	0	21
L1	5	0.5	9	0	1	1	0	9
Total	17	1.8	30	0	3	3	0	30
			Early Winters Creek					
EW5	0	0.0	0	0	0	0	0	0
EW4	4	0.4	7	0	1	1	0	7
EW3	26	2.8	45	14	2	16	42	5
EW2,1	1	0.1	2	3	0	3		
Total	31	3.3	54	17	3	20	42	12
			Methow River tributaries					
GDN4/M2,FD1	5	0.5	9	1	0	1	9	0
HA2,1	20	2.1	35	12	1	13	32	3
MH1	50	5.4	88	86	2	88	86	2
Susp1	31	3.3	54	7	2	9	42	12
W3	21	2.3	36	6	0	6		
W2	9	1.0	16	30	1	31	56	1
W1	3	0.3	5	15	0	15		
WN1	55	5.9	95	52	1	53	93	2
Total	194	20.8	337	209	7	216	318	20
Grand total	935	100.0	1,621	804	123	931[a]	1,331	290

[a] Includes fish of unknown origin.
[b] Redd counts provided in part by BioAnalysts.

Table 3. 2010 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 Propor. (%)		H	W	Total	H	W
			Chewuch River mainstem					
C13	2	0.7	3	0	1	1	0	3
C12	32	11.2	55	2	9	13[a]	10	45
C11	9	3.2	16	4	3	7	9	7
C10	10	3.5	17	4	4	8	9	8
C9	0	0.0	0	0	0	0	0	0
C8	8	2.8	14	3	5	8	5	9
C7	24	8.4	42	10	4	15[a]	30	12
C6	37	12.9	64	23	23	46	32	32
C5	15	5.2	26	6	2	8	20	6
C4	82	28.7	142	60	6	67[a]	129	13
C3	5	1.7	9	3	2	5	5	4
C2	52	18.2	90	41	9	50	74	16
C1	9	3.2	16	15	0	15	16	0
			Chewuch River tributaries					
EM1	0	0.0	0	0	0	0	0	0
LK2,1	1	0.3	2	1	0	1	2	0
Total	286	100.0	496	172	68	244[a]	341	155

Table 4. 2010 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 Propor. (%)		H	W	Total	H	W
T10	0	0	0	0	0	0	0	0
T9	1	0.7	2	0	1	1	0	2
T8	11	7.6	19	0	1	1	0	19
T7	21	14.5	36	1	3	4	9	27
T6	54	37.3	93	9	14	24[a]	36	57
T5	35	24.1	61	13	17	31[a]	26	35
T4	9	6.2	16	4	4	8	8	8
T3	9	6.2	16	1	1	2	8	8
T2	5	3.4	9	0	0	0	9	0
T1	0	0.0	0	1	0	1		
Total	145	100.0	252	29	41	72	96	156

Table 5. Redd life summary of 2010 spring Chinook salmon redds by subbasin and week. RE = redds evaluated; RV = Redds visible. Redds were considered visible if they were new since last survey, were existing and still measurable (defined margins), or were not measurable but still identifiable as redds from the current spawning season.

Subbasin	8 & 15-Aug		22-Aug		29-Aug		5-Sep		12-Sep		19-Sep	
	RE	RV (%)	RE	RV (%)	RE	RV (%)	RE	RV (%)	RE	RV (%)	RE	RV (%)
Chewuch	29	29 (100)	97	95 (98)	228	226 (99)	256	254 (99)	277	265 (96)	84	80 (95)
Methow	137	135 (99)	366	355 (97)	574	550 (96)	582	538 (92)	729	645 (88)	482	400 (83)
Twisp	11	11 (100)	41	41 (100)	102	102 (100)	138	135 (98)	142	138 (97)	54	54 (100)
Grand total	177	175 (99)	504	491 (97)	904	878 (97)	976	927 (95)	1,148	1,048 (91)	620	534 (86)

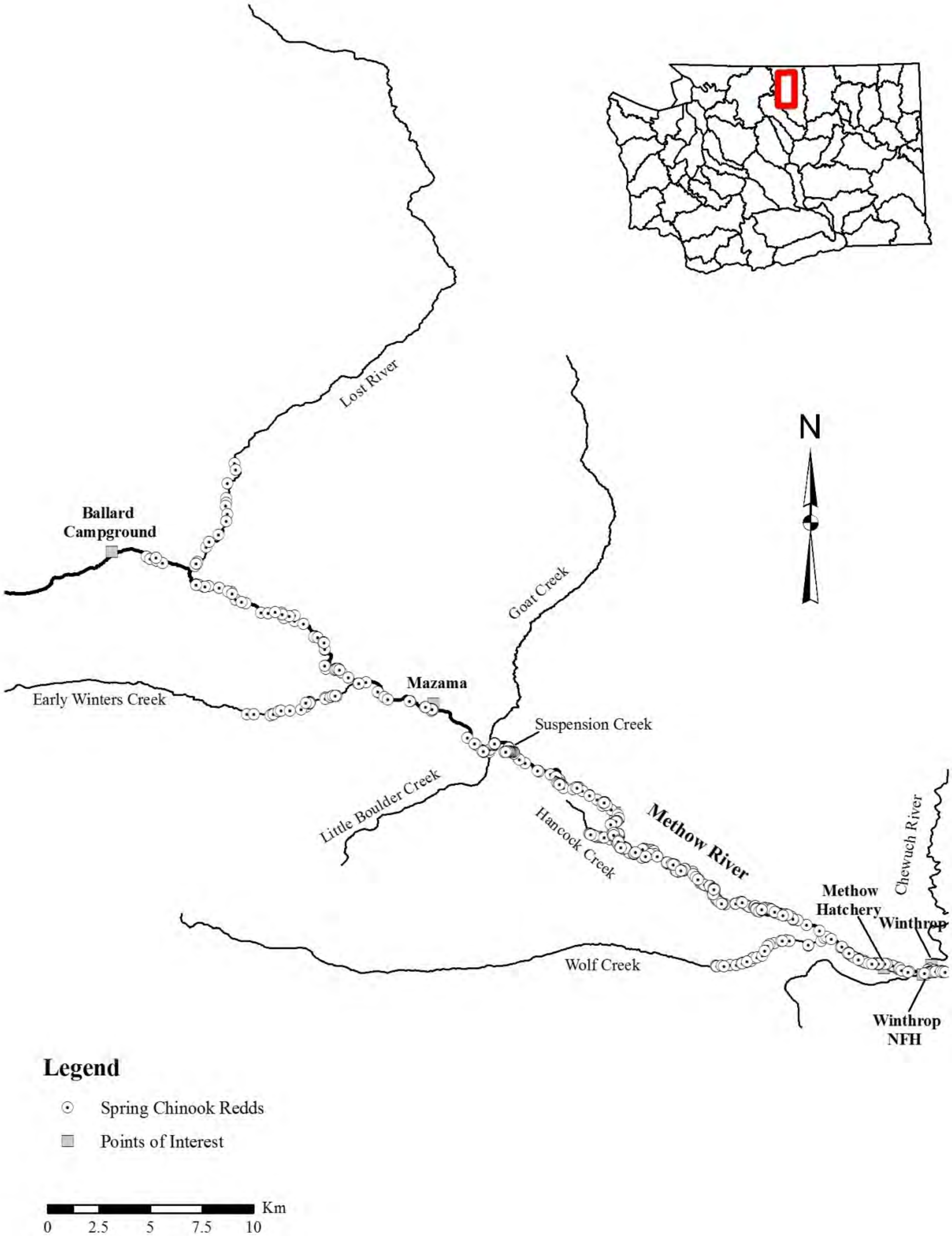

Figure 3. Spatial distribution of spring Chinook salmon redds in the upper Methow River subbasin based on GPS waypoints collected during 2010 surveys.

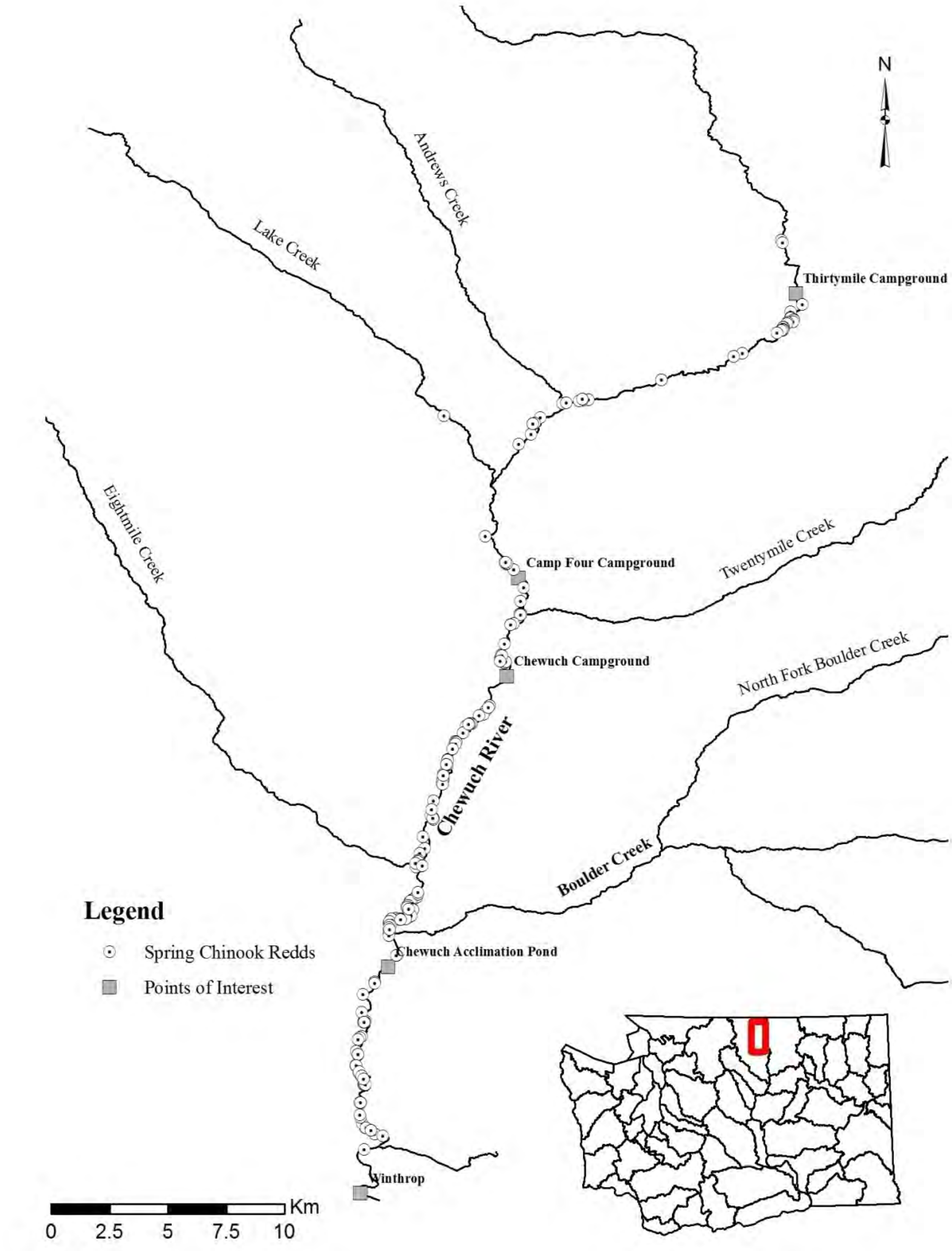

Figure 4. Spatial distribution of spring Chinook salmon redds in the Chewuch River subbasin based on GPS waypoints collected during 2010 surveys.

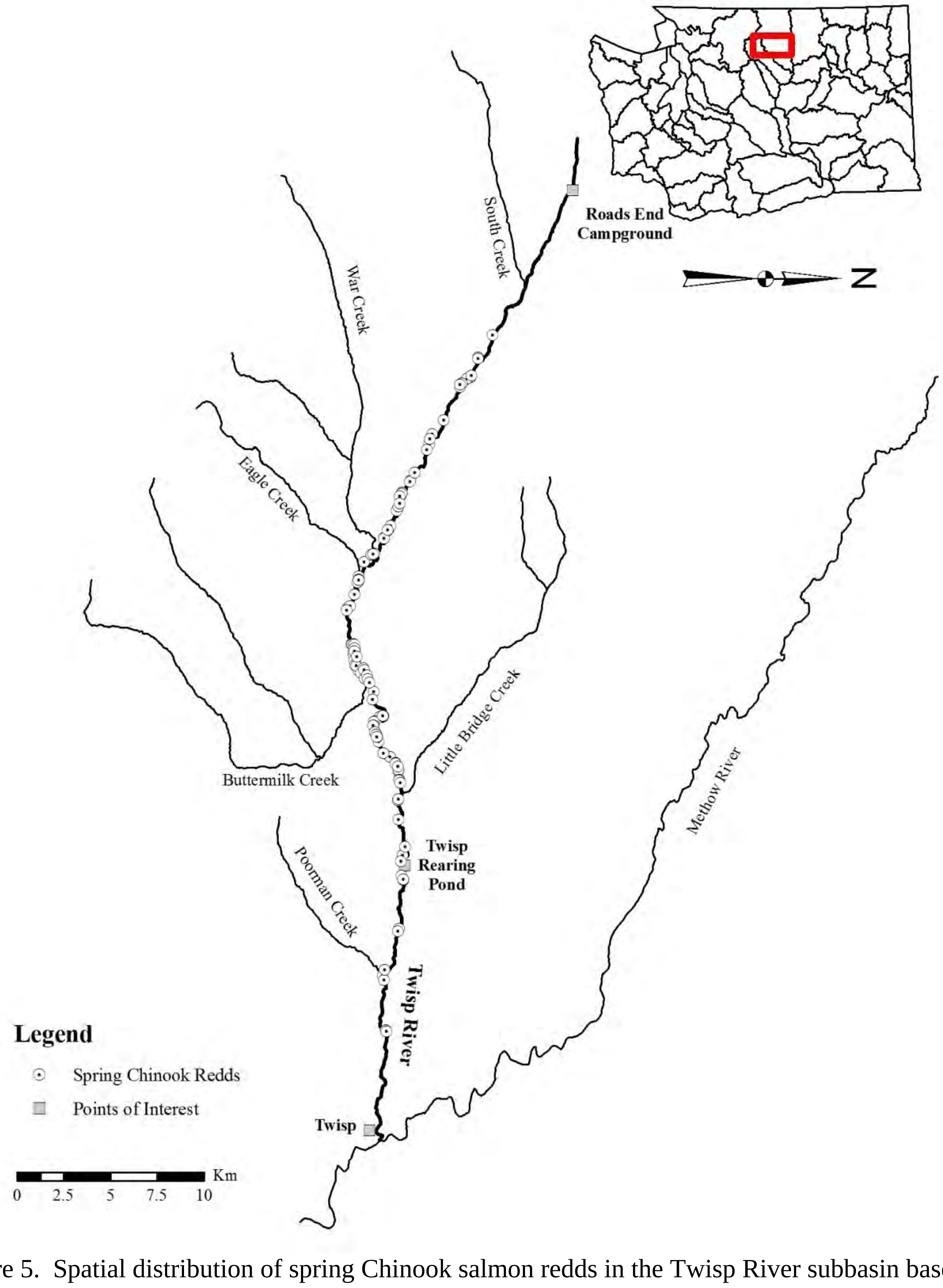

Figure 5. Spatial distribution of spring Chinook salmon redds in the Twisp River subbasin based on GPS waypoints collected during 2010 surveys.

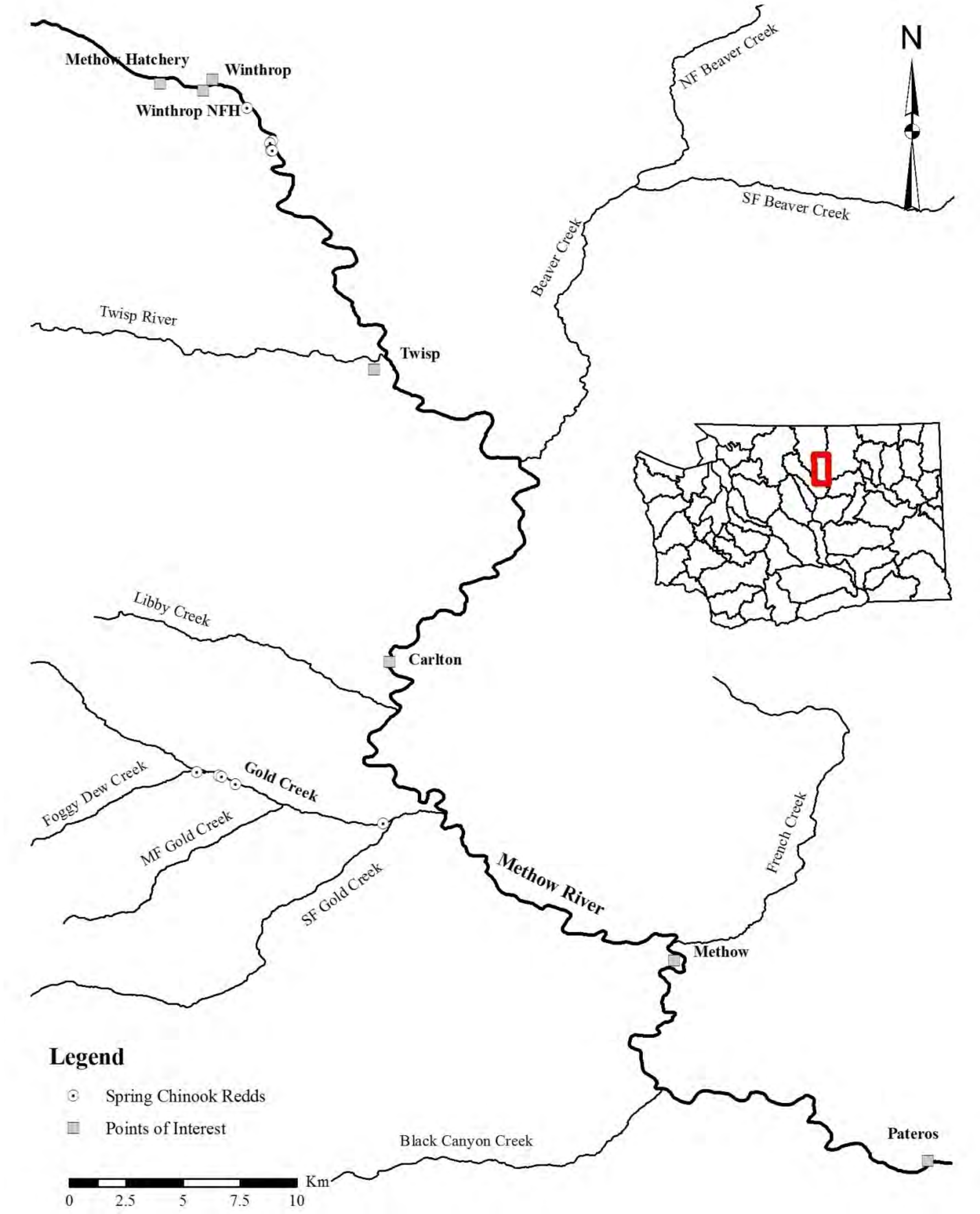

Figure 6. Spatial distribution of spring Chinook salmon redds in the lower Methow River subbasin based on GPS waypoints collected during 2010 surveys.

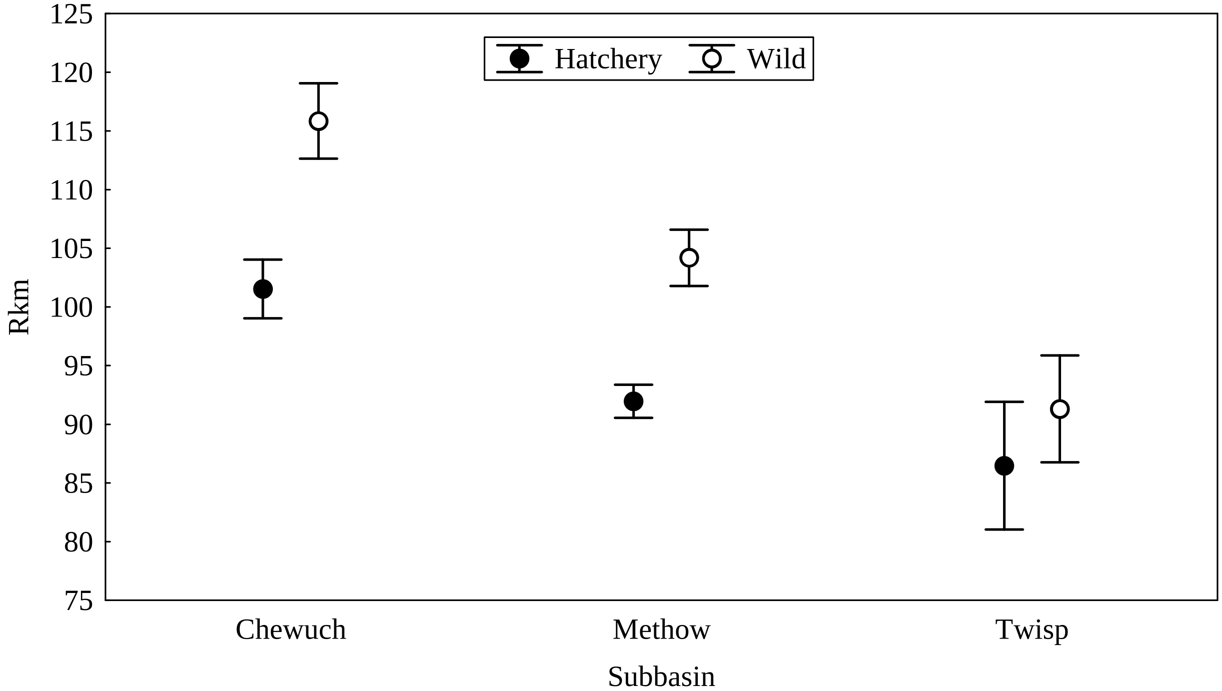

Figure 7. Mean redd distribution (rkm) of hatchery and wild females in the Methow River basin in 2010. Error bars represent 95% confidence intervals.

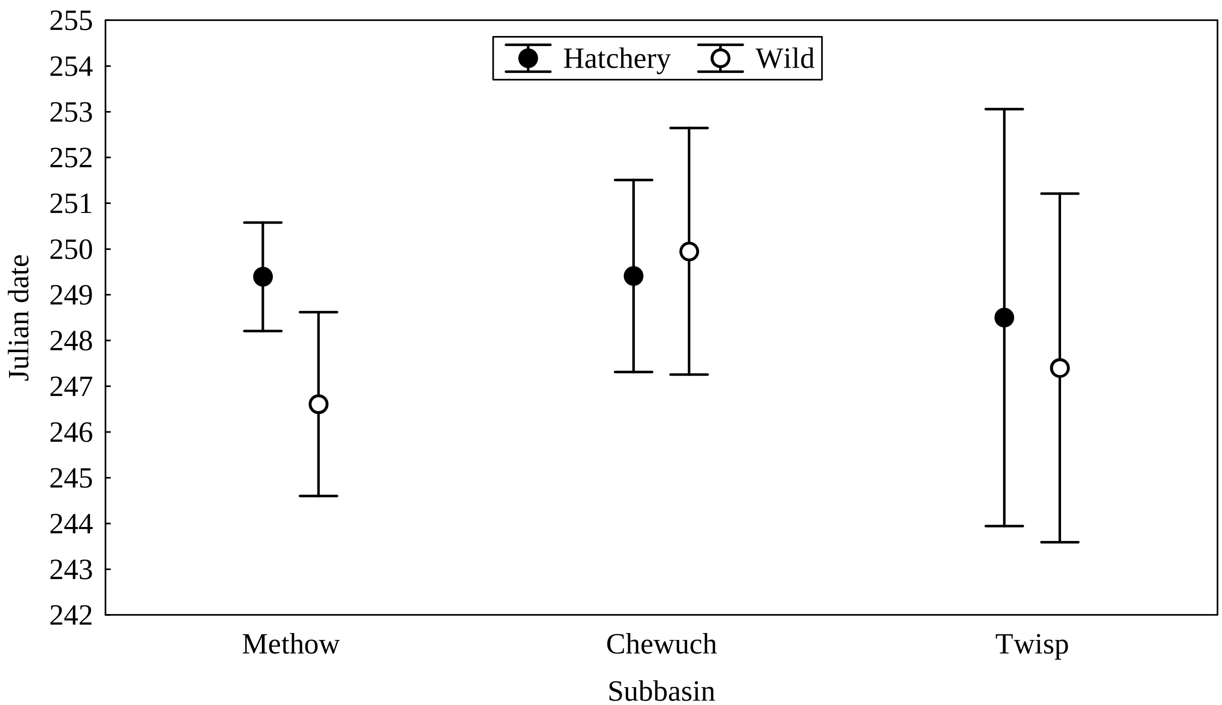

Figure 8. Mean spawn timing (Julian date) of hatchery and wild females in the Methow River basin in 2010. Error bars represent 95% confidence intervals.

Spawner Composition, Demographics, and Egg Deposition

Based on expanded redd counts, there were an estimated 2,369 spawners in the Methow River basin in 2010, of which 601 fish (25.4%) were estimated to be of wild origin (see Tables 2-4). Estimated spawning escapement does not include hatchery or wild fish collected for broodstock. The majority of carcasses (*N* = 931) were recovered in the Methow subbasin, followed by the Chewuch subbasin (*N* = 244), and the Twisp subbasin (*N* = 72; Table 6; Figures 9-11). Wild fish comprised 61.9%, 31.2%, and 17.9% of the estimated spawning escapement in the Twisp, Chewuch, and Methow subbasins, respectively.

Table 6. 2010 spring Chinook salmon carcass recoveries by origin, stock, and recovery subbasin. Age-3 and age-5 ad-clip-only fish were assumed to be Winthrop NFH releases while age-4 ad-clipped-only fish were assumed to be from Okanogan Basin (CCT) releases. Out-of-basin strays were identified through CWT extraction and identification.

Origin	Release site/mark	Recovery subbasin		
		Chewuch	Methow	Twisp
Hatchery	Chewuch	93	101	1
	Methow	16	334	0
	Twisp	1	8	21
	Winthrop NFH	35	269	2
	Ad-clip only - WNFH	1	0	0
	Ad-clip only - CCT	6	11	0
	Out-of-basin strays	6	4	1
	No mark (Unknown hatchery)[a]	14	77	4
Wild	Wild	68	123	41
Unknown	No mark (unknown)	4	4	2
Total		244	931	72

[a] Includes lost tags and hatchery fish missing heads.

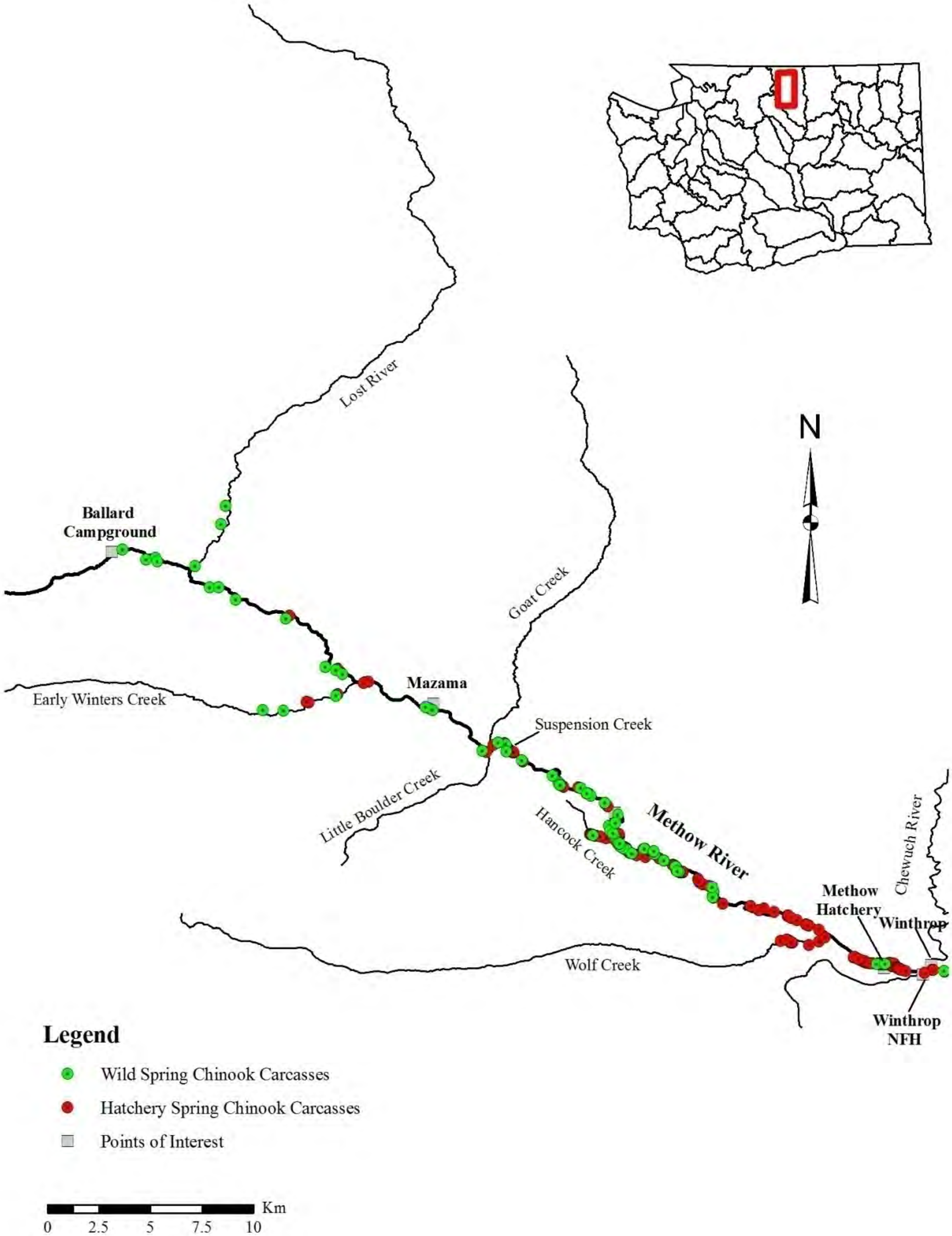

Figure 9. Spatial distribution of spring Chinook salmon carcasses in the upper Methow River subbasin based on GPS waypoints collected during 2010 surveys.

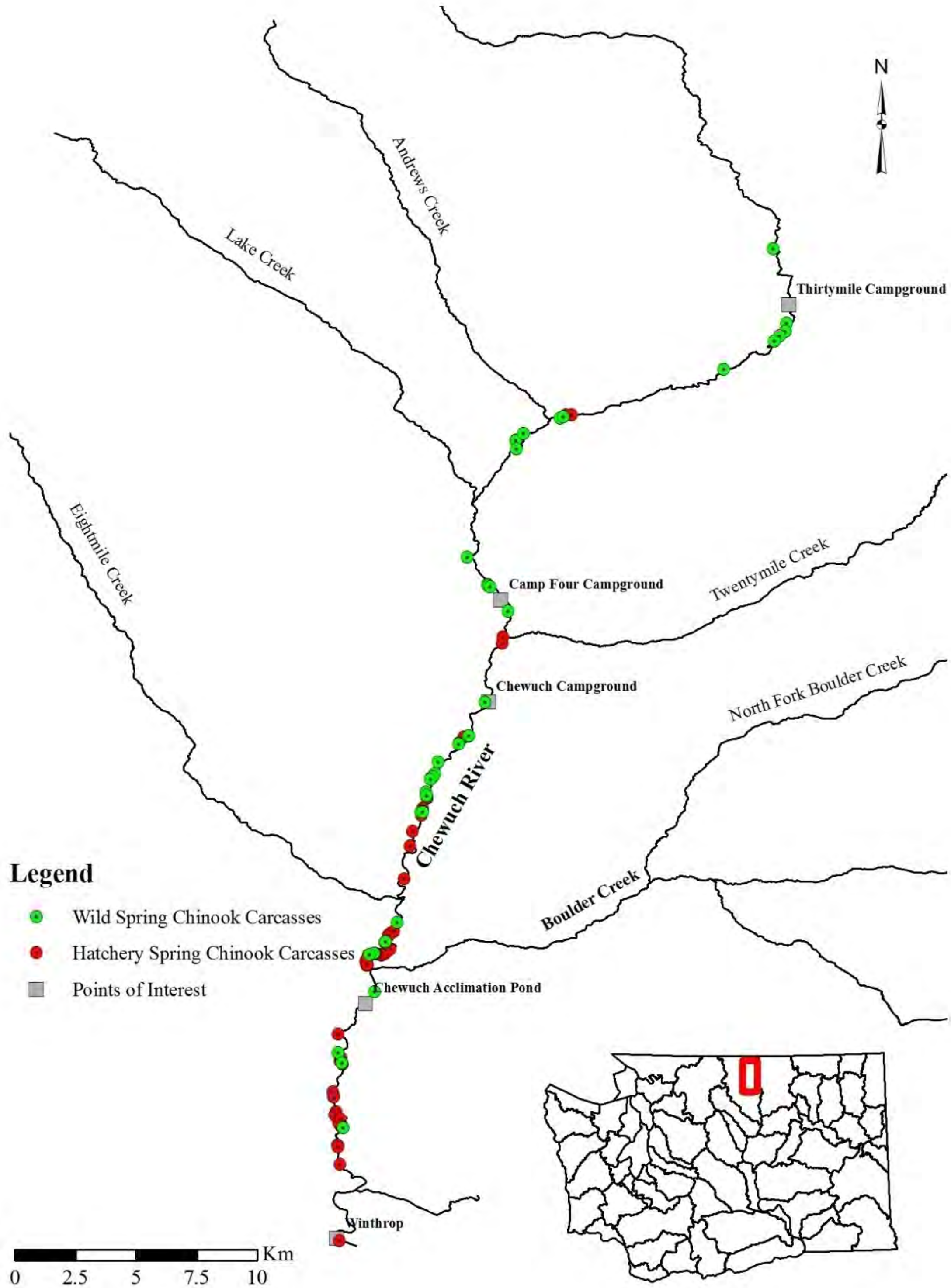

Figure 10. Spatial distribution of spring Chinook salmon carcasses in the Chewuch River subbasin based on GPS waypoints collected during 2010 surveys.

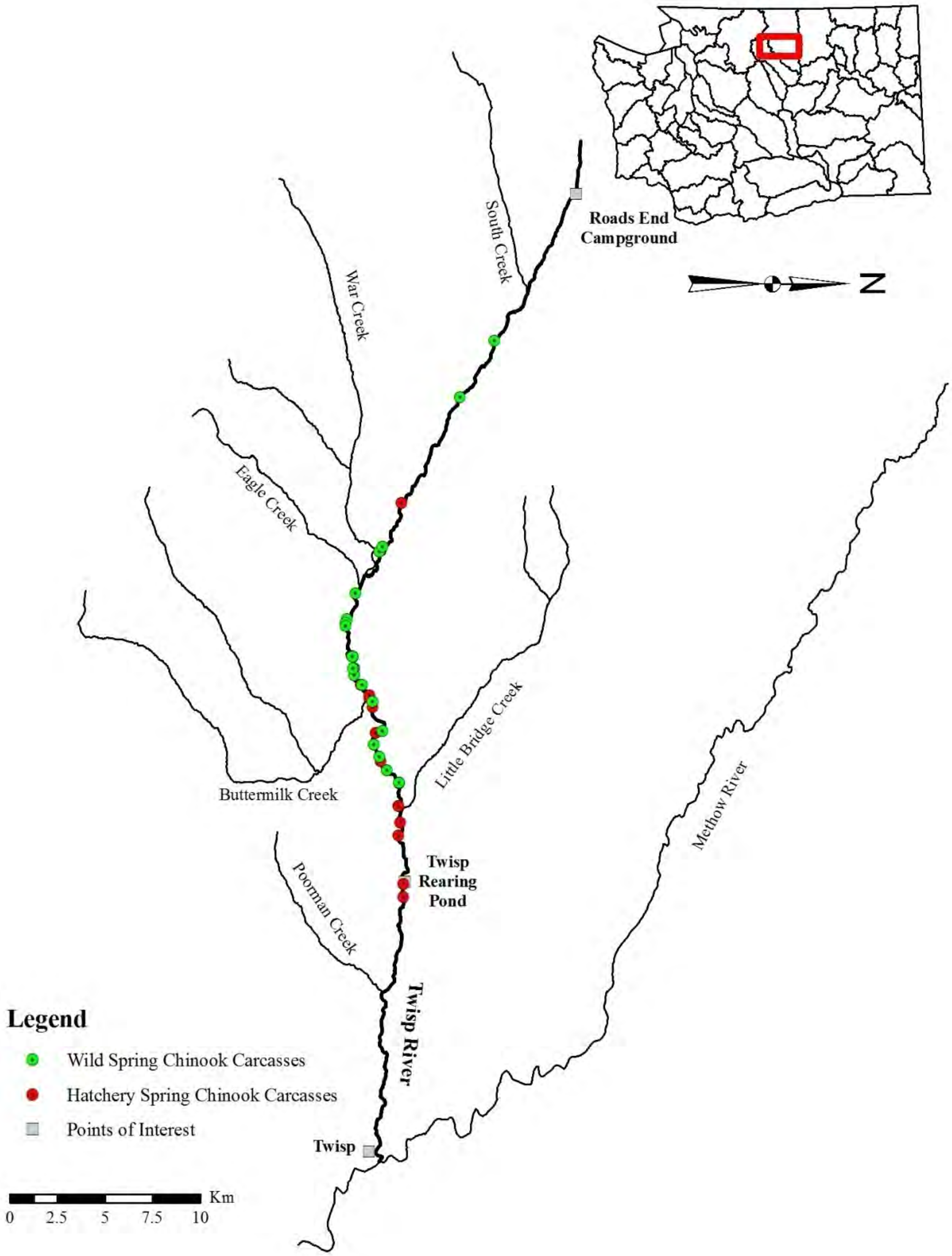

Figure 11. Spatial distribution of spring Chinook salmon carcasses in the Twisp River subbasin based on GPS waypoints collected during 2010 surveys.

Age, origin, gender, and length were determined for 1,221 of the 1,245 carcasses recovered (98.1%). Modal age of carcasses was age-4 (N = 1,168), accounting for 95.7% of confirmed hatchery and wild fish. Only 661 of 1,221 (54.1%) carcasses were wild or local Methow Hatchery fish recovered in their subbasin of release (Table 7); fish from Winthrop NFH comprised a large proportion of overall recoveries. Surveyors recovered 157 of the 993 fish PIT-tagged at Wells Dam estimated to be on spawning grounds (15.8%), and recovery rates increased with fish age (Table 8).

Egg retention was estimated for 690 of the 797 female carcasses examined. Using mean fecundities from MH broodstock (MetComp and Twisp), adjusting for mean egg-retention rates, and accounting for the proportion of hatchery and wild females by age class on the spawning grounds, an estimated total of 5,272,964 eggs were deposited in the Methow River basin in 2010 (Table 9). A total of three redds were considered to be dewatered in 2010 (Upper Methow subbasin). Four-year old MetComp-Methow hatchery females were on average two cm longer than four-year old Methow wild females (one-sample t-test: $P < 0.01$). There were no other significant differences in length at age for all other hatchery-wild, by-gender comparisons. There were no significant differences in age at maturity between hatchery and wild fish within the MetComp and Twisp stocks (brood years 1993-2004).

Table 7. Mean POH length (N; SD) by age and sex of spring Chinook salmon carcasses recovered during Methow Basin spawning ground surveys in 2010. These data only include wild and Methow Hatchery fish recovered in their subbasin of release.

Age	Male		Female	
	Hatchery	Wild	Hatchery	Wild
		Chewuch subbasin		
1.1	42.0 (1; - -)	41.3 (3; 2.5)	- -	- -
1.2	61.0 (24; 5.2)	60.4 (20; 6.6)	60.2 (68; 3.7)	59.8 (37; 4.0)
1.3	- -	82.0 (1; - -)	- -	70.5 (2; 4.9)
		Methow subbasin		
1.1	38.7 (11; 2.8)	38.7 (3; 2.5)	- -	- -
1.2	61.8 (99; 4.2)	62.1 (44; 5.1)	60.7 (212; 3.1)	59.1 (73; 4.6)
1.3	- -	75.0 (1; - -)	- -	- -
		Twisp subbasin		
1.1	- -	39.0 (1; - -)	- -	- -
1.2	54.9 (7; 3.2)	57.4 (18; 6.2)	59.9 (13; 3.1)	61.0 (21; 4.0)
1.3	- -	- -	71.0 (1; - -)	74.0 (1; - -)

Table 8. Spawning ground recovery rates of hatchery spring Chinook salmon PIT-tagged at Wells Dam in 2010. Recovery rates are calculated from the fish remaining on spawning grounds after management actions, accounting for escapement to the Okanogan Basin, and fallback.

Recovery subbasin/subtotal	Age			Total
	1.1	1.2	1.3	
Total PIT tags at Wells Dam[a]	60	1,309	7	1,376
Total collected in broodstock	16	258	3	277
Total excessed to tribes	13	251	0	264
Total identified in the Okanogan Basin	0	10	0	10
Total identified below Wells Dam	0	13	0	13
Potential spawning total	76	911	6	993
Recovered on Chewuch spawning grounds	0	21	1	22
Recovered on Methow spawning grounds	3	108	1	112
Recovered on Twisp spawning grounds	1	22	0	23
Total recovered	4	151	2	157
Recovery rate (%)	5.3	16.6	33.3	15.8

[a] Sum of existing and inserted tags. Includes 51 fish without confirmed age assumed to be 1.2 based on length.

Table 9. Estimated egg deposition for spring Chinook salmon in the Methow Basin in 2010. Mean fecundities were derived from Methow Hatchery broodstock (MetComp or Twisp) and adjusted according to hatchery and wild proportions by age class in each subbasin.

Subbasin	Females examined	Mean fecundity	Mean egg retention (%)	Redds	Subbasin proportion (%)	Estimated egg deposition		
						2008	2009	2010
Chewuch	134	3,903	0.5	286	29.5%	447,334	565,294	1,110,677
Methow	518	3,911	1.4	932[a]	65.6%	917,796	1,258,650	3,594,021
Twisp	38	3,923	0.1	145	4.9%	268,771	100,694	568,266
Total	690			1,363[a]	100.0%	1,633,901	1,924,638	5,272,964

[a] Total after removing 3 dewatered redds in the upper Methow River.

Natural Replacement Rate

Natural replacement rates for the latest complete brood (2004) were less than 1.0 in all subbasins (Chewuch = 0.24, Methow = 0.27, Twisp = 0.20; Table 10). Historical NRR values of the spring Chinook salmon stocks in the Methow River basin have not met values necessary to replace the parent population (i.e., NRR ≥ 1.0) in nine of thirteen broodyears. Parent broods from 1995-1998 had high NRR values relative to other years (Appendix A), in part due to the low density of spawners and improved ocean conditions. Also, estimated spawning escapement in 1996 and 1998 was not based on redd counts (Murdoch 2007). Comparisons between NRR and HRR only include broodyears in which both metrics were available. The HRRs were significantly greater than NRRs in the Chewuch and Twisp subbasins only when broodyears 1996 and 1998 were omitted (Chewuch two-sample t-test: $P = 0.03$, Twisp two-sample t-test: $P = 0.05$; Table 11). The HRR was significantly greater than NRR in the Methow subbasin whether or not broodyears 1996 and 1998 were included (two-sample t-tests: $P = 0.01$ and <0.01, respectively; Table 11). The HRR was not significantly different than the expected BAMP value (4.5; BAMP 1998) in the Chewuch, Methow, and Twisp subbasins (one-sample t-tests; Chewuch: $P = 0.69$, Methow: $P = 0.36$, Twisp: $P = 0.29$) when all complete broodyears were analyzed (1992-2004).

Table 10. Estimated spawning escapement and NRR of spring Chinook salmon populations in the Methow River basin. Total expanded recruits were adjusted for harvest and indirect mortality associated with non-selective fisheries. Estimated spawning escapements in 1996 and 1998 were not based on redd counts (Murdoch 2007), and mean values are reported both with and without these brood years.

Broodyear (BY)	Est. spawning escapement	Adult returns at age 1.1	1.2	1.3	Total expanded recruits	NRR Arithmetic	Geometric
			Chewuch River				
2004	335	4	63	11	81.6	0.24	- -
1992-2004 mean	377	2	96	29	146.9	2.87	0.66
1992-2004 mean (No BY 96, 98)	444	2	110	25	158.6	1.42	0.40
			Methow River and tributaries				
2004	821	13	163	35	219.8	0.27	- -
1992-2004 mean	1,041	5	101	47	168.6	2.18	0.39
1992-2004 mean (No BY 96, 98)	1,226	5	113	35	169.4	0.71	0.23
			Twisp River				
2004	341	8	48	9	67.1	0.20	- -
1992-2004 mean	209	8	85	26	136.8	2.90	0.65
1992-2004 mean (No BY 96, 98)	245	7	93	24	142.8	1.50	0.39

Table 11. Arithmetic mean NRR and HRR values for Methow basin spring Chinook salmon. All comparisons were analyzed using Mann-Whitney U-tests. Methow and Chewuch HRR values for 1996 and 1998 brood years are based on composite results (one CWT code for both release groups). Values are calculated both with and without brood years 1996 and 1998 because spawning escapements in these years were not based on redd counts.

Subbasin	Arithmetic mean (± SD) values for all years		
	NRR	HRR	*P*-value
Chewuch (92-04)[a]	2.87 (4.32)	4.21 (4.36)	0.26
Chewuch (92-95, 97, 99-04)[a]	1.42 (2.56)	3.49 (2.98)	0.03
Methow (92-04)[b]	2.18 (4.88)	5.58 (3.95)	0.01
Methow (92-95, 97, 99-04)[b]	0.71 (1.23)	4.79 (3.14)	<0.01
Twisp (92-04)[c]	2.90 (4.46)	3.35 (3.55)	0.28
Twisp (92-95, 97, 99-04)[c]	1.50 (3.02)	3.15 (3.77)	0.05
Overall (92-04)	2.47 (4.22)	4.66 (3.89)	0.04
Overall (92-95, 97, 99-04)	1.05 (1.98)	3.92 (3.09)	<0.01

[a] Statistical test excludes 1995 and 1999 brood year (no hatchery program).
[b] Statistical test excludes 1992 brood year (no hatchery program).
[c] Statistical test excludes 1995 brood year (no hatchery program).

<u>Stray Rates by Brood Year</u>

When fish are retained for broodstock, it is unknown whether they would have eventually migrated to their natal (or release) streams or to "non-target" areas. Therefore, fish retained for broodstock were excluded from stray rates calculations. Further, all CWT recoveries of the 1992 and 1994 broods were within broodstock collections, thus stray rates were not calculated for these broods, and no Twisp or Chewuch fish were released from the 1995 brood year. The Methow and Chewuch programs were maintained and released as an aggregate stock (Methow Composite) in the 1998 and 2000 brood years; stray rates could not be determined for the individual release sites.

Based on total expanded CWT recoveries, an estimated 15.0% of the 2004 brood Twisp spring Chinook salmon carcasses were recovered on spawning grounds of non-target areas (Appendix B). Excluding broods with no spawning ground recoveries (1992, 1994-1995), the recovery rate of Twisp River fish in stray areas (mean = 16.1%, SD = 11.3) was significantly greater than the 5% target (one-sample t-test: $P = 0.01$). Based on total expanded CWT recoveries, an estimated 34.5% of the 2004 brood Chewuch spring Chinook salmon were recovered on non-target spawning grounds. Excluding broods with no spawning ground recoveries (1992, 1994-1995, 1998, 2000), the recovery rate of Chewuch River fish in stray areas (mean = 25.4%, SD = 17.7) was significantly greater than the 5% target (one-sample t-test: $P = 0.02$). Based on total expanded CWT recoveries, an estimated 10.4% of the 2004 brood Methow spring Chinook salmon were recovered on non-target spawning grounds. Excluding broods with no spawning ground recoveries (1992, 1994, 1998, 2000), the recovery rate of Methow River fish in stray areas (mean = 2.9%, SD = 3.4) was not significantly less than the 5% target (one-sample t-test: $P = 0.10$).

Stray Rates within the Methow Basin

A total of 892 coded wire tags (CWT's) were successfully decoded from spring Chinook salmon collected during spawning ground surveys in the Methow River basin in 2010. These fish were expanded by tag-specific retention rates and stream-specific sample rates to account for 1,638 fish (Table 12, Appendix C). As a proportion of total CWT recoveries, most within-basin strays moved into the Methow River, while similar proportions of out-of-basin strays moved into the Chewuch and Twisp Rivers (Table 12). In 2010, CWT recovery data indicated that fish released in the Methow subbasin strayed less (5.5%) within the Methow Basin than fish released in the Chewuch (48.1%) or Twisp (16.5%) subbasins (Table 13).

Table 12. Expanded CWT recoveries by subbasin in the Methow River basin in 2010.

Subbasin	Local (%)	Winthrop (%)	Within-basin strays (%)	Out-of-basin strays (%)	Expanded CWT recoveries
Chewuch	61.7	23.3	11.2	3.8	313
Methow	45.9	38.3	15.2	0.6	1,232
Twisp	82.8	8.6	4.3	4.3	93
Total	51.0	33.8	13.8	1.4	1,638

Table 13. Expanded CWT recoveries (%) by recovery and release streams in the Methow River basin in 2010.

Recovery stream	Release stream		
	Chewuch	Methow	Twisp
	Chewuch subbasin		
Chewuch River	51.9	5.5	2.3
	Methow subbasin		
Methow River	34.8	71.9	11.8
Early Winters Creek	1.5	1.4	0.0
Suspension Creek	3.3	3.1	0.0
Wolf Creek	2.4	3.5	1.2
Hancock Creek	0.7	5.0	0.0
MH outfall	3.9	8.1	1.2
WNFH outfall	0.5	1.5	0.0
Methow subbasin total	47.1	94.5	14.2
	Twisp subbasin		
Twisp River	1.0	0.0	83.5
Total	100.0	100.0	100.0

Table 14 shows the proportion of CWT recoveries comprising the estimated spawning escapements from 2000-2010 by subbasin. For run years 2000 to 2010, Twisp hatchery spring Chinook salmon comprised significantly less than 10% of the estimated spawning escapement in the Methow and Chewuch subbasins (one-sample t-tests: $P < 0.001$). Methow and Chewuch hatchery spring Chinook salmon comprised significantly less than 10% of the estimated spawning escapement in the Twisp subbasin (one sample t-tests: $P < 0.001$). Data for run years 2002 through 2004 in the Chewuch and Methow subbasins were omitted from statistical analyses because release locations for the 1998 and 2000 broods could not be separated (same CWT code). Spring Chinook salmon released in the Methow comprised significantly less than 10% of the estimated spawning population in the Chewuch subbasin (one sample t-test: $P < 0.01$). Chewuch spring Chinook salmon did not comprise significantly less than 10% of the estimated spawning population in the Methow subbasin (one sample t-test: $P = 0.27$).

Table 14. Proportion of CWT recoveries by subbasin comprising estimated spawning escapement in the Methow Basin from 2000-2010. Percent of spawning escapement comprised by wild fish is not included.

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	8.4	8.4	0.0	8.7	- -	18.5
2001	1,761	732	2,493	33.8	2.0	0.2	10.4	2.1	0.2
2002	588	78	666	3.6	0.0	0.0	7.9	69.7	0.0
2003	465	25	490	0.0	1.5	0.0	2.6	78.5	0.5
2004	289	46	335	5.1	1.1	0.0	3.0	70.7	0.0
2005	289	219	508	41.9	3.6	0.4	2.1	4.0	3.8
2006	378	135	513	28.8	3.2	0.9	5.5	- -	7.4
2007	203	74	277	20.0	8.4	0.0	8.9	- -	19.4
2008	166	86	252	26.7	4.5	0.0	17.3	- -	10.4
2009	500	271	771	30.8	9.9	1.5	16.0	- -	1.5
2010	341	155	496	39.0	6.7	0.4	14.7	- -	2.5
Methow River									
2000	574	65	639	2.5	38.0	2.9	25.5	- -	0.0
2001	6,994	594	7,588	7.9	27.8	0.4	45.6	1.8	0.4
2002	1,644	86	1,730	0.6	4.6	1.1	28.3	47.1	0.0
2003	597	8	605	0.0	5.1	4.0	26.3	43.3	0.6
2004	622	199	821	3.6	4.5	4.4	16.9	35.6	0.0
2005	526	221	747	32.2	16.2	1.6	11.7	1.2	1.7
2006	942	128	1,070	22.8	25.2	4.6	19.1	- -	7.0
2007	545	152	697	12.3	6.8	7.2	36.6	- -	6.9
2008	468	172	640[c]	11.8	16.2	0.4	38.9	- -	3.1
2009	1,480	261	1,741	10.9	27.2	2.3	36.8	- -	3.4
2010	1,370	251	1,621	10.8	34.9	0.8	29.2	- -	0.4
Twisp River									
2000	235	21	256	0.0	0.0	72.6	2.2	- -	0.0
2001	384	506	890	1.5	0.8	19.6	0.8	0.0	0.0
2002	60	181	241	0.0	0.0	9.1	12.1	3.1	0.0
2003	18	25	43	0.0	0.0	30.2	0.0	0.0	0.0
2004	98	243	341	0.0	0.0	19.7	1.2	1.3	4.4
2005	34	87	121	2.6	0.0	15.8	0.0	0.0	0.0
2006	100	65	165	0.0	2.5	40.0	2.8	- -	0.0
2007	65	40	105	0.0	0.0	55.2	0.0	- -	0.0
2008	126	40	166	2.7	0.0	60.1	0.0	- -	4.0
2009	97	32	129	0.0	0.0	55.6	3.4	- -	3.4
2010	96	156	252	1.4	0.0	30.1	2.8	- -	1.4

[a] Unable to determine release location for 1998 and 2000 MetComp via CWT code.

[b] 2000 run year data not used in statistical analysis of Chewuch subbasin strays.

[c] Greater than estimated spawning escapement from fish-per-redd expanded redd counts; includes actual number of carcasses in reaches where total recoveries exceeded estimated escapement.

Stray Rates outside the Methow Basin

A total of 52 fish from Methow Hatchery were estimated to have strayed to spawning grounds outside the Methow River basin. Of these, 33 fish strayed into other spring Chinook salmon populations (e.g., Chiwawa and Entiat Rivers; Table 15). Historically, stray Methow Hatchery fish have comprised less than 5.0% of the overall estimated spawning escapement to the Entiat River (one-sample t-test: $P < 0.001$; Table 15).

Table 15. Methow Hatchery program strays by run year and recovery location.

Run year	Recovery location	CWT	Stock	Expanded recoveries	Estimated escapement	% of population
2006	Chiwawa River	631976	MetComp	2	529	0.38
1997	Entiat River	635551	Methow	1[a]	89	- -
2000	Entiat River	630130	Methow	6	175	3.43
2001	Entiat River	630613	Methow	3	485	0.62
2002	Entiat River	631024	MetComp	5	370	1.35
2003	Entiat River	631024	MetComp	6	259	2.32
2006	Entiat River	631976	MetComp	4	257	1.56
2007	Entiat River	632564	Twisp	6	245	2.45
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	- -	- -

[a] Fish was recovered during WDFW genetic study trapping and was not included in spawning escapement estimate.

Unknown Hatchery Fish

Based on reach-specific carcass expansions, the proportion of unknown hatchery fish comprising total hatchery spawning escapement in the Methow River basin in 2010 was 7.1% (N = 169; Appendix M). Based on stream-specific carcass expansions, this proportion was 4.1% (N = 98). These totals are the number of fish identified through scale analysis as hatchery origin but not accounted for through CWT expansions. This value is typically higher when sample rates are low in reaches with high spawning escapement.

Discussion

In 2010, the estimated redd-based spawning escapement in the Methow River basin represented 48.5% of the potential run escapement to the Methow River as estimated at Wells Dam. This value was similar to that reported in 2006 and 2008 (50.3 and 53.0%, respectively), and lower than that reported in 2007 and 2009 (81.0 and 71.6%, respectively). In years when the male-to-female ratio is high, typically due to large numbers of jacks (e.g., 2009 = 4.39:1.0 and 2007 = 2.5:1), redd-based estimated spawning escapement represents a larger proportion of the estimated run above Wells Dam than in years with lower ratios. During years with low male-to-female ratios (lower numbers of males), spawn onset-to-completion timing may be longer, increasing the probability of mortality prior to fertilization; females may be waiting for males to spawn rather than having an abundance of males present during the spawning period.

There was no difference in spawn timing between hatchery and wild fish in 2010. However, wild fish spawned significantly further upstream than did hatchery fish. In most years, there are no differences in temporal or spatial spawning distributions, suggesting that hatchery and wild populations are reproductively integrated in the natural environment. Increased density of spawners may increase the probability of wild fish spawning further upstream. This occurrence may also be represented by hatchery fish to the extent that redds are located in areas typically void or depauperate of spawning. For example, in 2010, surveyors found more spawners in Wolf Creek than normal. Wolf Creek is the first tributary upstream of the hatchery outfalls and large numbers of hatchery origin spawners in this area may have contributed to the large numbers of fish in Wolf Creek. Furthermore, in 2010, 1,851 hatchery fish were provided to tribes from the Winthrop NFH outfall. If this action had not occurred, the increased abundance of fish on the spawning grounds would likely contribute to increased density-dependent growth or mortality in 2010 broodyear progeny.

Run-at-large evaluation at Wells Dam using PIT tags has provided the opportunity to investigate aspects of the spring Chinook migration and spawning in the Columbia River basin that are difficult or impossible to determine through CWT analysis. Estimates of fallback and size-related bias of carcasses recovered during spawning ground surveys are being monitored to help explain differences between spawning escapements estimated via expanded redd counts, and the observed run size at Wells Dam. The utility of PIT tags relies heavily on existing interrogation sites, manual detection on spawning ground surveys, and detection during broodstock collection activities at local hatcheries. Data from 2010 allowed for estimates of dam fallback and eliminated double counting of fish that migrated through Wells Dam multiple times (fallback followed by re-ascension). As more in-stream PIT interrogation sites are developed, our ability to describe the fate of spring Chinook passing Wells Dam should increase. Over 1,000 fish were estimated to have returned from releases in the Okanogan Basin. Although not a part of this Monitoring and Evaluation Program, increased in-stream PIT monitoring in the Okanogan Basin would assist in describing the movements and spawning composition of spring Chinook stocks upstream of Wells Dam.

Methow Hatchery spring Chinook salmon are typically released in three locations in the Methow River basin, all of which incorporate surface-water rearing (i.e., acclimation) prior to release to increase homing fidelity. In 2010, an estimated 48.1% of the Chewuch-released fish spawning in the Methow Basin spawned in areas other than the Chewuch River, similar to the rate observed in 2009 (44%). The abundance of Chewuch-released fish in the basin is typically high and their prevalence comprises moderate to large proportions of the escapement within other spawning areas (e.g., Methow River, Suspension Creek). Conversely, the Methow and Twisp populations exhibited lower straying, with 5.5% and 16.5%, respectively of these fish straying to locations other than their subbasin of release. Stray rates within the Methow basin continue to fluctuate across years and release groups. It is not clear what factors are affecting this variability. However, several factors likely affect homing in the Methow basin, including early rearing history of hatchery fish and the presence of Methow Hatchery and Winthrop National Fish Hatchery, duration of time fish spent in remote acclimation ponds, prevalence of younger age classes in returning adults, sex ratio of returning adults, prevalence of BKD in release groups, genetic background, and inter-annual environmental variation.

Despite the run-at-large being the largest since 2001, straying of spring Chinook from other basins was lower than previous years. Overall, only 1.4% of the estimated recoveries of CWT hatchery fish spawning in the Methow River basin strayed from other independent populations. The lower proportion of CWT recoveries represented by out-of-basin stocks could be attributed to low sample rates by surveyors. However, overall sample rate in 2010 was greater than 50 percent. Current methodologies for estimating the origin of hatchery fish on spawning grounds incorporate stream-specific sample rates, and tag-specific retention rates. Some hatchery spring Chinook salmon produced outside the Methow River basin have low CWT tag rates and the presence of a single CWT code may greatly affect the estimated number of out-of-basin strays. When this situation occurs on a stream with a low overall sample rate (e.g., Lost River), the estimated contribution of that stock will likely be overestimated. Conversely, these stocks could also be underestimated (missed entirely) due to the low tag encounter rate.

The HRR must exceed the NRR of the target stock to meet Objective 4 of the M&E plan. Hatchery replacement rates for Chewuch and Twisp stock spring Chinook salmon released from Methow Hatchery have not met expected HRR values (Chapter 1) and in some years are no different than respective NRR values. During the period when Methow River spring Chinook salmon were being listed (1996-1998), management decisions were made which likely produced dramatic shifts in the natural productivity of spring Chinook salmon in the Methow River basin. In 1996 and 1998, broodstock collection goals targeted 100% retention of the run-at-large at Wells Dam. However, several fish were released upstream (i.e., likely classified as summer Chinook salmon) and long-term data suggest that fish migrated above Wells Dam after the trapping period. Although no spawning ground surveys were conducted, progeny (i.e., wild returning adults) from these broodyears suggest that the low spawning escapement coupled with high ocean survival produced high NRR rates for the 1996-1998 broods. While NRR from these years is uncharacteristically high compared to other years and appreciably increases the average NRR across years, only the Methow subbasin HRR was significantly higher than NRR when all years are examined. If these brood years are excluded, HRR is significantly greater than NRR for all stocks and for the Methow Basin overall. These results demand further examination of life stage survival rates in order to detect possible limiting factors to wild fish abundance (e.g., density dependence or reproductive success).

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Appendix A. Natural Replacement Rate (NRR) summary by subbasin for brood years 1992 through 2004 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 recruits (NOR)	NRR	HRR
			Chewuch River				
1992	421.75	0	25	14	41.25	0.10	1.86
1993	184.34	2	69	21	95.53	0.52	1.13
1994	62.85	0	15	3	18.95	0.30	0.17
1995	6.09	1	12	19	33.69	5.53	- -
1996	8.00	0	13	86	102.02	12.75	0.58
1997	123.30	1	662	55	921.30	7.47	5.63
1998	7.00	11	23	19	62.69	8.96	14.29
1999	21.08	0	2	0	2.14	0.10	- -
2000	82.84	6	47	13	69.97	0.85	5.80
2001	2,493.22	0	205	49	265.09	0.11	8.68
2002	665.75	2	91	60	164.69	0.25	5.68
2003	489.60	0	15	33	50.25	0.10	1.02
2004	334.62	4	63	11	81.58	0.24	1.47
			Methow River				
1992	924.26	0	44	43	92.38	0.10	- -
1993	759.56	5	79	32	119.66	0.16	2.11
1994	172.27	0	23	7	30.46	0.18	0.50
1995	27.39	1	54	18	77.30	2.82	10.17
1996	15.00	1	30	230	268.34	17.89	4.85
1997	152.45	21	348	50	537.66	3.53	5.06
1998	23.00	16	34	2	60.75	2.64	14.29
1999	70.27	3	2	0	4.32	0.06	1.61
2000	639.39	5	197	39	256.60	0.40	5.80
2001	7,587.84	3	183	36	231.13	0.03	7.36
2002	1,729.65	0	96	93	203.86	0.12	7.40
2003	604.80	0	59	27	90.12	0.15	1.90
2004	820.82	13	163	35	219.75	0.27	5.96
			Twisp River				
1992	316.61	0	54	37	96.00	0.30	1.17
1993	426.42	5	27	17	50.48	0.12	0.64
1994	74.49	0	13	9	22.94	0.31	1.00
1995	12.17	0	26	12	39.30	3.23	- -
1996	8.00	0	11	56	69.10	8.64	6.47
1997	71.74	0	460	109	729.31	10.17	4.47
1998	11.00	24	72	21	138.15	12.56	2.30
1999	24.60	0	7	0	7.36	0.30	1.91
2000	256.27	37	264	17	339.31	1.32	2.70
2001	889.58	27	77	20	129.24	0.15	1.47
2002	241.09	0	47	35	88.65	0.37	13.33
2003	43.20	0	1	0	1.05	0.02	1.48
2004	340.55	8	48	9	67.06	0.20	3.28

Appendix B. Methow Hatchery expanded CWT recoveries by program and brood year. Stray rate is the percent of spawning ground recoveries collected on 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 and are not included.

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	- -	- -
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	- -	- -
1996	- -	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	1	0	0	7	23	0	738	43.5%	45.4%
2002	2	92	58	174	299	9	0	0	23	29	13	699	42.8%	47.8%
2003	15	3	8	7	22	2	0	0	2	2	0	61	36.1%	40.0%
2004	0	35	4	76	70	0	0	0	9	9	0	203	34.5%	37.8%
Methow spring Chinook salmon														
1993	43	0	134	6	1	0	0	0	0	4	3	191	0.5%	0.5%
1994	0	0	1	0	0	0	0	0	0	0	0	1	- -	- -
1995	3	0	114	3	0	2	0	0	0	0	0	122	0.0%	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	- -	- -	- -	- -	- -	3	0	0	462	428	30	923	- -	- -
1999	93	0	- -	35	7	1	0	0	3	6	0	145	4.8%	5.2%
2000	- -	- -	- -	- -	- -	5	0	0	69	111	0	185	- -	- -
2001	289	0	5	182	23	3	0	0	5	16	0	521	4.4%	4.6%
2002	245	2	37	287	26	9	0	0	22	28	13	669	3.9%	4.4%
2003	37	6	5	4	0	1	0	0	2	2	0	57	0.0%	0.0%
2004	92	41	5	110	33	0	0	0	24	13	0	318	10.4%	11.7%
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	3.7%	4.3%
1994	0	0	4	0	0	0	0	0	0	0	0	4	- -	- -
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	23.2%	28.4%
2001	2	0	1	33	7	0	0	0	0	1	0	44	15.9%	16.3%
2002	7	59	6	70	66	3	0	0	8	10	4	233	28.3%	31.7%
2003	2	2	6	21	13	1	0	0	2	2	0	49	26.5%	29.5%
2004	22	6	5	97	27	0	0	0	16	7	0	180	15.0%	17.2%

Appendix C. Expanded coded wire tag (CWT) recoveries in 2010 by recovery location. Recoveries were expanded by tag-specific mark rates and stream (Methow River, Lost River, etc.) sample rates.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
Chewuch River	2006	052574	Methow	Winthrop	33
Chewuch River	2006	053179	Methow	Winthrop	21
Chewuch River	2006	053180	Methow	Winthrop	8
Chewuch River	2006	053181	Methow	Winthrop	11
Chewuch River	2006	054132	Clearwater	Out-of-basin	2
Chewuch River	2006	054806	Little White Salmon	Out-of-basin	2
Chewuch River	2006	105481	Meadow Creek	Out-of-basin	2
Chewuch River	2006	612713	Clearwater	Out-of-basin	2
Chewuch River	2006	633295	Chiwawa	Out-of-basin	2
Chewuch River	2006	633866	Methow	Within-basin	31
Chewuch River	2006	633884	Chewuch	Local	191
Chewuch River	2006	633899	Gobar Creek	Out-of-basin	2
Chewuch River	2006	634068	Twisp	Within-basin	2
Chewuch River	2007	634293	Methow	Within-basin	2
Chewuch River	2007	634294	Chewuch	Local	2
Early Winters Creek	2006	052574	Methow	Winthrop	16
Early Winters Creek	2006	053179	Methow	Winthrop	3
Early Winters Creek	2006	053180	Methow	Winthrop	5
Early Winters Creek	2006	053181	Methow	Winthrop	6
Early Winters Creek	2006	633866	Methow	Local	8
Early Winters Creek	2006	633884	Chewuch	Within-basin	6
Hancock Creek	2006	633866	Methow	Local	30
Hancock Creek	2007	634294	Chewuch	Within-basin	3
Methow River	2005	633294	Chewuch	Within-basin	3
Methow River	2006	052179	Methow	Winthrop	7
Methow River	2006	052574	Methow	Winthrop	130
Methow River	2006	053179	Methow	Winthrop	74
Methow River	2006	053180	Methow	Winthrop	46
Methow River	2006	053181	Methow	Winthrop	49
Methow River	2006	612713	Clearwater	Out-of-basin	3
Methow River	2006	633687	Twisp	Within-basin	7
Methow River	2006	633866	Methow	Local	417
Methow River	2006	633884	Chewuch	Within-basin	113
Methow River	2006	634068	Twisp	Within-basin	4
Methow River	2007	053576	Methow	Winthrop	2
Methow River	2007	054299	Methow	Winthrop	2
Methow River	2007	054364	Methow	Winthrop	2
Methow River	2007	634290	Chiwawa	Out-of-basin	2
Methow River	2007	634291	Chiwawa	Out-of-basin	2
Methow River	2007	634293	Methow	Local	12
Methow River	2007	634294	Chewuch	Within-basin	12
Methow River	2007	634674	Methow	Local	2
MH outfall	2006	052574	Methow	Winthrop	8
MH outfall	2006	053179	Methow	Winthrop	3
MH outfall	2006	053180	Methow	Winthrop	2

Appendix C, continued.

Recovery location	Brood year	Tag code	Release river	Stray status	Estimated escapement
MH outfall	2006	053181	Methow	Winthrop	1
MH outfall	2006	633866	Methow	Local	45
MH outfall	2006	633884	Chewuch	Within-basin	13
MH outfall	2007	053576	Methow	Winthrop	1
MH outfall	2007	054299	Methow	Winthrop	1
MH outfall	2007	054364	Methow	Winthrop	1
MH outfall	2007	634293	Methow	Local	3
MH outfall	2007	634673	Twisp	Within-basin	1
MH outfall	2008	634866	Methow	Local	1
MH outfall	2008	635099	Chewuch	Within-basin	1
Suspension Creek	2006	052574	Methow	Winthrop	6
Suspension Creek	2006	053180	Methow	Winthrop	6
Suspension Creek	2006	633866	Methow	Local	12
Suspension Creek	2006	633884	Chewuch	Within-basin	6
Suspension Creek	2007	634294	Chewuch	Within-basin	6
Suspension Creek	2007	634674	Methow	Local	6
Twisp River	2005	633483	Twisp	Local	4
Twisp River	2006	052574	Methow	Winthrop	4
Twisp River	2006	053180	Methow	Winthrop	4
Twisp River	2006	633687	Twisp	Local	47
Twisp River	2006	633884	Chewuch	Within-basin	4
Twisp River	2006	634068	Twisp	Local	26
Twisp River	2007	634290	Chiwawa	Out-of-basin	4
WNFH outfall	2006	052179	Methow	Winthrop	2
WNFH outfall	2006	052574	Methow	Winthrop	33
WNFH outfall	2006	053179	Methow	Winthrop	22
WNFH outfall	2006	053180	Methow	Winthrop	18
WNFH outfall	2006	053181	Methow	Winthrop	4
WNFH outfall	2006	633866	Methow	Local	9
WNFH outfall	2006	633884	Chewuch	Within-basin	2
Wolf Creek	2006	052179	Methow	Winthrop	1
Wolf Creek	2006	052574	Methow	Winthrop	10
Wolf Creek	2006	053179	Methow	Winthrop	4
Wolf Creek	2006	053180	Methow	Winthrop	3
Wolf Creek	2006	053181	Methow	Winthrop	2
Wolf Creek	2006	633687	Twisp	Within-basin	1
Wolf Creek	2006	633866	Methow	Local	21
Wolf Creek	2006	633884	Chewuch	Within-basin	8
Wolf Creek	2007	054299	Methow	Winthrop	1
Wolf Creek	2007	054364	Methow	Winthrop	1
Wolf Creek	2007	634294	Chewuch	Within-basin	1

[1]Methow State Fish Hatchery outfall.
[2]Winthrop National Fish Hatchery outfall.

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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

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
W1	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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish							Wild fish				Estimated
		L	WB	Win	M+C	OB	U	Total	1.1	1.2	1.3	Total	escapement
M15	0	0	0	0	0	0	0	0	0	0	0	0	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
W1	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	15	0	30	7	0	0	52	0	66	60	126	159
T5	13								0	0	19	19	29
T4	0								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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish							Wild fish				Estimated
		L	WB	Win	M+C	OB	U	Total	1.1	1.2	1.3	Total	escapement
M15	0	0	0	0	0	0	0	0	0	0	0	0	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
W1	2	0	0	3	2	0	0	5	0	0	0	0	5
Methow total	252	29	17	171	263	3	113	597	5	1	2	8	605
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	1,080	15	7	36	58	1,138

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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

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 M5	17 0	3	3	11	21	0	7	45	0	4	0	4	49 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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

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 M4	7 0	2	8	2	0	0	0	12	0	5	1	6	18 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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish						Wild fish				Estimated
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	escapement
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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

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
GDN4	1	0	0	0	0	4	4	0	0	0	0	4
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	199	33	127	225	63	97	545	6	42	104	152	697
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	308	134	140	246	117	176	813	9	56	201	266	1,079

Appendix K. Estimated escapement from 2008 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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish						Wild fish				Estimated
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	escapement
M15	1	0	0	14	0	15	29	0	5	4	9	2
M14	17											36
M13	13	0	0	7	7	0	14	0	13	0	13	27
M12	9	0	0	19	0	0	19	0	0	0	0	19
M11	17	7	7	2	0	6	22	0	12	2	14	36
M10	31	8	4	12	0	7	31	0	30	4	34	65
M9	94	29	29	40	5	25	128	7	52	11	70	198
M8	4	0	2	3	0	0	5	0	2	1	3	8
M7	13	4	8	11	0	2	25	0	2	0	2	27
M6	20	26	12	33	3	1	75[a]	1	0	0	1	42
M5,4	3	1	0	4	0	1	6[a]	0	1	0	1	6
L2	10	0	3	6	0	0	9	0	16	0	16	21
L1	2											4
EW3	2	0	0	0	0	0	0	0	4	0	4	4
EW2,1	0	0	0	0	0	0	0	0	0	0	0	0
MH1	10	6	4	11	0	0	21	0	0	0	0	21
Susp1	7	0	0	10	0	0	10	0	5	0	5	15
W1	0	0	0	0	0	0	0	0	0	0	0	0
WN1	25	2	2	63	0	7	74[a]	0	0	0	0	53
Methow total	278	83	71	235	15	64	468[a]	8	142	22	172	584
C13	2	0	0	0	8	4	12	0	0	0	0	4
C12	4											8
C11	3	0	0	0	3	0	3	0	0	3	3	6
C10	7	0	0	0	0	8	8	0	7	0	7	15
C9	1	0	0	0	0	0	0	0	2	0	2	2
C8	7	0	0	2	0	0	2	0	8	5	13	15
C7	16	11	0	2	10	0	23	0	9	2	11	34
C6	21	14	1	3	3	5	26	1	6	11	18	44
C5	12	8	0	6	0	2	16	0	9	0	9	25
C4	19	16	4	8	0	0	28	0	12	0	12	40
C3	0	0	0	0	0	0	0	0	0	0	0	0
C2	21	13	5	12	0	3	33	2	6	3	11	44
C1	7	0	0	8	0	7	15	0	0	0	0	15
Chewuch total	120	62	10	41	24	29	166	3	59	24	86	252
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	18	27	4	0	3	0	34	0	4	0	4	38
T6	24	21	0	0	0	12	33	0	17	0	17	50
T5	26	31	1	0	3	2	37	3	15	0	18	55
T4	7	13	0	0	0	2	15	0	0	0	0	15
T3	2	3	0	0	0	1	4	0	0	0	0	4
T2	2	3	0	0	0	0	3	0	1	0	1	4
T1	0	0	0	0	0	0	0	0	0	0	0	0
Twisp total	79	98	5	0	6	17	126	3	37	0	40	166
2008 total	477	243	86	276	45	110	760[a]	14	238	46	298	1,002

[a] Greater than estimated spawning escapement from fish-per-redd expanded redd counts; includes actual number of carcasses in reaches where total recoveries exceeded estimated escapement.

Appendix L. Estimated escapement from 2009 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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	
M15	0	0	0	0	0	0	0	0	0	0	0	0
M14	11	0	13	26	0	0	39	0	20	0	20	59
M13	1	0	0	0	0	0	0	0	5	0	5	5
M12	10	7	8	14	0	3	32	0	22	0	22	54
M11	14	19	10	24	0	9	62	0	14	0	14	76
M10	44	252	95	334	65	87	209	0	25	3	28	237
M9	138						624	8	96	16	120	744
M8	11	63	23	67	0	23	176	5	2	0	7	59
M7	11											59
M6	12											65
M5,4	3	5	0	5	0	4	14	0	2	0	2	16
L2	9	24	23	0	0	0	47	0	0	23	23	48
L1	4											22
EW5	0	0	0	0	0	0	0	0	0	0	0	0
EW4	3	14	13	14	0	0	41	0	0	13	13	16
EW3	7											38
EW2,1	0	0	0	0	0	0	0	0	0	0	0	0
MH1	14	30	19	19	1	6	75	0	0	0	0	75
Susp1	9	7	0	29	0	6	42	0	7	0	7	49
W2	5	5	17	5	0	0	27	0	0	0	0	27
W1	0	0	0	0	0	0	0	0	0	0	0	0
WN1	17	9	2	78	2	1	92	0	0	0	0	92
Methow total	323	435	223	615	68	139	1,480	13	193	55	261	1,741
C13	2	6	0	0	0	0	6	0	5	0	5	11
C12	10	11	0	0	0	22	33	10	33	0	43	54
C11	4											22
C10	4	6	0	0	0	3	9	0	13	0	13	22
C9	0	0	0	0	0	0	0	0	0	0	0	0
C8	7	5	0	0	5	4	14	0	24	0	24	38
C7	11	20	0	0	0	10	30	0	19	10	29	59
C6	30	25	4	30	4	20	83	4	75	0	79	162
C5	14	23	12	11	0	3	49	4	22	0	26	75
C4	26	60	10	33	3	14	120	3	17	0	20	140
C3	0											0
C2	29	56	29	19	0	23	127	0	29	0	29	156
C1	6	6	12	11	0	0	29	0	3	0	3	32
EM1	0	0	0	0	0	0	0	0	0	0	0	0
Chewuch total	143	218	67	104	12	99	500	21	240	10	271	771
T10-8	0	0	0	0	0	0	0	0	0	0	0	0
T7	5	50	0	5	5	14	74	10	19	0	29	27
T6	11											60
T5	3											16
T4	3	16	0	0	0	0	16	0	0	0	0	16
T3	1	6	0	0	0	1	7	0	0	3	3	5
T2	1											5
T1	0	0	0	0	0	0	0	0	0	0	0	0
Twisp total	24	72	0	5	5	15	97	10	19	3	32	129
2009 total	490	725	290	724	85	253	2,077	44	452	68	564	2,641

Appendix M. Estimated escapement from 2010 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 = total number of hatchery fish unaccounted for through CWT and sample rate expansions.

Reach	Redds	Hatchery fish						Wild fish				Estimated escapement
		L	WB	Win	OB	U	Total	1.1	1.2	1.3	Total	
M15	8	0	2	3	0	3	8	0	6	0	6	14
M14	32	2	4	15	6	5	32	0	23	0	23	55
M13	34	19	10	32	0	2	63	0	13	0	13	59
M12	14							0	7	0	7	24
M11	50	12	10	28	0	13	63	2	22	0	24	87
M10	63	27	7	36	0	8	78	2	29	0	31	109
M9	332	212	62	132	15	50	471	0	115	2	117	574
M8	8											14
M7	67	126	38	67	4	21	256	1	6	0	7	116
M6	71											123
M5,4[b]	10											17
M3,2[b]	4											7
L2	12	0	0	0	0	0	0	0	21	0	21	21
L1	5	0	0	0	0	0	0	0	9	0	9	9
EW5	0	0	0	0	0	0	0	0	0	0	0	0
EW4	4	0	0	0	0	0	0	0	7	0	7	7
EW3	26	8	6	28	0	0	42	0	5	0	5	45
EW2,1	1											2
GDN4/M2,FD1	5	0	0	0	0	9	9	0	0	0	0	9
HA2,1	20	29	3	0	0	0	32	0	3	0	3	35
MH1	50	49	15	17	1	4	86	0	2	0	2	88
Susp1	31	18	12	12	0	0	42	0	12	0	12	54
W3-1	33	21	10	24	0	1	56	0	1	0	1	57
WN1	55	9	2	78	0	4	93	0	2	0	2	95
Methow total	935	532	181	472	26	120	1,331	5	283	2	290	1,621
C13	2	0	0	0	0	0	0	0	3	0	3	3
C12	32	4	0	0	0	6	10	0	40	5	45	55
C11	9	5	2	0	2	0	9	0	7	0	7	16
C10	10	2	0	2	2	3	9	0	8	0	8	17
C9	0	0	0	0	0	0	0	0	0	0	0	0
C8	8	15	3	13	3	1	35	2	19	0	21	14
C7	24											42
C6	37	18	4	6	2	2	32	0	32	0	32	64
C5	15	13	3	3	0	1	20	0	6	0	6	26
C4	82	80	9	30	8	7	134	2	13	2	17	142
C3	5											9
C2	52	48	5	10	6	5	74	2	12	2	16	90
C1	9	3	4	5	1	3	16	0	0	0	0	16
EM1	0	0	0	0	0	0	0	0	0	0	0	0
LK2,1	1	0	0	0	0	2	2	0	0	0	0	2
Chewuch total	286	188	30	69	24	30	341	6	140	9	155	496
T10	0	0	0	0	0	0	0	0	0	0	0	0
T9	1	0	0	0	0	0	0	0	2	0	2	2
T8	11	0	0	0	0	0	0	0	19	0	19	19
T7	21	9	0	0	0	0	9	0	27	0	27	36
T6	54	20	4	4	0	8	36	0	57	0	57	93
T5	35	20	0	2	2	2	26	2	31	2	35	61
T4	9	8	0	0	0	0	8	0	8	0	8	16
T3	9	8	0	0	0	0	8	0	8	0	8	16
T2	5	0	0	0	0	9	9	0	0	0	0	9
T1	0											0
Twisp total	145	65	4	6	2	19	96	2	152	2	156	252
2010 total	1,366	785	215	547	52	169	1,768	13	575	13	601	2,369

APPENDIX L
2011 LETTERS INVITING NON-SIGNATORY PARTIES TO A MID-COLUMBIA FORUM

February 7, 2011

Ms. Brett Swift
American Rivers
320 SW Stark St., Suite 418
Portland, Oregon 97208

Dear Brett:

You may recall that I periodically contact you on behalf of the Parties to the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans (HCPs). This letter follows similar letters sent in 2006-2010 inquiring about your interest in participating in a meeting with members of the HCP Coordinating, Hatchery, and Tributary Committees. As parties who were involved in negotiating the HCPs, but elected to not sign the HCPs, the Committees would like to again provide you with a progress report on implementation, as well as give you an opportunity to ask questions of Committee members.

If held, the meeting would be limited to your representatives as well as those from the Confederated Tribes of the Umatilla Reservation, and invited representatives of Grant County PUD. The meeting would likely be a half-day session with a majority of the time available to address your questions and concerns; however, I would plan to work with you to shape an agenda and timeline beforehand.

Because the HCP Parties formally notified FERC of their intent to provide for continuing dialogue with the non-signatories in this type of periodic meeting, I would appreciate it if you could provide a formal response to this letter by March 7, 2011. Should you have any questions, please feel free to contact me at 206-287-9130 or mschiewe@anchorqea.com.

Sincerely,

Michael H. Schiewe
Chair, HCP Coordinating Committees
Anchor QEA, L.L.C.

cc: Steve Hemstrom, Chelan PUD
Tom Kahler, Douglas PUD
Jim Craig, USFWS
Jerry Marco, Colville Tribes
Steve Parker, Yakama Nation
Bryan Nordlund, NMFS
Teresa Scott, WDFW
Tracy Hillman, Chair, HCP Tributary Committees

February 7, 2011

Mr. Gary James
Confederated Tribes of the Umatilla Indian Reservation
P.O. Box 638
Pendleton, Oregon 97801

Dear Gary:

You may recall that I periodically contact you on behalf of the Parties to the Wells, Rocky Reach, and Rock Island Habitat Conservation Plans (HCPs). This letter follows similar letters sent in 2006-2010 inquiring about your interest in participating in a meeting with members of the HCP Coordinating, Hatchery, and Tributary Committees. As parties who were involved in negotiating the HCPs, but elected to not sign the HCPs, the Committees would like to again provide you with a progress report on implementation, as well as give you an opportunity to ask questions of Committee members.

If held, the meeting would be limited to your representatives as well as those from American Rivers, and invited representatives of Grant County PUD. The meeting would likely be a half-day session with a majority of the time available to address your questions and concerns; however, I would plan to work with you to shape an agenda and timeline beforehand.

Because the HCP Parties formally notified FERC of their intent to provide for continuing dialogue with the non-signatories in this type of periodic meeting, I would appreciate it if you could provide a formal response to this letter by March 7, 2011. Should you have any questions, please feel free to contact me at 206-287-9130 or mschiewe@anchorqea.com.

Sincerely,

Michael H. Schiewe
Chair, HCP Coordinating Committees
Anchor QEA, L.L.C.

cc: Steve Hemstrom, Chelan PUD
Tom Kahler, Douglas PUD
Jim Craig, USFWS
Jerry Marco, Colville Tribes
Steve Parker, Yakama Nation
Bryan Nordlund, NMFS
Teresa Scott, WDFW
Tracy Hillman, Chair, HCP Tributary Committee

APPENDIX M
CHRONOLOGY OF EVENTS LEADING TO HCP HATCHERY COMMITTEES APPROVAL OF 2013 RECALCULATED HATCHERY PRODUCTION

Date	Action	Supporting Documents
9/15/2010	Initiate discussion of 2013 recalculation of hatchery production	September 15, 2010 HCP HC Meeting Minutes
7/20/2011	Approved SOA describing recalculation method	2011_07_20 Douglas - SOA RR RI Wells NNI Recalc Methodology_Final_clean.docx
8/17/2011	Approved recalculation database	2011_07_29 Chelan - Mid-Columbia PUD Recalculation Data_updated.xlsx
8/30/2011	Agreed to use the ranges of hatchery compensation values described in the Sensitivity Analysis as the basis for development of the Recalculation Implementation Plans (RIPs)	2011_08_16 Chelan - HCP_HC_Recalculation _Sensitivity_Analysis_8_16_2011.pdf
12/14/2011	HC approved the Douglas PUD and Chelan PUD recalculation SOAs	2011_12_14 Douglas - Final SOA Recalculation SOA Douglas 10 14 2011 FINAL.pdf and 2011_12_14 Chelan - Final SOA CPUD Final Recalculation SOA_12-14-11.pdf
1/18/2012	PRCC HSC approved the Grant PUD recalculation SOA[1]	GPUD Recalculation Implementation plan SOA-Approved.docx

[1] Grant PUD's Priest Rapids Coordinating Committee Hatchery Subcommittee Statement of Agreement is included here because Grant PUD hatchery fish are produced at Douglas PUD hatchery facilities through a Memorandum of Understanding.

APPENDIX N
BULL TROUT MONITORING AND MANAGEMENT PLAN
2010 ANNUAL REPORT

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

March 28, 2011

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC 20426

Subject: **Wells Hydroelectric Project No. 2149**
Wells Bull Trout Monitoring and Management Plan – Annual Report

Dear Secretary:

In accordance with Article 62 of the Federal Energy Regulatory Commission (Commission) license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits the 2010 Annual Report associated with the implementation of the Wells Bull Trout Monitoring and Management Plan (Bull Trout Plan).

On June 21, 2004, the Commission issued orders amending the license for the Wells Project in order to implement the terms of the Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP). The United States Fish and Wildlife Service (USFWS) issued a biological opinion (BO) pursuant to Section 7 of the Endangered Species Act (ESA) to assess the effects of the HCP on ESA listed bull trout and other listed species under the jurisdiction of the USFWS. The BO included reasonable and prudent measures (RPMs) and associated terms and conditions for implementing the RPMs for bull trout. The Commission order approving the Wells HCP added Article 61, 62 and 63 to the Wells Project license.

Article 61 of the license required Douglas PUD to file with the Commission a Bull Trout Plan for monitoring take associated with the operations of the Wells Project. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation).

Following consultation with the USFWS, NMFS, WDFW, Colville Confederated Tribes, and the Yakama Nation, Douglas PUD filed the Bull Trout Plan with the Commission on February 28, 2005. The Bull Trout Plan was approved by the Commission on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the Commission an annual report describing the activities required by the Bull Trout Plan.

Article 63 of the license reserves the Commission's authority to require Douglas PUD to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan.

Consistent with Article 62 of the license, please find enclosed Douglas PUD's Annual Bull Trout Report for activities that took place between January 01, 2010 and December 31, 2010. This report is simultaneously being provided to the USFWS and the parties to the Wells HCP.

The next reporting deadline associated with the Bull Trout Plan is March 31, 2012 (2011 Annual Report).

If you have any questions related to the 2010 Annual Bull Trout Report, please contact me at (509) 881-2208 or sbickford@dcpud.org.

Sincerely,

Shane Bickford
Supervisor of Natural Resources

Enclosure: (1) 2010 Bull Trout Annual Report. Wells Hydroelectric Project FERC Project No. 2149. March 2011.

Copy: Steve Lewis, USFWS
Patrick Regan, FERC, Portland, with 1 copy
James Hastreiter, FERC, Portland, with 1 copy
Erich Gaedeke, FERC, Portland with 1 copy
Mike Schiewe, Coordinator – HCP Coordinating Committee
Wells HCP Coordinating Committee – Members List
Wells Aquatic Settlement Work Group – Members List
Scott Kreiter, Douglas PUD

BULL TROUT MONITORING AND MANAGEMENT PLAN
2010 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 28, 2011

Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

For copies of this Annual Report, contact:

Public Utility District No. 1 of Douglas County
Attention: Natural Resources
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497
Phone: (509) 884-7191

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EXECUTIVE SUMMARY

The goal of the Wells Hydroelectric Project (Wells Project) Bull Trout Monitoring and Management Plan (Bull Trout Plan) is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout (*Salvelinus confluentus*) associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan was prepared and is implemented to meet monitoring requirements stipulated in a U.S. Fish and Wildlife Service (USFWS) Biological Opinion (USFWS 2004) regarding implementation of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP). The USFWS Biological Opinion monitoring requirements were also incorporated by the Federal Energy Regulatory Commission (FERC) into the existing Wells Project license in 2004. The Bull Trout Plan was developed in collaboration with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), the Colville Confederated Tribes, and the Yakama Nation, and was approved by the FERC. The Bull Trout Plan has four objectives, addressed by carrying out various field study components from 2004 to 2008 at the Wells Project.

In accordance with Article 62 of the FERC license for the Wells Project, Douglas PUD is required to prepare and file with the Commission an annual report describing the activities required by the Bull Trout Plan. In December 2008, Public Utility District No. 1 of Douglas County (Douglas PUD) filed with the FERC, a final comprehensive report summarizing the results of all activities conducted under the Bull Trout Plan between January 2005 and July 2008.

In a letter to the FERC on December 29, 2008, Douglas PUD requested that the 2008 annual report filing (due March 31, 2009) be eliminated and instead include all remaining 2008 activities (August to December 2008) within the 2009 annual report that was scheduled to be filed with the FERC on March 31, 2010. In a letter dated February 3, 2009 the FERC approved Douglas PUD's request. The 2009 annual report was submitted in March of 2010, and included both the results of those additional activities conducted in 2008 that were not included in the Bull Trout Plan 2005-2008 Final Report (LGL and Douglas PUD, 2008) and the ongoing Bull Trout Plan activities that were conducted in 2009.

The enclosed annual report is a comprehensive summary of the bull trout research, monitoring and evaluation efforts through 2010. This document is due to be filed with the FERC by March 31, 2011.

Observations of bull trout passing Wells Dam in the 2010 season remain similar to 2008 and 2009. Adult bull trout fishway counts at the Wells Project were 43, 43 and 44 respectively for the past three years. Off-season fishway monitoring continues to indicate that bull trout are not passing Wells Dam during the winter months. During the 2010 season 82% of all bull trout fishway observations were in the May-June period, with the last observation in late October 2010. This timing is consistent with past years, and indicates bull trout passage at the dam is a seasonal trend independent of Project operations.

Past, stranding and entrapment surveys have indicated that infrequent Project operations that result in lowering of the reservoir have not impacted adult or sub-adult bull trout in the Wells

Project. These surveys were not conducted in 2010 because no low reservoir operating events took place during the 2010 monitoring period.

To date, no sub-adult bull trout have been observed in Wells Dam fishways. Data collected from Methow River basin smolt collection operations confirm that sub-adult bull trout are present outside of the Wells Project.

In 2010, 10 DNA samples were collected from bull trout captured in the Twisp River. These samples have yet to be delivered to USFWS. Bob Jateff (WDFW, Fish Management Biologist) is the current custodian of these 2010 samples. As reported in 2009, genetic samples were taken from 15 fish during the implementation of off-site smolt collection activities and provided to the USFWS for future genetic analysis. These samples were provided to Judy De La Vergne (USFWS, Wenatchee, WA). In addition to coordinating monitoring efforts and information exchanges of Project-specific bull trout data, Douglas PUD continues to participate in regional activities that support bull trout conservation and recovery.

Five adult bull trout were incidentally captured at Wells Dam during Chinook brood collection activities. All five of these fish were PIT-tagged and then released back into the fishways to continue their migration. Two of these fish were later detected in the Methow River Basin on instream PIT-tag detectors.

Ninety-one adult bull trout were incidentally captured at the Twisp River weir in 2010 (length range 44 - 79 cm), 87 of which were subsequently PIT-tagged and released back into the Twisp River upstream of the Twisp Weir. The other four adult bull trout had been previously PIT-tagged.

Bull trout behavior in the Methow Basin during 2010 remained similar to previous years. In the spring, adult bull trout were detected migrate upstream into the Twisp River. After spawning and before winter there is a directed downstream migration exhibited by both adult and subadult fish seeking out overwintering habitat found within the lower Methow and Wells reservoir.

Hook and line sampling for residual steelhead in the Methow Basin captured 18 adult bull trout from December 2009 to January 2011, all of which were subsequently PIT-tagged and released unharmed (Charlie Snow, pers. comm.). Tag codes for all PIT-tagged fish were uploaded to the PTAGIS database. Queries of the PTAGIS database show that none of the bull trout PIT-tagged in the Methow Basin have been subsequently detected at Wells Dam or outside the Methow Basin. The majority of bull trout detections in the Methow River Basin occurred between July and November in 2010 (95%) at the “Methow River at Twisp” and the “Lower Twisp River near MSRF Ponds” interrogation locations (nearly 82% of all detections were at these two locations).

1.0 INTRODUCTION

In August 1993, Douglas, Chelan, and Grant Public Utility Districts (collectively, "mid-Columbia PUDs") initiated discussions to develop a long-term, comprehensive program for managing fish and wildlife that inhabit the mid-Columbia River basin (the portion of the Columbia River from the tailrace of Chief Joseph Dam to the confluence of the Yakima and Columbia rivers). After an extensive review, the negotiating parties determined that the best basin-wide approach would be to develop an agreement for anadromous salmonids, specifically: spring and summer/fall Chinook salmon (*Oncorhynchus tshawytscha*); sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and steelhead (*O. mykiss*) (collectively, "Plan Species") which are under the jurisdiction of the National Marine Fisheries Service (NMFS).

On July 30, 1998, Public Utility District No. 1 of Douglas County (Douglas PUD) submitted an unexecuted form of an Application for Approval of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP) to the Federal Energy Regulatory Commission (FERC) and NMFS. To expedite the FERC's completion of formal consultation, Douglas PUD prepared a biological evaluation of the effects of implementing the Wells HCP on listed species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS).

In a letter to the FERC, the USFWS requested consultation under Section 7 of the Endangered Species Act (ESA) regarding the effects of hydroelectric project operations on bull trout in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, the FERC noted that there was virtually no information on bull trout in the mainstem Columbia River. To begin to address this information gap, an initial radio-telemetry study of bull trout in the mid-Columbia basin was requested by USFWS in 2000 and implemented from 2001 to 2004 by Douglas, Chelan, and Grant PUDs (BioAnalysts, Inc. 2004).

On November 24, 2003, Douglas PUD filed an application with the FERC for approval of the executed Wells HCP. The 2003 application for approval replaced the 1998 application with the executed form of the Wells HCP. On December 10, 2003, the USFWS received a request from the FERC for formal Section 7 ESA consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for Wells Project operations was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS issued a Biological Opinion (BO) pursuant to Section 7 of the ESA to assess the effects of implementing the HCP on bull trout and other listed species under the jurisdiction of the USFWS. The BO included an Incidental Take Statement outlining reasonable and prudent measures (RPMs) and associated terms and conditions to monitor and limit bull trout take at the Wells Project. On June 21, 2004, the FERC issued orders amending the license for the Wells Project to implement the terms of the Wells HCP. The FERC incorporated the USFWS bull trout RPMs and terms and conditions into the existing Wells Project license, which are detailed in license articles 61, 62, and 63.

Article 61 of the license requires Douglas PUD to file with the FERC a Bull Trout Plan for implementing the USFWS bull trout RPMs and terms and conditions, which were designed to monitor and limit bull trout take associated with Wells Project operations. Article 61 further requires that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, NMFS, Washington Department of Fish and Wildlife (WDFW), and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation). Following consultation with these stakeholders, on February 28, 2005, Douglas PUD filed with the FERC the "*Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008*" (Douglas PUD 2004), which is referred to as the "Bull Trout Plan" in this document. The Bull Trout Plan was approved by the FERC on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the FERC an annual report of the status of activities required by the Bull Trout Plan. On March 26, 2008, Douglas PUD with approval from USFWS filed a request for an extension of time to submit the 2007 annual bull trout monitoring report and to consolidate the 2007 annual report with the final bull trout monitoring report, required to be filed with the FERC by December 31, 2008. On April 16, 2008, the FERC issued an order granting this request and per the order, Douglas PUD filed with the FERC a 2005-2008 final monitoring report that summarized all data collected to meet the Bull Trout Plan objectives outlined in the USFWS bull trout RPMs and terms and conditions, and the Wells Project license articles 61 and 62.

The next reporting deadline associated with the Bull Trout Plan was March 31, 2009 (2008 Annual Report). However, because the 2005-2008 final report contained bull trout monitoring activities for most of 2008, Douglas PUD requested and was granted permission, via the FERC's April 16, 2008 letter to Douglas PUD, to eliminate the March 2009 filing of the 2008 Annual Report and instead include all remaining 2008 activities within the 2009 annual report**.** The former document was submitted in March of 2010, which summarized the results of those additional activities conducted in 2008 that were not completed in time for inclusion into the Bull Trout Plan 2005-2008 Final Report (LGL and Douglas PUD, 2008) and the ongoing Bull Trout Plan activities that were conducted in 2009. The current document follows a similar path as the 2009 annual bull trout compliance report. Although it is a comprehensive summary of all the bull trout research over the last ten years, it is focused largely on the monitoring and evaluation efforts conducted during 2010. This document is due to be filed with the FERC by March 31, 2011.

Article 63 was a reservation of authority by the FERC to require the licensee to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan. The USFWS has only recently reactivated the bull trout recovery planning process following a multi-year hiatus. In response to compliance with article 63 of the Wells Project license, Douglas PUD has and will continue to participate in the development of future recovery planning documents for bull trout.

2.0 GOALS AND OBJECTIVES

The goal of the Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout from Wells Project operations and facilities. The Bull Trout Plan was intended to be an adaptive approach, where strategies for meeting the goals and objectives may be negotiated under a collaborative effort with stakeholders based on new information and ongoing monitoring results. The plan was designed specifically to: (1) address ongoing project-related impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS Draft Bull Trout Recovery Plan; and (3) monitor and minimize the extent of any incidental take of bull trout consistent with Section 7 of the ESA.

The Bull Trout Plan has four main objectives: (1) identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout; (2) assess project-related impacts on upstream and downstream passage of sub-adult bull trout; (3) investigate the potential for bull trout entrapment or stranding in off-channel or backwater areas of Wells Reservoir; and (4) identify the core areas and local populations, as defined in the USFWS Draft Bull Trout Recovery Plan, for the bull trout that utilize the Wells Project Area.

Activities designed to support some objectives in the Bull Trout Plan were only intended to be conducted in the early phases of plan implementation (i.e., radio-tagging of bull trout at Wells Dam between 2005-2008 and comprehensive incidental take calculation for monitoring years 2001-2004 and 2005-2008). The results of these activities can be found in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD, 2008) and are considered completed tasks with the filing of that final report. For the purposes of continued annual reporting per Article 62, only ongoing Bull Trout Plan activities are reported herein.

Below is a brief summary of the Bull Trout Plan objectives. A more detailed strategic framework to implement each objective is summarized in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD, 2008).

2.1 Objective 1 - Adult Bull Trout Passage Monitoring

Strategy 1-1: Implement an adult bull trout telemetry program to monitor adult upstream and downstream passage in the Wells Project Area and implement appropriate measures to monitor any incidental take of bull trout.

Strategy 1-2: Analyze passage results and operational data to determine if correlations exist between passage times and passage events and project operations.

Strategy 1-3: Determine off-season adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period 2004-2005. Per request by the USFWS, off-season fishway monitoring for adult bull trout passage has continued to date.

Strategy 1-4: Should upstream or downstream passage problems be identified, pursue the feasibility of options to modify upstream passage facilities or operations that reduce the impact to bull trout passage.

2.2 Objective 2 - Sub-adult Bull Trout Passage Monitoring

Strategy 2-1: The stakeholders agree at this time[1] that because of the inability to collect a sufficient sample size of sub-adult bull trout, it is not feasible to assess sub-adult passage at Wells. However, when encountered at the Wells Project, or in tributary traps, sub-adult bull trout will be PIT-tagged.

Strategy 2-2: Determine off-season sub-adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period from 2004 to 2005. Per request by the USFWS, off-season fishway monitoring for sub-adult bull trout passage has continued to date.

2.3 Objective 3 - Bull Trout Entrapment and Stranding Evaluation

Strategy 3-1: Evaluate Wells inflow patterns, reservoir elevations, and backwater curves to determine if stranding or entrapment of bull trout may occur.

2.4 Objective 4 - Identification of Core Area and Local Populations of Bull Trout that Utilize the Wells Project Area

Strategy 4-1: Gather genetic samples from radio-tagged and PIT-tagged bull trout for comparison to baseline genetic samples from local populations and core areas.

Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the Project area.

3.0 STUDY AREA

3.1 Wells Bull Trout Plan Study Area

The study area for this report included all waters within the Wells Project, including the lower Okanogan and Methow rivers, the Wells Reservoir, Wells Dam, and Wells Tailrace, downstream to the "Gateway" location set at approximately 3 miles downstream from Wells Dam. Additional monitoring also took place at downstream hydroelectric projects and other accessible reaches of the mid-Columbia Basin including the Methow, Wenatchee, Entiat, and Okanogan rivers. PIT tagging activities also occurred in the Methow and Twisp rivers.

3.2 General Description of the Wells Hydroelectric Project Area

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (COE), and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros,

[1] At the time that the Bull Trout Plan was prepared in 2004.

Washington, located approximately 8 miles upstream from the Wells Project at the mouth of the Methow River.

The Wells Project is the chief generating resource for Douglas PUD. It includes 10 generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet mean sea level (msl) in height.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at elevation of 781 feet msl. The normal maximum water surface elevation of the reservoir is 781 feet msl (Figure 3.2-1).

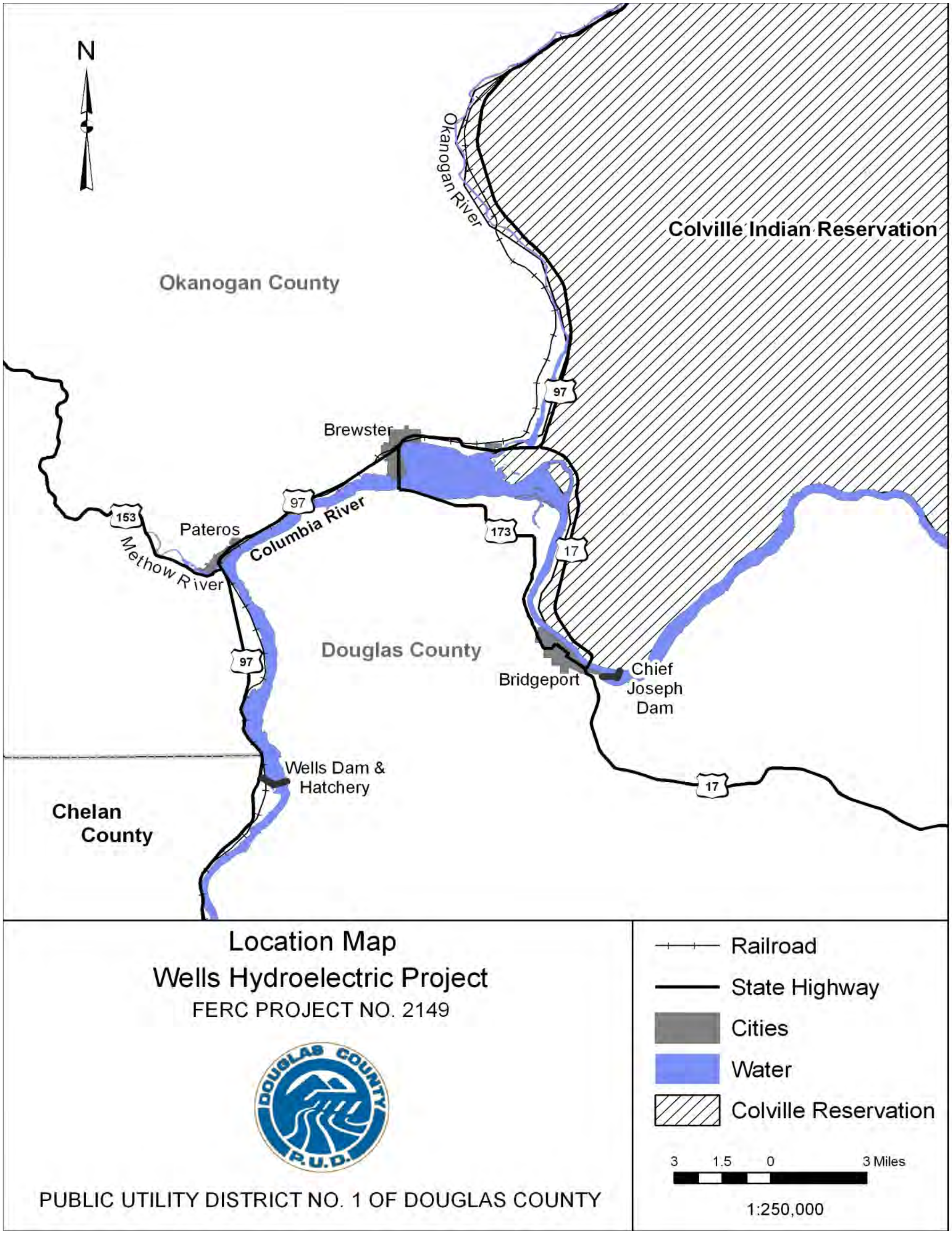

Figure 3.2-1 Location map of the Wells Project.

4.0 BACKGROUND AND EXISTING INFORMATION

4.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and East to Western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the Mackenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and a small portion of the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat (USFWS et al. 2000), and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993), although each form is not present everywhere. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Mongillo 1993; Kraemer 1994; McPhail and Baxter 1996; Volk 2000). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives. Sexually mature resident bull trout are often much smaller at maturation than sexually mature adults of other life histories (McPhail and Baxter 1996).

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes, but it is unknown if this emigration is a result of density dependent effects from limited stream rearing habitat, or if these young-of-the-year actually survive in the lake environment (Riehle et al. 1997). Juvenile bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993) with maximum summer water temperatures generally less than 16ºC (Dunham et al. 2003) and areas with cold hyporheic zones or groundwater upwellings (Baxter and Hauer 2000).

4.2 Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the ESA (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004, the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995). New critical habitat was proposed throughout the range of bull trout in January 14, 2010 (75 FR 2270), including all of the Wells Project waters except the Okanogan River.

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species, and determine if multiple distinct population segments exist within the Columbia River that merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit[2] and the USFWS has identified the Wenatchee, Entiat, and Methow rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area may function as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwintering, migration, and foraging habitats. The Wenatchee Core Area has populations using lake and riverine habitat (both the Wenatchee and Columbia rivers) for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent a regularly interacting reproductive unit. Sixteen local populations have been identified in the Wenatchee (6), Entiat (2), and Methow (8) core areas (USFWS 2002).

4.3 2001-2004 Mid-Columbia Bull Trout Radio Telemetry Study

Bull trout have been counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the behavior, migratory characteristics and habitat use of bull trout in the mid-Columbia River. Therefore, to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio telemetry (Figure 4.3-1) to address the information deficit described above. The number of bull trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

From 2001 to 2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams, radio-tagged, and monitored through 2004. Multiple-telemetry techniques were used to assess the movement and behavior of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the project, identify passage times and determine their direction of travel (i.e., upstream/downstream). In addition to these systems, a number of additional telemetry systems were deployed to address specific questions posed by the USFWS and Douglas PUD. At Wells Dam, several additional systems were installed to identify whether tagged bull trout could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually during the study period from 2001-2004, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system.

[2] Note that while the USFWS refers to the area encompassing the Wells Project as the Upper Columbia Recovery Unit for bull trout, the section of the Columbia River from Chief Joseph Dam to the confluence of the Yakima and Columbia rivers is often termed the "mid-Columbia" for other purposes, and is the term used in this document when referring to the reach.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial telemetry surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). English et al. (1998, 2001) provide a detailed description of the telemetry systems at each of the dams and within the tributaries.

Successful bull trout upstream and downstream passage was observed at the Wells Project. In addition, no bull trout injury or mortality was observed associated with the Wells Project. Radio-tagged bull trout that migrated upstream past Wells Dam used the Methow River subbasin during the bull trout spawning period. Key findings of the 2001 to 2004 study are used in this document to assess the 6-year average take analysis as stipulated in the Bull Trout Plan (Objective 1, Strategy 1-1) and are summarized in the results section of this document.

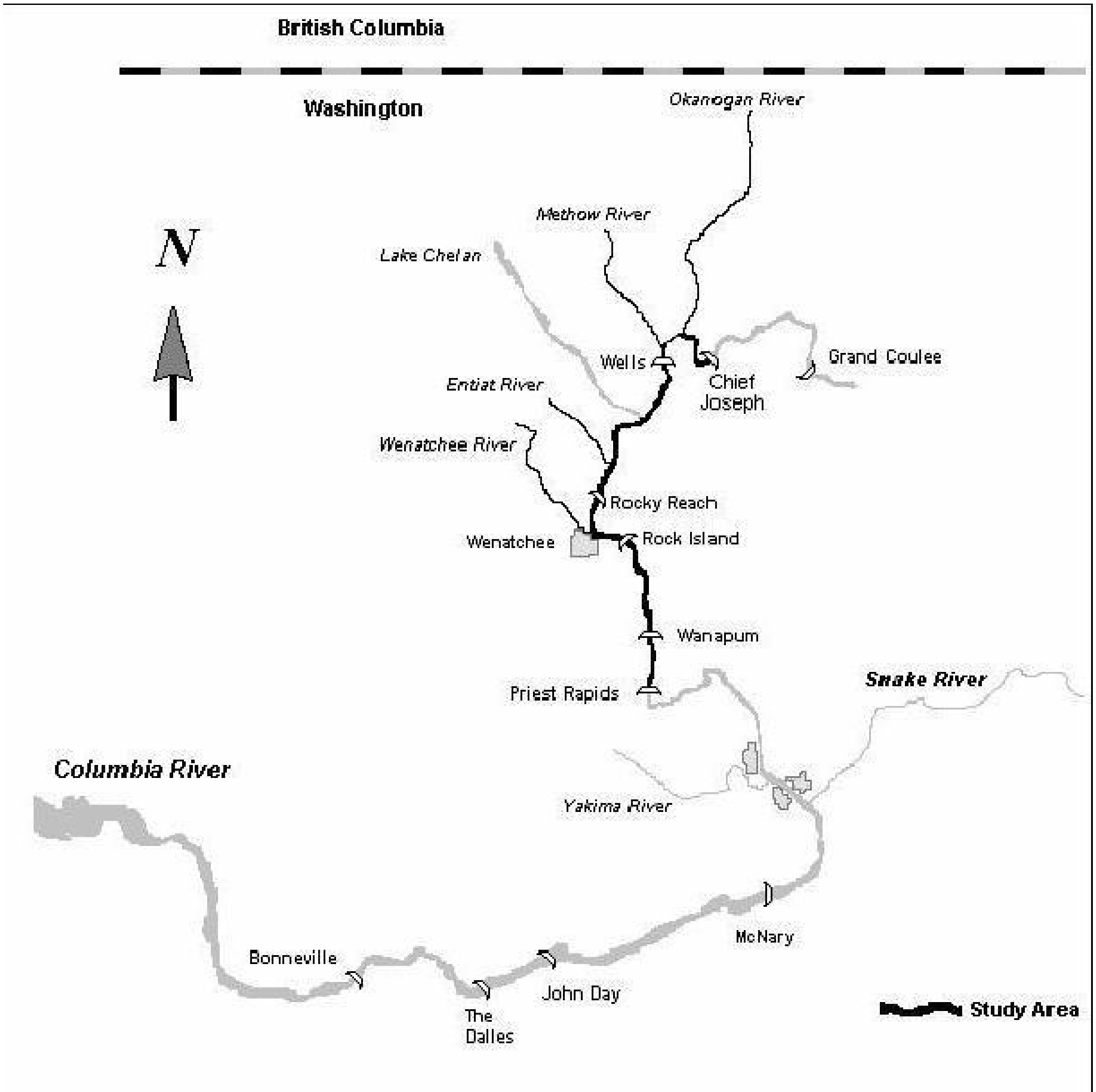

Figure 4.3-1 Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2004).

4.4 2005-2008 Bull Trout Monitoring and Management Plan Activities

The goal of the Wells Project Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan has four objectives, addressed by implementing various field study components from 2004 to 2008 at the Wells Project.

The first objective was to identify potential project-related impacts on upstream and downstream passage of adult bull trout (fish $\geq$ 400 mm in length) through Wells Dam and reservoir, and implement appropriate measures to monitor any incidental take of adult bull trout. To meet the first objective, radio telemetry was used to monitor upstream and downstream passage, and off-season video counting was done in the Wells Project fishways during the winter. Between 2005 and 2008, 26 adult bull trout were trapped at Wells Dam and radio-tagged. Concurrent with the implementation of the Bull Trout Plan, the USFWS and Chelan PUD radio-tagged and released 136 adult bull trout at other mid-Columbia River basin locations including the Methow River, and Rock Island and Rocky Reach dams (50 USFWS tags 2006-2008, 86 Chelan PUD tags 2005-2007).

From 2005 to 2008, 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam. Of these, 17 downstream and 41 upstream passage events occurred within one year of tagging and release. Of all tags released from 2001 to 2004, there were 2 downstream passage events and 41 upstream passage events. Of these, 2 downstream and 38 upstream passage events occurred within one year of release date. The take estimates for the Wells Project were based upon the number of unique upstream and downstream passage events that took place within one year of each bull trout being tagged and released. During the six-year study and eight years of monitoring, 19 downstream and 79 upstream passage events took place at Wells Dam by radio-tagged bull trout within one year of release date. Taking into account all observed passage events a total of 27 downstream and 93 upstream passage events took place at Wells Dam. Radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of the 19 downstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project. Out of the 79 upstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project.

Upstream passage of adult bull trout through the fish ladders at Wells Dam has historically occurred between early May and late October, with peak passage typically occurring in May and June. During the 2005 and 2008 study, 214 adult bull trout were counted passing upstream through Wells Dam. The proportion of the bull trout population at Wells Dam that was radio-tagged was 24% (52/214 = 0.24).

Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod and time of year with rather predictable patterns of upstream and downstream movement (LGL and Douglas PUD 2007; 2008). Because no take (injury or mortality) was observed during the study, there was no need to investigate how Project operations affected take at Wells Dam.

During the 2005-2008 monitoring period, no adult bull trout were counted during the 24-hour off-season fishway counting period (November 16 to April 30).

No upstream or downstream passage problems were identified during this study. Passage times upstream through the fishway appeared reasonable relative to the species migration and spawn timing. Because no passage problems were identified during the study, there was no need to develop recommendations to change or modify the fishway operations at Wells Dam.

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout (fish <400 mm in length). During the development of the Bull Trout Plan, stakeholders agreed that because of the inability to collect a sufficient sample size of sub-adult bull trout at Wells Dam, it was not feasible to assess sub-adult passage. However, when encountered at Wells Dam fishways, or in tributary traps, sub-adult bull trout would be PIT-tagged. Douglas PUD provided funding, equipment, training, and coordination for the sub-adult bull trout PIT tag program. From 2004 to 2008, 67 sub-adult bull trout were PIT-tagged in the Methow River sub-basin during standard tributary smolt trapping operations. Douglas PUD operated PIT tag detection systems year-round within the Wells Dam fishways during the study period (2005 to 2008) and no PIT-tagged sub-adult bull trout were detected. Additionally, sub-adult bull trout were to be PIT-tagged opportunistically when encountered at the Wells Project; however, no sub-adult bull trout have been encountered at Wells Dam to date. From 2008 to 2010 many sub-adult and adult bull trout have been PIT-tagged as a result of these efforts. Specifics of these efforts are included below in the results section.

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir. Field surveys were conducted at potential bull trout stranding sites during periods of low reservoir elevation. High resolution bathymetric information, reservoir elevations, backwater curves, and inflow patterns were used to identify potential stranding sites for the survey. No stranded or entrapped bull trout of any size were found during the field surveys conducted in 2006 and 2008. No surveys were conducted during 2005 or 2007 because river operations were not low enough to warrant a survey.

The fourth objective was to identify the core areas and local populations of bull trout that utilize the Wells Project. Data from radio-tagged bull trout tracked during the 2005 to 2008 study period were analyzed with data from the 2001 to 2004 study. Bull trout that pass Wells Dam (either upstream or downstream) migrated into the Methow, Entiat, and Wenatchee rivers during the spawning period. Observed tributary entrances of bull trout detected at Wells Dam from 2005 to 2008 were 86% Methow River, 10% Entiat River, and 2% Wenatchee River. Genetic samples of all fish tagged at Wells Dam were submitted to the USFWS for analysis. The USFWS is responsible for analyzing the genetic samples and providing those results. To further support this objective (Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the project area), Douglas PUD regularly coordinated bull trout data and monitoring activities with other agencies including the USFWS, WDFW and Chelan PUD.

In summary, no mortality or injury was observed for bull trout (adult and sub-adult) passing through or interacting with the operations of the Wells Project during the take monitoring studies conducted between 2001 and 2008. No incidental take of bull trout was observed at the Wells Project, and the Wells Project is presumed to be within the incidental take levels authorized by the USFWS Biological Opinion Incidental Take Statement (USFWS 2004).

5.0 METHODOLOGY

A more detailed description of the methodologies used to implement each Bull Trout Plan objective-strategy can be found in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD, 2008).

6.0 RESULTS

6.1 Strategy 1-1: Adult bull trout telemetry program

6.1.1 Bull trout tagged by Douglas PUD

As previously reported, an evaluation of station receiver data for the period of August 2008 to December 2009 at Wells Dam, Wells Dam Tailrace, the "Gateway" location (approximately 3 miles downstream from Wells Dam), and at stations located at the Methow and Okanogan river mouths yielded no additional detection data. During the latter half of 2008, bull trout would have already entered the Methow River to access spawning and overwintering habitat located outside of the Wells Project Area. By 2009, most of the tags activated in earlier years would have expired and been unavailable in providing additional data.

6.1.2 PIT tagging efforts and interrogations

Ninety-one adult bull trout were incidentally captured at the Twisp River weir (44-79 cm range) in 2010. To date, none of these fish have been observed at Wells or lower Wenatchee and Etiat River interrogation locations. Eighty seven of these fish were given new PIT tags, while 4 of them were recaptures from other Methow Basin tagging sites (Charlie Snow pers. comm.). A total of 460 bull trout observations were made in the Methow River Basin at 8 PIT-tag detection sites from Jan 8th 2010 to Dec 7th 2010. These observations came from 92 unique fish but were not evenly distributed among fish (One adult accounted for 111 of the 460 observations). Of the 92 unique fish, 72 were greater than 40 cm.

6.1.3 Movement and Behavior within the Methow Basin

Ninety-two unique fish were observed on at least one PIT tag interrogation station in the Methow Basin during 2010. Twenty-one of these 92 fish were observed at more than one interrogation station in the Methow, whereas the balance of fish, 71, was observed at only one Methow Basin location. These 71 fish were subsequently removed from any further behavior and migration analysis. Of the 21 fish remaining in the analysis, 16 (76%) had TWR (Twisp River Weir) as their first detection location. Fourteen of the 21 (67%) were both initially detected at TWR or MRT (Methow River at Twisp) and had their last detection location at LMR (Lower Methow

River). It appears that the majority of these fish were detected making downstream movements towards and, presumably, into the lower Methow river. Three more of these fish were last detected at the Gold Creek (GLC) detection site, another lower Methow location, after first being detected at TWR. Thus, 81% of the multiple detected fish were recorded making downstream movements toward the lower Methow in 2010. The lack of upstream detections is likely attributable to fish moving during a time of year when the PIT-tag detection systems are either operating at very low efficiency due to high water, have been removed to protect them from the high debris loads experienced during the spring run-off in May-July, or have been damaged because of debris and high flows during the spring freshet. Information regarding these outages and removal can be found on the PTAGIS website (http://www.ptagis.org/ptagis/index.jsp).

All 14 fish that made downstream migrations from TWR to LMR, were detected at the mouth of the Methow between September 17th and December 6th 2010. Therefore, these movements towards the Methow mouth are likely associated with behavioral movements to overwintering locations, and are consistent with previous radio-telemetry data. In addition, similar seasonal observations were observed at Wolf Creek (WFC) by one small, 173 mm bull trout. This fish may have been foraging upstream of WFC prior to September, when it moved downstream. Only one fish made a documented upstream migration, which occurred when an adult fish entered the Methow (LMR) on June 16th and subsequently detected at the Twisp River Weir on Oct 11th 2010. Together, 20 of the 21 fish or 95% (including 6 fish less that 224 mm) made downstream migrations in the late summer and fall, presumably into the Wells Project.

Together, three general trends exist for behavior of bull trout in the Methow River Basin:

1) Bull trout entering the Methow Basin do so in the spring and early summer. They move quickly up river, presumably, to foraging and spawning locations. It is unclear exactly where these locations are since these fish are not detected moving upstream throughout the basin, and thus they are likely moving quickly past arrays to higher elevation tributaries. The lack of upstream migration data is indicative of high flow river conditions, debris damaging PIT tag arrays and lower detection efficiencies during these seasonal conditions. However, radio-telemetry data confirms that upstream movements do take place in the spring and summer.
2) The most obvious location for spawning occurs in the Twisp River above the Twisp River Weir detection location, since the majority of the fish were detected at the Twisp River weir in September, but also in the late-summer and fall.
3) Both adult and sub-adult (157-720 mm) bull trout appear to make directed downstream movements into the lower Methow and likely the Wells Project after spawning and prior to the onset of winter.

6.2 Strategy 1-2: Correlations between passage events and Project operations

Results from the 2005-2008 radio-telemetry effort indicated bull trout movement was determined by seasonal conditions rather than project operations. No additional analysis of passage events at Well Dam and Project operations were conducted in 2010.

Observations of bull trout at Wells Dam in the 2010 season remained similar to observations from previous years. Adult bull trout fishway counts at the Wells Project were 43, 43 and 44 respectively for the past three years. The largest numbers of fishway counts of adult bull trout over the last ten years occurred during 2001 (N = 107), with a ten year average of 65 bull trout annually. Adult bull trout begin seasonal usage of the Wells Dam fishways reliably in early to mid-May, with the bulk of their fishway use occurring from May through the end of June. Collectively, 90% of Wells Dam fishway use by adult bull trout occurs during this late spring period (May-June). The seasonal end to Wells Dam fishway use by bull trout has been less predictable, occurring sometime between July and November over the last decade. During the 2010 season 82% of all bull trout fishway observations were in the May-June period, with the last observation in late October. These 2010 observations are consistent with previous years where fishway usage was dependent on seasonal movement by adult bull trout. Off-season fishway monitoring continues to indicate that adult and sub-adult bull trout are not passing Wells Dam during the winter months.

6.3 Strategy 1-3: Off-season fishway passage of adult bull trout

Off-season video monitoring of both Wells Dam fishways continued for the 2009-2010 winter period (November 16 - April 30). During these monitoring periods, no adult bull trout were observed using the fishways. Consistent with observations from several years of year-round fishway counts, adult bull trout passage through Wells Dam primarily occurs in May and June each year.

6.4 Strategy 1-4: Modifications to passage facilities or operations

There have been no passage issues identified that limit upstream or downstream passage of adult bull trout at Wells Dam. Therefore, there is no need for modifications to current passage facilities or operations.

6.5 Strategy 2-1: Sub-adult PIT tagging program

Douglas PUD passively collected information from all PIT-tagged fish, including bull trout, as they passed through the fishways at Wells Dam. Douglas PUD also scanned all bull trout incidentally captured at rotary screw traps and adult brood collection facilities. The information collected at the dam and in the tributaries was posted on the PTAGIS website, which is operated and maintained by the Pacific States Marine Fisheries Commission.

Consistent with previous years, no sub-adult bull trout were observed or detected at Wells Dam. Douglas PUD continues to provide support to WDFW for PIT tagging bull trout incidentally collected at both on-site and off-site smolt collection facilities (Table 6.5-1). Tag information for all tagged fish was posted on the PTAGIS website (http://www.ptagis.org/ptagis/index.jsp). The PTAGIS database shows that none of the sub-adult bull trout PIT-tagged in the Methow River basin have been detected at Wells Dam or outside the Methow Basin at other Columbia Basin dams through December 31, 2010. One bull trout PIT-tagged in the Entiat River by the USFWS in 2008 was detected passing upstream through Wells Dam in June 2009. This is the first PIT-tagged bull trout to be detected at Wells Dam since monitoring started in 2001. In addition to the

87 adult bull trout PIT-tagged at the Twisp Weir, 24 sub-adult bull trout were PIT-tagged at the Twisp River Weir and 29 sub-adults were tagged at the Twisp River smolt trap. No bull trout were PIT-tagged at the Methow River screw trap in 2010.

Within the Methow Basin there are 15 separate PIT-tag interrogations facilities, making it one of the most extensive PIT-tag interrogation networks in the Columbia Basin. Of the bull trout that have been PIT-tagged by WDFW using Douglas PUD tags, numerous within basin detections have occurred, including 460 detections in 2010 (See sections 6.1.2-3). In 2008, 10 observations of PIT-tagged sub-adult bull trout took place at four different monitoring locations within the Methow Basin. Seven of these observations were at the one Twisp River in-stream interrogation site. In 2009, 11 observations of PIT-tagged sub-adult bull trout took place with all but one of these fish observed at the Twisp River monitoring station. In 2010, 20 bull trout (include 3 tagged by USGS) under 30 cm were detected in the Methow Basin. These fish accounted for 160 of the 460 total detections in the Methow in 2010, with 89 of these 160 coming from one sub-adult bull trout. The skewed contributed observations from this sub-adult bull trout is attributed to repeated observations at the MRT interrogation location. Specifically, this fish was first detected on Sept 1st at MRT and subsequently detected nearly every day, multiple times a day, until Oct 13th. (A similar theme was observed for one adult October to November [111 detections]). These two fish were responsible for almost 43% of all 460 detections in the Methow River basin in 2010.) Detection sites where sub-adult bull trout have been observed in 2010 and previous years include the lower Methow, middle Methow, Chewuch, Beaver, Gold, Wolf and Eightmile Creek, Twisp River and the Twisp River weir detection sites. In summary, the majority of bull trout detections in the Methow River Basin occurred between July and November in 2010 (95%) at the MRT and the TWR interrogation locations (nearly 82% of all detections were at these two locations).

WDFW fish management staff incidentally captured and PIT-tagged 18 adult Methow Basin bull trout from Dec 2009 to March 2010 via hook and line sampling. All these adults were capture in the mainstem Methow River (mean size 547 mm; range 410-720). Winter tagging continues via hook and line however, only approximately 5 fish have been tagged as of January 31, 2011.

Table 6.5-1 Sub-adult bull trout PIT-tagged in the Methow Basin, 2008-2010 (data from C. Snow, WDFW).

Year	Collection/tag site	# PIT-tagged/ # captured	# DNA sampled
2008*	Methow River trap	0/0*	0*
2008*	Twisp River trap	13/14*	0*
2009	Methow River trap	6/6	5
2009	Twisp River trap	21/21	10
2010	Methow River trap	0/0	0
2010	Twisp River trap	29/29	10
2010	Twisp River weir	24/24	0

*August to December only: In early 2008 16 sub-adults were captures in the Twisp River trap and 10 DNA samples were taken from these fish. To see 2005-2008 data table similar to above refer to LGL and Douglas PUD (2008).

6.6 Strategy 2-2: Off-season fishway passage of sub-adult bull trout

Similar to off-season video monitoring of adult bull trout (Section 6.3), off-season video monitoring of the Wells Dam fishways for sub-adult bull trout continued for the 2008-2009 and 2009-2010 winter periods (November 16 - April 30). During these monitoring periods, no sub-adult bull trout were observed utilizing the fishways. To date, no sub-adult bull trout have been observed using Wells Dam fishways at any time during the year.

6.7 Strategy 3-1: Inflow patterns, reservoir elevations, and backwater curves

On November 5, 2008, Douglas PUD conducted several stranding surveys intended to document whether or not bull trout are stranded in the Wells Reservoir during lower than normal reservoir surface elevation operations (surface elevation at or below 773’ msl). The survey locations were selected based upon an analysis of detailed bathymetric maps produced in 2005 combined with Wells Reservoir hydraulic information. This effort identified several locations where stranding of sub-adult bull trout could potentially occur. Six total potential stranding locations were identified. These locations were the Methow River mouth, the Okanogan River mouth, the Kirk Islands, the shallow water habitat in the Columbia River directly across from the mouth of the Okanogan River, Schluneger Flats and the off-channel areas of the Bridgeport Bar Islands. Boat and foot surveys were conducted and included a combination of shoreline transects and inspection of isolated sanctuary pools. Similar to previous bull trout stranding surveys, no bull trout were observed during the 2008 survey which suggests that bull trout are able to avoid stranding and entrapment areas in the event of a Wells Reservoir drawdown. During 2009 and 2010, no entrapment surveys were conducted as low water events did not take place.

6.8 Strategy 4-1: Genetic sampling program

In 2010, 10 DNA samples were taken from juvenile bull trout in the Twisp River smolt trap (operated by WDFW), with no additional bull trout captured or sampled from the Methow River trap. Fifteen genetic samples were collected in 2009 from sub-adult bull trout captured during off-site smolt collection activities in the Methow River basin (Table 6.5-1). The samples collected in 2009 were provided to the USFWS in Wenatchee for analysis (Judy De La Vergne). The 10 DNA samples collected during 2010 are currently in the care of WDFW (Fish Management Biologist, Bob Jateff) and will be delivered to the USFWS. Genetic analysis results are not yet available, but are anticipated to be provided by USFWS in the future and when available will be included in future reports.

6.9 Strategy 4-2: Participation in information exchanges and regional efforts

Douglas PUD continues to coordinate with regional tribal, state, and federal agencies, to promote the exchange of bull trout information and to ensure that local and regional bull trout monitoring efforts are coordinated in the Upper Columbia River.

7.0 CONCLUSIONS

Six years of tagging results and eight years of monitoring results, as reported in the Bull Trout Plan 2005-2008 Final Report, demonstrate no project-related impacts to adult or sub-adult bull trout from passage through the Wells Project, nor by stranding/entrapment due to lowering of the reservoir elevation. Douglas PUD has also determined there are no apparent correlations between project operations and downstream passage events, and that there is no upstream movement of adult or sub-adult bull trout through the Wells Dam fishways during the November 16 through April 30 timeframe. Bull trout captured and tagged at Wells Dam were radio-tracked to the Methow and Entiat Core Areas during spawning periods, and have also demonstrated movement between these systems by successfully passing upstream and downstream through Wells Dam. Two of the 5 Adult bull trout PIT-tagged in 2010 at Wells Dam were later observed in the Methow and Twisp River basins.

Results of the 2010 implementation of the Bull Trout Plan remain consistent with the previous 9 years of monitoring and evaluation. Off-season fishway monitoring continues to document that adult and sub-adult bull trout are not passing Wells Dam during the winter months. To date, no sub-adult bull trout have been observed in Wells Dam fishways. Data collected from the Methow River basin smolt collection operations indicate that sub-adult bull trout are present outside of the Wells Project.

In 2010, 24 and 29 sub-adult bull trout were trapped in the Twisp River Weir and Twisp River smolt trap respectively, all of which were PIT-tagged. Ninety-one adults were captured at the Twisp River Weir. PIT tags were detected in four of these fish; the other 87 untagged fish were PIT-tagged and released upstream of the weir. An additional 18 adults were caught by hook in line in the Methow basin as a result of WDFW efforts; these fish were given PIT tags if they were not already carrying one. Tag codes for all PIT-tagged fish were uploaded to the PTAGIS database. Queries of the PTAGIS database show that none of these PIT-tagged bull trout have since been detected at Wells Dam but have been detected moving within several tributaries of the Methow River. To date, only one previously PIT-tagged adult bull trout has been detected at Wells Dam. This fish was detected moving upstream through the fishways at Wells Dam during June 2009, one year after being tagged in the Entiat River by the USFWS.

In 2010, genetic samples were taken from 10 fish during the implementation of off-site smolt collection activities and provided to the USFWS for future genetic analysis. In addition to coordinating monitoring efforts and information exchanges of Project specific bull trout data, Douglas PUD continues to participate in regional activities that support bull trout conservation and recovery.

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APPENDIX O
DOUGLAS 2012 M&E IMPLEMENTATION PLAN

IMPLEMENTATION OF COMPREHENSIVE MONITORING AND EVALUATION OF DOUGLAS COUNTY PUD HATCHERY PROGRAMS IN 2012

Submitted to

Greg Mackey
and
Tom Kahler

Douglas County PUD

Submitted by

Andrew Murdoch
and
Charlie Snow

Supplementation Research Team
Hatchery/Wild Interactions Unit, Science Division
Washington Department of Fish and Wildlife
20268 Hwy 20, Suite 7
Twisp, WA 98856

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Introduction

The Douglas County PUD Monitoring and Evaluation Plan (M&E Plan; Wells HCP Hatchery Committee 2007) describes eight objectives specific to the hatchery programs funded by Douglas County PUD and two regional objectives that are related to artificial propagation. These same objectives have been identified in the M&E Plan for Chelan County PUD (Murdoch and Peven 2005) and are designed to address key questions regarding the use of supplementation as mitigation for mortality associated with the operation of Wells Hydroelectric Project. All objectives have specified indicators (i.e., primary) that will be measured and compared against target values established in the M&E Plan. Specific tasks and methodologies to be used in accomplishing the objectives are provided in the M&E Plan.

The primary focus of this proposal is the first eight objectives outlined in the M&E Plan, but additional regional objectives are included where warranted. Both disease (Objective 9) and non-target taxa risk assessment (Objective 10) have been identified as important components of the M&E Plan. The Hatchery Evaluation Technical Team (HETT) is currently addressing Objective 10. Objective 9 will be implemented once an experimental design has been developed and approved by the Wells HCP Hatchery Committee.

Successful implementation of the M&E Plan requires a continuation and potential expansion of existing relationships between the WDFW and other entities conducting similar field work in the Upper Columbia River Basin. Certain objectives require data to be collected from both target and reference populations. Field activities (i.e., data collection) not conducted by the WDFW, that are also required to implement the M&E Plan (i.e., reference populations) are not included in this proposal.

Addressing all the objectives within the M&E Plan will require multiple years of data collection. Several objectives may be adequately addressed after one year or five years (Table 1), and may require only periodic monitoring (e.g., every five or ten years). This proposal and budget encompasses one year of work in which WDFW will furnish all supervision, labor, services, materials, tools, and equipment necessary to implement the Monitoring and Evaluation Plan of hatchery programs funded by Douglas County PUD. All statistical analyses will be conducted consistent with the Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs (Hays et al. 2007), or revised versions of that document as applicable.

Table 1. A potential long-term implementation schedule of objectives outlined in the Douglas County PUD M&E Plan.

Objective	Year of implementation									
	1-4	5	6-9	10	11-14	15	16-19	20	21-24	25
1	X	X	X	X	X	X	X	X	X	X
2	X	X		X		X		X		X
3	X				X				X	
4	X	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X	X
8	X	X		X		X		X		X
9	Experimental design not complete									
10	HETT is currently conducting this assessment									

Reference Populations

Reference populations are a critical component of the M&E Plan (Goodman 2004; ISRP & ISAB 2005). The HETT has developed a methodology for assessing and choosing reference populations, and WDFW and Douglas PUD have incorporated reference population analyses for Spring Chinook under Objective 1 in the 2011 draft 5-year M&E report (submittal to the HCP Hatchery Committee is pending at this time). Reference populations for steelhead and summer Chinook have not been identified by the HETT due to lack of populations similar to target populations that have not been substantially supplemented, or because potentially suitable reference populations lack the required data sets. Future analyses of spring Chinook program/populations will be able to build from this initial work. However, it is unclear if suitable reference populations will be available for steelhead due to lack of data. For Wells Hatchery summer Chinook, identifying suitable reference populations is not necessary, since the program is focused on harvest augmentation and not supplementation.

WORK PLAN BY OBJECTIVE

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(s) (i.e., reference population) and b) the changes in the natural replacement rate (NRR) of the supplemented population are similar to that of the non-supplemented population(s).

Hypotheses:

- Ho_1: Number of hatchery fish that spawn naturally > number of naturally and hatchery produced fish taken for broodstock.
- Ha_1: Number of hatchery fish that spawn naturally ≤ number of naturally and hatchery produced fish taken for broodstock.
- Ho_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ ≥ ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ha_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ < ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho_3: Δ NRR $_{\text{Supplemented population}}$ ≥ Δ NRR $_{\text{Non-supplemented population}}$
- Ha_3: Δ NRR $_{\text{Supplemented population}}$ < Δ NRR $_{\text{Non-supplemented population}}$

General Approach

Spawning ground, broodstock, and harvest data (e.g., selective fisheries) will be the source of all abundance, composition, and productivity information required for this objective. Identification of suitable non-supplemented reference populations will be problematic in the Upper Columbia Basin because some species/races do not have populations that have not been either supplemented or influenced by hatchery fish, or do not have adequate data sets for analyses (see discussion, above). For those supplemented populations without a suitable spatial reference population, temporal references may be used (i.e., before-after hatchery intervention comparison). Temporal reference populations may also be initiated if deemed necessary, by discontinuing hatchery releases in a target population for a predetermined period of time (i.e., at least one generation minimum) to allow a before-after comparison.

Methodology

Standard spawning ground survey methodology outlined in Appendix F of the M&E Plan (Spawning ground surveys) and data analysis outlined in Appendix G of the M&E Plan (Relative Abundance) will be used under this objective. WDFW will coordinate with other Agencies (i.e., USFWS, USFS, Tribes) that conduct spawning ground surveys to ensure methodologies and sample rates are consistent with methodologies used in this objective (Table 2). Spawning/carcass surveys will be conducted for Methow Basin spring Chinook (WDFW); Methow Basin steelhead (WDFW); and Okanogan steelhead

(CCT). The use of a composite spring Chinook broodstock in the Methow and Chewuch Rivers suggests that the Methow and Chewuch spawning aggregates be treated as a single group. The combined group (i.e., MetChew) is supported by analysis of genetic data, which concluded that both spawning aggregates are very closely related (Snow et al. 2007). However, differences in spawner abundance and carrying capacity of the two subbasins may require that each subbasin be treated independently for data analysis purposes.

Table 2. Methodologies used to determine biological information used in Objective 1.

Population	Spawning ground methodology	Spawner composition	Age composition
Methow steelhead	Expanded index	Wells Dam	Wells Dam
Twisp steelhead	Total ground	Twisp weir	Twisp weir
Okanogan steelhead [a]	Total ground	Wells Dam	Wells Dam
Methow sp. Chinook	Total ground	Carcasses	Wells Dam
Chewuch sp. Chinook	Total ground	Carcasses	Wells Dam
Twisp sp. Chinook	Total ground	Carcasses	Wells Dam

[a] Conducted by CCT.

Schedule of Activities

Table 4. Schedule for conducting spawning ground surveys and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A	A	D	D	D	D	A	A	A	A	A	A
Methow Basin spring Chinook	A	A	A	A	D	D	D	D	D	A	A	A

Analysis within the draft 5-year M&E Plan report identified low survival of hatchery- and natural-origin spring Chinook as a factor in the decrease in natural-origin spawner abundance and poor overall productivity of spring Chinook stocks. For 2012, we propose to increase PIT-tagging of wild spring Chinook parr in the Methow and Chewuch rivers in addition to ongoing PIT-tagging of wild steelhead and spring Chinook in the Methow Basin (Table 3). This tagging is expected to provide adequate sample sizes of wild spring Chinook to estimate migration survival through the Columbia River so that factors affecting survival can be identified. Fish collection for this tagging will be conducted via hook-and-line angling, seine or dip netting, electroshocking, trapping at irrigation ditch returns, or rescue from irrigation ditches or naturally de-watering areas via traps, nets, or electroshocking equipment. Additional effort for steelhead tagging conducted in the Twisp River will address sample size requirements for an on-going relative reproductive success study funded under BPA contract # 49080. Tagging methodologies will be consistent with ongoing activities in the Wenatchee and Entiat basins following protocols developed under the ISEMP.

Recommendations within the 5-year report suggest the Chewuch spring Chinook program be adjusted to rely on wild Chewuch-origin broodstock, or be discontinued. However, options to increase the number of locally adapted wild fish within the broodstock are limited. We propose to investigate alternative methods of collecting adult natural origin fish for inclusion in the Methow River and Chewuch River broodstocks using netting techniques, temporary picket-type weirs, or hook-and-line angling. Any adult fish collected would be incorporated into the Methow Hatchery spring Chinook program under the “Upper Columbia River Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols” developed annually prior to broodstock collection activities.

WDFW may assist DPUD in an assessment of subyearling summer Chinook life history by PIT-tagging up to 10,000 summer Chinook subyearlings in the Methow Basin.

Table 3. PIT-tagging goals for juvenile wild fish in the Methow Basin.

Target population	Wild fish		
	Steelhead	Age-0 (spring) Chinook	Subyearling summer Chinook
Methow River	1,000	1,500	Up to 10,000
Twisp River	2,000[a]	1,500	0
Chewuch River	1,000	1,500	0
Misc. tributaries	1,000	0	0
Total	5,000	4,500	10,000
DPUD Contribution	3,500	4,500	10,000

[a] Includes 1,500 fish tagged and funded though BPA contract No. 49080.

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.

Hypotheses:

- Ho_4: Migration timing $_{\text{Hatchery Age X}}$ = Migration timing $_{\text{Naturally produced Age X}}$
- Ha_4: Migration timing $_{\text{Hatchery Age X}}$ ≠ Migration timing $_{\text{Naturally produced Age X}}$
- Ho_5: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$
- Ha_5: Spawn timing $_{\text{Hatchery}}$ ≠ Spawn timing $_{\text{Naturally produced}}$
- Ho_6: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$
- Ha_6: Redd distribution $_{\text{Hatchery}}$ ≠ Redd distribution $_{\text{Naturally produced}}$

General Approach

A properly integrated hatchery program produces fish that have life-history traits similar to naturally produced fish. Differences in any of these behavioral life history traits may affect progeny survival. Migration timing in the Columbia River of both juvenile and adult fish will be assessed using PIT tags when available. Migration timing into spawning tributaries will be assessed at broodstock-collection locations, or using in-stream PIT antenna arrays. In 2009, in-stream antenna arrays were installed in the lower Methow and Twisp rivers to assess the distribution and migration timing of adult hatchery and wild steelhead. These antennas, in conjunction with arrays installed by other researchers (i.e., USGS) will be used to assess steelhead and spring Chinook run timing and distribution throughout the Methow Basin.

Spawn timing and redd distribution data for spring Chinook will be collected during spawning-ground surveys. We propose selecting index reaches to evaluate spawn timing in reaches where similar proportions of hatchery and naturally produced fish are expected to spawn (based on carcass recovery data). The use of index reaches will eliminate any potential bias in spawn timing due to differences in spawning locations. Carcass recovery locations will be used as a surrogate for spawning location.

For summer steelhead, WDFW will conduct an evaluation in the Twisp River using visual observation of spawning fish to evaluate spawn timing and location. All fish sampled at the Twisp River weir in 2012 will be PIT-tagged and steelhead will also be externally Floy-tagged with origin- and sex-specific colors. Surveyors will conduct intensive surveys to quantify redd distribution and collect observational data from Floy-tagged fish. Adult female steelhead will be PIT-tagged in the body cavity to maximize the likelihood that PIT tags will be expelled into redds. Redds will be scanned with portable PIT-tag antennas to confirm the origin of females observed spawning, and to provide spawn timing information for redds where no visual observations of spawners were made. Further, temporary in-stream PIT antennas will be installed in selected Methow Basin tributaries to assess whether surveys are conducted in all spawning areas, and to estimate spawner abundance in areas where conducting systematic surveys is problematic (e.g., Lost River). Funding for increased spawning ground surveys, PIT tag monitoring, and Floy Tag detections above baseline Douglas PUD M&E activities will be funded by the Bonneville Power Association (BPA) through contracts 49080 and 47950.

Methodology

Migration Timing

As previously stated, when available, PIT tags will be used to evaluate differences in migration timing in the Columbia River. During broodstock collection activities at mainstem dams, tributary traps, and the Twisp River weir, PIT tags will be inserted in all fish captured and released so that data on migration timing to spawning tributaries can be collected (Table 5). Migration timing into spawning tributaries will be assessed using PIT antenna arrays deployed at long-term sites in the lower Methow and Twisp rivers, utilizing antennas installed by other researchers within the Methow and Okanogan Basins (e.g., USGS), and using PIT antennas installed on a temporary basis in selected tributaries.

Table 5. Methods and locations used for evaluating differences in migration timing between hatchery and naturally produced salmon and steelhead.

Target population	Migration timing	
	Columbia River[a]	Spawning tributary
Methow spring Chinook	Wells Dam, PIT tags, CWTs	Twisp Weir, Chewuch PIT array
Methow steelhead	Wells Dam, PIT tags, VIE	Twisp Weir, PIT arrays in select tribs
Okanogan steelhead	Wells Dam, PIT tags, Ad clip	Omak Cr. Weir/Zosel Dam

[a] PIT tags will be used when available (i.e., in conjunction with other objectives).

Spawn Timing

All spawn timing information necessary for evaluating differences between hatchery and naturally produced salmon and steelhead will be collected during spawning-ground surveys (M&E Plan Appendix F). Specific spawn timing information will only be collected within index spawning areas. Index areas identified are likely to have a similar proportion of hatchery and naturally produced fish spawning, based on carcass recoveries between 2003 and 2006 (Table 6). Carcass recovery date of female spring Chinook salmon will be compared to examine relative differences in spawn timing.

Determining the relative spawn timing of steelhead in the natural environment is problematic because not all hatchery fish are adipose fin-clipped. In 2012, an evaluation of steelhead spawn-timing in the Methow Basin will be conducted utilizing female steelhead Floy-tagged at the Twisp River weir. Floy tag colors will be alternated every other year between hatchery and wild fish to control for any potential color effects on reproductive success. In 2012, male and female hatchery fish will be tagged with pink and blue tags, respectively; and male and female wild fish with chartreuse and red tags, respectively. Approximately 85% of the steelhead in the Twisp River spawn upstream of the Twisp River weir (mean 2003-2005). Steelhead will be captured and tagged at the Twisp River weir between 1 March and 15 June. All fish captured will be examined to determine origin (VIE, PIT, CWT, or eroded fins), age, and PIT tags, and colored anchor tags will be applied depending on stock and origin. Surveyors will record the tag color and date of all female steelhead observed during surveys and record GPS locations of all redds. Surveyors will also record the incidence of non Floy-tagged fish upstream of the Twisp River weir to determine weir capture efficiency. Because redd residence time of steelhead can be very low, female steelhead will be PIT-tagged in the body cavity to encourage tag expulsion into the redd. Surveyors will periodically scan completed redds for PIT tags to confirm female origin, or to identify female origin for redds where no visual observations of spawners occurred. Sampling at the Twisp River weir will be accomplished in conjunction with an on-going relative reproductive success study of steelhead in the Twisp River which receives funding through this implementation plan, and BPA contract No. 49080.

Table 6. Potential tributary index areas identified for each respective target population used for evaluating differences in spawn timing between hatchery and naturally produced salmon and steelhead.

Target population	Historical reach(s)
Twisp spring Chinook	Twisp River (T5 - T6)
Chewuch spring Chinook	Chewuch River (C4 - C6)
Methow spring Chinook	Methow River (M9 - M11)
Twisp steelhead	Twisp River (T4 - T10)

Spawning Distribution

Redd distribution data will also be collected during spawning ground surveys (M&E Plan Appendix F). The origin of spawners will be identified from carcasses (i.e., scales or CWT), and carcass recovery location (i.e., rkm) of female spring Chinook will be used to determine redd distribution. Overall steelhead redd distribution will be determined from GPS location information for each redd observed. Distribution by origin of spawning adult steelhead cannot be determined without application of an additional mark (e.g., Floy tag) because not all hatchery steelhead were adipose fin-clipped. Steelhead spawning distribution by origin of spawning adults will be assessed at the Twisp River weir in 2012. Surveys will be conducted at least weekly in the Twisp River to assess distribution of Floy-tagged females and to scan for PIT tags as previously described. Resident rainbow, residual hatchery steelhead, and cutthroat trout females will also be PIT-tagged in the body cavity to determine if these species or resident stages contribute to steelhead redd count estimates. Additionally, temporary in-stream PIT tag antenna arrays will be placed in selected tributaries to assist with spawning distribution evaluation. In conjunction with adult salmonid tagging at the Twisp weir and Wells and Priest Rapids Dams, these arrays are expected to provide a reliable, cost-effective means of corroborating current survey methodologies with observed salmonid use, and assessing spawning distribution (if any) in locations where spawning is presumed to not occur, or where surveys are difficult to conduct.

Schedule of Activities

Table 7. Schedule for conducting migration timing, spawn timing, and spawning distribution field activities and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D	D	D	D	D	A	A
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

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.

Hypotheses related to the genetic diversity, population structure, and effective population size (Ho 7-9) were addressed in the 2008-2010 work plans and will not be addressed in 2012. The following hypotheses of age and size at maturity will be addressed in 2012:

- Ho_{10}: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$
- Ha_{10}: Age at Maturity $_{\text{Hatchery}}$ ≠ Age at Maturity $_{\text{Naturally produced}}$
- Ho_{11}: Size (length) at Maturity $_{\text{Hatchery Age X and Gender Y}}$ = Size (length) at Maturity $_{\text{Naturally produced Age X and Gender Y}}$
- Ha_{11}: Size (length) at Maturity by age and gender $_{\text{Hatchery}}$ ≠ Size (length) at Maturity by age and gender $_{\text{Naturally produced}}$

General Approach

Genetic Assessment (not performed in 2012): Genotypes of hatchery and naturally produced populations will be sampled and monitored based upon the schedule outlined in Appendix H of the Douglas PUD M&E Plan. Priority of analysis was based upon recovery needs or relative risk a hatchery program may have on the naturally produced population.

Phenotypic Assessment: Differences in phenotypic characteristics that may arise as a result of hatchery programs (i.e., domestication) will be measured using historical (i.e., prior to current hatchery programs) and recent data collected from wild fish and broodstock or carcasses recovered on the spawning grounds. Data related to additional important phenotypic characteristics will be collected and analyzed as part of Objective 2 (e.g., run timing, spawn timing, and spawning location), Objective 4 (e.g., fecundity), and Objective 7 (e.g., size and age at smolt migration).

Methodology

Data for monitoring phenotypic characteristics (i.e., age at maturity and size at maturity) will be collected annually as part of the broodstock collection protocol (M&E Plan Appendix B), run assessment, and carcass recoveries. Broodstock for all programs are not collected randomly from the run at large with respect to sex, origin, or age. However, trapping activities do provide an opportunity to collect data from a random sample of the run-at-large (i.e., those fish collected during broodstock trapping and released upstream). Historically, information related to the spawning population was derived from broodstock, carcasses, or a combination of both. Recent data suggest that carcass recovery and broodstock methods are biased and additional sampling at sampling/broodstock collection sites (e.g. Wells Dam) is required (Zhou 2002; Murdoch et al. 2005). Broodstock collection sites are located near or below a majority of the spawning locations (Table 8). All fish trapped, or a random sample depending on the stock, will be sampled to determine origin, age, and size. This will provide a sample that more accurately, in a less biased way, represents the population. Additionally, PIT tags may be inserted into adult fish released upstream of Wells Dam and the Twisp River weir to address other M&E Plan objectives (i.e., migration timing and spawning distribution, Objective 2; stray rates, Objective 5).

Table 8. Broodstock collection locations for stock assessment and phenotypic characterization of hatchery and naturally produced fish.

Stock	Primary location	Secondary location
Methow Basin spring Chinook	Wells Dam	Twisp Weir
Methow/Okanogan steelhead	Wells Dam	Twisp Weir / Priest Rapids Dam

Schedule of Activities

Table 9. Schedule for conducting size and age at maturity comparisons (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	D	D	D	D	A	A	D	D	D	D	D	D
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate; HRR) is greater than the natural adult-to-adult survival (i.e., natural replacement rate; NRR) and equal to or greater than the program specific expected value (BAMP 1998).

Hypotheses:

- Ho_{12}: HRR $_{\text{Year x}} \geq$ NRR $_{\text{Year x}}$
- Ha_{12}: HRR $_{\text{Year x}} <$ NRR $_{\text{Year x}}$
- Ho_{13}: HRR ≥ BAMP value (preferred)
- Ha_{13}: HRR < BAMP value

General Approach

The survival advantage from the hatchery (i.e., egg-to-smolt) must be sufficient to overcome lower post-release survival (i.e., smolt-to-adult) in order to produce a greater number of returning adults than if broodstock were allowed to spawn naturally. If a hatchery program cannot produce a biologically significant greater number of adults than naturally spawning fish, the program should be modified or discontinued. More simply, the hatchery replacement rate should always be greater than the natural replacement rate.

Hatchery programs in the Upper Columbia River were initially designed based on observed mean survival rates for each stock (BAMP 1998). Performance of the hatchery programs will be assessed using those expected survival rates and the number of broodstock collected on a brood year basis. Harvest augmentation hatchery programs will only be compared to the expected HRR value because a corresponding NRR is not available or applicable (e.g., Wells summer Chinook).

Methodology

Smolt to adult (SAR) and HRR values will be calculated for each stock. SAR values are currently calculated using CWT recoveries from all locations (harvest, hatcheries, and spawning grounds), except for steelhead, for which SAR values are calculated based on sampling that occurs at Priest Rapids Dam or Wells Dam to obtain an estimate of the number of returning adults from the hatchery program. HRR values that fall below the expected values or the corresponding estimate of NRR (M&E Plan Appendix G) will be evaluated to determine whether in-hatchery (M&E Plan Appendix C) or out-of-hatchery (M&E Plan Appendix D) factors contributed to the reduced survival.

The 5-year M&E Plan analysis report noted that survival rates for hatchery and naturally-produced spring Chinook were lower than expected and increased PIT-tagging of both hatchery and wild fish was recommended to help identify survival constraints. For life-stage survival comparisons, stray rate monitoring, and assessment of migration patterns, rate, and speed within the basin, we propose that hatchery steelhead and spring Chinook be tagged at the Wells and Methow hatcheries prior to release (Table 10) for comparison to naturally produced fish (see Table 3). Comparison groups of hatchery spring Chinook and steelhead were historically tagged at each smolt trap, but tag rates were likely too low to provide meaningful comparisons. Further, PIT-tagging at the Methow smolt trap likely incorporated fish from hatchery programs not covered under the M&E Plan (i.e., WNFH) because release time and hatchery mark were often the same for steelhead and spring Chinook released from WDFW and USFWS hatcheries in the Methow Basin. Since releases of fish from these hatcheries have exhibited different survival rates (Townsend and Skalski 2004), tagging should occur at the hatcheries of origin to ensure that evaluations are conducted with target stocks.

Table 10. PIT-tagging goals for Douglas PUD hatchery fish released in 2013.

Target population	Hatchery fish	
	Steelhead	Spring Chinook
Methow River	5,000	6,000[a]
Twisp River	5,000	5,000
Chewuch River	0	5,000
Wells Hatchery	5,000	NA
Douglas PUD total	15,000	10,000

[a] 6,000 PIT tags already proposed for 2012 through Yakama Nation multi-species acclimation project.

Schedule of Activities

Table 11. Schedule of activities for hatchery evaluation activities (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Wells summer Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Methow Basin spring Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation.

Hypotheses:

- Ho_{14}: Stray rate $_{\text{Hatchery fish}}$ < 5% of total brood return
- Ha_{14}: Stray rate $_{\text{Hatchery fish}}$ ≥ 5% of total brood return
- Ho_{15}: Stray hatchery fish < 5% of spawning escapement (based on run year) within other independent populations
- Ha_{15}: Stray hatchery fish ≥ 5% of spawning escapement (based on run year) within other independent populations
- Ho_{16}: Stray hatchery fish < 10% of spawning escapement (based on run year) of any non-target streams within independent populations
- Ha_{16}: Stray hatchery fish ≥ 10% of spawning escapement (based on run year) of any non-target streams within independent populations

General Approach

Excessive strays from hatchery programs pose significant genetic risk (loss of genetic variation between populations) and must be monitored in order to determine the magnitude of the problem and develop reasonable and appropriate recommendations. Stray rates will be monitored using CWT recoveries from Chinook spawning ground surveys. The Regional Mark Information System (RMIS) database will provide all necessary CWT information needed when calculating stray rates for each brood year or within and outside basin stray rates based on spawning escapement estimates.

Brood year stray rates will require multiple-year CWT recoveries (i.e., all age classes) from broodstock and carcass recoveries on the spawning grounds. The estimated number of strays for the entire brood year will be calculated by dividing the number of strays by the total number of hatchery fish that returned. Stray rates within, and between independent populations will be calculated in a similar manner as brood year stray rates, except on an annual basis and based on the estimated spawning escapement.

Collecting stray rate information for steelhead poses the greatest challenge because carcasses are not available for examination. When available, radio tag information and/or adult PIT-tag monitoring may provide adequate information for evaluating stray rates. Some data needed for evaluating stray rates for the Methow/Okanogan steelhead will be collected during broodstock trapping activities at Wells Dam (M&E Plan Appendix B), and through operation of the Twisp River weir when assessing spawn-timing (see Objective 2). Stray rates in other tributaries may need to be calculated by other types of sampling (i.e., PIT tags, radio tags, hook-and-line, electroshocking) if warranted. Antenna arrays installed by WDFW and other researchers should provide tributary stray rate information, provided that adequate numbers of juvenile fish are PIT-tagged prior to release (hatchery fish) or within natal streams (wild fish). Tagging of hatchery steelhead under Objective 4 (see Table 10) should satisfy within-basin and out-of-basin stray rate monitoring goals of fish destined for release in the Methow Basin.

Methodology

Stray rates will be calculated using procedures outlined in the spawning ground survey methodology (M&E Plan Appendix F). As stated previously, information needed to evaluate steelhead stray rates will be obtained during broodstock collection activities at Wells Dam, operation of the Twisp Weir and antenna array, and through other proposals. However, direct observations on the spawning grounds by other Agencies (e.g., USFWS, CCT, or USGS) or via PIT tags may be required in non-target streams (Table 12).

Table 12. Proposed methodologies used to evaluate stray rates for target and non-target streams.

Hatchery program	Target stream/release location	Method
Twisp steelhead NNI	Twisp	PIT/Observation/creel[a]
Methow steelhead safety-net	Methow Hatchery	PIT/Observation/creel[a]
Wells steelhead safety-net	Wells Hatchery	PIT/Observation/creel[a]
Okanogan steelhead	Okanogan, Similkameen	PIT/Observation/creel[a,b]
Twisp spring Chinook NNI	Twisp	CWT
Chewuch spring Chinook NNI	Chewuch	CWT
Methow spring Chinook NNI	Methow	CWT
Wells summer Chinook	Wells Hatchery	CWT

[a] The number of strays will also be estimated during broodstock collection activities or PIT tag detections at Columbia River or tributary dams/detectors, where applicable.
[b] The Okanogan steelhead assessment is performed by the CCT.

Schedule of Activities

Table 13. Schedule for data analysis to determine stray rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D						
Okanogan steelhead	A	A	D	D	D	D						
Methow Basin spring Chinook	A	A						D	D			
Wells summer Chinook	A	A								D	D	

Objective 6. Determine if hatchery fish were released at the programmed size and number.

Hypotheses:

- Ho_{17}: Hatchery fish $_{\text{Size at release}}$ = Programmed $_{\text{Size at release}}$
- Ha_{17}: Hatchery fish $_{\text{Size at release}}$ ≠ Programmed $_{\text{Size at release}}$
- Ho_{18}: Hatchery fish $_{\text{Number released}}$ = Programmed $_{\text{Number released}}$
- Ha_{18}: Hatchery fish $_{\text{Number released}}$ ≠ Programmed $_{\text{Number released}}$

General Approach

The HCP outlines the number and size at which fish of each program are to be released. However, analyses in the 5-year report revealed that past length-weight targets are not appropriate. The 5-year report offers new targets based on recent data. New targets should be established, and assessment under this M&E program for 2012 will use the new targets, pending acceptance of the 5-year report by the Hatchery Committee. The programmed size and number of fish for each program will be compared to actual values at release each year. The number of broodstock collected and the population-dynamics assumptions (i.e., sex ratio, fecundity, and survival) in the broodstock collection protocol are important components for consideration. A program's failure to meet the HCP standards (e.g., over or under program goals) will be evaluated taking into account the number of broodstock and associated population-dynamics assumptions. The size of fish will be compared using a representative sample collected immediately prior to release.

Methodology

The number and size of fish released will be calculated according to methodologies outlined in the M&E Plan (Appendix C). An annual review of size and number of fish from each program will be compared to those values defined in the HCP, or adjusted values agreed to by the Wells HCP Hatchery Committee. If release targets were achieved within acceptable levels (i.e., 10% +/- of HCP defined values) then no change would be recommended. If release targets are not achieved then causation will be determined and recommendations made based upon the results of the evaluation. A review of the broodstock protocols will occur every five years (or more frequently if necessary) concurrently with an evaluation of the number of fish released from each program.

Schedule of Activities

Table 14. Schedule of activities to determine the number and size of fish released (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Wells steelhead	D	D	D	D	D	A	D	D	D	D	D	D
Wells summer Chinook	D	D	D	D	D	D	D	A	D	D	D	D
Methow spring Chinook	D	D	D	D	D	A	D	D	D	D	D	D

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.

Hypotheses:

- Ho_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ = Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ha_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ ≠ Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ho_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is ≥ 1.
- Ha_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is < 1.

General Approach

Supplementation should result in an increase in the natural production of the target stock. Given variability in abundance of adult salmonid populations in the Upper Columbia River Basin, monitoring juvenile production (e.g., smolts/redd) should provide a direct assessment of the efficacy of hatchery fish in rebuilding natural populations. Monitoring the freshwater production of both supplemented and non-supplemented populations may provide an early indication of the reproductive success of hatchery fish on the spawning grounds (i.e., no out of basin effects on survival). Conversely, without a smolt monitoring program, changes in smolt production may be masked by out of basin effects. Thus, subsequent recommendations concerning hatchery program modifications may be misdirected.

Smolt monitoring programs are currently ongoing for most treatment streams (Table 15). Coordination with the Agencies operating the various traps is ongoing to ensure similar levels of effort and methodologies are used.

Table 15. Population and location of smolt traps that may be used in examining the influence of hatchery fish on freshwater productivity.

Population	Smolt trap	Size	Agency
Methow Basin spring Chinook	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp spring Chinook	Twisp	1 - 5 ft trap	WDFW
Methow Basin steelhead	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp steelhead	Twisp	1 - 5 ft trap	WDFW
Okanogan steelhead	Okanogan	1 - 8 ft trap; 1 - 5 ft trap	CCT

Comparisons between supplemented and unsupplemented populations require extensive data sets, with potentially high annual variability that may require years before the efficacy of the program can be determined. Furthermore, the Wells steelhead program began decades before the HCP was signed and pretreatment data may not be available. Similarly, large releases of spring Chinook occurred in the Methow Basin for decades before the HCP program began.

Methodology

Procedures for this objective are outlined in Appendix E of the M&E Plan. Redd count activities required for this Objective will be accomplished under Objective 2. Juvenile monitoring requires an extensive trapping period (Table 16) over many successive generations due to the diverse life-history of spring Chinook (subyearling and yearling emigrants) and summer steelhead (multiple age-class smolts). Random samples of scales must be collected for all stocks with multiple age-class smolts in order to calculate the number of smolts produced from each brood-year. Whenever possible, direct measurements of the proportion of hatchery fish on the spawning grounds (pHOS) will be conducted (i.e., Twisp Weir). Otherwise, the proportion of hatchery-origin fish on the spawning grounds will be estimated where possible, as will the Proportionate Natural Influence (PNI).

Current estimates of egg-to-smolt survival for Methow spring Chinook are much lower than expected. Based on scale analysis of returning Chinook adults, we assumed that all yearling emigrants at the Methow smolt trap were spring Chinook and subyearling emigrants were summer Chinook. Results of DNA sampling at the Methow River trap during the fall of 2006 and 2007 indicated that the majority of subyearling Chinook captured were spring Chinook. Because of this, fall trapping and DNA sampling will be conducted at the Methow smolt trap to estimate total spring Chinook emigrants.

The low abundance of steelhead and yearling Chinook captured at smolt traps in the Methow Basin limits the sample size to conduct migration timing comparisons and life-stage survival estimates (e.g., PIT tag recaptures). The installation of PIT tag antenna arrays in the lower Twisp and Methow rivers will provide additional opportunities to assess migration behavior and survival, and detection rates should increase with additional PIT-tagging of hatchery and wild fish conducted under Objective 4 and Objective 1, respectively.

Schedule of Activities

Table 16. Schedule of activities for smolt monitoring programs in the Methow Basin (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow Basin steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow Basin spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow summer Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Wells Chinook salmon).

Hypotheses:

- Ho_{21}: Harvest rate ≤ Maximum level to meet program goals
- Ha_{21}: Harvest rate > Maximum level to meet program goals
- Ho_{22}: Escapement ≥ Maximum level to meet supplementation goals
- Ha_{22}: Escapement < Maximum level to meet supplementation goals

General Approach

In years when the expected returns of hatchery adults are above the levels required to meet program goals (i.e., broodstock, natural escapement), surplus fish may be available for harvest. Harvest of returning adults is the goal of some programs (e.g., Wells summer Chinook) and an ancillary benefit of other programs (e.g., Methow/Okanogan steelhead). Contribution to fisheries, whether incidental or directed, will be monitored using CWT recoveries on a brood-year basis. Target harvest rates have not been outlined in the M&E Plan. Hence, a qualitative assessment of the contribution rates of hatchery fish to fisheries versus broodstock or spawning grounds is required to determine if the objective has been met.

One approach, based on the goal of the hatchery program, is to compare CWT recoveries by recovery location (i.e., broodstock, fisheries, or spawning grounds). For example, a majority of the CWT recoveries for harvest augmentation programs should occur in fisheries. Conversely, supplementation programs should have a majority of the CWT recoveries occur on the spawning grounds.

Methodology

Robust statistically valid creel survey programs will be conducted for all sport fisheries in the Upper Columbia River to estimate harvest of hatchery fish from hatchery programs funded by Douglas County PUD (M&E Plan Appendix D). Creel survey programs will be designed and implemented by WDFW Fish Management staff. Creel surveys in the Upper Columbia River are also an important component in calculating the HRR (Objective 4) because most CWT recoveries occur within the Upper Columbia River, the exception being summer Chinook. Significant time lags in reporting CWT recovery data to the Regional Mark Information System (RMIS) database requires a continual requerying of recovery data until the number of estimated fish does not change. The number of fish and proportion by brood year for CWT recoveries will be summarized in several categories (Table 17).

Table 17. Categories for CWT recoveries of hatchery fish released from Douglas County PUD funded programs.

Category	Estimated number of fish (%)		
Broodstock	Total	Target stream	Nontarget streams
Spawning ground	Total	Target stream	Nontarget streams
Fisheries	Total	Commercial	Sport
Commercial	Ocean	Columbia River Treaty	Columbia River non-Treaty
Sport	Ocean	Columbia River	Terminal

Schedule of Activities

Table 18. Schedule of activities to determine harvest rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	D	D	D	A	A	A		D	D	D	D	D
Wells summer Chinook	A	A					D	D	D	D		
Methow basin spring Chinook	A	A										

DELIVERABLES

Annual Reports: A draft annual report will be provided to Douglas PUD by 1 July, 2012. A final report will be provided to the HCP HC within 30 days of receiving comments on the draft report. The annual report will summarize all field activities conducted during the contract period. The format of the report will be similar to the 2010 annual report that has been provided to Douglas PUD, with each task reported in a separate chapter. Primary indicators and the data used in calculations during each task will also be presented in each chapter. Secondary and tertiary indicators will be reported if needed to calculate the primary indicator.

Chapter 1. Hatchery Brood Report

a. Broodstock
    - Number collected
    - Age composition
    - Size at maturity
    - Report on Chewuch spring Chinook broodstock collection efforts

b. Juvenile
    - Number released
    - Size at release

c. Hatchery replacement rates

Chapter 2. Harvest

a. Hatchery fish
    - Number
    - Location
    - Stray rates

b. Wild fish
    - Number
    - Location

Chapter 3. Smolt Monitoring

a. Smolt production
    - Number of smolts (captured and total estimate)
    - Smolts/redd
    - Size at emigration
    - Age at emigration

b. Survival
    - Egg to emigrant survival
    - Number of fish PIT-tagged
    - Smolt-to-smolt survival

c. Remote PIT-tagging
    - Number tagged

Chapter 4. Steelhead Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
    Number of redds
    Spawning escapement
    Spawner composition
    pHOS and PNI estimates
    Number of NOR
    NRR
    Stray rates

Chapter 5. Chinook Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
    Number of redds
    Spawning escapement
    Spawner composition
    pHOS and PNI estimates
    Number of NOR
    NRR
    Stray rates

Recommendations: Recommendations to modify the M&E Plan or reporting will occur on an annual basis and again within the five-year summaries. Initially, changes to protocols or methodologies may be necessary to ensure the data required in the M&E Plan is collected. Changes to the M&E Plans' implementation or hypotheses will be included in the five-year summary report. Recommendations will be consistent with the hatchery program goals and will be included in a separate section of the summary report.

Presentations: A formal presentation (i.e., PowerPoint format) of the M&E Plan results will be provided to Douglas PUD or the HCP HC at their convenience. Presentations will include the status of all hatchery programs in meeting their objectives, potential problems and recommendations. Similar presentations of annual results from field activities can be requested and provided if warranted.

COORDINATION BETWEEN DOUGLAS PUD AND HATCHERY STAFF

The WDFW Supplementation Research Team (a.k.a. Methow Field Office) has been directly involved in the evaluation, development, and implementation of the hatchery programs since 1992. Currently, the WDFW is contracted by Douglas PUD not only to operate its hatcheries, but also to implement the Evaluation Plan developed when the Methow Hatchery program came online.

Coordination with hatchery staff has been a continual process. Hatchery staff conducts routine sampling at the hatcheries and data is provided to us for inclusion in monthly reports. However, special meetings with the hatchery staff are typically conducted prior to significant events (i.e., broodstock collection, spawning, release of juveniles) to ensure proper methodologies are used and critical data is collected. Evaluation staff is present at all significant events and collect data needed for evaluation purposes.

Additional coordination between evaluation staff, hatchery staff, and the WDFW ESA Permitting biologist is often required to ensure that conditions of ESA Section 10 permits are not violated. The ESA permitting biologist is co-located with evaluation staff, which allows for efficient and effective communication on a daily basis in order to ensure compliance with existing permits. Currently, all ESA reporting related to the hatchery programs is the responsibility of the WDFW Permitting Biologist (0.5 FTE). Given the limited resources dedicated to ESA Permit reporting and the extensive workload required to meet reporting requirements, this relationship is critical to ensuring hatchery programs operate within the conditions of the permit.

Monthly reports have served as a primary mode of coordination and are used to keep Douglas PUD as well as HCP Committee members and co-managers informed on all hatchery and evaluation related activities. Unless otherwise requested by Douglas PUD, the role of monthly reports will remain the same. Upon request, additional information can be included in the monthly reports.

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