PACIFICORP ENERGY
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 1500
Portland, Oregon 97232

December 16, 2014

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: License Article 401(9): Merwin, Yale, and Swift 1 Hydroelectric Projects, FERC Nos. P-935, P-2071, and P-2111 Cowlitz County PUD, Swift No. 2 Hydroelectric Project, FERC No. 2213
Lewis River Hatchery and Supplementation Plan (modified) – December 2014

Dear Ms. Bose:

On June 26, 2008, the Federal Energy Regulatory Commission issued new operating licenses for all Lewis River hydroelectric projects (Merwin Project, No. P-935, Yale Project, No. P-2071, Swift No. 1 Project, No. P-2111, and Swift No. 2 Project, No. P-2213). Pursuant to respective license Article 401(9) *Requirement to File Plans for Commission Approval and Requirement to Consult*, and 8.2.5 of the Settlement Agreement, *Plan Modifications*, the Licensees are filing under cover of this letter the updated *Lewis River Hatchery and Supplementation Plan, December 2014* (Plan). The 2009 plan, approved by the Commission on December 20, 2010 (**Attachment A**), was prepared to meet the license requirements and the Lewis River Settlement Agreement (Section 8.2) which stipulates that the Licensees' shall develop a Hatchery and Supplementation Plan to address hatchery operations, supplementation, and facilities.

This updated Plan represents a collaborative and collective effort by the Hatchery and Supplementation subgroup (H&S subgroup) representing state, federal, private and tribal entities. This subgroup of the Aquatic Coordination Committee (ACC) was formed to work specifically on Plan development and implementation. The draft modified Plan was distributed to the ACC on August 8, 2014 for a 60-day review and comment period (**Attachment B**). After the review and comment period ended, PacifiCorp organized and responded to all comments received (Appendix D of the Plan). On November 7, 2014, PacifiCorp held a meeting with the H&S subgroup, to review PacifiCorp's responses to comments and make final edits to the plan. PacifiCorp redistributed the Plan to the H&S subgroup on November 11, 2014. No further comments were received.

Modifications to the original 2009 Plan include: (1) removing repetition within the original plan; (2) updating sections to reflect new perspectives of the Hatchery and Scientific Review Group and fisheries management; (3) ensuring consistency with revised Hatchery and Genetic Management Plans and (4) removing duplication between PacifiCorp's Monitoring and Evaluation Plan (M&E plan) and this Plan.

Please find attached the NOAA Fisheries approval of the Hatchery and Supplementation Plan as stipulated in Section 8.2.5 of the Lewis River Settlement Agreement (**Attachment C**). The U.S. Fish and Wildlife Service deferred all comments and revisions to NOAA Fisheries (**Attachment D**).

This letter and its attachment have been filed electronically, and are considered public information. A complete hard copy has also been mailed to Erich Gaedeke in the Commission's Portland Regional Office.

If you need further information, please contact Erik Lesko, Senior Aquatic Biologist, (503) 813-6624 or at erik.lesko@pacificorp.com

Sincerely,

Mark A. Sturtevant
Managing Director, Hydro Resources
PacifiCorp Energy

MAS: km

Encl: Letter – Public

Hatchery and Supplementation Plan, December 2014 - Public

Attachment A - Order Modifying and Approving Lewis River Hatchery and Supplementation Plan, dated December 20, 2010 – Public

Attachment B – Lewis River H&S Plan 5-year rewrite: ACC 60 day review & comment, dated August 8, 2014 – Public

Attachment C – NOAA Fisheries email approval letter, dated December 11, 2014 - Public

Attachment D – USFWS email deferring to NMFS, dated December 12, 2014 - Public

cc: Diana Gritten-MacDonald, Cowlitz PUD
Erich Gaedeke - FERC Portland Regional Office

This letter and its attachments are considered Public Information.

Attachment A

133 FERC ¶ 62,272
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp

Project No. 935 – 112
Project No. 2071 – 063
Project No. 2111 – 057

Cowlitz County PUD

Project No. 2213-036

ORDER MODIFYING AND APPROVING LEWIS RIVER HATCHERY AND SUPPLEMENTATION PLAN, ARTICLE 401(9) AND SECTION 18 FISHWAY PRESCRIPTION CONDITION 1

(Issued December 20, 2010)

1. On December 23, 2009, PacifiCorp (licensee) filed its Lewis River Hatchery and Supplementation Plan for the Merwin Project No. 935, Yale Project No. 2071, and Swift No. 1 Project No. 2111, and for Cowlitz County PUD's Swift No. 2 Project No. 2213 pursuant to license Article 401(9) and the National Marine Fisheries Services' Section 18 Fishway Prescription Condition 1 under the June 26, 2008 Order Issuing New License[1] for the Merwin Project, Order Issuing New License[2] for the Yale Project, Order on Offer of Settlement and Issuing New License[3] for the Swift No. 1 Project, and Order Issuing New License[4] for the Swift No. 2 Project. The projects are located on the North Fork Lewis River in Cowlitz and Skamania Counties, Washington.

BACKGROUND AND LICENSE REQUIREMENTS

2. License Article 401(a) requires the licensees to prepare and file for Commission approval, plans pursuant to various conditions required by the mandatory conditioning agencies. Article 401(9) requires the licensee to file, for Commission approval, a

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1 123 FERC ¶ 62,258 (2008)

2 123 FERC ¶ 62,257 (2008)

3 123 FERC ¶ 62,260 (2008)

4 123 FERC ¶ 62,259 (2008)

Hatchery and Supplementation Plan within 18 months of license issuance. By Order Granting Extension of Time, issued July 16, 2009, the deadline for the licensees to file their plan was extended to December 26, 2009. The National Marine Fisheries Service (NMFS) Section 18 Fishway Prescription Condition 1 requires the licensees to comply with the Protection, Mitigation and Enhancement measures under the SA to achieve the 'Reintroduction Outcome Goal.'[5] Further, NMFS' biological opinion term and condition (1) requires the licensees, in part, to comply with the terms of Section 8 of the SA. Section 8 of the SA requires the licensees' plan to: (a) address hatchery operations, supplementation, and associated facilities; (b) address the means by which the licensees shall use the hatchery facilities to accomplish the goals and requirements of the Hatchery and Supplementation Program, including, without limitation, the Hatchery Targets; (c) be consistent with the objective of restoring and recovering wild stocks in the basin to healthy and harvestable levels; and (d) provide for the implementation of their plan through an Annual Operating Plan which should initially be included in their Hatchery and Supplementation Plan filing.

LICENSEES' PLAN

3. The goals of the licensees' plan are to support: (a) self-sustaining, naturally producing, harvestable native anadromous salmonid species throughout their historical range in the North Fork Lewis River; and (b) the continued harvest of resident and native anadromous fish species. The plan identifies an approach to reintroduce spring Chinook salmon, steelhead, and Type S coho salmon (surplus early coho) into stream reaches upstream of Merwin dam. Both adult and juvenile supplementation strategies would be used as the tools to jump start fish production in the upper Lewis River. The combined actions proposed in the plan are designed to achieve the following hatchery and natural production targets.

	Spring Chinook	*Steelhead*	*Coho*	*Total*
Hatchery Targets	12,800	13,200	60,000	86,000
Natural Prod. Threshold	2,977	3,070	13,953	20,000
Grand Total	15,777	16,270	73,953	106,000

[5] The "'Reintroduction Outcome Goal" is to achieve genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin Dam greater than minimum viable populations.

4. As natural production for each species exceeds the above threshold, hatchery production levels for that species would be reduced on a 1:1 (one wild fish for one hatchery fish) basis. The licensees state that the decision to adjust hatchery production would be made by the Aquatics Coordination Committee (ACC)[6] every five years based on the results of an ocean recruits analysis. However, as stipulated in the SA, hatchery production targets would not be reduced below the following Hatchery Target Floor levels.

	Spring Chinook	*Steelhead*	*Coho*	*Total*
Hatchery Target Floor	2,679	2,763	12,558	18,000

5. As stipulated in the SA, the following are the number of hatchery juvenile fish to be released each year. However, the licensees state that these numbers could be reduced if natural production exceeds identified threshold levels.

Smolt Production	*Spring Chinook*	*Steelhead*	*Coho*	*Total*
Years 1-3	1.35 million	275,000	1.8 million	3.425 million
Years 4-5	1.35 million	275,000	1.9 million	3.525 million
Years 6-50	1.35 million	275,000	2.0 million	3.625 million

6. The licensees propose to release juveniles both upstream and downstream of Merwin dam. The spring Chinook juveniles released upstream of Merwin dam would be used as part of the supplementation/reintroduction effort and to provide test specimens for evaluating juvenile collection facilities at Swift No. 1 dam. Juveniles released downstream of Merwin dam would provide adults for harvest, hatchery broodstock, and the fish necessary for the adult supplementation program. These numbers would be

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[6] The ACC is comprised of the signatories of the SA. These include: PacifiCorp, National Park Service, U.S. Bureau of Land Management, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, U.S. Forest Service, Cowlitz County PUD, Yakama Nation, American Rivers, Trout Unlimited, Washington Interagency Committee for Outdoor Recreation, Cowlitz County, Cowlitz-Skamania Fire District No. 7, North Country Emergency Medical Service, City of Woodland, Woodland Chamber of Commerce, Lewis River Community Council, Lewis River Citizens At-Large, Fish First, Rockey Mountain Elk Foundation, Inc. and the Native Fish Society.

adjusted over time as more information is gathered regarding the effectiveness of both strategies. For spring Chinook salmon and Type S coho salmon, existing hatchery broodstock would be used to produce juveniles necessary for the supplementation program. For steelhead, wild late winter run fish collected at the Merwin dam adult trapping facility or in the lower river tributaries would provide the broodstock necessary for the program. The numbers of juveniles to be released both upstream and downstream are as follows:

Smolt Production	*Spring Chinook*	*Steelhead*	*Coho*	*Total*
Downstream	1.25 million	275,000	1.8 million	3.275 million
Upstream	100,000	50,000*		150,000
Total	1.35 million	325,000	1.8 million	3.425 million

*The 50,000 late winter steelhead juveniles would be of wild origin and initially released below Merwin dam.

7. For spring Chinook salmon and Type S coho salmon, adult fish in excess of hatchery broodstock needs would be transported and released in river reaches upstream of Swift No. 1 dam as part of the upper Lewis River adult supplementation strategy. In addition, 100,000 juvenile spring Chinook salmon would be transported to acclimation ponds in the upper basin as part of a juvenile supplementation effort. As spring Chinook salmon, Type S coho salmon, and steelhead populations become established in the upper basin, hatchery releases into this area would be reduced to ensure that local adaptation for each species is driven by the natural rather than the hatchery environment. However, this action would not be considered for implementation until at least year 9 for Type S coho salmon, and year 15 for spring Chinook salmon and late winter steelhead. To limit exploitation rates on natural stocks, all juvenile hatchery fish would be mass-marked. Only these marked fish would be allowed to be harvested when they return as adults.

8. The long-term objective (>15 years) for spring Chinook salmon and Type S coho salmon hatchery programs would be to operate them as an Integrated Type hatchery program.[7] Over the short-term (9-15 years) the existing spring Chinook salmon and Type S coho salmon hatchery programs would be operated as a Segregated Type hatchery program.[8] The licensees' plan calls for the development (over time) of up to eight of the

[7] The Hatchery Scientific Review Group (HSRG) defines an Integrated Type hatchery program if the intent is for the natural environment to drive the adaptation and fitness of a composite population of fish that spawns both in a hatchery and in the wild.

[8] The HSRG defines a Segregated Type hatchery program if the intent is for

following hatchery programs with the purpose of each program to provide either fish for harvest (Segregated Type program), or to reintroduce anadromous fish to the upper river (Integrated Type program).

Program	*Program Type*	*Primary Program Purpose*
Lower River Spring Chinook	Segregated	Harvest
Lower River Type N Coho	Segregated	Harvest
Lower River Type S Coho	Segregated	Harvest
Lower River Summer Steelhead	Segregated	Harvest
Lower River Winter Steelhead	Segregated	Harvest
Upper River Spring Chinook	Integrated	Conservation/Restoration
Upper River Type S Coho	Integrated	Conservation/Restoration
Upper River Late Winter Steelhead	Integrated	Conservation/Restoration

9. Hatchery rearing conditions would be modified through hatchery upgrades to improve operational flexibility as stipulated in Section 8 of the SA. Hatchery programming would be based on providing optimum rearing conditions for stocks regardless of current or historical rearing and release sites while hatchery production levels or rearing strategies would not exceed current hatchery capacity limits to be defined as part of the hatchery remodel process. All hatchery spring Chinook salmon, coho salmon, and winter and summer steelhead released below Merwin dam would be marked by removing their adipose fin with the exception of the double-index group used for fish management which would still possess their adipose fin. Juvenile fish captured at collection facilities at Swift No. 1 dam would be subsampled at a rate defined in the licensees' Monitoring and Evaluation Plan. Upon completion of the Yale dam downstream collection facility, juveniles would be differentially marked with a Coded-Wire-Tag (or other tag type) to allow fish to be distinguished as to their collection location; Swift No. 1 dam and Yale dam. The licensees state, however, that once Merwin dam upstream fish passage facilities are constructed, naturally produced fish would no longer need to be differentially marked.

10. Life history performance measures to determine program success and data collection on hatchery practices related to the monitoring and evaluation program would be consistent with HSRG guidelines and continue to be developed and modified as part of

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the hatchery population to represent a distinct population that is reproductively isolated from naturally spawning populations.

the Annual Operation Plan for each species. The licensees plan to utilize their Adaptive Management Plan to make potential adjustments to their program over time in consultation with the ACC as new data becomes available. The licensees plan to maintain their existing resident rainbow trout and kokanee programs for recreational fisheries purposes in Swift reservoir and Lake Merwin. However, in order to determine any potential adverse effects on reintroduced salmon and steelhead, the licensees plan to investigate impacts of the rainbow trout program on juvenile anadromous fish. Finally, the licensees propose to update their plan every five years as stipulated in the SA. At each 5-year interval, an independent consultant would be hired to review the program and make recommendations to the ACC regarding possible modifications.

11. The licensees' plan included their Annual Operating Plan as required in Section 8 of the SA. The Annual Operating Plan identifies the following elements: (a) production plan specifying the species to be reared and broodstock source; (b) hatchery and juvenile production targets identifying adult and juvenile targets by species for each hatchery program; (c) fish release schedule identifying by species the rearing schedule and planned distribution of fish and the schedules and locations of releases; and (d) hatchery facility upgrades identifying upgrades to be implemented at each facility.

AGENCY CONSULTATION

12. Section 8.2 of the SA requires the licensees' plan to be prepared in consultation with the ACC and approved by NMFS and U.S. Fish and Wildlife Service (FWS). The licensees provided their draft plan to the ACC on August 5, 2009 for a 30-day review and comment period. Following consultation with the ACC, the plan was provided to NMFS and FWS on October 2, 2009 for a 60-day review and comment period. The licensees' filing included an extensive record of consultation with the ACC identifying and providing their response to all comments and recommendations received. The licensees incorporated ACC comments into their final plan or adequately provided appropriate responses and clarifications as necessary. By email dated December 21, 2009 and included in the licensees' filing, NMFS approved the licensees' plan. In an earlier email dated February 10, 2006, FWS deferred all comments and revisions to NMFS.

DISCUSSION AND CONCLUSIONS

13. As stipulated in Section 8.2.4 of the SA, the licensees plan to prepare an Annual Operating Report to the ACC. The licensees state that any proposed changes would be included in their Annual Operating Plan. Section 8.2.3 of the SA contemplates including

their Annual Operating Plan as part of the detailed annual reports of the ACC activities in accordance with Section 14.2.6 of the SA. Section 14.2.6 of the SA requires the licensees to file, with the Commission, an annual report on ACC activities, monitoring and evaluations under their Monitoring and Evaluation Plan, and implementation of the terrestrial and aquatics Protection, Mitigation and Enhancement Measures occurring during the prior year.

14. The licensees don't specifically state that the Annual Hatchery and Supplementation Plan Operating Report would be included in their Annual Aquatic and Terrestrial Resources Report filed with the Commission in accordance with Section 14.2.6 of the SA. In order to keep the Commission apprised of the progress of their plan, the licensees should include their annual in the said Commission filing required under Section 14.2.6. Additionally, as contemplated in Section 8.2.3 of the SA, the licensees should also include their Annual Operating Plan in their annual report under Section 14.2.6.

15. Section 8.2.5 of the SA requires the licensees to update their Hatchery and Supplementation Plan every five years in consultation with the ACC and with the approval of the Services. Therefore, the licensees should file their updated plan, for Commission approval, beginning December 26, 2014, and every five years thereafter. Although implementation of the licensees' plan would not occur until 2011 based on the timing of the subject order, the licensees should file their updated plan with the Commission by the date indicated which would alleviate any potential discrepancy from the original required filing date stipulated in the Swift No. 1 project license.

16. The licensees' Hatchery and Supplementation Plan should assist in promoting and developing self-sustaining, naturally producing, harvestable native anadromous salmonid species throughout the North Fork Lewis River while ensuring the continued harvest of resident and native anadromous fish species. Additionally, the licensees' adaptive management process in cooperation with the ACC, should ensure appropriate program adjustments and modifications over time based on implementation of their plan and such changes as new data become available.

17. The licensees' plan satisfies the requirements of license Article 401(9) and NMFS' Section 18 Fishway Prescription condition 1. Therefore, the licensees' plan, as modified, should be approved.

The Director orders:

(A) The Lewis River Hatchery and Supplementation Plan under Article 401(9) and National Marine Fisheries Services' Section 18 Fishway Prescription Condition 1 of the June 26, 2008 Order Issuing New License for the Merwin Project, Order Issuing New License for the Yale Project, Order on Offer of Settlement and Issuing New License for the Swift No. 1 Project, and Order Issuing New License for the Swift No. 2 Project, filed December 23, 2009, as modified by paragraphs (B) and (C), is approved.

(B) The licensees shall include their Annual Hatchery and Supplementation Plan Operating Report, including their Annual Operating Plan, in their Annual Aquatic and Terrestrial Resources Report filed annually with the Commission in accordance with Section 14.2.6 of the Settlement Agreement.

(C) The licensees shall file their updated Lewis River Hatchery and Supplementation Plan in accordance with Section 8.2.5 of the Settlement Agreement, for Commission approval, beginning December 26, 2014, and every five years thereafter. The licensee shall prepare their plan in consultation with the Aquatics Coordination Committee and for approval by the National Marine Fisheries Service prior to filing their plan with the Commission. Their filing shall include documentation of consultation with consulted entities, and include copies of any comments received. If the licensee does not adopt an agency recommendation, the filing shall include the licensee's reasons based on project specific information. The Commission reserves the right to require changes to the updated plan to ensure enhancement of anadromous salmonids.

(D) The licensee shall file any document required by this order with the Secretary of the Commission. Filings may be submitted electronically via the Internet, see 18 CFR 385.2001 (a)(1)(iii) and the instructions on the Commission's web site under the "e-filing" link. The Commission strongly encourages electronic filings. In lieu of electronic filing, an original and eight copies of all documents may be mailed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, Mail Code: DHAC, PJ-12.3, 888 First Street, N.E., Washington, D.C. 20426.

(E) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2010). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this

order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Steven Hocking
Chief, Biological Resources Branch
Division of Hydropower Administration
and Compliance

Attachment B

McCune, Kimberly

From: McCune, Kimberly
Sent: Friday, August 08, 2014 2:08 PM
To: (Aaron.roberts@dfw.wa.gov); (michael_hudson@fws.gov); (Timothy_Whitesel@fws.gov); 'Adam Haspiel (ahaspiel@fs.fed.us)'; 'Bart Stepp'; 'Bob Rose (rosb@yakamafish-nsn.gov)'; 'Bryan Nordlund'; cser461@ECY.WA.GOV; 'Diana MacDonald'; Doyle, Jeremiah; Eli Asher (easher@cowlitz.org); 'Eric Kinne'; Ferraiolo, Mark; Fish First (j.malinowski@ieee.org); gghalseth@gmail.com; James H Malinowski (jim.malinowski@icloud.com); 'Jeff Breckel'; Karchesky, Chris; Karen Adams; 'Kathryn Miller (kmiller@tu.org)'; Ken Weiman (kwieman@fs.fed.us); Lesko, Erik; 'LouEllyn Jones'; 'Mariah Stoll-Smith Reese (M.Reese@tds.net)'; 'Maynard, Chris (ECY)'; 'Melody Tereski'; 'Michelle Day'; Olson, Todd; Pam Johnson (johnson@co.skamania.wa.us); Patrick Frazier (pfrazier@lcfrb.gen.wa.us); 'Patrick Lee'; Peggy Miller; 'Rhidian Morgan (rmmorgan@plasnewydd.org)'; 'Ruth Tracy'; Samagaio, James; 'Shannon Wills'; Shrier, Frank; Taylor Aalvik (taylor.a@cowlitz.org); Weatherly, Briana
Subject: RE: ACTION REQUESTED: Lewis River Hatchery and Supplementation Plan 5-year Update: 60-day review & comment period

Follow Up Flag: Follow up
Flag Status: Flagged

Attn: ACC Participants

In accordance with SA 8.2.5 - Plan Modifications, please be advised that the *Lewis River Hatchery and Supplementation Plan (5-year Update)* is now available on the Lewis River website for a 60-day review and comment period. I have provided the link below for your convenience.

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/HS%20PLAN%20REWRITE%202015%20DRAFT.pdf

> *8.2.5 Plan Modifications. The Licensees shall update the Hatchery and Supplementation Plan every five years or earlier if required by the HGMP, in Consultation with the ACC and with the approval of the Services, using the process set out in Section 8.2 above in order to adaptively manage the Hatchery and Supplementation Program. The Licensees shall consider recommendations from members of the ACC and the comprehensive review set forth below, and identify those recommendations that have not been incorporated into the H&S Plan with a brief statement as to why the changes were not made.*

We ask that you provide your comments to PacifiCorp **on or before close of business Friday, October 10, 2014** to my attention at kimberly.mccune@pacificorp.com or to erik.lesko@pacificorp.com

Thank you.

Kimberly McCune
Sr. Project Coordinator
PacifiCorp Energy - Hydro Resources
825 NE Multnomah, Suite 1500
Portland, OR 97232
Phone: (503) 813-6078

Attachment C

McCune, Kimberly

From:	Rich Turner - NOAA Federal <rich.turner@noaa.gov>
Sent:	Thursday, December 11, 2014 3:14 PM
To:	Lesko, Erik
Cc:	michelle.day@noaa.gov; LouEllyn_Jones (LouEllyn_Jones@fws.gov); McCune, Kimberly
Subject:	Re: Request for approval of the 2nd version of the Hatchery and Supplementation Plan

Erik,

NMFS has reviewed the attached Lewis River H&S Plan and has approved the implementation of the plan as described.

Rich Turner

On Mon, Dec 8, 2014 at 9:58 AM, Lesko, Erik <Erik.Lesko@pacificorp.com> wrote:

Hello all – PacifiCorp has revised and finalized the Hatchery and Supplementation Plan in accordance with Section 8.2.5 of the Lewis River Settlement Agreement. This section requires the Utilities to submit a draft plan to the ACC for a 60-day review period. This draft was submitted for review on August 8, 2014 to the ACC. We received 109 comments on the draft during the 60-day review period. PacifiCorp developed a response matrix and scheduled a review meeting on November 7, 2014 at WDFW offices in Vancouver. At this meeting we discussed and finalized comments from the group into the plan. After this meeting we sent out the draft plan again to ensure that comments were incorporated accurately. We received a few additional edits/comments from the Lower Columbia Fish Recovery Board and those were addressed. No further revisions or comments were received.

The attached files represent the final version of the plan and response matrix. According to section 8.2.1 we must receive approval from the Services prior to submitting this plan to the FERC. In the past, you have simply sent an email indicating your approval with the USFWS deferring to NOAA. For reference, I have provided your past approval emails below for the original H&S Plan.

The FERC deadline for submittal of this plan is December 26, 2014. We would appreciate your response as soon as possible to ensure we meet this deadline. If you have any questions or concerns please send me an email or call.

Thank you

Erik

Attachment D

McCune, Kimberly

From:	Jones, LouEllyn <louellyn_jones@fws.gov>
Sent:	Friday, December 12, 2014 9:31 AM
To:	Lesko, Erik
Cc:	michelle.day@noaa.gov; Rich.Turner@noaa.gov; McCune, Kimberly
Subject:	Re: Request for approval of the 2nd version of the Hatchery and Supplementation Plan

Because this is not directly related to bull trout, US Fish and Wildlife Service is deferring to National Marine Fisheries Service on these documents. Thank you.

I will be the gladdest thing under the sun. I will touch a hundred flowers and not pick one.
- Edna St. Vincent Millay

Lou Ellyn Jones
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
510 Desmond Dr.
Lacey, WA 98503

phone 360-753-5822
Fax 360-753-9518

On Mon, Dec 8, 2014 at 9:58 AM, Lesko, Erik <Erik.Lesko@pacificorp.com> wrote:

Hello all – PacifiCorp has revised and finalized the Hatchery and Supplementation Plan in accordance with Section 8.2.5 of the Lewis River Settlement Agreement. This section requires the Utilities to submit a draft plan to the ACC for a 60-day review period. This draft was submitted for review on August 8, 2014 to the ACC. We received 109 comments on the draft during the 60-day review period. PacifiCorp developed a response matrix and scheduled a review meeting on November 7, 2014 at WDFW offices in Vancouver. At this meeting we discussed and finalized comments from the group into the plan. After this meeting we sent out the draft plan again to ensure that comments were incorporated accurately. We received a few additional edits/comments from the Lower Columbia Fish Recovery Board and those were addressed. No further revisions or comments were received.

The attached files represent the final version of the plan and response matrix. According to section 8.2.1 we must receive approval from the Services prior to submitting this plan to the FERC. In the past, you have simply sent an email indicating your approval with the USFWS deferring to NOAA. For reference, I have provided your past approval emails below for the original H&S Plan.

FINAL

Lewis River Hatchery and Supplementation Plan (FERC Project Nos. 935, 2071, 2111, 2213)

December 26, 2014

Prepared by:

PACIFICORP ENERGY AND COWLITZ PUD

Version 2.0

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APPENDICES

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DEFINITION OF TERMS AND ACRONYMS AS USED IN THIS PLAN

Annual Operating Plan (AOP): An annual planning document that describes the methods and protocols needed to implement the Hatchery and Supplementation Plan and program.

Aquatic Coordination Committee (ACC): This committee was formed after signing of the Settlement Agreement, and is composed of signatories to the Settlement Agreement. Many of the measures contained in the Settlement Agreement require review and Consultation with the ACC prior to implementation. Thus the committee acts as the governing body for implementing aquatic measures contained within the Settlement Agreement. The committee also approves aquatic habitat funds on an annual basis.

Aquatic Monitoring and Evaluation Plan (AMEP): A comprehensive monitoring and evaluation planning document required by the Settlement Agreement (Section 9). The purpose of the plan is to develop methods to evaluate aquatic M&E objectives contained within the Settlement Agreement. These objectives relate to fish passage, reintroduction outcome goals, anadromous and resident species monitoring, and development of the Hatchery and Supplementation Plan.

Blank Wire Tag (BWT): A small wire tag that is uncoded (blank) and inserted in the snout of fish but detectible through wire detection wands or devices.

Ecosystem, Diagnostic and Treatment (EDT) model: An analytical habitat based model that evaluates environmental constraints on a fish population(s) and is used to predict the carrying capacity or production potential of specific areas of the North Fork Lewis River such as upstream of Swift Dam.

Effective Population Size: The average size of a population in terms of the number of individuals that can contribute genes equally to the next generation. That is, the size of the effective population has the same properties with respect to genetic drift as the census population does. Thus, the effective population size is almost always smaller than the actual census size of the population.

Floy tag: Visible tags with unique codes (and colors) applied to the dorsal side of fish as a means to uniquely identify fish visually upon capture or through visual surveys by color. Floy tags are inserted near the posterior side of the dorsal fin and are intended to lock within the dorsal skeletal bones by means of a T-anchor.

Hatchery and Supplementation Plan (H&S plan): A five year planning document intended to provide the process and methods for implementing Section 8 of the Lewis River Settlement Agreement.

Hatchery and Supplementation Subgroup (H&S Subgroup): A group composed of representatives of Settlement Agreement signatories formed under the ACC to draft and finalize Hatchery and Supplementation Plans and develop annual operating plans for the H&S program.

Hatchery Origin: Fish that are spawned in a hatchery or reared in a controlled environment prior to release into the natural environment.

Hatchery Scientific Review Group (HSRG): An independent scientific review group established by the US Congress to initiate hatchery reform that balances both conservation and harvest goals.

Kelt: A post spawn iteroparous fish such as a steelhead or cutthroat.

Merwin Collection Facility (MCF): A trapping, collection and sorting facility located at the base of Merwin Dam. The MCF is used to transport fish species upstream as well as provide broodstock for hatchery operations.

Microsatellite Genotyping: Microsatellites are commonly used and versatile genetic markers composed of arrays of DNA sequences (or loci). DNA is extracted from tissue cells and specific polymorphic regions of the DNA are amplified by means of the polymerase chain reaction (PCR). Once resolved by electrophoresis, DNA can be visualized by fluorescent dyes and compared to established markers or baselines. Microsatellite analysis can detect differences in closely related species and determine origin of individuals using established markers (or baselines).

Native (or indigenous): Fish that have become established in the Lewis River Basin without human intervention or substantially affected by genetic interactions through hatchery origin stocks. Native Lewis River stocks may be present in areas outside the Lewis Basin.

Natural Origin (or wild): Fish that spawn naturally in the Lewis River, but not necessarily native to the area and, in many cases, may be progeny from hatchery origin fish or strays that spawn naturally with native stocks. For fish management purposes, any fish possessing an adipose fin (and no tags) are considered of natural origin. Genotyping is the only method to confirm if these fish are native.

Ocean Recruits: Total escapement of hatchery and natural origin fish plus harvest including ocean, Columbia River and terminal fisheries.

Proportion of Hatchery Origin Spawners (pHOS): Mean proportion of natural spawners in a watershed or stream composed of hatchery-origin adults.

Proportion of Natural Origin Broodstock (pNOB): Mean proportion of a hatchery broodstock composed of natural-origin adults.

Proportion of Natural Influence (PNI): An estimate of the proportion of natural influence on a population composed of hatchery and natural origin fish. Calculated as pNOB/(pNOB+pHOS).

PIT tag: Passive Integrated Transponder (PIT) tags are electronic tags inserted into fish most often with a hollow needle. Each PIT tag has a unique code allowing identification of individual tagged fish throughout their life with specialized readers that activate the tags indefinitely. Tags are either full duplex (FDX) or half duplex (HDX) and come in

many sizes. Many FDX tags are smaller than a grain of rice due to technology advances in recent years.

Settlement Agreement (Agreement): A binding agreement between the Utilities, federal, state and regional regulatory entities, tribal entities and non-governmental organizations. The Settlement Agreement establishes the collective agreement of all signatories with respect to the Utilities obligations in mitigating effects of hydropower operation on fisheries, wildlife, recreation, cultural, and aesthetic resources. The Agreement forms the basis for issuing hydroelectric operating licenses by the Federal Energy Regulatory Commission for the four hydroelectric projects on the North Fork Lewis River.

Supplementation: The use of artificial propagation to develop, maintain or increase natural production while maintaining the long-term fitness of the target population, and keeping the ecological and genetic impacts to non-target populations within specified biological limits

Steelhead broodstock: Steelhead captured either through traps or in-river netting that meet predetermined genetic assignment probabilities.

Stubby dorsal fin: A dorsal fin in which the rays have become crooked especially along the leading edge and depressed as compared to naturally produced fish. Stubby dorsal fins are indicative of fish reared in a hatchery environment.

EXECUTIVE SUMMARY

The Hatchery and Supplementation Plan (H&S plan) is intended to provide the framework for implementing activities associated with Section 8 of the Lewis River Settlement Agreement (Agreement) dated November 30, 2004. This section describes components of the hatchery and supplementation program including production of hatchery species and reintroduction strategies for target species into Swift, Yale and Merwin reservoirs.

Periodic 5-year updates to this plan are required under Section 8.25 of the Agreement. The initial plan was finalized on December 23, 2009 and this version represents the first update and second version to this original document. This version contains many of the same expected outcomes (Section 8) as the first version because there simply has not been sufficient data collected nor analyzed to update expectations within this section and determine whether expectations are reasonable.

Also, this version has removed some of the repetition present in the first version. Portions of some sections were deleted because they were duplicated in other sections and the M&E Section was updated to reflect new recommendations based primarily on updated perspectives from the Hatchery and Scientific Review Group and management issues that have developed since incorporation of the first version of the plan.

The goals identified by the parties to the Agreement formed the basis for actions proposed in this plan. The Agreement states that the goals of the hatchery and supplementation program are to support:

1. Self-sustaining, naturally producing, harvestable native anadromous salmonid species throughout their historical range in the North Fork Lewis River Basin, and

2. The continued harvest of resident and native anadromous fish species.

The H&S Plan is designed to be consistent with the priority objective of recovering natural origin fish stocks in the basin to viable and harvestable levels. When selecting between actions, deference will be given to those that provide the greatest benefit to the protection of natural origin fish populations.

The H&S Plan incorporates current recommendations of the Hatchery Scientific Review Group (HSRG). The Agreement also specifies that recommendations from the Northwest Power and Conservation Council's Artificial Production Review and Evaluation (APRE) be incorporated into the plan (NPCC 2005). However, the HSRG has adopted these recommendations and provides the metrics used to evaluate these recommendations. Therefore, unless the APRE process is updated the H&S Plan will refer to HSRG recommendations as a basis for evaluating the hatchery and

supplementation program. HSRG recommendations represent the regions current understanding of what constitutes best hatchery practices. The supplementation approach used in the plan was selected based on the results obtained as part of the Yakima River and Cowlitz River supplementation programs.

Other plans, documents or communications used in the development of the H&S Plan include:

- Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan (for North Fork Lewis Subbasin)
- Hatchery and Genetic Management Plans
- Recommendations from hatchery and fishery managers
- WDFW Hatchery and FIshery Reform Policy (policy No. C-3619)

Inconsistencies with Settlement Agreement

The H&S Plan was structured to be consistent with the Agreement. However, some actions and analyses proposed or eliminated1 in the H&S Plan may be considered inconsistent based on Agreement language. Examples include:

- Definition of Ocean Recruits (Section 8.1 of Agreement): In the Agreement, jacks are accounted for in calculating ocean recruits (defined as total escapement). However, after discussion with members of the ACC, a decision was made to not include this life stage in either defining or calculating ocean recruits for each species in the H&S Plan.
- Ocean Recruit Methodology (Section 8.3.2.2 of Agreement): Methodology for calculating ocean recruits will not be completed in time for this version of the H&S Plan. For clarity and efficiency, methodology for calculating and analyzing ocean recruits will be incorporated into the Aquatic Monitoring and Evaluation Plan (AMEP). Annual estimates of Ocean Recruits will be provided in the Annual Operations Report (AOR) to determine whether the Reintroduction Outcome Goals (Section 3 of the Agreement) are being met and whether modifications to hatchery production are warranted (Section 8.3.2 of the Agreement).
- Juvenile Supplementation (Section 8.5 of Agreement): In the Agreement, juvenile supplementation above Swift is an action for spring Chinook, steelhead, and coho. However within the H&S Plan, active juvenile supplementation is only proposed for spring Chinook and late winter steelhead. Coho supplementation will rely on surplus adults from the hatchery. Data collected on both the Lewis River and Cowlitz River show that adult coho releases produce a large number of juvenile offspring. Initial steelhead juvenile supplementation will not occur

above Swift, but from Merwin Hatchery below Merwin Dam. The steelhead program will use native adults collected downstream of Merwin Dam as the broodstock. As offspring from these fish return to the Merwin or Lewis River collection facilities as adults, they will be transported upstream and released.

Hatchery and Supplementation and Aquatic Monitoring and Evaluation Programs

After review of this version of the H&S Plan by the Aquatic Coordination Committee (ACC), there was a common theme from commenters stating that results collected as part of the H&S and M&E programs are not easily available or more importantly not linked with both plans. Furthermore, there is significant overlap between the two plans which make it difficult to determine where to obtain results. The Agreement specifies the development of a separate H&S Plan and AMEP despite this overlap between objectives of the two plans and despite the required evaluation of the H&S program by the AMEP (Section 9.5).

To reduce redundancy and improve clarity, the ocean recruit analysis will become part of the AMEP and be eliminated from the H&S Plan. In addition, objectives will be delineated by Merwin Dam. That is, all monitoring and evaluation that takes place downstream of Merwin Dam will be incorporated into the H&S Plan objectives. All monitoring upstream of Merwin Dam including those objectives associated with evaluating fish collectors (both adult and juvenile) will be included in the AMEP. Development of fish collection curves will remain as part of the H&S Plan as it relates directly to supplementation and hatchery operations.

With respect to the reporting of data and results, the H&S subgroup agreed that results would be linked through a master table that (1) specifies each objective, (2) where results can be found (H&S Plan or AMEP), (3) what analysis or method is used and (4) whether the objective was met (where appropriate). This table will provide reviewers an overview of all monitoring activities and methods related to implementation of the Agreement. Detailed reporting of results for each objective will continue to be included in their respective reports as stipulated by the Agreement.

1.0 INTRODUCTION

The Settlement Agreement for the Lewis River Hydroelectric Projects dated November 30, 2004 (Agreement) includes a comprehensive suite of salmon and steelhead protection, mitigation, and enhancement measures that PacifiCorp Energy and Cowlitz PUD have agreed to implement over the terms of the new project licenses (PacifiCorp and Cowlitz PUD 2004a). A central, significant feature of the Agreement involves the reintroduction of spring Chinook (*Oncorhynchus tshawytscha*), winter steelhead (*O. mykiss*), and early coho (*O. kisutch*) into their historical range above Merwin Dam by means of hatchery supplementation and newly constructed fish passage facilities.

To address hatchery operations and supplementation during the terms of the new licenses, Section 8 of the Agreement provides for a Hatchery and Supplementation Program. Primary goals of the Hatchery and Supplementation Program are to use the existing hatchery program to:

- Support self-sustaining, naturally producing, harvestable native anadromous salmonid species throughout their historical range in the North Fork Lewis River basin, and
- Provide for the continued harvest of resident and native anadromous fish species.

To ensure the Hatchery and Supplementation Program is meeting its goals, PacifiCorp Energy and Cowlitz PUD have developed this Hatchery and Supplementation Plan (H&S Plan) to adaptively manage the program and guide its implementation.

This Plan consists of seven sections designed to address the requirements outlined in Section 8.2.2 of the Agreement. These include:

Hatchery Production Program

This section contains the hatchery production targets and protocols applied at each of the Lewis River hatchery facilities to maintain harvest opportunities downstream of Merwin Dam and in project reservoirs (residents). Hatchery programs are also needed to provide both adult and juvenile anadromous fish for early supplementation efforts in the basin. Hatchery production programs, with the exception of Type N coho, are segregated programs as defined by HSRG; however, the intent is to integrate these programs as the hatchery and supplementation program matures. In 2014, the WDFW began running the Type N hatchery coho program as Integrated consistent with HSRG guidelines. Appendix A provides detailed information on current hatchery operations for the Lewis River Hatchery Complex.

Supplementation Program

This section provides an approach to reintroduce spring Chinook, late winter steelhead and early coho to habitat upstream of Merwin Dam. It includes the use of native[1] broodstock (winter steelhead), and hatchery origin spring Chinook and early coho to initiate reintroduction into areas upstream of Swift Dam. This section identifies minimum numeric targets for reintroduction based on Ecosystem, Diagnostic and Treatment (EDT) analysis and expected ocean recruit estimates designed to create self-sustaining runs.

Monitoring and Evaluation Objectives

Monitoring and evaluation of the program includes both the hatchery and supplementation program components. Criteria used to evaluate the H&S plan are included in the Aquatic Monitoring and Evaluations Plan (AMEP). Because Monitoring and Evaluation (M&E) activities, or at least the methodologies, are likely to change annually, the H&S plan provides objectives that should be considered to meet the requirements of the Agreement, Endangered Species Act, The Lower Columbia Salmon Recovery Plan and other policies at the state and federal level. Methodologies to meet these objectives will be provided each year in the Annual Operating Plan (AOP) for the hatchery and supplementation program. Required monitoring includes abundance, distribution and composition estimates, hatchery effects on native or ESA listed stocks (including resident species), and monitoring the adoption of HSRG recommendations at the hatchery facilities. NOAA Fisheries provides recommendations for data collection and monitoring through their VSP guidance document (Crawford and Rumsey 2011) and M&E activities will be consistent with this guidance.

Fish Marking Strategies

Section provides proposed strategies for marking and tagging both hatchery and supplementation fish. Tags include Passive Integrated Transponder (PIT) tags, Coded Wire Tags (CWT) and Blank Wire Tags (BWT). The marking strategies employed currently are likely to change as natural production increases upstream of Swift and at such time passage facilities may be completed at Yale and Merwin.

Adaptive Management

Adaptive management of the program is critical to achieving objectives of the program. Several mechanisms exist that ensures this occurs including developing of AOP's, comprehensive periodic reviews and 5 year updates to this plan. Additionally, there are a number of decision points indicated in this section where assumptions need to be verified and, if unverifiable, an alternative approach may need to be initiated.

[1] Native refers to the locally adapted late winter steelhead stocks prior to initiation of the late winter steelhead supplementation program that incorporates native broodstock.

Expected Outcomes

This section outlines the expected hatchery and natural production outcomes as the supplementation phases are implemented. Expectations are derived from literature sources and modeling through use of the All-H Hatchery Analyzer (AHA) model. It is important to note that the expectations derived from modeling or through ocean recruit targets will vary from year to year and thus the expected outcomes should be viewed as a base for which fish stocks should become self-sustaining through natural production and meet HSRG standards.

Annual Operating Plan and Report

Section 8.2.3 of the Agreement requires the drafting of an annual operating plan to implement the hatchery and supplementation program. This annual plan provides the means to adaptively manage the program within the general context of the H&S Plan as it is updated annually and can incorporate new technology or methods to achieve the goals and objectives of the program. Reporting (Section 8.2.4) will compile all information gathered pursuant to implementation of the H&S Plan. This includes all monitoring downstream of Merwin Dam, hatchery operations and whether fish transport and production targets were met.

Program Timeline

The salmon and steelhead supplementation program will follow a phased approach, where spring Chinook, winter steelhead, and coho will first be reintroduced into habitat above Swift Dam after completion of the Merwin Collection Facility (MCF) and transport facility (By 6 months after the 4th anniversary of Merwin license issuance), and then introduced into the habitat located between Merwin and Swift dams (following the 13th and 17th anniversaries of the new licenses), unless otherwise directed by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).

Figures 1-1 through 1-3 illustrate the progression of the program along with key milestones that are present in the Agreement. Figure 1-1 is a general timeline illustrating key milestones through year 2025. Figures 1-2 and 1-3 provide flow charts based on sections within the Agreement to help assist in understanding the many time dependent activities associated with both the hatchery and supplementation plan and separate, but related, AMEP.

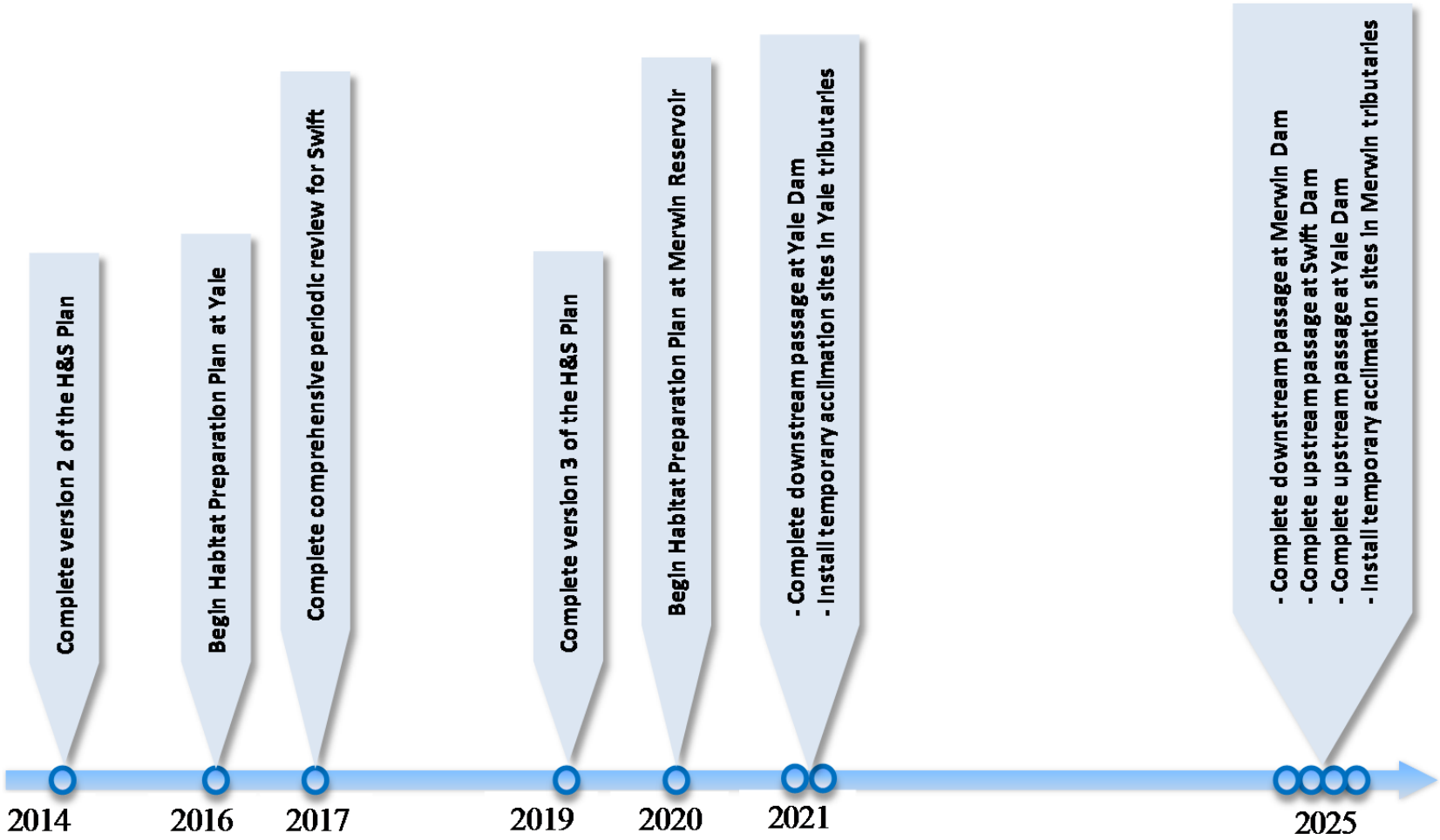

Figure 1-1. Generalized timeline by year for major milestones of the H&S and fish passage programs for the years 2014 through 2025.

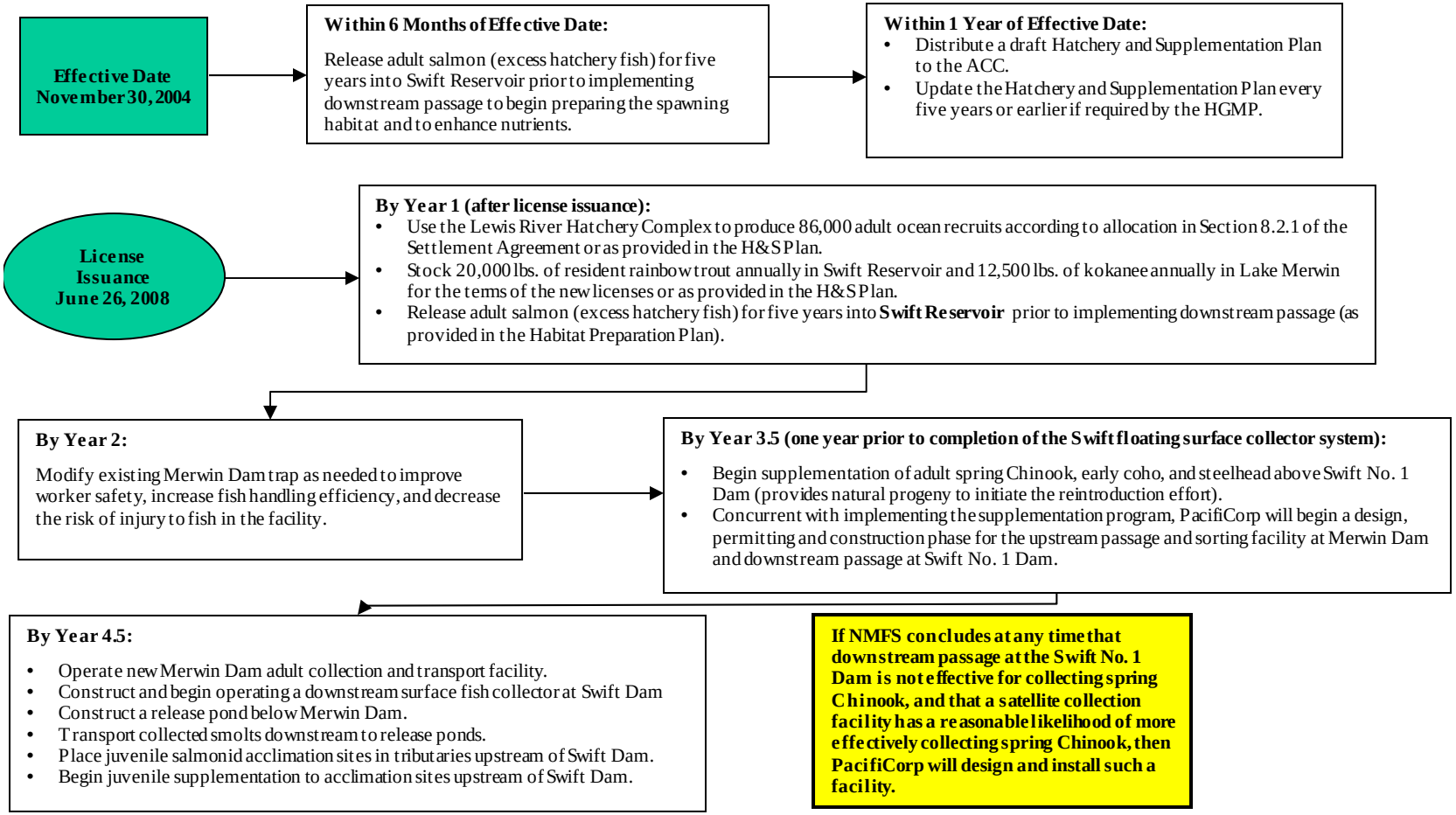

Figure 1-2. Settlement Agreement flow chart for anadromous fish reintroduction upstream of Swift Dam

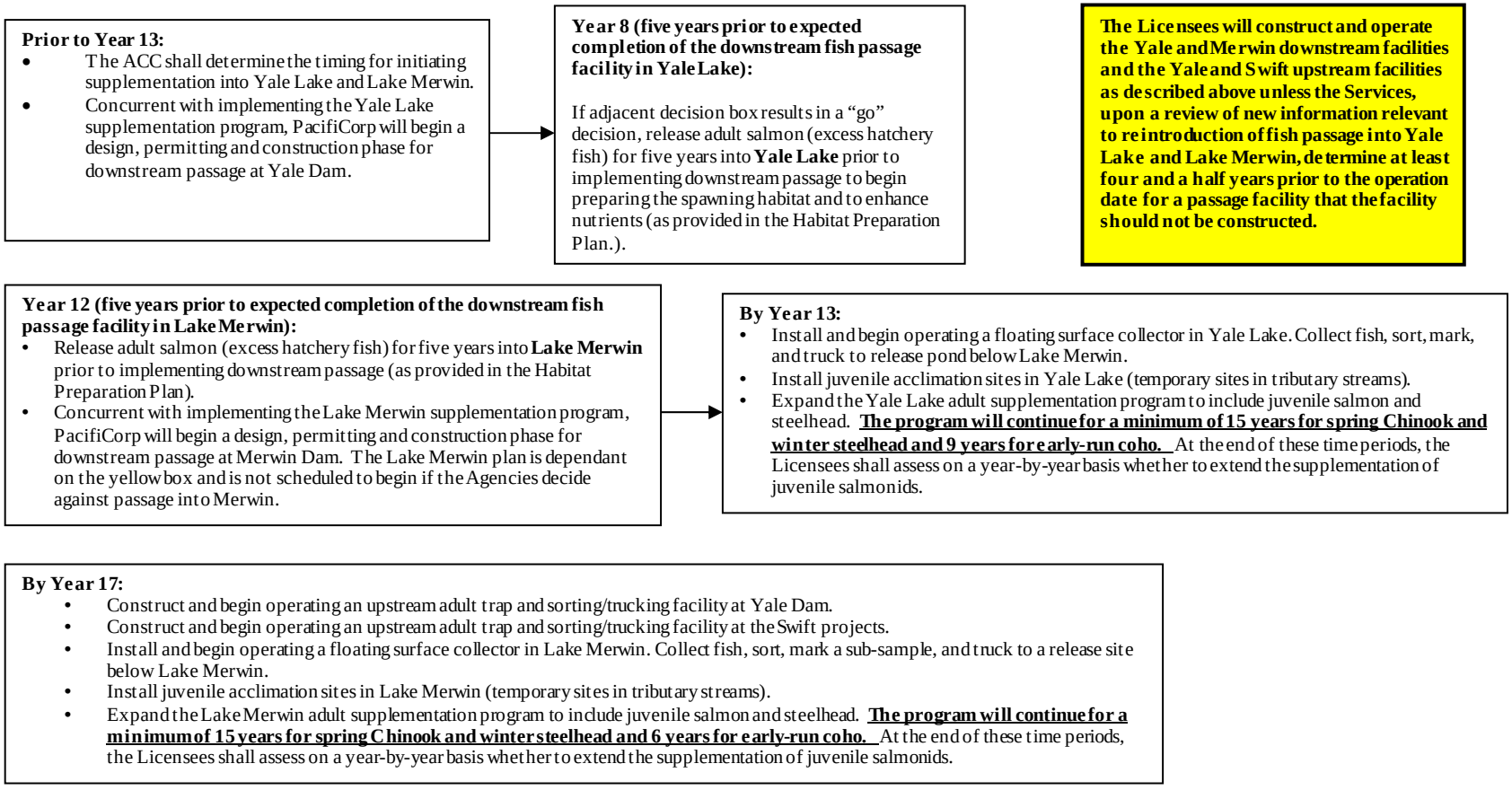

Figure 1-3. Settlement Agreement flow chart for anadromous fish reintroduction upstream of Yale and Merwin dams

2.0 HATCHERY PRODUCTION PROGRAM

The hatchery program includes the production of fish for the main purpose of harvest consistent with the priority objective to recover wild stock in the basin to healthy and harvestable levels through supplementation as described in section 3.0. Juveniles reared at the hatchery complex are released in both the North Fork Lewis River downstream of Merwin Dam (anadromous) and in Merwin and Swift reservoirs (resident) (Table2-1). Other juvenile production from native winter steelhead or spring Chinook for acclimation are included in Table 2-1, but are discussed in Section 3.0 -Supplementation Programs.

Table 2-1. Juvenile hatchery production for the Lewis River hatchery complex and release locations.

Species	Number of fish or (pounds)	Release Location
Spring Chinook	1,250,000	North Fork Lewis River
Spring Chinook	100,000	Upstream of Swift (supplementation)
Winter Steelhead	100,000	North Fork Lewis River
Winter Steelhead	50,000	North Fork Lewis River (supplementation)
Summer Steelhead	175,000	North Fork Lewis River
Coho Salmon	2,000,000	North Fork Lewis River
Kokanee	93,000 (12,500)	Merwin Reservoir
Rainbow trout	50,000 (20,000)	Swift Reservoir
TOTAL	**3,818,000**	

2.1 RESIDENT FISH PRODUCTION

As part of the H&S Plan, resident supplementation of both rainbow trout (Swift Reservoir) and kokanee (Merwin Reservoir) will continue. Rainbow trout production for Swift Reservoir will total 20,000 pounds; kokanee production of 12,500 pounds will be released into Merwin reservoir. It is important to note that neither of these programs shall interfere with reintroduction efforts and are to be managed separately. Thus, if these programs adversely affect the ability to create self-sustaining anadromous populations; management through the ACC and regulatory agencies will modify or possibly eliminate these programs.

2.2 HATCHERY FACILITIES

Hatchery rearing conditions have been modified through hatchery upgrades defined in Section and Schedule 8.7 of the Agreement. These upgrades were designed to improve operational flexibility and rearing conditions. Hatchery programming will be based on providing optimum rearing conditions for stocks regardless of current or historical rearing and release sites. Use of pond loading and agreed upon density and flow index guidelines, mating protocols that maximize genetic variability and modification of hatchery structures to allow volitional migration to the extent possible will enable hatchery populations to

develop the physiological, morphological, and behavioral traits important to long-term fitness.

2.3 FISH MARKING

All hatchery origin fish released downstream of Merwin Dam will be mass marked by removing their adipose fin. The two exceptions being that double-index tag (DIT) groups of coho and spring Chinook used for harvest management purposes would still possess their adipose fin. All DIT fish will however be tagged with coded wire in their snouts to differentiate these fish from naturally produced stocks. DIT groups at the hatchery will continue to be used until such time that sufficient numbers of smolts are collected at the floating surface collector(s) to enable an adequate sample size of naturally produced smolts. The second exception is winter steelhead smolts derived from native broodstock. These fish would also not have an adipose clip (to prevent harvest) but will be tagged with a blank (non-coded) wire tag (BWT) in their snouts.

Juvenile fish captured at collection facilities at Swift Dam (and eventually other projects) will be subsampled but no marks or tags will be placed on these fish. However, upon completion of Yale downstream collection facility (planned for 2021), juveniles will be marked with a PIT tag, or suitable alternative as recommended by the resource agencies at Yale. This will allow returning fish to be distinguished as to their collection location of either Swift or Yale Dam[2]. Note that if and when upstream and downstream fish passage facilities are completed (year 2025); naturally produced fish would no longer need to be differentially marked, as fish will have access to their natal stream by using passage facilities at each project.

2.4 ARTIFICIAL PRODUCTION MANAGEMENT

Over the short-term (<15-years) the existing spring Chinook and coho (Type S) hatchery programs would be run as Segregated programs. In other words, no wild fish would be used as hatchery broodstock (exception is juvenile spring Chinook used for acclimation). This approach results from the lack of local stocks adapted to stream conditions in the Lewis River upstream of Swift Dam from which to integrate the existing program. After 3-5 generations of wild production, it is suggested that the hatchery programs be converted to Integrated consistent with HSRG guidelines.

The long-term objective (>15 years) for spring Chinook and coho (Type S) hatchery programs will be to operate these as an Integrated type as defined by the HSRG. The ratio of natural and hatchery origin fish used as broodstock, and released upstream of Swift Dam, would be tightly controlled. Goals of long term integrated hatchery programs are to (1) ensure that the natural environment and not the hatchery environment drive local

[2] Because fish are not marked at the Swift collector it is assumed that all unmarked NOR transport species (with the exception of late-winter steelhead) that volunteer into the lower river traps will be of Swift origin and thus transported upstream of Swift Reservoir upon capture.

adaptation, (2) to provide harvest opportunity and (3) to provide for continued supplementation as needed.

Hatchery program fish will be reared to produce a smolt that migrates rapidly from the basin and maximizes adult production and contribution to fisheries. This will be achieved by implementing volitional release strategies to the extent possible given the limitation of hatchery facilities, and releasing fish at sizes that result in high survival or reduced effects on native salmonids. If volitional release is determined infeasible, then gill ATPase and smolt condition data should be collected on a weekly basis to determine when smoltification has occurred, thus defining the appropriate release time.

2.5 SEGREGATED AND INTEGRATED HATCHERY MANAGEMENT

The HSRG identifies two primary purposes (or potential benefits) of artificial production, 1) help conserve naturally spawning populations, and 2) provide fish for harvest. To this end, the hatchery criteria put forth by the HSRG vary dependent on whether the hatchery is to operate as an Integrated or Segregated type program. The definitions for both types of programs are as follows:

- ***Segregated***: A hatchery program is considered Segregated if the manager's intent is for the population to represent a distinct population that is reproductively isolated from naturally spawning populations. The principal intent of a Segregated program is to create a hatchery adapted population that can be used to meet harvest goals. Hatchery broodstock (and programs) are considered genetically segregated if the broodstock is maintained only with hatchery origin (HOR) adults. Therefore, gene flow from the natural origin population (NOR) to the hatchery broodstock is actively managed against in a Segregated program. In addition, hatchery origin adults are prevented from spawning naturally to prevent gene flow from the less well-adapted hatchery population to the native or natural origin population.

- ***Integrated:*** A hatchery program is classified as Integrated if the manager's intent is for the natural environment to drive the adaptation and fitness of a composite population of fish that spawns both in the hatchery and natural environment. In an Integrated program, the proportion of natural origin broodstock in the hatchery and the proportion of hatchery origin fish on the spawning grounds determine the influence the hatchery and natural environments have on the composite population. The larger the ratio of natural origin fish to hatchery origin fish in either environment, the greater the influence naturally adapted fish genetics will have on overall population genetic diversity. The greater the difference between the hatchery and natural stock components (e.g. run-timing), and the less natural the hatchery environment, the larger the ratio must be to reduce the effects of hatchery selection.

This H&S Plan calls for the development (over time) of up to eight hatchery programs (Table 2-2). The primary purpose of each program is to provide either fish for harvest, or to reintroduce anadromous fish upstream of Swift Dam (Supplementation).

Table 2-2. Hatchery program types by species for the H&S Plan.

	Program Type		Primary Program Purpose
	Current	Long-term	
Downstream of Merwin Dam			
Spring Chinook	Segregated	Integrated	Harvest
Type N Coho	Integrated*	Integrated	Harvest
Type S Coho	Segregated	Integrated	Harvest
Summer Steelhead	Segregated	Segregated	Harvest
Winter Steelhead	Segregated	Segregated	Harvest
Upstream of Swift Dam			
Spring Chinook	Integrated	Integrated	Supplementation
Type S Coho	Integrated	Integrated	Supplementation
Late Winter Steelhead	Integrated	Integrated	Supplementation

*** Beginning in 2014, WDFW intends to run the Type N hatchery coho program as Integrated consistent with HSRG guidelines**

Hatchery production and facilities will be operated consistent with HSRG guidelines for Segregated and Integrated programs. The key HSRG guidelines used for each type of program is presented in Table 2-3.

In the long term, the H&S Plan proposes to continue to operate the early winter and summer steelhead hatchery programs as Segregated type based on two assumptions:

1) The existing hatchery programs have had no systematic gene flow from the natural populations.

2) Natural spawning population genetics and fitness has been compromised by hatchery origin fish spawning in the natural environment.

In short, it is assumed that the hatchery environment, not the natural environment, has been driving fish fitness and genetics in the basin since anadromous fish were extirpated from the Lewis River upstream of Merwin Dam.

Table 2-3. HSRG guidelines used for Segregated and Integrated hatchery programs.

Segregated (Harvest)	Integrated (Conservation)
Maintain an effective population N_e of at least 500 fish.	Use mating protocols that maximize the effective population size (N_e) in the hatchery, including factorial mating, maintenance of the individual pedigrees, and cryopreserved gametes when necessary.
Avoid the use of broodstock from natural populations or other hatchery populations	Collect and spawn adults randomly with respect to time of return, time of spawning, size and other characteristics related to fitness.
Mark or tag all hatchery released fish, so that the proportions of natural and hatchery origin fish among natural spawners and in the broodstock can be monitored and controlled.	Rear in a hatchery environment and with operational protocols that ensure all portions of the population are treated equally and have the same opportunity to contribute to the release population.
Produce fish that have the physiological fitness to migrate rapidly to saltwater and to survive in that environment through growth regimes that promote smoltification.	Mark or tag all hatchery-released fish to ensure correct identification for use in future broodstocks or in other monitoring programs.
Produce fish that have the morphological characteristics to meet harvest goals.	Use a hatchery environment that allows synchronization of adult maturation, incubation, and emergence, and out-migration with natural populations.
Produce fish that have the behavioral characteristics, such as adult run-timing to meet harvest goals.	Rear fish at reduced densities in enriched environments to improve cryptic coloration, territorial fidelity, and social behavior.
Avoid crowding and build-up of wastes and dead fish in fish holding units.	Release fish volitionally during the out-migration timing of the natural stock
Monitor fish health regularly and implement needed treatment immediately	Use a hatchery environment and operational protocols that maximize the survival of each individual including captive rearing.
Use prophylaxis by vaccination where feasible.	Use prophylaxis by vaccination where feasible, monitor the health of stocks regularly, and implement needed treatment immediately.
Use adequate diets that have been stored for only short periods.	Use adequate diets that have been stored for only short periods.
Use locally adapted stocks that are likely to develop reasonable resistance to pathogens likely to be present in the water supply.	Use locally adapted stocks that are likely to develop reasonable resistance to pathogens likely to be present in the water supply.
Avoid practices and situations likely to result in chronic stress (e.g. frequent fish handling etc.)	Avoid practices and situations likely to result in chronic stress (e.g. frequent fish handling etc.)

Several comments received from the first version of this plan indicated reviewers would like to see the hatcheries run as Integrated programs as soon as feasible. The H&S Plan proposes to achieve this objective by following the HSRG guidelines shown in Table 2-4. This is the recommended approach given the existing conditions related to hatchery management and hatchery effects on native stocks over several decades. The HSRG recommends that managers allow three to four generations to establish a locally adapted

population before integrating the hatchery programs. However, if only natural origin fish are used the number of generations may be reduced. If reintroduction is successful, then it is likely that sufficient locally adapted spring Chinook and Type S coho adults would be available for integration sometime between years 12-17 of the new license[3].

Table 2-4. HSRG guidelines for developing an Integrated hatchery program if natural production (and thus fitness) has been compromised by hatchery releases (HSRG 2004).

Transition from an incompletely segregated program to an integrated program. Assumptions: • Hatchery broodstock has had no systematic gene flow from the natural population • Natural spawning population has had significant influence from hatchery origin fish	
Recommended Approach: Plus Differential Marking - Recommended approach if attaining harvest goal cannot be interrupted during transition to integrated program	**Considerations**
• Take steps to reduce the number of hatchery origin fish in the natural population to less than five percent of the natural population (reduce hatchery program, selectively harvest to limit strays, use a weir or other measures to control straying). • Allow a minimum of three to four generations to promote adaptation to the natural environment. • Initiate a new hatchery program by collecting representative sample of natural fish. • Collect a number of brood that allows for an effective population size of the composite population (natural plus hatchery) in excess of 500 fish. • If a long-term goal of the hatchery program is to provide a conservation benefit, or if the natural spawning of hatchery-origin fish will be difficult to control, then the effective population size of the hatchery component should also be greater than 500 fish. • Differentially mark and release offspring of hatchery and natural origin broodstock. Preferentially use returns that represent the NOS broodstock. Phase out use of hatchery origin broodstock as natural origin broodstock returns. • Incorporate a minimum of 10% NORs into hatchery broodstock each year once new broodstock returns. • Ensure that gene flow from the natural to the hatchery population is greater than gene flow from the hatchery to the natural population (pNOB > pHOS). • For stocks of moderate or high biological significance and viability (or goals to maintain or improve the biological significance and viability of the stock), PNI should be greater than 0.70. • Size program consistent with goals and the ability of the natural population to support hatchery broodstock requirements and gene flow limitations to the natural population.	**Likelihood of achieving natural adaptation:** Intermediate likelihood of attaining stock goals because of the uncertainly of adaptation to the natural environment after three to four generations. The likelihood of meeting stock goals increases with the amount of time allowed before initiating a new program and a lower contribution of hatchery origin fish in the natural population. **Cost:** Increase in cost incurred for broodstock collection appears similar for all approaches. An additional cost for differentially marking the two hatchery broodstocks would be incurred. Cost in terms of operational complexity is higher than all other approaches except Approach #4, but should be no greater than rearing an additional species. **Effect on Harvest:** Reduces loss of contribution to harvest during transition from the previous approach.

[3] Type N coho will not be released above Merwin Dam. Late winter steelhead will be run as an Integrated program from the start, as wild adults are available for use as broodstock.

2.6 HATCHERY PRODUCTION

The number of hatchery juveniles to be released as part of the harvest and supplementation programs is presented in Table 2-5.

Table 2-5. Juvenile release numbers by species for hatchery and supplementation programs.

Smolt Production	Spring Chinook	Summer Steelhead	Early-Winter Steelhead	Late-Winter Steelhead	Coho
Hatchery	1,250,000	175,000	100,000	NA	2,000,000
Supplementation	100,000	NA	NA	50,000	NA
Total	**1,350,000**	**175,000**	**100,000**	**50,000**	**2,000,000**

2.6.1 Release Size

Hatchery juveniles would be released at the following size ranges:

1. Coho- 14-16 fish per pound (fpp)
2. Spring Chinook- 8-12 fpp
3. Winter and Summer Steelhead 4.8-8 fpp

Hatchery juvenile release size and timing may be altered to mimic timing and smolt size of natural origin fish captured at the Swift Floating Surface Collector. The timing and size of natural origin smolts could be used as a template for evaluating release size and timing for the basin.

2.6.2 Broodstock Needs

The hatchery broodstock and adult supplementation targets for the H&S Plan are presented in Table 2-6. Adult Supplementation targets represent fish that are transported upstream of Swift Dam to spawn naturally. To help reach these adult targets, WDFW will manage harvest in the Lewis River in a manner that assists in achieving adult spring Chinook, late winter steelhead and coho return targets to adult collection facilities.

Table 2-6. Approximate adult broodstock targets for the Lewis River needed for hatchery (Segregated) and supplementation (Integrated) programs.

Smolt Production	Spring Chinook	Summer Steelhead	Early - Winter Steelhead	Late - Winter Steelhead	Type-N Coho	Type-S Coho
Hatchery Broodstock	1,000	105	90	0	800	800
Adult Supplementation (transported upstream)	2,000	0	0	500	0	9,000
Juvenile Supplementation broodstock*	65	0	0	50	0	0
Total	**3,065**	**105**	**90**	**550**	**800**	**9,800**

* Value represents broodstock required to meet juvenile supplementation targets.

2.6.3 Resident Fish

2.6.3.1 Kokanee

No changes are proposed for the existing kokanee program as the continued release of this species poses little risk to the success of the reintroduction effort being undertaken above Swift.

However, as anadromous fish are reintroduced into Merwin reservoir starting in year 12 of the license, the ACC should review the program and determine if it should be continued[4]. The decision to maintain the program would need to consider the importance of Merwin Reservoir as a rearing area for coho juveniles and management implications and cost of possibly handling large numbers of kokanee juveniles at the proposed Merwin juvenile collection facility. Ideally, all juveniles collected at the Merwin facility would be bypassed directly to the lower river with a minimum of handling. If managers allow kokanee to be released below Merwin Dam, then these fish would have to be sorted once they return as adults and released upstream of the dam.

2.6.3.2 Resident Rainbow Trout

The Agreement calls for the release of 20,000 pounds of rainbow trout into Swift Reservoir. Releases are sized at approximately 2.5 per pound resulting in about 50,000 catchable rainbow trout. These fish provide sport-fishing opportunities in Swift Reservoir.

The H&S Plan proposes that the rainbow trout program continue so long as the number of these fish entering juvenile collection facilities can be sorted accurately without anesthetization and returned upstream (i.e., not transported downstream of Merwin Dam).

[4] In year 12, anadromous fish may be released into Merwin Reservoir, if agreed to by the ACC.

Stocked rainbow trout collected at the Swift floating surface collector are directed to adult holding tanks based on their size and returned to the reservoir (i.e., not passed downstream). The size of rainbow trout planted into Swift Reservoir has increased from 3 to 2.5 per pound in 2014. This increase in size will help ensure that rainbow trout collected at the floating surface collector are not passed downstream. In addition, all stocked rainbow are adipose clipped to facilitate identification and harvest.

The combined actions proposed in the H&S Plan are designed to achieve the hatchery and natural production targets shown in Table 2-7. The values in the table are referred to as adult Ocean Recruits, which include escapement plus the number of fish caught or available in ocean and freshwater fisheries. The methodologies used for estimating ocean recruits will be developed as part of the AMEP update in 2015.

Table 2-7. Hatchery and natural production adult threshold levels (ocean recruits) for spring Chinook, steelhead and coho.

	Spring Chinook	Steelhead (Summer, Winter, Late Winter)	Coho (Type S and Type N)	Total
Hatchery	12,800	13,200	60,000	86,000
Natural Production Threshold	2,977	3,070	13,953	20,000
Grand Total	**15,777**	**16,270**	**73,953**	**106,000**

2.7 MODIFICATIONS TO HATCHERY PRODUCTION

Modifications to hatchery production may be made as natural production from reintroduction efforts increase. As natural production upstream of Merwin Dam for each species exceeds its threshold level, hatchery production levels for that species would be reduced on a 1:1 basis. For example, when natural spring Chinook adult recruits equal 3,977 fish (1,000 fish over threshold value of 2,977), the hatchery production target for this same species would be reduced by 1,000 adults to 11,800 (12,800-1,000 = 11,800). This would be accomplished by reducing the number of juveniles released from the hatchery each year for that species based on the average survival rate calculated over a 5-year period. The decision to adjust hatchery production to achieve threshold levels will be considered by the ACC each year after the initial five years based on the results of the Ocean Recruits analysis.[5] Note that hatchery targets may be increased back to initial levels if natural production were to decrease to below the threshold level. It is important to note that downward modifications to hatchery production based on increases in natural production are consistent with HSRG recommendations.

[5] The 5-year period was selected, as it is consistent with the independent review process established in the Settlement Agreement. The ACC will have the opportunity to evaluate hatchery production every year as part of their review of the Annual Hatchery operations plan.

However, as called for in the Agreement, hatchery production targets would not be reduced below the "Hatchery Target Floor" levels shown in Table 2-8 even though this number exceeds HSRG recommendations for pHOS at the 86,000 ocean recruit level provided in Table 2.7. In summary, no matter how many anadromous fish are produced above Merwin Dam, Lewis River hatcheries would continue to release sufficient juveniles to achieve the hatchery target floor[6].

Table 2-8. Hatchery target floor levels for adult spring Chinook, steelhead and coho.

	Spring Chinook	Steelhead	Coho	Total
Hatchery Target Floor	2,679	2,763	12,558	18,000

[6] Development and approval of hatchery and genetic management plans may modify this floor to comply with take prohibitions under the Endangered Species Act.

3.0 SUPPLEMENTATION PROGRAM

Supplementation is defined by the Regional Assessment of Supplementation Project (RASP 1992) as follows:

"Supplementation is the use of artificial propagation in an attempt to maintain or increase natural production, while maintaining the long-term fitness of the target population and keeping the ecological and genetic impacts on non-target populations within specified biological constraints."

Because anadromous fish have been extirpated from areas upstream of Merwin Dam, the supplementation program proposed is designed to re-establish self-sustaining populations of Type S coho, spring Chinook and late winter steelhead upstream of Merwin Dam.

The H&S Plan provides an approach to reintroduce adult spring Chinook, winter steelhead, and Type S coho into stream reaches upstream of Swift Dam, and in later years into Yale and Merwin reservoirs. Adult supplementation strategies will be used as the primary method to jump start fish production upstream of Merwin Dam. The source of adult supplementation fish for both spring Chinook and Type S coho will be derived from hatchery origin stocks. Supplementation of winter steelhead adults will come from returns of juvenile supplementation efforts downstream of Merwin Dam that originate from native stocks but are spawned and reared for one year in the hatchery facility and released as yearlings downstream of Merwin Dam[7]. Adult steelhead collection would continue for 12-years to ensure that sufficient genetic diversity was obtained to prevent founder effects (i.e. starting with too little genetic resources)[8].

In addition to adult spring Chinook, yearling spring Chinook will be released upstream of Swift Reservoir as part of acclimation efforts. Yearling spring Chinook will be planted in established acclimation sites upstream of Swift Reservoir and allowed to migrate volitionally from these sites. A 10 percent subsample of these juveniles will be marked with a body cavity PIT tag prior to release in acclimation sites to evaluate acclimation site performance and migration timing upon capture in the floating surface collector. These fish may also provide data for evaluating juvenile collection facilities at Swift Dam by the fact they possess a PIT tag for which travel time may be estimated.

For adult spring Chinook and Type S coho, returns in excess of hatchery broodstock needs will be transported and released in river reaches upstream of Swift Dam as part of the adult supplementation strategy (Table 3-1).

Returning adult winter steelhead that possess a blank wire tag (BWT) in their snout will be transported upstream and not used as hatchery broodstock. Returning BWT steelhead

[7] The H&S plan considered rearing 2+ smolts for the late winter steelhead program, but this idea was rejected in favor of the 1+ smolt program. The logic being that the longer hatchery residence time would reduce the fitness of the population by selecting traits for traits that increase survival in the hatchery environment.
[8] Collecting 50 wild adults for 12 years meets/exceeds HSRG criteria for eliminating founder effects.

represent returns from supplementation smolts released downstream of Merwin Dam and are intended to seed natural production upstream of Swift Dam.

Winter steelhead broodstock will be comprised of up to 50 (25 pairs) native winter steelhead parents each year. There will be some years that the number of broodstock pairs captured is less than 25, which increases the risk of poor family representation (and genetic drift) in the progeny. Mating and spawning protocols as described in the AOP must be carefully followed throughout the run to reduce this risk especially during years when broodstock targets are not met. All potential broodstock genotypes will be compared against the existing native winter steelhead baseline for the Lewis River to ensure that hatchery strays or misclipped fish are not used. The program will release up to 50,000 yearling smolts marked with a blank wire snout tag (or acceptable alternative), and released downstream of Merwin Dam (Table 3-1). The late- winter steelhead hatchery program is currently managed as an Integrated type as defined by the HSRG.

As spring Chinook, Type S coho, and steelhead populations become established upstream of Swift Dam, hatchery supplementation into this area shall be reduced. This action would ensure that local adaptation for each species is driven by the natural, not the hatchery environment. However, this action would not be considered for implementation until at least year 9 (2018) for Type S coho, and year 15 (2024) for spring Chinook and late winter steelhead.

Table 3-1. Minimum Supplementation targets for adults and juvenile spring Chinook, coho and winter steelhead upstream of Swift Dam and downstream of Merwin Dam.

	Spring Chinook	Type-S Coho	Steelhead
Adults (upstream of Swift Dam)	**2,000**	**9,000**	**500**
Juveniles	**100,000 (acclimation)**	**0**	**50,000 (downstream of Merwin Dam)**

A more detailed description of the proposed supplementation program for each of the three species is presented below by species.

3.1 SPRING CHINOOK

3.1.1 Supplementation Strategy

The reintroduction strategy for spring Chinook will rely on two life stages: smolts and adults. A total of 100,000 smolts and a minimum of 2,000 hatchery adults[9] (when available) will be released upstream of Swift Reservoir (when feasible) to rebuild a natural spawning

[9] Adults may include a proportion of jacks as described in the Annual Operating Plan.

population[10]. If access upstream of Swift Reservoir is not possible, adults will be released into Swift Reservoir. The timing and number of adults released upstream will mimic timing of the North Fork Lewis run downstream of Merwin Dam. Timing curves are developed as part of the AOP each year. The 2,000 adult escapement target was selected based on EDT estimates of spawning capacity for habitat upstream of Swift No. 1 Dam, required passage survival and collection rates, and the average expected level of surplus hatchery adults (~3,200) available after ocean and freshwater fisheries (See Section 7). Modifications to this number AND the proportion of NOR to HOR spring Chinook transported will be made through the annual planning process for the AOP. In-season decisions may also be made by the H&S subgroup to alter the transport number or proportion of NOR and HOR in the transported spring Chinook.

The reintroduction strategy will be conducted as a 15-year[11] program that will continue throughout this period with no trigger points that would discontinue the program prior to its completion[12].

This supplementation program will prioritize natural origin returns as the preferred strategy for supplementation of both adults and for use as broodstock for supplementation juveniles. However, because NOR's are rare for spring Chinook, the program will need to initially use mostly hatchery origin adults (HORs) for the adult supplementation strategy. After adults begin returning from the natural or supplemented releases, hatchery origin fish would only be used in the event that the number of fish produced above Swift are insufficient to meet the desired release numbers. The H&S Plan calls for the continuation of the adult and juvenile supplementation program for at least 15-years without interruption. Priority for the use of natural-origin returns to the MCF and Lewis River Hatchery will be as follows:

1. For use as broodstock for juvenile supplementation program: Up to 65 adults.

2. Use for adult supplementation upstream of Swift Dam: All NOR's above juvenile supplementation needs (65 adults).

At the completion of this initial supplementation period, both smolt and adult supplementation will be evaluated annually to determine if continued supplementation is necessary and if needed for all species. This evaluation will focus on whether continued hatchery supplementation is needed. Section 3.1.1 of the Agreement directs the Services, after discussion with the ACC, to determine how to assess whether the Reintroduction Outcome Goals have been met. This will happen prior to the 27th anniversary of the FERC Licenses. This action is consistent with the Agreement that states the primary goal of the program is to establish self-sustaining, naturally producing, harvestable native anadromous salmonid populations. To determine sustainability will require the elimination of the

[10] The 2,000 release target is greater than the 1,200 recommended in the Lewis River Fish Planning Document (Table D-19)
[11] The Settlement Agreement calls for supplementation to continue for 15-years.
[12] However, the ACC may stop or continue the program based on collected data.

supplementation program at some time in the future. However, any decision to terminate the program would be made in consultation with the ACC.

3.1.2 Broodstock Origin

Broodstock for the reintroduction efforts will initially come from returns to the Lewis River hatchery complex. This stock is chosen since the original native stock has been extirpated and the existing hatchery population, although originating from multiple out-of-basin stocks, has been self-sustaining in the Lewis River for approximately four (4) generations (WDFW and PacifiCorp Energy, 2014a). This stock therefore represents the stock most likely to adapt to environmental conditions in the Lewis River. The hatchery origin stock will be used in the first generation of the supplementation efforts. Once adult fish return from smolt or adult releases, the supplementation program will preferentially use these returns for both juvenile and adult releases.

Although actual spring Chinook productivity and capacity upstream of Swift Dam is currently estimated from EDT modeling, the goal will be to reduce the use of hatchery origin upstream of Swift Dam over successive generations and at some point eliminate the use of HOR spring Chinook. Therefore, all NOR spring Chinook that volunteer into traps will be used first for juvenile supplementation and then adult supplementation efforts upstream of Swift Dam. Because this plan recommends the use of all available NOR returning to traps for supplementation, there is no set standard or timeline other than the primary goal is to achieve a self-sustaining population of spring Chinook that does not rely on hatchery origin spring Chinook. That is, supplementation will end at some point.

The approach described above for spring Chinook should only be used as a guide for adaptive management decisions by the ACC. The decisions for broodstock use, composition of broodstock, and continuation or suspension of the supplementation program should be based on monitoring of survival rates and productivity upstream of Swift Dam as well as demographic and genetic risks to the supplemented population.

In recent years, escapement to the hatcheries has fallen to an average of about 2,000 fish (WDFW and PacifiCorp Energy, 2014a). As a result, there have been inadequate returns of adult spring Chinook available for supplementation upstream. Because this creates generational gaps and inconsistent cohorts, the adult supplementation program may need to be extended beyond Year 15 to achieve the NOR composition goals, assuming that spring Chinook runs return to levels exceeding 3,000 adults.

If spring Chinook returns fail to improve, Cowlitz River returns may be used for Lewis River supplementation as these fish are derived from Lewis River returns. If neither source provides sufficient adults, expansion of juvenile supplementation program may be evaluated and presented to the ACC for approval. This decision should take into consideration the ability of the Swift collector to achieve collection targets for juvenile Chinook.

3.1.3 Broodstock Collection and Mating

Broodstock for both the smolt and adult supplementation strategies will be collected so that fish for these programs will represent the entire run timing of the returning population. The juveniles released in the program will represent the full range of return timing of the existing stock. In order to accomplish this, eggs for this program must be taken throughout the run, or fish transported to upriver acclimation ponds should be collected as a sub-sample from the entire spring Chinook rearing population. Since adults released into the watershed will select their own mates, only the juvenile portion of the program requires mating protocols. Spawning protocols for the juvenile program should strive for selective neutrality and ensure that the maximum genetic effective number of breeders is represented in the population. The current protocol of single family pairing and incorporation of jacks into the spawning population should be sufficient to meet these needs when using hatchery or natural origin broodstock. Natural origin broodstock should be used whenever possible for the juvenile supplementation program. As supplementation NOR's begin to return as adults, natural origin broodstock availability should improve.

3.1.4 Incubation and Rearing of Acclimation Fish

Spring Chinook for this program will be incubated and reared at Speelyai Hatchery following the protocols described in the most recent WDFW spring Chinook HGMP (WDFW and PacifiCorp Energy, 2014a). Rearing conditions at Speelyai Hatchery will be managed to provide optimal flow and density indexes given current and planned hatchery upgrades. Fish will be held at Speelyai Hatchery until the yearling stage when they will be transferred to upriver acclimation sites following standard WDFW loading guidelines. Feeding of acclimation fish may not be required if adequate natural feed resources are available. This is preferred if practical to imitate conditions and growth patterns of naturally produced smolts. Yearling transfer will generally occur, approximately 6 weeks prior to release. Rearing conditions in the acclimation sites will also be managed to provide similar flow and density indices reached at Speelyai Hatchery.

3.1.5 Release Location and Numbers Released

Up to 100,000 smolts and a minimum of 2,000 adults (when available) will be released upstream of Swift Reservoir. After smolts are allowed to acclimate (4 to 5 weeks), acclimation ponds will be drawn down gradually to allow volitional release of acclimated smolts. The ACC will determine the period of volitional release and direct when the acclimation fish will be forced out of acclimation ponds. The target release size will be 20 to 25 fish per pound (PacifiCorp and Cowlitz PUD 2011). Smolt size released from acclimation sites will attempt to mimic the size of naturally produced spring Chinook outmigrants. A minimum of 2,000 adults will also be released upstream of Swift Reservoir (when feasible) to spawn naturally in the Lewis River upstream of Swift Dam. This number of fish is based on the habitat capacity of 1,942 fish estimated by EDT for the Lewis River above Swift Reservoir considering both adult and juvenile passage survival once collection facilities are in place (99 percent and 80 percent respectively).

Natural origin returns (NOR) will not be incorporated into the broodstock for the existing spring Chinook Segregated harvest program for the duration of the re-introduction program. At the completion of the 15 years and evaluation of stock sustainability, a decision will be made whether or not to modify the current segregated harvest program into an Integrated program.

3.1.6 Habitat Preparation Program at Yale Reservoir

The preparation of gravels and nutrient enhancement as part of the Habitat Preparation Plan is anticipated to begin in Yale Reservoir beginning in 2016. This action is dependent on approval by the Services and whether passage facilities will be constructed at Yale. This decision will be based on ongoing studies to determine the feasibility of installing downstream passage at Yale. If the Services determine that downstream passage facilities at Yale are required, spring Chinook (if available) will be planted in Yale in accordance with Section 7.4 of the Agreement. The number of spring Chinook planted in Yale will be determined by the Habitat Preparation Plan drafted for that year but is expected to be low if any based on current run projections and priorities for hatchery broodstock and Swift Reservoir reintroduction efforts. Assuming adequate spring Chinook returns the target release number is likely to be less than 200 based on EDT analysis of available habitat in Yale tributaries. The EDT model will be re-run in 2014 after survey and verification of existing habitat in all three reservoirs. Results may or may not alter the supplementation targets following ACC review of the EDT results and recommendations put forth by the US Geological Survey and University of Washington team performing the re-evaluation of habitat.

3.2 COHO SALMON (TYPE S)

3.2.1 Supplementation Strategy

The reintroduction strategy for Type S coho salmon will rely entirely on adult supplementation. The strategy chosen is based on the availability of adult Type S coho from returns to the MCF and Lewis River Hatchery which have averaged over 21,000 between 2002 and 2013 (WDFW and PacifiCorp Energy 2014b). Also, coho have relatively high natural productivity and capacity (over 4 recruits/spawner and capacity of nearly 9,000 adults) in habitat upstream of Swift Reservoir that is estimated using EDT. Adult supplementation alone, in this case, should provide both the abundant founding population and the mechanism to increase population fitness as described in the Lewis River Fish Planning Document (Cramer and Associates 2004).

Initially, 9,000 Type S coho adults (when available) will be released upstream of Swift Dam to rebuild a natural spawning population[13]. The 9,000 adult minimum escapement target has been in place since the original H&S Plan was finalized and was based on EDT estimates of spawning capacity for habitat upstream of Swift Dam. EDT estimates will be calculated

[13] The 9,000 adult release target is greater than the 6,200 proposed in the Lewis River Fish Planning Document (Table D-19)

again in 2015 based on updated habitat information. Based on these new calculations the ACC will need to determine if the 9,000 adult supplementation target is appropriate or if modifications need to be made. Any changes will be reflected in the AOP. Coho returns in excess of hatchery broodstock and upstream supplementation needs will be surplused by WDFW protocols.[14]

3.2.2 Broodstock Origin

Broodstock for the reintroduction efforts will initially come from returns of early Type S coho to the Lewis River hatchery complex[15]. This stock is chosen since the native Lewis River coho provided the initial broodstock for the hatchery program and because historical information suggests that early coho were predominately upper Lewis River spawners (WDFW and PacifiCorp Energy, 2014b). This stock therefore represents the stock most likely to adapt to environmental conditions in the Lewis River. The hatchery stock will be used in the first generation of the supplementation efforts. As adults return from supplementation programs (as NOR returns), they will be passed upstream for further introduction upstream of Swift Reservoir. Because this plan recommends the use of all available NOR returning to traps for supplementation there is no set standard or timeline other than the primary goal is to achieve a self-sustaining population of early coho that does not rely on hatchery origin coho. That is, supplementation will end at some point.

The approach described above for Type S coho should only be used as a guide for adaptive management decisions by the ACC. The decisions for broodstock use, composition of broodstock, and continuation or suspension of the supplementation program should be based on monitoring of survival rates and productivity upstream of Swift Dam as well as demographic and genetic risks to the supplemented population.

3.2.3 Hatchery Protocols

Since only adult supplementation will be used, broodstock collection, mating, rearing and release protocols will not be necessary.

3.2.4 Broodstock Collection

Adults for the supplementation program will be collected so that fish will represent the entire run timing of the returning population.

3.2.5 Release Location and Numbers Released

Initially, up to 9,000 hatchery origin adults will be released upstream of Swift Dam to naturally distribute themselves and reproduce. The adult release of up to 9,000 coho is based on the habitat capacity of 8,800 fish estimated by EDT modeling for the Lewis River

[14] In years when surplus exceeds 9,500 adults, the ACC will need to determine whether or not to release additional coho upstream of Swift Dam. Note that the release number is greater than the 6,200 proposed in the Lewis River Fish Planning Document (Table D-19).
[15] Broodstock collection dates for Type S coho would be established by the WDFW.

upstream of Swift Dam considering both adult and juvenile passage survival once collection facilities are in place (99 percent and 80 percent respectively)[16]. As naturally produced adults from the supplementation program return, priority for reintroduction will be given to fish that were produced in the watershed upstream of Swift Dam. All natural origin adults returning to the MCF and Lewis River Hatchery will be transported upstream of Swift Dam to spawn naturally. Hatchery origin fish may be used in the event that NOR returns are insufficient to meet the 9,000 fish target. Modifications to this number AND the proportion of NOR to HOR coho transported will be made through the annual planning process for the AOP. In-season decisions may also be made by the H&S subgroup to alter the transport number or proportion of NOR and HOR in the transported coho.

Radio telemetry data collected on adult coho released upstream of Swift Dam in 2001 and 2002 indicate that hatchery origin adult coho distribute throughout the watershed and produce large numbers of juveniles (PacifiCorp and Cowlitz PUD, 2004b). When larger releases have occurred (7 to 9,000 adults), however, it has been observed that a substantial number of coho do not fully distribute as predicted from previous studies. Carcass and redd surveys observed a majority of redds located in Swift Reservoir tributaries rather than upstream of Swift Reservoir. The reasons for this apparent lack of distribution are not entirely clear. Alternative release sites upstream of the Eagle Cliff Area should be considered as part of the AOP planning process for 2015. These sites may include Muddy and Clear Creek bridges and Curly and Forest Road 90 Bridge near lower falls on the Mainstem River.

Natural origin returns will not be incorporated into the broodstock for the existing Type-S coho harvest program for the duration of the re-introduction program[17]. At the completion of the 9 years and evaluation of stock sustainability, a decision will be made whether or not to modify the current segregated harvest program for Type-S coho into an Integrated Harvest program.

3.3 LATE WINTER STEELHEAD

3.3.1 Supplementation Strategy

The reintroduction strategy for steelhead will rely on two life stages: smolts and adults. Since relatively few native steelhead adults are currently available, approximately 50 adults from the native population will be collected through existing traps and in-river netting. Potential broodstock will be screened through microsatellite analysis (or appropriate alternative) and assigned a probability of belonging to the Lewis River indigenous stock. Only broodstock that meet criteria as outlined in the AOP will be retained for potential

[16] The ACC raised concerns that EDT estimates of carrying capacity may be too low, and suggested more fish be released upstream of Swift. The EDT release exceeds the 6,200 recommended in the Lewis River Fish Planning Document.
[17] The plan uses the HSRG assumption (HSRG 2004) that it will require 3-4 generations to build a truly wild stock that can be used for integrating into the hatchery environment. Until this occurs, the HSRG does not recommend the development of an Integrated program.

spawning. This ensures with reasonable certainty that the program is using only native broodstock for reintroduction.

Up to 50,000 smolts will be produced from captured native winter steelhead broodstock. Upon return, adults from this program will be transported upstream of Swift Reservoir to rebuild a natural spawning population. Adults returning from the program smolt releases will only be used for reintroduction. Broodstock for the program will continue to be derived each year from existing native stock[18] (non-program returns) in order to improve the effective population size of the reintroduced stock. Supplementation will be conducted for 15-years, unless otherwise determined by ACC through adaptive management. Throughout this period there are no proposed trigger points that would discontinue the program prior to its completion. The 15-year period was selected as it is required in the Agreement (Section 8.5.1) with provision for continuation of supplementation.

3.3.2 Broodstock Origin

Broodstock for the reintroduction efforts will come from native late winter steelhead returning annually to the North Fork Lewis River or Cedar Creek if necessary. Since each potential broodstock is assigned a genetic probability as to origin, native broodstock are the most appropriate for use in the supplementation program.

As the program continues to collect native broodstock from the Lewis River it is important to closely monitor the extent of broodstock mining on the natural population. Thus, an objective of this program is to reduce the reliance on mining native broodstock downstream of Merwin Dam. As natural production increases upstream of Swift Dam through supplementation, the number of adult returns originating upstream of Swift Dam should also increase; thereby reducing the need to mine native broodstock. A proposed approach to meet this objective is described in Table 3-2 below:

[18] Within 4 years after the first release of transported adults upstream there is no accurate method to determine potential broodstock origin from naturally spawning population upstream of Swift Dam or downstream of Merwin Dam.

Table 3-2. Priorities for use of hatchery and natural origin late winter steelhead broodstock (NOR)

Generation after Introduction	Broodstock Source, Number and Composition
1st Generation (3-4yrs)	All broodstock for juvenile supplementation releases obtained from native adults (50 fish goal) all adult returns from the juvenile program transferred upstream of Swift Dam; 500 minimum total adults is the target.
2nd Generation (5-8yrs)	All broodstock for juvenile supplementation releases obtained from native adults (not adult returns from supplemented juveniles); all adult returns from the juvenile supplementation to be transported upstream; 500 minimum total adults is the escapement target.
3rd Generation (9-12 yrs.)	All broodstock for juvenile supplementation releases obtained from native adults (not adult returns from supplemented juveniles); all adult returns from the juvenile supplementation; 500 minimum total adults is the escapement target
4th Generation (12-15 yrs.)	Juvenile supplementation program may be suspended after ACC review and decision; all adults with intact adipose fins and non-stubby dorsal fins arriving at MCF released upstream of Swift Dam

The approach described above should only be used as a guide for adaptive management decisions by the ACC. The decisions for broodstock use, composition of broodstock, and continuation or suspension of the juvenile supplementation program should be based on monitoring of survival rates and productivity upstream of Swift Dam as well as demographic and genetic risks to the supplemented population.

3.3.3 Broodstock Collection and Mating

Broodstock for the smolt release strategy will be collected so that fish for this program will represent the entire run timing of the returning population. Returns from the juvenile supplementation program will not be used as broodstock. Instead, 100 percent of the broodstock will be collected each year from the natural origin population in order to improve the effective population size of the reintroduced stock.

Because fish are collected both at traps and through in-river netting it should be possible to collect a sufficient number of broodstock throughout the duration of this program to reduce founder effects to the progeny produced each year and over the duration of the program.

This assumes that spawning crosses are representative of a robust broodstock source and not just a few crosses (families). Since adults released upstream of Swift Dam will select their own mates, only the juvenile portion of the program requires mating protocols. There is concern that founder effects could adversely affect the native population by releasing large numbers of program smolts into the system that would then spawn as returning adults with the native population downstream of Merwin Dam. This is especially troublesome if the release is represented by relatively few parents as this increases the risks of inbreeding, reduced effective population size and potential for a Ryman-Laikre effect to occur (Ryman and Laikre 1991) within the native population. Recommended methods to quantify this risk will be evaluated by the H&S subgroup and regional experts and incorporated into the AOP each year.

Spawning protocols for the juvenile program should strive for selective neutrality and ensure that the maximum genetic effective number of breeders is represented in the population. Additionally, after disease certification has been met, all broodstock will be "live-spawned" and returned to the river when spawning is complete to minimize impacts to this species. Generally, pairwise mating protocols will be followed with male backup (if available). However, in highly fecund females mating protocols should strive for 2x2 factorial crosses to maximize genetic diversity within that family.

3.3.4 Incubation and Rearing

Steelhead for this program will be incubated and reared at Merwin Hatchery following the protocols described in the most recent WDFW winter steelhead HGMP (WDFW and PacifiCorp Energy, 2014c). The goal of the program will be to produce a one-year smolt that will rapidly emigrate from the system. The target release size will be between 4.8 and 8 fish per pound with a condition factor of < 1.0 and fork lengths between 180 – 210 mm. These targets were chosen to reduce residualism in undersized juveniles and maximize survival for adult supplementation which is consistent with HSRG recommendations (HSRG 2014). In order to reach these goals, early rearing water may need to be heated in order to allow multiple egg takes to be combined into a single rearing unit, and to reach the goals for release size.

HSRG guidelines should be incorporated to the extent possible with this integrated program to ensure that hatchery effects are minimized and risks to the endemic population are minimized. This may include rearing strategies that produce an actively migrating smolt that has behavior and condition factors that mimic natural smolts to the extent possible.

3.3.5 Release Location and Numbers Released

Up to 50,000 smolts will be volitionally released starting in April, to coincide with smolt outmigration timing of natural origin outmigrants. Currently, hatchery managers note that facilities are insufficient to allow for a true volitional release directly into receiving waters. Instead, fish will have to volitionally migrate from the raceways (or ponds) to a collection facility, and then transported and released as directed by the Annual Operations Plan for

late winter steelhead. The release location will be sited so that the recovery of returning adults is maximized (i.e., trapping efficiency is maximized). Smolts that do not volitionally migrate at the end of the volitional period will be collected and transported downstream of Eagle Island and released. All returning adults collected through traps and tangle netting will be released upstream of Swift Dam to spawn naturally.

4.0 MONITORING & EVALUATION OBJECTIVES

Monitoring activities in the Lewis River basin as they relate to the Lewis River Settlement Agreement and FERC operating licenses are contained in two plans:

1. Aquatic Monitoring and Evaluation Plan (AMEP) – June 2010

2. Lewis River Hatchery and Supplementation Plan – December 2009

The AMEP comprises the majority of monitoring and evaluation (M&E) activities in the basin including fish passage performance monitoring and life history performance of reintroduced species upstream of Merwin Dam. An additional requirement of the AMEP is to monitor the effectiveness of the H&S plan in meeting its goals and objectives (Section 9.5 of the Agreement).

The H&S plan emphasizes hatchery monitoring and the effects of hatchery production on native species downstream of Merwin Dam. Additionally, monitoring of coho, spring Chinook and winter steelhead abundance and distribution of both juvenile and adults downstream of Merwin is a primary focus of the plan along with supplementation protocols.

This section describes the M&E Objectives of the hatchery and supplementation program which are consistent with the Agreement, current Hatchery and Genetic Management plans and supportive of HSRG recommendations as required under the Agreement and FERC operating licenses. This section is divided into four main groups each containing a series of objectives including: (1) Hatchery Effects, (2) Hatchery Operations, (3) Supplementation Program and (4) Life History Metrics. In addition to these, harvest effects are briefly discussed with respect to harvest impacts on reintroduction programs. Study design, methodologies and standards (or targets) for each objective will be provided annually in the AOP for this program or as part of the AMEP. Whether objectives are met or not will be reported annually in the annual operating report. The AOP is a collaborative document and changes may be made to adaptively manage and incorporate new technology and monitoring practices as they develop. Additionally, M&E objectives contained in this section are not intended to be all inclusive and addition or subtraction of these objectives is entirely possible through adaptive management and the AOP process.

4.1 HATCHERY EFFECTS OBJECTIVES

The Agreement (Section 9.5) requires that the H&S Plan incorporate M&E protocols that can determine whether or not hatchery origin fish are a significant limiting factor to the establishment of self-sustaining, naturally producing, harvestable runs. The term "significant" is problematic since no numeric value has been assigned to the term. The task of defining significance shall be determined by the H&S subgroup. A recommended approach to define whether hatchery stocks are a limiting factor is to determine if HSRG recommendations are being met with respect to pHOS, PNOB and PNI.

Regarding supplementation programs upstream of Swift Dam, hatcheries provide the fish needed for the reintroduction effort, therefore any effects these fish may have on program success will have to be accepted for reintroduced populations. Long-term, the H&S Plan calls for eliminating all hatchery releases upstream of Merwin Dam if data indicate that runs achieve the self-sustaining goal established in the Agreement.

Reintroduction efforts typically follow three phases to establish a self-sustaining population in a location where natural production of reintroduction species does not exist (e.g., upstream of Merwin Dam).

- **Phase 1 – Colonization:** During this phase the reintroduction effort is initiated by releasing adult or juvenile fish or both life stages (e.g., spring Chinook) into the natural environment. The expectation is that fish released into the natural environment will produce offspring that return as adults and provide natural production that will contribute to establishment of a self-sustaining natural origin population in future years. The goal of this phase is to reestablish spawning and rearing fish, and initiation of this process typically occurs with hatchery origin fish.

- **Phase 2 - Local Adaption:** This phase begins when the natural origin population has been reestablished and abundance is approaching self-sustaining levels. In this phase the focus shifts from just reestablishing a population to reducing use of hatchery origin fish and letting the population adapt to natural spawning, incubation and rearing conditions. A steady reduction in the number of hatchery fish used in the reintroduction program should occur during this phase with the goal of moving the natural origin population towards self-sufficiency.

- **Phase 3 – Stabilization:** This phase begins when the natural origin population becomes self-sustaining. During this phase use of hatchery fish should be consistent with HSRG standards or eliminated completely. The goal now is to allow the productivity of the natural origin population fluctuate in response to changing environmental conditions. Ultimately, the goal for this phase, and the entire reintroduction program, is that the population becomes a self-staining natural origin population that can persist over a wide range of environmental conditions, both freshwater and ocean.

Currently all reintroduction or supplementation efforts are in the colonization phase and will likely remain in that phase for the duration of this version the H&S Plan. Adult abundance, pHOS and smolt production will be used to evaluate the status of each population with respect to which phase they are in.

Section 8.6.1 of the Agreement provides for the production of 20,000 pounds of resident rainbow trout to be planted into Swift Reservoir each year. The size and plant timing of these fish has varied over the years and the effect of these plants on progeny from

supplementation programs has not been fully evaluated. Therefore, Objective 1 is added to evaluate the effects of resident rainbow trout plants on supplementation programs.

Objective 1: Evaluate the effects of hatchery plants on reintroduced species

Resident trout plants in Swift Reservoir shall be evaluated periodically to determine impacts on reintroduced anadromous fish and native bull trout populations. Impacts can include direct predation or potential competition for limited food sources present in an already oligotrophic reservoir. In 2014, the opening trout season was delayed to the first Saturday in June and thus stocking schedules were delayed to the last week of May. This action provides some protection to predation on (subyearling) progeny of naturally producing transport species.

Competition for food resources and predation in Swift is currently being evaluated through stable isotope studies of all species. Collection activities started in 2013 and will continue through 2014. Results from this work should indicate whether planted rainbow diets are similar to those of transport species, or if planted rainbow are consuming progeny of supplementation species. The ACC will then need to determine whether modifications to the existing rainbow trout plants are warranted and provide recommendations as to what those modifications shall be as stipulated in Section 8.6.3 of the Agreement. Further study designs to evaluate the effects of hatchery plants on reintroduced species will be described in the AMEP or H&S AOP.

To monitor the effects of hatchery production on native or natural origin fish, the following monitoring and evaluation objectives should be considered as a minimum for areas downstream of Merwin Dam:

Objective 2: Determine adult composition (pHOS) of late winter steelhead, Chinook and coho on spawning grounds downstream of Merwin Dam

Hatchery fish contribution to the composite spawning population (natural and hatchery) in river reaches below Merwin Dam will be used as the indicator of the level of risk hatchery origin fish pose to natural populations in this area. Based on HSRG guidelines, hatchery origin fish shall not make up more than 5 to 30 percent of the total natural spawning population depending on the designation of that population (Table 4-1). Spawning and carcass surveys would be used to document whether these criteria are being met each year for spring Chinook and coho. Determining the proportion of HOR late winter steelhead on the spawning grounds is more complicated and less accurate due to iteroparous life history of steelhead. Methods to determine pHOS for steelhead have been proposed in the AOP; however, it is unclear whether these methods (e.g., double floy tagging, netting spawning steelhead) will result in accurate assessments of this objective or whether the effects of these methods will have a detrimental effect on steelhead spawning success.

Results of surveys for each species will be included in the AOP. Note that fish with an intact adipose fin (and no tags) are considered and treated as fish of natural origin regardless if

one or both parents were of hatchery origin. Also for coho, a number of egg box programs on the North Fork Lewis River and Cedar Creek have operated for over a decade. This complicates estimates of pHOS as adult returns from these fish would be considered as natural origin despite being spawned in the hatchery.

Whether or not hatchery programs should be changed if this criterion is violated, is the responsibility of fishery managers and likely a key requirement in the hatchery and genetic management planning process. Options for reducing impacts could include the development of new hatchery release strategies, reduction or elimination of some hatchery programs, harvest management or other removal means of hatchery fish.

Table 4-1. HSRG criteria for populations designated as primary, contributing or stabilizing as defined by the Lower Columbia Fish Recovery Board.

Species	Program	Population Designation	$pHOS_{Eff}$	PNI
Spring Chinook	Hatchery	Primary	< 5%	> 0.67
Coho*	Hatchery	Contributing	<10%	> 0.50
Early Winter Steelhead	Hatchery	Contributing	<10%	> 0.50
Late Winter Steelhead	Supplementation	Contributing	<30%	> 0.50
Spring Chinook	Supplementation	Primary	<30%	> 0.67
Early Coho	Supplementation	Contributing	NA	NA

Source: Lower Columbia Fish Recovery Board, 2010

NOTE: In determining the Proportionate Natural Influence (PNI), the HSRG does not recommend using just census data for fish on the spawning grounds. Rather, the HSRG refers to the effective pHOS which takes into account the reproductive success of hatchery origin fish relative to natural origin spawners. Because the native spring chinook population is extirpated from the Lewis these criteria don't apply but as natural production upstream of Swift Dam increases over time it is important to understand that pHOS should ideally be zero.

Objective 3: Develop and monitor protocols to reduce hatchery effects on juvenile native and ESA listed species present downstream of Merwin Dam.

A primary impact to naturally spawning fish populations downstream of Merwin Dam come from hatchery operations. The release of over 3.5 million hatchery juveniles annually to the North Fork Lewis River downstream of Merwin Dam put natural origin and native stocks at risk from competition, predation and disease. The H&S Plan attempts to reduce these risks by operating the hatchery programs consistent with HSRG guidelines to the extent possible. This includes rearing strategies to produce smolts that migrate quickly and released downstream of key spawning areas. Annual Operating Plans for each species will specify

the methodology for applying HSRG recommendations, guidelines and monitoring metrics and at the direction of the H&S subgroup to achieve recovery plan goals.

Objective 4: Estimate Juvenile release behavior or residualism after release from hatcheries downstream of Merwin Dam

Hatchery origin smolts released from Lewis River hatchery should be tracked periodically to assess residency time and spatial distribution of smolts during emigration from the Lewis. Tracking through trapping, seining or radio telemetry will be determined in the AOP for each year. Radio telemetry provides the most complete information on residency time, migration rates and holding areas. Radio telemetry studies have been performed in the past during different flow regimes on coho (Table 4-2). Additional studies are necessary to assess different rearing strategies, release sizes or release timing for each species.

Previous telemetry studies focused on coho smolts but could apply to spring Chinook or steelhead smolts. Residency time of coho smolts at the 50 percent threshold was approximately 15 days for both years. After 22 days, approximately 40 percent of the released smolts were still detected in the river. The primary concern for producing smolts that emigrate quickly is to potentially lessen the effect they may have on other protected species within the basin namely fall chinook. Table 4-2 provides a summary of residency time observed in 2001 and 2002.

Table 4-2. Comparison statistics between coho smolt releases at the Lewis River Hatchery in 2001 and 2002.

STATISTIC	2001	2002
Sample Size (n)	15	30
Mean Smolt Length (FL, mm)	161	153
Fork Length Range (mm)	150-185	137-174
Standard Error	2.5	1.35
Standard Deviation	9.67	7.38
RESIDENCY TIME		
% remaining after 3 days	87	80
% remaining after 10 days	73	50
% remaining after 15 days	60	50
% remaining after 22 days	40	40

Full telemetry study reports describing these results can be found on the PacifiCorp Energy website under relicensing reports (AQU-11) at www.pacificorp.com/es/hydro/hl/lr.html#

4.2 HATCHERY OPERATIONS AND PRODUCTION OBJECTIVES

Objective 5: Produce an annual hatchery operations report

Hatchery operations include many activities including spawning, rearing, feeding, pathogen testing, permit compliance, fish marking and trapping counts. Each year the WDFW produces an annual report that includes a number of metrics. At a minimum this report should include the following metrics to monitor and ensure that fish health is not compromised:

- Rearing conditions by life stage (e.g., flow indexes, densities)
- Tracking consistency of programs with HSRG guidelines
- Disease presence, prevention (treatments) and loss by life stage
- Growth rate by month from fry ponding to release as smolts
- Length and condition factors (subsample) for each species at release
- Number of fish tagged, tag type, tag codes and purpose (experimental, production, other?)
- Number of adults (including jacks) collected, spawned, recycled, and sent to food banks or other disposition options.
- All fish transfers in or out of basin including species, number, marks and life stage
- Number of natural origin fish (no AD clip) collected, origin (if possible) and disposition
- Number of hatchery origin fish collected that originated from outside of the Lewis River basin (based on CWT tag data)

Objective 6: Monitor rearing conditions to be consistent with producing a high quality smolt that emigrates quickly with a relatively high rate of survival

Smolts produced through the hatchery programs should produce smolts that will leave the system quickly to minimize adverse effects to native or naturally produced smolts. These smolts should also have freshwater survival that surpasses naturally spawning populations (HSRG 2009). To accomplish this, rearing practices should produce a high quality smolt that is released when fish are smolting. This may include alternate rearing vessels (e.g., use of circular ponds) or strategies (feed rates, densities, release timing). The AOP process should strive to improve smolt quality for species that show low relative survival (e.g., spring Chinook).

Objective 7: Monitor hatchery upgrades

Schedule 8.7 of the Agreement includes a number of upgrades for all three facilities. These upgrades include pond reconstruction, modification to intakes and sorting facilities and controls upgrades. Most of these upgrades will have been completed by the end of 2014. These upgrades should continue to be monitored to ensure that the objectives of hatchery production are being met (e.g., rearing conditions and density), follow HSRG recommendations and conform to the biological opinion for artificial production (NMFS 1999). Section 8 of this plan provides current status of these upgrades.

Objective 8: Adopt release strategies that are consistent with HSRG and HGMP recommendations

The primary goal of Segregated hatchery programs is harvest and to reduce interaction of hatchery origin fish with natural origin migrants. One method to accomplish this is to release smolts downstream of NOR spawning areas. This is not entirely possible on the Lewis as coho and spring Chinook releases are done at Lewis River Hatchery and some overlap or mixing of natural and hatchery origin smolts does occur. The consequences of this overlap should be monitored and adjusted if necessary or as required through HGMP implementation.

Objective 9: Monitor production levels and program release numbers

Hatchery production and final release numbers are affected by a number of factors including achieving broodstock targets, disease outbreaks and operational or mechanical failures at the facilities. Hatchery managers along with pathologist routinely monitor fish health at the facilities as directed by state protocol. Mechanical failures at the facilities may occur, however, mechanisms that support fish health and life are given high priority with respect to maintenance. Production levels and final release numbers are provided each year for each species in the annual hatchery operations report.

Production levels may change during the implementation of this plan as stipulated in Section 8.3.2 "Modification to Hatchery Production" of the Agreement. Hatchery production may be reduced (subject to a hatchery floor) when natural production levels upstream of Merwin Dam increase to a specified threshold level. Ocean Recruit analysis will provide the data necessary to make this determination every year after the initial five year period.

Production levels may also change from changes to the Hatchery Genetic Management Plans required for production of ESA listed species and their impact to other listed species in the basin. Production changes related to ESA compliance would require changes to the FERC operating licenses and Agreement.

Objective 10: Submit and gain HGMP approval for all hatchery programs on the Lewis River.

The H&S Plan must be consistent with HGMP provisions once approved by the NOAA. An approved HGMP is required to maintain hatchery programs on the Lewis River. Hatchery programs are necessary to continue the H&S program. Thus, HGMP approval is a key component to maintaining hatchery and supplementation programs necessary to meet reintroduction objectives.

4.3 SUPPLEMENTATION PROGRAM OBJECTIVES

Objective 11: Routinely monitor effective population size for returning native winter steelhead and the potential for" Ryman-Laikre" effects on native winter steelhead population from supplementation activities.

As of 2014, the winter steelhead supplementation program has been ongoing for 6 years. Program fish (those with blank wire tags) began returning to the Lewis River in 2012. The effect these fish have on the native winter steelhead population downstream of Merwin Dam is unknown and difficult to quantify. The AOP should provide the means to quantify these effects whether beneficial or adverse to the native spawning population. Determining family representation in each return year, determining the proportion of hatchery origin (pHOS) spawning downstream of Merwin Dam (if possible) and ensuring that as many program fish are transported upstream should be a priority. There are no practical means to tell the difference between program fish that have lost their tag or progeny from naturally spawning program fish from true native stocks. This is of particular importance especially if family representation in any particular cohort is very small or disproportionate. In these instances, fitness of the native population will be adversely affected when these cohorts return to spawn with true native winter steelhead. Metrics such as effective population size and inbreeding coefficients should be developed and estimated on an annual basis to monitor this population to adaptively (and proactively) make decisions that limit impacts to the native population (e.g., random pairwise mating, number of broodstock used, family representation in program returns).

Objective 12: Sampling protocols for supplementation adults returning to traps or in-river capture

Beginning in 2012, the supplementation program received its first return year of winter steelhead. These fish are identified by a blank wire snout tag. Supplementation spring Chinook and coho that are progeny from adult supplementation programs will have no tags, and therefore identified as of natural origin. For winter steelhead returning to the MCF, a genetic subsample of all returns over the run period should be taken to estimate the family representation in the run for each production cohort. For unmarked spring Chinook and coho, these fish would be transported upstream either as program returns or fish of natural origin that volunteered into the trap. Additional sampling or tagging (if necessary for upstream monitoring purposes; e.g., PIT tagging) of these fish would be determined by the H&S subgroup and included in the AOP.

Objective 13: Effects of upstream adult and juvenile supplementation on ESA listed Species

The hatchery and supplementation program may pose ecological and disease risks to the native bull trout population and other resident species through anadromous and resident fish plants. The large releases of both hatchery origin juveniles and adults may result in increased competition for both food and space that may reduce bull trout abundance. Conversely, the expected increase in marine-derived nutrients resulting from the adult supplementation program, and increased prey base, may increase the food availability resulting in greater bull trout abundance

Comments received from the ACC on the first draft H&S Plan indicated concern about the effects of reintroducing anadromous fish upstream of Merwin Dam may have on ESA listed bull trout and other resident species. For example, a concern was expressed that if coho entered and spawned in Rush Creek or Cougar Creek, they may negatively impact bull trout spawning success.

The AMEP proposes to conduct carcass surveys of all available habitat upstream of Swift Dam to sample and count carcasses, determine the extent of distribution, perform redd counts and determine spawning success. Redd superimposition of adult coho is also documented through ongoing bull trout monitoring (Objective 19 of the AMEP) as coho and bull trout occupy the same habitat in which to spawn. These data should provide information to identify those areas where species may compete and the extent of impacts with respect to redd superimposition.

Once these effects are documented and quantified, the ACC may recommend actions necessary to help mitigate adverse impacts to ESA or other resident species. However, any actions should be consistent with the Agreement goals. The H&S Plan assumes that since bull trout and other species were present historically in areas upstream of Merwin Dam, the reintroduction program would simply restore ecological function in the system. Impacts such as bull trout predation on anadromous juveniles or vice-versa are simply accepted. However, the eruption of Mt. St. Helens in 1980 continues to impact spawning and rearing availability for bull trout and reintroduced anadromous species (e.g., Muddy Pine, P8 and Smith creeks). The sudden large influx of salmon has the potential to negatively affect the bull trout population more than anticipated. PacifiCorp continues to monitor the population during reintroduction to evaluate impacts from supplementation as part of Aquatic M&E plan objectives. Consultation with regulatory agencies occurs on an annual basis to review results from monitoring, identify negative effects and develop additional monitoring actions or provide recommended fishery management changes if instability with the bull trout population should happen.

4.4 LIFE HISTORY OBJECTIVES

Objective 14: Estimate juvenile and adult abundance of winter steelhead, coho and spring Chinook downstream of Merwin Dam

Obtaining accurate and precise abundance estimates of outmigrating smolts in systems such as the North Fork Lewis River is problematic because of the size of the river and fluctuating flows during migration periods. Methods to estimate abundance almost always rely on mark recapture techniques. Collection methods (e.g., traps, netting, seining) must be able to obtain a statistically valid sample size for marks and have the ability to recapture an adequate number of marks to develop a practical estimate for each species. Through the AOP process a system will need to be developed that meets capture efficiency standards to provide estimates of smolt abundance for each species.

Adult abundance estimates will be performed through a combination of redd surveys (steelhead) and carcass counts (salmon). Carcass surveys have been performed for fall chinook since the early 1980's. These same methods will be used to estimate abundance for spring Chinook and coho salmon. To estimate variance for carcass estimates, Jolly-Seber methods (or acceptable alternative) will periodically be used to confirm that precision goals are being met with this methodology.

Objective 15: Determine spatial and temporal distribution of spawning winter steelhead, spring Chinook and coho downstream of Merwin Dam

Monitoring temporal and spatial distribution of spawning locations downstream of Merwin Dam in the mainstem and tributaries should have the ability to detect changes (± 15%) over time with a reasonable amount of certainty (≥80%)(NOAA 2006). The use of index areas within the mainstem downstream of Merwin Dam is not necessary as a complete (or nearly complete) census can be accomplished with acceptable levels of effort. Tributary systems however likely require a probabilistic sampling approach due to the difficulty in accessing these areas and the large geographical area encompassing the available habitat downstream of Merwin Dam.

4.5 HARVEST EFFECTS

The H&S Plan assumes that resource managers have in place a well-designed harvest-monitoring plan sufficient to develop accurate estimates of:

- The number, age and sex of marked fish captured in fisheries and pHOS.
- Survival rates for natural origin fish captured in fisheries and released.
- Stray rates based on CWT's recovered in other basins.
- Double Index Tagging (DIT) Group harvest rates
- Harvest goals expressed in terms of number of fish for the Lewis River terminal fishery (HSRG 2010).

These estimates are used by both regulatory agencies and the Utilities to generate ocean recruit estimates for both hatchery and supplementation programs, to manage and set harvest regulations, to meet hatchery production goals and to meet HSRG recommendations such as pHOS, pNOB and PNI for both Integrated and Segregated programs.

Harvest management is the responsibility of the resource agencies. Because policies and regulations change often and because these changes may impact the reintroduction program the H&S subgroup should review proposed changes during annual AOP planning meetings and provide recommendations as needed to the resource agencies.

A key assumption in the H&S Plan is that the implementation of selective fisheries by the co-managers creates a harvest program that still allows for significant recreational and commercial harvest without jeopardizing the success of the reintroduction program. This is difficult to accurately measure because mark selective fisheries increase the uncertainty and bias in the estimates of angler impacts on native or natural stocks (ISAB 2005). Therefore, for management purposes it is assumed that fishery impacts would be managed based on the data presented in WDFW's Hatchery and Genetic Management Plans (www.nwr.noaa.gov/Salmon-Harvest-Hatcheries/Salmon-Fishery-Management/Fishery-Plans.cfm) and through adaptive management policies required to protect and preserve listed species.

5.0 FISH MARKING STRATEGIES

A fish marking program is needed to not only identify the origin (NOR or HOR) of adults returning to adult collection facilities, but also to determine if hatchery and supplementation goals are being achieved through estimates of ocean recruits.

Currently, juvenile fish released from Lewis River hatchery facilities are marked to quantify overall survival rates, contribution to fisheries (ocean and freshwater), stray rate, and the proportion of hatchery origin fish that spawn naturally in the basin. Fish released from the hatchery are generally distinguished through a combination of marks:

- Adipose Clip: This mark is used to inform fishers and managers that the fish is of hatchery origin. These fish can be retained in selective fisheries. Nearly all hatchery fish released in the Lewis River are mass marked in this manner: the two exceptions being double-index tag (DIT) groups and native winter steelhead smolt releases.

- Adipose Clip + CWT: A subset of the spring Chinook and coho salmon released are also marked with a CWT inserted into the nose. The CWT is used to determine overall survival rates of release groups, harvest rates, and stray rate into other basins etc.

- Adipose Present + CWT: This group is referred to as the DIT group and is used to estimate the impact mark selective fisheries have on natural populations (See Appendix C for more detail). In these fisheries, fish captured with adipose fins are released while adipose clipped fish are retained. The difference in survival between these groups quantifies harvest impacts to hatchery stocks.

- Adipose Present + BWT: This group represents late winter steelhead program releases. Adult steelhead returns possessing an adipose fin AND wire tag in the snout identifies these fish as program fish and thus are passed upstream upon capture at the MCF or Lewis River Hatchery traps to spawn naturally.

- PIT tagging: Ten percent of the spring Chinook reared at Speelyai Hatchery for release into acclimation sites are PIT tagged in the body cavity to assess site performance. A portion of late winter steelhead may also be PIT tagged to differentiate releases from circular tanks as opposed to standard rectangular hatchery ponds to determine relative survival.

All fish returning to adult collections facilities and transported upstream in the Lewis River are to be 100 percent mark-sampled to ensure that adult fish are transported and released to the correct location of origin of either Yale or Swift reservoirs.

As natural production upstream of Swift Dam increases it is suggested that the DIT group be eliminated and replaced by marking natural origin migrants. By using natural outmigrants, instead of hatchery smolt surrogates, the accuracy of ocean recruits estimates is improved for the natural production component.

A marking program will also be needed for managing the supplementation component of the H&S Plan. If the Yale downstream collector is built, outmigrating smolts will need to be differentially marked so that upon their return to adult handling facilities they can be sorted, transported and released into one of two areas:

1. Upstream of Swift Dam

2. Between Yale and Swift Dam

Once passage occurs at Merwin Dam, all fish will be passed into Merwin Reservoir where they sort themselves out as to whether they want to stay in a particular reservoir or move upstream.

As is the case with the hatchery releases, marking will be needed to determine the success of the supplementation program for Yale and Swift.

The proposed marking scheme for hatchery, supplementation and natural origin fish is presented in Table 5-1. The marking program emphasizes the use of CWT's for spring Chinook and coho, and blank wire snout tags for steelhead because few steelhead are captured in ocean fisheries. PIT tags are recommended for small differential marking programs such as acclimation fish or to evaluate rearing strategies for late winter steelhead.

No marking program is proposed for natural outmigrants in Swift or Merwin reservoirs as by the time fish production occurs at Merwin Dam, adult passage facilities will have been built at Yale and Swift; thereby allowing the fish to self-sort. And until such time that Yale downstream passage is finished all transport fish entering the traps will be transported upstream of Swift Dam.

Table 5-1. Marking program for hatchery and supplementation plants, and natural origin spring Chinook, coho and steelhead.

	Mark or Tag			
	Downstream of Merwin Dam	**Swift**	**Yale**	**Merwin**
HATCHERY				
Spring Chinook	• 950,000 AD only • 150,000 CWT only (DIT) • 150,000 CWT + AD			
Coho	• 1,700,000 AD only • 150,000 CWT only (DIT) • 150,000 CWT + AD			
Steelhead	100% AD clip			
Rainbow		100% AD clip		
Kokanee				None
SUPPLEMENTATION				
Winter Steelhead (Juveniles)	100 percent blank wire snout tag; additional PIT tagging on Circular Tank reared fish			
ADULTS Winter Steelhead Early Coho Spring Chinook		None*	None*	None*
Spring Chinook Juveniles (acclimation)		10 % PIT tagged	10 % PIT tagged	10 % PIT tagged
NATURAL OUTMIGRANTS				
Winter Steelhead Early Coho Spring Chinook		None	100% Marked**	None

* Although there is no plan to tag returning transport species there may be select tagging to one or all transport species for needed evaluations. **Differential marking will be required prior to Yale downstream collector to identify adult returns originating either from Yale or Swift dams. AD = Adipose Fin; CWT = Coded Wire Tag.

6.0 ADAPTIVE MANAGEMENT

This section provides the framework to actively and adaptively manage the hatchery and supplementation program on an annual basis. The H&S Plan provides a general framework and specifies targets or goals. The means to reach these goals and monitor performance of the plan will be identified on an annual basis. The AOP is a document produced by December 31 of each year that contains specific information and methodologies that will be used in the following year to meet the objectives of the H&S plan. The AOP is a collaborative effort that includes federal, state, tribal and private managers. The AOP has the ability to change program direction during in-season field work and of course through annual planning meetings.

In addition to annual planning, the H&S Plan has provisions contained within the Agreement that provides periodic revisions and review to facilitate and incorporate adaptive management. These two provisions are summarized below:

6.1 COMPREHENSIVE PERIODIC REVIEW

Section 8.2.6 of the Agreement calls for an independent review of the program in year five after reintroduction of transport species into each reservoir. Reintroduction into Swift began in 2012 and this independent review will be performed in 2017. This review will continue even if no reintroduction occurs in Yale or Merwin. The review will assess various components of the H&S Plan including impact of the reintroduction program on listed species, whether goals are being achieved and the efficiency of the hatchery operations. The review will also provide recommendations regarding ongoing management of the program. These recommendations may be incorporated as amendments to the plan pursuant to Section 8.2.5 and 8.2.6 of the Agreement.

6.2 FIVE YEAR PLAN MODIFICATIONS

The H&S Plan shall be updated and modified if necessary at least every five years. Updates or modifications to the plan are to be completed through Consultation with the ACC and require approval of the Services. Modifications to the plan may also be required through approval of the Hatchery and Genetic Management Plans for the North Fork Lewis River hatchery facilities. Approval of these plans is not yet complete and if inconsistencies are identified between the H&S Plan and approved HGMP's the H&S Plan will be amended to reflect these changes.

6.3 KEY QUESTIONS FOR ADAPTIVE MANAGEMENT

The major assumption, or hypothesis, being tested in this plan is whether hatchery origin fish can be used to restore anadromous fish production above a series of dams. The primary goals of this program are:

> ***To achieve self-sustaining, naturally producing, harvestable fish runs upstream of Merwin Dam.***

The H&S Plan assumes that the best approach for achieving these goals is to rear fish using HSRG guidelines, and to implement a juvenile and adult supplementation program to restore anadromous fish production upstream of Merwin Dam. It is assumed that these actions will not only be successful, but also that they will have acceptable effects on resident fish populations such as bull trout as well as coho, Chinook, chum and steelhead downstream of Merwin Dam.

To be successful in meeting the H&S goals above, runs of coho, winter steelhead and spring Chinook upstream of Merwin Dam must not only become self-sustaining, but remain self-sustaining in the presence of harvest. The level of harvest is not defined in the Agreement as this level cannot be defined until runs are considered self-sustaining. That is, the need for hatchery supplementation is no longer needed. Once runs become established and self-sustaining without the need for hatchery supplementation, the ACC along with harvest managers should develop a harvest policy that is compatible with the goal of maintaining self-sustaining runs.

The following key questions (or subset of them) will be addressed during the first comprehensive periodic review of the H&S program scheduled for 2017. This should allow adequate time to collect and analyze data to provide answers to these key questions. Depending on the results and answers to these key questions the ACC may need to make changes to the H&S plan and program to ensure that the primary goal stated above is being met or the plan is implemented in such a way that the goal has a reasonable chance of being met.

6.3.1 HSRG Guidelines

The H&S Plan relies on HSRG guidelines as the scientific basis for hatchery operations. However, these guidelines have never been tested, but simply represent HSRG understanding of best management practices for hatcheries attempting to achieve conservation or harvest goals. Although the H&S Plan will not attempt to validate these guidelines, data is needed to ensure that the recommendations are being carried out.

Of critical importance in the success of the reintroduction program is whether or not managers can effectively control the mix of natural and hatchery origin fish downstream and upstream of Merwin Dam.

Key Question:

Can the hatchery programs be operated consistent with HSRG guidelines to meet recovery goals?

Key Decision Point

If data collected as part of the H&S Plan, AMEP or by resource management agencies conclude that the guidelines can be met then the programs may continue. If not, the ACC will need to review the collected data and evaluate management alternatives.

6.3.2 Juvenile Supplementation Effectiveness

Four key research questions are associated with the juvenile supplementation program.

Is the survival and collection rate of juveniles released above Swift No.1 Dam sufficient to meet program goals?

The H&S plan recommends that hatchery juvenile supplementation and juvenile supplementation from naturally spawning adults be used to restore anadromous fish production upstream of Swift Dam. For this program to be successful, juveniles whether hatchery or from natural spawners must not only survive but be effectively collected, transported and released downstream of Merwin Dam at a rate that is sustainable.

Do supplemented juveniles upstream of Swift Dam have the same or greater SAR than hatchery fish released downstream of Merwin Dam?

There may be a survival cost associated with releasing juvenile fish upstream of Swift Dam in comparison to downstream of Merwin Dam. Juveniles released upstream of Swift Dam have to migrate through Swift Reservoir and be transported downstream to reach the lower river, which may result in significant loss. If the overall SAR for supplemented juvenile fish is found to be consistently less than for hatchery fish released downstream of Merwin Dam, then the ACC may want to revisit the need for this strategy. ***Will returning adults from the late winter juvenile supplementation program spawn successfully upstream of Swift Dam?***

The H&S Plan collects late winter steelhead adults from the river downstream of Merwin Dam, rears the off-spring as yearlings, and then releases these fish back to the river. Upon their return as adults, they are transported and released above Swift Reservoir. As the behavior of these fish is unknown, a portion will need to be radio-tagged and their distribution tracked. If these fish do not distribute themselves throughout the watershed, then the program may need to be revised. Possible changes include transporting adults to alternate release locations upstream of Swift Dam.

6.3.3 Adult Supplementation Effectiveness

What is the egg-to-smolt (or recruits per adult spawner) survival of hatchery adults upstream of Swift Dam?

Because surplus adult hatchery fish are generally available, the H&S Plan relies on adult supplementation as the only method to reintroduce Type S coho and spring Chinook upstream of Swift Dam. This strategy has been highly successful for these species on the Cowlitz River according to WDFW biologists (WDFW 2004d). For example, in 2004 WDFW estimated a smolt yield of over 300,000 coho smolts. Studies conducted during Lewis River relicensing and more recently from Eagle Cliff screw trapping results show large numbers of coho juveniles being produced from adult releases. However, as the Agreement emphasizes juvenile supplementation (as opposed to adult supplementation), species specific data are needed on the effectiveness of the adult supplementation strategy to produce smolts.

Key Decision Point

Results from carcass and redd surveys for coho and spring Chinook will be evaluated to quantify spawning and reproductive success. Estimates of smolt productivity will be derived as part of the AMEP objectives and reported annually to the ACC. The ACC will then make decisions to make program changes to be reflected in the AOP for each species.

6.3.4 EDT Modeling Results

Do EDT estimates of system productivity align with observed data?

EDT modeling was used to estimate potential juvenile and adult production originating from streams located upstream of Swift Dam. The accuracy of these estimates is unknown, but do provide a template for which to compare to observed data once fish production is re-established. The EDT estimates of production are important for they were used to set the minimum adult escapement targets upstream of Merwin Dam. Determining the accuracy of these estimates would help the ACC better adaptively manage the number of juveniles and adult released as part of the supplementation programs.

In addition, the Beverton-Holt production function produced by EDT provides managers the ability to forecast resulting juvenile production that may result from different spawner escapements. These estimates could then be compared to the estimated number of juveniles entering reservoirs and juvenile collection facilities.

Key Decision Point

In 2013 and 2014 biologists from the US Geological Survey and University of Washington are rerunning the EDT model based on updated habitat rankings from ground survey work throughout the basin upstream of Swift Dam. This should improve the accuracy of the model. Once the results from the updated EDT modeling are presented, the ACC should determine if modifications to the supplementation program numbers are needed.

7.0 EXPECTED OUTCOMES

The reintroduction outcome goal of the Lewis River Hatchery and Supplementation Program is stated as

"to achieve genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin Dam greater than minimum viable populations"

The metrics used to evaluate program success have yet to be developed. The identification of these metrics is the responsibility of NMFS and the USFWS. These two agencies (referred to as the "Services") will make this decision after consulting with the ACC, and taking into consideration the variability of the factors that may influence program success (i.e. ocean survival, fish passage success, freshwater variability etc.). According to the Agreement, the Services decision process needs to be defined prior to the later of: (a) the 27th anniversary of the Issuance of the new license, or (b) the 12th year after reintroduction of anadromous fish above Swift No. 1 Dam

The All-H Hatchery Analyzer

The All-H Hatchery Analyzer (AHA) model used in the development of this H&S Plan used current EDT habitat productivity/capacity estimates, anticipated harvest rates, and proposed hatchery operations to estimate the number of adult salmon and steelhead returning to areas upstream of Merwin Dam, the hatchery complex, and caught in freshwater and ocean fisheries.

It should be noted that the harvest and smolt-to-adult survival rates used in this analysis were approximated from the Lewis River Fish Planning Document (Cramer and Associates 2004), and comments received from WDFW on the November 2005 Draft H&S Plan. The SAR values used in the AHA analysis are shown in Table 7-1. It should be recognized that survival values could change by an order of magnitude for any given brood year[19].

[19] Note that the AHA model varies SAR by brood year over a range of SAR values.

Table 7-1. A comparison of SARs developed or reviewed as part of the development of the H&S Plan.

Species	Cramer Hatchery[1]	AHA Hatchery	EDT (Native or NOR)
Spring Chinook	0.5%- 2.2%	0.7%	3%
Type N Coho	2%-4.4%	2.2%	NA
Type S Coho	2%-4.4%	2.2%	4.8%
Late Winter Steelhead	NA	NA	6%
Winter Steelhead	1.4%-2.8%	1.6%*	NA
Summer Steelhead	6.8%-13.6%	2%*	NA

NA- Not applicable as natural origin or native fish production is not included in the H&S Plan.
1-Data taken from Table D-5, Cramer and Associates 2004 (Lewis River Fish Planning Document)
*- WDFW supplied survival estimates for winter and summer steelhead

A key difference in the SAR values used in this analysis and the Cramer and Associates (2004) analysis are the values for summer steelhead. Cramer and Associates (2004) used an SAR values greater than 6%, while this plan uses the 2% value submitted by WDFW. To meet steelhead hatchery production targets requires that the combined steelhead SAR (both species) average 4.8%. This SAR assumption would include all steelhead caught in fisheries, observed on the spawning grounds, and collected at the hatcheries or fish ladders. Because of this difference in SAR assumptions between the two analyses, the H&S Plan indicates that hatchery origin steelhead adult targets may be difficult to achieve.

The Use of Index Stocks

The Lewis River Fish Planning Document (Cramer and Associates 2004) makes a sound argument for using index stocks as a means to determine whether the success or failure of the Lewis River H&S Plan is a result of in-basin or out-of-basin factors. This information would feed into the Limiting Factors Analysis (LFA) called for in Year 27 of the license. The LFA would be used to develop a working hypothesis for why program goals were not met.

It is suggested that the Lower Columbia River spring Chinook, coho and late winter steelhead populations be used as the Index stocks for the proposed analysis. Specific Lower Columbia River salmon and steelhead populations will be identified during the development of the limiting factors analysis. Populations will be selected based on similarities to Lewis River populations and available data.

7.1 SPRING CHINOOK

The H&S Plan spring Chinook supplementation program uses 65 adults from the existing Lewis River Hatchery program to produce approximately 100,000 smolts that will be released upstream of Swift Dam (Table 7-2). The watershed upstream of Swift Dam is also seeded with up to 2,000 adults (based on a corrected (for fish passage) habitat capacity of 1,942 fish).

Table 7-2. Expected outcomes of the Lewis River H&S Plan spring Chinook program.

Phase	Broodstock	NOR's Spawning Naturally	HOR's (Supplemented) Spawning Naturally	Mixed Stock Harvest	Terminal Area Harvest	Average Adult Ocean Recruits
Supplementation Phase	65	1,159	390	372	66	~2,100
End of Supplementation	NA	1,215	NA	264	47	~1,500
Segregated Harvest Program	800 (+3,123 surplus)	NA	NA	1,308	2,319	~7,600

Ideally, the spring Chinook juvenile supplementation program will collect 100 percent of its broodstock from natural origin fish resulting from the "start-up" phase. Also, only natural origin adults would be allowed to spawn upstream of Swift Dam. Hatchery origin spring Chinook will only be used if the number of adults produced from above Swift is not sufficient to meet the broodstock needs (approximately 65 adults) or the adult supplementation objective of 2,000 adults. Under this scenario, the number of spawners of natural origin or produced from the juvenile supplementation program is expected to be approximately 1,559 adults (NOR + HOR Supplemented). Harvest occurs primarily in mixed-stock fisheries, with little harvest occurring in the terminal fishery. On average, in Years 1-12 of the program approximately 2,100 adults would be produced.

Once supplementation efforts are ended, adult escapement is reduced to 1,215 upstream of Swift Dam. Harvest still occurs primarily in mixed-stock fisheries, with little terminal harvest. However, WDFW and NOAA may alter harvest patterns as needed. The estimated number of naturally produced adult ocean recruits produced under this scenario is about 1,500 (Table 7-2).

The spring Chinook segregated harvest program represents the total catch and escapement of hatchery origin spring Chinook produced from the proposed Segregated harvest program. The total contribution of hatchery origin fish from the proposed segregated harvest program is on average about 7,600 fish (Table 7-2). This includes meeting the hatchery broodstock needs of 1,200 fish, having a surplus of 3,123 fish at the hatchery and contributing 3,627 fish to harvest (1,308 in mixed stock harvest and 2,319 in the terminal area). The expected surplus of hatchery origin fish indicates that on average, the existing

hatchery program can supply the juveniles (100,000) and adults (2,000) for re-introduction into the watershed upstream of Swift Dam.

7.2 COHO

Because of the large number of surplus early coho (Type-S) adults available from the hatchery and the potential productivity and capacity upstream of Swift Dam, no juveniles are needed for the proposed early coho supplementation program. Based on the estimates of habitat productivity and capacity, simply relying on adult supplementation (up to 9,000 adults) results in an average of 5,812 Type-S coho spawning upstream of Swift Dam (Table 8-3). Initially they will be 100 percent hatchery origin, but ultimately should consist of 100 percent natural origin fish.

Under the proposed Type S coho Segregated Harvest program, the total contribution of hatchery origin fish is on average about 19,700 (Table 7-3). This includes meeting the hatchery broodstock needs of 800 fish, having a surplus of 14,044 fish at the hatchery and contributing 4,866 fish to harvest (2,895 in mixed stock harvest and 1,971 in the terminal area). This program contributes a much lower proportion of the total run to harvest (24.6 percent) than the late coho harvest program (51 percent). However, the expected surplus of hatchery origin fish indicates that on average, the existing hatchery program can supply the 9,000 Type S adults needed for reintroduction upstream of Swift Dam.

Table 7-3. Expected outcomes of the Lewis River H&S Plan early (Type-S) coho program.

Phase	Brood-stock	NOR's Spawning Naturally	HOR's Spawning Naturally	Mixed Stock Harvest	Terminal Area Harvest	Average Adult Ocean Recruits
Type S After Supplementation	NA	5,812	NA	1,013	69	~6,900
Type S Segregated Harvest Program	800	NA	NA	2,895	1,971	~19,700*
Type-N Segregated Harvest Program	800	NA	NA	8,663	2,119	~21,000**

* Includes 14,044 surplus hatchery fish.

** Includes 9,547 surplus hatchery fish.

The proposed Lewis River Type N coho Integrated harvest program produces 900,000 smolts that are 100 percent derived from adult returns to the Lewis River Hatchery and MCF. This scenario assumes that 100 percent of the hatchery origin returns from the Integrated Harvest program return to the hatchery. The total contribution of hatchery origin fish from this program is on average about 21,000 fish (Table 7-3). This includes meeting the hatchery broodstock needs of 800 fish for on-station releases, having a surplus of 9,547 fish at the hatchery and contributing 10,782 fish to harvest (8,663 in mixed stock harvest and 2,119 in the terminal area). This program contributes a much higher proportion of the total run to harvest (51 percent) than the early coho harvest program (24.6 percent).

7.3 LATE WINTER STEELHEAD

The proposed Lewis River late-winter steelhead supplementation program (Years 1-15) uses 50 adults returning to Lewis River traps to start an Integrated supplementation recovery program. These 50 adults produce about 50,000 smolts. When these smolts return as adults, they will all be passed upstream of Swift Dam to spawn naturally. Harvest is expected to be minimal as it is assumed selective fisheries are in place. Broodstock will continue to be taken from other adult returns to the trap in order to increase the effective population size of the spawners upstream of Swift Dam. On average this strategy results in about 2,000 fish spawning of which 40 percent are from the supplementation program (Table 7-4).

Table 7-4. Expected outcomes of the Lewis River H&S Plan winter and summer steelhead program.

Phase	Broodstock[1]	NOR's Spawning Naturally	(Supplemented) Spawning Naturally	Mixed Stock Harvest	Terminal Area Harvest	Average Adult Ocean Recruits
Late-winter Supplementation Years (native broodstock)	50	1,200	800	65	108	~2,200
Late-winter After Supplementation (NOR)	NA	1,300	NA	42	70	~1,400
Early -winter Segregated Harvest Program	90	NA	NA	55	915	~1,800*
Summer Segregated Harvest Program	160	NA	NA	239	2,383	~4,000**

1-Broodstock numbers are an estimate; will vary based on fecundity and survival values for upgraded hatchery facilities

* Includes 779 surplus hatchery fish.

** Includes 1,211 surplus hatchery fish.

NA- Not Applicable

The late-winter steelhead (NOR) row represents a potential long-term supplementation program upstream of Swift Dam winter steelhead with supplementation efforts eliminated[20]. Under the conditions modeled, spawning escapement upstream of Swift Dam is ~1,300. There is harvest opportunity but it is limited to approximately 112 adults (Table 7-4).

The early winter steelhead Segregated harvest program produces approximately 1,800 ocean recruits, of which 55 adults to mixed stock fisheries and 915 to terminal area harvest. These adults were produced from a release of 100,000 smolts.

The proposed Lewis River summer steelhead Segregated Harvest program produces about 175,000 smolts that are 100 percent derived from adult returns to the hatchery. The total contribution of ocean recruits from this harvest program is on average approximately 4,000 fish (Table 7-4). This includes meeting the hatchery broodstock needs of 160 fish, having a surplus of 1,200 fish at the hatchery and contributing 2,700 fish to harvest (239 in mixed stock harvest and 2,383 in the terminal area).

7.4 RAINBOW TROUT AND KOKANEE

The proposed resident rainbow trout and kokanee programs are expected to maintain the existing recreational fisheries in Swift Reservoir and Lake Merwin; however, the potential adverse effects of these programs on reintroduced salmon and steelhead are unknown. Resident trout plants in Swift reservoir would be evaluated to determine impacts on reintroduced anadromous fish.

[20] Note that total adult ocean recruits are lower because the lower river wild later winter steelhead population is no longer being mined for supplementation.

8.0 ANNUAL OPERATING PLAN AND REPORT

8.1 ANNUAL OPERATING PLAN (AOP)

The Agreement Calls for the development of an AOP, which will be designed to implement the H&S Plan. The AOP needs to provide the following information:

1. Production Plan: Specifies the species to be reared and broodstock source.

2. Hatchery and Juvenile Production Targets: Identifies adult and juvenile targets by species for each hatchery program.

3. Fish Release Schedule: Identifies by species the rearing schedule and planned distribution of fish and the schedules and locations of release.

4. List of Hatchery Facility Upgrades: Identifies upgrades to be implemented at each hatchery facility

5. Broodstock Collection and Spawning: Describes specific spawning protocols for juvenile supplementation programs of winter steelhead and acclimation spring Chinook

6. Monitoring and Evaluation: Identifies the methods and protocols for meeting the objectives stated in the H&S Plan

A discussion of each of the six AOP elements is presented below.

8.1.1 Production Plan

The anadromous species (and stocks) to be released as part of the H&S Plan are presented in Table 8-1.

Table 8-1. Anadromous species and broodstock source of hatchery fish reared and released as part of the H&S Plan

Species and Stock	Broodstock Source
Spring Chinook	Lewis River Hatchery Complex
Type N Coho	Lewis River Hatchery Complex
Type S Coho	Lewis River Hatchery Complex
Late Winter Steelhead	Lower Lewis River Native
Winter Steelhead	Lewis River Hatchery Complex
Summer Steelhead	Lewis River Hatchery Complex

8.1.2 Hatchery and Juvenile Production targets

The adult and juvenile production targets are shown in Table 8-2.

Table 8-2. Adult and juvenile hatchery production targets for anadromous species.

Species and Stock	Adult Hatchery Production Targets (ocean recruits)	Juvenile Hatchery Production Targets
Coho	60,000	2.0 million
Late Winter Steelhead	None	50,000
Steelhead	13,200	275,000
Spring Chinook	12,800	1.35 million
Total	86,000	3.475 million

* Does not include resident species plants of rainbow and kokanee.

8.1.3 Fish Release Schedule

Hatchery release schedules are developed annually and as part of the WDFW's future brood document. Release windows may change depending on fish condition, fish weight or length but generally fish are released in a volitional manner over the period of weeks at each facility. Generally the release timing for each species follows:

Spring Chinook – October to March

Coho Salmon – April to May

Steelhead - April to May

8.1.4 Hatchery Facility Upgrades

The hatchery upgrades that have and will be implemented are provided in Table 8-3 and as stipulated in Schedule 8.7 of the Agreement.

Table 8-3. Summary of hatchery upgrades contained in Schedule 8.7 of the Agreement indicating the year in which each upgrade or task was completed (or proposed for completion).

	COMPLETION YEAR							
Lewis River Hatchery	2008	2009	2010	2011	2012	2013	2014	2015
Pond 15 and Sorting Facility upgrades		✓						
Convert rearing ponds to raceways			✓	✓				
Modify downstream water intake								✓
Inspect Intake Pipe				✓				
Merwin Hatchery								
Ozone PLC upgrade							✓	
Rearing pond flow Enhancement			✓	✓				
Modify smolt release ponds			✓					
Purchase two fish hauling trucks	✓		✓					
Speelyai Hatchery								
Convert Pond 14 into raceways						✓		
Convert burrow's ponds into raceways		✓	✓					
Improve water intake structure								✓
Improve and Expand adult fertilization area			✓					
Improve adult kokanee trap			✓					
Net Pen purchase and installation			✓					

8.1.5 Broodstock Collection and Spawning

A substantial portion of the AOP describes the broodstock collection and spawning of native winter steelhead used for supplementation. The AOP is intended to adapt as necessary to protect native stocks of winter steelhead by limiting collection and ensuring that only native stocks are used within the Cascade Stratum for spawning. Spring Chinook collection and spawning protocols are separated between supplementation (acclimation) juveniles and hatchery broodstock needs. Coho collection and spawning protocols follow WDFW guidelines.

8.1.6 Monitoring and Evaluation

A significant portion of the AOP relates to methodology and specifics of monitoring both adult and juvenile salmonids downstream of Merwin Dam. This includes interactions between hatchery origin and naturally spawning populations and ensuring that hatchery operations are not impacting ESA or native stocks. Future HGMP's will direct much of the monitoring requirements in the basin and the AOP and H&S Plan will be consistent with these plans as they are developed.

8.2 ANNUAL OPERATING REPORT (AOR)

Section 8.2.4 of the Agreement specifies that an annual report compiling all information gathered pursuant to implementation of the H&S Plan shall be provided to the ACC for review. This report is provided in the Utilities AOR for all implementation activities as an appendix along with the current AOP.

The Annual H&S Operating Report will contain at a minimum the following sections and subsections for all H&S fish species:

A. Hatchery Operations
   - Broodstock collection and timing
   - Smolt production tables to include release numbers, size and location
   - Genetic Analysis (late winter steelhead)
   - Mating Crosses (late winter steelhead)
   - Spawning and egg take goals
   - Rearing mortality
   - Tagging data

B. Upstream Transport Collection Timing and Numbers
   - Total numbers transported and time of transport (relative to collection curve)

C. Monitoring and Evaluation
   - Results from M&E activities by objective

D. Recommendations for ongoing H&S Plan implementation

E. Status of hatchery upgrades

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Appendix A

Current Hatchery Facilities and Operations in the Lewis River Basin

APPENDIX A
CURRENT HATCHERY FACILITIES AND OPERATIONS IN THE LEWIS RIVER BASIN

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CURRENT HATCHERY FACILITIES AND OPERATIONS IN THE LEWIS RIVER BASIN

Hatchery fish production in the Lewis River basin originates from the Lewis River, Speelyai, and Merwin hatcheries (collectively known as the Lewis River Hatchery Complex). The three hatcheries are currently operated as a complex, sharing adult return, rearing, and release functions. A detailed description of each of these facilities is presented in the following paragraphs. A description of current hatchery operations is presented in Section 2.0.

1.0 CURRENT HATCHERY FACILITIES

1.1 LEWIS RIVER HATCHERY

Adult Holding and Sorting

The Lewis River Hatchery is located adjacent to the mainstem Lewis River at RM 15.7, approximately 8 miles east of Woodland, Washington. Constructed in 1932, it is the oldest of the three fish production facilities in the Lewis River basin. The hatchery has undergone renovations in the 1980's and more recently through the Lewis River Settlement Agreement (Schedule 8.7). The most recent upgrades modified all rearing ponds into raceways to enhance operational flexibility and improve flow exchange rates. PacifiCorp Energy funds 100 percent of its operation; although, the hatchery is owned by the Washington Department of Fish and Wildlife (WDFW). The Lewis River Hatchery currently produces spring Chinook and Type-S (early) and Type-N (late) coho.

Situated on 119 acres, the Lewis River Hatchery has 312,000 cubic feet of outdoor rearing and adult holding space (WDFW 2013). Adults voluntarily enter the Pond 15 center channel via the existing Denil ladder. Additionally, Pond 15 contains four side ponds which can hold adults from the center channel via removable bulkheads and side crowders or by truck if necessary. All crowding within the center channel is automated by either remote or local controls. Adults held in the center channel, are typically crowded towards the newly constructed sorting facility. Once crowded, the adults are side-crowded by an additional crowder into the entry of a large Archimedes Screw ("pescalator") which leads to the sorting facility. From the pescalator, the fish are elevated to a diverter table where they then fill one of two electro-anesthesia baskets within the sorting facility. Each electro-anesthesia (EA) basket can be operated independently and drops the fish onto a sorting table. Fish that are selected for surplus or lethal spawning are run through a "wallaby whacker," which kills the fish instantly. A series of tubes and spiral flumes direct the fish to various destinations. Return tubes are capable of returning fish to any four of the side holding ponds. Spiral flumes send carcasses to totes for distribution. A large hoist and fry tank lower adults to be returned to stream via an underground tube exiting at the hatchery outlet.

Table 1-1. Lewis River Hatchery fish holding facilities.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Adult sorting pond (Center Channel, Pond 15)	18,500	170	20	6	3,800 -10,000
4	Concrete adult /holding pond (Pond 15)	8,500	83	20	6	1000
12	Concrete raceways	4,000	100	10	4	300
2	Concrete raceways (Pond 13)	26,000	190	20	7	4000
2	Concrete raceways (Pond 13)	28,000	200	20	7	4000
4	Concrete raceways (Pond 14)	24,500	175	20	7	4000
3	Concrete raceways (Pond 16)	15,600	120	20	6.5	2000
3	Concrete raceways (Pond 16)	12,480	120	16	6.5	2000

Source: WDFW 2014a

Source: modified photograph from Tetra Tech/KCM, Inc. 2002

Figure 1-1. Lewis River Hatchery facilities. (*Pond 16 not shown)

Incubation

Inside there are 50 incubator stacks (16 trays per stack) of vertical incubators. There are also four shallow troughs. The hatchery has an eyeing capacity of 13 million eggs and a hatching capacity of 7.7 million fry (Tetra Tech/KCM, Inc. 2002).

Support Facilities

On-site support facilities include three residences, a hatchery/office building, freezer building, two three-bay storage buildings, public restrooms, two intake structures, two pump control buildings, two compressor buildings, and a domestic water well (WDFW 2013).

Water Supply

Water is currently supplied to the Lewis River Hatchery only from the Lewis River via two intakes and nine pumps (WDFW 2014a). Three booster pumps distribute water to other areas of the facility as needed. Approximately 29,000 gpm can be delivered to the facility depending on hatchery needs (WDFW 2013). According to WDFW (2014a), the upstream pump station has a capacity of approximately 22,000 gpm and conforms to the latest NMFS screening requirements. The lower pump station has a capacity of 6,000 gpm and the screening does not currently meet NMFS criteria (Tetra Tech/KCM, Inc. 2002). As part of the hatchery upgrades (described below), the pump and screen will be upgraded to meet NMFS criteria.

If water entering the Lewis River Hatchery is supersaturated with gas, it is passed through four gas stabilization towers to reduce gas levels prior to being supplied to rearing units. Pumped water can bypass the aerators if gas levels are acceptable. All rearing units are supplied with single pass water and the water supply is protected by flow alarms at the intake head box, and holding ponds.

1.2 SPEELYAI HATCHERY

Speelyai Hatchery is located near confluence of Speelyai Creek and Lake Merwin (RM 26), approximately 21 miles east of Woodland, Washington. PacifiCorp Energy owns the 15-acre hatchery property; Cowlitz PUD and PacifiCorp Energy jointly funded its construction and continue to fund 100 percent of its operation. Modifications to the facility in recent years, has modified the burrows ponds and Pond 14 rearing pond to raceways. PacifiCorp Energy has also financed subsequent capital improvements. As described in PacifiCorp and Cowlitz PUD (2004a), the facility was originally built in 1958 to provide mitigation for lost habitat in the Lewis River above Swift Dam. Speelyai Hatchery currently produces rainbow trout and kokanee to supplement reservoir fisheries. The facility also provides support for the Lewis River spring Chinook and coho programs.

Rearing

Speelyai Hatchery has approximately 166,450 cubic feet of outdoor rearing space, including four intermediate troughs, twenty-eight raceways and one asphalt pond that serves as an adult holding pond for spring Chinook and early coho salmon (WDFW 2013) (Table 1-2) (Figure 1-2).

Table 1-2. Speelyai Creek Hatchery facilities.

Function	Units (number)	Size	Facilities
Water Supply			Gravity flow intake on Speelyai Creek (9,200 gallons per minute maximum capacity)
Adult Trap			Small adult trap for kokanee
Adult Holding	1	1/4 acre	Asphalt holding pond
Incubation	50		FAL vertical incubators
Early Rearing	2	17x15x1.5	Shallow Troughs
Raceways	24	80x10x4	Concrete Raceway
Starter Ponds	4	17x3x3	starter ponds
Rearing Ponds	4	115x10x5	Rearing raceways

Source: WDFW 2014a

Water Supply

The available flow to the Speelyai Hatchery intake was recently measured at 30 cfs (13,496 gpm) in August, and the hatchery intake has the capacity to take up to 24 cfs (10,797 gpm). Much of what does not flow into the intake flows past the existing diversion dam and into Speelyai Creek downstream of the diversion dam. Because the water quality in Speelyai Creek above the hatchery is excellent and water temperatures are relatively cool year round (48 to 55°F), the facility is used to hold broodstock and to incubate eggs collected at the Lewis River Hatchery and at the Merwin Dam trap.

Net Pens

There are 10 net pens located in Speelyai Bay that provide approximately 50,000 cubic feet of rearing space. Net pens were constructed as part of Schedule 8.7 of the Settlement Agreement to increase rearing space needed for additional coho production. These pens are currently being used for kokanee.

Source: modified photograph from Tetra Tech/KCM, Inc. 2002

Figure 1-2. Speelyai Hatchery facilities. (*photograph does not show upgrades)

On-site support facilities at Speelyai Hatchery include two residences, a hatchery building, a storage building, a shop/garage, domestic pump house, and the water supply intake (WDFW 2013).

Incubation

Incubation facilities include fifty stacks of FAL vertical incubators, two deep troughs, and one shallow trough. Total available flow at Speelyai Hatchery is reported to be 9,200 gpm from a gravity flow intake on Speelyai Creek (KCM/Tetra Tech 2002). Eggs are incubated on Speelyai Creek water; flow through the trays is 3.5 gpm. Water temperatures range from 48-55°F, with a DO of 10.5 ppm.

1.3 MERWIN HATCHERY

Merwin Hatchery is located just downstream of Merwin Dam at RM 19, near the town of Ariel, Washington. Constructed in 1993, it is the newest hatchery facility in the Lewis River basin. PacifiCorp Energy owns the facility and currently funds 100 percent of its operation. Merwin Hatchery currently produces summer and winter steelhead and rainbow trout.

Merwin Hatchery facilities include four quarter-acre rearing ponds, ten 9.5x80x2.5 foot fingerling raceways, four covered 7.5x33x4 foot adult holding raceways, two small smolt collection ponds, and two effluent settling ponds (Table 1-3) (Figure 1-3). Indoors are

six 4.5x34x2 foot intermediate raceways, four 20 cubic foot fry troughs and 15 double stack Mari Source incubators. Approximate rearing space is 216,500 cubic feet. Support facilities include an operations building with management offices, the ozone plant, a storage building, and three residences (WDFW 2013, Tetra Tech/KCM, Inc. 2002).

Water is supplied to the hatchery from Lake Merwin using a 4,939 (11 cfs) pump station on the dam face. The pump station consists of three pumps, however only two pumps are in operation at any one time. The third is used as a standby in the event of pump failure. Instantaneous non-consumptive water right for the hatchery is 4,935 gpm (11 cfs) or a total of 3,692 acre feet per year. Two screened intakes are used at depths of 15 and 90 feet to provide some temperature control of the source water. Ozone water sterilization is used to meet fish health needs and about two-thirds of the flow is ozone-disinfected prior to use. A maximum flow of 3,800 gpm can be disinfected and supplied to the hatchery building, raceways, and rearing ponds. The disinfected water is used in incubation and adult holding. The remaining water is routed to outdoor rearing ponds after passing through packed column degassing units. In addition to treating a portion of the incoming water, all water exiting the adult holding ponds and incubation building is routed into two effluent settling ponds (Tetra Tech/KCM, Inc. 2002).

Table 1-3. Merwin Hatchery fish holding facilities.

(No.)	Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)
10	Standard concrete raceway	2034	78	9.66	2.7
6	Intermediate raceways	382	33.5	4.6	2.5
4	Concrete rearing ponds	46000	175	75.4	3.9
4	Adult Holding Ponds	953	33	7.7	4
2	Smolt/adult ponds	1794	39	11.6	4
Heath Vertical Stack Tray Units	30 units (8 tray stacks)		24"	25"	4"

Source: WDFW 2014d

Incubation

The incubation/starter building consists of six intermediate raceways, four fry troughs (not used) and 15 double stack MariSource vertical incubators. It is fitted with back-up pumps to maintain flow through the intermediate raceways in emergency situations, and with secondary packed columns to maintain water oxygenation above 10 ppm. Flow monitors will sound an alarm if flow through the incubation troughs is interrupted.

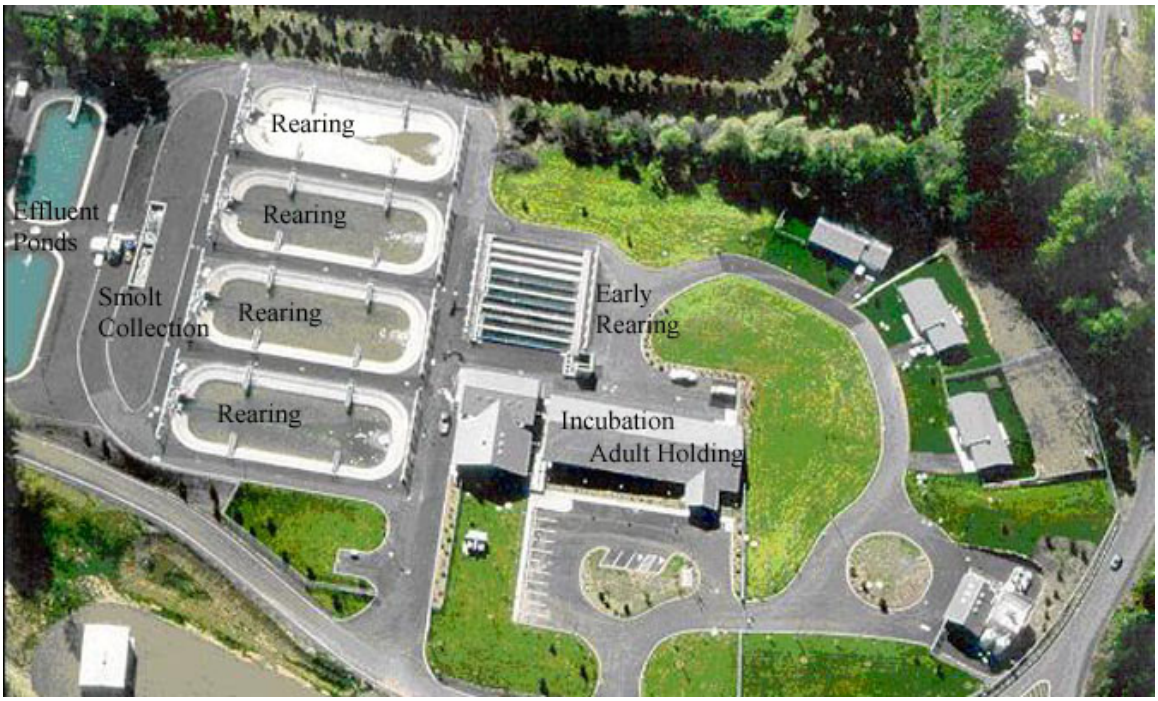
Eggs are incubated on water from Lake Merwin; flow through the trays is 3.5 gpm. The water used to supply the vertical incubators at Merwin Hatchery is pumped directly from Lake Merwin, treated with ozone, and passed through an enclosed stripper. Water quality is generally very good; water temperatures during incubation range from 48-55°F, with a DO of 10.5 ppm. High water temperatures in the summer (58°F to 59°F) can be a problem, but not during incubation or early rearing (Tetra Tech/KCM 2002). Fiberglass troughs are used only for egg disinfection and as a staging area for picking egg mortalities.

Rearing

Each standard raceway can be sectioned off with screening into thirds, if necessary, however this practice is not currently recommended. The intermediate raceways can be sectioned off with screening into fourths. Steelhead are reared in the sectioned intermediate raceways.

Bird netting spans over the juvenile-rearing raceway series, and are supported by opposing counterweights.

Initial feeding and early rearing occurs in the intermediate raceways in the incubation building. When fish reach approximately 100 fpp, they are moved to the outside four concrete rearing ponds, or transferred to the fingerling raceways. During smolting behavior, fish can make their way to two smolt collection ponds where they are transported to the river for release.



Source: modified photograph from Tetra Tech/KCM, Inc. 2002

Figure 1-3. Merwin Hatchery facilities. (*photograph does not show Schedule 8.7 upgrades)

2.0 EXISTING HATCHERY OPERATIONS

As described in the previous section, the Lewis River Hatchery Complex currently produces spring Chinook, Type-S (early) coho, Type-N (late) coho, summer steelhead, winter steelhead, late winter steelhead, resident rainbow trout, and kokanee. Existing hatchery operations and production levels are guided by FERC license articles (as amended) and by subsequent mitigation agreements between PacifiCorp Energy, Cowlitz PUD, and WDFW (PacifiCorp and Cowlitz PUD 2004b, Tetra Tech/KCM, Inc. 2002, and WDFW 2013). The actual operation and management of the Lewis River Hatchery Complex is the responsibility of WDFW. WDFW determines annual release goals, planting locations, policies regarding fish disease, harvest and general day-to-day operations. In 2013, the Lewis River Hatchery Complex released more than 3.8 million fish, including approximately 1.35 million spring Chinook, 2 million coho, 100,000 winter steelhead, 175,000 summer steelhead, 50,000 (20,000 pounds) rainbow trout, and 93,000 (12,500 pounds) of juvenile kokanee (Settlement Agreement, WDFW 2013, WDFW 2006). Current release numbers were negotiated with FERC and are part of the amended Merwin Project license. Past and current production levels at the Lewis River Hatchery Complex are summarized in Table 2-1.

Historically, PacifiCorp Energy and Cowlitz PUD funded 70 percent of the operation and maintenance costs at the Lewis River Hatchery Complex. The remaining 30 percent was funded through the Mitchell Act. Mitchell Act funds were used by WDFW to produce

additional fish for other WDFW programs, and for broodstock to provide eggs to other lower Columbia River hatcheries both of which are not part of PacifiCorp Energy's mitigation program. The Mitchell Act funding was eliminated in 2000 and production goals were subsequently reduced by 1.3 million fish (81,000 pounds) (Tetra Tech/KCM 2002).

Table 2-1. Past and current fish production levels at the Lewis River Hatchery Complex.

Species	License Article 50 and 51 Production Levels	Current Production Levels
Spring Chinook	250,000 juveniles to produce 12,800 adult fish	1,250,000 yearlings at about 8-12 fpp into the North Fork Lewis River. 100,000 for release upstream of Swift Reservoir into acclimation sites at 15 fpp.
Coho	2,100,000 juveniles to produce 71,000 adult fish	900,000 Type N smolts at 16.0 fpp and 1,100,000 Type S coho smolts at 16.0 fpp
Steelhead	250,000 juveniles (about 41,600 pounds)	175,000 summer steelhead at 4.8 fpp and 100,000 winter steelhead at 4.8 fpp and 50,000 late winter steelhead from native broodstock.
Sea-run Cutthroat	25,000 juveniles (up to 6,250 pounds).	Discontinued**
Rainbow Trout	800,000 rainbow trout juveniles at 25-30 fpp	20,000 pounds typically at about 2.5 fpp (50,000 trout).
Kokanee	100,000 juveniles at 7-8 fpp	12,500 pounds typically around 93,000 kokanee planted per year.

** WDFW discontinued hatchery production of sea-run cutthroat trout in 1999 and increase steelhead production by 25,000 to 275,000 smolts. Accordingly, FERC modified the Merwin License article to reflect the changes in production.

Source: Tetra Tech/KCM 2002 and WDFW 2013

In June 2000, the ESA listing of Columbia River Chinook and steelhead required WDFW to file Draft Hatchery Genetic Management Plans (HGMPs) for several Lewis River Hatchery Complex stocks. These HGMPs were resubmitted in 2014 and are currently awaiting approval by NOAA. These plans along with the Hatchery and Supplementation Plan may cause changes to the rearing and release strategies at the hatchery. The following paragraphs describe the current hatchery and fish management goals, production levels, and hatchery operations associated with each species produced at the Lewis River Hatchery Complex.

2.1 SPRING CHINOOK

2.1.1 Current Management Goals and Production Levels

According to WDFW (2014a), the primary purpose of the Lewis River Hatchery Complex spring Chinook program is to "mitigate Columbia River spring Chinook production

(predominantly from hatcheries), which is a major contributor to the catches in Washington and Oregon ocean fisheries[1]." Additional goals are to:

1. Plant 1,250,000 smolts at 8 to 12 fish per pound (fpp) into the Lewis River (Table 2-1);

2. Plant 100,000 yearlings into acclimation sites upstream of Swift Reservoir at 15 fpp.

3. Operate hatcheries consistent with the recovery of spring Chinook salmon in the Lewis River[2]. The major hatchery issues are: 1) to maintain the genetic diversity of spring Chinook in the Lewis River, and ensure the reproductive success of wild spring Chinook meets or exceeds recovery goals, 2) minimize the ecological interactions of hatchery spring Chinook on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations.

2.1.2 Broodstock Origin

Historically, the Lewis River basin supported an indigenous stock of spring Chinook salmon, but with the construction of Merwin Dam in 1932, the majority of the upper basin spawning habitat became inaccessible and the stock subsequently declined. Early attempts to maintain the stock through hatchery production failed, and by the mid-1950s spring Chinook had completely disappeared from Merwin Dam trap catches (PacifiCorp Energy and Cowlitz PUD 2004b).

Spring Chinook from the Cowlitz River, Carson National Fish Hatchery, and Willamette River were introduced into the Lewis River in the late 1950s; however, relatively few were planted until 1972 (PacifiCorp and Cowlitz PUD 2004b). In 1972, the Lewis River Hatchery manager used Carson and Cowlitz stocks to help reestablish spring Chinook in the basin (Myers et al. 1998). Since then, spring Chinook for the Lewis River Hatchery program have originated from a variety of sources including Cowlitz, Kalama, Carson, and Klickitat stock (Table 2-2) (Hymer et al. 1993, Myers et al. 1998). The stocks used now include only on-station returns to the Lewis River. The last release of out of basin spring Chinook was in 1997; since then, all broodstock has been from returning adults collected at the Lewis River Hatchery and Merwin traps. Recent genetic data compiled by Myers et al. (1998) and Marshall et al. (1995) have shown that Lewis River spring Chinook are closely related to Cowlitz, Kalama and Klickitat stocks. WDFW (2002) considers Lewis River spring Chinook to be a mixed stock with composite production.

[1] WDFW (2004) also notes that significant commercial net catches and recreational fishing occurs in the mainstem as well as minor catches in the individual tributaries streams.
[2] The spring Chinook recovery goal was not noted in the Draft HGMP; however, the recovery goal presented in the Lower Columbia River Salmon Recovery & Subbasin Plan (December 2004) is 2,200 adults.

Table 2-2. The origin of spring Chinook broodstock used at the Lewis River hatchery Complex.

Broodstock Source	Origin	Year(s) Used
Cowlitz River Spring Chinook	Hatchery	1967 to 1970
Carson National Fish Hatchery Spring Chinook	Hatchery	1960 to 1984
Kalama River Spring Chinook	Hatchery	Unknown
Willamette River Spring Chinook	Hatchery	1986
Lewis River Spring Chinook	Hatchery	1960 to present

Source: WDFW 2014a

2.1.3 Broodstock Collection

Broodstock for the Lewis River spring Chinook program is collected at the Lewis River Hatchery trap and Merwin Dam trap. The Lewis River Hatchery trap and Merwin Collection Facility are currently operated year-round. Adult spring Chinook usually arrive in early April and peak in May, June, and July. All Lewis River Hatchery-origin spring Chinook have been mass marked (adipose fin clip only) since 1998, except for a group of 150,000 that are coded-wire tagged with no adipose fin clip and another group of 150,000 that is coded-wire tagged and adipose fin clipped. When adults are handled, all fish with adipose fins are checked for presence of CWT (WDFW 2006). Those with adipose fins and no tags are either collected for broodstock (juvenile supplementation) or transported upstream of Swift Dam as part of the adult supplementation program. All hatchery-origin fish collected in the trap are transported to Speelyai Hatchery and spawned as broodstock. Spring Chinook not used as broodstock are transported upstream of Swift Dam as part of the adult supplementation efforts. After spawning at the hatchery, all spring Chinook carcasses are disposed of at a local landfill.

WDFW has a spring Chinook egg take goal of 1.8 million eggs. To meet this goal, the broodstock collection goal is set at 1,200 adults (600 males and 600 females) and 20 jacks, based on an average fecundity of 3,800 eggs/female and a pre-spawning mortality of 10 percent (Table 2-3) (WDFW 2014a). Between 1994 and 2013, an average of 408 adult male and 429 adult female spring Chinook were collected as broodstock at the Lewis River Hatchery Complex annually (Table 2-3).

Table 2-3. The spring Chinook broodstock collection level and egg take at the Lewis River Hatchery Complex (1994 through 2013).

Year	Adult Males	Adult Females	Jacks	Egg Take
Goal*	600	600	20	2,000,000
1994	223	357	4	1,563,300
1995	272	362	3	1,522,000
1996	306	403	5	1,612,000
1997	379	407	3	1,696,000
1998	498	497	2	1,990,000
1999	287	365	40	1,460,000
2000	330	417	7	1,579,630
2001	280	419	14	1,373,232
2002	371	456	7	1,326,200
2003	396	395	8	1,638,459
2004	405	413	17	1,586,241
2005	405	246	8	1,549,900
2006	413	360	0	1,492,300
2007	437	435	1	1,713,600
2008	480	460	24	1,668,000
2009	513	500	9	1,788,000
2010	470	464	5	1,681,700
2011	436	422	14	1,578,000
2012	445	424	10	1,346,000
2013	623	602	9	2,015,740

Source: WDFW 2003, WDFW 2014a and pers. comm. Eric Kinne, WDFW, September 27, 2005

*Reflects year 6 goal in the H&S Plan for juvenile production and the broodstock needed to meet that production target

2.1.4 Incubation and Rearing

According to WDFW (2014a), spring Chinook eggs are incubated in vertical incubators at Speelyai Hatchery consistent with loading densities recommended by Piper et al. (1982). Water temperature is monitored with thermographs and recorded temperature units (TU's) are tracked during embryonic development. During incubation, all eggs are treated with formalin at 600 parts per million (ppm) to keep them free of fungus (WDFW 2004a).

Spring Chinook fry are ponded when the yolk sac slit is approximately 1 millimeter wide (approximately 1,200 TU's) or based on 95 percent yolk sac absorption. Ponding takes place from December through January. In May of each year, approximately 825,000 spring Chinook are transferred from the Speelyai Hatchery to the Lewis River Hatchery (WDFW 2014a). Approximately 500,000 spring Chinook from Speelyai Hatchery will be planted directly into the North Fork Lewis River. The remaining 100,000 spring Chinook at Speelyai Hatchery are transferred to designated acclimation sites upstream of Swift

Dam in early spring as part of the juvenile supplementation program. According to WDFW, rearing densities are also consistent with those recommended by Piper (1982).

2.1.5 Release Location and Numbers Released

Most spring Chinook (1,250,000) are volitionally released as yearlings from Lewis River Hatchery directly into the North Fork Lewis River. The remaining smolts (100,000) are released into developed acclimation areas upstream of Swift Reservoir. Prior to 2014, releases usually occurred from February through March. Releases for 2014 will be staggered for experimental purposes in an effort to improve survival and reduce stress. A portion (about 2/3) of the 2013 cohort will be released in October. The remaining fish will be released in February. According to WDFW, release timing is determined by fish behavior such as aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance and scale loss during feeding. Prior to release, an area Fish Health Specialist evaluates the population's health and condition.

The vast majority of spring Chinook produced at the Lewis River Hatchery Complex since 1994 have been released as yearlings in February and March (Table 2-4), although fry and fingerlings have been released in the past (WDFW 2014a).

Table 2-4. The number, size, and release dates of spring Chinook yearlings released into the Lewis River (1994 through 2013).

Year	Number Released	Release Dates	Size (fpp)
1994	642,000	3/5	7.0
1995	1,312,600	2/12 through 3/20	6.0
1996	1,178,272	2/8 through 3/22	6.0
1997	1,108,045	2/14 through 3/23	6.0
1998	1,096,841*	1/1 through 3/28	6.5
1999	868,180	2/1 through 3/31	8.5
2000	1,045,056	2/1 through 3/31	5.1 to 7.6
2001	924,115**	2/1 through 3/31	5.3 to 6.2
2002	1,013,814	2/1 through 3/31	8.4
2003	1,076,972	3/1	8.6
2004	1,028,765	3/1	7.5
2005	880,454	2/15 through 3/14	7.5 to 11.4
2006	955,367	3/20	9.0
2007	945,195	3/19	8.0
2008	915,191	3/17	8.0
2009	953,676	2/17 through 3/23	9.0 to 14.0
2010	961,435	2/19 through 3/3	7.7
2011	904,139	March1	8.6
2012	1,256,990	2/1 through 2/15	7.4
2013	731,662	2/1 through 2/15	9.7
Average	987,656	--	--

Source: WDFW 2014a, WDFW 2013

* Low numbers due to a BKD outbreak.

** Numbers do not included fish released from the Echo bay net pens.

2.1.6 Adult Abundance

Between 1994 and 2013, an average of 1,752 adult spring Chinook have returned to the Lewis River Hatchery Complex annually (Table 2-5), exceeding the 500 males and 500 females needed to meet current egg take goals.

Table 2-5. Adult and jack spring Chinook returns to the Lewis River Hatchery Complex (hatchery escapement) from 1994 through 2013 (includes wild and hatchery fish).

Year	Total Hatchery Escapement	
	Adult Spring Chinook	Jack Spring Chinook
1994	786	10
1995	1,574	21
1996	1,080	26
1997	2,273	28
1998	1,199	11
1999	924	78
2000	827	50
2001	1,231	53
2002	1,869	58
2003	3,037	357
2004	2,053	336
2005	4,134	NA
2006	3,939	NA
2007	1,178	NA
2008	2,245	NA
2009	1,384	NA
2010	711	NA
2011	1,214	NA
2012	1,482	NA
2013	1,908	NA

Source: WDFW 2013 and WDFW 2014a

2.2 COHO

2.2.1 Current Management Goals and Production Levels

According to WDFW (2014b), the primary purpose of the Lewis River Hatchery Complex Type S coho program is to:

1. Produce coho salmon to mitigate for hydroelectric system development in the Lewis system and for activities within the Columbia River Basin for the loss of early coho salmon stock that would have been produced naturally in the North Fork Lewis River system in the absence of the hydroelectric dams.

2. Plant 1,100,000 yearling Type S coho smolts at 16.0 fpp into the Lewis River (Table 2-5).

3. Incorporate natural stock into the existing hatchery population to support overall ESU recovery goals.[3]

The primary purpose of the Type N coho program is to:

1. Produce coho salmon to mitigate for hydroelectric system development in the Lewis system and for activities within the Columbia River Basin for the loss of late coho salmon stock that would have been produced naturally in the North Fork Lewis River system in the absence of the hydroelectric dams.

2. Plant 900,000 Type N smolts at 16.0 fpp into the Lewis River (Table 2-1).

3. Incorporate natural stock into the existing hatchery population to support overall ESU recovery goals

4. Provide for enough returning broodstock to fill the egg needs of regional programs (not part of PacifiCorp Energy's mitigation program). As of 2014, WDFW Type N coho egg transfers total more than 2.75 million eggs and include the following programs:

    - 860,000 eyed eggs to Fish First for remote site incubator (RSI) production in the North Fork Lewis River tributaries and Cedar Creek,
    - 1,430,000 green eggs to Washougal for Klickitat Hatchery production,
    - 14,250 eyed eggs to Region 5 Salmon in the Classroom (SIC),
    - 5,000 eyed eggs to Steve Syverson project,
    - 60,000 eyed eggs to Clark County PUD,
    - 90,000 eggs to Vernerborg Firefighter and
    - 300,000 green eggs to Washougal Hatchery for the Klickitat River direct release, if needed (WDFW 2014c).

2.2.2 Broodstock Origin

Although the original Lewis River Hatchery coho stock was taken from indigenous coho trapped at the Merwin Dam, coho released into the basin in the past 70 years have originated from a variety of stock sources. The majority of these releases have been Cowlitz River (Type-N) and Toutle River (Type-S) stocks. Because of these extensive stock transfers, WDFW considers the existing Lewis River coho population to be a mixed stock of composite production (WDFW 2002). Allozyme analysis of Lewis River Hatchery

[3] Under existing operations, natural stocks are not incorporated into the hatchery population (i.e. the program is not integrated at this time) (WDFW 2006).

coho has shown them to be genetically distinct from other Washington coho stocks examined (WDFW 2002).

2.2.3 Broodstock Collection

Both Type S and Type N coho and are collected at Lewis River Hatchery and Merwin Dam traps. The traps are opened for coho collection during the entire run and trap entry timing is used to identify each stock. Type S coho are trapped from September through early November and Type N coho are trapped from mid-November through early January (WDFW 2014c). Like spring Chinook, all Type S and Type N coho are mass marked (adipose fin clipped) except for a group of 75,000 of each stock that are coded-wire tagged with no adipose fin clip (termed double-indexing) and another group of 75,000 each stock that is coded-wire tagged and adipose fin clipped.

Adult coho collected at the Lewis River Hatchery and Merwin Dam traps are identified as natural or hatchery origin, through the examination of fin clips or coded wire tags. All hatchery Type S coho selected for spawning purposes are transported to the Speelyai Hatchery holding pond prior to spawning at Speelyai Hatchery. All Type N coho selected for spawning are held and spawned at the Lewis River Hatchery. Type-N coho with an adipose fin and no tag are either collected for the integrated broodstock program or are top caudal clipped, and returned to the river as natural origin fish (WDFW 2004c). Type-S coho with an adipose fin and with no tags are transported upstream of Swift Dam as part of the reintroduction efforts. After spawning, all spawned carcasses are either used for nutrient enhancement or are disposed of through the existing carcass contract (WDFW 2006). As part of reintroduction efforts, 9,000 early Type-S adult coho are transported upstream of Swift Dam each year to spawn naturally.

WDFW has a Type S coho has an egg take goal of 1,100,000 and a broodstock collection goal set at 400 females and 400 males, excluding jacks (Table 2-6). The Type N coho egg take goal is 5,100,000 eggs (1,900 females and 1,900 males, excluding jacks) (Table 2-7). Both goals are based on an average fecundity of 3,000 eggs per female and pre-spawning mortality of 10 percent.

The vast majority of the coho collected at the Lewis River Hatchery and Merwin Dam trap are hatchery fish. Between 1994 and 2014, an average of 648 adult male and 617 adult female Type S coho and 1,329 adult male and 1,241 adult female Type N coho were used for broodstock at the Lewis River Hatchery Complex (Tables 2-6 and 2-7).

Table 2-6. The Type S coho broodstock collection level and egg take at the Lewis River Hatchery Complex (1994 through 2013).

	Type S Coho			
Year	**Adult Males**	**Adult Females**	**Jacks**	**Egg Take**
Goal*	500	500	NA	1,325,000
1994	1,024	887	17	2,517,000
1995	459	438	4	1,054,800
1996	773	682	7	2,252,700
1997	1,246	1,106	17	3,239,600
1998	1,237	1,142	41	3,463,200
1999	1,148	1,063	28	3,214,000
2000	775	770	13	2,307,000
2001	457	452	8	1,325,300
2002	396	399	3	1,363,157
2003	450	450	10	1,201,600
2004	441	443	24	1,134,119
2005 – 2007	**NA**	**NA**	**NA**	**NA**
2008	416	417	1	1,339,150
2009	500	505	5	1,588,700
2010	478	482	7	1,806,600
2011	643	644	1	1,858,000
2012	221	224	3	591,600
2013	514	503	6	1,926,071
Average	**649**	**617**	**11**	**1,861,533**

* Represent current goal as stipulated in the Settlement Agreement which will increased during the 2014 egg take.
Source: WDFW 2013 and WDFW 2014b

Table 2-7. The Type N coho broodstock collection level and egg take at the Lewis River Hatchery Complex (1994 through 2013)

Year	Type N Coho			
	Adult Males	**Adult Females**	**Jacks**	**Egg Take**
Goal*	360	360	NA	1,050,000
1994	3,986	2,331	36	8,936,900
1995	545	521	10	1,680,200
1996	2,453	1,920	40	7,696,400
1997	3,414	3,442	42	9,996,987
1998	2,262	2,296	39	7,750,612
1999	1,714	1,753	35	6,570,833
2000	1,150	1,159	11	4,154,920
2001	462	469	15	1,734,806
2002	584	566	8	2,228,766
2003	1,106	1,120	135	3,510,000
2004	1,052	1,099	48	3,979,051
2005	829	834	7	3,132,450
2006	775	783	11	2,987,441
2007	881	882	1	2,964,481
2008	776	777	1	2,742,882
2009	857	876	19	3,247,521
2010	851	865	18	3,422,401
2011	883	1,131	13	3,803,905
2012	1,036	1,036	50	3,318,584
2013	962	962	34	3,333,388
Average	**1,329**	**1,241**	**29**	**4,359,626**

* Represents mitigation goal for North Fork Lewis segregated program only.
Source: WDFW 2013 and WDFWc

2.2.4 Incubation and Rearing

Lewis River Type S coho are spawned at Speelyai Hatchery and the resulting eyed eggs are shipped to the Lewis River Hatchery in November for incubation in Vertical stack incubators.

According to WDFW (2014c), incubation conditions are consistent with loading densities recommended by Piper et al. (1982). Water quality and temperatures are generally very good. Stack flows during incubation are 3.6 gpm and all eggs are treated with formalin to keep them free of fungus (WDFW 2004c).

Lewis River Type N coho are held, spawned, incubated (approximately 2.5 million eyed eggs, and reared at the Lewis River Hatchery. Vertical stack incubators are also used for this stock and incubation conditions are similar to those described for Type S coho.

Lewis River water quality is generally very good but water temperatures are quite cold (40°F) during incubation and into the early rearing period (WDFW 2004c). Like Type S coho, stack flows during incubation are 3.6 gallons per minute (gpm) and all eggs are treated with formalin to keep them free of fungus (WDFW 2004c).

Both the Type S and Type N coho fry are ponded when the yolk sac slit measures less than 1 mm. The current practice is to start the fry in raceways and then move them into a large pond for rearing until released. To keep the size similar, the growth of Type S coho is slowed until the late coho reach a similar size. The two stocks are then mixed and reared until released on-site. According to WDFW (2004b) and WDFW (2004c), rearing densities are based on standardized agency guidelines, life-stage specific survival studies conducted on-site, life-stage specific survival studies conducted at other facilities, and staff experience. The rearing densities are also consistent with those recommended by Piper et al. (1982).

2.2.5 Release Location and Numbers Released

Both the Type S and Type N coho are released volitionally over a six-week period beginning on or after April 15. According to WDFW staff, approximately 80 percent of the stock migrates volitionally during that time period. The remaining 20 percent are forced out prior to May 20th. Release timing is determined by fish behavior such as aggressive screen and intake crowding, swarming against sloped pond sides, leaner condition factors, a more silvery physical appearance, and scale loss during feeding (WDFW 2014c).

Prior to release, an area Fish Health Specialist evaluates the coho population's health and condition. According to WDFW, the production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delay in the rivers, limiting interactions with naturally produced fish. However, fry and fingerling Type N coho fry and fingerlings were also released into to the Lewis River reservoirs in 1993, 1998, 1999, and 2001 (WDFW 2004b).

Between 1994 and 2004, an average of just over 940,000 Type S coho yearlings and 1.6 million Type N coho yearlings were released into the Lewis River annually (Tables 2-8 and 2-9). It should be noted that prior to 2002, the Lewis River Hatchery Complex also produced one million Type S coho smolts (and 750,000 eyed eggs) as part a Mitchell Act funded tribal program[4]. With the termination of the Mitchell Act funding, the tribal program was discontinued.

[4] In 1997, the Yakama Nation initiated a reintroduction program for selected tributaries in the Mid-Columbia Region with early stock coho salmon from lower Columbia River hatcheries to restore natural production identified in the Yakima Nation's "Coho Salmon Species Plan (CSSP) for the Mid-Columbia Basin. The goal of this program was to initiate restoration of coho salmon populations in mid-Columbia tributaries to levels of abundance and productivity sufficient to support sustainable annual harvest by tribal and other fisheries.

Table 2-8. The number, size, and release dates of Type S coho yearlings released into the Lewis River (1994 through 2013).

Year	Number Released	Release Dates	Size (fpp)
1994	839,300	April-May	14.0
1995	888,400	April-May	13.9
1996	897,200	April-May	13.2
1997	968,369	April-May	14.1
1998	945,321	April-May	13.0
1999	902,448	April-May	11.8
2000	1,395,072*	April-May	14.4
2001	909,038	April	14.7
2002	874,579	May	16.3
2003	912,230	May	15
2004	856,919	May	15
2005	883,851	April-May	15.5
2006	901,746	April-May	15
2007	919,424	April-May	16
2008	841,547	April-May	14
2009	889,003	April-May	16
2010	891,884	April-May	15.9
2011	828,695	April-May	15.8
2012	1,002,933	April-May	15.7
2013	988,411	April-May	15.5
Average	**902,174**	**--**	**15**

Source: WDFW 2013 and WDFWb

* 440,406 of the Type S coho released in 2000 were funded by the Mitchell Act (WDFW 2006).

Table 2-9. The number, size, and release dates of Type N coho yearlings released into the Lewis River (1994 through 2013).

Year	Number Released	Release Dates	Size (fpp)
1994	869,400	April-May	14.0
1995	2,199,200	April-May	14.1
1996	2,414,000	April-May	13.0
1997	1,981,379	April-May	14.8
1998	2,289,440	April-May	13.3
1999	2,193,653	April-May	14.2
2000	2,126,655	April-May	13.2
2001	868,756	April	10
2002	841,000	March 8	10
2003	840,219	May 7 - 10	15
2004	833,786	April 6-10	15
2005	853,338	April 21	15.5
2006	827,637	May 15	15.0
2007	857,591	May 22	16.0
2008	856,491	May 19	14.0
2009	834,665	April 14 – May 11	16.0
2010	810,158	May 10	15.9
2011	801,875	April 13-25	15.8
2012	891,156	April 16-23	15.7
2013	875,797	April 1 – 23	16.6
Average	**1,253,310**	--	--

Source: WDFW 2013 and WDFWc

2.2.6 Adult Abundance

From 1994 through 2004, the total adult Type S coho hatchery escapement (to the Lewis River hatchery and Merwin Dam trap) has ranged from a low of 1,145 in 1995 to 38,783 in 2001, with an average of approximately 16,922 fish (Table 2-10). The vast majority of the Type S coho returning to the facilities are marked hatchery fish.

Table 2-10. Adult and jack Type S coho returns to the Lewis River Hatchery Complex (hatchery escapement) from 1994 through 2013 (includes wild and hatchery fish).

	Type S Coho	
Year	Adult	Jacks
1994	3,916	136
1995	1,145	641
1996	4,784	1,007
1997	5,943	260
1998	7,142	3,528
1999	14,962	2,343
2000	17,031	7,281
2001	38,783	1,291
2002	17,334	8,177
2003	38,367	1,933
2004	21,853	1,438
2005	24,902	NA
2006	22,901	NA
2007	20,215	NA
2008	32,817	NA
2009	15,414	NA
2010	16,172	NA
2011	15,416	NA
2012	2,827	NA
2013	16,516	NA

Source: WDFW 2013 and WDFWb

From 1994 through 2004, the total adult Type N coho hatchery escapement has ranged from a low of 1,299 in 1995 to 60,873 in 2001, with an average of approximately 18,585 fish (Table 2-11). The vast majority of these are hatchery fish and the goal is to remove as many hatchery stock Type N coho as possible to minimize the interaction with those fish that result from wild spawners.

Table 2-11. Adult and jack Type N coho returns to the Lewis River Hatchery Complex (hatchery escapement) from 1994 through 2013 (includes wild and hatchery fish).

Year	Total Hatchery Escapement	
	Adult Type N Coho	Jack Type N Coho
1994	8,513	121
1995	1,299	460
1996	5,291	2,619
1997	12,571	307
1998	10,817	2,089
1999	17,724	6,757
2000	24,006	10,910
2001	60,873	533
2002	13,976	NA
2003	25,587	NA
2004	15,016	NA
2005	24,344	NA
2006	23,226	NA
2007	16,660	NA
2008	27,112	NA
2009	25,624	NA
2010	23,983	NA
2011	15,603	NA
2012	5,682	NA
2013	13,795	NA

Source: WDFW 2013 and WDFWc

2.3 STEELHEAD

2.3.1 Current Management Goals and Production Levels

According to WDFW (2014e), the primary purpose of the Lewis River summer steelhead program is to[5]:

1. Rear and release 175,000 summer steelhead smolts at 4.8 fpp into the Lewis River (Table 2-1),

2. Provide adult harvest under the selective fishery regulations (retention of adipose clipped fish only),

3. Provide some escapement for broodstock for continued Merwin Hatchery production,

[5] A more detailed description of the program goals is available in WDFW 2004e.

4. 60,000 yearlings to the Fish First Echo Bay Co-op Net Pens, , and

5. Operate the hatcheries consistent with the recovery of ESA listed steelhead in the Lewis River (i.e. maintain the genetic diversity of naturally spawned steelhead and minimize ecological interactions with naturally produced salmon and steelhead) (WDFW 2014e).

The primary purpose of the winter steelhead program is to[6]:

1. Release 100,000 winter steelhead smolts at 4.8 fpp into the Lewis River (Table 2-1).

2. Provide adult harvest under the selective fishery regulations (retention of adipose clipped fish only) and provide protection to listed fish,

3. Provide some escapement for broodstock for continued Merwin Hatchery production,

4. Operate the hatcheries consistent with the recovery of ESA listed steelhead in the Lewis River (i.e. maintain the genetic diversity of naturally spawned steelhead and minimize ecological interactions with naturally produced salmon and steelhead) (WDFW 2004e).

2.3.2 Broodstock Origin

Summer and winter steelhead are indigenous to the Lewis River basin; however, large numbers Skamania Hatchery summer steelhead and Skamania Hatchery and Beaver Creek Hatchery winter steelhead have been released into the Lewis River since the late 1950s (PacifiCorp and Cowlitz PUD 2004b). Skamania Hatchery summer steelhead were developed from Washougal River and Klickitat River summer steelhead at the Skamania Hatchery, Washington (Crawford 1979). This stock has been widely used in Washington, Idaho, Oregon, and California. Skamania Hatchery winter steelhead were derived from Beaver Creek Hatchery and Skamania Hatchery winter steelhead stocks. Skamania stock early-winter steelhead has been the source of nearly all the early winter hatchery smolts that WDFW releases in the Lower Columbia River region with the exception of Cowlitz River. Following the completion of Merwin Hatchery in 1993, the Lewis River Hatchery Complex egg take needs have been met using eggs from returning steelhead in the Lewis River system or by importing eggs from the Skamania Hatchery. It should be noted that Skamania eggs have not been used at the facility since 1998 (WDFW 2006).

2.3.3 Broodstock Collection

All summer and winter steelhead broodstock for the Lewis River Hatchery Complex program are volunteers to the Lewis River Hatchery and Merwin Dam traps. All

[6] A more detailed description of the program goals is available in WDFW 2004f.

hatchery-origin steelhead are adipose-fin clipped and only adipose fin-clipped adults are used for broodstock. According to WDFW (2014d,e), the vast majority of the steelhead collected in the traps are of hatchery stock. Adult collection and spawning guidelines for summer steelhead at Merwin Hatchery are as follows:

1. Broodstock will be collected from July through September. However, shortfalls may require additional collections through the fall.

2. There will be no size selection.

3. Spawning will occur from December through January and will be completed by January 31.

4. Spawning will be one-to-one female unless shortfalls in broodstock occur; then half of the eggs from one female will be spawned with a different male.

Winter steelhead collection and spawning guidelines at Merwin Hatchery are as follows:

1. Fish entering the racks prior to December 7 will be clipped on the upper lobe of the caudal fin so that they can be identified and will not be used for broodstock.

2. Broodstock are retained for spawning from December 7 through January. New fish will be recruited into spawning population throughout the period. 3. Bright (indicating recent freshwater entry) females that are running eggs will not be spawned.

4. There will be no selection for size.

5. Spawning will occur from December through January and will be completed by January 31.

6. Spawning will be one-to-one male to female unless shortfalls in broodstock occur, then half of the eggs from one female will be spawned with a different male.

WDFW has a summer steelhead broodstock collection goal of 175 males and 175 females and a winter steelhead broodstock collection goal of 75 males and 75 females (Tables 2-12 and 2-13). The egg take goals are 325,000 for summer steelhead and 145,000 for winter steelhead (WDFW 2013).

Table 2-12. The summer steelhead broodstock collection level and egg take at the Lewis River Hatchery Complex (1995 through 2013).

	Summer Steelhead		
Year	**Adult Males**	**Adult Females**	**Egg Take**
Goal	100	100	325,000
1995	NA	53	230,060

1996	NA	NA	276,500
1997	NA	NA	66,500
1998	196	132	247,500
1999	92	46	325,200
2000	206	104	440,609
2001	109	158	634,331
2002	293	227	399,000
2003	305	161	444,500
2004	399	215	669,594
2005	325	162	567,000
2006	271	134	469,000
2007	313	156	546,000
2008	338	169	589,000
2009	227	113	395,500
2010	178	96	384,000
2011	98	97	385,500
2012	131	130	520,000
2013	100	99	396,000

* Current goal, in the past additional brood was collected for use at other facilities.

Source WDFW 2013 and WDFWe

Table 2-13. The winter steelhead broodstock collection level and egg take at the Lewis River Hatchery Complex (1995 through 2013).

Year	Winter Steelhead		
	Adult Males	Adult Females	Egg Take
Goal	**45**	**45**	**145,000**
1995	NA	NA	570,657
1996	122	122	573,000
1997	136	136	401,575
1998	137	198	546,000
1999	102	102	282,800
2000	122	93	371,957
2001	260	130	398,919
2002	270	136	998,107
2003	322	326	NA
2004	205	102	423,935
2005	190	96	336,000
2006	106	51	178,500
2007	110	55	192,500
2008	136	73	255,500
2009	99	48	182,400
2010	49	43	159,600
2011	30	30	120,000
2012	35	33	138,600
2013	37	37	148,000

* Current goal, in the past additional brood was collected for use at other facilities.
Source: WDFW 2013 and WDFW 2014d

The first adult summer steelhead begin arriving at Merwin Hatchery in April; however, they are not collected until July. After being collected they are held until December before spawning begins. Fish can be held in raceways or holding ponds for maturation. The first adult winter steelhead begin arriving at Merwin Hatchery in December and are held briefly until before spawning begins. Holding adults are treated with formalin or hydrogen peroxide or a combination of both (up to 7 days per week) to control fungus growth. According to WDFW staff, pre-spawn mortality for summer steelhead can be as high as 20 percent due to IHN. After spawning, all summer steelhead carcasses are taken to the local landfill for disposal. Winter steelhead carcasses fit for human consumption are donated to local food banks. Treated carcasses are taken to a local rendering plant (WDFW 2014e and (WDFW 2013).

Between 1995 and 2004, an average of 229 adult male and 137 adult female summer steelhead broodstock were collected at the Lewis River Hatchery Complex annually (Table 2-12). During this same period, an average of 186 adult male and 149 adult

female winter steelhead broodstock were collected at the complex (Table 2-13). Returning hatchery steelhead that are not used for broodstock are marked (clipped upper caudal fin lobe) and returned to the Lewis River just below the confluence with the East Fork Lewis River (RM 3.4) for additional harvest opportunity.

2.3.4 Incubation and Rearing

All adult summer and winter steelhead are held, spawned, and incubated at Merwin Hatchery. Juvenile rearing takes place at Merwin Hatchery (WDFW 2014e,d). The water used to supply the MariSource vertical stack incubators at Merwin Hatchery is pumped directly from Lake Merwin, treated with ozone, and passed through an enclosed stripper. Water quality is generally very good; however, high water temperatures in the summer (58°F to 59°F) can be a problem (Tetra Tech/KCM 2002). According to WDFW staff, 3 fish pool spawnings are incubated separately during the green to eyed-egg stage to monitor for IHN (WDFW 2006). Water temperatures are monitored continuously during incubation and formalin is used to control of fungus and ecto-parasites.

Initial feeding and early rearing occurs in the incubation trough and ponding is on TU's and visual inspection (WDFW 2013). The fry are then transferred to the appropriate starter raceway. Ponding dates each year run between February 25th and April 5th (WDFW 2014e). According to WDFW, rearing densities are consistent with the loading densities recommended by Piper et al. (1982). In addition, flow rates, water temperatures, dissolved oxygen, and total suspended solids (TSS) is monitored on a routine basis throughout the rearing period.

2.3.5 Release Location and Numbers Released

Summer and winter steelhead releases occur from approximately mid-April to May 10th. Prior to release into the Lewis River, all steelhead volitionally migrate from two rearing ponds to a "smolt collection pond". They are then pumped into tank trucks on a daily basis and hauled to and released at WDFW's Martin Access boat just downstream of the mouth of the East Fork Lewis River (RKm 5.5) (WDFW 2014 e and WDFW 2014 d). According to WDFW, this is downstream of much of listed Chinook habitat. Prior to release, an area Fish Health Specialist evaluates the population's health and condition. This is commonly done 1 to 3 weeks prior to release and up to 6 weeks on systems with pathogen free water and little or no history of disease.

Between 1996 and 2004, an average of 162,145 summer steelhead yearlings and 105,838 winter steelhead yearlings have been released into the Lewis River annually (Tables 2-14 and 2-15). In the past 10 years, steelhead fry and fingerlings surplus to the anadromous program have also been planted in Lake Merwin and Swift Creek Reservoir to help support the landlocked trout lake fishery (not part of PacifiCorp Energy's mitigation program) (WDFW 2014e and WDFW 2014d).

Table 2-14. The number, size, and release dates of summer steelhead yearlings released into the Lewis River (1996 through 2013).

Year	Number Released*	Release Dates	Size (fpp)
1996	122,279	April 13 - May 1	5.9
1997	123,776	April 20 - May 11	6.3
1998	155,218	April - May	6.4
1999	149,242	April 17 - May 7	5.7
2000	172,038	April 16 - May 1	4.8
2001	238,188	April 16 - May 17	4.5 - 5.0
2002	178,160	April 16 - May 8	4.9
2003	144,104	May	4.7
2004	176,304	April 18 - May 7	4.7
2005	177,344	Apr 21-May 11	4.9
2006	166,827	May 1-28	5.4
2007	179,356	Apr 16-May 15	5.3
2008	171,822	Apr 16-May 12	4.7
2009	175,263	Apr 16-May 8[a]	5.1
2010	180,621	Apr 23, May 3-11	4.8
2011	189,071	Apr 15-29	5.4
2012	192,080	Apr 20-23, Apr 27-May 30	5.0
2013	192,325	Apr 15-17, 26- 30	5.8

Source: WDFW 2013 and WDFWe

* Releases do not include Echo Bay and Speelyai net pen releases, except in 2001.

Table 2-15. The number, size, and release dates of winter steelhead yearlings released into the Lewis River (1996 through 2013).

Year	Number Released	Release Dates	Size (fpp)
1996	123,248	April 13 - May 1	5.9
1997	123,776	April 20 - May 11	6.3
1998	104,018	April 16 - May 1	6.2
1999	101,542	April 19 - May 7	5.6
2000	101,473	April 17 - May 1	4.8
2001	104,110	April 16 - May 1	4.7
2002	102,633	April 30 - May 6	4.8
2003	89,585	May	4.7
2004	102,154	April 21 - May 7	4.6
2005	93,056	April 27-May 9	4.7
2006	97,359	May 4-29	4.8
2007	96,819	April 16-May 15	4.7
2008	103,684	April 16-May 13	4.4
2009	93,491	April 16-17, May 1	4.5
2010	116,691	April 15	4.9
2011	102,135	April 15	4.8
2012	26,760	April 27	4.5
2013	128,360	April 15	5.7

Source: WDFW 2013d

2.3.6 Adult Abundance

From 1995/1996 through 2013, the adult summer steelhead hatchery escapement has ranged from a low of 830 in 1995 to 20,289 in 2006 (Table 2-16). Winter steelhead escapement has ranged from 378 in 1997/1998 to 4,952 in 2001/2002.

Table 2-16. Summer steelhead returns to the Lewis River Hatchery Complex (hatchery escapement) from 1995/1996 through 2013 (includes wild and hatchery fish).

Year	Total Hatchery Escapement	
	Summer Steelhead	Winter Steelhead
1995/1996	830	642
1996/1997	2,069	581
1997/1998	1,216	378
1998/1999	1,446	923
1999/2000	1,126	401
2000/2001	2,079	935
2001/2002	2,819	4,957
2002/2003	6,961	2,132
2003/2004	14,717	3,076
2004/2005	11,329	617
2005/2006	9,354	3,300
2006/2007	20,289	3,263
2007/2008	14,273	4,632
2008/2009	6,293	2,528
2009/2010	11,304	3,497
2010/2011	10,206	2,840
2011/2012	9,521	2,334
2012/2013	4,932	1,119
2013	5,803	

Source: WDFW 2013, WDFWd and WDFWe

2.4 RESIDENT RAINBOW TROUT

2.4.1 Current Management Goals and Production Levels

The overall goal of the Lewis River Hatchery Complex resident rainbow trout program is to maintain the fishery in Swift Reservoir. Prior to 2006, approximately 800,000 to 1,000,000 rainbow trout fry at approximately 40 per pound were stocked in Swift Reservoir annually (as required by Article 51 of the Merwin license) (WDFW 2013). Beginning in 2006, the resident rainbow trout goal is to plant approximately 20,000 pounds of rainbow trout at 2.5 fpp (Table 2-1) (pers. comm. Eric Kinney, WDFW, Lewis River Complex Manager, October 5, 2005).). In 2012, the program size at released changes to 2.5 fpp to be consistent with statewide planting goals for size at release. This change in size reduced the planting goal to 50,000 fish to meet the 20,000 pound mitigation requirement.

2.4.2 Broodstock Origin

Over the past 25 years, the primary resident rainbow stock source for the Lewis River program has been from the Goldendale Hatchery in Washington; however, rainbow trout from the Spokane Hatchery (Washington) and Mt. Whitney Hatchery (California) have also been released into Swift Reservoir. According to Crawford (1979), Goldendale rainbow trout are derived from a combination of "McNott, Meander, and Cape Cod rainbow trout strains." Meander rainbow trout were originally obtained from the Meander Trout Farm in Pocatello, Idaho using eggs from the U.S. Fish Commission's hatchery at Springville, Utah. Cape Cod rainbow trout, originally produced at the Cape Cod Trout Company of Wareham, Massachusetts, were obtained from the McCloud River near Mt. Shasta. Spokane rainbow trout, produced at the Spokane Hatchery since 1942, were also originally obtained from the McCloud River. Mt. Whitney rainbow trout are a mixture of Sacramento River rainbow trout and Klamath River steelhead. This stock was originally obtained by WDFW in 1962 (Crawford 1979). Goldendale rainbow trout spawn from October through February, Spokane rainbow trout spawn from November through December, and Mt. Whitney rainbow trout spawn from February through March (Crawford 1979).

2.4.3 Broodstock Collection

All eggs currently used for the Lewis River resident rainbow trout program are transferred to the Lewis River Hatchery Complex from the Goldendale Hatchery or Spokane Hatchery. In December 2005, approximately 150,000 eyed eggs were transferred to Merwin Hatchery from the Goldendale Hatchery (WDFW 2013).

2.4.4 Incubation and Rearing

Under existing operations, all juvenile rainbow trout are incubated and reared at Merwin Hatchery to approximately 10 fpp. They are then transferred to Speelyai Hatchery where they are reared to about 2.5 fpp prior to planting in Swift Reservoir in April.

2.4.5 Release Location and Numbers Released

All 50,000 rainbow trout are released the week prior to the Swift Reservoir fishing opener (currently the first Saturday in June). Rainbow trout are released at the boat launch at Swift Forest Campground.

Table 2-17. The number, size, and release dates of resident rainbow trout released into Swift Reservoir (1994 through 2013).

Year	Number Released	Average Size (fpp)	Pounds Planted
1995	958,193	35.5	NA
1996	726,656	25	NA
1997	679,580	21.5	NA
1998	930,361	26.5	NA
1999	227,998	29.5	NA
2000	547,361	39	NA
2001	918,187	36	NA
2002	867,924	34.5	NA
2003	857,695	40	NA
2004	868,662	40	NA
2005	302,367	31.7	9,548
2006	57,675	2.3	25,076
2007	63,344	2.8	22,622
2008	60,418	2.0	30,209
2009	55,161	2.6	21,380
2010	60,000	2.0	30,000
2011	51,956	2.5	20,700
2012	69,885	2.6	26,372
2013	71,361	2.2	32,885

Source: WDFW 2013

2.4.6 Adult Abundance

As part of Merwin Project studies in 1990, PacifiCorp Energy biologists completed a creel survey on Swift Reservoir (PacifiCorp 1996). From May through October 1990, anglers on Swift Reservoir had an average catch rate of 0.97 fish per hour. Rainbow trout comprised approximately 99 percent of the fish harvested (PacifiCorp 1996). From April 24 through October 1999, WDFW conducted an additional creel survey in Swift Reservoir and Swift canal (PacifiCorp and Cowlitz PUD 2004b). During this survey, a total of 496 anglers were interviewed. These bank and boat anglers fished a total of 1,800 hours to harvest 1,504 fish. Rainbow trout and cutthroat trout comprised 84.7 percent and 14.7 percent of the fish harvested (PacifiCorp and Cowlitz PUD 2004b).

2.5 KOKANEE

2.5.1 Current Management Goals and Production Levels

The current kokanee production goal at the Lewis River Hatchery Complex is 45,000 fingerlings (12 fpp) and 48,000 yearlings (5.4 fpp) (12,500 pounds) (Table 2-1) (WDFW

2004a). All kokanee associated with this program are planted in Lake Merwin. The WDFW management objective for kokanee is to maintain the fishery.

2.5.2 Broodstock Origin

Kokanee are not native to the Lewis River basin. In the late 1950s and early 1960s, Swift Reservoir, Yale Lake and Lake Merwin all were stocked with kokanee from Kootenay Lake and Cultus Lake, British Columbia. A self-sustaining population currently exists in Yale Lake. Lake Merwin kokanee are thought to persist through escapement over Yale Dam (PacifiCorp 1999). In 1996, WDFW decided to supplement the kokanee population in Lake Merwin using hatchery kokanee spawned and reared at Speelyai Hatchery. In 1999, Yale Lake received its first planting of kokanee since 1957 due to low numbers of returning kokanee in Cougar Creek (PacifiCorp and Cowlitz PUD 2000). Plants in Yale Lake were temporary and discontinued in late 2001.

2.5.3 Broodstock Collection

All broodstock used for the Speelyai Hatchery kokanee program are collected at Speelyai Hatchery. As part of scheduled upgrades, a kokanee weir trap was installed at the hatchery. The Speelyai Hatchery water diversion dam, located at the mouth of Speelyai Creek, is a total barrier to upstream fish migration. As a result, fish are not able to access the creek from Lake Merwin. Between 1995 and 2013 the total number of kokanee broodstock collected at Speelyai Hatchery has ranged from 224 in 1996 to 1,701 in 1998 (Table 2-18). Following spawning, all kokanee carcasses are disposed of at a local landfill.

Table 2-18. The kokanee broodstock collection level and egg take at the Lewis River Hatchery Complex (1995 through 2013).

Year	Total Hatchery Escapement	Egg Take
1995	240	48,000
1996	224	14,021
1997	917	69,000
1998	1,701	237,500
1999	1,396	181,200
2000	929	180,000
2001	1,191	162,000
2002	836	145,200
2003	944	144,000
2004	1,075	208,190
2005	NA	NA
2006	930	152,838
2007	729	132,500
2008	683	255,400
2009	400	126,200
2010	400	122,740
2011	368	130,300
2012	380	137,700
2013	363	143,330

Source: WDFW 2013

2.5.4 Incubation and Rearing

Kokanee eggs are incubated at Speelyai Hatchery and are ponded in February of each year. As described previously, the kokanee program consists of two releases of unmarked fish, and early fingerling release directly from the hatchery in the October (45,000 at 12 fpp) and a yearling release from the Lake Merwin net pens in the spring (48,000 at 5.4 fpp).

2.5.5 Release Location and Numbers Released

All kokanee produced at the Lewis River Hatchery Complex are released directly into Lake Merwin. Release numbers and size at release have been highly variable in the past 8 years and recently; releases have exceeded the production targets (Table 2-19). Releases that exceed production targets have been unfed fry plants (except for Cougar Creek plants) (WDFW 2013). There is currently an escapement goal for Cougar Creek and if it is not met WDFW may augment that production with hatchery kokanee fry.

Table 2-19. The number, size, and release dates of kokanee released into Lake Merwin (1995 through 2013).

Year	Number Released	Average Size (fpp)
1997	46,360	1300
1998	NA	NA
1999	97,437	160
2000	44,120	7.9
2001	128,112	129
2002	97,572	10.9
2003	163,713	7.1
2004	112,830	10.6
2005	144,401	9.9
2006	129,461	10.2
2007	90,700	12.3
2008	78,105	8
2009	78,595	9.1
2010	96,135	10.4
2011	61,330	9.6
2012	93,448	7.3
2013	93,415	7.4

Source: WDFW 2013

2.5.6 Adult Abundance

Kokanee are the primary target species for anglers in Lake Merwin. Current adult abundance estimates are not available; however, a 1995 creel survey in Lake Merwin (May through August) estimated that 19,337 hours were expended to catch 3,068 kokanee, 511 resident coho (excess hatchery coho), 20 rainbow trout, and 20,764 northern pikeminnow (Hillson and Tipping 1999).

2.6 SEA-RUN CUTTHROAT TROUT

Prior to 1999, as a condition of the Merwin Project license, Merwin Hatchery annually released about 25,000 sea-run cutthroat smolts (Cowlitz and Skamania stocks) into the North Fork Lewis River. The original goal of the program was to produce sea-run cutthroat trout to mitigate for lost habitat due to construction of the three PacifiCorp Energy dams on the Lewis River (Hillson and Tipping 1999). Because of a low return to the creel in 1997 and 1998 and concerns over potential interactions (predation and competition) with wild cutthroat and fall Chinook salmon, the program was discontinued in 1999. The existing Lewis River coastal cutthroat trout population is considered native with wild production (WDFW 2000).

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Appendix B

Section 8 of the Lewis River Settlement Agreement

SECTION 8: HATCHERY AND SUPPLEMENTATION PROGRAM

8.1 Hatchery and Supplementation Program. The Licensees shall undertake a hatchery and supplementation program. The goals of the program are to support (i) self-sustaining, naturally producing, harvestable native anadromous salmonid species throughout their historical range in the North Fork Lewis River Basin, and (ii) the continued harvest of resident and native anadromous fish species (the "Hatchery and Supplementation Program"). The Hatchery and Supplementation Program shall be consistent with the priority objective of recovery of wild stocks in the basin to healthy and harvestable levels. The intention of the foregoing sentence is not necessarily to eliminate the hatchery program but it recognizes the importance of recovering wild stocks and a potential that hatchery production may adversely affect recovery. The Hatchery and Supplementation Program shall be consistent with the ESA, applicable state and federal fisheries policies, and regional recovery plans, and should be consistent with recommendations of the Hatchery Science Review Group and the Northwest Power Planning Council's Hatchery Review (Artificial Production Review & Evaluation) to the extent practicable. The supplementation portion of the program shall be a part of the reintroduction program (in addition to fish passage) and shall be limited to spring Chinook, steelhead and coho as provided in this Section 8.

To ensure that the Hatchery and Supplementation Program is meeting its goals, the Licensees, in Consultation with the ACC and with the approval of the Services, shall develop and implement a hatchery and supplementation plan to adaptively manage the program and guide its management as set out in Section 8.2 below ("Hatchery and Supplementation Plan" or "H&S Plan"). The Licensees shall incorporate best methodologies and practices into the Hatchery and Supplementation Plan. The Hatchery and Supplementation Plan shall be designed to achieve the numeric Hatchery Targets provided for in Section 8.3 below, and those targets shall be calculated in terms of ocean recruits of hatchery origin, taking into account harvest and escapement. For purposes of this Agreement, "Ocean Recruits" shall mean total escapement (fish that naturally spawned above Merwin and hatchery fish) plus harvest (including ocean, Columbia River, and Lewis River harvest). Subject to the ESA, applicable federal and state fisheries policies, regional recovery plans, other applicable laws and policies, and the terms of this Agreement, the Licensees shall provide for the implementation of the Hatchery and Supplementation Program for the terms of the New Licenses.

As of the Effective Date, WDFW owns the existing Lewis River Hatchery facility. Use and operation of the Lewis River Hatchery is subject to agreements between PacifiCorp and WDFW. The Licensees shall ensure the existing Lewis River, Merwin, and Speelyai hatchery facilities (the "Hatchery Facilities") are modified pursuant to Section 8.7 below to meet their obligations under this Section 8. The Licensees shall ensure the Hatchery Facilities, including the relevant or necessary support facilities (e.g., employee housing, shops, hatcheries, and related infrastructure), as modified, are maintained as necessary to consistently deliver a high-quality hatchery product that will meet their obligations. The Licensees' hatchery production obligations as set forth in Section 8.4 below, including both anadromous and resident fish, shall be limited by the combined production capacity

of the Hatchery Facilities ("Hatcheries Capacity Limit") as established after implementation of upgrades as set forth in Section 8.7. The Licensees may, after Consultation with the ACC, use different hatcheries than those described above; provided that such different hatcheries (a) have equal or greater capacity than the Hatchery Facilities if that capacity is still required to meet the Licensees' obligations under this Section 8, (b) are of quality equal to or greater than that of the Hatchery Facilities, and (c) comply with transfer and disease protocols and other requirements of the H&S Plan.

8.2 Hatchery and Supplementation Plan. The Licensees, in Consultation with the ACC and subject to the approval of the Services, shall develop a Hatchery and Supplementation Plan to address hatchery operations, supplementation, and facilities as provided in Section 8.2.1 below. Until implementation of the Hatchery and Supplementation Plan, PacifiCorp shall continue to implement the hatchery program set forth in Articles 50 and 51 of the 1983 Merwin license, as amended.

The Hatchery and Supplementation Plan will address both anadromous and resident fish. The Licensees shall incorporate best methodologies and practices into all components of the H&S Plan, including, but not limited to, the Hatchery Facilities and supplementation facilities. When developing the H&S Plan, the Licensees and the ACC shall be guided, at a minimum, by the Fish Planning and Hatchery Review Documents (submitted as AQU-18 with the Licensees' applications for the Merwin, Swift No. 1, and Swift No. 2 Projects in April 2004), and shall take into consideration the results of ongoing relevant hatchery reviews and the experience of other supplementation programs in the region, such as the Yakama Nation's Cle Elum facility. The Licensees shall transition from the hatchery program set forth in Articles 50 and 51 of the 1983 Merwin license, as amended, to implementing the Hatchery and Supplementation Plan as soon as practicable after Issuance of the New License(s) for the Merwin Project or the Swift Projects, whichever occurs earlier, provided that supplementation will commence as provided in Section 8.5. When finalized, the Licensees shall submit the Hatchery and Supplementation Plan to WDFW and NOAA Fisheries for consideration in their development of applicable hatchery genetic management plans ("HGMPs").

8.2.1 Development of Plan/Timing. The Licensees, in Consultation with the ACC, shall produce and distribute a draft Hatchery and Supplementation Plan to the ACC by the first anniversary of the Effective Date. The Yakama Nation may chair a subgroup of interested members of the ACC for purposes of coordinating the ACC's input regarding the supplementation elements of the draft H&S Plan. The members of the ACC shall have 60 days to comment on the draft H&S Plan. The Licensees shall provide a 60-day period for the public to provide written comments. The Licensees shall consider and address in writing the written comments provided by the members of the ACC, including the rationale behind the Licensees' decision to not address a comment in the final H&S Plan. The Licensees shall consider comments and submit a revised H&S Plan to the Services for approval within 120 days of the first anniversary of the Effective Date.

8.2.2 Hatchery and Supplementation Plan Contents. The H&S Plan shall address the means by which the Licensees shall use the Hatchery Facilities to accomplish

the goals and requirements of the Hatchery and Supplementation Program, including, without limitation, the Hatchery Targets. It shall also be consistent with the objective of restoring and recovering wild stocks in the basin to healthy and harvestable levels. The H&S Plan shall address, at a minimum, the following topics:

8.2.2.1 A description of the Hatchery Facilities, including the upgrades identified in Schedule 8.7;

8.2.2.2 Identification of species and broodstock sources to be used for the Hatchery and Supplementation Program;

8.2.2.3 The quantity and size of fish to be produced;

8.2.2.4 The allocation of smolts and adults between the hatchery and supplementation programs and a description of how the two programs are to be implemented at the same facility without causing unacceptable adverse impacts on each other;

8.2.2.5 Rearing and release strategies for each stock including, but not limited to, timing, planned distribution, locations for release, procedures to transport smolts to acclimation sites for supplementation purposes, and upward and downward production adjustments to accommodate natural returns;

8.2.2.6 The Ocean Recruits Methodology referenced in Section 8.3.2.2 below;

8.2.2.7 Plans and protocol for supplementation stocks;

8.2.2.8 Broodstock collection and breeding protocols;

8.2.2.9 Policies in effect regarding in-basin and out-of-basin stock transfers;

8.2.2.10 Measures to minimize potential negative impacts of the Hatchery and Supplementation Program on ESA-listed species;

8.2.2.11 Measures to protect production processes from predators, e.g., netting, consideration of evolving hatchery practices to condition fish to avoid predators;

8.2.2.12 A description of how the Hatchery and Supplementation Program monitoring and evaluation requirements will be implemented, including, but not limited to, marking strategies;

8.2.2.13 A description of the methods to prevent unacceptable adverse impacts, if any, of (1) the hatchery program on the reintroduction program, and

(2) the supplementation program on native resident species; and

8.2.2.14 Fish health protocols.

8.2.3 Annual Operating Plan. The Licensees shall provide for the implementation of the Hatchery and Supplementation Plan through an annual plan ("Annual Operating Plan"). The Annual Operating Plan shall be consistent with the Hatchery and Supplementation Plan. The Licensees, in Consultation with the hatchery managers and with the approval of the Services, shall develop the initial Annual Operating Plan as part of the Hatchery and Supplementation Plan. The Licensees shall develop subsequent Annual Operating Plans in Consultation with the hatchery managers and subject to the approval of the Services. The Annual Operating Plan may be included as part of the detailed annual reports of the ACC activities required by Section 14.2.6.

The Annual Operating Plan shall, at a minimum, contain: (1) a production plan, which shall specify the species and broodstock sources; (2) the current Hatchery Target and Juvenile Production Target for each species to be produced at the Hatchery Facilities; (3) a release plan which shall identify by species the rearing schedule and planned distribution of fish and the schedules and locations for releases; (4) a list of facility upgrades to be undertaken that year; and (5) a description of relevant monitoring and evaluation to be undertaken that year.

8.2.4 Reporting Requirements. On an annual basis, the Licensees shall provide to the ACC for review and comment a report compiling all information gathered pursuant to implementation of the Hatchery and Supplementation Plan. The report also will include recommendations for ongoing management of the Hatchery and Supplementation Program. The ACC shall have 60 days to comment on the annual report. Within 60 days of the close of the comment period, the Licensees shall finalize the report after consideration of all comments. The Licensees shall also provide the comprehensive periodic review undertaken pursuant to Section 8.2.6 below to the ACC. The Licensees shall provide final annual reports and the comprehensive periodic review to the Services during the development of any required ESA permit or authorization for hatchery operations, including NOAA Fisheries' HGMP process. The report may be included as part of the detailed annual reports of the ACC activities required by Section 14.2.6.

8.2.5 Plan Modifications. The Licensees shall update the Hatchery and Supplementation Plan every five years or earlier if required by the HGMP, in Consultation with the ACC and with the approval of the Services, using the process set out in Section 8.2 above in order to adaptively manage the Hatchery and Supplementation Program. The Licensees shall consider recommendations from members of the ACC and the comprehensive review set forth below, and identify those recommendations that have not been incorporated into the H&S Plan with a brief statement as to why the changes were not made.

8.2.6 Comprehensive Periodic Review. The Licensees shall undertake a comprehensive periodic review within 5 years after reintroduction above Swift No. 1 Dam, within 5 years after reintroduction into Yale Lake, and within 5 years after reintroduction into Lake Merwin, and then every 10 years after that. This schedule is to be followed even in the event that reintroduction into either Yale Lake or Lake Merwin does not occur. The Licensees, in Consultation with the ACC, shall hire an independent consultant to review the Hatchery and Supplementation Program to assess (i) the Program's impact on the reintroduction program and on listed species, (ii) the Program's effectiveness in achieving the goals set out in Section 8.1 above, and (iii) efficiency of hatchery operations. Factors to be considered in the review include current federal and state policies and plans, relevant best practices, and existing information regarding recent scientific advances. The reviewer will provide recommendations regarding ongoing management of the Hatchery and Supplementation Program and, if needed, recommend amendments to the Hatchery and Supplementation Plan. The Licensees shall incorporate recommendations for ongoing management of the Hatchery and Supplementation Program set forth in the review into the Hatchery and Supplementation Plan pursuant to Section 8.2.5 or explain why the recommendation is not being adopted.

8.3 Anadromous Fish Hatchery Adult Ocean Recruit Target by Species. The Licensees shall develop and implement the Hatchery and Supplementation Plan to achieve hatchery adult Chinook, steelhead, and coho ocean recruit targets ("Hatchery Targets") as described below.

8.3.1 Hatchery Targets. The following Hatchery Targets shall be in effect at the commencement of the Hatchery and Supplementation Program:

Table 8.3.1 – Hatchery Targets

	Spring Chinook	Steelhead	Coho	Total
Hatchery Targets (adult Hatchery Ocean Recruits)	12,800	13,200	60,000	86,000

8.3.2 Modifications to Hatchery Targets.

8.3.2.1 Hatchery Targets. The Licensees shall not increase any of the Hatchery Targets above the Hatchery Targets in Table 8.3.1 above during the terms of the New Licenses without the unanimous approval of the ACC.

8.3.2.2 Methods to Document Ocean Recruits. The Licensees, in Consultation with the ACC, shall determine the methods to document the number of Ocean Recruits and to separately identify Hatchery Ocean Recruits and Ocean Recruits from natural spawning in the Hatchery and Supplementation Plan ("Ocean Recruits Methodology"). The Ocean Recruits Methodology shall identify the appropriate assessment time frame over which to measure Hatchery Ocean Recruits and Natural Ocean Recruits.

8.3.2.3 Reductions in Hatchery Targets. When the Licensees determine, in Consultation with the ACC, through application of the Ocean Recruits Methodology that the number of Ocean Recruits from natural spawning grounds of any species exceeds the relevant natural production threshold(s) for that species identified in Table 8.3.2 ("Natural Production Threshold"), the Licensees shall decrease the appropriate Hatchery Target(s) identified in Table 8.3.1 on a fish-for-fish (1:1) basis. The Licensees shall not apply the amount of excess numbers of one species against another species' Hatchery Target. The Licensees shall not decrease the Hatchery Targets below the hatchery target floor ("Hatchery Target Floor") specified in Table 8.3.2.

8.3.2.4 Unacceptable Adverse Impacts on Reintroduction Program or Fisheries Management Objectives. If the Services determine that there are unacceptable impacts from hatchery production on the reintroduction program or fishery management objectives including, but not limited to, the recovery of wild stocks in the basin, then the Licensees, in Consultation with the ACC, shall identify and consider options to mitigate or avoid such unacceptable impacts. In Consultation with the ACC and at the direction of the Services, the Licensees shall implement options necessary to address such unacceptable adverse impacts, including, without limitation, modifying hatchery practices, reducing Hatchery Targets, or implementing other options that are identified pursuant to this Section 8.3.2.4.

8.3.2.5 Increases in Previously Reduced Hatchery Targets. If the Licensees reduce Hatchery Targets based on the number of Natural Ocean Recruits as determined by the Ocean Recruits Methodology, but the number of Ocean Recruits subsequently declines under such methodology, the Licensees, in Consultation with the ACC and at the direction of the Services, shall increase the Hatchery Targets on a fish-for-fish (1:1) basis, provided that the increased Hatchery Targets shall not exceed the initial Hatchery Targets in Table 8.3.1, and available data demonstrates that the hatchery fish are not the cause of decline or a significant limiting factor to self-sustaining, naturally producing, harvestable native anadromous salmonid species.

Table 8.3.2 – Numbers Governing Modifications to Hatchery Targets

	Spring Chinook	Steelhead	Coho	Total
Natural Production Threshold for Hatchery Reduction	2,977	3,070	13,953	20,000
Hatchery Target Floor	2,679	2,763	12,558	18,000

8.4 Anadromous Fish Hatchery Juvenile Production. Each year, the Licensees shall provide for the production of spring Chinook salmon smolts, steelhead smolts, and coho salmon smolts at levels specified below ("Juvenile Production"). The Licensees shall use

the Juvenile Production to provide (1) juveniles for the supplementation program under Section 8.5, and (2) juveniles for harvest opportunities. To the extent that there are not sufficient juveniles for the Hatchery and Supplementation Program and to ensure that enough adults will return to ensure adequate broodstock for the Hatchery and Supplementation Program in future years, the Licensees shall, in Consultation with the ACC and subject to the approval of the Services, determine how best to allocate juveniles.

8.4.1 Juvenile Production Targets. The Licensees shall provide for the implementation of the following Juvenile Production targets ("Juvenile Production Targets") when the Hatchery and Supplementation Program commences. The following Juvenile Production Targets shall be used unless and until modified by the Licensees pursuant to Section 8.4.2 as part of the Hatchery and Supplementation Plan in accordance with Section 8.2.5:

Table 8.4 – Juvenile Production Targets

Smolt Production	Spring Chinook	Steelhead	Coho
H&S Plan Years 1 – 3	1.35 million	275,000	1.8 million
H&S Plan Years 4 – 5	1.35 million	275,000	1.9 million
H&S Plan Years 6 – 50	1.35 million	275,000	2.0 million

8.4.2 Adjustment of Juvenile Production. The Licensees, in Consultation with the ACC, shall adjust the Juvenile Production as needed to achieve the Hatchery Targets subject to the Hatcheries Capacity Limit, e.g., at some point in the future a smaller number of juveniles may be needed to get the same number of returning adults. When determining whether adjustments should be made, the Licensees, in Consultation with the ACC, shall consider the hatchery practices component of the Hatchery and Supplementation Plan (e.g., density, best management practices), data from the Monitoring and Evaluation Plan identified in Section 9 (including, but not limited to, fish quality and adult return requirements), the periodic comprehensive review described in Section 8.2.6 above, and the terms of Section 8.1.

8.4.3 Stock Selection. The Licensees shall select stocks for the production of juveniles that are the most appropriate for the basin. The stock selected and the rationale shall be set forth in the Hatchery and Supplementation Plan. The following stocks shall be used unless and until modified by the Licensees as part of the Hatchery and Supplementation Plan in accordance with Section 8.2.5:

Table 8.4.3 – Broodstock

	Spring Chinook	Steelhead	Coho
Juveniles for Supplementation (release above Merwin)	Lewis River hatchery stock with Cowlitz River hatchery stock as contingency	Lewis River wild winter stock with Kalama hatchery stock as contingency	Lewis River hatchery early (type S) stock

Juveniles for Harvest (release below Merwin)	Same as for supplementation	Same as for supplementation **and** existing Lewis River hatchery summer and winter stock	Same as for supplementation **and** Lewis River hatchery late (type N) stock

8.5 Supplementation Program.

8.5.1 Juvenile Salmonids Above Swift No. 1 Dam. The Licensees shall, for the purpose of supplementation, provide for the transport of juvenile anadromous salmonids to acclimation sites selected pursuant to Section 8.8.1, for the following periods of time:

(1) Spring Chinook and Steelhead. The Licensees shall provide the means to supplement juvenile spring Chinook and steelhead for a period of 15 years commencing upon completion of the Swift Downstream Facility pursuant to Section 4.4.1; and

(2) Coho. The Licensees shall provide the means to supplement juvenile coho salmon for a period of 9 years commencing upon completion of the Swift Downstream Facility.

At the end of these time periods, the Licensees shall assess on a year-by-year basis whether to extend the supplementation of juvenile salmonids. Upon ACC agreement and subject to the Services' approval, the Licensees shall continue to supplement juvenile salmonids. In evaluating whether to extend the supplementation of juveniles, the ACC shall consider, among other things, the impact of continuing supplementation on the overall reintroduction program and on ESA-listed species.

8.5.2 Juvenile Salmonids to Yale Lake and Lake Merwin. PacifiCorp shall, for the purposes of supplementation, provide for the transport of juvenile anadromous salmonids to appropriate release sites in Yale Lake and Lake Merwin, as described in Section 8.8.2 below, for the following periods of time:

(1) Spring Chinook and Steelhead. PacifiCorp shall provide the means to supplement juvenile spring Chinook and steelhead for a period of 15 years to Yale Lake commencing upon completion of the Yale Downstream Facility as provided in Section 4.5; and for a period of 15 years to Lake Merwin commencing upon completion of the Merwin Downstream Facility as provided in Section 4.6; and

(2) Coho. PacifiCorp shall provide the means to supplement juvenile coho salmon into Yale Lake for a period of 9 years commencing upon completion of the Yale Downstream Facility and into Lake Merwin for a period of 6 years commencing upon completion of the Merwin Downstream Facility.

At the end of these time periods, PacifiCorp shall assess on a year-by-year basis whether to extend the supplementation of juvenile salmonids. Upon ACC agreement and subject

to the Services' approval, the Licensees shall continue to supplement juvenile salmonids. In evaluating whether to extend the supplementation of juveniles, the ACC shall consider, among other things, the impact of continuing supplementation on the overall reintroduction program and on ESA-listed species.

8.5.3 Adult Salmonids. The Licensees shall begin providing for the supplementation of adult fish one year prior to completion of the Swift Downstream Facility. Throughout the terms of the New Licenses, the Licensees shall provide for the transport and release of supplementation stocks of adult spring Chinook, coho, and steelhead above Swift No. 1 as directed by the ACC. Throughout the terms of the New Licenses, PacifiCorp shall provide for the transport and release of supplementation stocks of adult spring Chinook, coho, and steelhead into Yale Lake and Lake Merwin as directed by the ACC. The ACC shall determine the timing for initiating supplementation into Yale Lake and Lake Merwin. The ACC, subject to the approval of the Services, may recommend discontinuing or recommencing the supplementation of such supplementation stocks, provided that any such recommendations are biologically based and not contrary to the goals of the ESA.

8.5.4 Supplemental Juveniles. The Licensees shall not mark supplementation juveniles in the same manner as hatchery fish are marked for harvest.

8.6 Resident Fish Production.

8.6.1 Rainbow Trout Production. Each year, for the terms of the New Licenses, subject to Section 8.6.3, the Licensees shall provide for the production of 20,000 pounds of resident rainbow trout. When the New License is Issued for either the Merwin Project or the Swift Projects, whichever is earlier, the Licensees shall fulfill their obligation by providing for the production of 800,000 juveniles with an estimated weight of 40 juvenile fish per pound, or an equivalent number, in pounds, of resident rainbow trout of a different life stage as directed by WDFW, following Consultation with the ACC. The Licensees shall provide for the stocking of such rainbow trout in Swift Reservoir. Resident rainbow trout will be managed separately from steelhead and shall not significantly interfere with the recovery of self-sustaining, naturally producing, harvestable populations of native steelhead.

8.6.2 Resident Kokanee Production. Each year, for the terms of the New Licenses, subject to Section 8.6.3, PacifiCorp shall provide for the production of 12,500 pounds of resident kokanee. When the New License is Issued for either the Merwin Project or the Swift Projects, whichever is earlier, PacifiCorp shall fulfill its obligation by providing for the production of 93,000 juveniles of various sizes which have an estimated weight of 12,500 pounds or an equivalent number, in pounds, of resident kokanee of a different life stage as directed by WDFW, following Consultation with the ACC. Unless otherwise determined by the ACC through the Hatchery and Supplementation Plan, PacifiCorp shall provide for the annual stocking of such resident kokanee in Lake Merwin.

8.6.3 Modifications in Resident Rainbow Trout and Kokanee Production. The Licensees shall modify resident rainbow trout and kokanee production numbers as part of the Hatchery and Supplementation Plan, in Consultation with the ACC and subject to the approval of the Services and WDFW, to address other management goals, including, without limitation, harvest considerations and impacts of the resident fish hatchery program on the reintroduction program; provided that the Licensees shall not increase (i) resident rainbow trout production above a cap of 20,000 pounds and, (ii) resident kokanee production above a cap of 12,500 pounds.

8.7 Hatchery and Supplementation Facilities, Upgrades, and Maintenance. The Licensees shall, in collaboration with the hatchery managers and hatchery engineers and in Consultation with the ACC, undertake or fund facility additions, upgrades, and maintenance actions as provided in Schedule 8.7, consistent with best methodologies and practices. The Licensees, in collaboration with the hatchery managers and hatchery engineers, and in Consultation with the ACC, shall design these facilities, upgrades, and maintenance actions to include elements that ensure usefulness of the facilities for supplementation and production fish culturing practices and to accommodate the facility additions, upgrades, and maintenance actions identified in Schedule 8.7. The Licensees shall complete the upgrades or actions by the deadlines identified in Schedule 8.7, provided that the Licensees shall schedule the updates or actions consistent with (i) the required hatchery production or (ii) the reintroduction program. The Licensees shall not be required to construct new hatchery facilities or to expand the existing Hatchery Facilities except as provided pursuant to this Section 8.7. WDFW retains the right and authority to operate its hatchery and conduct other or additional fish production activities that do not impact the goals set forth in Section 8.1 at the state-owned Lewis River Hatchery at no additional cost to the Licensees.

8.8 Juvenile Acclimation Sites.

8.8.1 Above Swift No. 1 Dam. Beginning upon completion of the Swift Downstream Facility, the Licensees shall place juvenile salmonid acclimation sites in areas reasonably accessible to fish hauling trucks and in practical areas in the upper watershed above Swift No. 1 Dam, as determined by the Licensees in Consultation with the Yakama Nation and the ACC. The acclimation sites shall consist of fish containment areas that allow juvenile fish to acclimate in natural or semi-natural waterways and allow necessary pre-release juvenile fish management; such sites will not consist of or include concrete-lined ponds or waterways, but may include other concrete structures necessary for facility functionality and structural integrity during the supplementation program.

8.8.2 In Yale Lake and Lake Merwin. Beginning upon completion of the Yale Downstream Facility and the Merwin Downstream Facility, respectively, PacifiCorp shall provide in-stream enclosures to confine juvenile salmonids in tributaries to Yale Lake and Lake Merwin after they are transported from rearing facilities for the purpose of allowing juveniles to adjust to the natural environment for a short period of time, to be determined by the Licensees, in Consultation with the ACC and with the approval of the Services, prior to being exposed to natural mortality factors such as predators. These

enclosures are intended to provide an opportunity for the juveniles to acclimate to the natural environment prior to being exposed to predators. While it is assumed that there will be sufficient food in the natural stream, if evidence suggests, prior to placing juveniles in the enclosures, that this is not the case, the Licensees will Consult with the ACC to determine if feeding of juveniles in the enclosures should occur. Prior to completion of the Yale Downstream Facility and the Merwin Downstream Facility, respectively, the Licensees shall, in Consultation with the ACC, evaluate whether Hatchery and Supplementation Program goals will be cost-effectively served by establishing and operating acclimation sites for any of the targeted stocks in Yale Lake, Lake Merwin, or their tributaries. In the event that funding becomes available for acclimation facility establishment and operation in Yale Lake, Lake Merwin or their tributaries from Parties other than the Licensees or from third parties, the Licensees shall amend the H&S Plan, subject to the approval of the Services, to provide for placing of juvenile anadromous salmonids in such acclimation facilities for so long as the funding continues to be available and placement does not negatively impact the supplementation program or otherwise alter the obligations of the Licensees.

Appendix C

ISAB Clarification on Mass Marking and Mark-Selective Fisheries

Independent Scientific Advisory Board
for the Northwest Power and Conservation Council,
Columbia River Basin Indian Tribes,
and National Marine Fisheries Service
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
ISAB@nwcouncil.org

MEMORANDUM (ISAB 2005-4A) July 29, 2005

TO: Melinda Eden, Chair, Northwest Power and Conservation Council

FROM: Eric J. Loudenslager, ISAB Chair

SUBJECT: ISAB Clarification on Mass Marking and Mark-Selective Fisheries

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Purpose

On July 12, 2005, the ISAB report on harvest management of Columbia River Salmon and Steelhead was summarized for the Northwest Power and Conservation Council (Council). In response to several questions raised by Council members during the ISAB presentation, this briefing paper summarizes technical issues surrounding the impacts of mass marking and mark-selective fishing.

Background – the critical importance of the Coded-Wire Tag (CWT) system

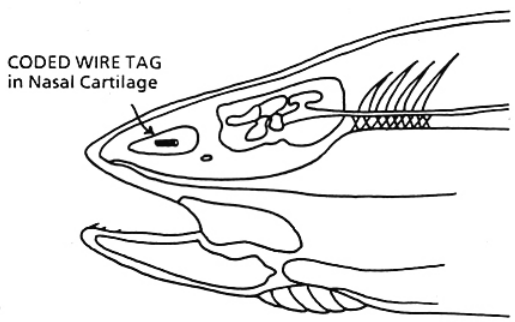


FIGURE 1.—Longitudinal section through the head of a juvenile salmonid showing the correct placement of a coded wire tag in the nasal cartilage. (After Koerner 1977.)

Coded-Wire Tag (CWT) data are central to the management of natural stocks of Chinook and coho salmon. These species are impacted by a variety of commercial and recreational fisheries at various stages of the life history throughout their migratory ranges, making efficient coastwide data collection systems essential for stock and fishery assessments. Current fishery regimes for Chinook and coho salmon are inextricably linked to the CWT system. In his introductory remarks to a CWT Workshop, convened by the Pacific Salmon Commission in June 2004, Larry Rutter from the National Marine Fisheries Service described this relationship as follows:

"Over the past thirty years or so we have constructed an elaborate and interdependent fishery management and stock assessment scheme that is heavily reliant upon data comprised of CWT recoveries. Billions of CWTs have been placed in salmon over the years, mostly in Chinook and coho salmon. And, through an elaborate,

coastwide sampling program that sifts through escapements and catch in fisheries far and wide, millions of CWTs have been recovered. Over time, we have accumulated what surely must be one of the most extensive fishery management data sets found anywhere in the world. This data set is analyzed and manipulated with increasingly complex models and algorithms; the results of these analyses provide the backbone of our system for managing Chinook and coho salmon fisheries coastwide."

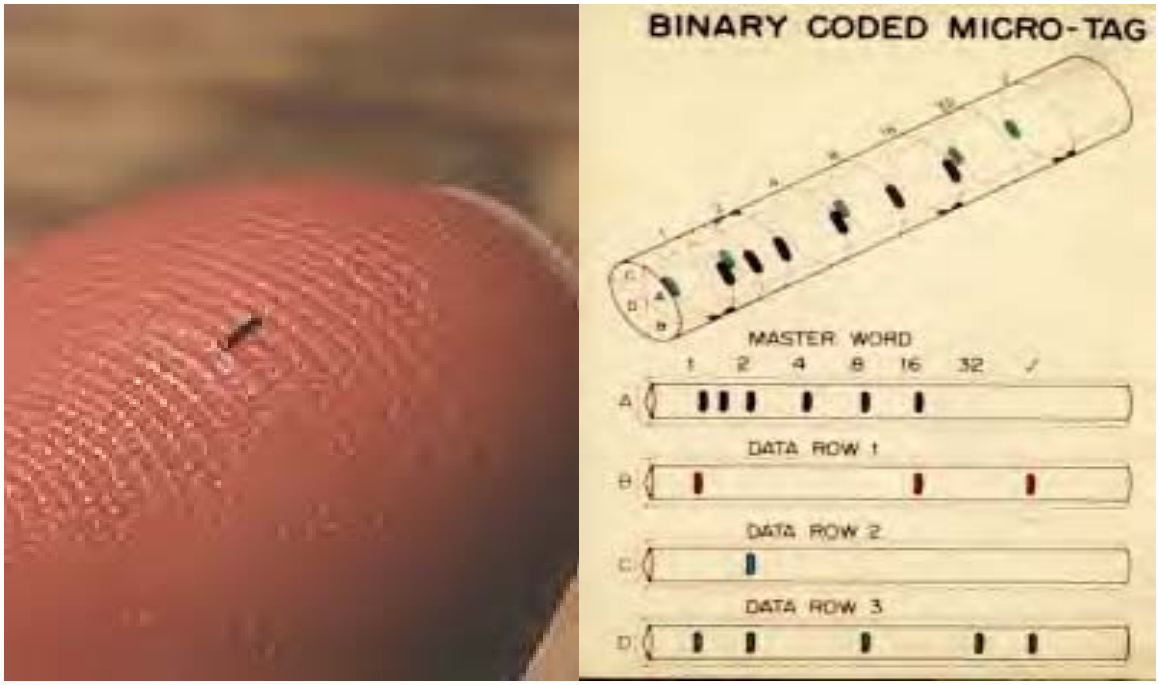


Fig 2. CWT size and coding system.

Harvest management regimes for *natural stocks* of Chinook and coho salmon are largely based upon data collected through a system of CWT releases of hatchery indicator stocks that are selected to represent specific natural stocks and are based on brood stock and rearing/release strategies.[1] Direct tagging of wild fish is rarely performed due to the costs and logistics of marking and recovering sufficient numbers of fish; hatcheries provide large concentrations of juvenile salmon for tagging and represent convenient places where mature salmon can be recovered.

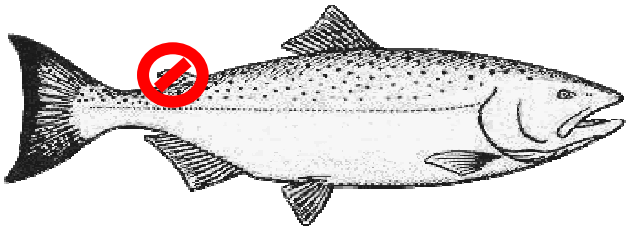
Prior to the advent of mass marking and mark-selective fishing, both the hatchery indicator stocks and the natural stocks they represent were subject to the same fishing patterns (locations and exploitation rates). Consequently, estimates of fishery impacts derived from cohort reconstruction (e.g., maturation rates, fishery-age exploitation rates) of CWT hatchery indicator stock groups could be employed as surrogate measures for naturally spawning populations (i.e., the hatchery indicator and the associated natural

[1] Wild smolt tagging experiments in Puget Sound, southern British Columbia, and the Washington Coast support the belief that hatchery indicator and wild coho salmon stocks are subjected to similar fishing patterns. This relationship is less clear for Chinook salmon, but tagging experiments with progeny from wild and hatchery brood stock suggest that the use of indicator stocks is reasonable, but not certain.

stock were assumed to experience the same exploitation history and impacts). The advent of mark-selective fishing, however, can seriously compromise the ability to make inferences regarding fishery impacts on natural stocks from CWT data.

Mass Marking and Mark-Selective Fisheries

When survivals plummeted in the early 1990s, conservation concerns resulted in several natural stocks being listed under the Endangered Species Act (ESA). To a large degree, the data necessary to establish jeopardy standards for ESA listed stocks and monitor compliance is provided by the CWT system through the use of hatchery indicator stocks.



In fisheries that exploit complex stock mixtures, mass marking and mark-selective fishing developed as a means to increase utilization of hatchery fish within constraints established to protect natural stocks of concern. Currently, mass marking involves clipping the adipose fin to provide a visual cue that allows differential retention of marked fish while requiring unmarked fish to be released in mark-selective fisheries. While some of the unmarked fish will die as a result of stress and injury when caught and released in mark-selective fisheries, some will survive. In theory, the lower mortality suffered by natural fish enables more hatchery fish to be caught while allowing more natural fish to escape to their natal streams and increase the spawning abundance.

The United States and Canada share common issues that exert pressure for the wider application of mass marking and mark-selective fisheries in management of Chinook and coho salmon. Both countries have experienced severe fishery restrictions resulting from the need to conserve natural stocks. Both countries have large investments in hatchery infrastructure to mitigate for destruction of fish production due to damage to habitat and to provide harvest opportunity for fisheries. Both countries are suffering from intense budgetary pressures for fiscal austerity. Both countries recognize that if investment in their hatchery programs is to continue, then some means must be found to provide harvest opportunity that relies upon hatchery production to support economically and socially viable fisheries, while constraining impacts to wild salmon stocks at levels appropriate for their conservation and rebuilding.

Canada and the United States currently mass mark millions of hatchery coho salmon each year. The United States has also mass marked millions of Chinook salmon in recent years (Canada has not mass marked Chinook salmon). New technology has been developed to automate the process of mass marking and/or inserting CWTs into large numbers of hatchery-produced Chinook and coho salmon. The concept of mass marking to support mark-selective fisheries has become so appealing to some that it recently found its way into federal legislation in the United States in the 2004

appropriation bill for the U.S. Fish and Wildlife Service (USFWS) (Bowhay 2004), regardless of potential adverse consequences for the future viability of the CWT system. Under the provisions of the appropriations bill, the USFWS is directed to *" ...implement a system of mass marking of salmonid stocks, intended for harvest, that are released from Federally operated or Federally financed hatcheries including, but not limited to fish releases of coho, chinook, and steelhead species. Marked fish must have a visible mark that can be readily identified by commercial and recreational fisheries.*" As a consequence of this legislation, many millions more Chinook and coho salmon originating in the Pacific Northwest will be mass marked.

In the early 1990s, when mass marking and mark-selective fisheries were in their infancy, the Pacific Salmon Commission (PSC) found itself at the center of heated policy and technical debates over potential impacts of mass marking and mark-selective fisheries to the CWT system. Recognizing the reality that political pressures would press for continued implementation of mass marking and mark-selective fishing and that these methods could adversely affect the viability of the CWT system that has been essential to Chinook and coho salmon management for three decades, the Pacific Salmon Commission ultimately adopted an "Understanding of the PSC Concerning Mass Marking and Selective Fisheries" and established a permanent Selective Fishery Evaluation Committee (SFEC) in 1998. This committee has addressed the technical issues surrounding mass marking and mark-selective fisheries and has documented the extent and magnitude of mass marking and mark-selective fisheries in various reports (http://psc.org/publications_tech_techcommitteereport.htm#SFEC).

Issues Pertaining to Mass Marking and Mark-Selective Fisheries

Differential fishery impacts on natural fish and their hatchery indicators

Because marked hatchery fish and unmarked natural fish are no longer subject to the same patterns of exploitation under mark-selective fisheries, CWTs on hatchery indicator stocks can no longer serve as suitable surrogates to evaluate and monitor fishery impacts on natural stocks. In the presence of mass marking and mark-selective fisheries, impacts on natural stocks cannot be inferred from direct samplingbecause unmarked fish must be released. In addition, analytical results increasingly rely upon new assumptions on fishery impacts that are difficult to validate (e.g., assumed values for release and drop off mortality rates, plus mark retention and unmarked recognition error).

A concept termed Double Index Tagging (DIT) has been proposed as a means to provide data to help evaluate the impact of mark-selective fisheries on natural stocks. With DIT, two groups of fish with CWTs are released, identical in every respect except that: (a) the groups carry different CWT codes; and (b) only one of the groups is mass marked. When these fish are subjected to mark-selective fishing, fish from the unmarked DIT pair are released while fish from the marked DIT pair are retained. In mark-selective fisheries, only CWTs from the marked DIT pair can be recovered while in non-mass-selective fisheries, CWTs from both marked and unmarked DIT releases could be collected.

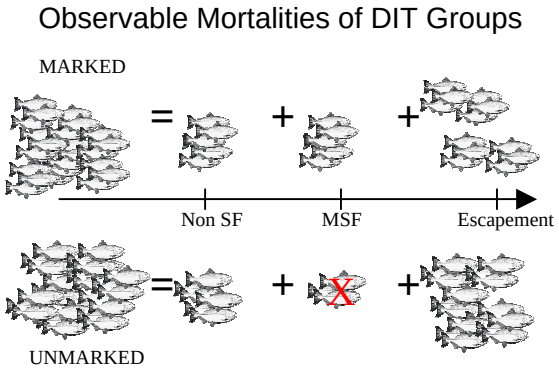


Fig 3. Observable recoveries of Double Index Tag Releases

With DIT, CWT recovery programs for fisheries and spawning escapements now must sample both marked and unmarked fish, and there must be provisions for recovering CWTs in both mark-selective and non-mark selective fisheries on the same stock. In theory, differences in recovery patterns between the DIT pairs would be used to assess the effect of mark-selective fishing.

DIT effectively doubles tagging costs for indicator stocks because now two groups of fish would need to be tagged. The number of fish in each group could not be reduced because of increased uncertainty surrounding recovery statistics.

In addition to differential patterns of fishery impacts on marked and unmarked fish, mass marking also poses an additional problem with the capacity of the CWT system to provide the data necessary to evaluate impacts of mark-selective fisheries and other fisheries. Prior to the advent of mass marking, the adipose fin clip had long been sequestered to indicate the presence of a CWT so sampling programs could efficiently identify fish with CWTs for analysis. With mass marking, the number of fish with missing adipose fins would increase many times over, so electronic tag detection (ETD) has been developed to identify fish containing a CWT. ETD equipment detects the presence of the CWT as magnetized wire. Two main types of ETD equipment are used: a hand-held wand and a tube. Wands are designed for use by field samplers who inspect fish in catches and escapements. They are passed over the head of a fish and a beep identifies the detection of metal. With a tube, the entire fish is passed through and the presence of a tag detected. Tubes are designed to be employed in high-volume installations such as hatcheries and processing plants. ETD technology must be used by trained samplers and employed throughout the migratory range of the stocks to recover the CWTs required for cohort analysis.

Fig. 4. Wand Detector and Tube Detector

Some jurisdictions that do not conduct mark-selective fisheries, however, continue to rely upon the missing adipose fin as the potential indicator of a CWT. Agreement to deploy ETD has not been reached in some areas because of increased cost of equipment and sampling plus unresolved technical or operational concerns. Consequently, since many mass-marked fish migrate to areas where there are no plans to employ ETD, CWT recoveries, particularly for unmarked DIT releases, will be incomplete, resulting in biased estimates of exploitation rates.[2] For many natural stocks, particularly, those listed under the ESA with jeopardy standards tied to exploitation rates, such bias can be problematic since accurate, unbiased estimates of exploitation rates are essential to monitor compliance and evaluate the effectiveness of fishery management measures.

Even with ETD and DIT, however, the capacity to generate the stock-age-fishery specific exploitation rates needed to preserve the viability of the CWT system as a means to estimate fishery impacts on natural stocks remains uncertain. The Selective Fishery Evaluation Committee (SFEC) established by the Pacific Salmon Commission in 1998, noted that no methods had yet been found to generate reliable estimates of mark-selective fishing impacts on unmarked fish when more than one mark-selective fishery impacts, particularly in the presence of substocks[3].

The potential impact of mass marking and mark-selective fishing is situational, depending on the biological characteristics of the stocks involved and the location and intensity of the mark-selective fishery. Under certain circumstances, mass marking and mark-selective fishing could seriously and adversely affect the future utility of the CWT system, which currently serves as the foundation for stock and fishery assessments of Chinook and coho salmon.

Effectiveness of mass marking and mark selective fisheries have not been demonstrated

Despite their "common sense" appeal, mass marking and mark-selective fisheries have not been shown to be an effective management tool to constrain impacts on natural stocks of Chinook and coho salmon to allowable levels. The effectiveness of mass marking and mark-selective fishing has not been evaluated prior to widespread application, and has instead, been blindly accepted as a matter of faith.

[2] For a given stock, if mark selective fisheries occur in pre-terminal fishing areas, CWTs of unmarked DIT groups will not be recovered in non-selective fisheries that do not employ ETD; consequently, impacts of mark selective fisheries cannot be estimated by differences in exploitation patterns between marked and unmarked DIT pairs.

[3] Substocks are portions of a larger population that have different migratory patterns, for example, some coho originating in Puget Sound may reside in Puget Sound, while other portions migrate to the ocean. It is not possible to know in advance which fish will migrate to a given area. In the absence of mark-selective fisheries, the presence of substocks does not matter because marked and unmarked fish are subjected to the same fishing patterns. But when substocks are subjected to different mark-selective fishing patterns, fishery-specific impacts of mark-selective fisheries on unmarked fish cannot be readily estimated.

Management targets have not been adjusted to compensate for increased uncertainty

Statistical uncertainty surrounding CWT-based estimates has two general components, precision and bias. Precision relates to the amount of variability in the estimates, while bias concerns the accuracy of the estimates. Mass marking and mark-selective fisheries increase uncertainty and introduce additional bias in estimates of fishery impacts on unmarked fish due to the necessity to rely upon assumptions (e.g., release mortality rates) that cannot be readily validated. Current management regimes do not adjust allowable exploitation rates on natural stocks to compensate for this increased uncertainty; therefore, the risk that management objectives for natural stocks will not be achieved is increased, and the risk is an added burden on the viability of natural stocks.

Mass marking and mark-selective fishery have increased the cost of the CWT data collection system

DIT, changes in sampling requirements, requirements for ETD, and the need for sampling all fish in all fisheries and escapements greatly increases the cost of maintaining the CWT system. There is a potential for budget pressures resulting from the costs of mass marking and mark-selective fishery to reduce the amount of funding that agencies have available to operate other aspects of their program responsibilities.

The Pacific Salmon Commission's CWT Workshop

Since the early 1980's, the CWT system has served as the foundation for Chinook and coho salmon management in the Pacific Northwest and the scientific basis for the Pacific Salmon Treaty. Concerns over statistical uncertainty, the adequacy of reliance upon hatchery stock surrogates for associated natural stocks, and the impact of mass marking and mark-selective fisheries have been building in recent years. Taken together, these concerns have generated questions regarding the continuing utility of the CWT and associated sampling regimes and analytical tools that the Pacific Salmon Commission has relied upon for decades. As a result, the ability of the CWT system to continue to serve in that capacity is now very much in doubt.

As more and more of the fishing mortality on natural stocks is accounted for by non-landed catch (e.g., shaker loss, drop off, release and non-retention), the capacity of the CWT system to provide the data necessary for stock and fishery assessments is being increasingly challenged. Requirements to constrain exploitation rates on depressed natural stocks are increasing. Although reliable estimates of total mortalities are being demanded, the information systems necessary to provide the required data are deteriorating. Estimates of mortalities on natural stocks are becoming ever more dependent upon assumptions, inferences, and methods that cannot be readily validated, as well as programs for sampling and tag recovery in natural spawning populations whose accuracy is unknown. In June 2004, the Pacific Salmon Commission convened an expert panel to develop recommendations for addressing emerging concerns over the future of the CWT system. The Panel's report is scheduled for release this fall.

Other Considerations

There are other potential adverse impacts of mass marking and mark-selective fisheries, including:

a. the high costs associated with mass marking and sampling could reduce funding available to agencies to perform other program functions;
b. the implementation of fisheries that target the harvest of hatchery fish may reduce the motivation to protect the quantity and quality of habitat for production of natural fish;
c. the potential for agencies to try to increase production of hatchery fish could result in increased interactions that can reduce the survival of naturally produced fish.

Summary and Discussion

The effectiveness of mass marking and mark-selective fisheries as a management tool to constrain impacts on natural stocks to levels that effectively conserve natural populations has not been operationally demonstrated. Instead, that effectiveness in general has been accepted blindly. This change in management effectiveness is completely contrary to the management successes evident during the 1980s when coded-wire tag analyses provided reliable information for the coastwide management and assessment of coho and Chinook salmon populations.

Mass marking and mark-selective fisheries increase uncertainty and bias in the estimates of fishery impacts on natural stocks. Increased uncertainty resulting from different fishing pressures on hatchery and natural stocks, coupled with less than complete coverage of electronic tag detection throughout the migratory ranges of stocks, can substantially reduce the ability to monitor and evaluate fishery impacts on natural stocks. While these problems will exist to some extent in the presence of any mass marking and mark-selective fishery, their severity will vary among different salmon stocks, depending on the location, timing, and intensity of the mark-selective fishery.

Increased costs of implementing mass marking and mark-selective fisheries can adversely affect the ability of agencies to fulfill other responsibilities. In some quarters, there is concern that reliance on mass marking and mark-selective fisheries to sustain fisheries can lead to reduced protection of habitat and survival rates of natural fish. If hatchery production is increased to support mark-selective fishery, there are additional concerns that the accompanying increases in hatchery-wild interactions (competition, interbreeding) will adversely affect the future viability of natural stocks.

The issues associated with mass-marking and mass-mark selective fisheries are technical in nature and can be difficult for the public to appreciate; i.e., what could be wrong with selectively removing hatchery fish while reducing harvest impacts on naturally produced salmon that require increased conservation actions? What seems very logical in words, however, does not guarantee that the desired outcome will be reached. Fundamentally, mass marking and mark-selective fishing together represent a trade-off

from what we can now measure and assess versus what we hope will be the case based on largely untested assumptions. The issue is further complicated because the level of concern over mass marking is dependent upon the application and magnitude of the mark-selective fishery. Even though a small, localized, terminal mark-selective fishery will likely have minimal increase in uncertainty, the scale of mass marking being conducted is not consistent with a plan for limited use of mark-selective fishing. Large-scale mass marking and mark-selective fisheries will substantially compromise the technical bases that have been established to assess and manage Chinook and coho salmon. In the presence of mass making and mark selective fisheries, how would an agency assess the role of harvest in the continued decline in abundance of a listed ESU? Will it be adequate to assume that 1) unvalidated values for the incidental mortality rates (e.g., release mortality rates) are accurate and known without error, 2) the incidence of multiple catch-and-release events is inconsequential, and 3) the physiological impact of multiple catch-and-release on reproductive potential of spawning fish is negligible? Will reduced levels of harvest impacts to natural stocks be assumed and risks ignored?

Although technical advisors working on CWT, mass-marking, and mark-selective fisheries have identified these concerns for several years now, the mass marking proceeds, and the benefit of mark-selective fisheries seems broadly accepted without thorough evaluation. These benefits may be realized in the end, but they have not been demonstrated to date.

Accurate, unbiased data are essential to decision-making and cooperative management approaches to conserve naturally spawning stocks of Chinook and coho salmon. In the 1970s and early 1980s, management actions to address declining Chinook salmon spawning escapements were frequently delayed because of uncertainty in the data and the lack of "proof" that particular user groups were contributing to a problem. Very few groups would have believed that total exploitation rates on Chinook salmon exceeded 80% and that many groups contributed to this over-fishing. Reliable CWT programs produced the "hard evidence" that allowed managers coastwide to resolve these issues and ultimately to agree on a coastwide management plan for rebuilding depressed populations of Chinook salmon in the Pacific Salmon Treaty.

In this period where stock rebuilding is given priority, increased uncertainty in outcomes should be explicitly accounted for in fishery regimes, management objectives, and assessment standards. Furthermore, technical debates over CWT data must NOT overshadow the three points noted previously under "Other Considerations." As the ISAB explained in their Harvest Report, harvest is only one component of the impacts imposed on natural populations throughout their life cycle. If the issues associated with the other three H's are ignored due to an assumption that mass marking and mark-selective fisheries will protect naturally spawning stocks, then natural populations may not recover. In addition, if mass marking and mark-selective fisheries continue to be promoted without adequate scientific evaluation, costs for assessments will have been substantially increased, critical information lost, and additional costs imposed on other users groups without obtaining the desired benefits. Resolution of the data concerns merits investment in studies to assess the validity of key assumptions involved in mass

marking and mark-selective fishing. These issues will be further developed in the report of the Pacific Salmon Commission's Expert Panel report due in the fall, 2005.

Appendix D

Responses to comments received on Version 2 Draft Hatchery and Supplementation Plan

Responses to Comments Received on Draft Hatchery and Supplementation Rewrite 2014.

	Commenter	Comment Number	Location	Comment	Response
1	LCFRB	LCFRB1	General Comment	The H&S plan does not adress the entire monitoring needs for the basin. There should be a comprehensive plan that includes all M&E activities in the basin, not just those related to hatchery and supplementation programs. The LCFRB recommends that the H&S Subgroup discuss a strategy for developing a comprehensive M&E Plan for the North Fork Lewis Subbasin.	The presence of two separate plans with a separate planning process causes some confusion and inefficiency, however, the Utilities are following the Settlement Agreement terms which stipulate this separation. The H&S plan focuses on reintroduction efforts and hatchery production. The M&E plan focuses mainly on determining effectiveness of the fish collectors. Unfortunately, there are some programs and objectives that overlap the intent of both plans and the Utilities are open to discussing options for increasing efficiency and decreasing confusion among the two plans. One solution may be to eliminate the overlap between the two plans whereby the H&S Plan focuses on M&E activities downtream of Merwin (Both hatcheries and hatchery effects and in-river monitoring) and the M&E Plan focuses on M&E activities upstream of Merwin to include Ocean Recruit Analysis.
2	LCFRB	LCFRB2	Section 3.1.5 Release Location and Numbers Released – Page 21 1st paragraph, Page 23 & Page 27:	The release location needs to be discussed by the H&S subgroup. Is there a need to have additional release locations to improve penetration further into the subbasin and/or increase distribution throughout the subbasin? Data regarding distribution from previous years of adult supplementation will be necessary to effectively make decisions regarding this topic. Currently the H&S Plan identifies release locations as the head of Swift Reservoir for spring chinook and upstream of Swift Dam for steelhead and coho. Additionally, language should be added in this section that states that adult supplementation fish will be transported over the breadth of the run in a manner that mimics run timing of natural origin population.	Section 3.1.5 corrected to be the same as 3.1.1 in that "spring Chinook will be released upstream of Swift Reservoir (when feasible)". Releasing fish upstream of Swift Reservoir may not always be possible due to flood or snow events. The AOP for 2015 will have language referring to alternate release locations for all transport species after discussion with the H&S subgroup. Added language with respect to release timing of spring Chinook to 3.1.1.
3	LCFRB	LCFRB3	Executive Summary – 3rd paragraph:	This paragraph implies that the ACC can chose not to measure ocean recruits. The LCFRB does not believe this is a choice that is within the authority of the ACC because this is a requirement of the Settlement Agreement (Section 8.3.2.2 Methods to Document Ocean Recruits and Section 8.3.2.3 Reductions in Hatchery Targets). Additionally, the Implementation Work Schedule PacifiCorp submitted in response to the Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan utilizes ocean recruits as hatchery program targets for spring chinook, steelhead and coho.	Complete: See WDFW06 comment and response
4	LCFRB	LCFRB4	Executive Summary to Pages vi, 10 & 43:	In several places in this document you refer to incorporating recommendations of both HSRG and APRE programs. The HSRG work has been completed more recently than the APRE so it is not clear why recommendations from the APRE program are being incorporated into this document. Since the HSRG is a more recent process their recommendations will likely encompass the previous APRE Program recommendations. The APRE program recommendations may be outdated due to the more recent HSRG review. The HSRG is the most recent work and is well accepted in the region so it would make sense to incorporate those recommendations. Page 10 (paragraph below Table 2-2) calls for hatchery operations to be consistent with HSRG and APRE recommendations; however, only HSRG recommendations are included in this document. If there are APRE recommendations that are being incorporated then they should be included in this same section where the HSRG recommendations are presented (Table 2-3).	The reference to APRE work was deleted because the HSRG provides the metrics used today to evaluate hatchery effects. However, because the Agreement specifically states APRE, language was added that the H&S Plan would consider APRE if new information shouud be published.

	Commenter	Comment Number	Location	Comment	Response
5	LCFRB	LCFRB5	Executive Summary – 1st bullet on Page vi:	Title for Washington Recovery Plan is incorrect. The changes should be as follows: Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan (for North Fork Lewis Subbasin)	Complete
6	LCFRB	LCFRB6	Executive Summary – Page vi:	The section including the 3 bullets may need to include an additional document that guides development of the H&S Plan. That document would be WDFW's "Hatchery and Fishery Reform Policy".	Complete
7	LCFRB	LCFRB7	Multiple Occurrences – Pages vi(8x), 1(2x), 25(1x), 29(1x), & 30(1x):	In the first paragraph of the Executive Summary and the Introduction sections it is designated that the Settlement Agreement be referred to as the Agreement; however, there are other places in this document where the term Settlement Agreement or Lewis River Settlement Agreement is used. There are many other places in the document where the term the Agreement is used. The term Agreement should be used consistently throughout the document.	Complete
8	LCFRB	LCFRB8	Page 2 – 2nd sentence:	This sentence in the paragraph for the Monitoring and Evaluation Objectives section states that H&S Plan objectives should meet requirement of Endangered Species Act. The Lower Columbia Salmon Recovery Plan adopted by NMFS should be included in this sentence or used to replace the reference to the Endangered Species Act.	Complete
9	LCFRB	LCFRB9	Page 3:	The paragraph title Expected Outcomes should include a sentence that states that metrics for expected outcomes will include the 4 VSP parameters. Additionally, it should be included that outcomes are expected to meet HSRG standards.	HSRG comment added. The Expected Outcome section is based on results from EDT and the All-H Hatchery Analyzer model to predict abundance and survival of hatchery and supplementation programs. The VSP concept includes metrics beyond abundance that are not applicable to expected outcomes at this time. However, VSP precision guidelines are provided in the monitoring section of the H&S plan as well as the aquatic M&E Plan. Also, the Expected Outcome section was left largely unchanged from the previous version as we do not have sufficient data yet to even determine if we are meeting expections for supplementation programs.
10	LCFRB	LCFRB10	Pages 8, 28, 37 & 39(2x):	There are references to double-index groups that are incorrect. The reference should be Double-Index Tag (DIT) Group. The incorrect references also include Double Index Group (DIG). Need to consistently use the term DIT group throughout this document.	Complete
11	LCFRB	LCFRB11	Page 8 – 3rd sentence of first paragraph in section 2.3 FISH MARKING:	The third sentence uses the term "naturally derived stocks". This sentence would be more accurate if it used the term "naturally produced stocks".	Complete
12	LCFRB	LCFRB12	Multiple Occurrences – Pages 8(2x), 9(3x), 13(2x), 17(2x), 18(1x), 19(2x), 23(1x), 24(4x), 25(6x), 26(2x), 28(1x), 32(1x), 35(7x), 37(2x), 39(2x), 43(1x) & 50(1x):	The terms native, wild and natural are used interchangeably throughout this document. While the terms native and wild have been defined in other forums, these terms lend themselves to interpretation of the definitions and therefore what is a native or a wild fish can vary significantly depending on who you ask. The terms native and wild should not be used in this document at all and should be replaced with the terms naturally produced or natural origin. The terms naturally produced and natural origin are terms that are less prone to interpretation and the definition is more intuitively obvious. There are a few places where the term native may be more applicable.	The term "wild" has been replaced with either "natural origin" or "native" when applicable to late winter steelhead. In addition, a terms and definition section was added for clarity. Hatchery was replaced with "hatchery origin" where applicable.
13	LCFRB	LCFRB13	Page 9 – last sentence in paragraph titled Segregated:	The term spawning in the wild is used. Consistent with the previous comment the term spawning in the natural environment would be a better phrase to use.	Complete (throughout draft)

	Commenter	Comment Number	Location	Comment	Response
14	LCFRB	LCFRB14	Page 10 – 2nd paragraph below Table 2-2:	The first sentence states that HSRG definitions fit well for those basins that have both wild and natural populations of the same species; however, the following tables (Table 2-3 and Table 2-4) includes the HSRG guidelines that will be followed and those guidelines use only the term natural when referring to populations. In reading the first sentence it is not clear what the difference is between hatchery and wild. Additionally, without HSRG using the term wild it appears that the first sentence is inaccurate. The entire paragraph should be deleted in its entirety because part of the paragraph appears to be inaccurate and the remainder of the paragraph does provide information that is significant for implementing the H&S plan.	Complete (paragraph deleted)
15	LCFRB	LCFRB15	Page 12 – last sentence in 1st paragraph:	Sentence is unclear as currently written. The sentence needs to be reworded to make clear what this sentence is intended to say.	Complete: Sentence deleted
16	LCFRB	LCFRB16	Page 15 – 1st paragraph:	The information regarding the experience with the rainbow trout program in Mayfield Reservoir is taken out of context. There was a time when significant numbers of catchable trout were being captured in downstream trap at Mayfield Dam; however, since then there have been changes in operation that reduced this occurrence to low levels. Changes included a different rearing location, different release locations and a different entity rearing the fish. This sentence should be removed from the plan or there needs to be additional language that describes the changes that were implemented more recently and how the results of those changes significantly reduced the capture of rainbow trout in the downstream trap at Mayfield Dam.	Complete: Reference to Mayfield deleted
17	LCFRB	LCFRB17	Multiple Occurrences – Pages 15, 29 & 34:	The paragraph under Section 2.7 MODIFICATIONS TO HATCHERY PRODUCTION states that decisions to adjust hatchery production would occur every 5 years based on the results of the ocean recruit analysis. This would be a good topic to bring up with the H&S subgroup for discussion. In the Cowlitz decisions are made annually based on 5-year rolling averages. Making changes to hatchery programs on a 5-year interval has the advantage of increased stability, but it is also a fairly long period of time between changes. The annual process with 5-year rolling averages does better at incorporating the most recent data into decisions regarding program size, but does require more work and may result in less year to year consistency in program size. At this point I do not have a strong support for either option so I would like to hear input from other ACC members on this subject.	Corrected to reflect that only the intial period will be five year. After the initial five year period, ocean recruit analysis will be completed every year as suggested.
18	LCFRB	LCFRB18	Page 17 – last paragraph, 1st sentence:	It is stated that all steelhead possessing a blank wire tag are transported upstream. Need to clarify that fish with blank wire tag are offspring of supplementation broodstock program that is intended to support reintroduction efforts.	Complete

	Commenter	Comment Number	Location	Comment	Response
19	LCFRB	LCFRB19	Multiple Occurrences - Pages 18 & 24:	The maximum number of parents used for the winter steelhead broodstock program is identified on Page 18. Guidance regarding the minimum number of parents should also be included here. The program needs to guard against the genetic impact of offspring from a few parents comprising the majority of the returning adults in a given year. There should be some discussion regarding protocol to prevent this from happening in the situations when collection of naturally produced adults for brood stock is low. It could be addressed at a higher level here and a more detailed protocol for decision making included in the AOP. On page 24 the last sentence identifies a maximum of 50,000 smolts be produced. Similar to the adult broodstock number do we also want to set a minimum smolt number to eliminate potential genetic effects results when offspring from few adults comprise the majority of the returning adults.	The HS plan indicates up to 50 (25 pairs) broodstock will be used. Additional language was added to this paragraph to point out this risk. The AOP is the more appropriate plan to discuss the protocols associated with low brood years and reduced smolt production.
20	LCFRB	LCFRB20	Page 19 – paragraph preceding section 3.1.2 Broodstock Origin:	The first sentence indications that populations will be monitored to determine if reintroduction goals have been achieved, but it does not say how. This paragraph should also include a reference to where the monitoring strategy and protocol is described or a description of how this monitoring will occur and what are the key metrics that will be collected by this monitoring.	An evaluation to determine whether hatchery supplementation should continue beyond Year 15 (current period contained within the H&S Plan) will need to be done prior to the end of scheduled supplementation. This however is different than determining whether the Reintroduciton Outcome Goals have been met. Evaluating this, according to the Agreement, is to take place prior to Year 27 and is to be determined by the Services after discussion with the ACC (Section 3.1.1). Paragraph edited to reflect this.
21	LCFRB	LCFRB21	Page 20 – 2nd paragraph:	Similar to the previous comment, there is a statement that monitoring data will be used to evaluate and make decisions regarding the supplementation program. In this case the data used for decision making (survival rates, productivity, demographic risks and genetic risks) are identified, but there is no description of the monitoring strategy and protocol to be used and no reference to where a description of the monitoring strategy and protocol can be found. This information regarding, or reference to, monitoring strategy and protocol should be included here.	Monitoring of supplementation programs in the upper basin is included in the M&E plan. Spawning success and distribution through carcass surveys and productivity estimates are objectives in the plan. Genetic analysis for steelhead is currently being evaluated to determine spawn success as well as information on mate selection. See response to comment LCFRB1.
22	LCFRB	LCFRB22	Page 20 – 3rd paragraph:	The first sentence is very confusing as written and needs to be rewritten. It appears to be providing options for future direction of the supplementation program if the population is not responding, but what those options are is not clear.	The paragraph suggests extending the supplementation program beyond Year 15 assuming that spring Chinook return to average levels. Also, the following paragraph propose increasing juvenile supplementation or use of alternate broodstock sources. Beyond that, there arent many options left for spring Chinook. Minor edits made.
23	LCFRB	LCFRB23	Page 24 – 1st paragraph:	This paragraph includes a statement that hatchery fish will be used to supplement adults transported upstream to always achieve at least 9,000 coho above Swift Reservoir. As the natural origin population grows and begins to approach 9,000 adults do we still want to take hatchery fish upstream. For instance, if we have a return of 7,000 natural origin fish do we really need to take 2,000 hatchery fish upstream or is the reintroduction effort better served by taking only 7,000 natural origin fish upstream. This would be a good topic of discussion for the H&S	Agreed. While the H&S plan prefers natural origin coho for supplementation it does not preclude hatchery origin fish to make up the difference. Based on observations during carcass surveys EDT estimates may not be accurate and assumptions for distribution have not been met. Edits made to reflect up to 9,000 coho and that modifications to this number and the proportion of NOR's to HOR's may be made through the annual planning process for the AOP. NOTE:
24	LCFRB	LCFRB24	Page 30 – 4th paragraph:	In the 1st sentence Hatchery Scientific Review Group is spelled out when you should use HSRG instead. You have already defined this acronym so it would be appropriate to use it here.	Complete

	Commenter	Comment Number	Location	Comment	Response
25	LCFRB	LCFRB25	Multiple Occurrences - Page 30, 4th paragraph & Page 37:	The 3rd sentence states that harvest monitoring is not within the scope of this plan. While the H&S Plan is not responsible for monitoring activities required to manage fisheries, the H&S Plan does require that hatchery and supplementation programs implemented as a result of the Settlement Agreement be monitored for their impact on natural origin populations. Monitoring the impacts of hatchery and supplementation actions funded by PacifiCorp will depend on run reconstruction data that accounts all sources of mortality and escapement, which would include harvest. While there are ongoing programs that are collecting harvest data, they may not be collecting the data at the appropriate scale or precision necessary to evaluate hatchery and supplementation programs implemented as a result of the Settlement Agreement. If there is additional data that needs to be collected from fisheries to evaluate these programs then PacifiCorp may have some responsibility in collecting this data.	Deleted not within the scope of this plan. The impact of hatchery programs on natural origin fish is part of the HS plan as they pertain to HSRG metrics (e.g, pHOS). Harvest management objectives are not included in the HS plan. The effects of harvest management on abundance, however, is an important metric as this affects the supplementation program and is measured as part of calculating ocean recruits. Collection of harvest data is limited to calculation of ocean recruits.
26	LCFRB	LCFRB26	Page 30 – last paragraph:	The last 2 sentences in this paragraph state that the term significant has not been defined and the ACC will be responsible for defining this term. The HSRG has provided some metrics and standards that help in evaluating impacts of hatchery programs on naturally produced populations. At a minimum the metrics provided by HSRG include pNOB, pHOS and PNI. Standards to be achieved depend on the population classification. Additionally, there are the AHA and ISIT tools that have been developed. The use of these tools, metrics and standards should be discussed by the H&S subgroup and the H&S subgroup should develop proposal on how hatchery programs will be evaluated with respect to their impact on natural origin populations. This discussion would include what criteria will be used to determine if the hatchery and supplementation programs constitute a significant limiting factor. Additionally, VSP parameters may also be useful for providing metrics that can be used to evaluate the impact of hatchery programs on natural populations.	This section refers to a goal related to reintroduction efforts in the upper basin. Agreement section 9.5 speaks to the effects of hatchery rainbow on reintroduced fish not the effect of hatchery releases downstream of Merwin Dam on NOR stocks (eventhough that is an objective as well). If that were the case, NOR would explicity be referenced in this section. The section was reworded to make this distinction as it do not apply to upstream populations which are composed mostly of hatchery origin fish - at least in the short term. NOTE: Objective 12 under Supplementation Program Objectives was moved to Objective 1 under Hatchery Effects Objectives to help clarify this.
27	LCFRB	LCFRB27	Page 32 – Table 5.1:	Population designations were defined by the Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan. A footnote should be added to the table that abundance (Historical and Target) were determined through EDT analysis completed during the development of the Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan.	Table titled modified as suggested. Abundance columns of table were removed based on WDFW comments.
28	LCFRB	LCFRB28	Pages 37 & 38:	The last paragraph on Page 37 and the three bullets at the start Page 38 provide harvest recommendations; however, this appears to be outside the scope of the H&S Plan. The purpose of the H&S Plan is to address PacifiCorp responsibilities, and while the H&S Plan identifies activities that will provide fish to support fisheries it does not include fishery management responsibilities. It is important the fishery management actions support supplementation efforts funded by PacifiCorp, but it is likely a different forum than the H&S Plan where the evaluation of fishery management actions occurs. This would be a good topic of the H&S Subgroup to discuss to ensure a consistent interpretation of the role of the H&S Plan in fishery management activities.	The HS plan provides harvest management recommendations that affect the supplementation programs. Recommendations were deleted, however, annual review by the H&S subgroup of harvest regulations was added.
29	LCFRB	LCFRB29	Page 39:	This section lists 3 different types of fish marking and how they are used. Even though we are not using PIT tags at this time it might be advisable to include them in the list of potential tags and describe their potential uses. It could be included that PIT tags are not currently used but would be considered as a future marking strategies depending on data that needs to be collected.	Complete

	Commenter	Comment Number	Location	Comment	Response
30	LCFRB	LCFRB30	Page 42 – Section 7.2 FIVE YEAR PLAN MODIFICATIONS:	This section identifies that the plan will be updated every 5 years. Are there any provisions for changes within the 5 year time frame? If so that should be described here or if not that should be stated here.	The only provision would be from changes in programs resulting from HGMP implementation. This is described in Section 8.2.5 of the Agreement. Section 8.2.6 however requires a comprehensive review by an independent consultant within 5 years of reintroduction at each reservoir which means this will occur first in 2017. In addiiton, the AOP provides for changes on an annual basis in terms of implementation.
31	LCFRB	LCFRB31	Page 43:	1st sentence should be modified as follows: If the data collected as part of the H&S Plan or by WDFW ~~sponsored spawning surveys~~ conclude that the guidelines can be met then the programs may continue.	Complete
32	LCFRB	LCFRB32	Page 44	This paragraph states that if collection rate is not sustainable then ACC should consider eliminating the supplementation program until survival increases (e.g. collection efficiency improves). The concern is that if supplementation of fish upstream of Swift Reservoir is discontinued then how will survival rates be evaluated and how will be improvements in the collector be tested.	Complete (Sentence deleted)
33	LCFRB	LCFRB33	Page 47 – 1st paragraph:	This 1st sentence says the outcome goal has been defined by the Agreement. That outcome goal should be included in this paragraph.	Complete
34	WDFW	WDFW01	General Comment	"Native", "natural" and "wild" need to be defined and used consistently through this document.	Complete
35	WDFW	WDFW02	General Comment	According to the Settlement Agreement (SA) – section 9.5 "The Licensees shall include in the [Aquatic] M&E all elements required to monitor the effectiveness of the Hatchery and Supplementation Plan…." The Aquatic M&E plan lays out the criteria to evaluate the success of the monitoring included in the H&S plan, but the H&S plan does not refer to these criteria. We recommend that Monitoring and Evaluation described in the H&S plan be specifically linked with the objectives and criteria described in the Aquatic Monitoring and Evaluation Plan. This could be done by cross referencing or using repetitive language in the two plans.	This section refers to the M&E plan and the obligation of the M&E plan to essentially monitor whether the H&S plan is meeting its goals as stated in Section 8 (H&S plan). Where overlap exists between the two plans (e.g., M&E objective 17) the language is similar if not identical. The H&S plan is not intended to define how each objective is to be measured. This is the intent of the AOP and Aquatic M&E plan. The H&S plan presents objectives that are required and consistent with the Agreement. See response to LCFRB01 and WDFW02.
36	WDFW	WDFW03	General Comment	In several places within the document, lower river and upper river populations are referenced. The LCFRB recovery plan does not distinguish between the upper and lower river, but treats the population in their entirety. The H&S plan would benefit from a description of the population structure for the Lewis basin, including population shared between the North Fork and the East Fork Lewis River.	The separation between lower and upper is only spatial as the two populations currently are produced with the same broodstock, which is probably why the recovery plan does not make this differentiation. Therefore, a description of the population structure would not be very helpful in the near term. The H&S plan makes the differntiation between upper and lower areas because they represent very different areas in terms of management. Replacement of "upper" and "lower" with "upstream" or downstream" of will be made when possible to be more exact.
37	WDFW	WDFW04	General Comment	"Conservation" and "supplementation" are used interchangeably throughout the document. For consistency we recommend using "supplementation".	Complete
38	WDFW	WDFW05	General Comment	References to the "Annual Operating Plan" and "AOP" are inconsistent. We recommend providing a definition at first use and then using "AOP" throughout.	Complete
39	WDFW	WDFW06	page v, paragraph 3, last sentence	based on the Settlement Agreement, it is unclear that the ACC could alter the choice of using the ocean recruits as the key metric for evaluating the success of the programs. We suggest re-wording the last sentence "given the importance of ocean recruit estimates for evaluating success of the programs and the different metrics of ocean recruits the ACC will need to select the appropriate ocean recruit for making this evaluation".	Complete

	Commenter	Comment Number	Location	Comment	Response
40	WDFW	WDFW07	Page 1, last paragraph	incorrect statement. Not all current hatchery programs are segregated (e.g., late winter steelhead). Not all hatchery programs will be transitioned to integrated programs in the future. Programs with a harvest objective only may or may not be transitioned to integrated programs.	Review comment added to text. Need to discuss how and which programs are Integrated. Currently, with the exception of late steelhead, all hatchery programs appear Segregated – at least in the short term. Long term the goal is to integrate.
41	WDFW	WDFW08	Page 2, first paragraph	first use of EDT, spell out acronym.	Complete
42	WDFW	WDFW09	Page 2, paragraph 2	Suggest re-wording first sentence “Ocean recruit information is needed to evaluate objectives related to both harvest opportunity and reintroduction into areas upstream of Merwin Dam”.	Harvest "opportunity" is not related to H&S objectives. Your suggestion was reworded slighty as "Ocean recruit information is needed to evaluate objectives related to both harvest impacts and production from both supplementation and hatchery programs"
43	WDFW	WDFW10	Page 2, paragraph 3	Insert between sentence 2 and 3, “Criteria used to evaluate the H&S plan are included in the Aquatic Monitoring and Evaluations Plan.	Complete
44	WDFW	WDFW11	Page 2, paragraph 3, sentence 4	suggested re-wording “Required monitoring includes Viable Salmonid Population (VSP) metrics (e.g., abundance, distribution, and diversity), hatchery effects….”	Added NOAA Fisheries provides guidance related to monitoring these objectives
45	WDFW	WDFW12	Page 3, paragraph 1, first sentence	the meaning of this sentence is unclear. Suggested re-wording “This section outlines the expected hatchery and natural production outcomes as the supplementation phases are implemented”.	Complete
46	WDFW	WDFW13	Page 3, last sentence	clarify Aquatic Monitoring and Evaluation Plan	Complete
47	WDFW	WDFW14	Page 7, first paragraph, first sentence	need a more complete description of the current use of hatchery production. Re-word to read “the hatchery program includes the production of fishes for the main purpose of harvest; however, spring Chinook, type-s coho and late winter steelhead programs also provide fish for supplementation as described in section 3.0”	Complete
48	WDFW	WDFW15	Page 8, paragraph 1, sentence 2	double-index groups (DIG) needs to be changed to “double index tag (DIT) groups”. This change needs to occur throughout the document. It is also referenced as a Double index production (DIP) in section 5.5.	Complete
49	WDFW	WDFW16	Page 8, last paragraph	need to add sentence that describes the shift on goals for the program. Suggested re-wording “in the long-term, the goals of the spring Chinook and type-s coho will be to provide fish for harvest to meet the ocean recruit targets in the SA. In the interim, these integrated programs may also provide fish for continued supplementation as needed”.	Modified last sentence to the following: Goals of long term integrated hatchery programs are to (1) ensure that the natural environment and not the hatchery environment drive local adaptation, (2) to provide harvest opportunity and (3) to provide for continued supplementation as needed.
50	WDFW	WDFW17	Page 10, paragraph 3, last sentence	Coho need to be added to this sentence as there is a wild population in the lower river as well.	Paragraph was deleted based on other comments.
51	WDFW	WDFW18	Page 10, paragraph 3	Purpose of this paragraph is unclear and incorrect and this paragraph should be stricken.	Complete
52	WDFW	WDFW19	Page 10, paragraph 4	The statement only applies to the summer steelhead and early winter steelhead program and needs to be revised accordingly.	This is an assmption based on the current hatchery programs and the long term practice of large and consistent releases of hatchery origin fish into the North Fork Lewis River for the main purpose of harvest.
53	WDFW	WDFW20	Page 10, last paragraph	statement is not true for most species and should be stricken.	See response to WDFW 19
54	WDFW	WDFW21	Page 17, paragraph 3	See general comment number 3: avoid using upper and lower population distinction.	Plan updated to remove these designations
55	WDFW	WDFW22	Page 20, paragraph 4	The SA calls for the use of Cowlitz stock spring Chinook and not Kalama Stock.	Yes, but the SA allows the H&S plan to modify the stock selection during the update process and it is assumed that Kalama stock is a more appropriate stock and has been used in the past 5 years to supplement spring Chinook supplementation

	Commenter	Comment Number	Location	Comment	Response
56	WDFW	WDFW23	Page 21, section 3.1.5, paragraph 1	Describe the fate of spring Chinook smolts that do not volitionally migrate.	Added sentence that fish will be forced out at some point.
57	WDFW	WDFW24	Page 23, section 3.2.5, paragraph 1	Information from recent years surveys have shown that hatchery adult coho do not always distribute throughout the watershed (2013 surveys).	Correct. Modified to indicate lack of distribution in recent years and the need to evaluate alternative release sites through the AOP planning process for 2015.
58	WDFW	WDFW25	Page 24, section 3.3.1, paragraph 2	Add sentence explaining link to the Aquatic M&E Plan (see general comment). Recommended wording for last sentence: "These concerns should be evaluated each year using monitoring criteria for winter steelhead spawner escapement as detailed in the Aquatic M&E Plan and the methodologies included in the evaluation portion of the Annual Operating Plan."	Portions of paragraph moved to Section 3.3.2 and 3.3.3 and revised. The AOP will provide these criteria and methodologies; sentence added to second paragraph of 3.3.3 to reflect this.
59	WDFW	WDFW26	Page 24, section 3.3.1, paragraph 3	Describe the fate of steelhead smolts that do not volitionally migrate.	Reference to volitional release removed as it appears in 3.3.5 (comment WDFW28). Fate of steelhead described in 3.3.5.
60	WDFW	WDFW27	Page 26, section 3.3.3, paragraph 1, last sentence	Add sentence explaining link between H&S Plan information need and Aquatic M&E Plan and AOP. Suggested wording: "Criteria to evaluate genetic diversity should be described in the Aquatic M&E Plan and the methodologies included in the AOP."	See response to WDFW 25. Sentence modified.
61	WDFW	WDFW28	Page 27, section 3.3.5	Describe the fate of steelhead smolts that do not volitionally migrate (repeat comment from above because volitional migration is mentioned in both sections).	Section 3.3.5 describes the general protocol. More detailed information is availbable in the AOP in the event of changes in protocol for the next 5 year period. Fate of steelhead that do not migrate updated to indicate releases downstream of Eagle Island.
62	WDFW	WDFW29	Page 28, paragraph 10, second sentence	Sentence that starts with "Based on Ocean Recruits definition provided…" is inconsistent with statement in Executive Summary regarding the uncertainty of Ocean Recruit metrics to be used (page v, paragraph 3, last sentence). See comment under Executive Summary section.	Executive summary revised as per WDFW recommended edits. Therefore, this paragraph is now consistent.
63	WDFW	WDFW30	Page 29, paragraph 1	paragraph is repeated from earlier in the document (Page 15, section 2.7) and applies to adaptive management of hatchery production. Recommend removal from Ocean Recruit section.	Yes, paragraph in Section 4.0 deleted.
64	WDFW	WDFW31	Page 30	It is our understanding that the SA requires the Aquatic M&E Plan to include all monitoring objectives described in the H&S Plan. See general comments. Modify the text in this section to reflect this requirement.	As stated in response to General Comment No. 1, the M&E plan is to monitor the effectiveness of the H&S plan in meeting its goals/objectives. It is not our understanding that every objective become an M&E objective, however, it is true that as currently written the M&E objectives share the same H&S objectives where there is overlap between the two plans (specifically Objective 17 of the ME plan). Language added to clarify this understanding.
65	WDFW	WDFW32	Page 30, paragraph 5	Provide a better link between H&S Plan, Aquatic M&E Plan, and AOP per general comments. Include statement that the criteria (standards/targets) for each monitoring objective are described in the Aquatic M&E Plan and the methodologies will be detailed in the AOP.	See responses to WDFW 2 and 31.
66	WDFW	WDFW33	Page 31, Objective 1, first paragraph	Need to modify language. Spawner and carcass surveys of sufficient sample size are needed to estimate composition of spring Chinook and coho populations. Alternate methods need to be developed for winter steelhead.	Sample sizes are based on the number of fish recovered. Attempts are made to sample all available carcasses. That is, there is no set limit unless subsampling is initiated to to large numbers of carcasses and limitations of the crew to sample the entire survey area. Steelhead language added as you are correct it was completely absent.

	Commenter	Comment Number	Location	Comment	Response
67	WDFW	WDFW34	Page 31, Objective 1, first paragraph	Statement regarding composition of coho population being most hatchery spawners is incorrect and should be removed.	Hatchery releases of 2.0 million coho and hundreds of thousands of eggs spawned in the hatchery releases through egg box programs as non clipped coho into the wild is a concern and we believe a valid assumption. Removed last sentence, but updated this understanding in the paragraph. Needs further discussion.
68	WDFW	WDFW35	Page 32, heading to Table 5-1	Population designations are defined by LCFRB Recovery Plan not by HSRG.	Modified as suggested
69	WDFW	WDFW36	Page 32, Table 5-1	Recommend removing abundance targets from this table as this information is irrelevant to pHOS and hatchery effects. Abundance targets entered for upper basin are based on EDT capacity which is not the same metric as the viability targets calculated for lower river in the Recovery Plan.	Columns removed
70	WDFW	WDFW37	Page 32, Objective 2, paragraph 2, last sentence	Need to include monitoring of effectiveness of these protocols (i.e., did smolts volitionally migrate? Did fish residualize?). Recommend changing last sentence : "Annual Operating Plans for each species will specify the methodology for applying HSRG guidelines and monitoring their effectiveness to achieve…"	Monitoring is limited to the objectives described in the Agreement. "Effectiveness monitoirng" is limited to the HSRG metrics described in the plan (i.e, pHOS, pNOB, PNI) to the extent that the program meets or fails to meet these HSRG guidelines. This statement was added minus the "effectiveness monitoring" and includes monitoring of the HSRG metrics"when possible and at the drection of the H&S subgroup" was added.
71	WDFW	WDFW38	Page 32, Objective 3	The text associated with the objective is too vague. If studies have been done in the past on coho and this is being used as a justification for limiting future studies then the major results from coho need to be described (e.g., What levels of residualism were observed? What was the relationship between flow and residualism and how have flow regimes been modified in response? Why would coho residualism rates be expected as a surrogate for other species?). Section could be strengthened by linking directly to objectives in the Aquatic M&E Plan.	Yes, this was included in the Draft AOP but was inadvertently left out for this objective. Summary information from previous studies has been added. The H&S plan states that telemetry studies or some from of tracking should be done for other species as well. To date we have only done this for coho.
72	WDFW	WDFW39	Page 33, Objective 4	Suggest rewording sentence 2 & 3 to reflect information needs rather than annual deliverables. Suggested rewording: "Each year, the following metrics should be monitored and reported:"	Production of an annual report is required under our agreement with WDFW and is mentioned as an action under HSRG recommendations.
73	WDFW	WDFW40	Page 33, Objective 5	We assume the reference to higher survival of hatchery smolts than natural smolts is referring to freshwater survival not marine survival – this needs to be clarified.	Yes. Clarified in text
74	WDFW	WDFW41	Page 34, Objective 7	Language in this objective is confusing. We suggest removing the first sentence as it does not apply to the Lewis River. We suggest changing the wording of the third sentence to "The consequences of overlap should be monitored…"	Complete
75	WDFW	WDFW42	Page 34, Objective 8	First three sentences are unclear and need updating. First sentence -Not all current programs are segregated. Second Sentence -This sentence is unclear, not sure of its intent. Third Sentence – need more explanation of what constitutes "adverse effects"; what are the criteria that would be used to determine "adverse effects"	Agree. First paragraph containing these sentences deleted. Description reworded to align with the stated objective.
76	WDFW	WDFW43	Page 34, Objective 9	last sentence. Recommend updating this sentence to include both **hatchery** and supplementation program objectives, since this is under the hatchery production objectives section. Suggested rewording: "Thus, HGMP approval is a key component to maintaining the hatchery and supplementation programs necessary to meet harvest and reintroduction objectives."	Complete

	Commenter	Comment Number	Location	Comment	Response
77	WDFW	WDFW44	Page 35, Objective 10 – sentence 4.	We agree that the AOP should provide the means to evaluate these issues. We suggest that the Aquatic M&E plan should be updated to include this monitoring need and describe the criteria (metrics) described later in the paragraph (i.e effective population size, inbreeding coefficients). The paragraph would be strengthened by linking this objective to the Aquatic M&E plan (see general comment #2).	See responses to WDFW 2 and 31.
78	WDFW	WDFW45	Page 35, Objective 10 – sentence 5.	This sentence should be expanded to include pHOS. Suggested rewording: "Determining family representation in each return year, determining the proportion of hatchery origin fish (program fish) spawning naturally below Merwin Dam, documenting program fish on redds…"	Complete
79	WDFW	WDFW46	Page 35, Objective 11 – sentence 3.	Use of "technically wild" – needs to be defined (see general comment #1).	Replaced with "natural origin"
80	WDFW	WDFW47	Page 35, Objective 11 – last sentence.	Monitoring of fish transported upstream is described in the Aquatic M&E plan. We assume you are referring to bio-sampling of these fish, and suggest you change wording from "monitoring" to "sampling".	Reprhased to include sampling and tagging (if necessary for upstream monitoring purposes)
81	WDFW	WDFW48	Page 35, Objective 12 – first paragraph, last sentence.	We do not agree that samples collected from bull trout netting alone are an adequate method to evaluate predation – fish throughout the reservoir are likely to have differential predation rates, and a representative sampling design would need to be established to estimate predation rates. Utilizing sample from creel checks may be possible, but has some logistical challenges (i.e. cleaned fish). Rather than prescribe a method in the H&S plan, we suggest eliminating this sentence.	Complete. Portions of this objective were relocated to Objective 1 "Evaluated the effects of hatcheyr plants on reintroduced species" and the reference to creel checks and bull trout netting were replaced with stable isotope evaluations currently being conducted by USGS and University of Washington in Swift Reservoir.
82	WDFW	WDFW49	Page 36, Objective 12 – third paragraph	Even as a placeholder, some justification for a 3% predation rate should be provided. What is the source of this number?	3 percent value deleted. Rather predation rates once known will be presented to the ACC to determine if modifications to the rainbow trout plants should be made.
83	WDFW	WDFW50	Page 36, Objective 12 – last paragraph, fourth sentence.	What constitutes a "substantial adverse change"? This paragraph would be strengthened by a reference to where the monitoring criteria and metrics for determining an adverse change can be found – i.e. Aquatic M&E plan and/or recovery plans.	Phrase removed and paragraph was moved from Objective 12 to the more appropriate Objective 13.
84	WDFW	WDFW51	Page 36, Objective 12 – general comment	Objective 12 lays out four monitoring needs: 1) predation rates of resident trout plants, 2) limiting factor analysis – food resources, 3) overall estimate of total predation (which also requires estimates of total # of juveniles entering reservoir), and 4) Bull trout monitoring- disease and ecological interactions. The end of this section should outline that the monitoring methods and criteria for evaluating these issues will be contained in the Aquatic M&E plan and the AOP.	Bull trout monitoring moved to Objective 13. Objective 12 description has been updated.
85	WDFW	WDFW52	. Page 36, Objective 13 Title – The title only references ESA listed species	The first sentence of the section states that the ACC commented that they were concerned about impacts to bull trout and other resident fish. This section should be expanded to include monitoring objectives for other resident fish – not just ESA listed. This is also called for in the SA under section 9.7.	The Aquatic M&E plan selected Rainbow, bull trout and transported anadromous species to monitor as these species were identified in the initial H&S plan and are management priority species. ESA species have regulatory requirements and recovery plans associated with their listing. These regulatory requirements and recovery plans to not apply to other resident species such as cutthroat, whitefish, suckers, sculpin, etc. Objective 1 in the M&E section of the plan points out that the USGS and University of Washington is currently evaluating stable isotopes for all resident species so this has already been expanded from the original plan. See response to WDFW48. Complete.

	Commenter	Comment Number	Location	Comment	Response
86	WDFW	WDFW53	Page 36, Objective 13 – second paragraph, last sentence	Collecting data alone will never “prevent” an interaction from occurring. The intent of this monitoring is to quantify the effects of the re-introduction on other species (i.e. ESA listed bull trout). This sentence seems to suggest that the monitoring is not needed unless a management action, such as construction of a weir at Cougar Creek is implemented. We would suggest that the monitoring is needed and has great value for two reasons: 1) to quantify the effects of reintroduction, and 2) to determine if and what type of management actions may need to occur if effects are adverse and deemed unacceptable. We suggest either re-wording or removing this sentence.	This statement implies that management actions may not be consistent with the Settlement Agreeement goals. Phrase reworded to indicate that the ACC may recommend actions to mitigate any adverse effects, but maintained that management actions should be consistent with the goals of the Agreement.
87	WDFW	WDFW54	Page 36, Objective 13 – last paragraph	We agree with the first sentence – however, establishing ecologically functioning, self-sustaining populations will also take some time. It is the impacts of the supplementation strategy (i.e. using hatchery fish) that need to be monitored in the interim. We suggest removing the last sentence or re-wording it as follows: “Monitoring during re-introduction is intended to evaluate the impacts of supplementation on resident fish, including bull trout, during the supplementation phase while ecological function is restored.”	It is important to note that reintroduciton is a Settlement Agreement requirement and that the H&S Plan proposes continuing supplementation for 15 years without interuption. Because of this, effects from the program must be accepted and pointed out in the plan. Additional language added ot reflect that the eruption of Mt. St. Helens has decreased both available spawning and rearing habitat and this has disrupted normal ecological balance requiring the ongoing work in developing a well defined monitoring plan including annual review and planning meetings with management/regulatory entities.
88	WDFW	WDFW55	Page 37, Objective 14.	This objective deals with both adult and juvenile abundance and should be updated to reflect both. Also, it is unclear what a “reasonable estimate” is. Lastly, this sentence refers to smolt abundance not juvenile abundance, while smolt abundance is the agreed to metric that is being used – this should be defined. All of this could be addressed by linking this to the Aquatic M&E plan and AOP, where this monitoring is described. Suggested rewordings: (1) First sentence: change “smolt” to “adult and juvenile”; change “outmigration” to “migration” (2) Third sentence: expand examples to “(e.g. traps, netting, seining, carcass sampling) (3) Last sentence: replace with “The Aquatic M&E plan and AOP will provide the criteria and protocols needed to develop accurate and precise estimates of adult and juvenile abundance.”	"Reasonable" deleted. "outmigrating smolts" used in place of "smolts". The description under this objective includes both smolt and adult abundance. In the beginning of the M&E portion of this plan it is stated that methods and protocols will be developed as part of the AOP or as part of the Aquatic M&E plan. This was done becuase the H&S plan objectives are intended to present the desired objectives to meet requirements of the Agreement and the AOP or Aquatic M&E plan provide the details needed to quantify the objectives. See response to WDFW02.
89	WDFW	WDFW56	Page 37, Objective 15	Link to Aquatic M&E plan and AOP.	See response to WDFW02
90	WDFW	WDFW57	Page 37. Harvest Effects	General comment. We agree that setting fisheries is WDFW responsibility, however; the level of harvest monitoring is dependent on what the information is needed for. WDFW relies on CRC to get harvest information – this data is usually 2-3 years old. Because the SA requires an estimate of ocean recruits, monitoring must be sufficient to gather the appropriate metrics to answer this question. The additional monitoring needed is outside the normal activities that WDFW conducts and PacifiCorp will need to provide the resources to gather this information, as stated in the SA.	This will require further discussion to better understand what gaps exist with WDFW harvest monitoring and development of ocean recruits.
91	WDFW	WDFW58	. Page 37, Harvest Effects- 1st bullet	Suggests estimates of marked fish “spawning in the wild” are the responsibility of co-managers. The SA and Aquatic M&E plan describe this monitoring and outlines PacifiCorp responsibilities for this metric. We recommend removing this portion of the bullet.	CWT marking and recovery is a harvest management tool used by WDFW and other state agencies. The Utilities do not set or manage harvest policy, rather we rely on this information for ocean recruit analysis and in quantifiying pHOS during carcass surveys.
92	WDFW	WDFW59	Page 37 and 38	Harvest management recommendations. This section should be deleted from the document. WDFW does not agree with some of these points but more importantly, they should be discussed on an annual basis as conditions change over time. The points noted should be part of an annual planning process associated with the AOP.	Deleted, however it is important to note the harvest policies that affect the reintroduction program. Maintained language that harvest policies will be reviewed as part of AOP planning.

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93	WDFW	WDFW60	Page 39, Third bullet – Adipose Present + CWT	This is also the marking strategy for the late winter steelhead program, which is not a DIT group. We recommend including two sub-bullets for this description, one for DIT groups and one for late wild winter steelhead.	Complete
94	WDFW	WDFW61	Page 39, last paragraph	The paragraph is unclear. Suggested edits and comments are: **Fish will need to be marked so that upon their return to adult and juvenile handling facilities they can be sorted, transported and released ~~into one of two areas~~** according to the following strategies:	The bullets in this paragrpah are in error. The bullets have been deleted an replaced with two bullets indicating that once Yale downstream collector is running that outmigrants need to be differntially marked so that upon adult returns it will be known where to transport adults: either upstream of Swift or into Yale.
95	WDFW	WDFW62	Fish Marking Strategies	**Winter Steelhead downstream of Merwin Dam.** This strategy needs to be better described. Not all winter steelhead will go downstream. Early on Ad intact/CWT adults will be transported upstream and NORs will go downstream, - eventually NORs will go upstream too.	
96	WDFW	WDFW63	Fish Marking Strategies	**A portion of acclimation spring Chinook released upstream of Swift** Needs more explanation. Does this refer to adults returning from acclimated spring Chinook smolts? If so, how will they be identified – are all acclimated spring Chinook being AD CWT? Does table 6-1 need to be updated? What happens to the other portion?	
97	WDFW	WDFW64	Fish Marking Strategies	**A portion of adults transported upstream (if necessary):** What species? Needs more explanation.	
98	WDFW	WDFW65	Fish Marking Strategies	**Differential marking of fish collected at downstream collection facilities at Swift and Yale (when and if constructed) to determine relative survival for each collection facility:** Assume this is referring to juveniles? Need to add "and juvenile" handling facilities to lead sentence (see above).	
99	WDFW	WDFW66	Page 42, first paragraph.	This section should identify how the H&S plan relates to the Aquatic M&E plan as well, regarding monitoring targets and goals and adaptive management. See general comment #2.	See response to WDFW02
100	WDFW	WDFW67	Page 43, first paragraph	This section addresses goal 1 related to self-sustaining runs, but does not address goal 2 related to harvest. Both goals were listed in the introduction. This section should be updated to include both goals.	Harvest paragraph added and related to the definition of successful. NOTE: It is not anticipated that harvest will begin until at least Year 15 of the plan as supplementation is expected to continue uninterupted for that period. Therefore, havest management is not addressed in this second rewrite.
101	WDFW	WDFW68	Page 43, Second paragraph, last sentence.	Species list should include chum: "but also that they will have acceptable effects on other basin fish populations such as ESA listed bull trout and lower river coho, Chinook, chum and steelhead."	Complete
102	WDFW	WDFW69	Page 43, section 7.3.1, last sentence	Should include "mainstem" as well, not just lower river tributaries. Suggested rewording: "control the mix of wild and hatchery fish in lower basin (mainstem and tributaries) and in the upper basin".	Complete
103	WDFW	WDFW70	Page 43, last paragraph	Remove reference to "WDFW sponsored spawning surveys" and include reference to Aquatic M&E plan. Suggested rewording: "If the data collected as part of the H&S Plan, Aquatic M&E plan and/or other co-manager sponsored monitoring conclude that the guidelines can be met then the programs may continue.	Complete
104	WDFW	WDFW71	Page 44, section 7.3.2, second paragraph related to SAR.	States that lower SAR from supplemented fish upstream of Merwin would trigger an ACC review. Recommend quantifying how much lower would trigger a strategy change.	Replaced lower with "found to be consistently less". As worded, this does not automatically trigger an ACC review. It states that the ACC may want to revisit the need for this strategy if SAR values for supplementation juveniles are less than for fish released directly downstream of Merwin Dam. To manage adaptively this should be done.

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105	WDFW	WDFW72	Page 45, section 7.3.3, first sentence	Late winter steelhead trucked upstream as part of adult supplementation are not the result of surplus hatchery fish. The late winter steelhead program was created specifically to produce adults for supplementation. This sentence should be updated to reflect this.	Late winter steelhead replaced with spring Chinook.
106	WDFW	WDFW73	Page 46, section 7.3.4, Key Decision Point	The EDT model is a habitat based model based on ranking habitat attributes of stream reaches within each species spawning/rearing distribution. Another alternative to waiting 10 years to assess model assumption validity would be to identify where habitat data was lacking for the model and begin collecting that data now, so that the EDT model can be updated with more empirical data.	Removed "after year 10" and replaced with "In 2013 and 2014 biologists from the US Geological Survey and University of Washington are rerunning the EDT model based on updated habitat rankings from ground survey work throughout the basin upstream of Swift Dam. This should substantially increase the accuracy of the model. Once the results from the updated EDT modeling are presented, the ACC should determine if modifications to the supplementation program numbers are needed."
107	WDFW	WDFW74	Page 53, section 9.0 opening paragraph	This section refers to only four elements, yet 6 elements are discussed in the section. Does not include reference to section 9.5 Broodstock collection and spawning, and 9.6 Monitoring and Evaluation . Should be updated to include this information.	Corrected
108	WDFW	WDFW75	Page 55, section 9.5 Broodstock Collection and Spawning	This paragraph only refers to winter steelhead broodstock collection, yet the AOP also addresses spring Chinook and coho broodstock collection goals, etc. Recommend updating this paragraph to address all three species.	Complete
109	WDFW	WDFW76	Page 55, section 9.6 Monitoring & Evalutation	Througout the H&S plan there is a significant amount of M&E described and discussed. In several sections, there are references to key results that will drive decisions made by the ACC. This section would benefit from development of a table summarizing monitoring and evaluation needs, and identifying key analysis and timelines that will need to occur to fully evaluate the H&S plan.	While not included in this plan it should be discussed as part of WDFW and LCFRB comments asking that a single M&E plan (or crossreferenced plans) be produced and whether the "keeper" of the timeline resides in the H&S or M&E plan.