HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Lewis River Summer Steelhead (Segregated)
Species or Hatchery Stock:	Summer Steelhead (*Oncorhynchus mykiss*) Lewis River (Merwin Hatchery) Stock
Agency/Operator:	Washington Department of Fish and Wildlife PacifiCorp Energy
Watershed and Region:	Lewis River/ Lower Columbia River
Date Submitted:	
Date Last Updated:	July 15, 2014

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Executive Summary

The Washington Department of Fish and Wildlife and PacifiCorp Energy is submitting a Hatchery and Genetic Management Plan (HGMP) for the Lewis River Summer Steelhead program to the National Marine Fisheries (NMFS) for consultation under Section 10(a)(1)(A) of the Endangered Species Act (ESA). NMFS will use the information in this HGMP to evaluate the hatchery impacts on salmon and steelhead listed under the ESA. The primary goal of an HGMP is to devise biologically-based hatchery management strategies that ensure the conservation and recovery of salmon and steelhead populations. This HGMP focuses on the implementation of hatchery reform actions adopted by the Washington Fish and Wildlife Commission Policy on Hatchery and Fishery Reform C-3619 and implementation of PacifiCorp Energy's Federal Energy Regulatory Commission (FERC) Licenses.

The purpose of the program is to produce Lewis River summer steelhead for sustainable escapement to the watershed, while providing recreational fisheries under mark-selective fishery regulations. Program fish will be produced at the Merwin Hatchery, located on the Lewis River (WRIA 27.0168). The program will annually release 175,000 yearlings to the Lewis River. In addition, this program provides 60,000 yearlings for the Echo Bay Net Pen program, located on the North Fork Lewis River near the confluence of Staples (WRIA 27.0315) and Houghton (WRIA 27.0319) creeks.

This summer steelhead HGMP is built around the principles and recommendations of the Hatchery Scientific Review Group (HSRG). These principles and recommendations represent the best science available for operating hatchery facilities consistent with the conservation of salmonid species. The program has been operated as a "segregated type" program, as defined by the HSRG. A "segregated" program is one in which only hatchery-origin individuals are used in the hatchery broodstocks. Segregation is achieved by using returning adult hatchery-origin summer steelhead (distinguished by an adipose fin clip) returning to the Lewis River at the Lewis River Hatchery trap (RKm 25.0), and the Merwin Dam Fish Collection Facility (FCF) at RKm 30.4 from July through September. All fish released through this hatchery program have been 100% mass-marked (adipose fin-clipped) since 1994.

The Lower Columbia River steelhead are listed as "Threatened" under the ESA. The DPS does not include the Lewis River summer-run program.

Broodstock Collection:
The broodstock is derived from hatchery-origin stock returning to the Lewis River sub-basin. The current egg-take goal is 325,000 at Merwin Hatchery; around 105 adult pairs may be collected. Surplus hatchery-origin fish trapped at Merwin Dam may be recycled downstream, or transported to below the confluence with the East Fork Lewis River, or transported to Horseshoe Lake for additional sport harvest opportunity. Fish fit for human consumption may be donated to the Tribes, statewide or local food banks; fish unfit for human consumption are taken to a local rendering plant.

Harvest:
Total annual harvest is dependent on management response to annual abundance in *Pacific Salmon Commission* (PSC - U.S./Canada), *Pacific Fishery Management Council* (PFMC - U.S. ocean), and *Columbia River Compact* forums. WDFW has also received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the *Fisheries Management and Evaluation Plan* (FMEP), *Columbia River Fish Management Plan* (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia River steelhead populations. The *U.S. v Oregon* Technical Advisory Committee (TAC) has prepared Biological Assessments (BAs) for combined fisheries based on relevant *U.S. v Oregon* management plans and agreements. The current BA concerns Columbia River treaty Indian and non-Indian fisheries, as described in the "2008–2017 *U.S. v Oregon* Management Agreement for upriver Chinook, sockeye, steelhead, coho, and white sturgeon" (2008–2017 MA).

Under permanent regulations, the mainstem Columbia River is open to the retention of hatchery steelhead beginning May 16 from the Tongue Point/Rocky Point line upstream to the I-5 Bridge and June 16 from

the I-5 Bridge upstream to the Oregon/Washington border above McNary Dam. The steelhead fishery is closed under permanent regulations during April 1–May 15 between Tongue Point and the I-5 Bridge and April 1–June 15 upstream of I-5, when spring Chinook abundance is high.

Summer steelhead enter fisheries from March through October and most of the catch occurs from late May through August. Selective harvest regulations allow only the harvest of adipose-fin clipped summer steelhead in the lower Columbia River to protect wild summer steelhead. Specific harvest rates for the hatchery steelhead are unknown, however, catch record "punch card" (CRC) estimates for total harvest of marked hatchery steelhead are available by month for all areas open to sport harvest. Due to a lack of coded-wire tag studies and limitations that not all fish can be accounted for as being harvested or as back-to-rack counts, smolt-to-adult survival rates (SAR) are likely underestimated. Based on the average SAR of 8.4% for brood years 1998-2009, and a programmed on-station release goal of 175,000 yearlings, the estimated production goal would be 14,613 adults.

Monitoring and Evaluation:
The Lewis River Settlement Agreement (SA 2004) outlines monitoring requirements for the Lewis River Hatchery programs developed as part of the new license that PacifiCorp and Cowlitz PUD received from FERC. A Monitoring and Evaluation (M&E) Plan, a Hatchery and Supplementation (H&S) Plan and associated Annual Operating Plans (AOP) have been developed to address the monitoring requirements of the Settlement Agreement (SA 2004, H&S 2009, M&E 2010).

Operation and Maintenance of Hatchery Facilities:
WDFW's Lewis River summer steelhead program are spawned and reared at Merwin Hatchery. The facility draws water from an intake on Lake Merwin at a rate of up to 11 cubic feet per second (cfs). The intake and screen criteria are in compliance with state and federal guidelines (NOAA-NMFS 1995, 1996), and meet the current *Anadromous Salmonid Passage Facility Design* criteria. The return water systems operates under the *National Pollutant Discharge Elimination System* (NPDES) permit

The Echo Bay Net Pens are sited out of the mainstem flow of the N.F. Lewis River, and serves as a short-term rearing/ acclimation project. Feeding and production stays below the NPDES guidelines for permitting, because total pounds of production at the site are less than 20,000 pounds.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Lewis River (Merwin Hatchery) summer steelhead

1.2 Species and population (or stock) under propagation, and ESA status.

Lewis River (Merwin Hatchery) summer steelhead (*Oncorhynchus mykiss*) – within the geographic range, but not included in the DPS.

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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Fish Management Staff Lead Contact

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Fish First: Non-Profit 501c enhancement co-operative group provides in-kind contributions – volunteer operational costs are unknown.

PacifiCorp Energy and Cowlitz PUD: FERC license operators for Lewis River Hydroelectric Projects.

PacifiCorp Energy Staff Lead Contact

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1.4 Funding source, staffing level, and annual hatchery program operational costs.

Funding Sources	Operation Information – FY 2013
PacifiCorp	Full time equivalent staff – 3.7
	Annual operating cost (dollars) - $481,288

The above information for full-time equivalent staff and annual operating cost applies cumulatively to anadromous program facilities and cannot be broken out specifically by program.

PacifiCorp Energy and the Cowlitz County Public Utility District (PUD) No. 1 presently funds production of mitigation fish released in the Lewis River system, including spring Chinook, kokanee, rainbow trout, coho and steelhead.

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Lewis River hatchery summer steelhead.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Merwin Dam Fish Collection Facility (FCF)	Broodstock collection	Located at RKm 30.42 on the Lewis River (WRIA 27.0168), Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Lewis River Hatchery	Broodstock collection	Located at RKm 24.95 on the Lewis River (WRIA 27.0168), Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Merwin Hatchery	Adult holding/ spawning, incubation, rearing, acclimation	Located at RKm 30.6 on the Lewis River (WRIA 27.0168); tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Echo Bay Net Pens	Acclimation	Located at RKm 19.0 on the NF Lewis River (WRIA 27.0168), at the confluence of Staples (WRIA 27.0315) and Houghton (WRIA 27.0319) creeks; tributary to the Columbia River at RKm 140.

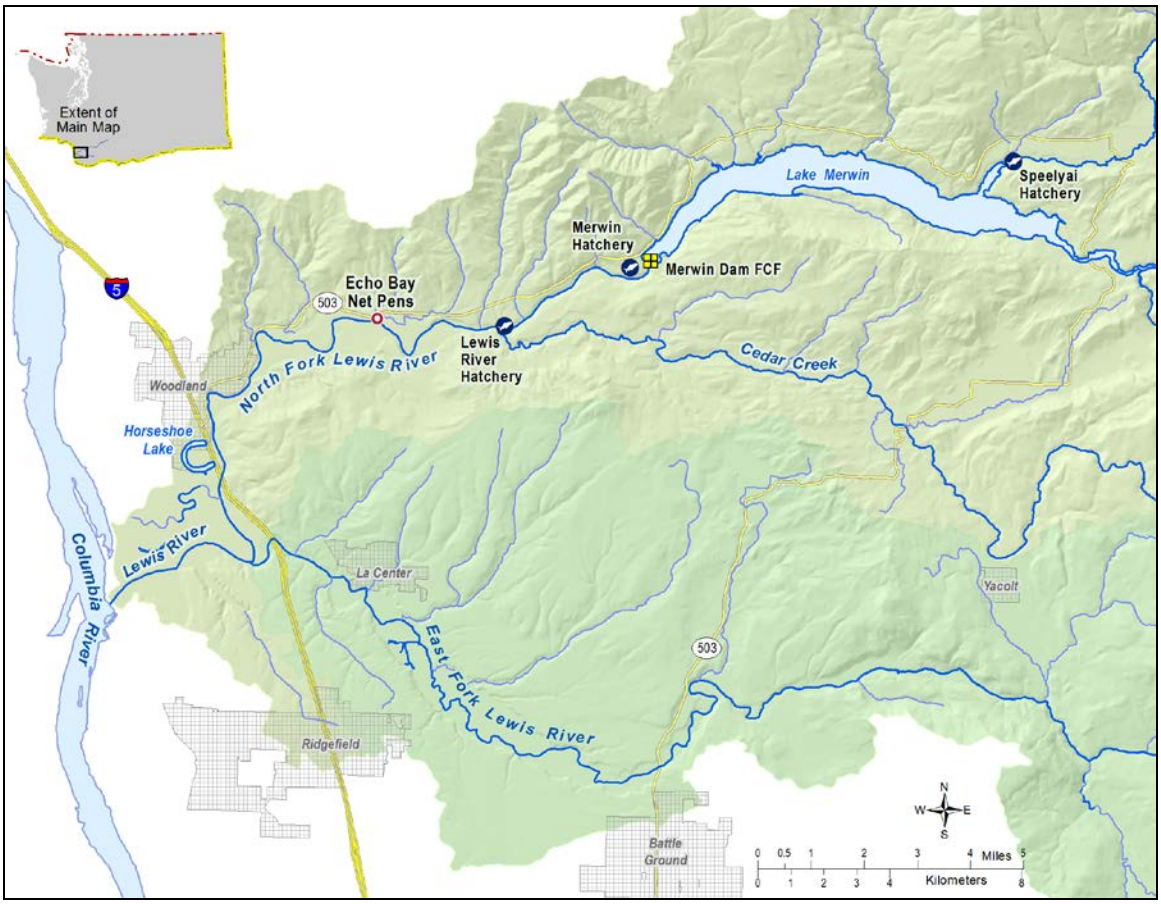

Figure 1.1: Map of Lewis Hatchery Complex and associated acclimation and release sites. Source: WDFW GIS 2014.

1.6 Type of program.

Segregated Harvest

1.7 Purpose (Goal) of program.

Mitigation/Augmentation. The goal of this program is to support mark-selective fisheries in the basin and lower Columbia River, while eliminating a directed harvest on wild fish, and also provide adult ocean-recruits for supplementation and reintroduction efforts in the Upper North Fork Lewis River sub-basin. *Lewis River Hatchery and Supplementation Plan* (H&S 2006). Also serves as mitigation for development (including hydro-power) and habitat degradation.

1.8 Justification for the program.

The program is funded through PacifiCorp and the Cowlitz County PUD for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River- *Fish Management and Evaluation Plan* (FMEP) (WDFW 2001) and the *Lewis River Hatchery and Supplementation Plan* (H&S 2006).

Fish First, a 501(c)3 non-profit organization that began on June 22, 1995, maintains a coalition of land owners, big business, small business, government groups, fishers, fish enhancement groups, commercial fisherman, sports fisherman and other interested parties to bring back selected streams and ecosystems to their fullest potential possible for current and future generations. Fish First has been involved in the day to day operation of the Echo Cove Net Pen summer steelhead program since 1997.

Catches of hatchery fish sustain the economies of local communities while keeping incidental mortalities of ESA-Listed fish at approved levels. Value of hatchery production and benefit to local economies will be further increased by implementing fisheries that increase harvest of hatchery produced fish, as expected through implementation of the *Lower Columbia Salmon Recovery Plan* LCSRP.

To minimize impact on listed fish by the Lewis River program and operations, the following risk aversions are included in this HGMP (**Table 1.8.1**).

Table 1.8.1: Summary of risk aversion measures for the Lewis River summer steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Water rights are formalized through trust water right from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.1	Intake and screen criteria are in compliance with state and federal guidelines (NOAA-NMFS 1995, 1996), and meet the current *Anadromous Salmonid Passage Facility Design* criteria (NOAA-NMFS 2011).
Effluent Discharge	4.1	Merwin Hatchery operates under the "U*pland Fin-Fish Hatching and Rearing*" *National Pollution Discharge Elimination System* (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-1052. Echo Bay net pen are short-term rearing project; feeding and production stays under NPDES guidelines for permitting. The facilities meet guidelines which do not require the NPDES general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).
Broodstock Collection & Adult Passage	7.9	All fish are mass marked (adipose fin clipped) prior to release. Broodstock collection and sorting procedures can quickly identify non-target listed fish (assumed if adipose fin is

		intact), and if encountered, released per protocol to minimize impact as determined by WDFW Region 5 staff.
Disease Transmission	7.9, 10.11	The *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and the *Fish Health Policy in the Columbia Basin* details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size and the system and life history stage to foster rapid migration to marine waters, and to allow juvenile listed fish to grow to a size that reduces potential for predation. Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See HGMP section 1.10. Standards and indicators are referenced from Northwest Power Planning Council (NPPC) Artificial Production Review (APR) (NPPC 2001).

1.10 List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1 <u>"Performance Indicators" addressing benefits.</u>

Table 1.10.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.2 Program contributes to mitigation requirements. Program provides mitigation for lost fish production due to development within the Columbia River Basin.	Number of fish released by program returning, or caught, as applicable to given mitigation requirements.	Annually estimate survival and contribution for each brood year released. This program provides mitigation for lost fish production due to development within the Lewis River Basin and contributes to a meaningful harvest in sport and commercial fisheries.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	Hatchery program operation addresses ESA requirements through the development and review of this HGMP. HGMP updated and re-submitted to NOAA with significant changes or under permit agreement. Compliance with ESA is managed with sport fishery regulations that minimize impacts to ESA-listed fish and are monitored by WDFW law enforcement officers. The FMEP outlines anticipated encounter rates and expected mortality rates

		for these fisheries. Natural populations are monitored annually to assess trends and compare with goals. Enhancement co-op submits yearly WDFW *Volunteer Fish Production Release and Planting Record Form* that includes details on number of fish, date and location of releases.
3.2.1: Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities	A quality control check is done prior to release to estimate the error rate of mass marking. The external mark enables mark-selective fisheries, which can reduce directed harvest mortality on natural-origin fish. Harvest is regulated to meet appropriate biological assessment criteria. Agencies monitor harvests to provide up-to-date information. Estimate survival and contribution to fisheries for each brood year released.
3.3.1. Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.	An annual number of naturally-produced adults or redds on the spawning grounds or selected natural production index areas is estimated.	The returns to the hatchery and spawning grounds are monitored and reported annually.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (fin-clip, CWT, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish. See also 3.2.1	Annually monitor and report size, number, mass-mark quality (mark rate/tag rate) and date of all hatchery releases. Annually sample returning fish for the mass-mark and CWT in fisheries and at the hatchery; monitor and report numbers of estimated hatchery (marked) and natural (unmarked) fish.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal distribution of broodstock collection at point of collection.	Collect broodstock representatively and systematically throughout the early portion of the return (July through September). Collect annual run timing, age and sex composition and spawning escapement timing data. Adhere to WDFW spawning guidelines (Seidel 1983; HSRG 2009).
3.5.5 Juveniles are released at	Level of smoltification (size,	Monitor fish condition in the

fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	appearance, behavior, etc.) at release compared to WDFW rearing and release guidelines. Release type (forced, volitional, or direct).	facilities throughout all rearing stages. Annually monitor and record size, number, and date of release.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Apply basic monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Collect annual run timing, age and sex composition data upon adult return. Annually record growth rates, mark rate and size at release and release dates. See also HGMP section 11 for program monitoring and evaluation. Enhancement co-op submits yearly WDFW *Volunteer Fish Production Release and Planting Record Form* that includes details on number of fish, date and location of releases.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Program is designed to help achieve the end goal of conserving and stabilizing natural salmon populations.	Long-term monitoring of system population will indicate success of program.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2: **"Performance indicators" addressing risks.**

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Program risks have been addressed in this HGMP through best available science hatchery management actions. WDFW staff annually reviews Future Brood Document (FBD) for stock, size, number, date and location of releases from all production programs. Monitor and record juvenile hatchery fish size, number, date of release and mass-mark quality; monitor contribution of hatchery adult fish to fisheries and escapement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults on the spawning	Monitor and record juvenile hatchery fish size, number, date of release and mass-mark (fin clips, tags, etc.) quality; monitor

applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	ground. Production fish are mass-marked (adipose fin-clip) to allow for their differentiation from naturally-produced fish	contribution of hatchery adult fish to fisheries and escapement. Harvest is regulated to meet appropriate biological assessment criteria. Steelhead fisheries in the Lewis River are mark selective, and require the release of all wild steelhead. Agencies monitor harvests and hatchery escapements to provide up-to-date information.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, etc., depending on species) produced fish to allow for their differentiation from naturally produced fish for selective fisheries.	Annually monitor and report mass-mark type, quality and rates. Annually assess harvest of mass-marked hatchery fish based on CRC estimates and creel surveys.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production and to evaluate effects of the program on the local natural population.	All hatchery production is identifiable in some manner (fin-marks, tags, otolith, etc.) consistent with information needs.	Annually monitor and report mass-mark type, quality and rates. Examine returning fish encountered for the mass-marked at the hatchery and on the spawning ground. Annually record numbers of estimated hatchery (marked) and natural (unmarked).
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at collection point.	Collect annual run timing, age and sex composition and return timing data.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	See HGMP section 11 for M&E information.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Total number of natural-origin spawners (if any) reaching the collection facility. Timing of collection compared to overall run timing.	All on-station hatchery releases are identifiable in some manner (fin-marks, tags, etc.). Collect annual run timing, origin, and age and sex composition data.
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release).	Annually record and report release information, including location, method and age class in hatchery data systems (WDFW Hatcheries Headquarters Database).

3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct).	Annually monitor and record size, number, date of release and release type.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State*).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), *Fish Health Policy in the Columbia Basin*, and *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). Enhancement co-op coordinators communicate regularly with Region 5 staff.
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDFW water right permit compliance.	Flow and discharge reported in monthly NPDES reports. Enhancement co-ops comply with all permits required and submits MOU to WDFW for each year involved in the project before project is approved.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, revised 2006).	Necropsies of fish to assess health, nutritional status, and culture conditions.	DFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	Examine fish 1 to 6 weeks prior to transfer or release, in accordance with the *Salmonid*

		Disease Control Policy of the Fisheries Co-Managers of Washington State (WDFW and WWTIT 1998, updated 2006).
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below broodstock collection site is currently compared to historic distribution.	Trap is checked regularly. Non-target and/or ESA listed fish, when encountered, are returned to the river.
3.7.7 Weir/trapping operations do not result in significant stress, injury or mortality in natural populations.	Mortality rates in trap. Pre-spawning mortality rates of captured fish in the hatchery and/or after release.	Traps checked regularly. Annually record and report abundances and observations of natural- origin fish at hatchery facilities.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally-origin salmon and steelhead (Sharpe et al. 2008).
3.8.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	Total cost of program operation.	Annually monitor and report feed costs and fish health actions. Enhancement co-ops submit yearly WDFW *Volunteer Fish production Project Release and Planting Record Form* that includes details success or operational concerns.

1.11 Expected size of program.

1.11.1 <u>Proposed annual broodstock collection level (maximum number of adult fish).</u>

Around 105 adult pairs are needed to achieve the established egg-take goal of 325,000 (FBD 2014), based on an average fecundity of around 3,500 eggs/female and a pre-spawning mortality of 10%. This take includes the 63,000 juveniles transferred to the Fish First Echo Bay Net Pen project on the NF Lewis River. Additional adults can be taken in case of virus concerns (IHNV-positive eggs); this program can also provide back-up to the Skamania summer steelhead program.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location.

Table 1.11.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Max. No.	Location	Major Watershed
Yearlings	175,000	Lewis River (WRIA 27.0168)	Lewis
	60,000	Echo Bay Net Pens	

Source: Future Brood Document 2014.

1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Due to a lack of coded-wire tag (CWT) studies and limitations that not all fish can be accounted for as being harvested or as back-to-rack counts, smolt-to-adult survival rates (SAR) are likely underestimated. Based on the average smolt-to-adult survival of 8.35 % for brood years 1998-2009 and a current program release goal of 175,000 yearlings, the estimated adult production (goal) level would be 14,613 (see also HGMP section 3.3.1).

Table 1.12.1: Lewis River summer steelhead hatchery escapement 2001 to 2013.

Return Year	Hatchery Return
2001	2,819
2002	6,961
2003	14,717
2004	11,329
2005	9,354
2006	20,289
2007	14,273
2008	6,293
2009	11,304
2010	10,206
2011	9,521
2012	4,932
2013	5,803
Average	**10,167**

Source: WDFW Hatcheries Headquarters Database 2014

1.13 Date program started (years in operation), or is expected to start.

The first year of operation for this hatchery program was 1994. The first year of operation for the Echo Bay Net Pen program was 1997. Previously, Fish First also operated a summer steelhead Speelyai Bay net pen program, from 1994-2005.

1.14 Expected duration of program.

On-going with no plans for termination.

1.15 Watersheds targeted by program.

Lewis River (WRIA 27.0168), Lewis Sub-Basin, Lower Columbia River.

1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues.

The sole purpose of the release of Lewis stock summer steelhead (derivative of the early summer stock) into the NF Lewis is to continue a summer steelhead sport fishery while eliminating a directed harvest on wild summer steelhead. Adults are trapped at the Merwin Dam FCF and are spawned and incubated at Merwin Hatchery. Rearing takes place at Merwin Hatchery and in net pens in Echo Bay. Returning hatchery steelhead that are trapped at Merwin Dam are marked and returned to the river just below the confluence with the EF Lewis (RKm 5.5) for additional harvest opportunity. Fish trapped at Merwin Dam FCF a second time are trucked to Horseshoe Lake for additional sport harvest in a closed system. Any adults that escape the fishery may spawn in the system, but the historic spawning area for natural-origin summer steelhead in the NF Lewis is not accessible at this time because of a series of dams that blocks migration.

Broodstock for the Echo Bay net pen program is collected at Merwin Trap or Lewis River Hatchery. In addition, Fish First released around 50,000 additional yearlings into Echo Cove from Skamania Hatchery until 2008.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: *Discontinue the program*: This action would reduce potential interaction with natural populations and eliminate potential impacts on other ESA-listed species. Currently this program supports popular sport fisheries in the NF Lewis River and Lower Columbia mainstem (including Puget Island), and is consistent with the mitigation requirements.

Alternative 2: *Eliminate the non-local programs and use native stock*: This alternative would require mining of the local stock. This program uses hatchery summer steelhead returning to the Lewis Hatchery Complex.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: Expand Lewis River monitoring. There is a need to expand the monitoring of steelhead in the Lewis River to identify a strategy that would reduce predation on ESA-listed species.

2 SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1 List all ESA permits or authorizations in hand for the hatchery program.

None currently. This HGMP is submitted to the NOAA Fisheries for ESA consultation and take prohibition exemption under ESA section 4(d), 7, or 10.

2.2 Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1 Description of NMFS ESA-listed salmonid population(s) affected by the program.

- Identify the NMFS ESA-listed population(s) that will be directly affected by the program.

Lower Columbia River steelhead (*Oncorhynchus mykiss*). Listed as a threatened species on March 19, 1998 (63FR13347); threatened status reaffirmed on January 5, 2006 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia River Chinook (*Oncorhynchus tshawytscha*). Listed as "threatened" on March 24, 1999 (64FR14308); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Lower Columbia River coho (*Oncorhynchus kisutch*). Identified as a candidate species on June 25, 1995 (60FR38011). Listed as threatened on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Columbia River chum salmon (*Oncorhynchus keta*). Listed as threatened on March 25, 1999 (64FR14507); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

2.2.2 Status of NMFS ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.

Lower Columbia River Chinook: In Washington, the LCR Chinook ESU includes all naturally spawned Chinook populations from the mouth of the Columbia to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, as well as seventeen artificial propagation programs (NMFS 2005 -70FR37160).

Status: Of the 32 historical populations in the ESU, 28 are considered extirpated or at very high risk (Ford 2011). Dam construction eliminated habitat for a number of populations leading to the extirpation of spring Chinook salmon populations in the Upper Cowlitz, Cispus, Tilton, North Fork Lewis , Big White Salmon rivers, and fall Chinook populations in the Upper Cowlitz and Big White Salmon rivers (SHIEER, NMFS 2004). Projects to allow access have been initiated in the Cowlitz and Lewis systems but these are not close to producing self-sustaining populations; Condit Dam on the Big White Salmon River was breached October 26, 2011. Based on the recovery plan analyses, all of the 14 Tule populations (**Table 2.2.1**) are considered very high risk except one that is considered at high risk. The modeling conducted in association with Tule harvest management suggests that three of the populations (Coweeman, Lewis and Washougal) are at a somewhat lower risk. The Lewis River late-fall population is considered low or very low risk (Ford 2011).

Table 2.2.1: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River Chinook populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Fall										
Grays/Chinook	Contributing[2]	VL	H	VL	VL[2]	M+	+500%	800	<50	1,000
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	+150%	3,000	<50	1,500
Mill/Aber/Germ	Primary[1]	VL	H	L	VL[2]	H	+155%	2,500	50	900
Youngs Bay (OR)	Stabilizing	--[3]	--[3]	--[3]	L	L	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Contributing[1]	--[3]	--[3]	--[3]	VL	L	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	L	H	--[3]	--[3]	--[3]	--[3]
Cascade Fall										
Lower Cowlitz [C]	Contributing	VL	H	M	VL[2]	M+	+50%	24,000	500	3,000
Upper Cowlitz	Stabilizing	VL	VL	M	VL	VL	--	28,000	0	--
Toutle[C]	Primary[1]	VL	H	M	VL[2]	H+	+265%	11,000	<50	4,000
Coweeman [G]	Primary	VL	H	H	VL[2]	H+	+80%	3,500	100	900
Kalama	Contributing[2]	VL	H	M	VL[2]	M	+110%	2,700	<50	500
Lewis [G]	Primary	VL	H	H	VL[2]	H+	+280%	2,600	<50	1,500
Salmon	Stabilizing	VL	H	M	VL	VL	--	n/a	<50	--
Washougal	Primary	VL	H	M	VL[2]	H+	+190%	2,600	<50	1,200
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Contributing[1]	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Cascade L Fall										
Lewis NF [C,G]	Primary	VH	H	H	VH[1]	VH	0%	23,000	7,300	7,300
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Cascade Spring										
Upper Cowlitz [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	22,000	300	1,800
Cispus [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	7,800	150	1,800
Tilton	Stabilizing	VL	VL	VL	VL	VL	0%	5,400	<100	--
Toutle	Contributing	VL	H	L	VL	M	>500%	3,100	100	1,100
Kalama	Contributing[2]	VL	H	L	VL	L	>500%	4,900	100	300
Lewis NF [C]	Primary	VL	L	M	VL	H	>500%	15,700	300	1,500
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Fall										
L. Gorge (WA/OR)	Contributing	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
U. Gorge (WA/OR) [C]	Contributing[1]	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
White Salmon [C]	Contributing	VL	L	L	VL	M	>500%	n/a	<50	500
Hood (OR)	Primary[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge Spring										
White Salmon [C]	Contributing	VL	VL	VL	VL	L+	>500%	n/a	<50	500
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	VH	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

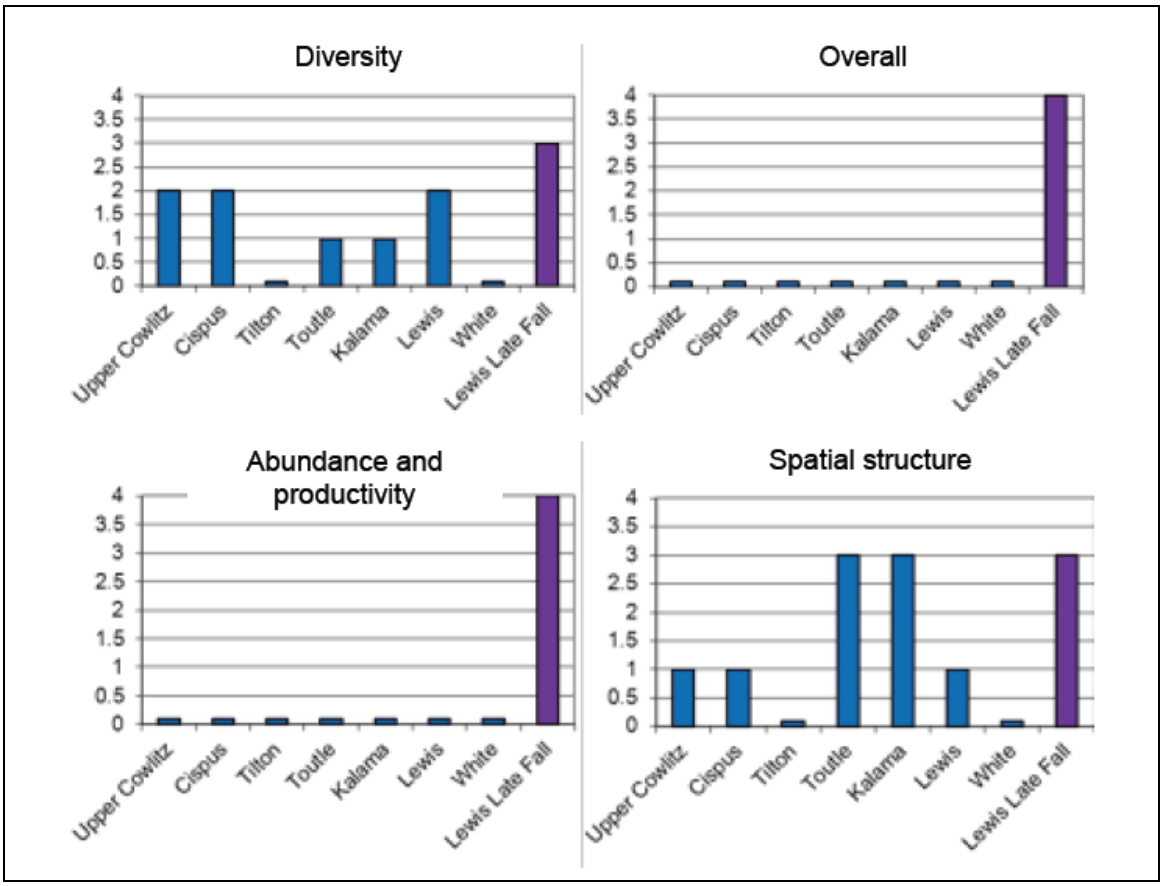

Figure 2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River Steelhead *(Oncorhynchus mykiss*): The DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as ten artificial propagation programs: the Cowlitz Trout Hatchery Late-Winter (Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton rivers), Kalama River Wild (winter- and summer-run), and four Oregon programs (NMFS 2006). Merwin Hatchery steelhead programs are not considered part of the DPS listing.

Status: Of the 26 historical populations in the ESU, 17 are considered at high or very high risk. Populations in the upper Lewis and Cowlitz watersheds remain cut-off from access to essential spawning habitat by hydroelectric dams. Projects to allow access have been initiated in the Cowlitz and Lewis systems but these have not yet produced self-sustaining populations (Ford 2011). Condit Dam on the White Salmon River was breached October 26, 2011. WDFW is currently developing watershed-specific management plans in accordance with the SSMP. As part of this planning process, WDFW is proposing to complete a thorough review of current steelhead stock status using the most up to date estimates of adult abundance, juvenile production and genetic information.

Table 2.2.2: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River steelhead populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Winter										
Grays/Chinook	Primary	VH	VH	M	M[1]	H	0%[4]	1,600	800	800
Eloch/Skam	Contributing	VH	VH	M	M[1]	M+	0%[4]	1,100	600	600
Mill/Ab/Germ	Primary	H	VH	M	M[1]	H	0%[4]	900	500	500
Youngs Bay (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Big Creek (OR)	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Cascade Winter										
Lower Cowlitz	Contributing	L	M	M	L	M	+5%	1,400	350	400
Upper Cowlitz [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,400	<50	500
Cispus [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,500	<50	500
Tilton	Contributing	VL	M	M	VL	L	>500%	1,700	<50	200
S.F. Toutle	Primary	M	VH	H	M	H+	+35%	3,600	350	600
N.F. Toutle [C]	Primary	VL	H	H	VL[2]	H	+125%		120	600
Coweeman	Primary	L	VH	VH	L[2]	H	+25%	900	350	500
Kalama	Primary	L	VH	H	L[2]	H+	+45%	800	300	600
N.F. Lewis [C]	Contributing	VL	M	M	VL[2]	M	>500%	8,300	150	400
E.F. Lewis	Primary	M	VH	M	M[1]	H	+25%	900	350	500
Salmon	Stabilizing	VL	H	M	VL[2]	VL	0%	na	<50	--
Washougal	Contributing	L	VH	M	L[2]	M	+15%	800	300	350
Clackamas (OR) [C]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [C]	Primary	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Cascade Summer										
Kalama [C]	Primary	H	VH	M	M[1]	H	0%[4]	1,000	500	500
N.F. Lewis	Stabilizing	VL	VL	VL	VL	VL	0%	na	150	--
E.F. Lewis [G]	Primary	VL	VH	M	VL[2]	H	>500%	600	<50	500
Washougal [C,G]	Primary	M	VH	M	M[1]	H	+40%	2,200	400	500
Gorge Winter										
L. Gorge (WA/OR)	Primary	L	VH	M	L[2]	H	+45%	na	200	300
U. Gorge (WA/OR)	Stabilizing	L	M	M	L[2]	L	0%	na	200	--
Hood (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Summer										
Wind [C]	Primary	VH	VH	H	H[1]	VH	0%[4]	na	1,000	1,000
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

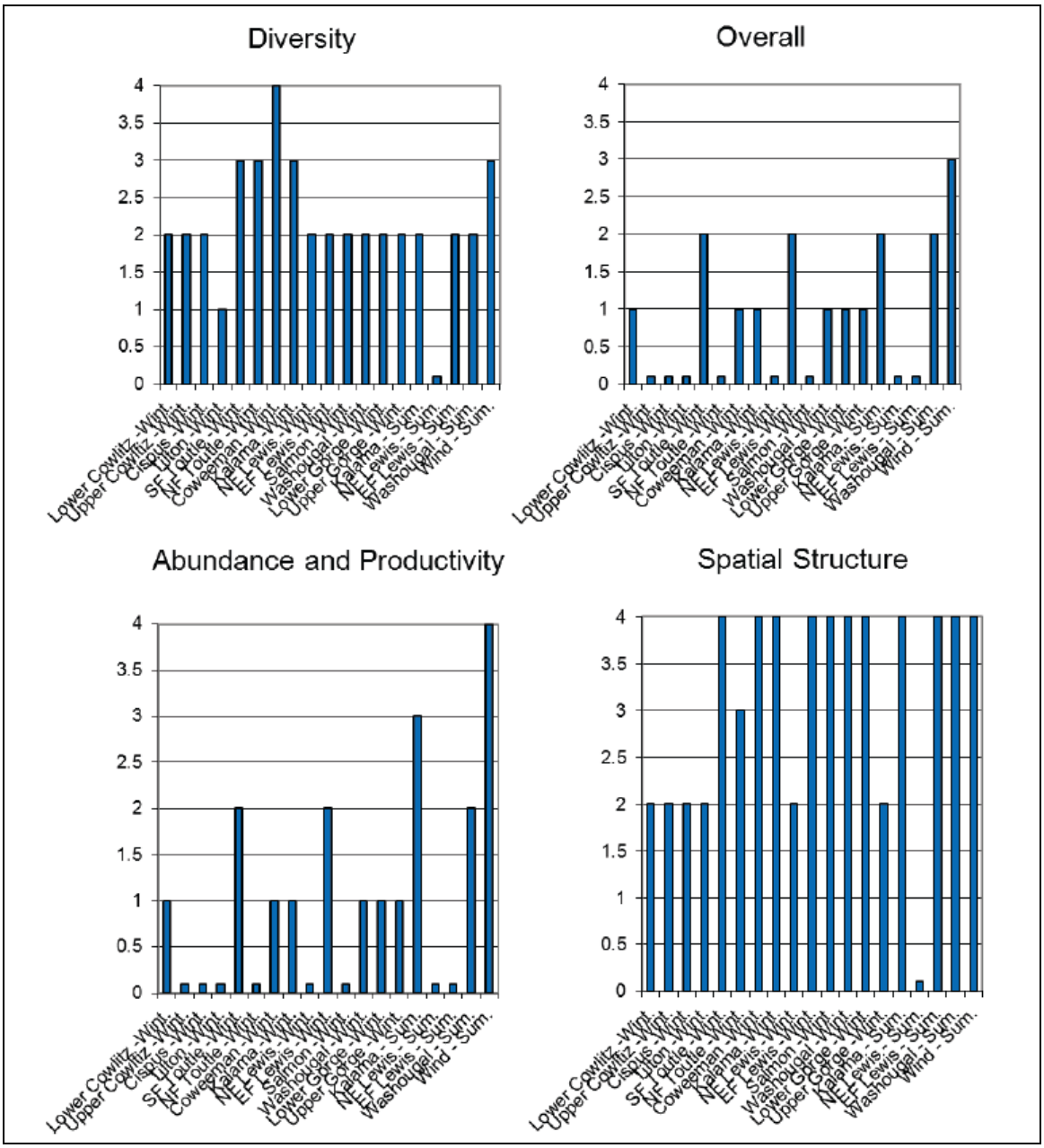

Figure 2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River coho *(Oncorhynchus kisutch)*: Originally part of a larger Lower Columbia River/Southwest Washington ESU, Lower Columbia coho were identified as a separate ESU and listed as threatened on June 28, 2005. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, The twenty-five artificial propagation programs include: the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program,

Washougal Hatchery Type-N Coho Program, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program.

Status: Three status evaluations of LCR coho status, all based on WLC-TRT criteria, have been conducted since the last BRT status update in 2005 (McElhany et al. 2007, Beamesderfer et al. 2010, LCFRB 2010). All three evaluations concluded that the ESU is currently at very high risk of extinction. All of the Washington side populations are considered at very high risk, although uncertainty is high because of a lack of adult spawner surveys. The 2005 BRT evaluation noted that smolt traps indicate some natural production in Washington populations, though given the high fraction of hatchery origin spawners suspected to occur in these populations it is not clear that any are self-sustaining (Ford 2011). Since this time WDFW has implemented an ESU wide monitoring program for LCR coho which began in 2010. Preliminary results indicate that natural origin population abundance may be higher than previously thought for certain populations (WDFW, unpublished). Results from the first 3 years of monitoring should be available in the near future.

Table 2.2.3: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River coho populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [L]	Primary	VL	H	VL	VL[2]	H	+370%	3,800	<50	2,400
Eloch/Skam [L]	Primary	VL	H	VL	VL[2]	H	+170%	6,500	<50	2,400
Mill/Ab/Germ [L]	Contributing	VL	H	L	VL[2]	M	>500%	2,800	<50	1,800
Youngs (OR) [L]	Stabilizing	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [L]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR) [L]	Primary[1]	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR) [L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Cascade										
Lower Cowlitz [L]	Primary	VL	M	M	VL[2]	H	+100%	18,000	500	3,700
Upper Cowlitz [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	18,000	<50	2,000
Cispus [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	8,000	<50	2,000
Tilton [E, L]	Stabilizing[2]	VL	M	L	VL	VL[2]	0%	5,600	<50	--
Toutle SF [E, L]	Primary	VL	H	M	VL[2]	H	+180%	27,000	<50	1,900
Toutle NF [E, L]	Primary	VL	M	L	VL[2]	H	+180%		<50	1,900
Coweeman [L]	Primary	VL	H	M	VL[2]	H	+170%	5,000	<50	1,200
Kalama [L]	Contributing	VL	H	L	VL[2]	L	>500%	800	<50	500
NF Lewis [E, L]	Contributing	VL	L	L	VL[2]	L	+50%	40,000	200	500
EF Lewis [E, L]	Primary	VL	H	M	VL[2]	H	>500%	3,000	<50	2,000
Salmon [L]	Stabilizing	VL	M	VL	VL	VL	0%	na	<50	--
Washougal [L]	Contributing	VL	H	L	VL[2]	M+	>500%	3,000	<50	1,500
Clackamas (OR) [E, L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [E, L]	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L Gorge (WA/OR) [L]	Primary	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge (WA) [L]	Primary[1]	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge/Hood (OR)[E]	Contributing[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[E] Early run (Type S) coho stock.
[L] Late run (Type N) coho stock.
(Core and Legacy populations not designated by the TRT for coho).

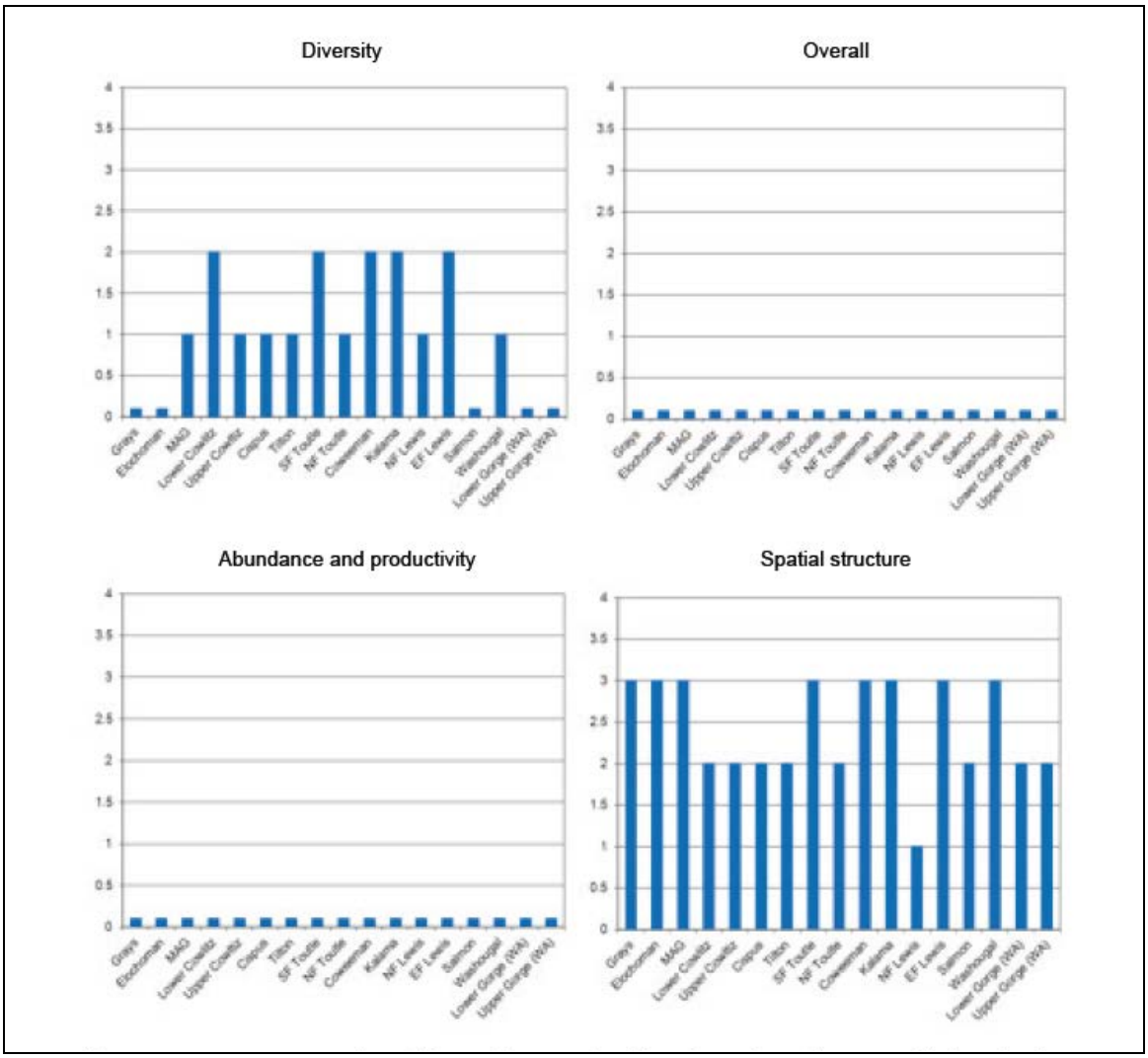

Figure 2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Columbia River chum salmon (*Oncorhynchus keta*). ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, as well as artificial propagation programs at Big Creek, Grays River, Lewis River, and Washougal River/Duncan Creek chum hatchery programs.

Status: A report on the population structure of lower Columbia River salmon and steelhead populations was published by the WLC-TRT in 2006 (Myers et al. 2006). The chum population designations in that report are used in this status update and were used for status evaluations in recent recovery plans by ODFW and LCFRB.

The LCFRB completed a revision recovery plan in 2010 that includes Washington populations of Columbia River chum salmon. This plan includes an assessment of the current status of Columbia River chum populations, which relied and built on the viability criteria developed by the WLC-TRT (McElhany et al. 2006) and an earlier evaluation of Oregon WLC populations (McElhany et al. 2007). This evaluation assessed the status of populations with regard to the VSP parameters of A/P, spatial structure, and diversity (McElhany et al. 2000). The result of this analysis is shown in **Figure 2.3**. The analysis indicates that all of the Washington populations with two exceptions are

in the overall very high risk category (also described as extirpated or nearly so). The Grays River population was considered to be at moderate risk and the Lower Gorge population to be at low risk. The very high risk status assigned to the majority of Washington populations (and all the Oregon populations) reflects the very low abundance observed in these populations (e.g., <10 fish/year) (Ford 2011).

Table 2.2.4: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River chum populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [C,G]	Primary	VH	M	H	M[1]	VH	0%[4]	10,000	1,600	1,600
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	>500%	16,000	<200	1,300
Mill/Ab/Germ	Primary	VL	H	L	VL	H	>500%	7,000	<100	1,300
Youngs (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Cascade										
Cowlitz (Fall) [C]	Contributing	VL	H	L	VL	M	>500%	195,000	<300	900
Cowlitz (Summer) [C]	Contributing	VL	L	L	VL	M	>500%	n/a	n/a	900
Kalama	Contributing	VL	H	L	VL	M	>500%	20,000	<100	900
Lewis [C]	Primary	VL	H	L	VL	H	>500%	125,000	<100	1,300
Salmon	Stabilizing	VL	L	L	VL	VL	0%	n/a	<100	--
Washougal	Primary	VL	H	L	VL[2]	H+	>500%	18,000	<100	1,300
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L. Gorge (WA/OR) [C,G]	Primary	VH	H	VH	H[1]	VH	0%[4]	6,000	2,000	2,000
U. Gorge (WA/OR)	Contributing	VL	L	L	VL	M	>500%	11,000	<50	900

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[5] Increase relative to interim Plan.
[6] Reduction relative to interim Plan.
[7] Addressed in Oregon Management Unit plan.
[8] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

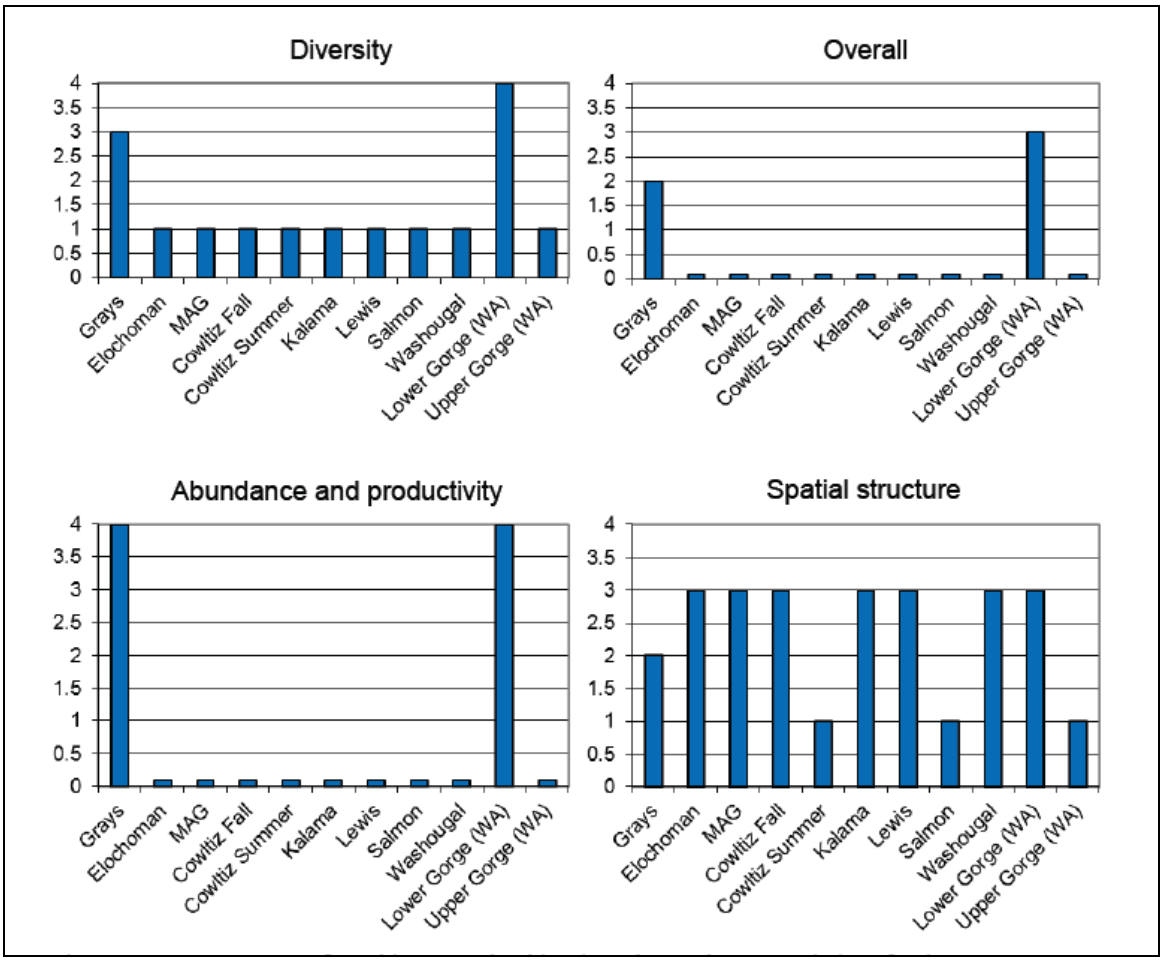

Figure 2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lewis River eulachon (*Thaleichthys pacificus):* The Southern Distinct Population Segment (DPS) of Pacific eulachon was listed as *Threatened* under the ESA on May 17, 2010 (75 FR 13012).

Status: The lower Columbia River and its tributaries support the largest known spawning run of eulachon. The main stem of the lower Columbia River provides spawning and incubation sites, and major tributaries in Washington State that have supported runs in the past include the Grays, Elochoman, Cowlitz, Kalama and Lewis Rivers. Although generally not considered as large a eulachon run as the Cowlitz River, the Lewis River has produced very large runs periodically and nearly half of the total commercial eulachon catch for the Columbia River Basin in 2002 and 2003 came from the Lewis River. Larval eulachon have been caught in the Lewis River during sampling efforts by WDFW and the Cowlitz Indian Tribe (JCRMS 2009, NMFS 2011). During spawning, eulachon typically move upstream in the Lewis River about 10 miles to Eagle Island, but they have been observed as far upstream as Merwin Dam RM 19.5 mi. Larval eulachon have also been caught in the East Fork of the Lewis River, up to the confluence with Mason Creek, RM 5.7 mi. Merwin Dam was completed in 1931, and it presents a passage barrier to all anadromous fish, including eulachon (LCFRB 2004). The current abundance of eulachon is low and is declining in all surveyed populations throughout the DPS. The major threats and continued causes for declines in eulachon populations include climate change and its impacts on both ocean

conditions and freshwater habitat, by-catch in commercial fisheries, dams and water diversions, degraded water quality, dredging and predation (NMFS 2011).

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population.

Not available for most species. See HGMP section 11.1 for planned M&E. Juvenile coho production estimates is the one measure of production in the Lower Columbia system.

Table 2.2.5: Lower Columbia River Washington tributary coho smolt production estimates, 1997-2009 (WDFW, Region 5).

Year	Cedar Creek	Mill Creek	Abernathy Creek	Germany Creek	Cowlitz Falls Dam	Mayfield Dam
1997	-----	-----	-----	-----	3,700	700
1998	38,400	-----	-----	-----	110,000	16,700
1999	28,000	-----	-----	-----	15,100	9,700
2000	20,300	-----	-----	-----	106,900	23,500
2001	24,200	6,300	6,500	8,200	334,700	82,200
2002	35,000	8,200	5,400	4,300	166,800	11,900
2003	36,700	10,500	9,600	6,200	403,600	38,900
2004	37,000	5,700	6,400	5,100	396,200	36,100
2005	58,300	11,400	9,000	4,900	766,100	40,900
2006	46,000	6,700	4,400	2,300	370,000	33,600
2007	29,300	7,000	3,300	2,300	277,400	34,200
2008	36,340	90,97	5,077	3,976	-----	38,917
2009	61,140	62,83	3,761	2,576	-----	29,718
2010	-----	-----	-----	-----	-----	49,171
2011	-----	-----	-----	-----	-----	43,831

Source: LCR FMEP Annual Report 2010 and WDFW Data 2012.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Table 2.2.6: Spring Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2012.

Year	Cowlitz	Kalama	Lewis
2000	266	34	523
2001	347	578	754
2002	419	898	498
2003	1,953	790	745
2004	1,877	358	529
2005	405	380	122
2006	783	292	857
2007	74	2,150	264
2008	425	364	40
2009	763	34	80
2010	711	0	160
2011	1,359	26	120
2012	1,359	28	200

Source: Joe Hymer, WDFW Annual Database 2012

Table 2.2.7: Fall Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2011[a].

Year	Elochoman River	Coweeman River[a]	Grays River	Skamokawa Creek	Cowlitz River	Green River (Toutle)	SF Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River
2000	884	424	80	482	2,100	1,580	204	3,877	391	6,504	2,757
2001	230	251	104	3	1,979	1,081	102	3,451	245	4,281	1,704
2002	332	566	390	7	3,038	5,654	216	10,560	441	5,518	2,728
2003	2,204	753	149	529	2,968	2,985	327	9,272	607	11,519	2,678
2004	4,796	1,590	745	2,109	4,621	4,188	618	6,680	918	13,987	10,597
2005	6,820	1,090	387	588	10,329	13,846	140	24,782	727	18,913	3,444
2006	7,581	900	82	372	14,427	7,477	450	18,952	1,375	17,106	6,050
2007	194	140	99	36	2,724	961	30	1,521	308	10,934	2,143
2008	782	95	311	253	1,334	824	45	2,617	236	4,268	3,182
2009	231	147	93	139	2,156	1,302	66	4,356	110	6,112	2,995
2010	1,883	1,330	12	268	2,762	605	NE	3,576	314	8,908	4,529
2011	508	2,148	353	41	1,616	668	NE	10,639	334	14,033	2,961

Source: Ron Roler, WDFW Natural Spawn Progress Reports 2012.
* Estimates of total adult and jack fall Chinook. May include fish put upstream of hatchery weirs.

Table 2.2.8: Wild fall Chinook escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Grays River	Elochoman/ Skamokawa	Mill/Abernathy/ Germany
WDFW Escapement Goal	**1486**	**853**	**508**
LCSRP Abundance Target	**800**	**600**	**500**
2000	1064	650	380
2001	1130	656	458
2002	724	370	354
2003	1200	668	342
2004	1132	768	446
2005	396	376	274
2006	718	632	398
2007	724	490	376
2008	764	666	528
2009	568	222	396
2010	422	534	398
2011	318	442	270
3-year average	**436**	**399**	**355**
5-year average	**559**	**471**	**394**
10-year average	**697**	**517**	**378**

Source: WDFW Data 2012

Table 2.2.9: Wild fall Chinook escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Coweeman	SF Toutle	NF Toutle/ Green	Kalama	EF Lewis	Washougal
WDFW Escapement Goal	**1064**	**1058**	**NA**	**1000**	**1243**	**520**
LCSRP Abundance Target	**500**	**600**	**600**	**600**	**500**	**350**
2000	530	490	----	921	NA	NA
2001	384	348	----	1042	377	216
2002	298	640	----	1495	292	286
2003	460	1510	----	1815	532	764
2004	722	1212	----	2400	1298	1114
2005	370	520	388	1856	246	320
2006	372	656	892	1724	458	524
2007	384	548	565	1050	448	632
2008	722	412	650	776	548	732
2009	602	498	699	1044	688	418
2010	528	274	508	961	336	232
2011	408	210	416	622	308	204
3-year average	**513**	**327**	**541**	**876**	**444**	**285**
5-year average	**529**	**388**	**568**	**891**	**466**	**444**
10-year average	**487**	**648**	***588**	**1374**	**515**	**523**

Source: WDFW Data 2012.
* 7-year average for NF Toutle/Green.

Table 2.2.10: Wild summer steelhead population estimates for LCR populations from 2001 to 2011, current WDFW escapement goals, and LCSRP abundance targets.

Location	Kalama	EF Lewis	Washougal	Wind
WDFW Escapement Goal	**1000**	**NA**	**NA**	**1557**
LCSRP Abundance Target	**500**	**500**	**500**	**1000**
2001	286	271	184	457
2002	454	440	404	680
2003	817	910	607	1096
2004	632	425	NA	861
2005	400	673	608	587
2006	387	560	636	632
2007	361	412	681	737
2008	237	365	755	614
2009	308	800	433	580
2010	370	602	787	788
2011	534	1084*	956*	1468
3-year average	**404**	**829**	**725**	**945**
5-year average	**362**	**653**	**722**	**837**
10-year average	**450**	**627**	**652**	**804**

Source: WDFW Data 2012.
* Preliminary estimates.

Table 2.2.11: Population estimates of chum salmon in the Columbia River.

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010[a]	2011[a]
Crazy Johnson Creek	---	---	966	1,471	3,639	759	1,034	981	677	2,374
WF Grays River	---	---	9,015	1,324	1,232	1,909	800	994	1,967	7,002
Mainstem Grays River	---	---	4,872	1,400	1,244	1,164	886	750	3,467	1,848
I-205 area	3,468	2,844	2,102	1,009	862	544	626	1,132	2,105	4,947
Multnomah area	1,267	1,130	665	211	313	115	28	102	427	641
St Cloud area	---	137	104	92	173	9	1	14	99	509
Horsetail area	---	---	106	40	63	17	33	6	45	183
Ives area[b]	4,466	1,942	363	263	387	145	168	141	214	162
Duncan Creek[c]	13	16	2	7	42	9	2	26	48	85
Hardy Creek	343	392	49	73	104	14	3	39	137	173
Hamilton Creek	1,000	500	222	174	246	79	114	115	247	517
Hamilton Spring Channel	794	363	346	84	236	44	109	91	187	324
Grays return[d]	12,041	16,974	15,157	4,327	6,232	3,966	2,807	2,833	6,399	11,518
I-205 to Bonneville return	11,351	7,324	3,959	1,953	2,426	976	1,084	1,666	3,509	7,541
Lower Columbia River Total	23,392	24,298	19,116	6,280	8,658	4,942	3,891	4,499	9,908	19,059

Source: Todd Hillson - WDFW Chum Program 2012

[a] Data for 2010 and 2011 is preliminary.

[b] Ives area counts are the carcass tagging estimate plus fish removed for broodstock, except for 2007 and 2008, which is area under the curve.

[c] Totals for Duncan Creek do not include broodstock brought in from mainstem spawning areas, adult trap catch or surveys below monitoring weirs only..

[d] Grays return totals include natural spawners and removed for broodstock.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Not available for most species. In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependent on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. See HGMP section 11.1 for planned M&E. The proportion of effective hatchery-origin spawners (pHOS) should be less than 10% of the naturally spawning population.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock Program:

Broodstock Collection: No take of natural stocks are associated with this operation.

Genetic introgression: The expected gene flow rate can be much lower than the "stray" rate. In a well-run segregated program, the level of gene flow should be quite low for three reasons: 1) the numbers of hatchery-origin fish that have escaped harvest should be low compared to the number of natural-origin fish present; 2) the reproductive success of the hatchery-origin fish can be expected to be low (Leider et al. 1990; Kostow et al. 2003; McLean et al. 2003; McLean et al. 2004); and 3) spawning overlap may be low (Scott and Gill 2008).

Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. Summer steelhead begin entering the Lewis River system from April and continue through December. The traps are opened for summer steelhead collection during the entire run to allow for collection over the entire run timing. Fish are sorted on a daily basis at the Merwin Trap and 1-2 times a week at Lewis River Hatchery or dictated by numbers of fish entering the trap. All fish are identified as natural-or hatchery-origin through examination for fin-clips or CWTs, and are examined for gill net or predator marks. Fish sorted at the collection facility and released may sustain some physical damage but little or no mortality is documented (see "take" tables at the end of this document). Broodstock are spawned at Merwin Hatchery in November and December. Natural-origin stock interbreeding with Merwin Hatchery broodstock is thought to be low because of differences in spawn timing (LCFRB 2010). Several studies corroborate findings from the earlier work that translocated domesticated hatchery stocks had poor reproductive success relative to wild fish (Hulett et al. 2004). Crew can quickly distinguish wild steelhead (intact adipose fin) and pass the fish back to the river (see "Take" tables to be submitted to NMFS). Indirect take from genetic introgression is unknown.

Rearing Program:

Operation of Hatchery Facilities: Hatchery facility operation impacts include water withdrawal, effluent, and intake compliance. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted NPDES guidelines (see HGMP sections 4.1 and 4.2). Indirect take from this operation is unknown.

Net pen operation impacts include water use from the Lewis River (Echo Bay) and rearing effluent. Net Pen placement site and production limits fall with permitted and non-permitted limits (NPDES). Indirect take from this operation is unknown.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the hatchery programs. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*-Chapter 5 (IHOT 1995) have been instrumental in reducing disease outbreaks. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected with predation quickly removing those fish.

In addition, although pathogens may cause post release mortality in fish from hatcheries, there is little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986 and Steward and Bjornn 1990). Prior to release, the hatchery population health and condition is established by the Area Fish Health Specialist. This is commonly done one to three weeks pre-release, and up to six weeks on systems with pathogen-free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Fish are released as active smolts that will emigrate in order to minimize the effect of the release. Indirect take from density dependent effects is unknown.

Potential Lewis summer steelhead predation and competition effects on listed salmonids and eulachon: The proposed annual production goal for this program is 235,000 yearlings. Steelhead releases are at 4.8 fpp (213 mm fl) and can be released starting April 15. This later date allows additional growth for listed Chinook. Steelhead smolts could encounter listed Chinook, coho, steelhead, chum and eulachon in the Lewis sub-basin and Columbia mainstem. Due to size differences between hatchery smolts and sub-yearling listed stocks, competition is unlikely with different prey items and habitat preferences. In addition, the net pens are located well below the existing in-stream rearing habitat. Indirect take from predation is unknown. At 4.8 fpp (213 mm fl), potential predation on listed Chinook would be on fish of 62-64 mm fl and smaller.

The downstream location of the Echo Bay net pen complex (RKm 19) should reduce impacts to listed Chinook, as it is below known Chinook habitat in the North Fork and Cedar Creek. Chinook emigration from Cedar Creek to the Lewis River is early, starting in mid-March (Rawding 2004).

Both juvenile and adult salmonids have been documented to feed on eulachon (Gustafson et al. 2010). Predation of eulachon by steelhead reared in this program may occur, however it is unknown to what degree such predation may occur.

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.

- Condition factors, standard deviation and co-efficient of variation (CV) are measured throughout the rearing cycle and at release.
- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out-of-size fish and programmed to produce smolt size fish at date of release.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.

Monitoring:
Associated monitoring Activities: WDFW has implemented an expanded monitoring program for Chinook, coho, chum and steelhead populations in the Lower Columbia River (LCR) region of Southwest Washington (WDFW's Region 5) and fishery monitoring in the lower mainstem of the Columbia River. The focus of this expanded monitoring is to 1) gather data on Viable Salmonid Population (VSP) parameters – spawner abundance, including proportion of hatchery origin spawners (pHOS), spatial distribution, diversity, and productivity, 2) to increase the Coded Wire Tag (CWT) recovery rate from spawning grounds to meet regional standards, and 3) to evaluate the use of PIT tags to develop harvest rates for salmon and steelhead populations. Additionally, key watersheds are monitored for juvenile salmonid outmigrant abundance. Coupled with adult abundance information, these data sets allow for evaluation of freshwater productivity and development of biological reference points, such as seeding capacity. Monitoring protocols and analysis methods utilized are intended to produce unbiased estimates with measurements of precision in an effort to meet NOAA monitoring guidelines (Crawford and Rumsey 2009).

Monitoring activities are developed annually through the Annual Operating Plan (AOP).

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Table 2.2.12: Disposition of unmarked (no adipose fin-clip) summer steelhead returning to Lewis Hatchery Complex.

Brood Year	Mortality	Plants	Surplus	Spawn
2002	1	11	0	0
2003	0	55	0	0
2004	1	112	0	0
2005	3	77	0	0
2006	1	50	0	0
2007	1	41	0	0
2008	0	21	0	0
2009	0	17	0	0

2010	1	12	0	0
2011	1	32	0	0
2012	0	17	0	0
2013	0	17	0	0

Source: WDFW Hatcheries Headquarters Database 2014.

See also "Take" tables to be submitted to NMFS.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See "take" tables to be submitted to NMFS.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

No situations are expected to occur where take would exceed ESA limits. If significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District Biologist, Fish Health Specialist or Area Habitat Biologist who, along with the Hatchery Complex Manager, would determine an appropriate plan and consult with NOAA-NMFS for adaptive management review and protocols.

Handling and release of listed fish in broodstock trapping operations is monitored and take observations have been rare. Any additionally mortality from this operation on a yearly basis would be communicated to Fish program staff for additional guidance.

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

This is a segregated/harvest program, and is not used to supplement natural-origin fish. WDFW's primary objective is to augment harvest while trying to minimize the abundance of hatchery-origin fish on the natural spawning grounds. The LCFRB Recovery Plan (2010) identifies the presence of hatchery-origin fish on the natural spawning grounds as a factor in the reduced productivity of the natural populations in Lower Columbia River ESUs.

3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. Hood Canal Summer Chum Conservation Initiative) or other regionally accepted policies (e.g. the NPPC Annual Production Review Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

WDFW has several policies/plans that help inform management decisions regarding the HGMPs currently under review. These policies include:

1. Hatchery and Fishery Reform Policy (Commission Policy C3619)
2. The Conservation and Sustainable Fisheries Plan (draft)
3. The Hatchery Action Implementation Plans (HAIP)
4. Lower Columbia Salmon Recovery Plan (LCSRP)

Descriptions of these policies and excerpts are shown below:

Policies/Plans – Key Excerpts

Hatchery and Fishery Reform Policy: Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the Hatchery and Fishery Reform Policy C-3619 in 2009. Its

purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under *U.S. v Washington* (1974) and *U.S. v Oregon* and that hatchery reform actions must be done in close coordination with tribal co-managers. Washington Fish and Wildlife Commission Policy: POL-C3619.

Guidelines from the policy include:

1. Use the principles, standards, and recommendations of the Hatchery Scientific Review Group (HSRG) to guide the management of hatcheries operated by the Department.
2. Develop watershed-specific action plans that systematically implement hatchery reform as part of a comprehensive, integrated (All-H) strategy for meeting conservation and harvest goals at the watershed and Evolutionarily Significant Unit (ESU)/Distinct Population Segment (DPS) levels. Action Plans will include development of stock (watershed) specific population designations and application of HSRG broodstock management standards.

Conservation and Sustainable Fisheries Plan (*CSFP*)*:* The CSFP is a draft plan that has been developed to meet WDFW's responsibilities outlined in the Lower Columbia Salmon Recovery Plan (LCSRP) and address the HSRG suggested solutions and achieve HRSG standards for primary, contributing and stabilizing populations. The plan describes the implementation of changes to hatchery and harvest programs and how they assist in recovery and achieve HSRG guidelines. The draft plan also identifies Viable Salmonid Population (VSP) parameters that will be addressed.

Hatchery Action Implementation Plans (*HAIP*)*:* The HAIPs illustrate how WDFW is implementing hatchery programs to incorporate the HSRG guidelines. The plans provide the current programs and explain the future goals.

Lower Columbia Salmon Recovery Plan (*LCSRP*)*:* Some sub-basins will be free of hatchery influence and hatchery programs. In other sub-basins, hatchery programs will serve specific conservation and harvest purposes consistent with goals for naturally-spawning populations. The mosaic of programs is designed to ensure that overall each DPS will be naturally self-sustaining.

Strategies

1. Reconfigure production-based hatchery programs to minimize impacts on natural populations and complement recovery objectives.
2. Adaptively manage hatcheries to respond to future knowledge, enhance natural production, and improve operational efficiencies.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Lewis Hatchery Mitigation Agreement (*FERC Project #s 935, 2071, 2111 and 2213*). The program will operate under the Settlement Agreement (SA) for the Lewis River Hydroelectric Projects (FERC Nos. 935, 2071, 2111 and 2213). The *Lewis River Hatchery and Supplementation Plan* (H&S Plan) was proposed by Jones and Stokes (April 2006) for the Lewis River Hydroelectric Projects (FERC Nos. 935, 2071, 2111 and 2213). Key elements for planning and goals for the system were based on the Lewis River Fish Planning Document, S.P. Cramer and Associates, April 2004. The H&S Plan is required under Section 8 of the Lewis River

Hydroelectric Projects Settlement Agreement dated November 30, 2004. The goals identified by the parties to the Settlement Agreement formed the basis for actions proposed in this plan. PacifiCorp Energy and Cowlitz PUD provided the following requirements to fulfill Section 14.2.6 of the Settlement Agreement.

Future Brood Document. Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document, a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season (July 1 – June 30).

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

Total annual harvest is dependent on management response to annual abundance in Pacific Salmon Commission (PSC - U.S./Canada), Pacific Fishery Management Council (PFMC - U.S. ocean), and Columbia River Compact forums. WDFW has submitted to NOAA Fisheries a *Fisheries Management and Evaluation Plan* (FMEP) for all lower Columbia River tributaries and has updated this document after coho were listed under ESA.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Summer steelhead plants contribute to limited Lower Columbia River mainstem sport fisheries. Program is 100% mass-marked (adipose fin-clipped) for the purpose of selective fisheries management. Summer steelhead enter fisheries from March through October and most of the catch occurs from late May through August. Selective harvest regulations allow only the harvest of adipose-fin clipped summer steelhead in the lower Columbia River to protect wild summer steelhead. Specific harvest rates for the hatchery steelhead are unknown; however, catch record "punch card" (CRC) estimates for total harvest of marked hatchery steelhead are available by month for all areas open to sport harvest.

Incidental impact on non-targeted wild steelhead. Selective fisheries rules were initiated for steelhead in lower Columbia River tributaries in 1986 (1990s in Puget Sound) to provide maximum sport harvest (retention of adipose-clipped fish only) and requires the release of all wild steelhead. This has reduced wild steelhead harvest statewide to approximately 1% of the catch. Selective gear restrictions and cool water temperatures minimize mortality on listed steelhead. Non-targeted wild steelhead may be hooked and released with an unknown impact for most streams and direct studies have not been done in this system. Nelson et al. (2005) showed catch and release mortalities of 1.4% to 5.8% in 1999 and 2000 respectively on steelhead caught in recreational fisheries on the Chilliwack River in British Columbia. This study also showed no indication of increased mortality on fish that had been caught released multiple times. As such hooking mortality associated with recreational sport harvest is generally believed to be less than 10% of fish hooked and released.

Table 3.3.1: Sport harvest and escapement, Lewis River summer steelhead, based on WDFW Catch Record Card (CRC) data for brood years 2001-2008, release years 2002-2009, fishery years 2003-2011.

Brood Year	Return Year	Total Released	Sport Harvest	Hatchery Escapement	SAR %
1998	**2001**	305,691	2,703	2,819	1.81%
1999	**2002**	182,872	5,619	6,961	6.88%
2000	**2003**	176,014	4,984	14,717	11.19%
2001	**2004**	178,160	7,297	11,329	10.45%

2002	**2005**	182,950	4,209	9,354	7.41%
2003	**2006**	176,304	4,902	20,289	14.29%
2004	**2007**	177,344	3,039	14,273	9.76%
2005	**2008**	166,827	5,444	6,293	7.04%
2006	**2009**	179,356	4,307	11,304	8.70%
2007	**2010**	171,822	7,595	10,206	10.36%
2008	**2011**	175,263	3,994	9,521	7.71%
2009	**2012**	180,621	3,418	4,932	4.62%
Average		**187,769**	**3,276**	**10,167**	**8.35%**

Source: WDFW catch record cards (CRC) 2014, *Hatcheries Headquarters Database* 2014.
Note: Harvest based on N.F. Lewis River catch only, does not include mainstem Columbia harvest.
[a] Total Release = number released two years prior which generated the return.

3.4 Relationship to habitat protection and recovery strategies.

The following processes have included habitat identification problems, priority fixes and evolved as key components to The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, LCFRB 2010) and the *Lower Columbia River Salmon and Steelhead ESA Recovery Plan* (Dornbusch and Sihler2013).

Lewis River Hatchery and Supplementation Plan (*H&S Plan 2009*). The development of the Hydroelectric Dams in the Lewis River system has blocked all upstream passage to 80% of the historical anadromous habitat while significant riverine habitat is permanently lost to reservoir storage. Goals as identified in the Settlement Agreement (SA 2004) proposed by PacifiCorp Energy and Cowlitz County PUD for the Lewis River Hydroelectric Projects is to provide self-sustaining, naturally producing, harvestable native anadromous salmonids species throughout their historical range in the North Fork Lewis River FERC Nos. 935, 2071, 2111 and 2213). Options for restoring habitat and the re-introduction of fish have been detailed in the Settlement Agreement. Habitat improvements and productivity models are detailed in the Draft *Lewis River Hatchery & Supplementation Plan* and the *Lewis River Fish Planning Document, p*repared *for* PacifiCorp and Cowlitz PUD (April 2006, December 2009).

Sub-Basin Planning - Regional sub-basin planning processes include the Lewis River Sub-basin Salmon and Steelhead Production Plan, September 1, 1990 with a more recent Draft Lewis River Sub-basin Summary (May 17, 2002) was prepared for the Northwest Power Planning Council. The Sub-basin efforts provided initial building blocks for the LCFRB regional recovery plan. The Lower Columbia fish Recovery Board (LCFRB) has adopted The *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans* (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, December 15, 2004, revised June 6, 2010) with the understanding that Implementation of the schedule and actions for local jurisdictions depends upon funding and other resources.

Habitat Treatment and Protection - Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. EDT has been modeled for productivity in the Cowlitz basin in The *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans* and has been used by Tacoma Power for the FERC re-licensing agreements for the upper basin productivity goals. WDFW is also conducting a *Salmon Steelhead Habitat Inventory Assessment Program* (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis (LFA) - A WRIA 27 (Kalama, North Fork Lewis River, and East Fork Lewis River/Salmon Creek) LFA was conducted by the Washington State Conservation Commission (May 2002).

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program:* Out-migrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on steelhead smolts. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas

(2) *Salmonid and non-salmonid fishes or species that could be negatively impacted by the program:* Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. In addition the program may have unknown impacts on eulachon populations in the basin.

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Multiple programs including spring Chinook, coho and steelhead programs are released from the Lewis Hatcheries and significant natural production of fall Chinook occurs, with lesser numbers of natural production of coho, chum and steelhead occurring in this system along with non-salmonid fishes (eulachon, sculpins, lampreys and sucker etc.). None of these species would be expected to have a positive impact on the program except by providing nutrient enhancement which will provide benefit to all of the natural populations.

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Steelhead smolts can be preyed upon release thru the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary, and thus providing a food source for other populations. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons can prey on steelhead smolts. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas. Except for yearling coho and steelhead, these species may serve as prey items during the emigration through the basin. Hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. Hatchery releases can also behaviorally encourage mass emigration of multiple species through the watershed, reducing residency. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including:

a) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998);
b) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and
c) Juvenile salmonids have been observed to feed directly on carcasses (Bilby et al. 1996).

4 SECTION 4. WATER SOURCE

4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Table 4.1.1: Water sources at Merwin Hatchery.

Facility	Water Source	Water Right		Available Water Flow	Avg Water Temp. (F°)[a]	Usage	Limitations
		Record/Cert. No.	Permit No.				
Merwin Hatchery	Lake Merwin (surface)	S2-28311	---	11.0 cfs	42-61	All	None

Source: Phinney 2006, WDOE Water Resources Explorer 2014, WDFW hatchery data.

Merwin Hatchery Merwin Hatchery is supplied with 100% Lake Merwin water; total available flow is 5,000 gpm from two intakes used at 15-ft and 110-ft deep, respectively. Water temperatures range from 42-61°F. Water clarity is good. Merwin Hatchery has ozonation capabilities to treat 3,800 gpm.

Holding ponds are supplied at 600 gallons per minute (gpm). Total flow to incubators and rearing ponds is approximately 5,000 gpm.

The water right permit for Merwin Hatchery is formalized through the Washington Department of Ecology (see **Table 4.1.1**), and was obtained by Pacific Power & Light Co. in 1991.

Echo Bay Net Pens. The net pens were sited to be out of the mainstem flow of the N.F. Lewis River at RKm 19.0, but also have a directionally even flow through the complex. River flow is dominated by winter rains, though summer flow in the Lower North Fork is slightly augmented by glacier melt in the upper basin.

NPDES Permits:
Merwin Hatchery operates under the *Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System* (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE).

Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids* (*TSS*) 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids* (*SS*) 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperature* - daily maximum and minimum readings.

Table 4.1.2: Record of NPDES permit compliance.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Merwin WAG13-1052	Y	Y	Y	5/18/2013	0	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.

Echo Bay Net Pens. The net pens serve as a short-term rearing project; feeding and production stays under NPDES guidelines for permitting. The facilities meet guidelines which do not require the NPDES general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).

4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Merwin Hatchery. Fish rearing activities meet State water quality guidelines and satisfy all required permits. In addition, program fish are confined in structures until an active smolting phase and time is achieved. Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.

Echo Bay Net Pens. The Echo Cove Net Pen Facility has the following permits for operation:

- SEPA checklist and Determination of Non-Significance (DNS)
- Aquatics Resources Use Authorization No. 20-071210
- Cowlitz County Shoreline Substantial Development Permit
- WDFW Hydraulic Project Permit

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Table 5.1.1: Broodstock collection facilities at Lewis River Hatchery and Merwin Dam.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete adult/sorting pond (Center Channel) –Lewis*	18,500	170	20	6	3,800 -10,000
1	Adult /pre-sort pond - Merwin FCF	8,000	100	8	10	4,490

* See also **Table 5.3.1** for adult holding facilities.

Broodstock for this program are trapped at the Lewis River Hatchery ladder at RKm 25.3 (RM 15.7) and Merwin Dam Fish Collection Facility (FCF) at RKm 30.6 (RM 19). Traps are open for adult collection for approximately seven months to allow for collection over the entire run time. Both traps have "V" weirs to prevent the escape of captured fish.

Lewis River Hatchery. Adults voluntarily enter the pond via the existing ladder and into the center channel (sorting pond) to be crowded. Additionally, each of the four side ponds can be crowded into the center channel via removable bulkheads and side crowders. All crowding is automated by either remote or local controls. Adults can be moved via truck into two of the side ponds when sorting elsewhere is impractical. Once crowded, the adults are side-crowded by an additional crowder into the entry of a large Archimedes Screw "pescalator." From the pescalator entrance, the fish are elevated to a diverter table where they then fill one of two electro-anesthesia baskets. 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.

Merwin FCF. The new upstream collection and transport facility at Merwin Dam provides safe, timely, and effective passage of adult salmonids transported upstream as part of PacifiCorp's reintroduction program. Broodstock fish are also collected at the facility and transported to one of

three WDFW facilities on the Lewis River (Lewis River, Merwin, and Speelyai hatcheries). The new facility is designed to be constructed in phases, offering the ability to incrementally improve fish passage performance (if needed) in the future to meet biological performance goals. Depending on the biological monitoring of the facility's performance, there are up to four additional phases that will increase flow into the fishway attraction pools, and add a second fishway with additional attraction flow, if necessary. Phase I represents the initial construction that was completed in 2014. The operational components of the Phase I include:

- Construction of Fish Entrance 1, located in the south corner of the powerhouse;
- Nominal 400 cfs attraction flow supplied by two Auxiliary Water Supply (AWS) pumps and the fishway ladder flow;
- Construction of Fishway 1, which consist of a 4-ft entrance slot and four pools with "vertical slot" styles weirs that fish volitionally ascend to reach automatic fish crowder and loading hopper;
- Ladder water supply water which combines hatchery return water from Merwin Hatchery and reservoir water for a total of 30 cfs;
- The automatic crowder located in the upper most fish ladder pool – when the crowder is in the parked position, it works as a V-trap, and when operated crowds fish into the loading hopper;
- Construction of the fish lift and conveyance system which is designed to automatically transport fish from the fishway to the conveyance pipe and into the presort fish holding pond.
- The presort pond is approximately 100-ft x 8-ft x 10-ft, and designed to hold up to 3,700 adult coho at one time.
- Fish are removed from the presort pond into the sorting facility by false weirs and a crowder system;
- An electro-anesthesia (EA) system is provided to temporarily anesthetize the fish to allow easier handling by biologists, and to reduce stress during sorting;
- Fish are sorted and then place in one of four 3,000 gallon holding tanks or one of six 250 gallon small transport tanks;
- Fish are transferred from holding tank to the transport truck using a water-to-water transfer process.

5.2 Fish transportation equipment (description of pen, tank truck, or container used).

Table 5.2.1: Transportation equipment available at Lewis Hatchery Complex.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker truck (WDFW)	1800	Y	N	30	Sodium chloride (salt)	5000
Tanker truck (WDFW)	1100	Y	N	30	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	1800	Y	N	60	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	1800	Y	N	60	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	250	Y	N	60	Sodium chloride (salt)	5000

Adults are transported from the Lewis River Hatchery and the Merwin Dam FCF to Merwin Hatchery via tanker truck; transport time is around 20 minutes.

Juveniles are transported via tanker truck to the release site at the WDFW's Martin Access; transport time is around 30 minutes.

5.3 Broodstock holding and spawning facilities.

Table 5.3.1: Adult holding/spawning facilities available, Merwin Hatchery.

(No.)	Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
4	Adult Holding Ponds	953	33	7.7	4.0	180
2	Smolt/adult ponds	1794	39	11.6	4.0	935

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available at Merwin Hatchery.

Type	Units (number)	Size	Flow (gpm)	Volume (cu.ft.)	Loading (eggs/unit)
Heath Vertical Stack Tray Units	30 units (8 tray stacks)	24" x 25' 'x 4"	3.5	n/a	8,000

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 7.6 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.

5.5 Rearing facilities.

Table 5.5.1: Rearing vessels available at Merwin Hatchery.

(No.)	Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)
10	Standard concrete raceway	2034	78	9.66	2.7	520
-raceways can be screened into smaller sections		1426	55.5	9.7	2.7	
		643	22.5	9.7	2.7	
6	Intermediate raceways	382	33.5	4.6	2.5	100
-raceways can be screened into smaller sections		260	22.6	4.6	2.5	
		135	11.6	4.6	2.5	
		254	21.9	4.6	2.5	
		126	10.8	4.6	2.5	
4	Concrete rearing ponds	46000	175	75.4	3.9	935

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.

5.6 Acclimation/release facilities.

Merwin Hatchery. Fish are reared to smolts at Merwin Hatchery on Lake Merwin water (see HGMP section 5.5). Smolts are loaded into trucks and transported downstream to the WDFW's Martin Access at RKm 5.5 on the north bank of the Lewis River, and released directly into the river.

Echo Bay Net Pens. Six net pens (20'x20'x10') each provide 4,000 cu-ft of rearing. Another net pen (12'x60'x10') provides 8,640 cu-ft of rearing. The pen complex is configured with two rows of three of the 20'x20' pens in line; the larger pens straddles one row of three pens. A system of 3-ft wide walkways is constructed on the complex frame and surrounds all the pens. The pens are secured in Echo Cove by stone anchors. Fish are acclimated from late-March to late-April/early-May (approximately 36-40 days).

5.7 Describe operational difficulties or disasters that led to significant fish mortality.

Merwin Hatchery. Despite the fact that all water supplied during incubation and early rearing for this stock is ozone-treated, the facility still experiences periods of high mortality. These losses are associated with diseases associated from *Saprolegniasis* (fungus) and Low Temperature Disease (*Cytophaga psychrophila*). Adults also experience high losses during holding associated with fungus and IHNV.

Net Pens. Severe flooding events can cause early release if the net pen structure and program are determined to be in jeopardy.

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Merwin Hatchery. A prolonged loss of hatchery water supply would result in catastrophic loss of all rearing units, with incubation and the raceways being most vulnerable. Under a temporary cessation of the surface water supply, water can be re-directed from other supply sources as first pass or re-use to the units. Hatchery is staffed 24/7 and ready to react to system failure and WDFW has emergency procedures and plans in place. All systems are alarmed to alert us of failure.

IHOT fish health guidelines are followed. WDFW fish health specialists conduct inspections monthly and problems are managed promptly to limit mortality and reduce possible disease transmission. In the event of possible virus outbreak, WDFW facilities follow very strict disinfection procedures and comprehensive lab analysis of all egg-takes for culling, if needed.

Net pens. For equipment or operational net pen problems, the pens operate under an Emergency Response Plan pursuant to section S6.A-J of the *Upland Fin-fish Hatching and Rearing National Pollutant Discharge Elimination System* Waste Discharge General Permit. During storm events, contingency plans are prepared, with increased monitoring of the net pen program and communication with Lewis Hatchery Complex staff. Fish health is monitored by staff and any problems observed are quickly communicated.

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1 Source.

Broodstock used for this program are collected from fish volunteering to the Lewis Hatchery trap and Merwin Dam Fish Collection Facility (FCF) on the Lewis River.

6.2 Supporting information.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Skamania Hatchery summer steelhead	H	1994	2004
Lewis River summer steelhead	H	2004	present

The Merwin summer steelhead stock was derived from Skamania Hatchery early summer steelhead. Original source was from wild fish taken from the Washougal and Klickitat rivers (1950s). For decades the Skamania Hatchery early summer steelhead broodstock has been obtained directly from adults returning to the hatchery. Merwin Hatchery has developed its broodstock from fish returning to that station.

Eyed-eggs were first transferred from Skamania Hatchery to Merwin Hatchery in 1997. The broodstock that is used in this program is derived from mass-marked Merwin Hatchery/NF Lewis River adults (adipose fin-clipped) returning to Lewis River Hatchery and the Merwin Dam FCF. This hatchery stock is a locally-adapted early summer stock that has been used in the Lewis River summer steelhead program since its inception. Naturally-produced spawning adults in Elochoman River, like other Lower Columbia/Columbia Estuary sub-basin, are most likely a derivative-ancestor of the Merwin/Skamania hatchery-origin stocks.

6.2.2 Annual size.

Around 105 adult pairs are needed to achieve the established egg-take goal of 325,000 (FBD 2014), based on an average fecundity of around 3,500 smolts/female and a pre-spawning mortality of 10%. This take includes the 63,000 juveniles transferred to the Fish First Echo Bay Net Pen project on the NF Lewis River. Additional adults can be taken in case of virus concerns (IHNV-positive eggs); this program can also provide back-up to the Skamania summer steelhead program.

6.2.3 Past and proposed level of natural fish in broodstock.

Only returning hatchery-origin broodstock have been used for propagation purposes, and are identified by their missing adipose fin. Natural fish are not incorporated within the broodstock.

6.2.4 Genetic or ecological differences.

The expected gene flow rate can be much lower than the “stray” rate. In a well-run segregated program, the level of gene flow should be quite low for three reasons: 1) the numbers of hatchery-origin fish that have escaped harvest should be low compared to the number of natural-origin fish present; 2) the reproductive success of the hatchery-origin fish can be expected to be low (Leider et al. 1990; Kostow et al. 2003; McLean et al. 2003; McLean et al. 2004); and 3) spawning overlap may be low (Scott and Gill 2008).

Wild stock interbreeding with Merwin Hatchery broodstock is thought to be low because of differences in spawn timing and distribution. The early summer steelhead stock is the source of nearly all summer steelhead smolt releases on the Washington side of the lower Columbia River,

except for the Cowlitz and Lewis rivers, and accounts for most adult summer steelhead returning to the Washougal River. The wild steelhead smolt emigration appears to be timed slightly later than the hatchery releases (LCFRB Recovery Plan: Vol. II, 2010).

6.2.5 Reasons for choosing.

Current broodstock collection comes from adults returning to the hatchery. There has been a long history of adaptation of the stock contributing to the success of the summer steelhead program. Because spawn timing of wild fish and naturally spawning hatchery fish is different, little interaction between adult wild and hatchery summer steelhead is thought to occur. The early summer steelhead stock is the source of nearly all hatchery summer steelhead smolt releases on the Washington side of the lower Columbia River, except for the Cowlitz and Lewis rivers (LCFRB 2010).

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Because spawn timing and distribution of wild fish and naturally-spawning hatchery fish is different, little interaction between adult wild and hatchery summer steelhead is thought to occur. Natural fish are not used in broodstock selection, can be identified by presence of the adipose fin, and are handled with care and released in stream reaches as prescribed by Region 5 biologists; listed fish, if identified, will be released immediately if encountered during the broodstock collection process. See also HGMP section 6.2.5.

7 SECTION 7. BROODSTOCK COLLECTION

7.1 Life-history stage to be collected (adults, eggs, or juveniles).

Adults

7.2 Collection or sampling design.

Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. Both the Lewis River trap and Merwin Dam FCF are operated year-round, allowing steelhead collection over the entire run-timing (July through September). Traps are supplied with Lewis River water and have “V”-weirs to prevent the escape of captured fish.

Fish are sorted on a weekly schedule as dictated by numbers of fish entering the trap; fish are transferred to Merwin Hatchery for spawning, incubation, and early rearing. All fish are identified as natural-or hatchery-origin through examination for fin clips or CWTs, and checked for gill net or predator marks. Lengths, sex, and scales will be randomly taken from both natural-origin (adipose fin intact) and hatchery (adipose fin-clipped) fish. Scale samples and recovered CWTs will be read at WDFW Headquarters in Olympia. Every attempt is made to represent the entire run of the broodstock.

Spawning will occur from December (50%) through January (50%) and will be completed by January 31.

7.3 Identity.

All hatchery-origin summer steelhead returning to the Lewis River have been mass-marked (adipose-fin clip) since 1994. Only adipose fin-clipped adults are used for broodstock.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):

See HGMP section 6.2.2.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7.4.1: Broodstock collection levels, Merwin Hatchery summer steelhead.

Brood Year	Egg-Take	Females	Males	Jacks
2002	399,000	133	270	0
2003	399,000	114	228	0
2004	577,500	165	318	0
2005	567,000	162	325	0
2006	469,000	134	271	0
2007	546,000	156	313	0
2008	589,000	169	338	0
2009	395,500	113	227	0
2010	384,000	96	178	0
2011	385,500	97	98	0
2012	520,000	130	131	0
2013	396,000	99	100	0

Source: WDFW Hatcheries Headquarters Database 2014.

7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Returning hatchery steelhead that are trapped at Merwin Dam are recycled (caudal clipped) and returned to the river just below the confluence with the EF Lewis at RKm 5.5 (RM 3.4) for additional harvest opportunity. If they are trapped at the Merwin Dam FCF a second time, they can be trucked to Horseshoe Lake for additional sport harvest in a closed system.

Table 7.5.1: Disposition of marked (adipose fin-clipped) summer returning to Lewis Hatchery Complex.

Brood Year	Mortalities	Plants[a]	Surplus
2002	112	4,988	1,032
2003	204	6,721	6,890
2004	229	7,240	3,767
2005	744	9,212	5,473
2006	128	6,959	7,286
2007	97	6,818	6,403
2008	74	2,549	2,863
2009	68	5,866	4,686
2010	142	4,407	4,892
2011	152	1,774	7,410
2012	80	718	3,777
2013	78	981	4,200

Source: WDFW Hatcheries Headquarters Database 2014.
[a] Recycled downstream for additional sport harvest opportunity.

7.6 Fish transportation and holding methods.

Steelhead adults from Lewis River Hatchery and the Merwin Dam FCF are transported to Merwin Hatchery by 1800 or 1100 gallon capacity tanker trucks. Transit time is 5-12 minutes. Fish can be held in raceways or holding ponds for maturation. The first adult summer steelhead begin arriving

at Merwin Hatchery in May and are held until December before spawning begins. Pre-spawning mortality is typically 1 to 2%.

See also HGMP section 5.2.

7.7 Describe fish health maintenance and sanitation procedures applied.

The adult holding area is separated from all other hatchery operations. All equipment and personnel use disinfection (chlorine) procedures upon entering or exiting the area. Fish treatments are for fungus control using formalin bath treatments. Adults are treated with formalin or hydrogen peroxide or a combination of both to control fungus growth twice weekly. Fish health measures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

See also **Attachment 1** for IHNV detections at this facility.

7.8 Disposition of carcasses.

Carcasses fit for human consumption are donated to local food banks or Tribes. Fish unfit for consumption and all mortality carcasses are taken to a local rendering plant.

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

No listed natural fish are used for broodstock collection. See also HGMP sections 6.2.4 and 6.3. Listed fish will be released immediately if encountered during the broodstock selection process.

8 SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1 Selection method.

Broodstock for this program arrives April through September. Spawning will occur from November (50%) through December (50%) and will be completed by December 31. Spawners are selected randomly over the entire run from fish arriving at both Lewis River Hatchery and Merwin FCF traps. Broodstock numbers represent that percentage of the total run that is collected during that particular sorting period.

8.2 Males.

A ratio of 1:1 males to females is used. A proportion of the males were live-spawned in 1999 through 2001. The occurrence of jacks is scarce in the returning population; protocols would allow use up to 2% if jacks were present.

8.3 Fertilization.

Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning. Spawning implements are rinsed with an iodophor solution, and spawning area and implements are disinfected with iodophor solution at the day's end of spawning. An overall ratio of 1:1 (females/males) is applied. Fish health procedures used for disease prevention include water hardening of all eggs in an iodophor solution for one hour. Sixty adult fish are sampled for ovarian fluid and kidney/spleen to test for viral pathogens. Agency spawning guidelines are closely followed (Seidel 1983).

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

8.5 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

- No listed natural fish are used in the mating scheme.
- Mating cohorts are randomly selected.
- Protocols for population size, fish health disinfection and genetic guidelines followed.
- Spawn all collected mature broodstock if possible without regard to age, size, color or other physical characteristics. If not spawning all collected mature adults over the season, apply the same rational to individual spawn days.
- Randomize mating and avoid selectivity beyond ripeness on a given spawn day.
- Use one male to one female as much as possible in order to ensure an equal genetic contribution.
- Do not mix milt from multiple males and add to eggs (pooling prior to mixing) in order to eliminate disproportionate genetic male contributions.
- Do not re-use males except as part of specific spawning protocols. A given male should be used as the first mate for only one female total.

9 SECTION 9. INCUBATION AND REARING -Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1 Incubation:

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

Table 9.1.1: Survival rates (%) from egg-take to ponding, Lewis River summer steelhead.

Brood Year	% Egg Survival	
	Green-to-Eyed	Eyed Egg-to-Ponding
2002	86.2	97.67
2003	80.64	95.10
2004	73.51	90.75
2005	79.31	89.82
2006	90.45	93.75
2007	91.1	97.03
2008	87.54	96.72
2009	87.46	97.89
2010	86.01	95.56
2011	92.72	98.36
2012	90.87	98.75
2013	86.81	96.22

Source: WDFW Hatcheries Headquarters Database.
NA – Not available

Skamania Hatchery can provide backfill in the event of egg-take shortfalls.

9.1.2 Cause for, and disposition of surplus egg takes.

The annual broodstock/egg-take collection is managed to prevent surpluses. At times, shortfalls in egg-take occur at other Lower Columbia hatcheries, and surplus eggs may be transferred to help these facilities meet their egg-take/program objectives. Otherwise, in the event that egg survival

is higher than expected, WDFW Regional Managers will be contacted for instructions for disposition of the surplus in accordance with Regional policy and guidelines set forth in management plans/agreements and ESA permits. Dead or destroyed eggs are disposed of at the landfill.

9.1.3 Loading densities applied during incubation.

Heath stack incubators are used for this stock. Incubation conditions are consistent with loading densities recommended by Piper et al. (1982). Summer steelhead eggs range in size from 2,800 eggs/lb to 3,000 eggs/lb.

9.1.4 Incubation conditions.

Table 9.1.2: Minimum and maximum temperature ranges (°F) during incubation, Merwin Hatchery.

Month	Temperature Range (°F)
October	48-51
November	47-49
December	44-46
January	41-45
February	41-42

Source: WDFW Hatchery Data 2014.

Water is pumped from the Merwin Reservoir and provides silt-free water to the incubators. Because all the water to the hatchery is ozonated, and runs through an enclosed stripper with additional packed columns, the water is disbursed of any entrained gases and is well-oxygenated. Flow through each tray is 3.5 gpm; DO is closely monitored and has averaged around 10.5ppm.

Family spawnings are incubated separately during the green to eyed-egg stage to monitor for IHNV. The water temperature is monitored continuously with a thermograph and recorded while temperature units (TU) are tracked for embryonic development.

9.1.5 Ponding.

Initial feeding and early rearing occurs in the intermediate raceways. Ponding/feeding begins on a volitional basis when the fry are 100% at the swim-up stage. At this point very little, if any, yolk sack will be present. Fry are ponded when a visual inspection of the amount of yolk sac remaining with the yolk slit closed to approximately 1-mm wide (approximately 1200 TUs) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starter raceway (See HGMP Section 5.5 for raceway specifications). Ponding dates each year run between February 25 and April 5.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eye, fry fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW fish health specialist. In addition, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission. Disease treatment varies with the pathogen encountered but generally is antibiotic in nature for bacterial infections and bath or drip treatments with chemotheraputants for external infections and parasites. All eggs are treated with iodophor during water hardening for disease prevention. Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs. Egg mortality ranges from 6 to 16 % and all eggs are processed through an automated egg-picking machine and to some degree by hand.

See also **Attachment 1** for health monitoring information.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

- IHOT and WDFW fish health guidelines followed.
- Multiple units are used in incubators.
- Splash curtains can isolate incubators.
- Temperature, dissolved oxygen, and flow are monitored.
- Dead eggs are discarded in a manner that prevents disease transmission.

9.2 Rearing:

9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

Table 9.2.1: Survival rates (%) from ponding to release, Lewis River summer steelhead.

Brood Year	Fry-to-Smolt Survival (%)
2001	NA
2002	87.6
2003	85.1
2004	81.7
2005	79.4
2006	87.6
2007	83.2
2008	80.3
2009	88.8
2010	83.5
2011	87.4
2012	87.0

Source: WDFW hatchery data.
NA – Not available

9.2.2 Density and loading criteria (goals and actual levels).

Loading and density levels at WDFW hatcheries conform to standards and guidelines set forth in *Fish Hatchery Management* (Piper et. al. 1982), the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density.

In all hatchery facilities within Lewis River, densities are kept at or below 3.3 lbs /gpm and 0.5 lbs /cu ft. before the last loading reduction in the fall of the year. Trough maximum loading is 40 lbs at 12 gpm (3.33 lbs/gpm). Tank and raceway maximum loading for early rearing is 132 lbs for the tanks at 40 gpm (3.3 lbs/gpm) and 800 lbs per raceway at 300 gpm (2.66 lbs/gpm). The final loading per raceway is approximately 3200 lbs. at 300 gpm (10.6 lbs/gpm).

Steelhead poundage in the Echo Bay net pen complex is programmed to not exceed 0.50 lbs/per cubic ft. At 7,500 smolts per net pen, actual maximum loadings are 0.375 lbs per cubic ft.

9.2.3 Fish rearing conditions

Table 9.2.2: Minimum and maximum temperature ranges (°F) during rearing, Merwin Hatchery.

Month	Max-Min Water Temps (°F)
April	42-48
May	45-52
June	51-54
July	53-57
August	54-60
September	57-61
October	56-61
November	50-57
December	45-51
January	41-44
February	41-42
March	41-44

Source: WDFW Hatchery Data 2014.

Fish are reared on water from Lake Merwin. Temperature, dissolved oxygen and pond turnover rate are monitored. IHOT standards are followed for water quality, alarm systems, predator control measures (netting), loading and density. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. Bird netting spans over the juvenile-rearing raceway series.

Fish are 100% mass-marked (adipose fin-clipped-only) when they reach 100 fpp, so that they can be distinguished from the natural population. This occurs generally from July through end of September, during fry stage, a year before release, depending on growth rates and water temperature.

9.2.4 Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Table 9.2.3: Monthly fish growth information by length (mm), weight (fpp), condition factor and growth rate, collected during rearing at Merwin Hatchery.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor
April	31.1	2,245.0	1.88
May	44.0	601.1	0.88
June	56.5	266.0	1.243
July	71.0	134.0	1.065
August	91.0	50.0	1.20
September	101.3	46.0	1.213
October	124.2	21.1	1.12
November	144.2	12.5	1.20
December	166.0	8.3	1.18
January	175.3	8.9	1.199
February	179.2	8.3	1.131
March	188.0	6.2	1.10
April	201.6	5.0	1.10
May	213.8	4.8	0.95

Source: WDFW hatchery data

9.2.5 Indicate monthly fish growth rate and energy reserve data (average program performance), if available.

See HGMP section 9.2.4.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Fish are given variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contacts. Feeding frequencies varies depending on the fish size and water temperature, and usually begin at 4-8 feedings/7 days a week, and end at 1 feeding/4 days a week. Feed rates vary from 0.5% to 2.5% B.W./day. The overall season feed conversion ratio has averaged approximately 1:1.

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

Monitoring. Policy guidance includes: *Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). A fish health specialist inspects fish monthly and checks both healthy and presence of symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted (see **Attachment 1** for Virology Sampling reports).

Disease Treatment. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Bacterial Cold Water Disease (BCWD) has been problematic at Lewis River Hatchery in early phases of rearing and is treated with Florincol and amoxicillin. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file. *Saprolegniasis* occurrences in young hatchery fish have been observed at an increasing frequency on Mitchell Act stations. In some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor observations or occurrences of this possibility. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.

Sanitation. All eggs brought to Lewis River Hatchery are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens (see **Attachment 1** for Virology Sampling reports).

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

Besides time, size and past history, aggressive screen and inflow crowding, swarming against pond sides, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to 0.90 (K).

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

Not applicable.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

No listed natural fish are under propagation.

10 SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1 Proposed fish release levels.

Table 10.1.1: Proposed release levels (maximum number), Lewis River summer steelhead.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearlings	175,000	4.8	April/May	Lewis River
	60,000	4.8	April	NF Lewis River

Source: WDFW Future Brood Document 2014
Note: 4.8 fpp = 213 mm fork length (fl)

10.2 Specific location(s) of proposed release(s).

Table 10.2.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Location			
	Stream	Release Point (RKm)	Major Watershed	Basin
Yearlings	Lewis River (WRIA 27.0168)	5.5	Lewis	Lower Columbia
	NF Lewis River (WRIA 27.0168)	19.0		

10.3 Actual numbers and sizes of fish released by age class through the program.

Table 10.3.1: Number of fish released, size, CVs and release date, by age and year, Merwin Hatchery summer steelhead on-station program.

Release Year	Merwin Hatchery			
	Number	Avg Size (fpp)	CV	Date
2002	178,160	4.9		Apr 16-May 8
2003	182,950	4.7		Apr 16-May 9
2004	176,304	4.7		Apr 18-May 7
2005	177,344	4.9		Apr 21-May 11
2006	166,827	5.4		May 1-28
2007	179,356	5.3		Apr 16-May 15
2008	171,822	4.7		Apr 16-May 12
2009	175,263	5.1	7.59	Apr 16-May 8[a]
2010	180,621	4.8	7.02	Apr 23, May 3-11
2011	189,071	5.4	6.85	Apr 15-29
2012	192,080	5.0	7.33	Apr 20-23, Apr 27-May 30
2013	192,325	5.8	8.28	Apr 15-17, 26- 30

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 4.8 fpp = 213 mm fork length (fl); 5.5 fpp = 204 mm fl; 6.0 fpp = 198 mm fl.
[a] In addition, 68,000 fry were released in April 2009.

Table 10.3.2: Number of fish released, size, CVs and release date, by age and year, Lewis River summer steelhead net pen releases.

Release Year	Lewis Stock				Skamania Stock			
	Number	Avg Size (fpp)	CV	Date	Number	Avg Size (fpp)	CV	Date
2002[a]	58,245	4.8	9.52	Apr 25	49,303	5.3	6.52	May 3
2003	58,030	4.9	8.48	May 6	-----	-----	-----	-----
2004	46,984	5.0	8.37	May 6	-----	-----	-----	-----
2005	62,633	5.4	8.02	May 4	-----	-----	-----	-----
	31,724	5.2	6.34	May 6	-----	-----	-----	-----
2006	49,940	4.4	6.73	Apr 15	-----	-----	-----	-----
	63,024	5.4	5.82	May 8	-----	-----	-----	-----
2007	52,350	6.0	6.83	Apr 15	-----	-----	-----	-----
	56,766	5.0	8.41	May 15	-----	-----	-----	-----
2008	60,102	6.0	7.54	Apr 15	53,897	5.6	6.82	May 15
2009	58,220	5.2	7.46	May 1	-----	-----	-----	-----
2010	50,303	5.2	7.55	Apr 17	-----	-----	-----	-----
2011	34,400	6.1	7.90	Apr 23	-----	-----	-----	-----
2012	69,717	5.1	9.04	Apr 13	-----	-----	-----	-----
2013	70,441	5.3	n/a	Apr 20	-----	-----	-----	-----

Source: WDFW Hatcheries Headquarters Database 2014.

Note: 4.8 fpp = 213 mm fork length (fl); 5.5 fpp = 204 mm fl; 6.0 fpp = 198 mm fl.

[a] In addition, 125,677 fry (67.3 fpp) were released into Yale Reservoir in 2002. Fry were also planted into Merwin Reservoir in 1996, and fingerlings in 1998-2000.

10.4 Actual dates of release and description of release protocols.

On-station program. Releases generally occur between April 15 and May 10 (see **Table 10.3.1** for actual release dates). The release area is below most of the listed Chinook habitat, and below the confluence of the East Fork and mainstem Lewis rivers. Release strategies are to ensure that hatchery fish migrate from the hatchery/release site with a minimal amount of interaction with native fish populations.

Net pen releases. Yearlings are transferred from Merwin Hatchery in late-March/early-April to the net pens in Echo Cove for acclimation before release. Fish are released directly from the net pens as specified in the program guidelines between April 15 and May 15.

10.5 Fish transportation procedures, if applicable.

On-station program. Fish are loaded via pump into the truck at 0.75 lb./gallon, and hauled 19.3 km (12 miles) to the release site; transport time is approximately 30 minutes. Temperatures are dictated by the natural temperature levels of the river water being used to transport. The tank water is re-circulated via pumps and oxygen is defused into the system at a set rate. See HGMP section 5.2 for transportation equipment available.

Net pen releases. Fish are transferred from Merwin Hatchery to the net pen site in a 1,800 and 1,100 gallon tanker is supplied with oxygen and sodium chloride at 5000 ppm. Transport time is approximately 20 minutes.

10.6 Acclimation procedures (methods applied and length of time).

On-station program. Fish are reared on Lake Merwin water; as the spring smolt occurs, summer fish reared in two intermediate ponds can be moved to one of two lower “smolt” ponds. Fish are

loaded into trucks (see HGMP sections 5.2 and 10.5) and hauled to the WDFW's Martin Access at RKm 5.5 on the north bank of the Lewis River, and released directly into the river.

Net pen releases. Yearlings are transferred from Merwin Hatchery to the net pen site in late-March/early-April. Fish are acclimated for approximately 30-40 days before release; the pen sides are lowered from the walkway frames to release the fish directly into the river.

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Table 10.7.1: Marks applied to on-station releases, Lewis River summer steelhead.

Brood Year	Stage	Number	Mark Type
2014	**Yearlings**	235,000	AD-only

All Merwin Hatchery summer steelhead are released adipose fin-clipped (AD) only. Fish are mass-marked (adipose fin-clipped-only) when they reach 100 fpp, so that they can be distinguished from the natural population. This occurs generally from July through end of September, during fry stage, a year before release, depending on growth rates and water temperature. During mass marking, pin-heads/non-performing fish are selectively culled and destroyed.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

The program guidelines for annual broodstock/egg-take collection are managed to prevent any surpluses. In the event of unanticipated higher egg survival, WDFW Regional Managers would instruct hatchery staff for disposition of the surplus in accordance with regional policy and guidelines set forth in management plans/agreements and ESA permits. Fish surplus to the anadromous program have been planted in Merwin Reservoir and contribute as landlocked trout for the lake fishery.

10.9 Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the P*acific Northwest Fish Health Protection Committee* (PNFHPC) disease control guidelines, within three weeks prior to release.

Fish transfers into the sub-basin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines.

Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen-free water and little or no history of disease. Prior to this examination, whenever abnormal behavior or mortality is observed, staff also contacts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and IHOT guidelines.

10.10 Emergency release procedures in response to flooding or water system failure.

If the program is threatened by ecological or mechanical events, the Complex Manager would contact and inform regional management of the situation and determination and directive per Section 7 guidelines and policy. Based on a determination of a partial or complete emergency release of program fish, personnel would pull screens and sumps to allow a force release of fish. No release of fish will occur without a review by WDFW Fish Management and a risk assessment.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Merwin Hatchery:

- Smolt releases from this facility occur below known wild fish spawning and rearing habitat in the upper Lewis Basin tributaries.
- Returning hatchery fish are under heavy selective harvest and are identified by an adipose-fin-clip.
- Hatchery stock and wild fish are thought to be isolated by timing.
- Surplus adults are killed and donated to the food bank or taken to local rendering plant, thus removing them from the system; or are opercle-punched and recycled to the lower river for additional harvest opportunity (see HGMP section 7.5).
- WDFW fish health and operational concerns for Lewis Hatchery Complex programs are communicated to Region 5 staff for risk management or needed treatment. See also HGMP section 9.2.7.

Net Pens:

- Siting of the pens has sufficient depth and flow for siting guidelines.
- Program fish are confined in structures until an active smolting phase.
- Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.
- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.
- WDFW uses acclimation and release of smolts in lower river reaches where possible, this in an area below known wild fish spawning and rearing habitat.
- All program fish are mass marked for heavy harvest removal.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW Fish Health and operational concerns for the Echo Cove Pen program is communicated to Region 5 staff for risk management or needed treatment.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1 Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

The HSRG Columbia Basin System Wide Report (2009) provides guidelines and hatchery performance standards that require monitoring both in the hatchery setting and the natural environment. Appendix A4 of the System Wide Report outlines a framework for monitoring hatchery programs that includes:

- Statement of Population Goals
- Implementation Monitoring
- Effectiveness Monitoring
- Validation Monitoring
- Regional Coordination of Monitoring and Evaluation

NOAA Fisheries has developed a guidance document on recovery monitoring that provides recommendations for monitoring, data collection, and reporting ESA information (Crawford and Rumsely 2011). This document is intended to encourage consistency in monitoring across recovery domains.

As described in HGMP section 2.2.3, WDFW has implemented a comprehensive monitoring program in the LCR to evaluate natural origin salmonid populations and the effects of associated hatchery programs. WDFW has incorporated HSRG and NOAA guidance into this program and has worked with PacifiCorp to integrate Lewis River monitoring programs into this regional framework.

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The Lewis River Settlement Agreement (SA 2004) outlines monitoring requirements for the Lewis River Hatchery programs developed as part of the new license that PacifiCorp and Cowlitz PUD received from FERC. A Monitoring and Evaluation (M&E 2010) Plan, a Hatchery and Supplemenation (H&S 2009) Plan and associated Annual Operating Plans (AOP) have been developed to address the monitoring requirements of the Settlement Agreement (SA 2004, H&S 2009, M&E 2010).

The M&E plan objectives are as follows:

Objective 1:	Quantify overall juvenile fish downstream survival (ODS) which includes reservoir survival, collection survival, transport survival, and survival at the release ponds
Objective 2:	Quantify SDF collection efficiency
Objective 3:	Quantify the percentage of juvenile fish available for collection that are not captured by the SDF and that enter the powerhouse intakes
Objective 4:	Quantify juvenile and adult collection survival
Objective 5:	Quantify juvenile injury and mortality rates during collection at the SDF (includes injury and mortality of adult bull trout, adult sea-run cutthroat, and steelhead kelts)
Objective 6:	Quantify the number, by species, of juvenile and adult fish collected at the SDF
Objective 7:	Quantify the number of juveniles entering Swift Reservoir
Objective 8:	Develop index of juvenile migration timing
Objective 9:	Quantify adult upstream passage survival
Objective 10:	Quantify adult trap efficiency at each upstream fish transport facility (emphasizes analysis of the Merwin Adult Trapping Facility)
Objective 11:	Quantify the number, by species, of adult fish being collected at the projects (emphasizes Merwin Dam)
Objective 12:	Quantify ocean recruits
Objective 13:	Develop performance measures for index stocks
Objective 14:	Document upstream and downstream passage facility compliance with hydraulic design criteria
Objective 15:	Determine spawn timing, distribution and abundance of transported anadromous adults
Objective 16:	Evaluate lower Lewis River wild fall Chinook and chum populations
Objective 17:	Objectives for wild winter steelhead, spring Chinook, and coho
Objective 18:	Objectives for bull trout

Objective 19: Determine interactions between reintroduced anadromous salmonids and resident fish

Objective 20: Document Project compliance with flow, ramping rate and flow plateau requirements

Objective 21: Determine when reintroduction outcome goals are achieved

Objective 22: Develop a Hatchery and Supplementation Plan (H&S) to support and protect Lewis River native anadromous fish populations and provide harvest opportunity

See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary.

Additional research, monitoring and evaluation in the Lower Columbia.

Monitoring activities occur in the lower Columbia River for harvest accounting and tag recovery in sport and commercial fisheries, commercial gear evaluations, natural spawn abundance estimate for fall Chinook and Chum, juvenile salmonid evaluations in trawl gear (NOAA Fisheries) and sturgeon/eulachon research and monitoring.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Monitoring activities required in the Settlement Agreement related to their license to operate the hydroelectric projects and outlined in the M&E and H&S plan (see Section 11.1.1) are primarily the funding responsibility of PacifiCorp. Many of the other monitoring activities are dependent on state and/or federal funding which is not guaranteed at current levels.

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

No adverse ecological effects are expected to occur from monitoring and evaluation activities. Monitoring, evaluation and research follow scientific protocols with adaptive management processes, if needed. In addition, we will adaptively manage all other aspects of the program to continue to minimize associated risks using the more recent available scientific research.

Juvenile sampling at hatchery facilities will be conducted with accepted procedures to minimize stress and mortality from sampling. Sample sizes will be the minimum necessary to achieve statistically valid results for growth, tag retention and fish health.

Adult trapping facilities will be monitored daily, or more often as necessary to prevent injury and unnecessary delay.

VSP monitoring (including juvenile out-migrant monitoring) follows established WDFW protocols designed to minimize impacts to listed fish.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

No research is currently directly associated with the program.

12.2 Cooperating and funding agencies.

Any future research to be conducted by WDFW and funded by PacifiCorp and Cowlitz PUD would be coordinated through the following contacts.

12.3 Principle investigator or project supervisor and staff.

WDFW (Bryce Glaser) and PacifiCorp (Erik Lesko).

12.4 Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Not applicable.

12.5 Techniques: include capture methods, drugs, samples collected, tags applied.

Not applicable.

12.6 Dates or time period in which research activity occurs.

Not applicable.

12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.

Not applicable.

12.8 Expected type and effects of take and potential for injury or mortality.

Not applicable.

12.9 Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Not applicable.

12.10 Alternative methods to achieve project objectives.

Not applicable.

12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Not applicable.

12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Not applicable.

13 SECTION 13. ATTACHMENTS AND CITATIONS

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Attachment 1: WDFW Virology Sampling 2006-2007 through 2012-2013: Merwin Hatchery.

Source: WDFW Fish Health Lab data 2014 (John Kerwin)

Hatchery/ Collection site	Stock	Species	DateSampled	Results	Comments	LifeStage	Sample number	NUMBER OF SAMPLEs						Cell Line	ID	FROZ Date
								OF	POOL	K/S	POOL	fry/visc/other	pools			
MERWIN	GOLDENDALE	RBT	06/20/07	IHNV	3+/3p; diag; RP14; 10^0, 10^{-1}	imAD/05	0621-1			3	3			DB,SN	E/C	07/05/07
MERWIN	GOLDENDALE	RBT	06/27/07	IHNV	1+/4p K/S; RP12, 10^0, 10^{-1}, 10^{-3}, 10^{-5}	imAD/04	0628-5			4	4					
MERWIN	GOLDENDALE	RBT	06/27/07	IHNV	4+/4p K/S; RP11; 10^0, 10^{-1}, 10^{-3}, 10^{-5}	imAD/05	0628-6			4	4				E/C	03/09 and 22/2011
MERWIN	LEWIS R	SSTHD	12/07/06	IHNV	4+/12p OF & K/S	AD	1208-3/4	35	12	35	12			SN	E/C	02/02/07
MERWIN	LEWIS R	SSTHD	12/13/06	IHNV	2+/7p K/S, #13-19	AD	1214-5/6	18	7	18	7			ND	E/C	ND
MERWIN	LEWIS R	SSTHD	12/20/06	IHNV	2+/9p OF, #20-28	AD	1221-1/2	16	9	13	5			ND	E	ND
MERWIN	LEWIS R	SSTHD	12/27/06	IHNV	4+/9p OF, #31-39	AD	1228-12	26	9					ND	E/C	ND
MERWIN	LEWIS R	SSTHD	01/03/07	NEV	#40-47	AD	0104-7	21	8							
MERWIN	LEWIS R	SSTHD	01/10/07	IHNV	3+/8p OF, #48-55	AD	0111-4	24	8					ND	E/C	ND
MERWIN	LEWIS R	SSTHD	01/17/07	IHNV	1+/3p OF, #56-58	AD	0118-5	8	3					ND	E	ND
MERWIN	LEWIS R	WSTHD	12/27/06	NEV	#1	AD	1228-13/14	3	1	3	1					
MERWIN	LEWIS R	WSTHD	01/03/07	IHNV	1+/1p OF & 1+/2p K/S	AD	0104-8/9	2	1	6	2			DB	E/C	01/26/07
MERWIN	LEWIS R	WSTHD	01/10/07	IHNV	2+/4p OF & 6+/6p K/S, #3-6	AD	0111-5/6	10	4	20	6			ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/17/07	IHNV	6+/6p OF & 3+/4p K/S, #7-12	AD	0118-6/7	17	6	17	6			ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/24/07	IHNV	3+/4p K/S	AD	0123-3			14	4			ND	C	ND
MERWIN	LEWIS R	WSTHD	01/24/07	IHNV	4+/4p K/S, #13-16	AD	0125-2							ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/31/07	IHNV	4+/4p OF, #17-20	AD	0201-1	12	4					ND	E/C	ND
MERWIN	GOLDENDALE	RBT	06/17/08	NEV			0618-2			2	1					
MERWIN	LEWIS R	SSTHD	07/17/07	NEV		JUV/07	0718-2					9	3			
MERWIN	LEWIS R	SSTHD	07/19/07	NEV		JUV/07	0720-1					9	3			
MERWIN	LEWIS R	SSTHD	08/13/07	NEV	diag; ponds 4, 5, 7; 10^0-10^{-3}	JUV/07	0814-1					12	3			
MERWIN	LEWIS R	SSTHD	12/05/07	NEV	#1-19	AD	1206-5/6	54	19	54	19					
MERWIN	LEWIS R	SSTHD	12/11/07	IHNV	1+/12p OF, #20-31	AD	1212-8/9	32	12	7	3			DB	E/C	01/04/08
MERWIN	LEWIS R	SSTHD	12/18/07	NEV	#32-43	AD	1219-11	33	12							
MERWIN	LEWIS R	SSTHD	12/26/07	NEV	#44-54	AD	1228-1	31	11							
MERWIN	LEWIS R	WSTHD	12/26/07	NEV		AD	1228-2/3	7	3	7	3					
MERWIN	LEWIS R	WSTHD	01/02/08	IHNV	1+/2p OF & 1+/1p K/S	AD	0103-27/28	4	2	4	1			SN	E/C	01/24/08
MERWIN	LEWIS R	SSTHD	01/02/08	NEV	#55-61	AD	0103-30	19	7							
MERWIN	LEWIS R	WSTHD	01/09/08	IHNV	4+/6p OF & 4+/5p K/S; OF: #7-12, K/S: #7-11	AD	0110-3/4	16	6	16	5			ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/15/08	IHNV	6+/6p OF & 6+/7p K/S, #13-18	AD	0116-14/15	17	6	33	7			ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/23/08	IHNV	7+/7p OF, #19-25	AD	0124-1	21	7					ND	E/C	ND
MERWIN	LEWIS R	WSTHD	01/30/08	IHNV	3+/3p OF, #26-28	AD	0131-4	8	3					ND	E/C	ND
MERWIN	LEWIS R	SSTHD	06/17/08	NEV	diag; 10^0-10^{-3}	JUV/08	0618-3					10	2			
MERWIN	LEWIS R	SSTHD	12/04/08	IHNV	1+/11p OF & 1+/7p K/S , #1-11	AD	1205-1/2	32	11	32	7			DB	E/C	12/19/08
MERWIN	LEWIS R	SSTHD	12/11/08	IHNV	2+/16p OF & 1+/6p K/S, #12-27	AD	1212-1/2	45	16	28	6				E/C	
MERWIN	LEWIS R	SSTHD	12/16/08	IHNV	1+/13p OF, #28-40	AD	1217-9	37	13						E	
MERWIN	LEWIS R	WSTHD	12/29/08	NEV	#1-3	AD	1230-9/10	8	3	8	3					
MERWIN	LEWIS R	WSTHD	01/12/09	NEV	#4-9	AD	0113-3/4	16	6	17	4					
MERWIN	LEWIS R	WSTHD	01/21/09	IHNV	OF #10-17, K/S #10-14	AD	0122-1/2	24	8	24	5			DB	E	02/05/09
MERWIN	LEWIS R/WILD	WSTHD	04/16/09	NEV	OF & K/S: 10^0-10^{-3}	AD	0417-1/2	1	1	1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/16/09	NEV	male #12, spawned, sample frozen	AD	0501-4			1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/23/09	NEV	male mortality, sample frozen	AD	0430-4			1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/26/09	NEV	male mortality, sample frozen	AD	0430-5			1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/28/09	NEV	male mortality, fresh	AD	0430-6			1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/29/09	NEV	OF lost in transit, dil w 1ml AB, spawned	AD	0430-1/2	1	1	3	2					
MERWIN	LEWIS R/WILD	WSTHD	04/29/09	NEV	male mortality, fresh	AD	0430-3			1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/30/09	NEV	mortality, #58	AD	0501-5			1	1					
MERWIN	LEWIS R/WILD	WSTHD	05/01/09	NEV	F #23 & M #19 & 39, spawned	AD	0501-2/3	1	1	3	2					
MERWIN	LEWIS R/WILD	WSTHD	05/11/09	NEV	F #63 & M #57 & 40	AD	0513-2/3	1	1	3	2					
MERWIN	LEWIS R/WILD	WSTHD	05/13/09	NEV	F #66-67 & M #17/51, 49/45, 34 (mort)	AD	0514-1/2	2	2	7	5					
MERWIN	LEWIS R/WILD	WSTHD	05/14/09	NEV	F #68 & M #41/55	AD	0515-1/2	1	1	3	2					

Hatchery/ Collection site	Stock	Species	DateSampled	Results	Comments	LifeStage	Sample number	NUMBER OF SAMPLEs						Cell Line	ID	FROZ Date
								OF	POOL	K/S	POOL	fry/visc/other	pools			
MERWIN	LEWIS R/WILD	WSTHD	05/19/09	NEV	F #65 & 69, M #46 & 56	AD	0521-1/2	2	2	4	4					
MERWIN	LEWIS R/WILD	WSTHD	05/21/09	NEV	F #74, M #25	AD	0522-1/2	1	1	2	2					
MERWIN	LEWIS R/WILD	WSTHD	05/26/09	NEV	F #64 & 70, M #73 & 71	AD	0527-2/3	2	2	4	4					
MERWIN	LEWIS R	SSTHD	11/30/09	IHNV	2+/16p OF & 1+/16p K/S	AD	1201-19/20	45	16	45	16			PCR	E/C	12/23/09
MERWIN	LEWIS R	SSTHD	11/30/09	IHNV	2+/16p OF & 1+/16p K/S	AD	1201-19/20	45	16	45	16			PCR	E/C	12/23/09
MERWIN	LEWIS R	SSTHD	12/07/09	IHNV	2+/13p OF & 2+/5p K/S, #17-29	AD	1208-2/3	39	13	15	5				E/C	
MERWIN	LEWIS R	SSTHD	12/07/09	IHNV	2+/13p OF & 2+/5p K/S, #17-29	AD	1208-2/3	39	13	15	5				E/C	
MERWIN	LEWIS R	SSTHD	12/14/09	IHNV	3+/4p OF, #30-33	AD	1215-17	12	4					DB	E/C	01/08/10
MERWIN	LEWIS R	SSTHD	12/14/09	IHNV	3+/4p OF, #30-33	AD	1215-17	12	4					DB	E/C	01/08/10
MERWIN	LEWIS R	WSTHD	12/28/09	NEV	#1-5	AD	1229-9/10	13	5	13	5					
MERWIN	LEWIS R	WSTHD	12/28/09	NEV	#1-5	AD	1229-9/10	13	5	13	5					
MERWIN	LEWIS R	WSTHD	01/04/10	IHNV	1+/1p K/S, #6-9	AD	0105-3/4	12	4	12	4			PCR	E	01/26/10
MERWIN	LEWIS R	WSTHD	01/11/10	NEV	#10, 11	AD	0112-3/4	7	2	7	2					
MERWIN	LEWIS R	WSTHD	01/19/10	IHNV	1+/4p OF & K/S, #12-15	AD	0120-3/4	10	4	10	4				E/C	
MERWIN	LEWIS R/WILD	WSTHD	03/17/10	IHNV	1+/1p OF & K/S, #12-15	AD	0318-1/2	1	1	1	1			PCR	E/C	04/01/10
MERWIN	LEWIS R/WILD	WSTHD	03/26/10	IHNV	1+/1, #12	AD	0326-4			1	1				C	04/20/10
MERWIN	LEWIS R/WILD	WSTHD	04/01/10	NEV	#37	AD	0402-1/2	1	1	1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/01/10	IHNV	1+/1 OF & K/S, #11	AD	0402-3/4	1	1	1	1				E/C	04/14/10
MERWIN	LEWIS R/WILD	WSTHD	04/06/10	NEV	F#52	AD	0407-2/3	1	1	1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/09/10	NEV	F#56	AD	0409-2/3	1	1	1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/12/10	NEV	#21, 57, 59	AD	0413-3/4	3	3	3	3					
MERWIN	LEWIS R/WILD	WSTHD	04/13/10	NEV	#44, 51, 66	AD	0414-4/5	3	3	3	3					
MERWIN	LEWIS R/WILD	WSTHD	04/19/10	IHNV	5+/5 OF & K/S; #47, 64, 67, 69, 72	AD	0421-2/3	5	5	5	5				E/C	05/21/10
MERWIN	LEWIS R/WILD	WSTHD	04/26/10	NEV	F#70, 77	AD	0427-4/5	2	2	2	2					
MERWIN	LEWIS R/WILD	WSTHD	05/14/10	IHNV	2+/3 OF; #88, 95, 99; spawned on Friday, samples frozen over weekend	AD	0518-2/3	3	3	3	3				E/C	06/17/10
MERWIN	LEWIS R	SSTHD	07/15/10	IHNV	1+/2p K/S	IMM AD	0716-1			2	2			PCR	E	08/05/10
MERWIN	LEWIS R	SSTHD	11/30/10	NEV	#1-4	AD	1201-1/2	12	4	12	4					
MERWIN	LEWIS R	SSTHD	12/06/10	NEV	#5-8	AD	1206-1/2	10	4	10	4					
MERWIN	LEWIS R	SSTHD	12/13/10	NEV	#9-14	AD	1214-5/6	16	6	16	6					
MERWIN	LEWIS R	WSTHD	12/29/10	NEV		AD	1229-25/26	15	5	15	5					
MERWIN	LEWIS R	WSTHD	01/05/11	NEV	#6-8, EPC 10^{0}-10^{-2}	AD	0106-7/8	9	3	9	3					
MERWIN	LEWIS R	WSTHD	04/01/11	NEV	#22	AD	0402-1/2	1	1	1	1					
MERWIN	LEWIS R/WILD	WSTHD	04/15/11	NEV	#34	AD	0415-1/2	1	1	1	1					
MERWIN	LEWIS R	SSTHD	12/20/10	IHNV	3+/8p OF & 1+/8p K/S, #15-22	AD	1220-5/6	24	8	24	8			DB	E/C	01/04/11
MERWIN	LEWIS R	WSTHD	01/12/11	IHNV	1+/2p OF & K/S, #9-10	AD	0113-4/5	6	2	6	2			S/N		02/25/11
MERWIN	LEWIS R	WSTHD	05/26/11	IHNV	Int 6, 10^{0}-10^{-3}, diag	JUV/11	0526-3					15	3	PCR	E/C	
MERWIN	LEWIS R	WSTHD	05/31/11	IHNV	10^{0}-10^{-3}, fresh morts	JUV/11	0531-1					20	4			
MERWIN	LEWIS R/WILD	WSTHD	04/11/11	IHNV	2+/2p K/S, males, #25-26	AD	0412-1			2	2			DB	E/C	04/26/11
MERWIN	LEWIS R/WILD	WSTHD	04/18/11	IHNV	2+/2p OF & K/S; F #13, 27	AD	0419-3/4	2	2	2	2				E/C	
MERWIN	LEWIS R/WILD	WSTHD	04/25/11	IHNV	1/3p OF & 3+/9p K/S; F #39, 43, 44 & M #15, 24, 31, 35, 37, 38	AD	0426-1/2	3	3	9	9				E/C	
MERWIN	LEWIS R/WILD	WSTHD	04/28/11	IHNV	2+/2p OF & 4+/4p K/S; F #36, 65 & M #23, 28	AD	0429-2/3	2	2	4	4				E/C	
MERWIN	LEWIS R/WILD	WSTHD	05/02/11	IHNV	1+/1p OF & 1+/3p K/S; F #68 & M #30, 61	AD	0504-8/9	1	1	3	3				E/C	
MERWIN	LEWIS R/WILD	WSTHD	05/12/11	IHNV	F #31, 50, 66, 74 & M #29, 62, 67, 75	AD	0513-1/2	4	4	8	8				E/C	
MERWIN	LEWIS R/WILD	WSTHD	06/06/11	IHNV	2+/2p	JUV/11	WADDL					10	2			
MERWIN	LEWIS R	SSTHD	12/29/10	IHNV	3+/12p & 2+/12p K/S, #23-34, EPC 10^{0}-10^{-3}	AD	1229-23/24	36	12	36	12				E/C	
MERWIN	LEWIS R/WILD	WSTHD	05/16/11	NEV	EPC 10^{0}-10^{-3}; F #84-85 & M #86-87	AD	0517-2/3	2	2	4	4					
MERWIN	LEWIS R/WILD	WSTHD	05/26/11	NEV	healthy, 10^{0}-10^{-1}, from hen 22	JUV/11	0526-1					10	2			
MERWIN	LEWIS R/WILD	WSTHD	05/26/11	NEV	healthy,10^{0}-10^{-1}, from hen 34	JUV/11	0526-2					10	2			
MERWIN	LEWIS R/W	WSTHD	07/21/11	NEV	morts from 1R1, diag 10^{0}-10^{-2}	JUV/11	0722-1					10	2			
MERWIN	LEWIS R/W	WSTHD	07/21/11	NEV	morts from 1R6, diag 10^{0}-10^{-3}	JUV/11	0722-2					5	1			
MERWIN	LEWIS R	SSTHD	11/28/11	NEV	Pools 1-19 have 3 fish, pools 20+21 have 2 fish	AD	1129-5/6	61	21	61	21					

Hatchery/ Collection site	Stock	Species	DateSampled	Results	Comments	LifeStage	Sample number	NUMBER OF SAMPLEs						Cell Line	ID	FROZ Date
								OF	POOL	K/S	POOL	fry/visc/other	pools			
MERWIN	LEWIS R	SSTHD	12/07/11	IHNV	#22-39; 2+/18P	AD	1208-3	53	18					DB		12/27/11
MERWIN	LEWIS R	SSTHD	12/12/11	NEV	#40-45, #43 AND 45 ARE 2 FISH/POOL	AD	1213-4	16	6							
MERWIN	LEWIS R	WSTHD	12/28/11	IHNV	OF: F#1-5, 4+/5p; K/S: F#1-5, M#1-5, 10+/10p	AD	1230-3/4	14	5	28	10			SN	E/C	1/13/12
MERWIN	LEWIS R	WSTHD	01/04/12	IHNV	#6, 7, 8; OF: 3+/3P; K/S: 5+/6P	AD	0105-22/23	9	3	18	6				E/C	
MERWIN	LEWIS R	WSTHD	01/11/12	IHNV	OF:#9-12, 1+/4P; K/S: F#9-12, M#9-10, 3+/6P	AD	0112-5/6	10	4	14	6					
MERWIN	LEWIS R/W	LWSTHD	04/10/12	IHNV	OF: TN-9, 1+/1P; K/S: TN-2, 1+/1P	AD	0411-9/10	1	1	1	1			SN	E/C	4/23/12
MERWIN	LEWIS R/W	LWSTHD	04/17/12	IHNV	OF: #2-5; K/S: TN#8,11, 12,13, 3+/4P	AD	0419-1/2	4	4	4	4				E/C	
MERWIN	LEWIS R/W	LWSTHD	04/25/12	IHNV	OF: #6, 7, 1+/2P; K/S: TN#22, 30, 39, 43, 3+/4P	AD	0427-3/4	2	2	4	4				E/C	
MERWIN	LEWIS R/W	LWSTHD	05/02/12	IHNV	OF: #8, 9, 2+/2P; K/S: TN#66, 69, 2+/2P	AD	0504-3/4	2	2	2	2					
MERWIN	LEWIS R/W	LWSTHD	05/03/12	IHNV	OF: #10 (F#02163), NEV; K/S: TN#44, 40, 2+/2P	AD	0504-5/6	1	1	2	2					
MERWIN	LEWIS R/W	LWSTHD	05/08/12	IHNV	OF: #11-15, 5+/5P; K/S: TN#32, 33, 41, 64, MT#3, 2+/5P	AD	0510-1/2	5	5	5	5				E/C	
MERWIN	LEWIS R/W	LWSTHD	05/09/12	IHNV	OF: #16; K/S: TN#19, 28, 2+/2P	AD	0510-3/4	1	1	2	2				E/C	
MERWIN	LEWIS R/W	LWSTHD	05/14/12	IHNV	OF: #17, 1+/1P; K/S: TN#29, 1+/1P	AD	0515-1/2	1	1	1	1				E/C	
MERWIN	LEWIS R/W	LWSTHD	05/29/12	IHNV	OF: TN-72 1+/1P; K/S: MT-7,10 1+/2P	AD	0530-3/4	1	1	2	2					
MERWIN	LEWIS R	SSTHD	11/28/12	NEV	OF: #1-15, No #3 or #4	AD	1129-8/9	38	13	45	9					
MERWIN	LEWIS R	SSTHD	12/03/12	NEV	OF: #16-22 K/S: #10-12	AD	1204-12/13	19	7	15	3					
MERWIN	LEWIS R	WSTHD	01/02/13	NEV	OF: #8-12	AD	0103-21/22	12	5	23	5					
MERWIN	LEWIS R	WSTHD	01/09/13	NEV	#13,14	AD	0110-9	6	2							
MERWIN	LEWIS R	LWSTHD	04/10/13	NEV	MT-5	AD	0411-1	1	1							
MERWIN	LEWIS R	LWSTHD	04/18/13	NEV	TN-19	AD	0419-1	1	1							
MERWIN	LEWIS R	WSTHD	04/29/13	NEV	#1 orange 100, #2 pit tag#5 699E75, #3 orange 99, #4 white 257, #5 orange 19	AD	0430-1	5	5							
MERWIN	LEWIS R/ W	WSTHD	05/06/13	IHNV	TN-29	AD	0508-1	1	1					E/C		
MERWIN	LEWIS R	WSTHD	12/26/13	NEV		AD	1227-13/14	19	7	37	8					

14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

15 ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2).

15.1 List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> *"The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."*

15.2 Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Lower Columbia Basin DPS Bull Trout *(Salvelinus confluentus*). Bull trout were listed as threatened in June 1998 (63 FR:31647-31674). Critical habitat was designated in 2005 (70 FR 56211 56311). A recovery plan was drafted in 2005 and has not been finalized. A 5-year review was finalized in 2008. In January 2010, the USFWS proposed a revision of critical habitat.

Status: The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries. The Columbia River population segment is composed of 141 subpopulations. The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. The Service identified 20 subpopulations in watersheds of nine major tributaries of the lower Columbia River (number of subpopulations in each watershed)—the Lewis River (2), Willamette River (3), White Salmon River (1), Klickitat River (1), Hood River (2), Deschutes River (3), John Day River (3), Umatilla River (2), and Walla Walla River (3).

The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. The Klickitat Core Area includes all tributaries downstream to the confluence with the Columbia River (USFWS 2002). Local populations within the Lower Columbia Recovery Unit are currently contained in Cougar, Pine, and Rush creeks (Lewis River), and in the WF Klickitat River. Additional spawning and rearing areas within the Klickitat River have not been identified. Studies in the White Salmon and Klickitat rivers should assess the potential habitat suitability and productive capacity of tributaries that could support local populations. Subsequently, factors that may limit the reintroduction potential should be identified, and corrective restoration activities or management actions should be implemented. Reestablishment of local populations within the White Salmon and Klickitat rivers may require the use of artificial propagation and would follow Federal policy and guidelines.

*Changes in the Status of the Columbia River Interim Recovery***:** The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number to actions addressed under section 7 of the ESA. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population of bull trout.

Several other listed and candidate species are found in Clark, Cowlitz and Skamania Counties; however the hatchery operations and facilities for this program do not fall within the critical habitat for any of these species. As such there are no effects anticipated for these species.

Other listed or candidate species:
"No effect" for the following species:

Northern Spotted owl (*Strix occidentalis caurina*) –Threatened (Critical Habitat Designated)
Columbia white-tailed deer (*Odocoileus virginianus leucurus*)
Grizzly bear (*Ursus arctos*)
Canada lynx (*Lynx canadensis*)
Golden paintbrush (*Castilleja levisecta*) [historic]
Water howellia (*Howellia aquatilis*)
Bradshaw's lomatium (*Lomatium bradshawii*)
Nelson's checker mallow (*Sidalcea nelsoniana*)
Marbled murrelet (*Brachyramphus marmoratus*) (Critical Habitat Designated)
Gray wolf (*Canis lupus*); although Table 6.0-1 in the Final BE stated the proposed actions "was not likely to adversely affect" the gray wolf, it was clarified by the Utilities on May 17, 2006, that the effect determination should have been a "no effect" for the gray wolf to be consisted with the statement on page 58 that "we do not anticipate any project effects on the gray wolf."

Candidate Species
(Brush Prairie) Mazama pocket gopher (*Thomomys mazama* ssp. *oregonus*)
North American wolverine (*Gulo gulo luteus*) – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa*) [historic]
Fisher (*Martes pennanti*) – West Coast DPS
Mardon skipper (*Polites mardon*)
Whitebark pine (*Pinus albicaulis*)

15.3 Analyze effects.

Actions associated with this hatchery program that may affect the bull trout population in the North Fork Lewis River:
Anadromous Reintroduction- Overall, the anadromous fish reintroduction program will likely be beneficial by providing MDNs and increasing the forage base for bull trout. This strategy will be aided by the reintroduction schedule as laid out in the SA where salmon and steelhead are reintroduced above Swift Creek Dam 4½ years after the licenses are issued. Yale Lake reintroduction begins with the HPP calling for adults to be transported to Yale Lake 8 years after the licenses are issued. Finally Merwin Lake reintroduction begins with the HPP in year 12 of the new licenses. This strategy allows time for assessments to occur prior to massive reintroductions at each project.

15.4 Actions taken to minimize potential effects.

The *Hatchery and Supplementation Plan* (2006) will include measures to minimize the potential negative impact of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10). Program steelhead are released fully smolted to foster rapid outmigration from the basin and to minimize predation and residualism risks.

15.5 References

Biological Opinion for the Federal Energy Regulatory Commission Relicensing of the Lewis River Hydroelectric Projects: Merwin (No. 935), Yale (No. 2071), Swift No. 1 (No. 2111), Swift No. 2 (No. 2213), FWS Reference number 1-3-06-F-0177.

LCFRB (Lower Columbia Fish Recovery Board). 2004. Lower Columbia salmon recovery and fish and wildlife subbasin plan, volume 1. Longview, Washington.

USFWS (U.S. Fish and Wildlife Service). 2002. Chapter 20, Lower Columbia Recovery Unit, Washington. 89 p. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

16 "Take" Tables

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook (*Oncorhynchus tshawytscha*) Steelhead *(Oncorhynchus mykiss*) Coho (*Oncorhynchus kisutch*)	**ESU/Population:** Lower Columbia River Chinook Lower Columbia River Steelhead Lower Columbia River Coho	**Activity:** Lewis Summer Steelhead Program
Location of hatchery activity: Lewis River Hatchery, Lewis River (WRIA 27.0168) at RKm 25.0 Merwin Dam Fish Collection Facility, Lewis River (WRIA 27.0168) at RKm 30.4 Merwin Hatchery , Lewis River (WRIA 27.0168) at RKm 46.7	**Dates of activity:** May-December	**Hatchery program operator:** WDFW

Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass [a]	TBD	TBD	TBD	TBD
Collect for transport [b]	TBD	TBD	TBD	TBD
Capture, handle, and release [c]	TBD	TBD	TBD	TBD
Capture, handle, tag/mark/tissue sample, and released[d]	TBD	TBD	TBD	TBD
Removal (e.g. broodstock) [e]	TBD	TBD	TBD	TBD
Intentional lethal take [f]	TBD	TBD	TBD	TBD
Unintentional lethal take [g]	TBD	TBD	TBD	TBD
Other Take (specify) [h]	TBD	TBD	TBD	TBD

* Steelhead are separated from the spring Chinook trapping. See Lewis River Spring Chinook HGMP.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:
1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.*