HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Lewis River Type-S Coho (Segregated)
Species or Hatchery Stock:	Type-S Coho (*Oncorhynchus kisutch*) Lewis River 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 is submitting a Hatchery and Genetic Management Plan (HGMP) for the Lewis River Type-S (early returning) coho 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 Type-S coho for sustainable escapement to the watershed, while providing recreational harvest under mark-selective fisheries. Program fish will be produced at the Speelyai Hatchery, located on Speelyai Creek (WRIA 27.00431), and Lewis River Hatchery, located on the Lewis River at RKm 25.0. The program will annually release 1,100,000 yearlings to the Lewis River. In addition, 450,000 eggs are taken for Deep River Net Pen production.

This Type-S Coho 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 Type-S coho program is operated as a "segregated-type" program, as defined by the HSRG. The segregated program has operated since 1932. 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 Type-S coho (distinguished by an adipose fin clip or CWT only) returning to the Lewis River at the Lewis River Hatchery trap and Merwin Dam Fish Collection Facility (FCF) (RKm 25.0 and 30.4, respectively) from September through November. All fish released through this hatchery program have been 100% mass-marked since brood year 1998: of these, the current program releases 950,000 adipose fin-clipped only (AD), 75,000 yearlings are also coded-wire tagged (AD+CWT), and 75,000 yearlings are CWT-only, without the external mark.

The Lower Columbia River coho are listed as "Threatened" under the ESA. The ESU includes the artificial propagation programs covered by this HGMP.

Broodstock Collection:
The broodstock is derived from hatchery origin Type-S coho stock returning to the Lewis sub-basin. The current egg-take goal is 1,850,000 at Speelyai Hatchery; around 640 adult pairs are collected. In addition to the adults needed to meet broodstock goals, a minimum supplementation goal of 9,000 adults, has been established for the upper watershed. Surplus hatchery fish in excess of broodstock and supplementation needs are used for system nutrient enhancement. In high return years, fish may be donated to the statewide or local food banks, or donated for educational purposes to local schools and colleges

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. 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).

Hatchery coho can contribute significantly to the lower Columbia River gill net fishery; commercial harvest of early-returning (Type-S) coho is constrained by fall Chinook and Sandy River coho management; commercial harvest of late-returning (Type-N) coho is focused in October during the peak abundance of hatchery-origin Type-N coho. A substantial estuary sport fishery exists between Buoy 10 and the Astoria-Megler Bridge; majority of the catch is hatchery-origin Type-S coho, but the hatchery-origin Type-N coho harvest can also be substantial.

Based on the average smolt-to-adult survival rate of 3.24% for 2000-2009 brood years (RMIS 2014), and a programmed release goal of 1,100,000 yearlings, the estimated adult production (goal) level would be 35,640.

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 2010) Plan, a Hatchery and Supplementation (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).

Performance indicators for harvest will be accomplished by continuing mass-marking (adipose fin-clip); CWT recoveries help determine stray rate contributions on spawning grounds by watersheds close in proximity to this program's release vicinity.

Operation and Maintenance of Hatchery Facilities:
The Lewis Type-S coho program is conducted at Speelyai and Lewis River hatcheries. Speelyai Hatchery has water rights to divert water at a rate of 30 cfs from Speelyai Creek. Lewis River Hatchery has water rights totaling 38,613 gpm from the Lewis River. The return water system operates under a National Pollutant Discharge Elimination System (NPDES) permit.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Lewis River Type-S Coho

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

Lewis River (Speelyai Hatchery) Type-S Coho (*Oncorhynchus kisutch*)

ESA Status: "Threatened" June 28, 2005 (70FR37160); reaffirmed on August 15, 2011 (76 FR 50448).

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:

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
PacifiCorp	Full time equivalent staff – 9.75
Cowlitz PUD	Annual operating cost (dollars) -1,392,185

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

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Lewis River Type-S (early-returning) coho

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Lewis River Hatchery	Broodstock collection, acclimation, release	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 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.
Speelyai Hatchery	Adult holding/ spawning, incubation, rearing	Located at RKm 1.61 on Speelyai Creek (WRIA 27.0431); tributary to the Lewis River (WRIA 27.0168) at RKm 46.67, Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.

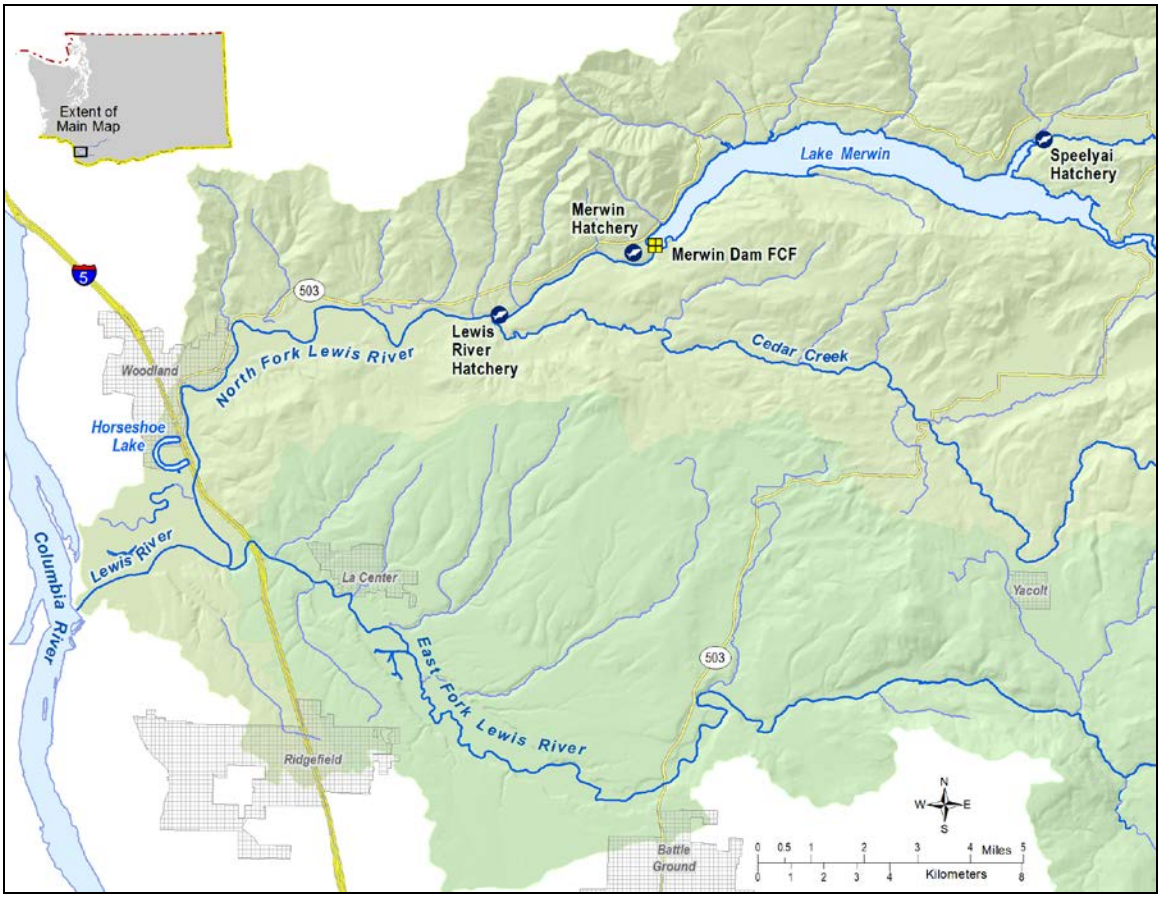

Figure 1.5.1: Map of Lewis Hatchery Complex and Merwin Dam FCF. Source: WDFW GIS 2014.

1.6 Type of program.

Segregated Harvest and Adult Supplementation Program (see also 1.7)

1.7 Purpose (Goal) of program.

Mitigation/Augmentation. The goal of this program is to support 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. A minimum upstream supplementation goal of 9,000 hatchery adult coho (when available) above Swift Reservoir has been established in the *Lewis River Hatchery and Supplementation Plan* (H&S 2009), Update planned in 2014. Also serves as mitigation for development (including

hydro-power) and habitat degradation. In the long term, the goal of this program is to transition to an integrated program.

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 Lewis 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 2009).

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 Type-S Coho 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 Type-S Coho 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	The upper intake and screens 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). The lower intake is scheduled to be remodeled in 2015 to meet standards.
Effluent Discharge	4.1	This facility 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 13-1040.
Broodstock Collection & Adult Passage	7.9	All fish are mass marked (adipose fin clipped and/or coded wire tagged) 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 "Performance Indicators" addressing benefits.

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. The FMEP has been submitted to NOAA and was revised after the coho listing. Ocean and Columbia River fisheries are covered under section 7 permits.	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.
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	An annual number of naturally-produced adults or redds on the spawning grounds or selected natural production index areas is	The returns to the hatchery and spawning grounds are monitored and reported annually.

areas.	estimated.	A minimum of 9,000 adult coho are passed upstream to supplement seeding of the upper Lewis watershed (H&S 2006).
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 Standard *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. Report CWT analysis to RMIS database. The DIT group (CWT-only) was introduced to provide indicators for natural production in order to evaluate differential effects of mark-selective fisheries, catch contributions, run timing, total survival, migration patterns and straying into other watersheds.
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 (September through November). 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 fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Level of smoltification (size, appearance, behavior, etc.) at release compared to WDFW rearing and release guidelines. Release type (forced, volitional, or direct).	Monitor fish condition in the 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.
3.8.3 Non-monetary societal	Program is designed to help	Long-term monitoring of system

benefits for which the program is designed are achieved.	achieve the end goal of conserving and stabilizing natural salmon populations.	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 applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	The number of marks released and the proportion of marks in out-migrant juveniles and returning adults on the spawning ground are estimated annually. Production fish are mass-marked (adipose fin-clip) to allow for their differentiation from naturally-produced fish.	Monitor and record juvenile hatchery fish size, number, date of release and mass-mark (fin clips, tags, etc.) quality; monitor contribution of hatchery adult fish to fisheries and escapement. Harvest is regulated to meet appropriate biological assessment criteria. Coho fisheries in the Lewis River are mark selective, and require the release of all wild coho. 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 size, number, date of release and mass-mark quality (adipose fin-clip rate) of all hatchery releases. Annually assess harvest of mass-marked hatchery fish based on CRC estimates and creel surveys. Double Index Tag (DIT) groups (CWT-only) can provide data on catch contributions, run timing, total survival, migration patterns,

		straying, in-stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds.
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 record size, number, date of release and mass-mark quality (tag rate) of hatchery releases. Examine returning fish encountered for the mass-mark (CWT) at the hatchery and on the spawning ground. Annually record numbers of estimated hatchery (marked) and natural (unmarked). The DIT group (CWT-only) provides indicators for natural production in order to evaluate differential effects of mark-selective fisheries, catch contributions, run timing, total survival, migration patterns and straying into other watersheds
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. CWT data reported to RMIS. Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked).
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return	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

locations.		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).
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.
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.

1.11 Expected size of program.

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish).

Around 640 adult pairs are needed to achieve the established egg-take goal of 1,850,000 (FBD 2014), based on an average fecundity of around 3,000 eggs/female, and a pre-spawning mortality of 10%. This take provides 1,325,000 eyed-eggs to the on-station type-S coho program, and 450,000 eggs to the Deep River net pen program (see Deep River Net Pen Type-S Coho HGMP).

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.	Size (fpp)	Release Date	Location	Major Watershed
Yearlings	1,100,000	16.0	May	Lewis River	Lewis

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.

Based on the average smolt-to-adult survival rate of 3.24% for 2000-2009 brood years (RMIS 2014), and a programmed release goal of 1,100,000 yearlings, the estimated adult production (goal) level would be 35,640 (see also **Table 3.3.1**).

Table 1.12.1: Lewis River South Type Coho Hatchery Escapement 2002-2013.

Return Year	Hatchery Escapement
2002	26,414
2003	40,746
2004	24,192
2005	24,902
2006	22,901
2007	20,215
2008	32,817
2009	15,414
2010	16,172
2011	15,416
2012	2,827
2013	16,516
Average	**21,544**

Source: WDFW Hatcheries Headquarters Database 2013.

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

The Lewis River Hatchery began operations in 1932.

1.14 Expected duration of program.

Program is 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.

Type S coho are collected at Lewis River Hatchery and the Merwin Dam Fish Collection Facility (FCF). They are held at Speelyai Hatchery until ripe, then spawned, and incubated, reared and released from Lewis River Hatchery. In addition, a minimum of 9,000 adult coho are transported to the Upper Lewis watershed to reintroduce and supplement naturally-reproducing populations (H&S 2006).

1.16.2 Potential Alternatives to the Current Program

Alternative 1: *Eliminate 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 Lower Columbia River, and is consistent with the mitigation requirements.

Alternative 2: Truck smolts down to the forks and release below the rearing area of wild fall Chinook and other ESA listed species. Experience with transportation of coho smolts in the Lewis River has shown that smolts survive at a lower rate than direct-released smolts, and the stray rate of returning adults may increase as well. WDFW does not support this alternative.

Alternative 3: Transition to Integrated program: Natural origin returns will not be incorporated into the broodstock for the existing Type-S coho harvest program for the duration of the re-introduction program. At the completion of the 9 years and evaluation of stock sustainability, a decision will be made whether or not to modify the current segregated harvest program for Type-S coho into an Integrated Harvest program. The plan uses the HSRG assumption that it will require 3-4 generations to build a truly wild stock that can be used for integrating into the hatchery environment. Until this occurs, the HSRG does not recommend the development of an integrated program.

1.16.3 Potential Reforms and Investments

The Lewis River Hatchery was renovated in 2009/2010. Modifications included a redesign of the adult pond and sorting facility and three rearing ponds, and conversion of the existing large asphalt-lined ponds to a series of smaller concrete raceways. The new ponds are designed with supply and drain systems that tie into the modifications of the adult ponds, providing a first-pass and reuse water supply.

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 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).

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

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).

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.

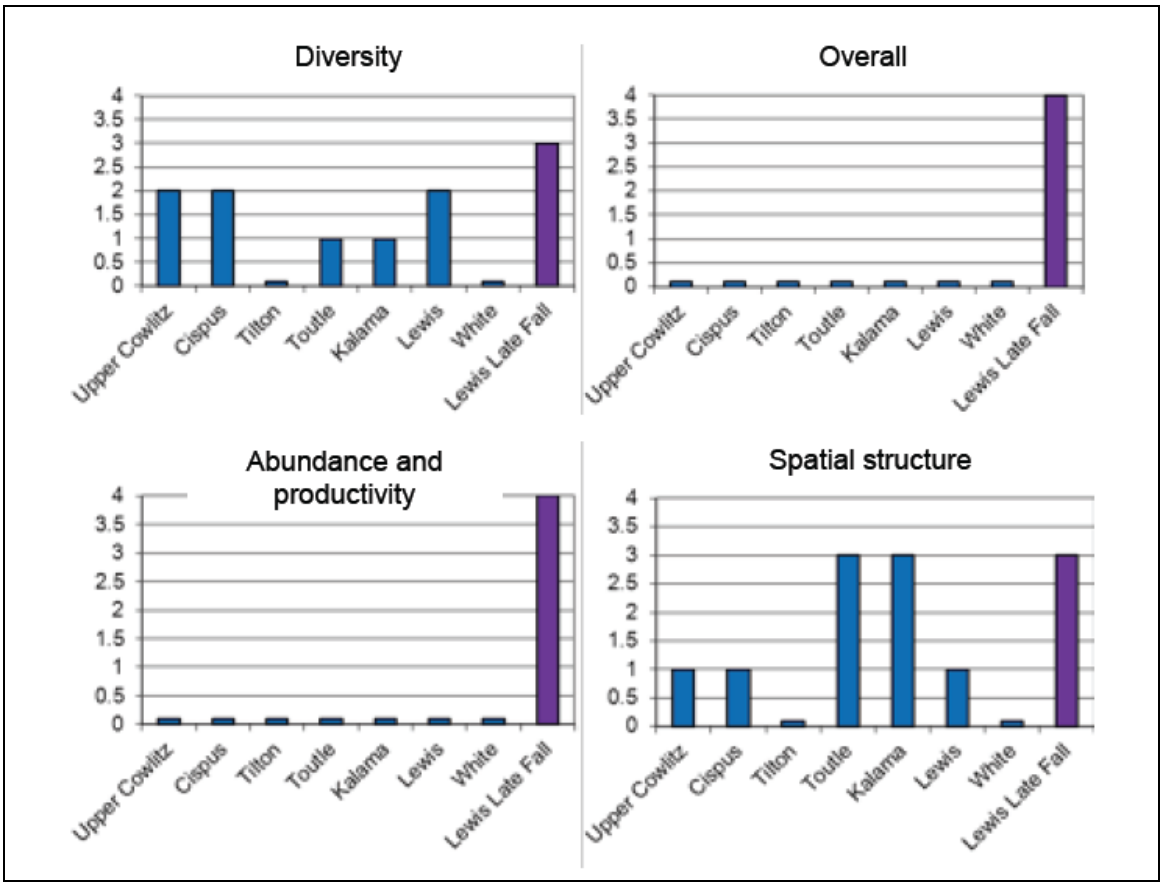

Figure 2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score 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 (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton Rivers), Kalama River Wild (winter- and summer-run) and Lewis River Wild Winter.

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.

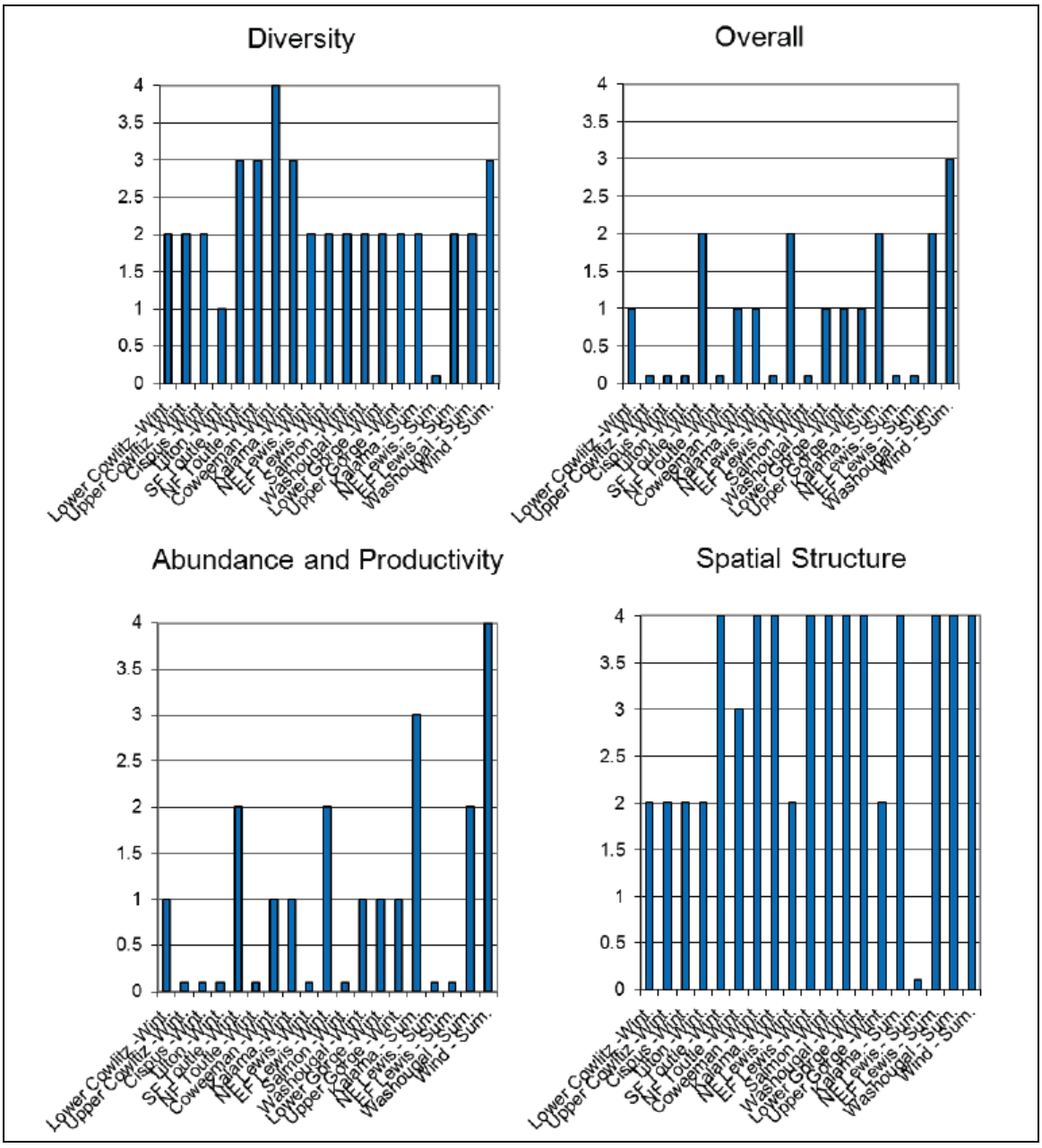

Figure 2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable")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

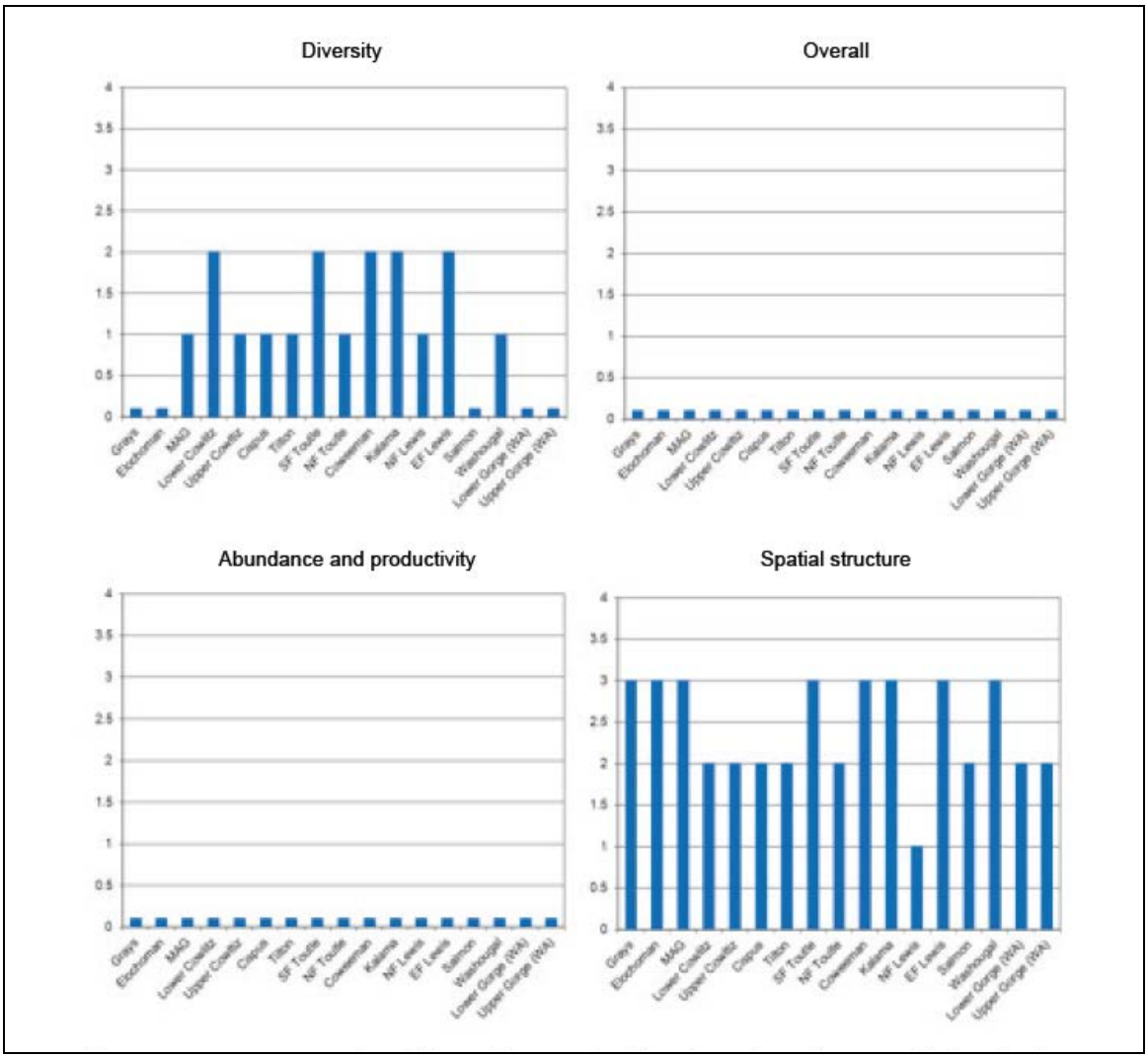

Figure 2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 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 2.4**. 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.

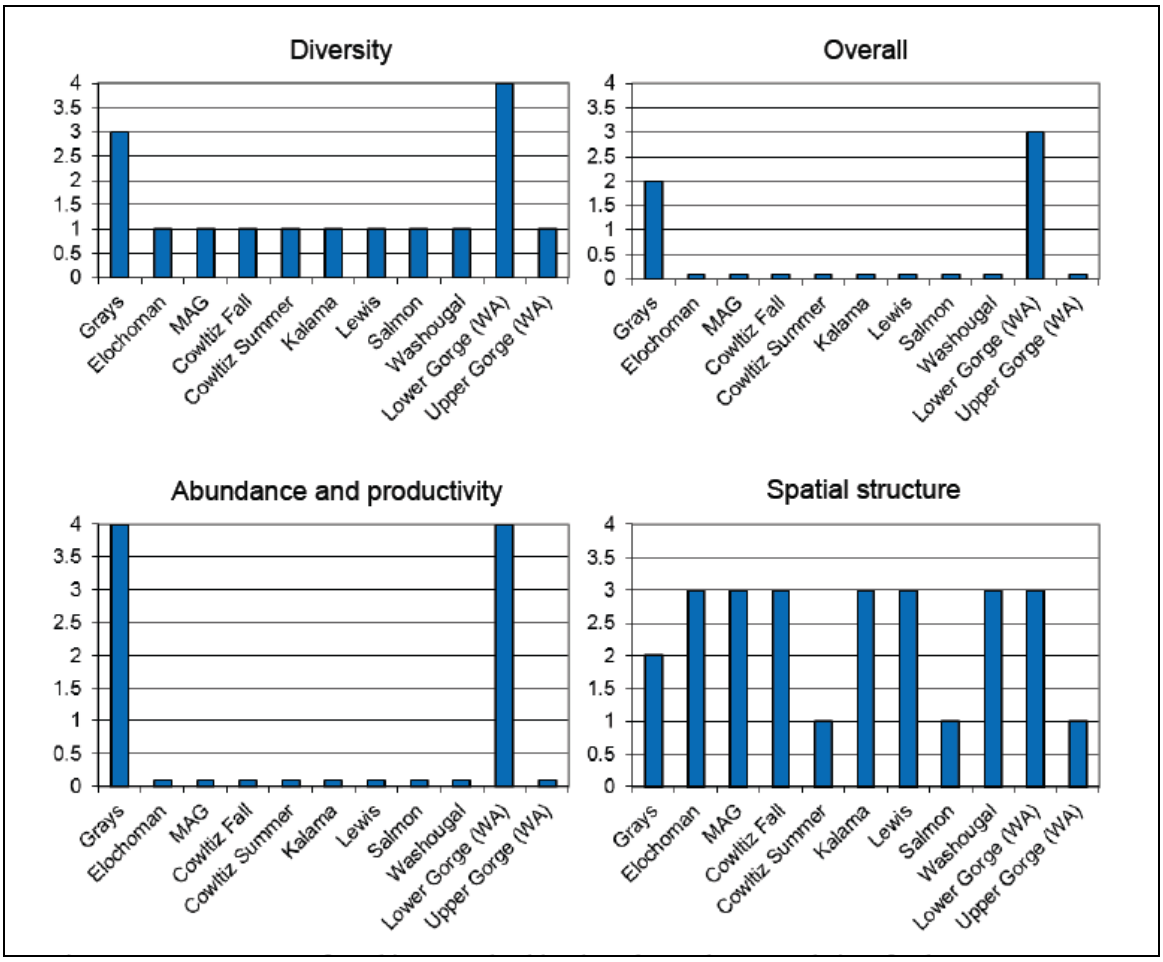

Figure 2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 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: Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. The traps are opened for coho collection during the entire run (September through November) to allow for collection over the entire run timing. Anadromous stocks including Chinook, coho, bull trout, steelhead and chum are collected at Merwin Dam FCF, retained or returned back to stream. 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. Fish sorted at the collection facility and released may sustain some physical damage but little or no mortality is documented (see "take" tables to be submitted to NMFS).

Genetic introgression: Broodstock for this program was initiated from local coho salmon. Few transfers into the basin have occurred in the recent past. Egg-takes are representative of adult arriving throughout the run and the current collection protocol preserves the range timing of the historical coho stock in the system.

Rearing Program:

Operation of Hatchery Facilities: 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.

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 coho predation and competition effects on listed salmonids and eulachon: The proposed annual production goal for this program is 1,100,000 yearlings. Coho are released at 16 fpp (143 mm fl). Due to size differences between coho smolts and fingerling listed stocks, competition is unlikely with different prey items and habitat preferences.

Both juvenile and adult salmonids have been documented to feed on eulachon (Gustafson et al. 2010). Predation of eulachon by coho 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 acclimation 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) coho returning to Lewis Hatchery Complex.

Brood Year	Mortality		Return to Stream		Surplus	Spawn
	Lewis H.	Merwin FCF	Lewis H.	Merwin FCF		
2007	2	4	104	75	0	0
2008	1	0	88	114	0	0
2009	1	0	82	50	0	0
2010	0	0	62	43	0	0
2011	0	0	212	9	0	0
2012	0	0	27	14	0	0
Average	**1**	**1**	**95**	**50**	**0**	**0**

Source: WDFW Hatcheries Headquarters Database 2014.

- 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 wild coho 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. This program is intended to transition to an integrated program once reintroduction in the upper basin yields enough naturally produced fish to integrate with the lower river hatchery program. One of the objectives of this program 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.

Hatchery coho contribute to ocean sport, commercial and tribal fisheries; mainstem Columbia River sport and commercial fisheries; and Lewis River tributary sport fisheries.

Table 3.3.1: Lewis River Hatchery Type-S Coho fisheries contributions.

Brood Years: 2000-2009 Fishery Years: 2003-2012		
	Average SAR%[a]	**3.24**
Agency	***Non-WA Fishery***	***% of total Survival***
CDFG	All	*0.39*
CDFO	All	*0.11*
NMFS	All	*0.01*
Agency	***OR Fishery***	***% of total Survival***
ODFW	10- Ocean Troll	*0.67*
ODFW	21- Columbia R. Gillnet	*8.58*
ODFW	40- Ocean Sport	*8.90*
ODFW	44- Columbia R. Sport	*0.14*
ODFW	45- Estuarine Sport	*1.53*
ODFW	50- Hatchery Escapement [c]	*0.00*
ODFW	72- Juvenile Sampling - Seine (Marine)	*0.03*
Agency	***WA Fishery***	***% of total Survival***
WDFW	10- Ocean Troll	*0.57*
MAKA	15- Treaty Troll	*0.01*
WDFW	15- Treaty Troll	*0.41*
WDFW	22- Coastal Gillnet	*0.20*
WDFW	23- PS Net	*0.01*
WDFW	40- Ocean Sport	*0.02*
WDFW	41- Ocean Sport- Charter	*4.95*
WDFW	42- Ocean Sport- Private	*8.84*
WDFW	45- PS Sport	*0.40*
WDFW	46- Freshwater Sport[b]	*6.01*
WDFW	50- Hatchery Escapement	*58.15*
WDFW	50- Hatchery Escapement (Strays) [d]	*0.07*
	Total	*100.0*

Source: RMIS 2014

[a] Average SAR% = (tags recovered/tags released)

[b] Freshwater Sport based on WDFW Catch Record Card (CRC) data

[c] Includes recoveries at Big Creek Hatchery

[d] Includes recoveries at Fallert Creek, Kalama Falls, and Washougal Hatcheries.

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 Lower Columbia River Salmon and Steelhead ESA Recovery (Dornbusch and Sihler 2013).*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) 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:* Outmigrant 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.* Coho 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 coho 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 Lewis Hatchery Complex.

Facility	Water Source	Water Right		Available Water Flow	Avg Water Temp. (F°)[a]	Usage	Limitations
		Record/Cert. No.	Permit No.				
Lewis	Lewis R (lower intake)	S2-CV2P903/ 01084	01590	6 cfs	48-50	Broodstock Collection	Elevated water temperatures in the summer.
		S2-23233C WRIS	---	2 cfs			
	Lewis R (upper intake)	S2-24939C WRIS	-----	60 cfs			
Speelyai	Speelyai Creek (surface)[a]	S2-*10532CWRIS/ 07492	07941	15 cfs	48-55	Adult holding, spawning, incubation, rearing	None
	Speelyai Creek (intake)[b]	S2-*21697CWRIS/ 11380	15822	15 cfs			

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

[a] Right held by WDFW

[b] Right held by Pacifc Power & Light Co.

Speelyai Hatchery: Total available flow for Speelyai Hatchery is 9,200 gpm from a gravity flow intake on Speelyai Creek, tributary to Lake Merwin. All adults trapped are supplied with 100% NF Lewis River water, with adults selected for spawning purposed transported to the Speelyai Hatchery holding pond, where they are held on Speelyai Creek water. Water quality is excellent for adult holding. Maximum inflow at Speelyai is 20 cfs.

The Lewis River Settlement Agreement (SA 2004) outlined repairs and upgrades needed to the intake structures at Speelyai Hatchery. Modifications to the intake are scheduled for 2014.

The water right permit for the Speelyai Hatchery is formalized through the Washington Department of Ecology (see **Table 4.1.1**).

Lewis River Hatchery Water rights total 38,613 gpm from the Lewis River via the upstream reservoirs. All river water flow to the Lewis facility is provided via pumps. Water clarity is usually good, but can be water temperatures in the summer may be elevated. Ambient river temperatures during June through October can exceed 60°F (pers. comm. Mike Chamberlain 2014), so adults are transferred to Speelyai Hatchery.

The Lewis River Settlement Agreement (SA 2004) outlined repairs and upgrades needed to the intake structures at Lewis River Hatchery. Modifications to upstream intake were completed in 2012; modifications to the downstream intake are scheduled for 2015.

The water right permit for the Lewis River Hatchery is formalized through the Washington Department of Ecology (see **Table 4.1.1**).

NPDES Permits:
Speelyai and Lewis River hatcheries operate 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 (see Table 4.1.3)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Lewis WAG13-1040	Y	Y	Y	5/2/2013	0	N	Y
Speelyai WAG13-1041	Y	Y	Y	1/30/2014	1	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2013.

Table 4.1.3: List of NPDES violations at over the last five years (2008-2012).

Facility	Month/ Year	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
Speelyai	Oct 2010	TSS	Drawdown Max Grab	125.0 mg/L	100.0 mg/L	A combination of heavy rains and the pump not working properly.	Work order was submitted for the pump.

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.

Fish rearing activities meet State water quality guidelines and satisfy all required permits.

- 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.

5 SECTION 5. FACILITIES

The Lewis River Hatchery was renovated in 2009/2011. Modifications included a redesign of the adult pond and sorting facility and three rearing ponds, and conversion of the existing large asphalt-lined ponds to a series of large concrete raceways. The new ponds are designed with supply and drain systems that tie into the modifications of the adult ponds, providing a first-pass and reuse water supply.

Figure 5.1: Aerial view of Lewis River Hatchery ponds 13-15, after remodel was completed in 2011 (source: Lewis River Hatchery staff).

Completely remodeled, Pond 13 now consists of four concrete raceways (**Figure 5.1**). Two racways measure 190’ x 20’ x 7’ with 26, 600 cubic feet each. The other two measure 200’ x 20’ x 7’ with 28,000 cubic feet each. In-flow is provided from the upstream intake (USI) and is directed into the ponds via two sub-surface baffles behind header screens. Water exits the raceways behind a wall of outlet screens, either from an 18’’ winch-operated stand pipe over stop logs, or through a 24’’ gate-valve supplying reuse water from the Pond 14 series. Reuse/drain water from these raceways can alternately supply any or all side channels of Pond 15.

Another four concrete raceways were created in the footprint of the previous Pond 14, immediately downstream of the Pond 13 series (**Figure 5.1**). This completely remodeled Pond 14 now consists four raceways measuring 175' x 20' x 7' with 24,500 cubic feet each (**Table 5.5.1**). In-flow is also provided from the USI, and is directed into the ponds via two subsurface baffles behind header screens. All raceways in this series can be supplied with reuse from the effluent of the Pond 13 series in addition to fresh water supply. Water exits the raceways behind a wall of outlet screens, either from an 18'' winch-operated stand pipe over stop logs, or through a 24'' gate-valve supplying reuse water to Pond 15's center channel. Each new "pond" was outfitted with fish-friendly release channels connecting to a 36'' outlet line.

Completely remodeled, Pond 15 now has four 83' x 20' x 6' ponds with a volume of 8,500 cu ft. and one center (crowding channel) 170' x 20' x 6' with a vol. of 18,500 cu ft (**Figure 5.1**).

Completely remodeled, Pond 16 now consists of six concrete raceways (**Figure 5.2**). Three raceways are situated immediately above three lower raceways. The upper series measure 120' x 20' x 6.5' with 15,600 cubic feet each. The lower three measure 120' x 16' x 6.5' with 12,480 cubic feet each. In-flow is provided from the downstream intake (DSI) and is directed into the ponds via two subsurface baffles behind header screens. Water exits the raceways behind a wall of outlet screens, either from an 18'' winch-operated stand pipe over stop logs, or through a 24'' gate-valve supplying reuse water from the three upper raceways. The Pond 16 series was outfitted with fish friendly release channels connecting to a 36'' outlet line. A high pressure pump was installed in the outlet channel of the lower series to drive four Venturis for pond cleaning.

Figure 5.2: Lewis River Hatchery Pond 16 after remodel (source: Lewis River Hatchery staff).

The remodel also included above-ground valve access, individual float alarms, electrical outlets, lighting, walkways and handrails. The remodel has increased the rearing capacity and the quality of flow dynamics. In addition, these new changes are expected to lead to a better quality product with fewer disease problems and healthier smolts.

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 15 via the existing ladder and into the center channel (sorting pond) to be crowded (**Figure 5.3**). 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" (**Figure 5.4**). 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," pneumaticly driven devise 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 is used to transport 250 gallon holding tanks to the lower level where fish are released into an underground tube back the river.

Figure 5.4: Lewis River Hatchery adult holding/ sorting pond (Pond 15) during construction.

Figure 5.3: Lewis River Hatchery spawning building showing the "pescalator" and return tubes.

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-foot by 17 foot 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 Speelyai Hatchery.

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 may be transported from the Lewis River Hatchery and the Merwin Dam FCF upstream to the Speelyai.

5.3 Broodstock holding and spawning facilities.

Table 5.3.1: Adult holding/spawning facilities available at Lewis and Speelyai hatcheries.

Facility	Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
Lewis	4	Concrete adult /holding pond (Pond 15)	8,500	83	20	6	1000
Speelyai	1	Adult asphalt holding/ sorting pond	42,000	140	60	5	1000-1500

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available at Lewis and Speelyai hatcheries.

Facility	Type	Units (number)	Size	Flow (gpm)	Volume (cu.ft.)	Loading (eggs/unit)
Lewis	Vertical Stack Tray Units	50 units (16 tray stacks)	24" x 25' 'x 4"	5.0	n/a	8,000
Speelyai	Heath Vertical Stack Tray Units	50 units (9 tray stacks)	24" x 25' 'x 4"	3.5	n/a	9,000
	Deep trough Horizontal units	2 units (10 cells per unit)	1.25'x1.3'x1.3'	10	2.1	70,000

Lewis River Hatchery. The facility has an egg-eyeing capacity of 11-million, and utilizes FAL verticals and bulk eyeing troughs. Incubation water is supplied from the Lewis River via pumps and is equipped with a de-gassing tower to be used when total gas levels exceed the accepted standard. A backup pump is available if needed and the system is alarmed at several points to provide backup if one system fails. In case of power failure, the system is fully served by one of two auxiliary generators. Eggs are incubated on North Fork Lewis River water. Water temperature ranges from 48-55°F with a DO of 10.5ppm.

Speelyai Hatchery. Eggs are incubated on Speelyai Creek water; flow through the trays is 3.5 gpm. Water temperatures range from 48-55°F, with a DO of 10.5 ppm.

5.5 Rearing facilities.

Table 5.5.1: Rearing facilities at Lewis River Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Density Index
12	Concrete raceways	4,000	100	10	4	300	0.3
2	Concrete raceways (Pond 13)	26,000	190	20	7	4000	0.3
2	Concrete raceways (Pond 13)	28,000	200	20	7	4000	0.3
4	Concrete raceways (Pond 14)	24,500	175	20	7	4000	0.3
3	Concrete raceways (Pond 16)	15,600	120	20	6.5	2000	0.3
3	Concrete raceways (Pond 16)	12,480	120	16	6.5	2000	0.3

Lewis River Hatchery. Coho are ponded into the raceways, where they remain until mass-marked and coded-wire tagged in June/July. Rearing loadings adhere to the Piper et al. (1982) loading levels at all times. Lewis River water is used during the entire rearing period.

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

5.6 Acclimation/release facilities.

See HGMP section 5.5.

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

None that have resulted in significant mortality.

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.

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.

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 the coho volunteering to the Lewis Hatchery trap and Merwin Dam Fish Collection Facility (FCF) on the Lewis River. The majority of the fish collected are of hatchery stock, identified by the missing adipose fin. Only hatchery-origin broodstock have been used for propagation purposes, although prior to mass-marking starting in 1998, the level of integration with the natural-origin broodstock is unknown.

6.2 Supporting information.

6.2.1 History.

The initial broodstock came from native Lewis River coho salmon. Adult run timing of native Lewis River coho salmon historically extended at least from late-August through early-December. It is probable that run timing was more protracted but is not adequately reflected in the broodstock trapping records, which show that the adult collection period became shortened over time. The earliest record indicates adults were trapped into December and January, at least through 1936. By 1942, however, trapping was ended by the end of October. This practice persisted through the early 1980s.

6.2.2 Annual size.

Around 640 adult pairs are needed to achieve the established egg-take goal of 1,850,000 (FBD 2014), based on an average fecundity of around 3,000 eggs /female, and a pre-spawning mortality of 10%.

6.2.3 Past and proposed level of natural fish in broodstock.

Stock is derived from H x H crosses from returns to the Lewis River Hatchery traps. Lewis River Type-S hatchery coho have been mass-marked since the 1998 brood. The level of natural fish in the returning broodstock was unknown prior to the start mass-marking.

6.2.4 Genetic or ecological differences.

There are no known genotypic, phenotypic or behavioral differences between the hatchery and natural stocks in the Lewis River drainage. Historic run timing may have been more protracted, but it is not adequately reflected in the broodstock trapping records.

6.2.5 Reasons for choosing.

The Type S coho in the Lewis River, probably best represents the stock timing that would have best accesses the Upper Lewis watershed.

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.

All natural-origin fish trapped in the Lewis River Hatchery and Merwin FCF adult traps will be transported to the upper basin for reintroduction with minimal handling and holding time. Numbers of wild fish trapped, returned to the river or passed into the upper watershed, and any observed mortalities will be reported in near real-time in the WDFW Hatcheries Headquarters Database.

7 SECTION 7. BROODSTOCK COLLECTION

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

Marked hatchery adults collected from the run at-large returning to Lewis River Hatchery trap and Merwin Dam FCF (see HGMP section 5.1).

7.2 Collection or sampling design.

Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. The traps are opened for coho collection during the entire run (September through November) to allow for collection over the entire run timing. Traps are supplied with Lewis River water and have “V” weirs to prevent the escape of captured fish.

"Type S" coho are captured in volunteer traps on the Lewis River from September through early-November. Fish are sorted on a weekly schedule as 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 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.

7.3 Identity.

All type-S coho produced from this program are mass-marked (adipose fin-clip), with the exception of the double-index tag (DIT) group, which is released CWT-only. Scale samples and recovered CWTs will be read at WDFW Headquarters in Olympia. Fish morphology and timing are used to keep separation between the early and late stocks of coho.

7.4 Proposed number to be collected:

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

Around 640 adult pairs are needed to achieve the established egg-take goal of 1,850,000 (FBD 2014), based on an average fecundity of around 3,000 eggs smolts /female, and a pre-spawning mortality of 10%. This take provides 1,325,000 eyed-eggs to the on-station type-S coho program, and 450,000 eggs to the Deep River net pen program (see Deep River Net Pen Type-S Coho HGMP).

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, Speelyai Hatchery.

Brood Year	Egg-Take	Females	Males	Jacks
2008	1,339,150	417	416	1
2009	1,588,700	505	500	5
2010	1,806,600	482	478	7
2011	1,858,000	644	643	1
2012	591,600 [a]	224	221	3
2013	1,926,071	503	514	6
Average	**1,518,354**	**463**	**462**	**4**

Source: WDFW Hatcheries Headquarters Database 2014.
[a] Brood year 2012 shortfall was backfilled with Type-N coho.

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

In addition to the adults needed to meet broodstock goals, a minimum supplementation goal of 9,000 adults, has been established for the upper watershed. In years when surplus exceeds 9,500 adults, the Aquatic Coordination Committee (ACC) will need to determine if harvest should be increased or release additional coho into the upper watershed (H&S Plan 2006).

In previous years, when escapements were large, fish in surplus of nutrient enhancement needs were donated to local food bank organizations, sold to a contract buyer, or donated for educational purposes to local schools and colleges.

7.6 Fish transportation and holding methods.

Adults are transported from the Lewis River Hatchery and the Merwin Dam FCF upstream to the Speelyai Hatchery via tanker truck; transport time is around 25 minutes. The fish are held at Speelyai Hatchery in a ¼ acre holding/sorting pond, until spawned.

See also HGMP section 5.2.

7.7 Describe fish health maintenance and sanitation procedures applied.

Speelyai Hatchery. The adult holding area is separated from all other hatchery operations. 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 end the spawning day.

7.8 Disposition of carcasses.

Speelyai Hatchery. Spawned carcasses are either used for nutrient enhancement in the Lewis River and Cedar Creek system or taken to the local landfill for disposal along with pond mortality.

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.

Proper trap operation and fish handling techniques are followed. Broodstock are collected throughout the return period. Proper and safe adult transport methods are used.

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.

Spawners are selected randomly over the entire run, September through November, from fish arriving at both Lewis River traps.

8.2 Males.

A ratio of 1:1 males to females is used. Jack coho salmon (2-year olds) are incorporated into the broodstock as males at a minimum of 5% of the total number spawners.

8.3 Fertilization.

A ratio of 1:1 males to females is used. Five fish pools of eggs and five fish pool for sperm are combined. 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 (see also Lewis River Type-S Coho HGMP).

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.

- 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 rationale 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 Type-S coho on-station releases.

Brood Year	Egg-Take	% Egg Survival	
		Green-to-Eyed	Eyed Egg-to-Ponding
2002	1,188,000	92.9	98.9
2003	1,201,600	93.2	94.7
2004	1,134,119	89.6	98.9
2005	1,240,498	89.9	96.2
2006	1,146,550	92.6	91.1
2007	1,045,415	88.1	97.8
2008	1,110,313	89.6	98.6
2009	1,075,924	93.3	99.0
2010	1,285,979	94.1	94.6
2011	1,215,000	92.7	93.3
2012	569,600	96.3	98.1
2013	1,338,672	91.9	99.2

Source: WDFW hatchery data.
NA – Not available

The egg-take goal at Speelyai Hatchery is 1,850,000 (FBD 2014) : a total of 1,325,000 eyed-eggs shipped to Lewis River Hatchery for the to the on-station program, and 450,000 green eggs are shipped to Washougal Hatchery for the Deep River net pen coho program (see Deep River Net Pen Type-S Coho HGMP).

9.1.2 Cause for, and disposition of surplus egg takes.

The annual broodstock/egg-take collection is managed to prevent surpluses. 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.

9.1.3 Loading densities applied during incubation.

Eggs placed in vertical stack incubator trays. Incubation conditions are consistent with loading densities recommended by Piper et al. (1982).

9.1.4 Incubation conditions.

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

Month	Temperature Range (°F)	
	Lewis River	Speelyai Creek
October	56-60	48-51
November	50-57	47-49
December	45-51	44-46
January	41-44	44-45

February	41-42	45-47

Speelyai Hatchery. All eggs were water hardened in a 100-ppm iodophor solution for one hour. Water is supplied by Speelyai Creek to the eyed stage, with stack flows set to 3.6 gpm and deep troughs set to 10 gpm fungus growth on dead eggs in the incubators is controlled by formalin drip treatments at a target dose of 1:600 ppm formalin throughout incubation to just prior to hatching. Once eyed, eggs are shocked and dead eggs removed. Eyed eggs are then transferred to Lewis River Hatchery for the remainder of incubation. Average incubation temperature ranges at Speelyai Hatchery are 48-51°F in October, 47-49°F in November and 44-46°F in December (**Table 9.1.2**)..

Harmful silt and sediment is cleaned from incubation systems regularly, while eggs are monitored to determine fertilization and mortality. Incubation water is from Speelyai Creek; temperature is monitored and recorded, and temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable levels of saturation (minimum criteria of 8 ppm). When using artificial substrate, Vexar® or bio-rings, egg densities within incubation units are reduced by 10%.

Lewis River Hatchery. Eyed eggs received from Speelyai Hatchery are surface disinfected at 100 ppm for 10 minutes, then placed in vertical stack incubators. Water is supplied from the North Fork Lewis River; stack flows are at 5 gpm until ponding. Average water temperature ranges during incubation are 50-57°F in November, 45-51°F in December, 41-44°F in January, and 41-42°F in February (**Table 9.1.2**).

9.1.5 Ponding.

Lewis River Hatchery. Fry are typically ponded when the yolk slit is closed to approximately 1-mm wide (approximately 1320 TUs) or KD factor (95% yolk absorption).

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.

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.

Brood Year	Fry -to-Smolt Survival (%)
2001	99.8
2002	99.1
2003	98.4
2004	91.0
2005	93.7
2006	88.5
2007	95.7
2008	97.2
2009	92.6
2010	95.7
2011	94.7
2012	92.7

Source: WDFW Hatchery Data 2014.

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.

9.2.3 Fish rearing conditions

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

Month	Max-Min Water Temps (°F)
October	56-60
November	50-57
December	45-51
January	41-44
February	41-42
March	40-46
April	42-48
May	44-52
June	49-56
July	52-58
August	53-59
September	55-59

Source: WDFW Hatchery Data 2014.

Lewis River Hatchery. Fish are reared on a combination of river water. 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. Fish are mass-marked in June when they are about 120 fpp.

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 Lewis River Hatchery.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
January	37	964	0.897	Na
February	40	733	Na	0.240
March	49	340	1.130	0.536
April	57	244	Na	0.2838
May	66	156	Na	0.359
June	72	118	Na	0.244
July	79	95	1.150	0.197
August	84	78	Na	0.179
September	89	66	Na	0.148
October	97	52	Na	0.222
November	106	39	1.190	0.252
December	114	32	n/a	0.174
January	123	25	n/a	0.226
February	131	21	n/a	0.162
March	137	18	n/a	0.121
April	144	16	n/a	0.137

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 2-8 feedings/7 days a week, and end at 1 feeding/4 days a week. Feed rates vary from 0.6% to 2.0% 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.

Disease Treatment. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.

Sanitation. All eggs brought to the facility 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.

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

Fish from this program are released on a volitional basis over a six week period, with approximately 80% of the stock volitionally migrating during that time period. The remaining 20% are forced out prior to May 20.

No smolt index is assessed other than the pre-stated data. Fish size at release time is critical to the readiness for migration. The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, a leaner (0.95 – 1.05) condition factor (K), a silvery physical appearance and loose scales during feeding events are signs of smolt development.

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.

See HGMP sections 5.8, 6.3, 7.9 and 9.1.7.

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).**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	1,100,000	16.0	April/May	Lewis

Source: WDFW Future Brood Document 2014
Note: 16 fpp = 143 mm fork length (fl)

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

Stream, river, or watercourse: Lewis River (WRIA 27.0168)
Release point: RKm 20.9
Major watershed: Lewis
Basin or Region: Lower Columbia

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.

Release Year	Yearlings			
	Number	Avg Size (fpp)	CV	Date
2002	874,579	16.3	7.50	3/8
2003	912,230	15.0	7.86	5/7-5/10
2004	856,919	15.3	6.68	4/6-4/10
2005	883,851	15.5	7.94	4/21, 5/21
2006	901,746	15.0	7.60	5/15
2007	919,424	16.0	9.21	5/22
2008	841,547	14.0	6.04	5/19
2009	889,003	16.0	7.03	4/14-5/15
2010	891,884	15.9	8.51	5/10
2011	828,695	15.8	6.79	5/13
2012	1,002,933	15.7	7.93	5/16
2013	988,411	15.5	8.66	4/1, 4/22
Average	**828,513**	**15.4**	**7.66**	

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 16 fpp = 143 mm fork length (fl)

10.4 Actual dates of release and description of release protocols.

This program is released on a volitional basis over a six-week period beginning on or after April 1; approximately 80% of the stock volitionally migrate during that time period. The remaining 20% are forced out prior to May 20 (see **Table 10.3.1** for release dates).

10.5 Fish transportation procedures, if applicable.

Fish are reared from eyed-eggs to yearling stage at Lewis River Hatchery, and released directly into the mainstem Lewis River.

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

Fish are reared on river water from during their entire time at Lewis River Hatchery, and released from the ponds directly into Lewis River.

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

Brood Year	Yearlings	Mark Type
2014	75,000	AD+CWT
	75,000	CWT-only
	950,000	AD-only

Fish are 100% mass-marked with either adipose fin-clips (AD), AD + coded-wire tag (CWT) or CWT-only, to differentiate them from the natural population. A total of 150,000 CWTs are split between the AD+CWT and CWT-only group. Double Index Tag (DIT) groups (CWT-only) provide data on mark-selective fisheries catch contributions, run timing, total survival, migration patterns, straying, in-stream evaluations of juvenile and adult behaviors, NOR:HOR ratios on the spawning grounds.

Program fish are mass-marked in June through mid-July, when fish reach 120 fpp.

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.

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.

There have been no instances of flooding or water system failure leading to early releases, however, policies the water systems at all of the Lewis River facilities are backed-up either by generator power or a secondary system. Lewis River Hatchery also has the ability to flush release the fish into the lower river, should it be necessary. Every attempt to keep the fish alive and healthy throughout the entire rearing-release cycle will be accommodated and all appropriate resource managers from the complex level to the federal level will be informed of the actions taken.

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.

- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delay in the rivers, limiting interactions with naturally produced juveniles.
- Smolt releases occur in areas below known wild fish spawning and rearing habitat.
- Returning hatchery fish are under heavy selective harvest, and are identified by an adipose fin-clip.
- The DIT release group (CWT-only) provides data on mark-selective fisheries catch contributions, run timing, total survival, migration patterns, straying, in-stream evaluations of juvenile and adult behaviors, and NOR:HOR ratios on the spawning grounds.
- 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 Lewis River Hatchery programs are communicated to WDFW Region 5 staff for any risk management or needed treatment. See also HGMP section 9.7.

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 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.

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary, In addition, we will adaptively manage all 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 outmigrant 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: Lewis Hatchery Complex.

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			
LEWIS R	LEWIS R	COHO	11/20/06	NEV		AD	1121-5/6	50	10	50	10					
LEWIS R	LEWIS R	NCOHO	11/28/06	NEV		AD	1129-3/4	10	2	10	2					
SPEELYAI	LEWIS R	COHO	12/04/06	NEV		AD	1205-3/4	12	3	25	6					
SPEELYAI	LK MERWIN	KOK	10/04/06	**IHNV**	12+/12p OF & K/S	AD	1005-1	60	12	60	12			SN	E/C	10/17/06
SPEELYAI	LEWIS R	NCOHO	12/11/06	NEV		AD	1212-1/2	7	2	14	4					
SPEELYAI	LEWIS R	NCOHO	12/18/06	NEV		AD	1219-1/2	11	2	22	4					
SPEELYAI	LEWIS R/WILD	NCOHO	12/27/06	NEV		AD	1228-9	12	3							
SPEELYAI	LEWIS R	SCOHO	10/10/06	NEV		AD	1011-9/10	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/29/06	**IHNV**	7+/12p OF & K/S	AD	0830-1/2	60	12	60	12			SN	E/C	09/28/06
SPEELYAI	LEWIS R	SPCHIN	01/24/07	NEV	10^{0}, 10^{-1}; tails removed	JUV/06	0125-1					5	1			
LEWIS R	LEWIS R	NCOHO	11/27/07	NEV		AD	1128-11/12	60	12	60	12					
LEWIS R	LEWIS R	SPCHIN	01/02/08	NEV	diag; 10^{0} - 10^{-3}	JUV/06	0103-29			3	1					
SPEELYAI	LEWIS R	SPCHIN	08/28/07	NEV		AD	0829-8/9	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/10/07	NEV		AD	1011-2/3	60	12	60	12					
SPEELYAI	LEWIS R/WILD	NCOHO	11/28/07	NEV		AD	1129-1/2	23	5	23	5					
SPEELYAI	LEWIS R/WILD	NCOHO	12/05/07	NEV		AD	1206-7/8	22	5	37	8					
SPEELYAI	LEWIS R/WILD	NCOHO	12/12/07	NEV		AD	1213-10	15	3							
SPEELYAI	LK MERWIN	KOK	10/10/07	NEV		AD	1011-4/5	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	09/02/08	**PARAMYXOVIRUS**	1+/12p K/S	AD	0904-2/3	60	12	60	12			F&P	C	10/23/08
SPEELYAI	MERWIN LK	KOK	10/06/08	**IHNV**	6+/12p OF & 1/12p K/S	AD	1007-3/4	60	12	60	12			DB	E/C	10/17/08
SPEELYAI	LEWIS R	SCOHO	10/22/08	NEV		AD	1023-5/6	60	12	60	12					
SPEELYAI	LEWIS R	NCOHO	11/25/08	NEV		AD	1126-5/6	23	5	25	9					
SPEELYAI	LEWIS R	NCOHO	12/03/08	NEV		AD	1204-1/2	25	5	15	3					
LEWIS R	LEWIS R	NCOHO	12/09/08	NEV		AD	1209-8/9	60	12	60	12					
SPEELYAI	LEWIS R/WILD	NCOHO	12/10/08	NEV		AD	1211-1	46	10							
SPEELYAI	GOLDENDALE	RBT	01/12/09	NEV	diag, 10^{0}-10^{-2}	JUV/07	0113-6			2	1					
SPEELYAI	GOLDENDALE	RBT	01/12/09	**IHNV**	1+/1p K/S, diag, 10^{0}-10^{-2}	JUV/06	0113-5			3	1			DB	E/C	01/27/09
SPEELYAI	LEWIS R	SPCHIN	08/18/09	NEV		AD	0819-2/3	52	11	52	11					
SPEELYAI	LEWIS R	SPCHIN	08/18/09	NEV		AD	0819-2/3	52	11	52	11					
SPEELYAI	LEWIS R	SPCHIN	09/09/09	NEV		AD	0911-3/4	10	2	10	2					
SPEELYAI	LEWIS R	SPCHIN	09/09/09	NEV		AD	0911-3/4	10	2	10	2					
SPEELYAI	LEWIS R	SCOHO	10/07/09	NEV		AD	1007-7/8	60	12	60	12					
SPEELYAI	LK MERWIN	KOK	10/07/09	NEV		AD	1007-9/10	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/07/09	NEV		AD	1007-7/8	60	12	60	12					
SPEELYAI	LK MERWIN	KOK	10/07/09	NEV		AD	1007-9/10	60	12	60	12					
SPEELYAI	LEWIS R	NCOHO	11/23/09	NEV		AD	1124-3/4	15	3	30	6					
SPEELYAI	LEWIS R	NCOHO	11/23/09	NEV		AD	1124-3/4	15	3	30	6					
SPEELYAI	LEWIS R	NCOHO	11/30/09	NEV		AD	1201-17/18	22	5	30	6					
SPEELYAI	LEWIS R	NCOHO	11/30/09	NEV		AD	1201-17/18	22	5	30	6					
SPEELYAI	LEWIS R	NCOHO	12/07/09	NEV		AD	1208-4	20	4							
SPEELYAI	LEWIS R	NCOHO	12/07/09	NEV		AD	1208-4	20	4							
SPEELYAI	LEWIS R	NCOHO	12/14/09	NEV		AD	1215-18	3	1							
SPEELYAI	LEWIS R	NCOHO	12/14/09	NEV		AD	1215-18	3	1							
LEWIS	LEWIS R	NCOHO	12/15/09	NEV		AD	1215-15/16	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/15/09	NEV		AD	1215-15/16	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	06/28/10	**IHNV**	2+/3p K/S	IMM AD	0629-1			12	4			PCR	E/C	07/15/10
SPEELYAI	LEWIS R	SPCHIN	08/18/10	NEV		AD	0819-2	6	2							
SPEELYAI	LEWIS R	SPCHIN	08/31/10	**IHNV**	1+/12p OF	AD	0901-3/4	60	12	60	12			PCR	E/C	09/14/10
SPEELYAI	MERWIN LK	KOK	09/28/10	NEV		AD	0929-7/8	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/12/10	NEV		AD	1012-9/10	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/07/10	NEV		AD	1208-10/11	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/23/11	NEV		AD	0824-1/2	15	3	15	3					
SPEELYAI	LEWIS R	SPCHIN	08/31/11	**IHNV**	OF: 1+/9P; K/S NEV	AD	0831-7/8	45	9	45	9			DB		9/21/11

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			
SPEELYAI	LK MERWIN	KOK	10/12/11	NEV		AD	1013-1/2	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/12/11	NEV		AD	1013-3/4	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/13/11	NEV		AD	1214-5/6	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/28/12	**IHNV**	1+/12P	AD	0829-1/2	60	12	60	12			E/C	DB	9/18/12
SPEELYAI	LEWIS R	KOK	10/03/12	NEV		AD	1004-3/4	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/24/12	NEV		AD	1025-3/4	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/03/12	NEV		AD	1204-1/2	60	12	60	12					

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.

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.