HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Deep River Net Pen Type-S Coho (Segregated)
Species or Hatchery Stock:	Type-S Coho (*Oncorhynchus kisutch*) Lewis River Stock
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Columbia River Estuary
Date Submitted:	
Date Last Updated:	September 26, 2014

Executive Summary

The Washington Department of Fish and Wildlife is submitting a Hatchery and Genetic Management Plan (HGMP) for the Deep River Net Pens (DRNP) Type-S (early-returning) coho program to the National Marine Fisheries (NMFS) for consultation under Section 7 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*.

The purpose of the program is to produce Type-S coho to provide recreational harvest under mark-selective fisheries in the basin and lower Columbia River, under Mitchell Act funding, and also serves as mitigation for development (including hydro-power) and habitat degradation. Program fish are collected and spawned at the Lewis Hatchery Complex, (Lewis River - WRIA 27.0168), incubated and reared at Washougal Hatchery (Washougal River - WRIA 28.0159), and acclimated and released from the DRNP site (Deep River - WRIA 25.0071). The program will annually release 350,000 yearlings to the Deep River in the Grays-Elochoman watershed. Beginning in 2014 (brood year 2013) a portion of the release, 45,000 juveniles, will be coded-wire tagged (CWT) as well as adipose fin clipped.

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 program will be operated as a "segregated type" program, as defined by the HSRG. A "segregated" program is one in which only hatchery-origin individuals are used in the hatchery broodstocks. Segregation is achieved by using returning adult hatchery-origin Type-S coho returning to the Lewis Hatchery Complex (see Lewis River Type-S Coho HGMP). Coho from this program are released 100% mass-marked (adipose fin-clipped) to differentiate them from the natural population and enable harvest in mark-selective fisheries.

The Lower Columbia River coho are listed as "Threatened" under the ESA. The ESU includes the Lewis River Type-S artificial propagation programs.

Broodstock Collection:
The broodstock is derived from hatchery origin Type-S coho stock returning to the Lewis sub-basin (see Lewis River Type-S Coho HGMP).

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).

This DRNP Type-S program was initiated in 2008 (2010 release year). The net pen program is designed to put marked hatchery coho into the ocean, Buoy 10 and terminal fisheries where they can be harvested with minimal impact on ESA-listed natural-origin fish. No harvest data is currently available (RMIS 2014).

Monitoring and Evaluation:
Performance indicators for harvest for this program will be accomplished by continuing mass-marking (adipose fin-clip).

Operation and Maintenance of Hatchery Facilities:
The pens are located directly in the Deep River (at RKm 6.4); the river supplies all water to these programs. WDFW applied for NPDES coverage (under the "Upland Fin Fish Rearing General Permit") for Deep River net pens in December 2005. WDOE acknowledged receipt of the applications, but did not issue a permit, as WDOE has not yet developed a permit for freshwater net pens (the permit is currently under development). WDFW reapplied for the permit in March 2013 with similar results (personal comm. Catie Mains, WDFW Hatchery Data Section, 2014).

See also Lewis River Type-S Coho HGMP.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Deep River Net Pen Type-S Coho

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

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

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

1.3 Responsible organization and individuals

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

NOAA-National Marine Fisheries Service (NMFS) – Manager of Mitchell Act Funds

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

Funding Sources	Operation Information
Mitchell Act	Full time equivalent staff – 1.7 (supplied from Grays River and Beaver Creek facilities)*
	Annual operating cost (dollars) - $241,878**

* See also Lewis River and Washougal hatcheries

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

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Lewis River Early (Type-S) Coho

In the event of egg-take shortfalls, any surplus Type-S stock may be used as backfill for this program.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Lewis River Hatchery	Broodstock collection	Lewis River (WRIA 27.0168) at RKm 24.95, Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Merwin Dam FCF	Broodstock collection	Merwin Dam fishway, on the Lewis River (WRIA 27.0168) at RKm 30.42, Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Speelyai Hatchery	Adult holding/spawning	Speelyai Creek (WRIA 27.0431) at RKm 1.61, Lewis sub-basin; tributary to the Lewis River (WRIA 27.0168) at RKm 46.67; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Washougal Hatchery	Incubation, Rearing	Washougal River (WRIA 28.0159) at RM 13.7), Washougal sub-basin; Lower Columbia River, Washington
Deep River Net Pens	Acclimation, Release	Deep River (WRIA 25.0071, LLID 1236973462451) at RKm 6.4, Grays–Elochoman sub-basin; tributary to the Columbia River at R.M. 20.5, Columbia Estuary, Washington.

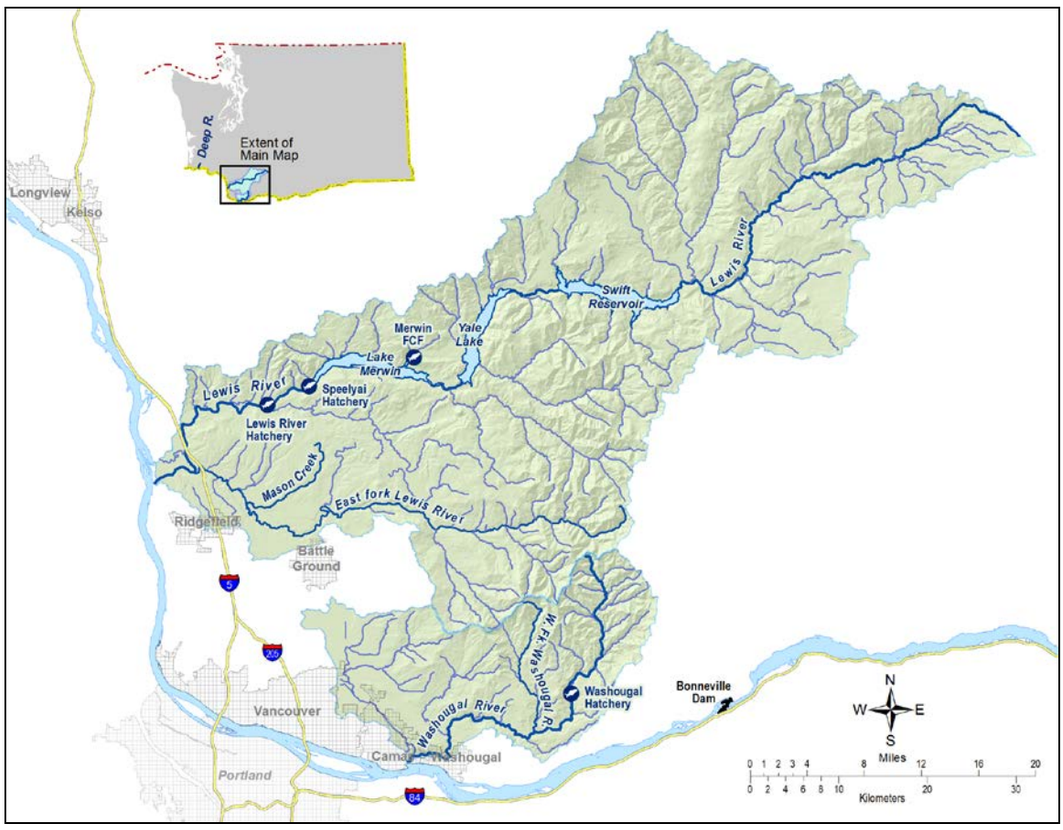

Figure 1.5.1: Map of location of Washougal, Lewis and Speelyai hatcheries, and Merwin Dam FCF. Source WDFW GIS 2014.

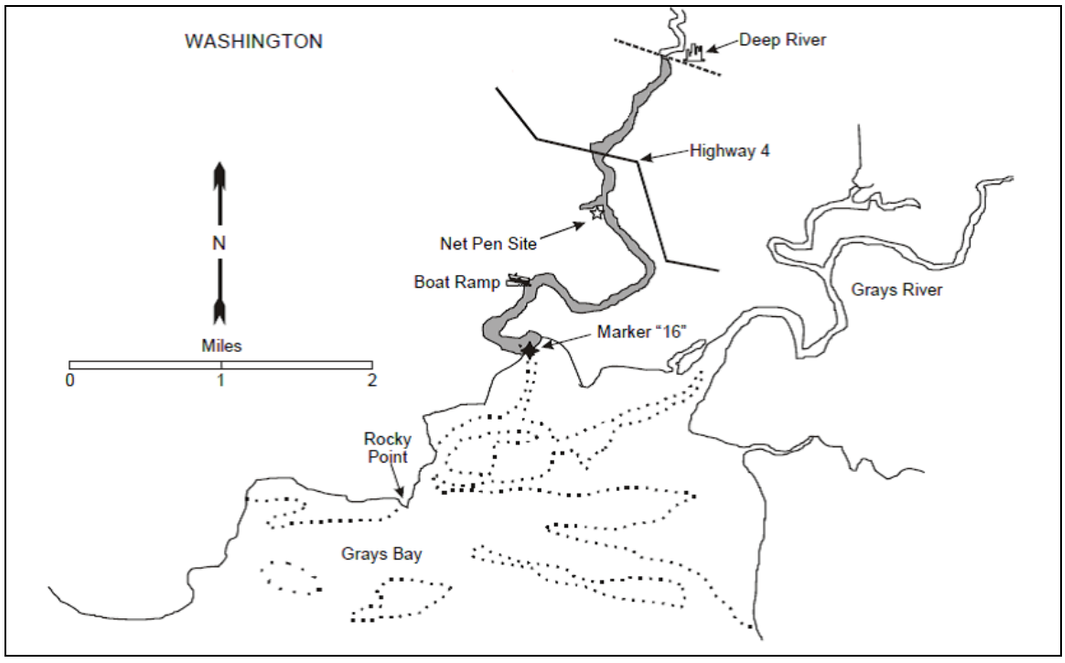

Figure 1.5.2 Deep River net pen site. Source: North et al. (2006).

1.6 Type of program.

Segregated Harvest

1.7 Purpose (Goal) of program.

Mitigation. The goal of this program is to support fisheries in the basin and lower Columbia River, while eliminating a directed harvest on wild fish. Also serves as mitigation for development (including hydro-power) and habitat degradation.

1.8 Justification for the program.

The program is funded through the Mitchell Act via NOAA-NMFS for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River-*Fish Management and Evaluation Plan* (FMEP) (WDFW 2001).

Mitchell Act programs are intended to support Northwest fishing economies – particularly coastal and Native American -- that have relied on Columbia River production both before and after dam construction. 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 LCSRP.

To minimize impact on listed fish by the Deep River Net Pen 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 Deep River Net Pen coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal Intake Screening Effluent Discharge	4.2	*Operation of Net Pen Facilities:* The Deep River Net Pen facilities meet State water quality guidelines and satisfy all permit requirements including Washington Department of Ecology #1995-SW00373 and Army Corps of Engineers 404 Permit for Navigable waters No. 98-1-01828. WDFW applied for NPDES coverage in December 2005; no permit was issued (see also HGMP section 4.2)
Broodstock Collection & Adult Passage	7.9	All fish are mass marked prior to release. Broodstock collection and sorting procedures can quickly identify listed non-target listed fish, and if encountered, released per protocol to minimize impact as determined by WDFW Region 5 staff. See also Lewis River Hatchery Type-S Coho HGMP.
Disease Transmission	7.9, 10.11	*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* (Fish Health Policy Chapter 5, IHOT 1995).
Competition & Predation	2.2.3, 10.11	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 1.10.1.1: "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 Columbia 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.	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. Creel surveys are being implemented to verify. HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
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.	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.
3.3.2 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.	Annually monitor and report size, number, mass-mark quality (mark rate) and date of all hatchery releases. Annually sample returning fish for the mass-mark in fisheries and at the hatchery; record numbers of estimated hatchery (marked) and natural (unmarked) fish. Report CWT analysis to RMIS database.
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 benefits for which the program is designed are achieved.	Program is designed to help achieve the end goal of conserving and stabilizing natural salmon populations.	Long-term monitoring of system population will indicate success of program.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1: **"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.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults on the spawning ground. 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 quality (fin clips, tags, etc.); monitor contribution of hatchery adult fish to fisheries and escapement. Harvest is regulated to meet appropriate biological assessment criteria. 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.
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 (fin clip/ tag rate) of hatchery releases. Examine returning fish encountered for the mass-mark (fin clip/ CWT) at the hatchery and on the spawning ground. Annually record numbers of estimated hatchery (marked) and natural (unmarked).
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at collection point.	Broodstock not collected at this site; see Lewis River Type-S Coho HGMP.
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.	Program was initiated in 2008. See HGMP section 11 for M&E information.
3.5.3 Artificially-produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS).	WDFW has plans to possibly utilize genetic samples to get at gene-flow estimates from recent hatchery operations (see HGMP section 11.1.)
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release).	Annually record and report release information, including location, method and age class in hatchery data systems (WDFW Hatcheries Headquarters Database).
3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct).	Annually monitor and record size, number, date of release and release type.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State*).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), *Fish Health Policy in the Columbia Basin*, and *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Health 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.	Not applicable at the net pen site (see HGMP section 4.2).
3.7.3 Water withdrawals and in-stream water diversion structures for artificial	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening	Not applicable at the net pen site (see HGMP section 4.2).

production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	criteria for juveniles and adults.	
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 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.	Broodstock not collected at this site; see Lewis River Type-S Coho HGMP.
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).
3.8.1 Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	Total cost of operation.	Compare annual operational cost of program to calculated fishery contribution value (Wegge 2009).
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 130 pairs are needed to achieve the established egg-take goal of 385,000 (FBD 2014) for this program, based on an average fecundity of around 3,000 eggs/female.

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

Table 1.11.2.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Max. No.	Location	Major Watershed	Eco-Province
Yearlings	350,000	Deep River	Grays/Elochoman	Columbia Estuary

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.

This Type-S coho program was initiated with the 2008 (release in 2010). Beginning in 2014 (BY 2013), a portion of the group (45,000) will receive a coded-wire tag (CWT). Once these tagged fish begin to return (fishery year 2016), return data can be analyzed.

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

The Type-S coho program was initiated with the 2008 brood (release in 2010). The Deep River Net Pen Selected Area Fish Enhancement (SAFE) coho program, which also operates on this site, uses Toutle stock and has operated in the area since 1995 (1993 brood).

1.14 Expected duration of program.

On-going program with no plans for termination.

1.15 Watersheds targeted by program.

Deep River (WRIA 25.0071), Grays-Elochoman Sub-Basin, Columbia River Estuary.

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.

Program will be evaluated to determine if returning adults are straying into Lower Columbia Tributaries.

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 Estuary, and is consistent with the mitigation responsibility of the Mitchell Act program requirements.

Alternative 2: Use local hatchery stocks: This action would require development of a local hatchery broodstock program, including adult collection facilities and acclimation sites. The Elochoman River (Beaver Creek Hatchery) does not have a hatchery Type-S coho program.

Alternative 3: Switch to an Integrated Type-N program at Grays River Hatchery: This action would require development of a new broodstock source for this program (HSRG 2009).

Alternative 4: Reduce release size from 12 fpp to 15 fpp. Program release size was reduced to 15 fpp in 2012 as a cost-saving measure.

1.16.3 Potential Reforms and Investments

None.

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 7.

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 Lower Columbia River (LCR) Chinook Evolutionarily Significant Unit (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 fifteen artificial propagation programs. Excluded are Upper Columbia River bright hatchery stocks that spawn in the mainstem Columbia River below Bonneville Dam and in other tributaries upstream from the Sandy River to the Hood and White Salmon rivers (NMFS 2014 79FR20802).

Status: Currently, only two of 32 historical populations in the ESU – the North Fork Lewis and Sandy late-fall populations –are considered viable. Most populations (26 out of 32) have a very low probability of persistence over the next 100 years, and some populations are extirpated, or nearly so. Five of the six strata fall significantly short of the Willamette- Lower Columbia Technical Recovery Team (WLC TRT) criteria for viability. One stratum – Cascade late fall – meets the WLC TRT criteria (Dornbusch and Sihler 2013). 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 2010 recovery plan analyses, all of the 14 Tule populations (**Table 2.2.2.1**) 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.

Table 2.2.2.1: 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: LCFRB 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.

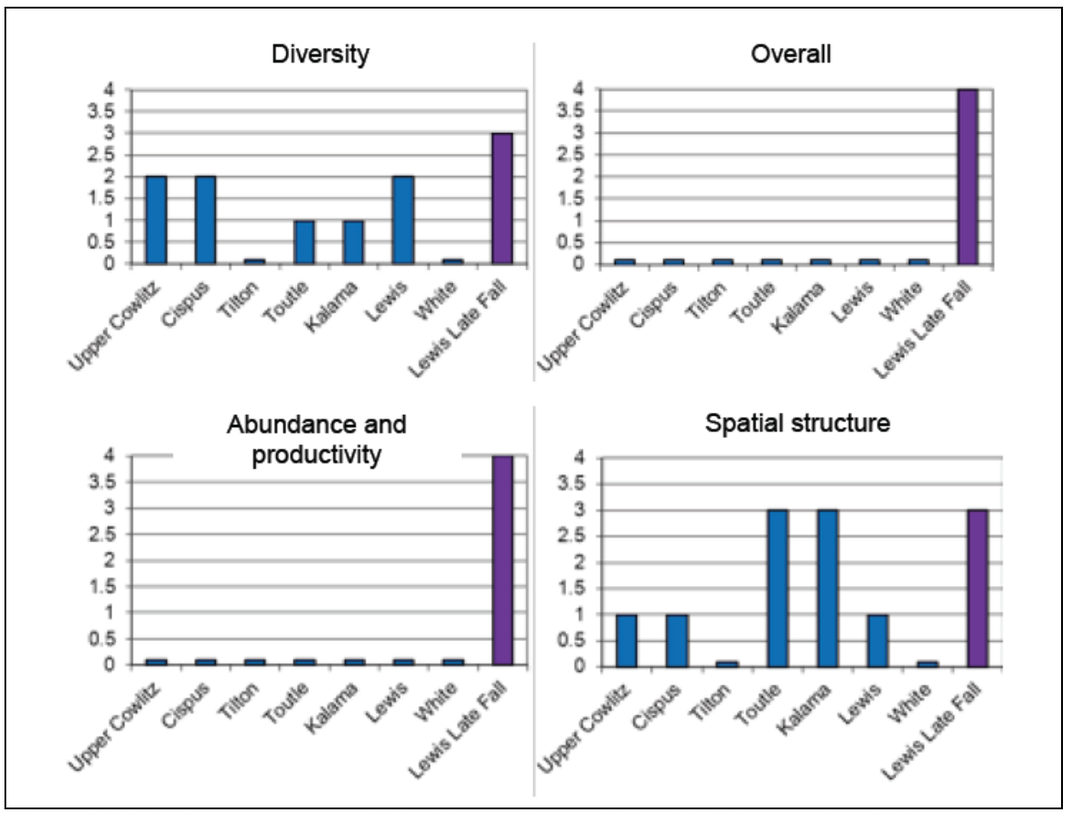

Figure 2.2.2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, 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).The DPS includes seven artificial propagation programs: the Cowlitz Trout Hatchery Winter-late (Lower Cowlitz), Kalama River Wild (winter- and summer-run) and Lewis River Wild Winter (NMFS 2014 79FR20802).

Status: Currently, 16 of the 26 steelhead populations in the ESU have low or very low probability of persisting over the next 100 years, and six populations have a moderate probability of persistence. Only the summer-run Wind population is considered viable. All four strata in the DPS fall short of WLC TRT criteria for viability (Dornbusch and Sihler 2013). 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 2.2.2.2: 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: LCFRB 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.

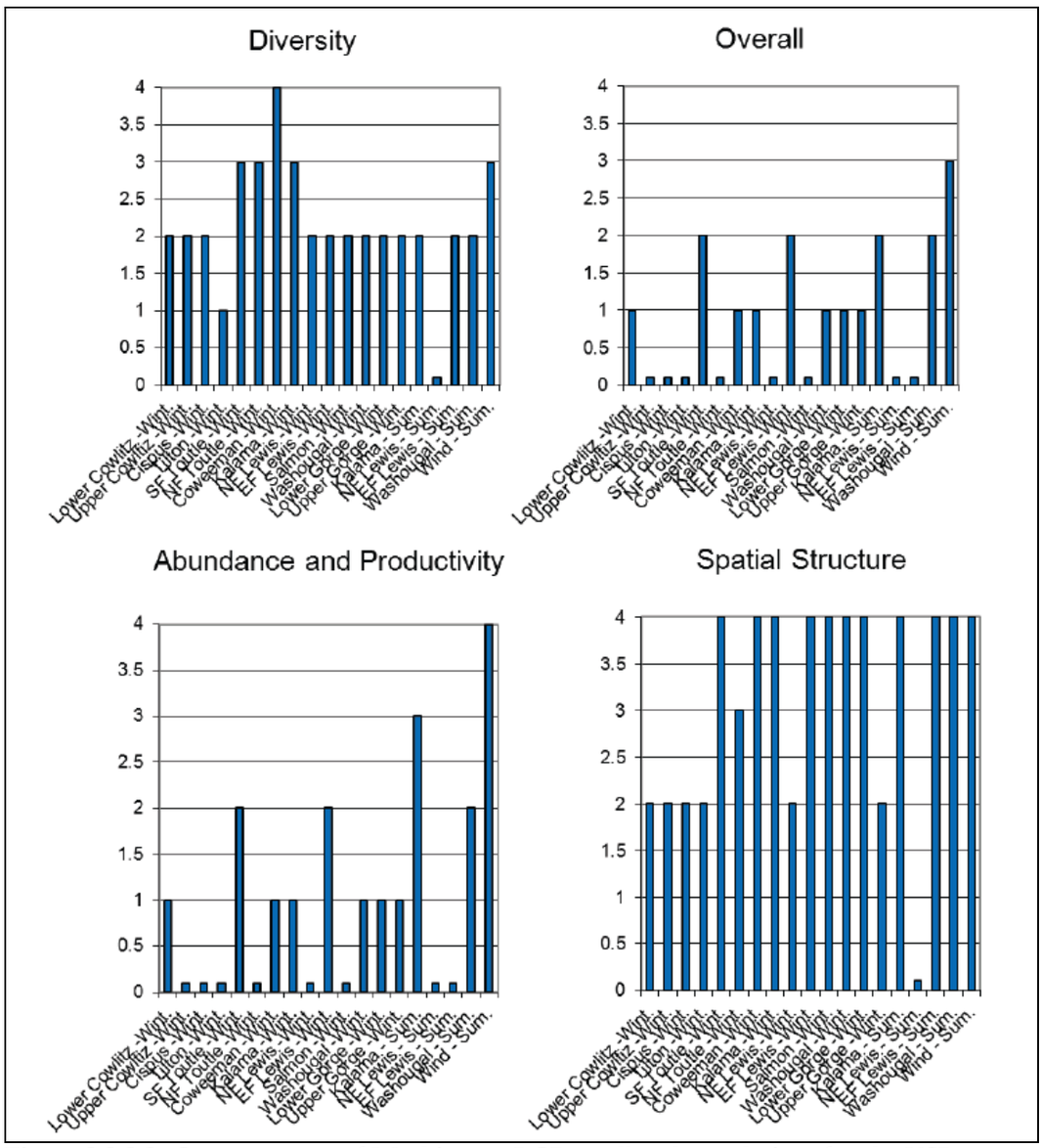

Figure 2.2.2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") 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-one artificial propagation programs include: the Grays River, Peterson Coho Project, 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 and Type-S Coho Programs, Lewis River Type-N and Type-S Coho programs, Fish First Wild Coho and Type-N Coho programs, Syverson Project Type-N Coho Program, and Washougal Hatchery Type-N Coho Program (NMFS 2014 - 79FR20802).

Status: 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, Dornbusch and Sihler 2013). All of these 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 three years of monitoring should be available in the near future. Currently, 21 of the 24 Lower Columbia River coho salmon populations are considered to have a very low probability of persisting over the next 100 years, and none is considered viable (Dornbusch and Sihler 2013). All three strata in the ESU fall significantly short of the WLC-TRT criteria for viability.

Table 2.2.2.3: 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: LCFRB 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).

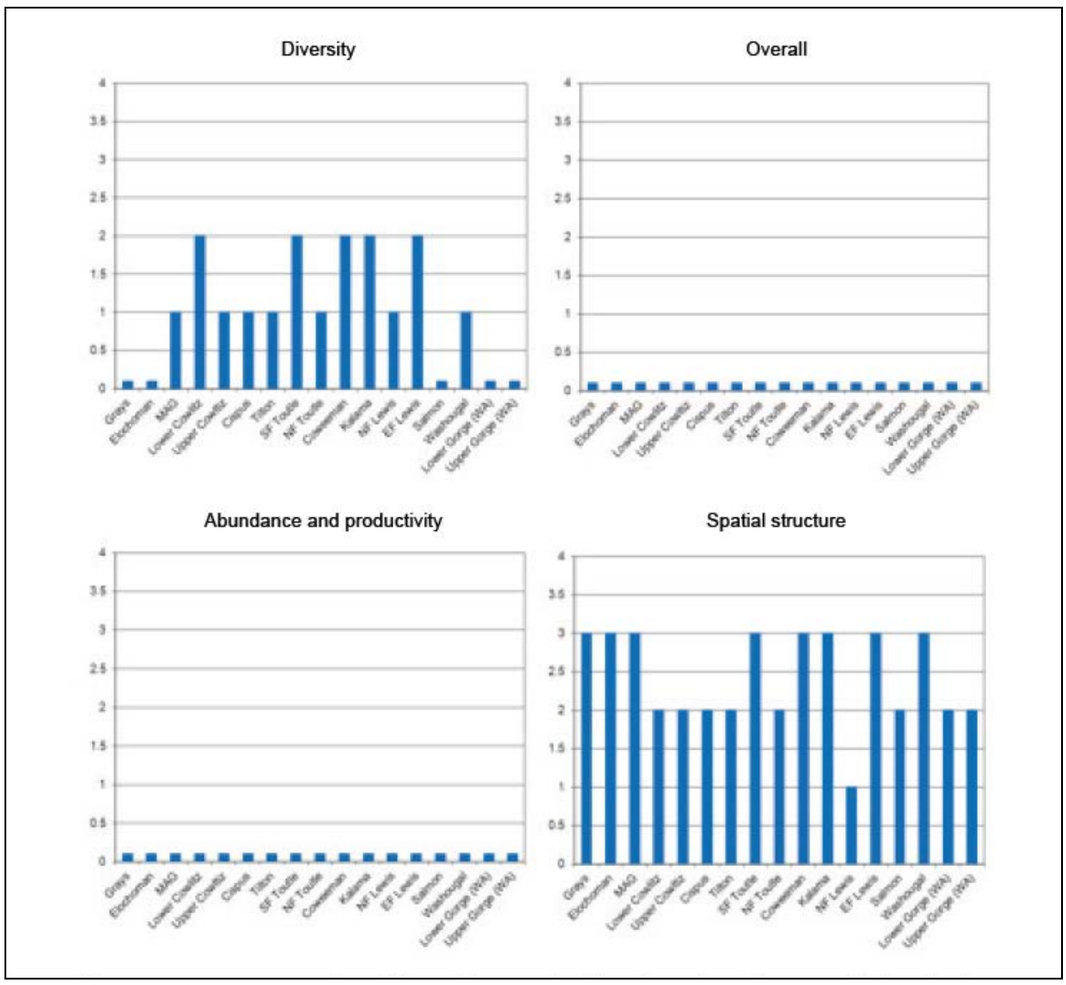

Figure 2.2.2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") 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: Grays River and Washougal River/Duncan Creek (NMFS 2014 – 79FR20802).

Status: 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 abundance, productivity, spatial structure, and diversity (McElhany et al. 2000). The result of this analysis is shown in **Figure 2.2.2.4**. The analysis indicated 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). Currently, 15 of the 17 populations that historically made up this ESU are so depleted that either their baseline probability of persistence is very low or they are extirpated or nearly so; this is the case for all six of the Oregon populations. Currently almost all natural production occurs in just three populations: Grays/Chinook, Washougal (with 99% of that production occurring at the I-205 spawning areas in the mainstem Columbia River) and the Lower Gorge. All three strata in the ESU fall significantly short of the WLC TRT criteria for viability (Dornbusch and Sihler 2013).

Table 2.2.2.4: 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: LCFRB 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.

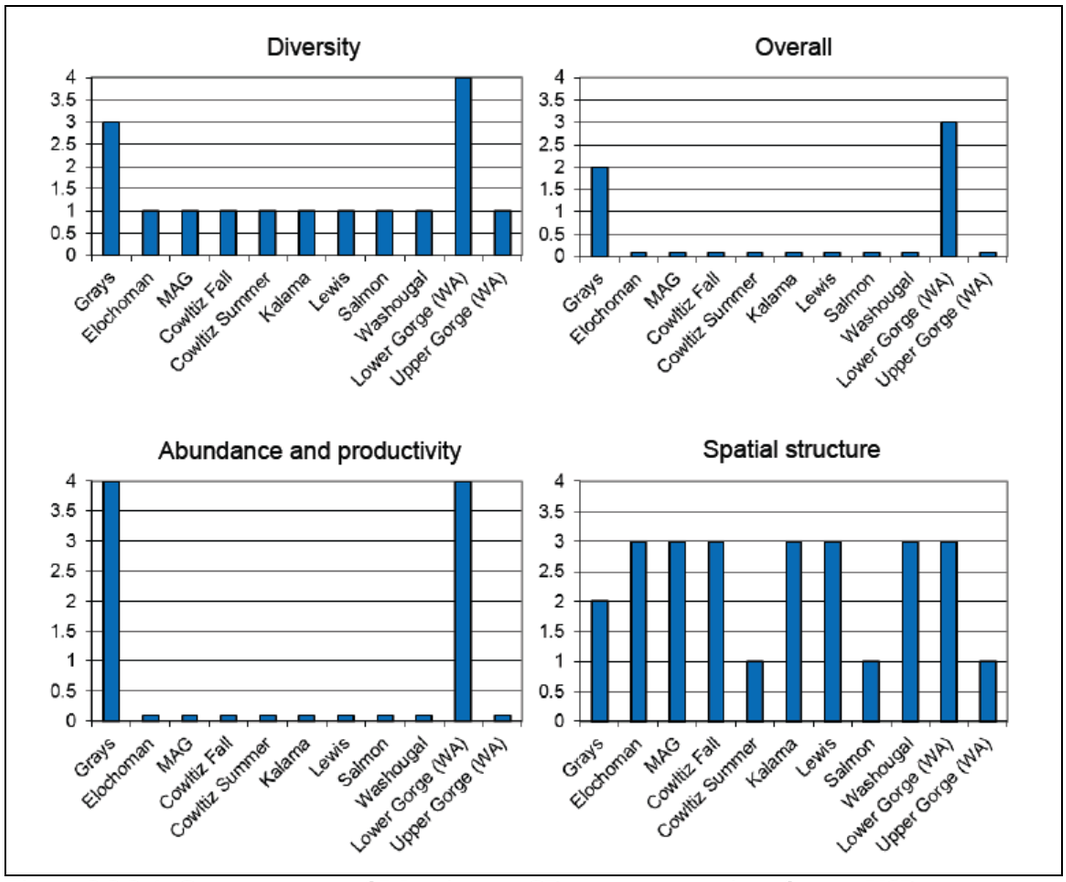

Figure 2.2.2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

- 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. Juvenile coho production estimates is the one measure of production in the Lower Columbia system.

Table 2.2.2.5: 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 2.2.2.6: 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 2.2.2.7: 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 2.2.2.8: Wild winter steelhead 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	**1,486**	**853**	**508**
LCSRP Abundance Target	**800**	**600**	**500**
2000	1,064	650	380
2001	1,130	656	458
2002	724	370	354
2003	1,200	668	342
2004	1,132	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 2.2.2.9: Wild winter steelhead 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	**1,064**	**1,058**	**NA**	**1,000**	**1,243**	**520**
LCSRP Abundance Target	**500**	**600**	**600**	**600**	**500**	**350**
2000	530	490	----	921	NA	NA
2001	384	348	----	1,042	377	216
2002	298	640	----	1,495	292	286
2003	460	1,510	----	1,815	532	764
2004	722	1,212	----	2,400	1,298	1,114
2005	370	520	388	1,856	246	320
2006	372	656	892	1,724	458	524
2007	384	548	565	1,050	448	632
2008	722	412	650	776	548	732
2009	602	498	699	1,044	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 2.2.2.10: 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	**1,000**	**NA**	**NA**	**1,557**
LCSRP Abundance Target	**500**	**500**	**500**	**1,000**
2001	286	271	184	457
2002	454	440	404	680
2003	817	910	607	1,096
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	1,084*	956*	1,468
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 2.2.2.11: 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.

Deep River does not naturally support coho habitat, and the net pen fish are not managed to contribute to any natural population. These coho are part of the Lower Columbia River Coho ESU are listed under ESA.

Potential hatchery-origin strays from this program into adjacent basins (Grays/Elochoman) are reduced by the use of monitoring weirs (NOAA Section 10(a) Scientific Research Permit #16578) that are in place and operating during the fall Chinook return to trap and remove identified (marked) hatchery fish from the systems. Returning hatchery coho to these weirs are removed to assist in controlling pHOS.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, which 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: There is no adult collection, egg-take or incubation activities associated with this program. See also Lewis River Hatchery Type-S Coho HGMP.

Rearing Program:
Operation of Hatchery Facilities: Net pen rearing is conducted under the criteria and policies of the Integrated Hatchery Operations team (IHOT). Full time rearing at the net pens does not occur and avoids summer and early fall temperatures (60-70°F) that are detrimental to the project and surrounding environment. Appropriate net pen mesh size confines the program until fish are in smolt condition and ready for release. Siting and placement of the net pen complexes are permitted and rearing activities meet State water quality (NPDES Clean Water Act) guidelines and satisfy all permit requirements. 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 Deep River Net Pen coho predation and competition effects on listed salmonids and eulachon: The proposed annual production goal for this program is 350,000 fish. This time frame of release could encounter listed fish (emerging chinook, chum and coho) in the Deep River, Grays River or Sea Resources sub-basins. Coho are released at 15 fpp (146 mm fl), reduced from 12 fpp in 2012. Competition is unlikely, due to size differences between coho smolts and fingerling listed stocks (**Table 2.2.3.1**), with different prey items and habitat preferences. In addition, the net pens are located well below the existing in-stream rearing habitat. Indirect take from predation is unknown.

Table 2.2.3.1: Peak migration timing and average fork length (mm) of out-migrant juvenile Chinook, coho and steelhead captured in rotary screw traps on Mill, Germany and Abernathy creek, Lower Columbia River, 2008.

Stream	Chinook		Coho		Steelhead	
	Avg Size (mm)	Peak Migration	Avg Size (mm)	Peak Migration	Avg Size (mm)	Peak Migration
Mill Cr	37.0	Mar 10-Apr 13	104.2	June 2-8	154.5	Apr 28-May 4
Germany Cr	39.8	Mar 17-23	115.3	May 19-25	177.8	May 12-18
Abernathy Cr	37.9	Mar 31 – Apr 6	112.1	May 19-25	163.8	May 12-18

Source: Kinsel et al 2009.

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 sites.

- Minimal residualism from WDFW coho programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss et al. 2000) and on Nemah and Forks Creek (Riley et al. 2004).

Monitoring:
See HGMP section 11.1.1, and Lewis River Type-S Coho HGMP.

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

Unknown. See also Lewis River Type-S Coho HGMP.

- 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).

No "Take" tables will be provided for this program. See also Lewis River Type-S Coho HGMP.

- 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.

For listed species, any abnormal take observed, staff would inform WDFW District Biologist, Fish Health Specialist, or Area Habitat Biologist, who along with the Complex Manager would determine an appropriate plan and consult with NOAA for adaptive management review and protocol.

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. These net pen fish are not managed to contribute to any natural population (HSRG 2009). WDFW's primary objective is to augment harvest while trying to minimize the abundance of hatchery-origin fish on the natural spawning grounds. The *LCFRB Recovery Plan* (2010) identifies the presence of hatchery-origin fish on the natural spawning grounds as a factor in the reduced productivity of the natural populations in Lower Columbia River ESUs.

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

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

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

Descriptions of these policies and excerpts are shown below:

Policies/Plans – Key Excerpts
Hatchery and Fishery Reform Policy: Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the *Hatchery and Fishery Reform Policy C-3619* in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under *U.S. v Washington* (1974) and *U.S. v Oregon* and that hatchery reform actions must be done in close coordination with tribal co-managers. Washington Fish and Wildlife Commission Policy: POL-C3619.

Guidelines from the policy include:

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

(watershed) specific population designations and application of HSRG broodstock management standards.

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

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

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

Strategies:

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

Mitchell Act: This program receives Mitchell Act Funding. Initially passed in 1938, the Mitchell Act is intended to help rebuild and conserve the fish runs, and mitigate the impacts to fish from water diversions, dams on the mainstem of the Columbia River, pollution and logging. The Mitchell Act specifically directs establishment of salmon hatcheries, conduct of engineering and biological surveys and experiments, and installing fish protective devices. It also authorizes agreements with State fishery agencies and construction of facilities on State-owned lands. NMFS has administered the program as of 1970. There are 15 Mitchell Act hatcheries in Washington State; the majority of which are below Bonneville Dam.

The Mitchell Act programs are intended to support Northwest fishing economies – particularly coastal and Native American -- that have relied on Columbia River production both before and after dam construction. 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 LCSRP.

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

Future Brood Document (*FBD*). Hatchery salmon and steelhead production levels are detailed in the annual FBD, 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.

These coho are part of the Lower Columbia River Coho ESU and are listed as a threatened species. The net pen program is designed to put marked hatchery coho into ocean, Buoy 10 and terminal fisheries where they can be harvested with minimal impact on ESA-listed natural-origin fish. These fish are not meant to contribute to any natural populations or recovery of the ESU (HSRG 2009).

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.

This is a new program, initiated with the 2008 brood (released in 2010). No harvest data is currently available (RMIS 2014). Beginning in 2014 (2013 brood) a portion of the group, 45,000 juveniles, will be coded-wire tagged (CWT) which will yield harvest data beginning in 2016.

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* (LCFRB 2010), and the *Lower Columbia River Salmon and Steelhead ESA Recovery Plan* (Dornbusch and Sihler 2013).

Sub-Basin Planning - The Lower Columbia fish Recovery Board (LCFRB) has adopted the *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans* (LCFRB 2010) with

the understanding that implementation of the schedule and actions for local jurisdictions depends upon funding and other resources.

Habitat Treatment and Protection - Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. EDT has been modeled for productivity in the Cowlitz basin in the *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans*. 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 25 LFA was conducted by the Washington State Conservation Commission (Wade 2002). WRIA 25 is located in Southwest Washington within portions of Lewis, Cowlitz and Pacific counties, encompasses numerous tributaries to the Columbia River (including Deep River), and is separated into three sub-basins; Mill/Germany/Abernathy, Elochoman/Skamokawa, and the Grays. Streams within WRIA 24 were included in the Grays River Sub-basin.

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program:* Out-migrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on coho 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 fall Chinook, coho and steelhead programs are released from WDFW hatchery facilities in adjacent systems, and limited natural production of Chinook, coho, chum and steelhead occurs in this system along with non-salmonids (sculpins, lampreys and sucker etc.).

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Hatchery fish provide an additional food source to natural predators (see #1 in this section) 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 for Deep River Net Pens Type-S coho program.

Facility	Water Source	Water Right	Available Water Flow	Avg Water Temp. (F°)[a]	Usage	Limitations
Speelyai Hatchery	Speelyai Cr. (surface)	S2-10532C WRIS	9,200 gpm	48-55	Adult holding, incubation	None
Washougal Hatchery	Washougal River (surface)	S2-25274C WRIS	10.0 cfs 12.0 cfs	48 48	Rearing	Limited water during summer months due to low flows. Temps in lower river can reach the 70s in the summer.
	Boyles Creek		5.5 cfs	48	Rearing	Limited water during summer months due to low flows.
	Bob Creek (surface)		3.0 cfs	48	Rearing, incubation	None. Not used for incubation in the summer.
Deep River NP	Deep River (surface)	Not Required	NA	34 - 62°F	Acclimation	Too warm for fish rearing during the summer months; late-June - September

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

Speelyai Hatchery: See Lewis Type-S Coho HGMP.

Washougal Hatchery. Four electric pumps deliver river water to the hatchery at 1,600 gpm each from intakes on the Washougal River. Two turbine-driven pumps can also provide water at up to 2,000 gpm each; the turbine pumps provided up to 700 gpm prior to replacement in 2012. An emergency generator located in the pump house can run the electric pumps in case of power outage. During lower-use periods (November/December), the river intake supplies 3,500 gpm (7.8 cfs); from March through August, use increases to 7,500 gpm (16.7 cfs).

Spring water from Boyles Creek, located approximately 68.6 m from the hatchery, supplies 2,300 gpm (5.1 cfs) non-turbid and minimal silt-laden water to the hatchery during high flow river events and is used for ponds 13 thru 24 as well as 27 for fall Chinook rearing. Since this is a short stream from a spring source, the agency has determined there are no fish populations within this stretch and does not need a screen intake. A gravity intake on Bob Creek is located 0.54 km from the grounds and supplies 2.5 cfs for incubation. Water temperature stays constant year-round, and it is not used for incubation in the summer months. “C-Creek”, another small spring source, is not used anymore (Richard Johnson, pers. comm., 2004).

During summer, water from the river intake reflects elevated temperatures. Water temperature data collected at the Washougal Salmon Hatchery between 1987 and 1991 also documents high water temperatures in the upper Washougal basin. During this five-year recording period, water temperatures at the hatchery frequently exceeded 17.8°C during July, August and September; in some cases for as long as 17 days in a row.

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

Deep River Net Pens. The pens are located directly in the Deep River (at RKm 6.4); the river supplies all water to these programs. Ambient water temperatures until April are acceptable for rearing (>56°F) but by late-April/early-May, surface water temperatures can reach the high 50s to low 60s.

NPDES Permits:
Speelyai and Washougal 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 (WDOE).

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				
Speelyai WAG13-1041	Y	Y	Y	2/22/2006	1	N	Y
Washougal WAG13-1026	Y	Y	Y	07/25/2012	0	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.

WDFW applied for NPDES coverage (using the "Marine/Freshwater Salmonid Net-Pen National Pollutant Discharge Elimination System Waste Discharge Permit Application Form") for Deep River net pens in December 2005. WDOE acknowledged receipt of the application, but did not issue a permit, as WDOE has not yet developed a permit for freshwater net pens (the permit is currently under development). WDFW reapplied for the permit in March 2013, with similar results (personal comm. Catie Mains, WDFW Hatchery Data Section, 2014).

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.

Speelyai Hatchery. 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.

Washougal Hatchery. Intake structures were designed and constructed to specifications at the time the Washougal facility was built. The *Mitchell Act Intake and Screening Assessment* (2002) has determined that the intake screens and velocity at Washougal Hatchery are not compliant with NOAA fish screening standards. The allowable velocity of 0.40 fps is exceeded and the backup pump is too close to the screen area, causing high approach velocities. WDFW has requested funding for future scoping, design, and construction work of a new intake system.

Feeder creek streams are spring-fed and determined to be non-fish bearing streams, therefore, of no impact. Due to the steep elevation and grade, the stream is a natural barrier to fish and Bob Creek is not a fish-bearing stream.

Deep River Net Pens. Fish rearing activities meet State water quality guidelines and satisfy all permit requirements including Oregon Department of Environmental Quality #101198 and Washington Department of Ecology #1995-SW-00373.

Other risk aversion measures taken:

- Net pen sites are geographically isolated from listed fish habitat.
- Siting of the pens has sufficient depth and flow for siting guidelines.
- Net pen mesh sizes retain program fish throughout the rearing period.
- Program fish are confined in structures until an active smolting phase and time is achieved.

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

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

Ponds (number)	Pond Type	Volume (cu-ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Adult /Sorting Pond (Asphalt)-Lewis	7,000	200	7.0	5.0	3,500
1	Adult /Sorting Pond (Asphalt)- Merwin Dam	5,040	60	12.0	7.0	25,000

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. See also Lewis River Type-S Coho HGMP.

In the event of egg-take shortfalls, any surplus Type-S stock may be used as backfill for this program.

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

Green eggs and milt are transported from Speelyai Hatchery to Washougal Hatchery in an insulated box on back of pickup; transit time is approximately 100 minutes.

Table 5.2.1: Transportation equipment available at Washougal Hatchery.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker truck	1,800	Y	N	180	Sodium chloride (salt)	5,000

Sub-yearlings are transported from Washougal Hatchery to Deep River Net Pens in a tanker truck in November; average transit time is 2-3 hours.

5.3 Broodstock holding and spawning facilities.

Broodstock are not spawned at this facility. See Lewis River Type-S Coho HGMP.

5.4 Incubation facilities.

Eggs for this program are incubated at Washougal Hatchery.

Table 5.4.1: Incubation vessels available, Washougal Hatchery.

Type	Units (number)	Size			Flow (gpm)	Volume (cu-ft)	Loading (eggs/unit)
		Length	Width	Depth			
Vertical Stack Tray Units (16 trays/stack)	72 (1,152 trays)	24-in	25-in	4-in	3-5	0.55/tray	8,000
Fiberglass DeepTroughs w/ cell baffles (9-cells/trough)	4	14-ft	3-ft	25-in	8-12	87	1,000,000

Washougal Hatchery. Fertilized eggs are incubated in the deep troughs until eyed, then moved to Heath stack incubators for hatching. Water source is from Bob Creek (spring water); water temperatures during incubation average 45°F. Standard 1:6000 (1,667 ppm) formalin drip treatments controls fungus on eggs and are administered for 15 minutes, six times a week.

5.5 Rearing facilities.

Coho for this program are ponded and reared to the sub-yearling stage (25 fpp) at Washougal Hatchery (see also Washougal Coho HGMP).

Table 5.5.1: Rearing facilities available, Washougal Hatchery.

Pond Type	Units (No.)	Volume (cu-ft)	Size			Flow (gpm)	Max. Flow Index	Max. Density Index
			Length (ft)	Width (ft)	Depth (ft)			
Concrete Raceways	12	4,800	80	20.0	3.0	265	2.69	0.17
Concrete Raceways	12	8,300	135	17.5	3.5	320	2.10	0.068
Concrete Rearing Pond	1	85,500	475	40	4.5	11,000	2.26	0.26

5.6 Acclimation/release facilities.

Table 5.6.1: Acclimation/release facilities at Deep River net pens.

Pens (No.)	Pond Type	Volume (cu-ft)	Length (ft)	Width (ft)	Depth (ft)	Flow (gpm)	Max. Flow Index	Max. Density Index
1-40	Net Pens- Deep River Site	5,200	20	20	13.0	NA	U	U

Sub-yearlings (25 fpp) are transferred from Washougal Hatchery to the Deep River Net Pens in November. Fish are acclimated to the lower Deep River and mainstem Columbia River tidal influence for approximately 5-6 months until release in May.

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

Speelyai Hatchery. See Lewis River Type-S Coho HGMP.

Washougal Hatchery. Drought events have caused problems in water availability and quality (temperature). Icing and slushing problems during the winter within the ponds can be a problem. Otherwise, the facility does not experience abnormal operational difficulties.

Deep River Net Pens. Avian (kingfishers and blue heron) and mammal (otter and mink) predation impact the program and can cause significant mortality.

The current release timeframe (May 1) can occur after smolting behavior starts in March in some years. With smolting behavior, fish stress levels increase with the population using energy trying to escape from the pens. Pushing and swarming against the sides of the net pen results in scale

loss and some body abrasions. Along with elevating temperatures starting in April, overall fish health can deteriorate because of smolt stress.

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.

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.

Speelyai Hatchery. See Lewis River Type-S Coho HGMP.

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

Deep River Net Pens. The program is distributed over multiple net pen units to reduce overall risk. Net pen mesh sizes used are appropriate to retain the fish until smolt stage is reached without premature escape. Predator measures of cover nettings and electrical grid fences are used to minimize predation impact. Grays River staff provides operational support five times weekly, or as needed.

See also Lewis River Type-S Coho HGMP.

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 (see also Lewis River Type-S Coho HGMP). 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.

In the event of egg-take shortfalls, any surplus Lower Columbia River Type-S hatchery stock may be used as backfill for this program.

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 operations ended by late-October. This practice persisted through the early-1980s, with rare exceptions.

This project was initiated with the 2008 brood, and is in addition to the SAFE Type-S coho program, which uses Toutle River stock. The program is part of the C&SFP to maintain overall coho production in the Lower Columbia basin.

6.2.2 Annual size.

Around 130 adult pairs are needed to achieve the established egg-take goal of 385,000 (FBD 2014) for this program, based on an average fecundity of around 3,000 eggs/female (see also Lewis River Type-S Coho HGMP).

6.2.3 Past and proposed level of natural fish in broodstock.

Stock is derived from HxH crosses from returns to the Lewis River Hatchery traps. Natural-origin fish are currently not integrated within the Deep River NP broodstock program.

Lewis River Type-S hatchery coho adult returns have been mass-marked since the 1998 brood (see Lewis Type-S Coho HGMP). The level of natural fish in the returning broodstock was unknown prior to the start mass-marking.

6.2.4 Genetic or ecological differences.

Lewis River Hatchery coho are genetically different from Grays or Elochoman coho.

Deep River is not coho habitat and the net pen fish are not managed to contribute to any natural population (HSRG 2009).

6.2.5 Reasons for choosing.

The broodstock chosen has the desired life history traits to meet harvest goals. See also HGMP section 6.2.1.

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.

- This program is managed as a segregated program, genetically separated from the natural coho in the Columbia Estuary Basin.
- Only hatchery stock used.
- Holding pen procedures follow IHOT guidelines.
- Weir/traps on the Grays and Elochoman rivers prevent upstream migration from hatchery strays into the system (see Grays and Elochoman Steelhead HGMPs).

See also Lewis River Type-S Coho HGMP.

7 SECTION 7. BROODSTOCK COLLECTION

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

Marked hatchery adults returning to Lewis River Hatchery trap and Merwin Dam FCF (see HGMP section 5.1).

7.2 Collection or sampling design.

All coho broodstock used for the programs at Lewis River and Speelyai hatcheries are volunteers to the traps at Lewis River Hatchery and Merwin Dam FCF. The traps are opened for coho collection during the entire run. Traps are supplied with Lewis River water and have “V”-weirs to prevent the escape of captured fish.

Early (Type S) coho are captured in volunteer traps on the Lewis River from September through early-November. The recent egg-take procedures have tended to collect eggs from two major run timing components. Egg collection from the earliest part of the run has been limited to one or two days within the second or third week of October. All fish are identified to wild or hatchery origin, through fin-clips and examined 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 will be read at WDFW Headquarters in Olympia. All Type-S coho produced for this program are mass-marked.

See also Lewis River Type-S Coho HGMP.

7.3 Identity.

This program uses Lewis River Hatchery "Type-S" coho stock, identified by run-timing. All Type-S coho are released with an adipose fin-clip (AD).

See also Lewis River Type-S Coho HGMP.

7.4 Proposed number to be collected:

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

Around 130 pairs are needed to achieve the established egg-take goal of 385,000 (FBD 2014) for this program, based on an average fecundity of around 3,000 smolts/female.

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

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

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

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

7.6 Fish transportation and holding methods.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

See also HGMP section 5.2.

7.7 Describe fish health maintenance and sanitation procedures applied.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

7.8 Disposition of carcasses.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

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.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

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, from September through November, from fish arriving at both Lewis River traps; see Lewis River Type-S Coho HGMP.

8.2 Males.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

8.3 Fertilization.

Broodstock is not collected at this site. See Lewis River Type-S Coho HGMP.

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 9.1.1.1: Survival rates (%) from egg-take to ponding, Lewis River Type-S coho at Washougal Hatchery.

Brood Year	Eggs Transferred	% Survival	
		Green-to-Eyed Eggs	Eyed Egg-to-Ponding
2008	400,000	83.7	98.1
2009	420,000	87.3	98.3
2010	464,120	89.7	98.1
2011	433,000	88.1	98.7
2012	435,000[a]	81.5	98.8
2013	452,071	83.8	98.6

Source: WDFW Hatcheries Headquarters Database 2014, hatchery data.
NA – Not available
[a] Speelyai Hatchery experienced a shortfall in Type-S coho egg-take (see Lewis Type-S Coho HGMP). Eggs were provided from North Toutle Hatchery.

The egg-take goal for this program is around 385,000 (FBD 2014). This is part of a larger type-S coho egg-take at Speelyai (1,850,000), which provides 1,325,000 eyed-eggs to the Lewis River Type-S Coho program (see Lewis Type-S Coho HGMP). Green eggs are shipped from Speelyai Hatchery to Washougal Hatchery for eyeing and ponding.

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.

Washougal Hatchery. Eggs are placed in deep troughs to the eyed stage then moved to stack incubators for hatching. Dead eggs are removed, and enumeration and loadings are adjusted. The *Integrated Hatchery Operations Team* (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate, and incubator capacities.

9.1.4 Incubation conditions.

Washougal Hatchery. All eggs were water hardened in a 100-ppm iodophor solution for 1 hour and hatched in vertical incubators with flows set at 3.5 gpm. Once eyed, eggs are shocked and dead eggs removed. Eyed-eggs are loaded into the stack incubators at 10,000 eggs/tray, and incubated on surface water at a flow of 5 gpm. All eggs were treated with formalin, dripped at 1:600 to control *Saprolegnia* until hatched. Incubation water is from Bob Creek. Water temperatures during incubation average 45°F, and dissolved oxygen (DO) content has been at acceptable levels of saturation, with a minimum criteria of 8 to 10 ppm. Siltation is controlled with rodding, as needed. Vexar® is used as an artificial substrate.

Eyed egg-to-ponded fry loss will be picked at the time of ponding and then fry mortalities are removed daily afterward.

9.1.5 Ponding.

Fry are typically ponded when the yolk slit is closed to approximately 1-mm wide (approximately 1,600 TUs) or KD factor (95% yolk absorption). At this time, fry are put into a 400-gallon fry tank and transferred to the appropriate raceway,

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.

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 9.2.1.1: Survival rates (%) from ponding to release.

Brood Year	% Survival	
	Fry-to-Sub-yearling (Washougal)	Sub-yearling-to-Smolt (DRNP)
2008	98.2	84.7
2009	98.6	97.3
2010	97.4	95.4
2011	97.6	91.7
2012	98.4[a]	98.2

Source: WDFW Annual Escapement Reports and Hatcheries Headquarters Database 2014.
NA – Not available

[a] A portion of the 2012 brood (151,415 sub-yearlings) were transferred to Skamania Hatchery for rearing in May 2013. This was to make room for the additional 1-million fall Chinook raised for the DRNP program (see Deep River Net Pen Fall Chinook HGMP). Fish were transferred directly from Skamania Hatchery to the net pens.

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

Washougal Hatchery. 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.

Densities are kept at or below 3.3 lbs /gpm and 0.5 lbs /cu ft. before the last loading reduction in the fall of the year. Trough maximum loading is 40 lbs at 12 gpm (3.33 lbs/gpm). Tank and raceway maximum loading for early rearing is 132 lbs for the tanks at 40 gpm (3.3 lbs/gpm) and 800 lbs per raceway at 300 gpm.(2.66 lbs/gpm). The final loading per raceway is approximately 3,200 lbs. at 400 gpm (8.0 lbs/gpm).

Deep River Net Pens. The goal is to raise fish to 15 fpp at release. Around 15,400 lbs of coho are transferred in November. Density starts at 0.375 lbs/cu-ft, and is around is 1 lbs/cu-ft at release.

9.2.3 Fish rearing conditions

Washougal Hatchery. Fish are reared on a combination of river and spring 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. See also Washougal Coho HGMP.

Fish are mass-marked in June when they are about 120 fpp. Sub-yearlings (25 fpp) are transferred to the net pen site in November; transport time is 2-3 hours

Deep River Net Pens. The site is monitored for water quality to determine whether any change is occurring in local biochemical composition. Monthly measurements of water chemistry and macro invertebrate populations have been conducted before, during and after each rearing period.

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 9.2.4.1: Monthly fish growth information by length (mm), weight (fpp), condition factor and growth rate, collected during rearing at Washougal 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

Source: WDFW hatchery data 2014.
Na – Not available

Table 9.2.4.2: Monthly fish growth information by length (mm), weight (fpp), condition factor and growth rate, collected during rearing at Deep River Net Pens.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
November	112	32	Na	1:1
December	115	30	Na	1.05:1
January	120	27	Na	1.15:1
February	125	24	Na	1.1:1
March	134	19	Na	1:1
April	146	15	1.05	1:1

Source: WDFW hatchery data 2014.
Na – Not available

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 and fry feed; the food brand used may vary, depending on cost and vendor contracts.

Washougal Hatchery. Feeding frequencies varies depending on the fish size and water temperature, and usually begin at 8 feedings/7 days a week to 2 feedings/7 days a week; frequency of feeding decreases as fish grow from fry (hourly) to smolt (once or twice daily). Feed rates range from 0.05 to 2.0% B.W./day. The overall season feed conversion ratio has averaged approximately 0.09.

Deep River Net Pens. Feeding frequency is 1 feeding/day; feed rate is 1% B.W./day. Overall feed conversion ratio is 1:1.

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

See also Lewis River Type-S Coho and Washougal Coho HGMPs.

Deep River Net Pens. WDFW staff conducts work at the net pens five days/week. Observations and weekly progress is communicated to the area Fish Health Specialist monthly. Loss rate above normal >1 fish per day (0.02) or other problems are reported immediately. After release, net pens are removed from the water, dried and broom cleaned at the hatchery grounds and stored until needed for the next cycle.

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

Gill ATPase levels are not measured. Hatchery staff observe fish behaviors as signs of smolt development. These include aggressive screen and intake crowding, swarming against sloped pond sides, a lean (0.90-1.0) condition factor (K), a silvery physical appearance absent of parr markings and loose scales during feeding events.

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	350,000	15.0	April 15	Deep River

Source: WDFW Future Brood Document 2014
Note: 15 fpp = 146 mm fork length (fl)

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

Stream, river, or watercourse: Deep River (WRIA 25.0071)
Release point: RKm 6.4
Major watershed: Grays-Elochoman
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
2010	292,000	11.0	7.52	May 3
2011	325,000	11.9	11.79	May 2
2012	338,000	15.3	7.30	May 12
2013	320,000	14.0	5.33	May 1
2014	280,000[a]	15.8	5.14	May 1

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 12 fpp = 157 mm fork length (fl); 15 fpp = 146 mm fl.
[a] Brood year 2012 North Toutle stock.

10.4 Actual dates of release and description of release protocols.

Net pen sides are lowered in mid-April to allow fish to swim out. An option exists to tow the net pen complex to the Columbia mainstem if needed to further avoid further risks to native chum salmon (see **Table 10.3.1** for release dates).

10.5 Fish transportation procedures, if applicable.

Sub-yearling coho (25 fpp) are transported from Washougal Hatchery to the Deep River net pen site via tanker truck in November. Fish are loaded with 6-inch fish pumps and oxygen is supplied through diffuser stones in the tanks. Temperature is monitored in the tank and tempering is performed at the release site if the difference between the tank and the release water is greater than 7ºF. Supplemental oxygen is administered at 2.5 liters per minute. Densities are always less than one pound per gallon. The fish have been released from the net pen locations.

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

Sub-yearling coho (25 fpp) are transferred from Washougal Hatchery to the Deep River net pen site (RKm 6.4) in November. Fish are reared and acclimated at the net pen site, near the mouth of Deep River, and released as yearlings (15 fpp) in May.

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

Table 10.7.1: Marks applied, by brood year, age class and mark-type, Deep River Net Pen coho releases.

Brood Year	Yearlings	Mark Type
2014	45,000	AD+CWT
	305,000	AD-only

Fish are 100% mass-marked with adipose fin-clips (AD), to differentiate them from the natural population. Mass-marking begins in June, when fish reach 120 fpp. Marking is suspended in the summer months due to rising water temperatures, and resumes in October when the fish are around 65 fpp. Deep River Net Pen coho are probably clipped during the first round.

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

The level of fish transferred to the net pen complexes would not exceed program levels so releases would not have any surplus.

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 six 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.

The Complex Manager would contact and inform regional management of any emergency situations. Policy is generally to retain fish at the site. Net pen operation includes an Emergency Response Plan pursuant to section S6.A-J of the *Upland Fin-fish Hatching and Rearing National Pollutant Discharge Elimination System Waste Discharge General Permit*, which outlines contingency plans in case of emergencies. Emergency release of fish in case of severe flooding could be one of the emergency plan options.

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.

- Net pen sites are geographically isolated from listed fish habitat.
- Siting of the pens has sufficient depth and flow for siting guidelines.
- Program fish are confined in structures until an active smolting phase.
- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.

- WDFW uses acclimation and release of smolts in lower river reaches where possible, this in an area below known wild fish spawning and rearing habitat.
- All program fish are mass-marked for harvest removal.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.
- WDFW fish health and operational concerns for the Deep River Net Pen program is communicated to Region 5 staff for risk management or needed treatment. See also HGMP section 9.2.7.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Performance indicators for harvest will be accomplished by continuing mass marking (ad clip). CWT recoveries will help determine stray rate contributions on spawning grounds by watersheds close in proximity to this program's release vicinity. 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. WDFW is currently conducting the following Mitchell Act-funded research, monitoring and evaluation projects:

Table 11.1.1.1: Current WDFW Mitchell Act-funded research, monitoring and evaluation projects.

Project	Description
Lower Columbia River Monitoring	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 out-migrant 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 2011).

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

Except for a risk involving genetic introgression, all other aspects of the M&E outlined in HGMP section 1.10 are currently funded (see also HGMP section 11.1.1).

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.

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, WDFW will adaptively manage all aspects of the program to continue to minimize associated risks using the more recent available scientific research.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

No research is directly associated with the program.

12.2 Cooperating and funding agencies.

Any research is conducted by WDFW and funded through Mitchell Act.

12.3 Principle investigator or project supervisor and staff.

Not applicable.

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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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.

Several listed and candidate species are found in Wahkiakum County; 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.

“No effect” for the following listed species:

Bull trout (*Salvelinus confluentus*) – Threatened (Critical Habitat Designated)
Marbled murrelet (*Brachyramphus marmoratus*) –Threatened (Critical Habitat Designated)
Columbian White-Tailed deer (*Odocoileus virginianus leucurus*) – Endangered
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened (Critical Habitat Designated)

Candidate Species:
(Cathlamet) Mazama pocket gopher (*Thomomys mazama* ssp. *louiei*) [historic]
Streaked horned lark (*Eremophila alpestris strigata*)

15.3 Analyze effects.

Not applicable.

15.4 Actions taken to minimize potential effects.

Program fish are released fully smolted to foster rapid outmigration from the basin and to minimize predation and residualism risks.

15.5 References

Not applicable.