HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Deep River Net Pen (SAFE) Type-S Coho (Segregated)
Species or Hatchery Stock:	Type-S Coho (*Oncorhynchus kisutch*) North Toutle Hatchery 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) Select Area Fisheries Enhancement (SAFE) Coho Program to the National Marine Fisheries (NMFS) for consultation under Section 10(a)(1)(A) or 4(d) 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 mitigate for reduced coho salmon catch in sport and commercial fisheries due to habitat and passage loss or degradation in the Columbia River Basin, with minimal effects on natural-origin fish. Program fish are collected and spawned at the North Toutle Hatchery Complex, located on the Green River (WRIA 26.0323) in the Cowlitz sub-basin; incubated and reared at Grays River Hatchery, located on the West Fork Grays River (WRIA 25.0130) in the Grays-Elochoman sub-basin; and acclimated and released from the DRNP site, located on the Deep River (WRIA 25.0071). The program will annually release 400,000 yearlings to the Deep River in the Grays-Elochoman watershed.

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 North Toutle Hatchery (see North Toutle Type-S Coho HGMP). Coho from this program are released 100% adipose fin-clipped (AD) to differentiate them from the natural population and enable harvest in mark-selective fisheries. In addition, 30,000 yearlings are also released adipose fin clipped and coded-wire tagged (CWT).

The Lower Columbia River coho are listed as "Threatened" under the ESA. The ESU includes the North Toutle Hatchery artificial propagation program.

Broodstock Collection:
The broodstock is derived from hatchery origin Type-S coho stock returning to the North Toutle Hatchery (see North Toutle 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).

The net pen program is designed to put marked hatchery coho into commercial and sport ocean, Columbia River and Select Area fisheries, where they can be harvested with minimal impact on ESA-listed natural-origin fish. The first year of coho releases from this net pen operation was in 1995 (1993 brood). Due to limitations that not all fish can be accounted for as being harvested or as back-to-rack counts, smolt-to-adult survival rates (SAR) are likely underestimated. Based on the average SAR of 1.85% for brood years

2000-2009, and a programmed release goal of 400,000 yearlings, the estimated production goal would be 7,400 adults.

Monitoring and Evaluation:
Performance indicators for harvest for this program will be accomplished by continuing mass-marking (adipose fin-clip). WDFW is responsible for sampling its SAFE fisheries to collect biological data, including CWT recoveries, and for summarizing data to estimate landed catch. The landed catch from all SAFE fisheries is sampled for biological information, including collecting scale and snout samples for aging and CWT recovery to determine stock origin, straying and survival rates. Minimum target sampling rates are 20% of the landed catch by area and season.

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 issued 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 a similar result (personal comm. Catie Mains, WDFW Hatchery Data Unit, 2014).

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Deep River Net Pen Select Area Fisheries Enhancement (SAFE) Type-S Coho

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

North Toutle Hatchery Type-S Coho (*Oncorhynchus kisutch*)

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

ESA Status: "*Threatened*" June 28, 2005 (70FR37160); reaffirmed on August 15, 2011 (76FR50448).

1.3 Responsible organization and individuals

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Fish Management Staff Lead Contact

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

*Bonneville Power Administration (*BPA*)*
- Funding source and administrator (SAFE Net Pen Program)

Oregon Department of Fish and Wildlife (ODFW)
- Sponsor and Regional Fisheries Management entity

Clatsop County Economic Development Council (CEDC) – Sponsor

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

Funding Sources	Operation Information
BPA	Full time equivalent staff - 3*
	Annual operating cost (dollars) - $414,537

* Deep River net pens are supported from Grays River Hatchery.
Note: The above information for 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: North Toutle Hatchery 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
North Toutle Hatchery	Broodstock collection, Adult holding/spawning, Incubation, Rearing	Green River (WRIA 26.0323) at RKm 0.81; tributary to North Fork Toutle River (WRIA 26.0314) at R.M. 11.5; tributary to the Toutle River (WRIA 26.0227) at R.M. 17.2; tributary to the Cowlitz River (WRIA 26.0002) at R.M. 20.0; tributary to the Columbia River at R.M. 68.0, Lower Columbia River, Washington.
Grays River Hatchery	Incubation, Rearing	West Fork Grays River (WRIA 25.0130) at RKm 3.2; tributary to the Grays River (WRIA 25.0093) at RKm 20.9; tributary to the Columbia River at RKm 37.0, Lower Columbia River, Washington.
Deep River Net Pens	Acclimation, Release	Deep River (WRIA 25.0071) at RKm 6.4, Grays–Elochoman Sub-basin; tributary to the Columbia River at R.M. 20.5, Columbia Estuary, Washington.

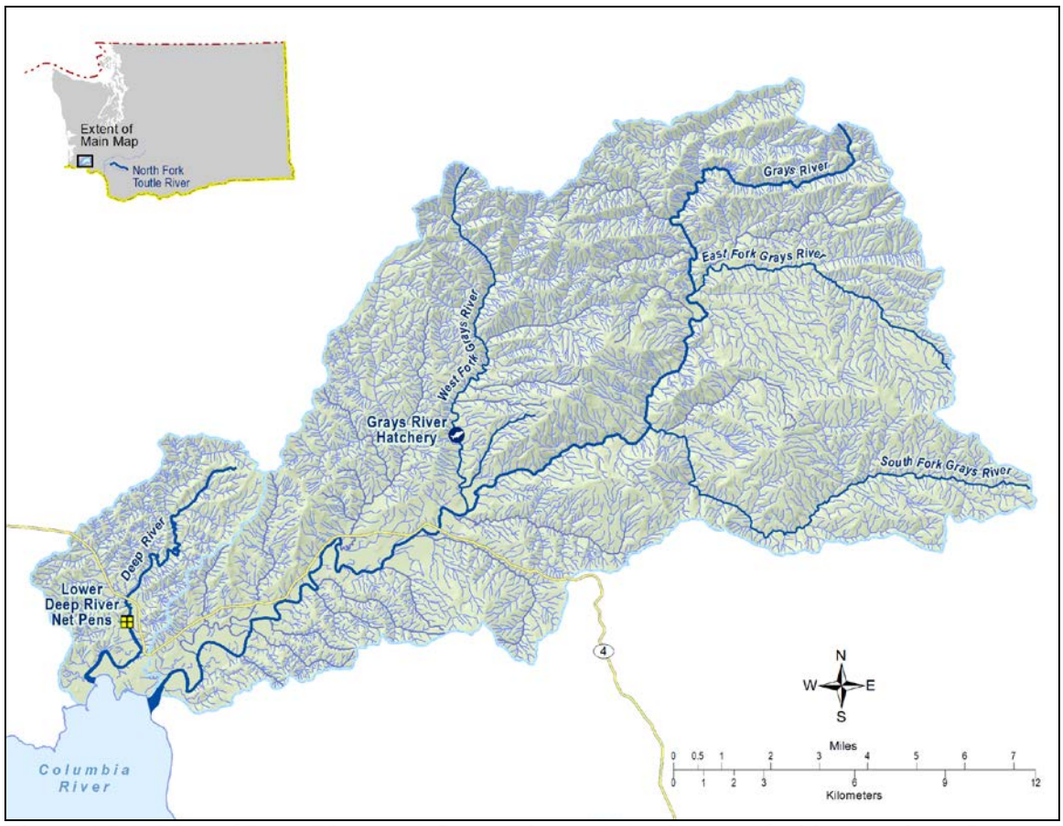

Figure 1.5.1: Map of Deep River and Grays River sub-basins, and facility locations. Source: WDFW GIS 2014.

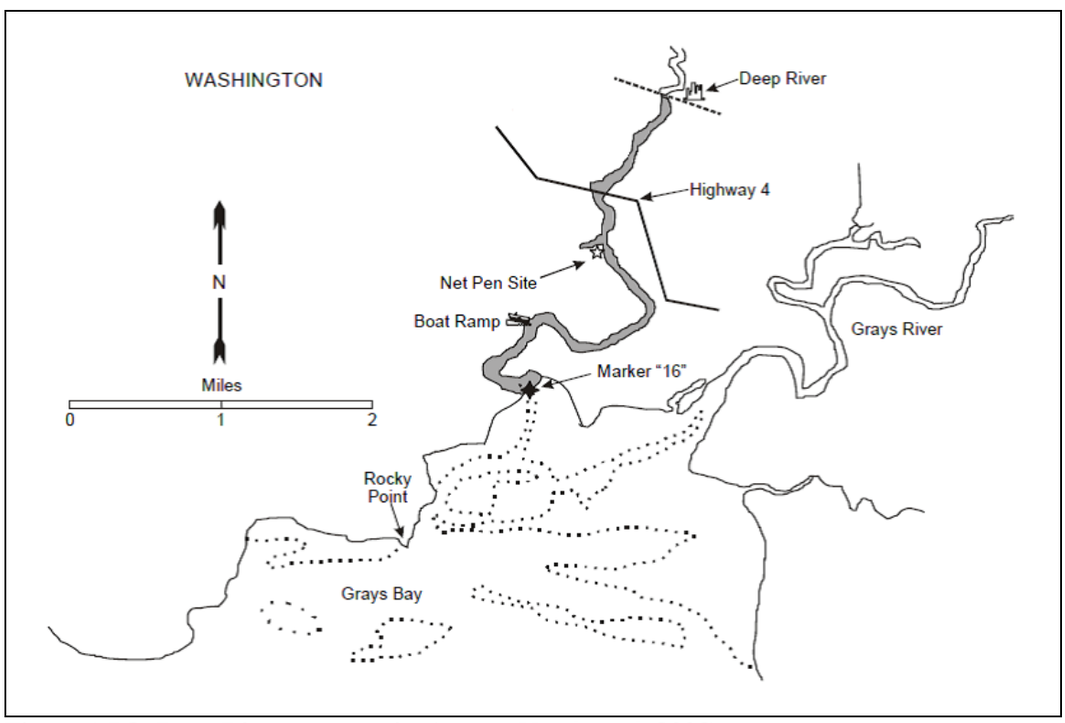

Figure 1.5.2: Deep River net pen site (source North et al. 2006).

1.6 Type of program.

Segregated Harvest

1.7 Purpose (Goal) of program.

Mitigation. The goal of this program is mitigate for reduced coho salmon catch in sport and commercial fisheries due to habitat and passage loss or degradation in the Columbia River Basin, while eliminating a directed harvest on wild fish.

1.8 Justification for the program.

The SAFE Project was initiated in late 1993 with funding by the Bonneville Power Administration (BPA) under the Northwest Power Planning Council (NPPC). The goal is to determine the feasibility of creating and expanding terminal known-stock fisheries in the Columbia River Basin to allow harvest of strong anadromous salmonid stocks. This program involves transferring 400,000 coho sub-yearlings to the Deep River Net Pens.

In its *Strategy For Salmon* (1993), the NPPC recommended that terminal fishing sites be identified and developed to harvest abundant fish stocks while minimizing the incidental harvest of weak stocks. The Council called on the BPA to fund a study to evaluate potential terminal fishery sites and opportunities. This study should include: 1) general requirements for developing those sites (e.g., construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest); 2) the potential number of harvesters that might be accommodated; type of gear to be used; and 3) other relevant information needed to determine the feasibility and magnitude of the program.

BPA initiated the Columbia River Terminal Fisheries Project, a 10-year comprehensive program to investigate the feasibility of terminal fisheries in Youngs Bay and other sites in Oregon and Washington (BPA 1993). Terminal fisheries were explored as a means to increase the sport and commercial harvest of hatchery fish while providing greater protection of weak wild salmon stocks. The Youngs Bay Net Pen Project (1986) originally served as the model for the development of the SAFE project. Several new sites were established on the Lower Columbia in 1993, including Deep River; the Steamboat Slough site was discontinued after 2004.

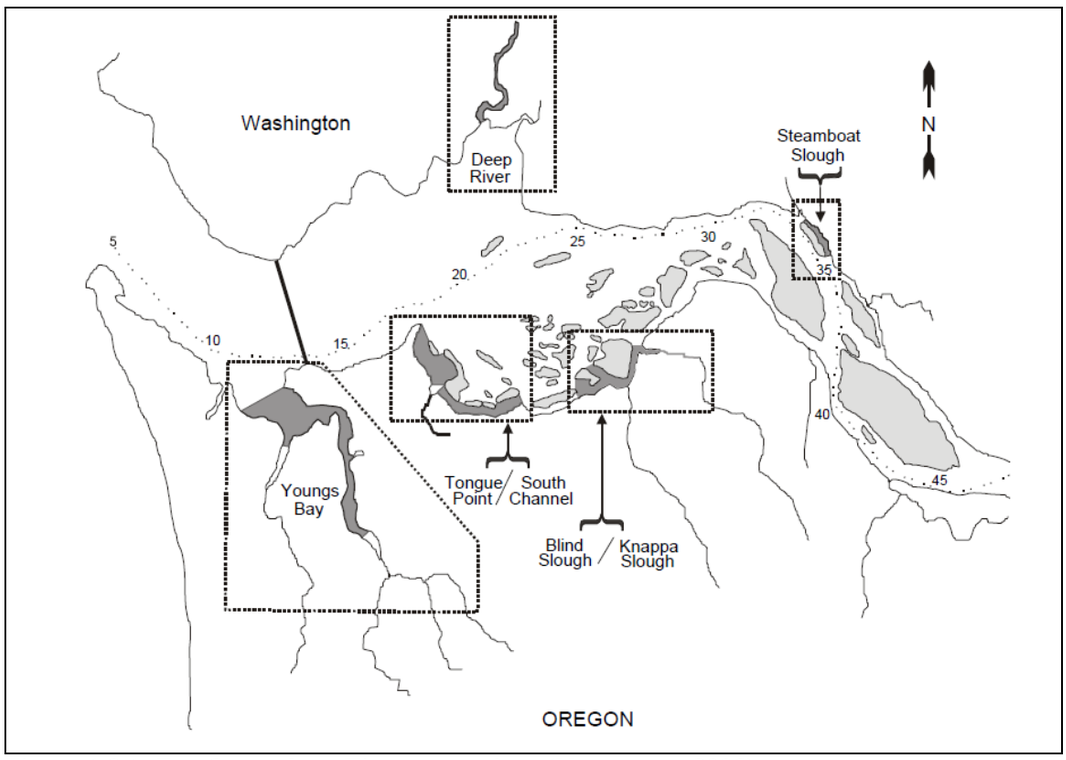

Figure 1.8.1: Fall Select Area Fishery locations (North et al. 2006).

To minimize impact on listed fish by the Deep River Net Pen (SAFE) 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 (SAFE) Type-S Coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	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)
Intake Screening		
Effluent Discharge		
Broodstock Collection & Adult Passage	7.9	Not applicable for this site; see North Toutle 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 steelhead 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 program caught in all fisheries, including estimates of fish released.	Annually mass-mark (adipose fin-clip and/or CWT) hatchery releases to differentiate hatchery from natural-origin fish and record estimates of mark rate. 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/tag 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.
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 <u>"Performance Indicators" addressing risks.</u>

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.	Annual 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 (fin clips and/or CWT) quality; 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/tag 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	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at	Broodstock not collected at this site; see North Toutle Type-S Coho HGMP.

proportions approximating the timing and age distribution of population from which broodstock is taken.	collection point.	
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 in1995 (brood year 1993). 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).	This program is projected to meet HSRG standards for pHOS based on the AHA modeling tool (All H Analyzer). 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). Proportion of adult returns to program's intended return location, compared to fisheries and artificial or natural production areas.	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 sections 4.1 and 4.2).
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Not applicable at the net pen site (see HGMP section 4.2).
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 inspects 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 North Toutle 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).

A total of around 215 hatchery-origin adult pairs are needed to achieve the egg-take goal of 645,000 collected for the Selected Area Fisheries Enhancement (SAFE) releases from Deep River Net Pens (see also North Toutle Type-S Coho HGMP).

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.	Size (fpp)	Release Date	Location	Major Watershed
Yearlings	400,000	15.0	April/May	Deep River	Grays/Elochoman

Source: Future Brood Document 2014.

The program was initiated in brood year 1993 (released 1995), with around 200,000 yearlings released in 1995. With the addition of the Steamboat Slough site in 1999, coho releases increased to around 550,000 yearlings. The Steamboat Slough program was discontinued after 2004, and coho releases were reduced to around 400,000, while spring Chinook releases were increased.

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

Table 1.12.1: Type-S Coho SAFE Program releases from Deep River Net Pens, and adult returns to Grays River Hatchery.

Brood Year/ Release and Return Year	Total Release	Hatchery-Escapement
2000/2002	354,557	612
2001/2003	366,435	682
2002/2004	357,200	2,394
2003/2005	144,900	4,838
2004/2006	201,300	874
2005/2007	449,200	979
2006/2008	368,000	1,372
2007/2009	435,750	745*
2008/2010	455,000	237
2009/2011	367,000	141
2010/2012	462,000	45
2011/2013	445,000	128
Average	**367,195**	**1,087**

* Last year of Grays River Type-S returning to the hatchery.
Source: WDFW Hatcheries Headquarters Database 2014.

See also **Table 3.3.1.1**.

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

The first year of coho releases from this net pen operation was in 1995 (1993 brood).

1.14 Expected duration of program.

It was expected that after 10 years of research, potential expansion to a full capacity fishery would begin. The SAFE program underwent a major review (BPA Funding Process) in 2004 (see North et al. 2006).

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.

This is part of the SAFE program, which was to provide non-mainstem Columbia River harvest opportunities for the commercial industry and the sport fishery. The BPA Funding Process conducted a major review of the Deep River program (and the SAFE program as a whole) in 2004. Depressed prices for commercially-caught salmon have reduced effort and the desired harvest rate has not been achieved. It was also apparent that returning adult coho do not hold in Steamboat Slough (discontinued after 2004), but tend to stray into the Elochoman River.

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.

Alternative 2: Change the program to spring Chinook: WDFW decreased the coho net pen program by eliminating the Steamboat Slough pens after 2004, and increased spring Chinook production at Deep River net pens. However, the spring Chinook program in Deep River was discontinued in 2012, and moved to Cathlamet Channel net pens in 2013 (see Cathlamet Channel Net Pen Spring Chinook HGMP).

Alternative 3: Transport the fish closer to the mouth of the Columbia River for release: This may increase production, but towing the pens is not an option due to the sunken debris load in lower Deep River. Other options such as trucking will need to be explored.

Alternative 4.Use over-summer rearing to increase production. By receiving fish in the spring and rearing fish in the net pens over the summer, the SAFE project could significantly increase the number of smolts produced. ODFW has tested this rearing strategy at the Tongue Point and Youngs Bay sites, with moderate success at Youngs Bay, but poor results due to disease at Tongue Point (North et al. 2006).

Alternative 5: Reduce release size from 11 fpp to 15 fpp. Program release size was reduced to 15 fpp in 2012 as a cost-saving measure, and to align with Mitchell Act-funded releases at the same site.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: *Continue program monitoring and evaluation.*

Reform/Investment 2: *Funding for alternate transportation for smolt releases* (see *Alternative 3*).

Reform/Investment 3: *Expand facilities associated with smolt production*. Given the existing facilities, most sites are at, or near, production capacities. Expansion to full production would require significant capital construction costs for additional net pens, and/or major modifications of existing hatchery facilities (North et al. 2006).

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

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

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

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

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

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

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

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

Lower Columbia River steelhead (*Oncorhynchus mykiss*). Listed as a threatened species on March 19, 1998 (63FR13347); threatened status reaffirmed on January 5, 2006 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448), updated April 14, 2014.

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

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

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

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

Lower Columbia River Chinook: In Washington, the LCR Chinook ESU includes all naturally spawned Chinook populations from the mouth of the Columbia to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, as well as 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: Today only two of 32 historical populations – 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 (Dornbush 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 (LCFRB 2010).

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.

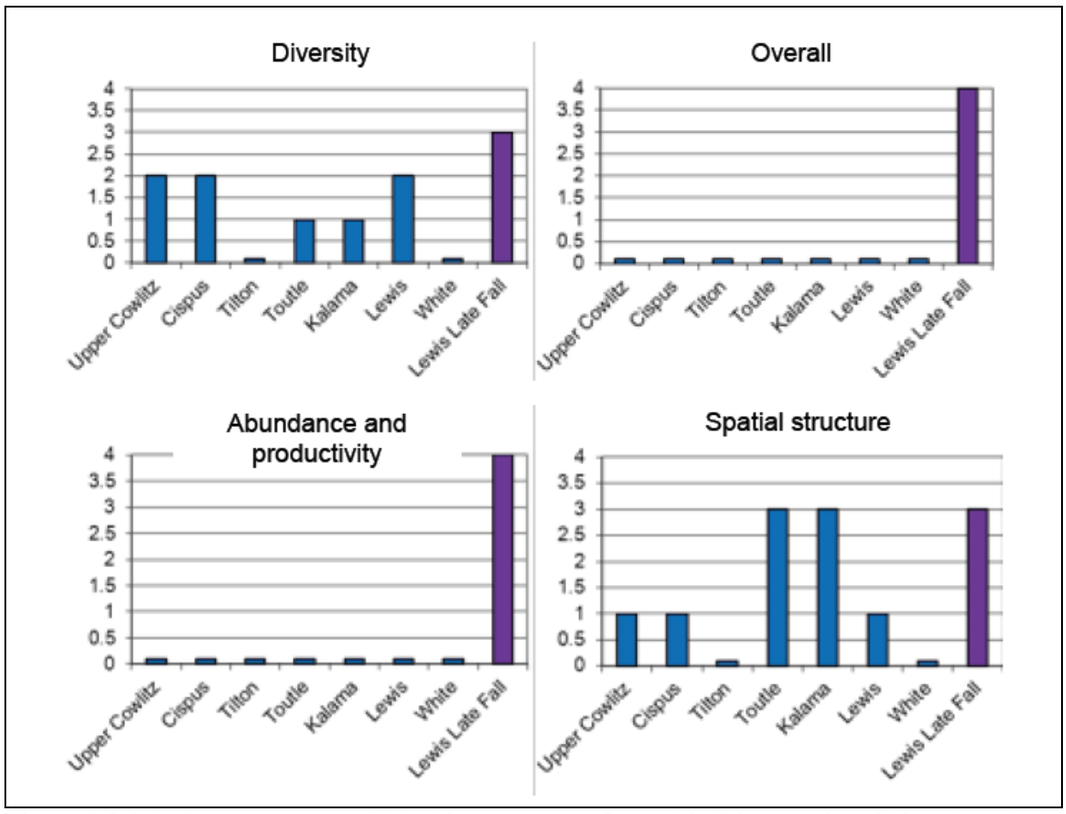

Figure 2.2.2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so,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

Status: Today, 16 of the 23 Lower Columbia River steelhead populations have a 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 the WLC TRT criteria for viability (Dornbush 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.

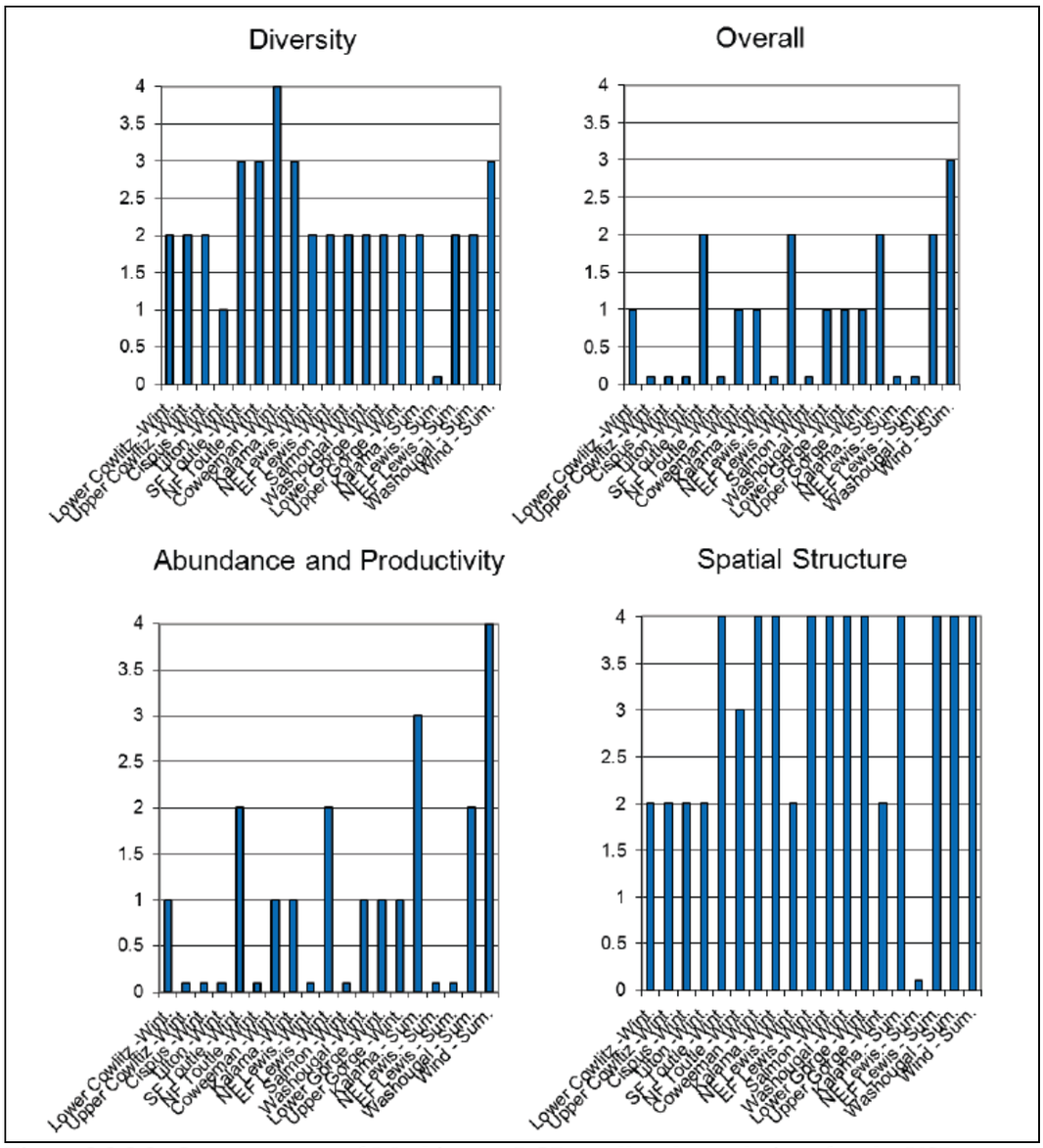

Figure 2.2.2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") 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 3 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).

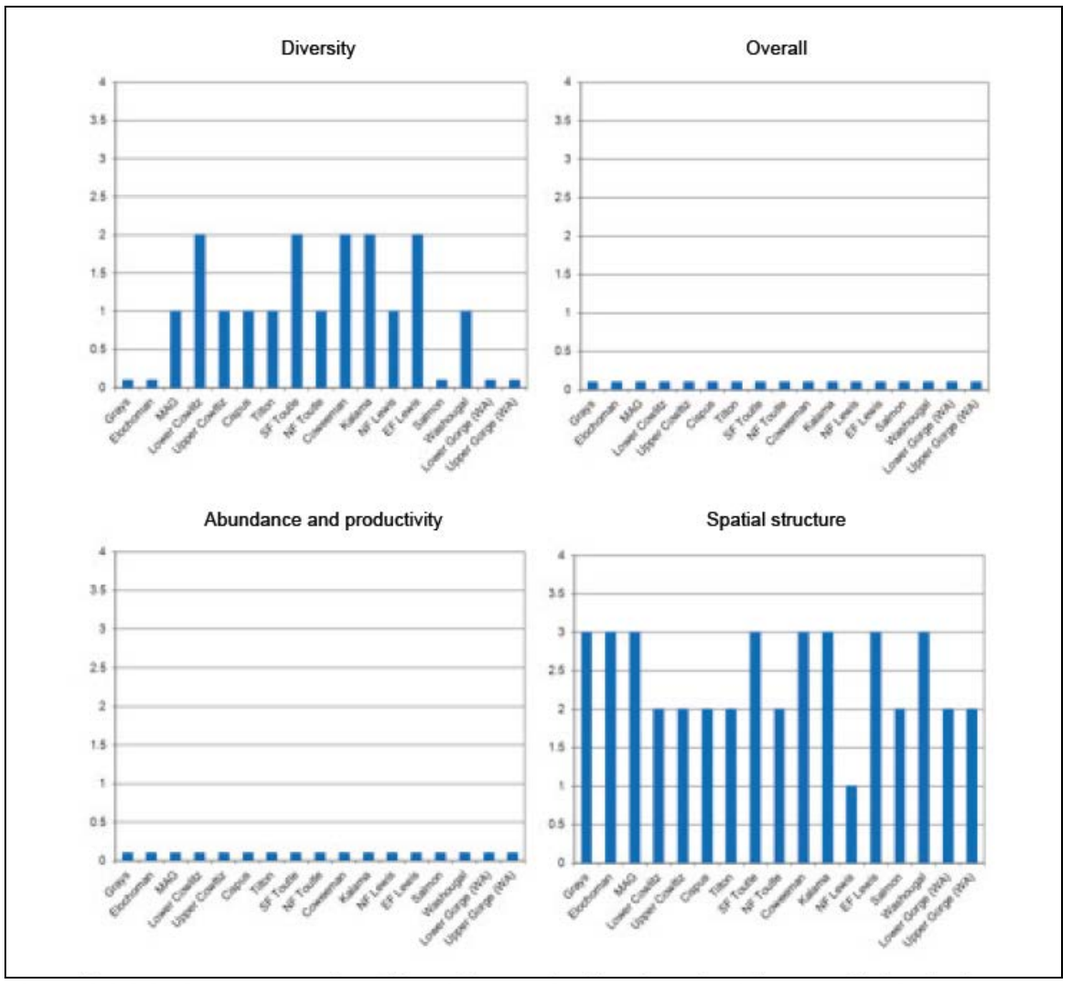

Figure 2.2.2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") 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 A/P, spatial structure, and diversity (McElhany et al. 2000). The result of this analysis is shown in **Figure 2.2.2.3**. The analysis indicates that all of the Washington populations with two exceptions are in the overall very high risk category (also described as extirpated or nearly so). The Grays River population was considered to be at moderate risk and the Lower Gorge population to be at low risk. The very high risk status assigned to the majority of Washington populations (and all the Oregon populations) reflects the very low abundance observed in these populations (e.g., <10 fish/year) (Ford 2011). Today, 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 two populations: Grays/Chinook and the Lower Gorge. All three strata in the ESU fall significantly short of the WLC TRT criteria for viability (Dornbush 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.

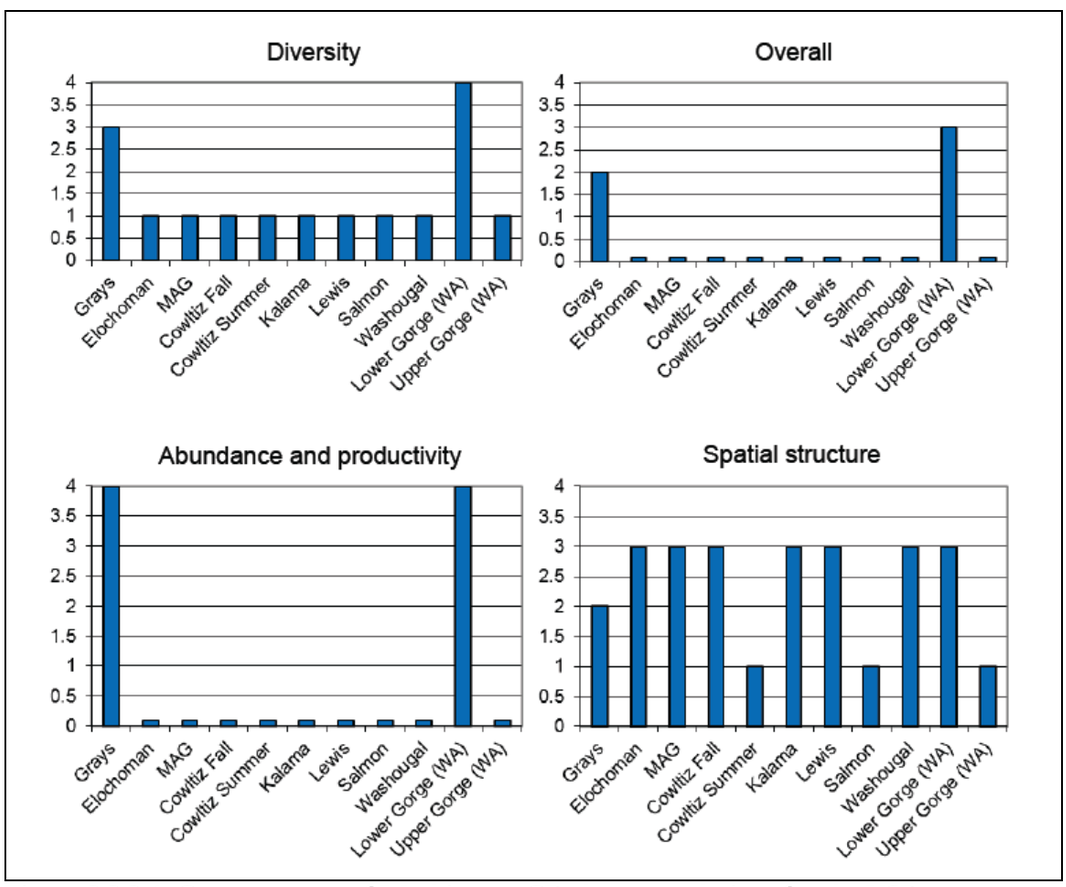

Figure 2.2.2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable")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

Juvenile coho production estimates is the one measure of production in the Lower Columbia system. See HGMP section 11.1 for planned M&E.

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**	**1,374**	**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 is not a 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 and 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, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

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

Broodstock Program:
Broodstock Collection: There is no adult collection, egg-take or incubation activity associated at this site. See also North Toutle 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 (SAFE) coho predation and competition effects on listed salmonids and eulachon: The proposed annual production goal for this program is 600,000 yearlings. 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 11 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 acclimated ponds.

- Releases from these net pens are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.
- 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.

- 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 North Toutle 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 North Toutle 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. 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.

The Select Area Fishery Evaluation Project (SAFE) is integrated with *U.S. v Oregon* and the Columbia River Fish Management Plan (CRFMP) (see HGMP section 3.1). It is also included in hatchery plans documented in WDFW's yearly *Future Brood Document* (FBD – see HGMP section 3.2), and the *Lower Columbia Fisheries Management and Evaluation Plan* (FMEP 2002). The project was initially operated under the Final Environmental Assessment (FEA) of Youngs Bay Salmon Rearing and Release program (BPA 1993). SAFE programs are currently aligned with the Environmental Assessment of Lower Columbia Fisheries Research Project (BPA 1995).

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

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

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

Descriptions of these policies and excerpts are shown below:

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

v Oregon and that hatchery reform actions must be done in close coordination with tribal co-managers. Washington Fish and Wildlife Commission Policy: POL-C3619.

Guidelines from the policy include:

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

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

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

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

Strategies:

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

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

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

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

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.

WDFW is responsible for sampling its SAFE fisheries to collect biological data, including CWT recoveries, and for summarizing data to estimate landed catch. The landed catch from all SAFE fisheries is sampled for biological information, including collecting scale and snout samples for aging and CWT recovery to determine stock origin, straying and survival rates. Funding for fishery sampling is provided by the BPA, through the SAFE project (BPA #1993-06000) in Oregon and Washington.

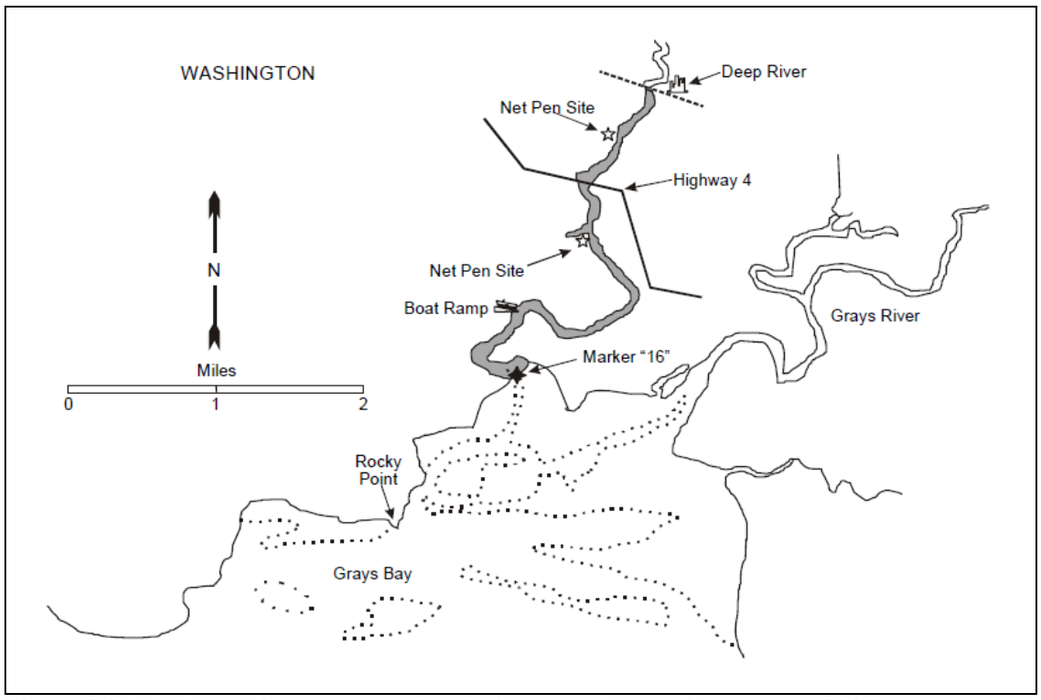

Figure 3.3.1.1: Deep River commercial fishing area (source North et al. 2006).

SAFE programs are specifically targeted for Columbia Estuary harvest. Deep River fishing area includes all waters downriver from the town of Deep River to the mouth (a line from navigation marker "16" southwest to a marker on the Washington shore) (**Figure 3.3.1.1**). Concurrent waters extend downstream of the Highway 4 bridge. Washington State waters extend upstream of the Highway-4 bridge (North et al. 2006). Fisheries in the Deep River select area site averaged about 97% fish of net pen-origin since the 1995 brood. The purpose of the Deep River Net Pen SAFE program is to provide fish for isolated harvest opportunity in the Deep River Basin; however, other fisheries benefit as well.

All Deep River Net Pen releases (both Mitchell Act and BPA-funded) are adipose fin-clipped; a portion of the SAFE program coho (7.5%) are also released with a coded-wire tag (CWT). Coho salmon are an important target species in ocean and Columbia River commercial and recreational fisheries, as well as tributary recreational fisheries. Commercial and recreational fisheries in the lower Columbia River, as well as some ocean fisheries have regulations regarding wild fish releases. Specific hatchery-selective commercial and recreational fisheries in the lower Columbia River target hatchery coho.

Table 3.3.1.1: Deep River Net Pens Type-S coho fishery contributions.

Brood Years: 2000-2009 Fishery Years: 2003-2012		
	Average SAR%[a]	**1.85**
Agency	***Non-WA Fishery***	***% of total Survival***
ADFG	All	*0.00*
CDFO	All	*0.14*
CDFW	All	*0.00*
NWFSC	All	*0.00*
Agency	***OR Fishery***	***% of total Survival***
ODFW	10- Ocean Troll	*0.82*
ODFW	21- Columbia R. Gillnet	*78.61*
ODFW	40- Ocean Sport	*7.57*
ODFW	44- Columbia R. Sport	*0.20*
ODFW	45- Estuarine Sport	*2.83*
ODFW	61- Test Fishery Net	*0.00*
ODFW	72- Juvenile Sampling - Seine (Marine)	*0.03*
Agency	***WA Fishery***	***% of total Survival***
WDFW	10- Ocean Troll	*0.18*
MAKA	15- Treaty Troll	*0.00*
WDFW	15- Treaty Troll	*0.14*
QDNR	22- Coastal Gillnet	*0.03*
WDFW	22- Coastal Gillnet	*0.09*
WDFW	23- Mixed Net and Seine	*0.00*
WDFW	40- Ocean Sport	*0.00*
WDFW	41- Ocean Sport- Charter	*2.33*
WDFW	42- Ocean Sport- Private	*4.95*

WDFW	43- Sport (Jetty)	*0.00*
WDFW	45- Estuarine Sport	*0.14*
WDFW	46- Freshwater Sport	*0.00*
WDFW	50- Hatchery Escapement[b]	*1.47*
WDFW	50- Hatchery Escapement (Strays)[c]	*0.49*
	Total	***100***

Source: RMIS 2014.
Note: Data is preliminary and subject to change.
[a] Average SAR% = (tags recovered/tags released).
[b] Recoveries from Grays River Hatchery
[c] Includes recoveries at Elochoman Hatchery, Sol Duc Hatchery, Big Creek Hatchery (OR), and Salmon River Hatchery (OR)

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 *Grays-Elochoman and Cowlitz Watershed Management Plan WRIA 25/26* (December 9, 2004, adopted July 2006), 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. 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:* Outmigrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on 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 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 (SAFE) program.

Facility	Water Source	Water Right		Available Water Flow	Avg Water Temp. (F°)	Usage	Limitations
		Record/Cert. No.	Permit No.				
Grays River Hatchery	Unnamed stream (surface)	S2-CV2P754/ 08315	11847	0.25 cfs	NA	Incubation to hatching and rearing	High water temps from mid-July – Sept.; low flows from mid-June – Sept; summertime pathogens
	WF Grays River (surface)	S2-CV2P755/ 08312	08270	9.25 cfs	34 – 68	Broodstocking, rearing, acclimation	
	Well	G2-21976 CWRIS	-----	1280 gpm	50 - 52	Incubation to eyeing and rearing	Low summertime flows July - Sept.
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.

North Toutle Hatchery: see North Toutle Type-S Coho HGMP.

Grays River Hatchery: The facility gets its water from three sources: Grays River, an unnamed Creek, and well water. Most of the water is supplied by gravity flow from a river intake. The unnamed creek through the hatchery grounds is seasonal (dry from early summer to late fall); WDFW has determined that it is a non-fish bearing stream therefore of no impact. It provides 200-300 gpm for incubation. The river intake provides 4,500 to 5,000 gpm of surface water for most of the facility's needs. The well provides approximately 500-600 gpm for incubation and rearing. Water rights were obtained in 1949, 1960 and 1974.

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

Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids* (*TSS*) one to two times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids* (*SS*) one to two 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				
N Toutle WAG13-1010	Y	Y	Y	5/2/2006	0	N	Y
Grays WAG13-1015	Y	Y	Y	9/13/2012	2	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2013.

Table 4.1.3: List of NPDES violations over the last five years (2008-2012), Grays River Hatchery.

Month/ Year	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
May 2011	TSS	Drawdown	237.0 mg/L	100.0 mg/L	Sample taken late at end of drawdown. Pond difficult to clean prior to release. Sediments from heavy rain.	N/A
	TSS	Drawdown	173.2 mg/L	100.0 mg/L		

Source: Ann West, WDFW Hatcheries Headquarters Database 2013
Note: These violations did not result in non-compliance with NPDES permit.

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. WDOE notified WDFW that a permit had not yet been developed (personal comm. Catie Mains, WDFW Hatchery Data Unit, 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.

North Toutle Hatchery. See North Toutle Type-S Coho HGMP.

Grays River Hatchery. The intake screens are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current *Anadromous Salmonid Passage Facility Design criteria* (NMFS 2011). WDFW received a Mitchell Act Grant in 2008 to assess and evaluate a new gravity intake. The assessment and evaluation of the main intake was completed in 2010, which determined that the upper watershed is unstable and to expect bed load movement for the next 100 years. WDFW is currently evaluating options which may include moving production to Beaver Creek Hatchery.

The unnamed creek has an intake and has been determined to be a non-fish bearing, seasonal stream. The stream effluent to the West Fork Grays River is located about 228.6 m (250-yds) upstream of the hatchery effluents; the intake structure from which the facility draws water is approximately the same distance (228.6 m) from the hatchery building itself and from the confluence with the WF Grays River.

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).

Broodstock is collected at North Toutle Hatchery; see North Toutle 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).

Table 5.2.1: Transportation equipment available.

Facility	Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Grays R Hatchery	Tanker truck	1.100	Y	N	30	None	NA
	Tanker truck	1.100	Y	N	30	None	NA

Green eggs are transported in coolers via pick-up truck from North Toutle Hatchery to Grays River Hatchery in November. Average transit time is 1.5 hours.

Sub-yearlings (25 fpp) are transferred from the Grays River Hatchery to the Deep River net pens in November via 1,100 gallon tanker truck; travel time from Grays River Hatchery is about 0.5 hours.

5.3 Broodstock holding and spawning facilities.

Broodstock is collected at North Toutle Hatchery; see North Toutle Type-S Coho HGMP.

5.4 Incubation facilities.

Grays River Hatchery: Green eggs are transferred from North Toutle Hatchery to Grays River Hatchery in October-November. Eggs are started in the deep troughs; once eyed, they are transferred to the vertical tray incubators.

Table 5.4.1: Incubation vessels available at Grays River Hatchery.

Type	Number	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Loading (eggs/unit)
Vertical Stack Tray Units (8 trays each)	128 half stacks (1024 trays)	10.7	2.0	2.1	2.7	3-5	49,000-70,000
Deep Troughs	2	29.4	14.0	1.3	1.6	10-15	100,000-650,000
Shallow Troughs	2	8.7	15.0	0.6	1	6-8	20,000-120,000
Freestyle Deep Troughs	4	9.0	2.6	1.7	2.1	10-15	100,000-450,000

5.5 Rearing facilities.

Table 5.5.1: Rearing facilities available at Grays River Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
10	Concrete Raceways	4,800	80	20	3.0	300	1.875	0.30
1	Earthen Pond	95,722	n/a	n/a	n/a	4,200	2.10	0.09
2	Concrete holding ponds	12,000	60	40	5.0	450-800	1.950	0.30
2	Intermediate Raceways	96	16	3	2	10-50	1.73	0.30
3	Intermediate Raceways	106.8	16	2.5	2.7	10-50	1.73	0.30

Coho for this program are ponded and reared to the sub-yearling stage (25 fpp) at Grays River Hatchery. Fry are ponded into the appropriate starter raceway during the last two weeks of January.

5.6 Acclimation/release facilities.

Table 5.6.1: **Rearing/holding 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	Unk	Unk

Fish are acclimated to the lower Deep River and mainstem Columbia River tidal influence. Fish have been reared for approximately 5-6 months at this site until release in May. The fish are currently released directly from the current net pen sites.

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

Flooding and associated debris and sediments have chronically affected fish production programs at this facility. Current hatchery practices and production changes have helped to alleviate these issues to a more manageable level. Flood events can lead to inundation of the river intake with flood waters. Fish stocks are generally managed away from this water source during likely times that flooding would occur.

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

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

See also North Toutle and Grays River Coho HGMPs

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.

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.

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.

Hatchery (adipose fin-clipped) adults returning to North Toutle Hatchery.

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

6.2 Supporting information.

6.2.1 History.

Deep River Net Pen SAFE program coho initiated with stock from North Toutle Hatchery (1993-1995). From 1995 through 2010, coho was primarily supplied from Grays River Type-S coho stock. The Grays River Type-S coho on-station program was discontinued in 2006, although the facility continued to provide Type-S coho for the SAFE program through brood year 2010. Current stock is primarily from Toutle River Type-S coho stocks, although in the event of egg-take shortfalls, any surplus Type-S coho stock may be used for backfill (FBD 2014).

Table 6.2.1: Broodstock source for Deep River Net Pen (SAFE) Type-S Coho program.

Stock Source (Facility)	Brood Year	
	Start	End
North Toutle Hatchery	1993	2002
	2007	Present
Grays River Hatchery	1998	2010

Source: WDFW Hatcheries Headquarters Database 2014.

Lewis River Type-S coho stocks have been used for the Mitchell Act-supported program at Deep River net pens since 2008, and are also acclimated and released at this site (see Deep River Net Pen Type-S Coho HGMP).

6.2.2 Annual size.

A total of around 215 hatchery-origin adult pairs are needed to achieve the egg-take goal of 645,000 collected for the Selected Area Fisheries Enhancement (SAFE) releases from Deep River net pens (see North Toutle 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 North Toutle Hatchery traps (segregated program). Natural-origin fish are not used for the Deep River Net Pen (SAFE) program.

All Type S coho at North Toutle Hatchery have been mass-marked since brood year 1995 (see North Toutle Type-S Coho HGMP).

6.2.4 Genetic or ecological differences.

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 is 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 North Toutle 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 North Toutle Hatchery trap (see North Toutle Type-S Coho HGMP).

7.2 Collection or sampling design.

Broodstock is collected at North Toutle Hatchery (see North Toutle Type-S Coho HGMP).

Broodstock from this program were previously collected from the Grays River Hatchery Type-S coho program, which was discontinued in 2006 (see HGMP section 6.2.1). Grays River Type-S coho broodstock were collected from adults returning to the hatchery in late-September/early-October through early-November.

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

7.3 Identity.

This program uses North Toutle Hatchery "Type-S" coho stock, identified by run-timing. All Type-S coho are released with an adipose fin-clip (AD). See also North Toutle Type-S Coho HGMP.

7.4 Proposed number to be collected:

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

See HGMP section 6.2.2.

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

Broodstock is collected at North Toutle Hatchery (see North Toutle Type-S Coho HGMP).

Table 7.4.2.1: Broodstock collection levels, for the Deep River Net Pen (SAFE) Type-S Coho program.

Brood Year	Grays River Hatchery				North Toutle Hatchery			
	Egg-Take	Females	Males	Jacks	Egg-Take	Females	Males	Jacks
2002	300,000	102	102	0	-----	-----	-----	-----
2003	456,000	180	188	1	-----	-----	-----	-----
2004	500,000	200	198	5	-----	-----	-----	-----
2005	750,000	300	300	4	-----	-----	-----	-----
2006	750,000	300	302	5	-----	-----	-----	-----
2007	862,500	345	345	3	-----	-----	-----	-----
2008	600,000	240	240	7	-----	-----	-----	-----
2009	-----	-----	-----	-----	645,000	215	215	2
2010	89,000	33	27	0	691,393	185	185	0
2011	-----	-----	-----	-----	625,000	204	200	4
2012	-----	-----	-----	-----	1,065,000	355	352	3
2013	-----	-----	-----	-----	900,047	285	254	12

Source: WDFW Hatcheries Headquarters Database 2014.

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

Broodstock is not collected at this site (see North Toutle Type-S Coho HGMP).

7.6 Fish transportation and holding methods.

Broodstock is not collected at this site (see North Toutle Type-S Coho HGMP).

7.7 Describe fish health maintenance and sanitation procedures applied.

Broodstock is not collected at this site (see North Toutle Type-S Coho HGMP).

7.8 Disposition of carcasses.

Broodstock is not collected at this site (see North Toutle 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 North Toutle 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.

Spawning is not conducted at this site (see North Toutle Type-S Coho HGMP).

8.2 Males.

Broodstock is not collected at this site (see North Toutle Type-S Coho HGMP).

8.3 Fertilization.

Broodstock is not collected at this site (see North Toutle Type-S Coho HGMP).

A ratio of 1:1 males to females is used.

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.

Spawning is not conducted at this site (see North Toutle Type-S Coho HGMP).

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, at Grays River Hatchery, North Toutle Type-S coho for the Deep River Net Pen (SAFE) program.

Brood Year	Egg-Take	North Toutle Hatchery		Grays River Hatchery	
		Green-to-Eyed Eggs	Eyed Egg-to-Ponding	Green-to-Eyed Eggs	Eyed Egg-to-Ponding
2008	600,000	-	-	89.2	95.4
2009	645,000	-	-	76.7	95.9
2010	780,393	-	-	94.5	94.8
2011	625,000	-	-	91.3	98.0
2012	1,065,000	-	-	91.1	99.0
2013	900,047	95.5	99.0	92.0	94.2

Source: WDFW hatchery data 2014.

The egg-take goal for this program is around 645,000 (FBD 2014). A total of 645,000 green eggs are transferred from North Toutle Hatchery to Grays River Hatchery for incubation and rearing.

Any Type-S coho stocks may be used for backfill in the event of egg-take shortfalls. In brood year 2013, 113,056 eggs were received from Fallert Creek (Kalama stock); of which 101,000 fry were ponded (89.3% egg-to-ponding survival).

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.

WDFW follows *Integrated Hatchery Operations Team* (IHOT) species-specific incubation recommendations for water quality, flows, temperature, substrate, and incubator capacities.

Grays River Hatchery. Eggs are placed in freestyle deep troughs to the eye stage then moved to stack incubators for hatching. Eggs are loaded at 7,000-7,500 eggs (approximately 4.5 lbs) per tray. Removal of dead eggs, accurate enumeration and loadings are adjusted during this time.

9.1.4 Incubation conditions.

IHOT species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities. Harmful silt and sediment is cleaned from incubation systems regularly while eggs are monitored to determine fertilization and mortality. Incubation water temperature is monitored and recorded. Temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable

levels of saturation with a minimum criteria of 8 parts per million (ppm). When using artificial substrate, Vexar® or bio-rings, egg densities within incubation units are reduced by 10%.

Grays River Hatchery. After weighing, eyed-eggs are placed in trays with a Vexar® substrate. Eyed-eggs on well water have experienced difficulty in shells not breaking down during hatching, which can plug receptacles. If this condition occurs, eggs can be incubated on water from a seasonal unnamed creek adjacent to the hatchery. Flow rate through the trays is 4 gpm; well water temperatures are a constant 51°F, while the creek temperatures will range from 45-50°F. Dissolved oxygen is a little higher for the creek water, but ranges around 9-11 ppm. There is very little silt: only a small percentage of creek water is used, and creek water is not used during flood events. Siltation is controlled with rodding, as needed.

North Toutle Hatchery. A portion of the 2013 brood was reared at North Toutle Hatchery. See also North Toutle Type-S Coho HGMP.

9.1.5 Ponding.

Grays River Hatchery. Fry are ponded when: a visual inspection of the amount of yolk sac remaining with the yolk slit closed to approximately 1-mm wide (approximately 1,600 TUs) or based on (95% yolk absorption) KD factor. At this time fry are transferred to the appropriate starter raceway during the last two weeks of January.

See also North Toutle Type-S Coho HGMP.

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, by facility.

Brood Year	Fry-to-Sub-yearling (Grays River Hatchery)	Sub-yearling-to-Smolt (Deep River NP)
2008	79.8	90.4
2009	69.1	92.9
2010	51.0	91.8
2011	85.3	95.2
2012	79.8	96.7

Source: WDFW hatchery data 2014.

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

Grays River Hatchery. 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 300 gpm (10.6 lbs/gpm).

Net pens. The goal is to raise fish to 15 fpp at release. Around 29,000 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

IHOT standards are followed for water quality, alarm systems, predator control measures (netting), loading and density.

See also North Toutle Type-S Coho HGMP.

Grays River Hatchery. Fish are reared on river water. Temperature, dissolved oxygen (DO) and pond turn-over rate are monitored and recorded daily during fish rearing; water temperatures during the rearing cycle range from 63°F to 34°F. Ponds are vacuum-cleaned regularly, generally weekly, to remove settleable solids, unused feed and feces, and broom-cleaned as needed to ensure proper cleanliness. Predator netting over the rearing ponds minimize predation. All ponds are pressure washed between broods.

Deep River Net Pen. 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 Deep River Net Pens (adapted from Type-S coho rearing at Grays River Hatchery).

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.

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*).

See also North Toutle Type-S Coho HGMP.

Grays River Hatchery. Fish are given variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contracts. Feeding frequencies varies depending on the fish size and water temperature, and usually begin at 8-3 feedings/7 days a week, and end at 1 feeding/3 days a week. Feed rates vary from 1.0% to 2.5% B.W./day. The overall season feed conversion ratio has averaged approximately 1:1.

Deep River Net Pens. Feedings are 1 feeding/day. Feed rate is 1.0% B.W./day, and feed conversion rate is 1:1.

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

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

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.

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

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

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. Staff observes fish behaviors such as 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 as signs of smolt development.

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

Net pen rearing can acclimate fish to environmental conditions in the river. River flows, ambient temperatures, turbidity are natural cues that can help with the fitness of the fish. Also, potential food items such as crustaceans or insects from the river could be attracted to the pens and benefit the fish. Pens also are subject to indirect mammal and avian predation attempts that can ultimately benefit coho smolt survival. This occurs when birds will perch on the net pen covers and the walkways and try to spear potential prey from within the pen. Mammals will crowd the net pen sides to try and catch fish from the net pens.

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	400,000	15.0	April/May	Columbia Estuary

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: Columbia Estuary

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

Table 10.3.1: Number of fish released, size, CVs and release date, by age and year.

Release Year	Yearlings			
	Number	Avg Size (fpp)	CV	Date
2002	354,557	10.4	4.55	May 16
2003	366,435	12.0	4.85	April 30
2004	357,200	13.5	5.00	May 1
2005	144,900	11.0	7.70	April 1
2006	201,300	12.3	6.20	May 1
2007	449,200	13.0	4.80	May 1
2008	368,000	15.5	6.60	May 1
2009	435,750	12.0	n/a	May 6
2010	455,000	11.0	7.52	May 3
2011	367,000	11.9	11.79	May 2
2012	462,000	14.8	6.92	May 2
2013	445,000	14.0	5.33	May 1

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 10 fpp = 167 mm fork length (fl); 11 fpp = 162 mm fl; 12 fpp = 157 mm fl; 14 fpp 149 mm fl

10.4 Actual dates of release and description of release protocols.

Net pen sides are lowered to allow fish to swim out of the pens. 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.

Grays River Hatchery. Around 500,000 sub-yearlings are transferred to the Deep River net pens program in November. Average transit time is around 0.5 hours.

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

Sub-yearling coho (25 fpp) are transferred to Grays River 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 SAFE program.

Brood Year	Yearlings	Mark Type
2014	30,000	AD+CWT
	370,000	AD-only

Fish are 100% mass-marked with either adipose fin-clips (AD) or AD+ coded-wire tags (CWT), 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.

Snouts collected from the adipose fin-clipped adults are dissected, recovered and read at the WDFW CWT Lab in Olympia. Scale samples are read at WDFW Headquarters Olympia to verify hatchery- or natural-origin.

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 surplus numbers.

10.9 Fish health certification procedures applied pre-release.

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

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

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

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

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 (adipose fin- 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.

Deep River Net Pen (SAFE) program. The goal of the project is to determine the feasibility of creating and expanding select area, known stock fisheries in the Columbia River Basin to allow harvest of strong anadromous salmonid stocks while providing greater protection to depressed stocks. This goal is being accomplished by addressing nine defined project objectives:

1) Survey and categorize potential select area fishing sites in the Columbia River basin for basic physical characteristics (high, medium, and low).
2) Determine the capability of the medium and high select area fishing sites for rearing and acclimating anadromous fish species in net pens or other facilities.
3) Determine the capability of the medium and high select area fishing sites to allow manageable and economically competitive harvest of returning fish.
4) For the medium and high select area fishing sites, determine the potential for harvest of target and non-target fish species.
5) Evaluate the suitability of various anadromous fish stocks for use in the medium and high select area fishing sites.
6) Determine the generic costs and logistics of a large-scale net pen rearing program (overwinter rearing and short-term acclimation) and estimate the variables for each of the medium and high select area fishing sites.
7) Evaluate the effects of a large-scale net pen rearing program (overwinter rearing and short-term acclimation) for select area fishing on hatchery production programs.
8) Determine the effects on upriver fish runs, escapements, and Zone 6 fisheries of shifting various levels of historical Zone 1-5 commercial fisheries to select area sites.
9) Coordinate activities with ODFW, WDFW, CEDC, BPA, NMFS, and Salmon For All (SFA).

Sampling of SAFE commercial fisheries includes collecting representative weight and length data by species, and examining the catch for any external tags or marks. Scales and CWTs are collected for age and stock composition analyses, and to determine straying and survival rates. Snouts collected from the adipose fin-clipped adults are dissected, recovered and read at the WDFW CWT Lab in Olympia. Scale samples are read at WDFW Headquarters Olympia to verify hatchery- or natural-origin. Minimum target sampling rates are 20% of the landed catch by area and season.

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).

WDFW is responsible for sampling its SAFE fisheries to collect biological data, including CWT recoveries, and for summarizing data to estimate landed catch. The landed catch from all SAFE fisheries is sampled for biological information, including collecting scales and snout samples for aging and CWT recovery, and to determine stock composition, straying and survival rates. Funding for fishery sampling is provided by the BPA, through the SAFE project (BPA #1993-06000) in Oregon and Washington. Snouts collected from the adipose fin-clipped adults are dissected, recovered and read at the WDFW CWT Lab in Olympia. Scale samples are read at WDFW Headquarters Olympia to verify hatchery- or natural-origin. Associated fishery/recovery and biological data are entered into the WDFW database, and transferred to the PSMFC RMIS website.

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 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.

Not applicable.

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.