HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Washougal River Fall Chinook (Segregated + Integrated)
Species or Hatchery Stock:	Fall Chinook (*Oncorhynchus tshawytscha*) Washougal River Stock
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Washougal River/Lower Columbia
Date Submitted:	
Date Last Updated:	August 19, 2014

Executive Summary

The Washington Department of Fish and Wildlife is submitting a Hatchery and Genetic Management Plan (HGMP) for the Washougal River Fall Chinook 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 produce Washougal River fall Chinook for sustainable escapement to the watershed, while providing recreational fisheries. Program fish will be produced at the Washougal Hatchery, located on the Washougal River (WRIA 28.0159). The program will annually release a total of 3,000,000 sub-yearlings to the Washougal River. Eggs are also taken for the Deep River Net Pen program (1.3 million).

This fall Chinook 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 operates as a "stepping stone type" program, as defined by the HSRG starting in 2014. This will include both integrated and segregated programs. An "integrated" program is one in which natural-origin individuals are used in the hatchery broodstocks and a "segregated" program is one in which only hatchery-origin individuals are used in the hatchery broodstocks. Integration for the integrated program is achieved by using up to 30% of the returning adult natural-origin fall Chinook (distinguished by an intact adipose fin) returning to the Washougal River at the resistance board weir (RBW) at RKm 22.0, from August 1 through October 31. All fish released through this hatchery program have been 100% mass-marked (adipose fin-clipped) since 2006, return year 2011 for all age classes. The integrated program will also be 100% coded wire tagged (CWT).

The Lower Columbia River Chinook are listed as "Threatened" under the ESA. The ESU includes the Washougal River Tule Chinook Program.

Broodstock Collection:
The broodstock is derived from stock returning to the Washougal sub-basin. The proportion of natural-origin fish in the integrated broodstock (pNOB) is expected to be 30%. The current egg-take goal is 4.7-million at Washougal Hatchery; up to 1,600 adult pairs may be collected. Washougal fall Chinook carcasses have been used by the Lower Columbia Fishery Enhancement Group (LCFEG) for nutrient enhancement in past years.

Harvest:
Total annual harvest is dependent on management response to annual abundance in *Pacific Salmon Commission* (PSC - U.S./Canada), *Pacific Fishery Management Council* (PFMC - U.S. ocean), and *Columbia River Compact* forums. WDFW has also received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the *Fisheries Management and Evaluation Plan* (FMEP), *Columbia River Fish Management Plan* (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia River Tule Chinook population. 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).

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 0.32% for

brood years 2000-2009, and a programmed release goal of 3,000,000 sub-yearlings, the estimated production goal would be 9,600 adults.

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

In addition, temporary fish collection weirs were installed, and are operated on the lower Grays, Coweeman, Washougal and Elochoman rivers. Operation of these weirs allows WDFW to control the number of hatchery fall Chinook reaching natural spawning locations, thereby benefiting natural production in these basins.

Operation and Maintenance of Hatchery Facilities:
Washougal Hatchery has water rights to divert water a total of 15,061 gpm from the four sources: two from Washougal River (10 and 12 cfs); one from Boyle Creek (spring water) at 5.5 cfs; and Bob Creek at 3.0 cfs. Both Boyle and Bob creeks are determined to be non-fish-bearing streams. Intake structures on the Washougal River were designed and constructed to specifications at the time the Washougal facility was built. The *Mitchell Act Intake and Screening Assessment* (2002) determined that the intake screens and velocity at Washougal Hatchery are not compliant with NOAA fish screening standards. WDFW has requested funding for future scoping, design, and construction work of a new intake system.

The return water systems operate under a National Pollutant Discharge Elimination System (NPDES) permit.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Washougal River Fall Chinook

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

Washougal Fall Chinook (*Oncorhynchus tshawytscha*)

ESA Status: "Threatened" March 24, 1999 (64FR14308); reaffirmed on August 15, 2011 (76 FR 50448).

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

Name (and title): Mark Johnson, Hatcheries Operations and Complex Manager
Agency or Tribe: Washington Department of Fish & Wildlife
Address: 165 Osprey Lane, Toledo WA 98591
Telephone: (360) 864-6135
Fax: (360) 864-6122
Email: Mark.Johnson@dfw.wa.gov

Fish Management Staff Lead Contact

Name (and title): Eric Kinne, Region 5 Hatchery Reform Coordinator
Agency or Tribe: Washington Dept. of Fish and Wildlife
Address: 2108 Grand Boulevard, Mail Stop: S-19, Vancouver, WA 98661-4624
Telephone: (360) 906-6747
Fax: (360) 906-6776
Email: Eric.Kinne@dfw.wa.gov

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

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

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

Funding Sources	Operation Information
Mitchell Act	Full time equivalent staff – 4.6
	Annual operating cost (dollars) - $782,149

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

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Washougal Hatchery Tule Fall Chinook

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Washougal RB Weir	Broodstock collection	Washougal R. (WRIA 28.0159) at RKm 22.0 (RM 13.7); tributary to the Columbia R. via Camas Slough (WRIA 28.0154) at RKm 190.1 (RM 118.1), Lower Columbia R., Washington.
Washougal Hatchery	Broodstock collection*, Adult holding/spawning, Incubation, Rearing, Acclimation	Washougal R. (WRIA 28.0159) at RKm 32.2 (RM 20); tributary to the Columbia River via Camas Slough (WRIA 28.0154) at RKm 190.1 (RM 118.1), Lower Columbia R., Washington.

* If a high flow event prevents trapping at the lower RBW, the Washougal Hatchery fishway will be the secondary collection site in order to meet broodstock needs and to remove hatchery fish form the spawning areas.

1.6 Type of program.

Stepping Stone (Integrated and Segregated) Harvest

1.7 Purpose (Goal) of program.

Mitigation/Augmentation. The goal of this program is to provide escapement to the watershed and meet sport harvest goals under the mark-selective fishery regulations (retention of adipose-clipped fish only) , consistent with the recovery of ESA listed populations and/or use hatcheries to reduce extinction risk or assist in recovery of listed populations, and minimizing impacts to natural-origin listed salmonids and steelhead. Also serves as mitigation for development (including hydro-power) and habitat degradation.

The proposed integrated strategy for this program is based on WDFW's assessment of the genetic characteristics of the hatchery and local natural population. The current and anticipated productivity of the habitat used by the populations, the potential for successfully implementing an integrated program, and NMFS' listing determination (70 FR 37160; June 2005).

1.8 Justification for the program.

The program is funded through the Mitchell Act via NOAA-NMFS for the purpose of mitigation for lost fish production due to development within the Columbia River Basin.

WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River- *Fish Management and Evaluation Plan* (FMEP) (WDFW 2001). All mainstem and tributary fisheries are managed as mark-selective (no wild retention) fisheries to minimize the impact on listed wild fish.

To minimize impact on listed fish by this 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 Washougal Fall Chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Water rights are formalized through trust water right from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.1	WDFW has requested funding for future scoping, design, and construction work of a new river intake system to meet NOAA compliance (*Mitchell Act Intake and Screening Assessment* 2002).
Effluent Discharge	4.1	This facility operates under the "U*pland Fin-Fish Hatching and Rearing*" *National Pollution Discharge Elimination System* (NPDES) administered by the Washington Department of Ecology (DOE).
Broodstock Collection & Adult Passage	7.9	All fish are mass-marked prior to release. Broodstock collection and sorting procedures can quickly identify listed non-target listed fish, and if encountered, released per protocol to minimize impact as determined by WDFW Region 5 staff.

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

1.9 List of program "Performance Standards".

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

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

1.10.1 "Performance Indicators" addressing benefits.

Table 1.10.1: "Performance Indicators" addressing benefits.

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

		Natural populations are monitored annually to assess trends and compare with goals. HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1 Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released.	Annually mass-mark 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.
3.3.1. Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.	Annual number of naturally-produced adults or redds on the spawning grounds or selected natural production index areas.	Annually monitor and report returns to the hatchery and spawning grounds.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (fin-clip, CWT, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish.	Annually monitor and report size, number, mass-mark quality (mark rate/tag rate) and date of all hatchery releases by mark type. Annually sample returning fish for the mass-mark and CWT in fisheries and at the hatchery; monitor and report numbers of estimated hatchery (marked) and natural (unmarked) fish. Report CWT analysis to RMIS database.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal distribution of broodstock collection at point of collection.	Collect broodstock representatively and systematically throughout the return (August 1 through October). Collect annual run timing, age and sex composition and spawning escapement timing data. Adhere to WDFW spawning guidelines (Seidel 1983; HSRG 2009).

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

1.10.2 "Performance Indicators" addressing risks.

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

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Program risks have been addressed in this HGMP through best available science hatchery management actions. WDFW staff annually reviews Future Brood Document (FBD) for stock, size, number, date and location of releases from all production programs. Monitor and record juvenile hatchery fish size, number, date of release and mass-mark quality; monitor contribution of hatchery adult fish to fisheries and escapement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults on the spawning ground. Production fish are mass-marked (adipose fin-clip) to allow for their differentiation from naturally-produced fish	Monitor and record juvenile hatchery fish size, number, date of release and mass-mark (fin clips, tags, etc.) 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 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 (tag rate) of hatchery releases. Examine returning fish encountered for the mass-mark (CWT) at the hatchery and on the spawning ground. Annually record numbers of estimated hatchery (marked) and natural (unmarked).
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at collection point.	Collect annual run timing, age and sex composition and return timing data.
3.4.3 Life history characteristics of the natural population do not change as a result of the hatchery program.	Life history characteristics are measured in adult and juvenile hatchery fish: return timing, age and sex composition, spawning timing, and size in returning hatchery adults; size, growth rates, and survival to release in juvenile production. Life history patterns of juvenile and adult NOR are stable.	Collect annual run timing, origin, and age and sex composition data. Annually monitor and record juvenile hatchery fish size, growth rates, number released, mass-mark/tag data, survival-to-release rates, and date of release. Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked).
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	See HGMP section 11 for M&E information.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Total number of natural-origin spawners (if any) reaching the collection facility.	All on-station hatchery releases are identifiable in some manner (fin-marks, tags, etc.).

	Timing of collection compared to overall run timing.	Collect annual run timing, origin, and age and sex composition data. CWT data reported to RMIS. Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked).
3.5.3 Artificially-produced adults in natural production areas do not negatively affect 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).	Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked).
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return 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.	Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked). 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. See also **Attachment 1** for pre-release Fish Health History. 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.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, revised 2006).	Necropsies of fish to assess health, nutritional status, and culture conditions.	DFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	Examine fish 1 to 6 weeks prior to transfer or release, in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below broodstock collection site is currently compared to historic distribution.	Trap is checked daily. Non-target listed fish, when encountered, are returned to the river.
3.7.7 Weir/trapping operations	Mortality rates in trap.	Traps checked daily. Annually

do not result in significant stress, injury or mortality in natural populations.	Pre-spawning mortality rates of captured fish in the hatchery and/or after release.	record and report abundances and observations of natural-origin fish at hatchery facilities.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally-origin salmon and steelhead (Sharpe et al. 2008).
3.8.1 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 1,600 spawning pairs are collected from the annual adult return to Washougal Hatchery to meet egg-take goals for the segregated (1.3-million; see Deep River Net Pen Fall Chinook HGMP) and on-station integrated and segregated programs (900,000 integrated and 2.1 million segregated). This is based on an average fecundity of 4,400 eggs/female and pre-spawning mortality of 10%. To meet the needs of the integrated program, up to 30% of the broodstock will be of natural-origin.

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

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

Age Class	Max. No.	Location	Major Watershed	Eco-Province
Sub-yearlings	3,000,000	Washougal River	Washougal	Lower Columbia

Source: Future Brood Document 2014.

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

Table 1.12.1: Total releases and hatchery escapement.

Year	Total Release	Hatchery Escapement
2002	4,144,650	7,628
2003	3,948,490	9,817
2004	3,684,580	10,692
2005	4,248,610	6,419
2006	4,109,300	5,070
2007	4,224,300	5,258
2008	4,169,737	8,126
2009	3,067,999	9,751

2010	3,032,420	23,253
2011	3,355,864	11,365
2012	3,141,458	5,913
2013	3,120,005	9,996
Average	**3,687,284**	**9,441**

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.

Washougal Hatchery began operations in 1958.

1.14 Expected duration of program.

Program is on-going, with no plans for termination.

1.15 Watersheds targeted by program.

Washougal River (WRIA 28.0159/ Washougal Subbasin/ Lower Columbia Province).

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.

Fall Chinook in the Washougal River are collected at the resistance board weir (RBW) on the Washougal River (RKm 32.2). Washougal Hatchery fall Chinook have been mass-marked across all age classes since 2011. The hatchery is located above a barrier falls that historically limited the passage of fall Chinook. Hatcheries can be managed for recovery and/or harvest benefits. In addition, returning hatchery carcasses can be used for nutrient enhancement. The nutrients can have positive benefits on all listed stocks because they can increase a watersheds juvenile salmonid productivity and capacity.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: *Eliminate the program*: This action would reduce potential interaction with natural populations and eliminate potential impacts on other ESA-listed species. Currently this program supports popular sport fisheries in the lower Columbia River, and is consistent with the mitigation requirements.

Alternative 2: Reduce the program to bring broodstock management within the Conservation goals. This action would not meet current fisheries management goals. Installation of a weir in the lower river would enable current production needs to be met while attaining conservation objectives for the Washougal fall Chinook stock.

Alternative 3: Modify release time or location. The primary ecological risks include competition, predation, and disease transfer between hatchery and natural-origin fish. Of greatest concerned is competition between natural- and hatchery-origin fall Chinook. Data from other Chinook populations suggests that natural fall Chinook juvenile out-migration peaks in February or March, and continues through July. WDFW hatchery fall Chinook salmon are released in late-June, near the end of the natural-origin migration.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: *Current screening and passage were not compliant with current NOAA-NMFS standards for ESA fish.* The I*ntake and Passage Report* (2002) indicates that the screens and passage are not in compliance with current standards. As a Reform Investment, we recommend the Capital Projects for compliance be invested in to provide future programmatic

adaptive management strategies that will protect listed fish as well as integrate hatchery programs.

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 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).

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

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).

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.

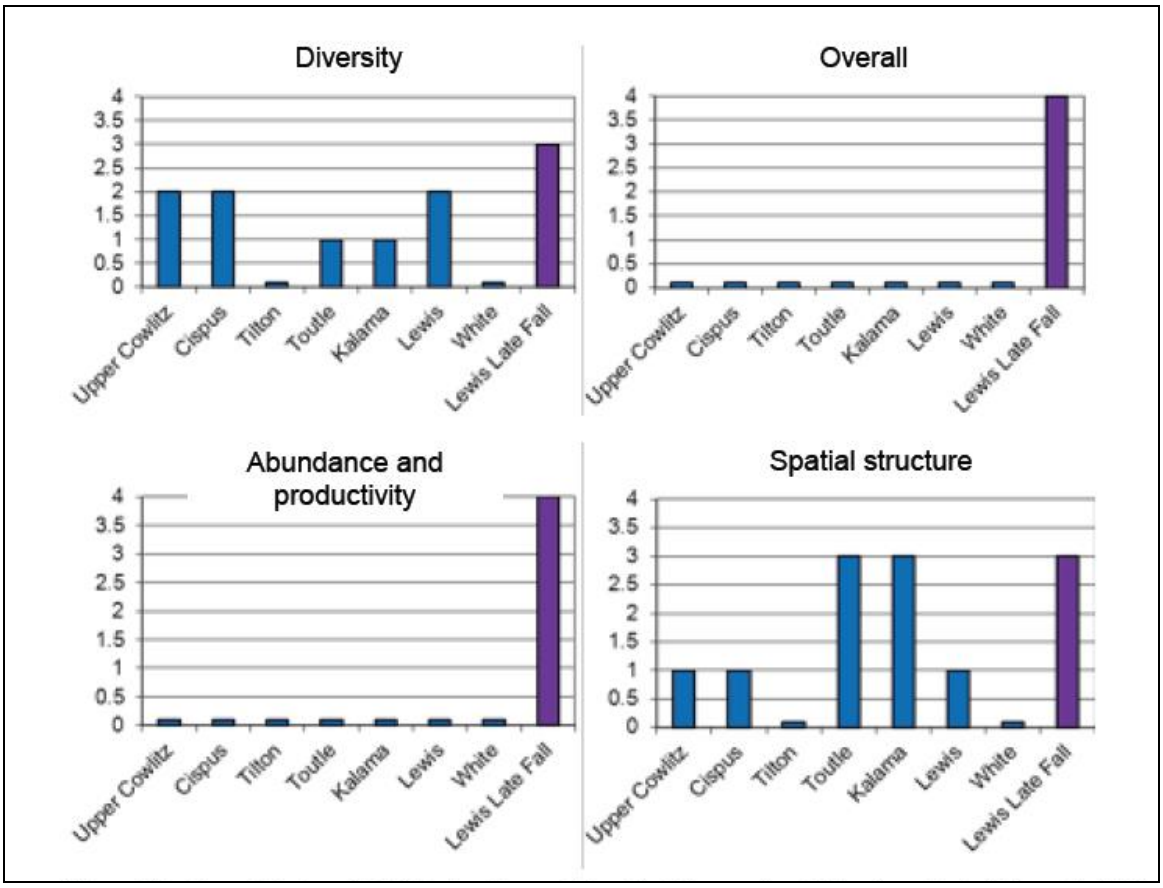

Figure 2.2.2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, 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.

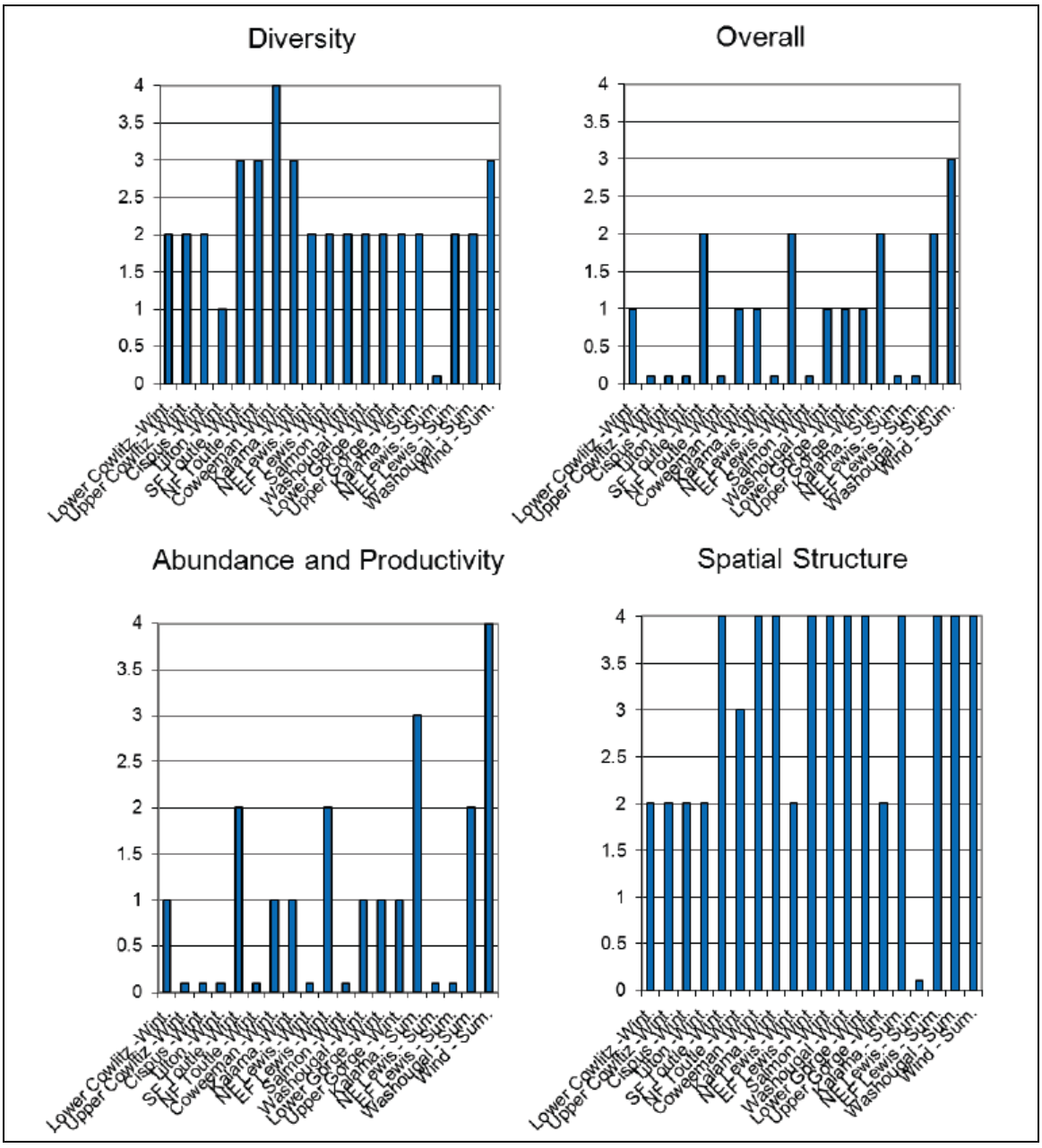

Figure 2.2.2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable")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

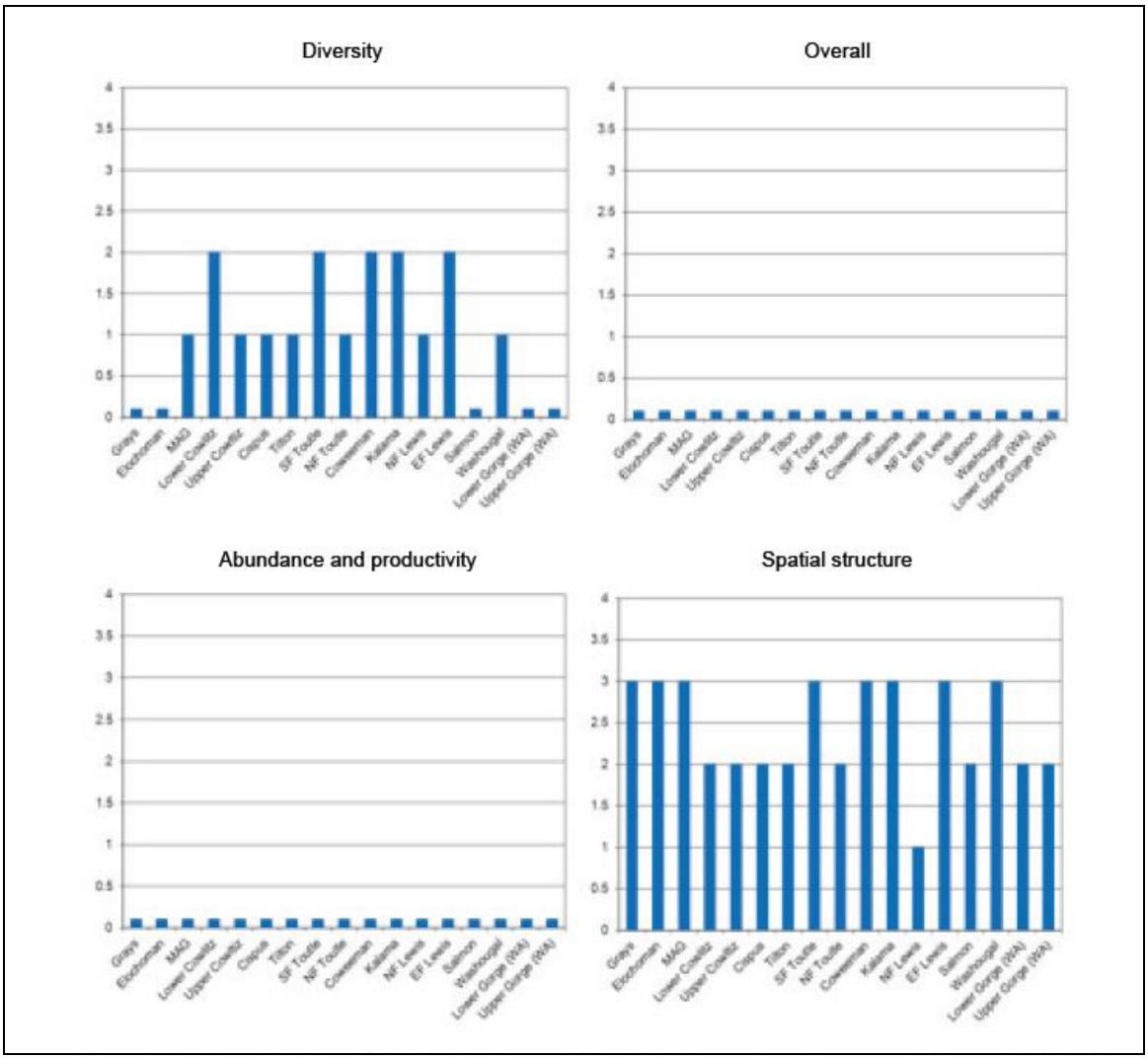

Figure 2.2.2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable")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

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

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 2.2.2.4**. The analysis indicates that all of the

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

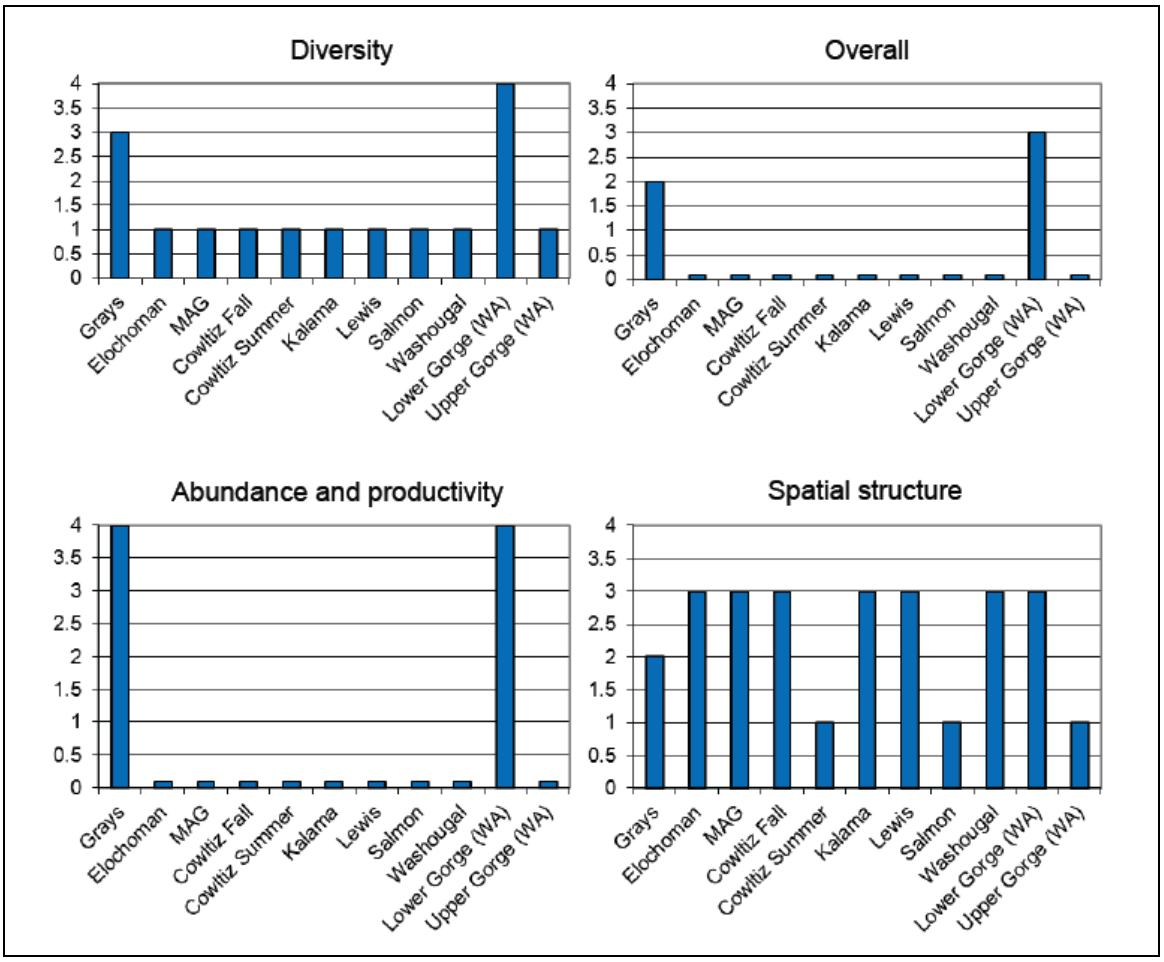

Figure 2.2.2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable")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

The proportion of hatchery-origin spawners (pHOS) should be less than 30% of the naturally spawning population, of which 5% can be from the segregated program per HSRG guidelines (2009), as this program is associated with a Primary natural population. pHOS estimates from 2011 through 2013 have averaged 0.70. This was during the seeding phase when hatchery fish were passed into the upper watershed to provide natural production. This will be reduced with the future integrated stepping stone program. See HGMP section 6.2.

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: A river-spanning resistance board weir (RBW) was installed in 2011 to facilitate annual fall/winter collection/management/monitoring of returning adult salmonids. This is the primary broodstock collection site, and will primarily be focused on fall Chinook management; however, information gathered from other returning salmonids (chum, coho, and steelhead) will also be used to improve monitoring and management when possible.

A river-spanning weir provides the ability to capture returning adult salmonids at a high rate. When the weir is "fish tight" (all fish are captured), direct census counts of a population are possible, all fish can be sampled (if necessary) and the ability to selectively remove and/or pass 100% of fish is provided.

Lethal removal of known hatchery fish, identified by a fin-mark, will be utilized as a tool to promote recovery of natural-origin stocks and meet management guidelines and objectives. The proportion of hatchery fish removed will vary to meet management goals and objectives in the basin and, in some cases, may be used to evaluate hatchery reform actions.

Because there is an integrated portion of this stepping stone program, up to 30% of the broodstock for the integrated releases will come from natural-origin spawners. Natural-origin spawners in excess of weekly needs will be passed upstream. All others, including hatchery fish needed for broodstock, will be transported to Washougal Hatchery holding ponds until spawning.

Genetic introgression: When hatchery and wild salmon interbreed, genetic material is exchanged between both groups. Mass-marking enables known levels of integration. Indirect "take" from genetic introgression is unknown. There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the sub-basin and estimates prior to 2012 indicate 80% of the natural spawners were hatchery origin fall Chinook prior to weir installation.

Rearing Program:

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

Washougal Hatchery withdraws water from the river at two locations (see HGMP section 4.1), which can reduce low flows in late-summer and early-fall from the sections between the intake to where the non-consumptive water rejoins the river (a distance of 0.5 mile) (Mitchell Act Hatcheries Intake and Passage Study -April 2003).

Indirect take from this program 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. The current release program (3,000,000) is a nearly 50% reduction from the mid-1990s, due in part to Mitchell Act funding reductions but also to reduce ecological interactions. Hatchery fish are released as active smolts that will emigrate quickly from the system. In addition, fish are released from the hatchery over a period of ten days to two weeks in order to minimize density effects. This strategy allows groups to emigrate and move from the area daily. Indirect take from density dependent effects is unknown.

Potential Washougal Hatchery fall Chinook predation and competition effects on listed salmonids and eulachon: The proposed annual production goal for this program is 3-million sub-yearlings. Chinook are released at 80 fpp (88 mm fl) in June (see HGMP section 10.3). Due to size differences between listed yearling and sub-yearling smolts **(Table 2.2.3.1**), competition is unlikely, with different prey items and habitat preferences.

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	Mar 17-23	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 Chinook 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, 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.
- Minimal residualism from WDFW Chinook 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). In extensive surveys conducted on the Lewis River, Hawkins and Tipping (1999) found no residualized hatchery Chinook. Indirect take from residualism is unknown.

Monitoring:

Associated monitoring Activities: WDFW has implemented an expanded monitoring program for Chinook, coho, chum and steelhead populations in the Lower Columbia River (LCR) region of Southwest Washington (WDFW's Region 5) and fishery monitoring in the lower mainstem of the Columbia River. The focus of this expanded monitoring is to 1) gather data on Viable Salmonid Population (VSP) parameters – spawner abundance, including proportion of hatchery-origin spawners (pHOS), spatial distribution, diversity, and productivity, 2) to increase the Coded Wire Tag (CWT) recovery rate from spawning grounds to meet regional standards, and 3) to evaluate the use of PIT tags to develop harvest rates for salmon and steelhead populations. Additionally, key watersheds are monitored for juvenile salmonid 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).

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

Table 2.2.3.2: Disposition of wild fall Chinook returning to the Washougal River RBW.

Brood Year	Mortality	Spawned
2011	2	0
2012	1	0
2013	0	0

Source: WDFW Hatcheries Headquarters Database 2014.

Table 2.2.3.3: Disposition of wild fall Chinook returning to Washougal Hatchery.

Brood Year	Mortality	Spawned
2011	2	0
2012	0	0
2013	1	0

Source: WDFW Hatcheries Headquarters Database 2014.

See also **Table 7.4.2.1**.

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

See "take" tables at the end of this 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.

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

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

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

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

Descriptions of these policies and excerpts are shown below:

Policies/Plans – Key Excerpts

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

Guidelines from the policy include:

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

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

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

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

Strategies:

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

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

The Mitchell Act programs are intended to support Northwest fishing economies – particularly coastal and Native American -- that have relied on Columbia River production both before and after dam construction. Catches of hatchery fish sustain the economies of local communities while keeping incidental mortalities of ESA-Listed fish at approved levels. Value of hatchery production and benefit to local economies will be further increased by implementing fisheries that increase harvest of hatchery produced fish, as expected through implementation of the LCSRP.

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

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

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

Total annual harvest is dependent on management response to annual abundance in Pacific Salmon Commission (PSC - U.S./Canada), Pacific Fishery Management Council (PFMC - U.S. ocean), and Columbia River Compact forums. WDFW also has 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.

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.

The Washougal Hatchery fall Chinook contribute to coastal ocean fisheries in Alaska, British Columbia and Washington, as well as Toutle tributary sport fisheries. An extremely popular fishery for Tule Chinook exists in the Washougal River downstream of the weir location.

Table 3.3.1.1: Washougal River Hatchery Sub-yearling Fall Chinook Fishery Contributions

Brood Years: 2000-2009[c] Fishery Years:2004-2013		
		Average SAR%[a] 0.32
Agency	**Non-WA Fishery**	*% of total Survival*
ADFG	All	7.34
CDFO	All	19.60
NMFS	All	0.04
Agency	**OR Fishery**	*% of total Survival*
ODFW	10- Ocean Troll	0.26
ODFW	21- Columbia R. Gillnet	7.73
ODFW	40- Ocean Sport	0.13
ODFW	44- Columbia R. Sport	3.15
ODFW	45- Estuarine Sport	1.45
ODFW	50- Hatchery Escapement[d]	0.55
ODFW	54- Spawning Ground	0.03
Agency	**WA Fishery**	*% of total Survival*
WDFW	10- Ocean Troll	1.14
MAKA	15- Treaty Troll	0.34
WDFW	15- Treaty Troll	0.42

WDFW	22- Coastal Gillnet	0.20
WDFW	23- Estuarine Net	0.11
WDFW	40- Ocean Sport	0.13
WDFW	41- Ocean Sport- Charter	1.26
WDFW	42- Ocean Sport- Private	2.53
WDFW	45- Esturine Sport	0.51
WDFW	46- Freshwater Sport[b]	4.98
FWS	50- Hatchery Escapement[d]	0.10
WDFW	50- Hatchery Escapement	37.70
WDFW	50- Hatchery Escapement (Strays)[d]	1.18
WDFW	54- Spawning Grounds[e]	9.10
	Total	*100.00*

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

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

[c] 2009 data preliminary and represents a minimum estimate.

[d] Includes recoveries at Bonneville, Fallert Creek, Kalama Falls, Little White Salmon and Merwin Hatcheries.

[e] Includes recoveries in the Sandy River (OR), and WRIA 27 and 28

Source: RMIS 2014.

3.4 Relationship to habitat protection and recovery strategies.

The following processes have included habitat identification problems, priority fixes and evolved as key components to *The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans* (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, December 15, 2004).

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

Habitat Treatment and Protection - Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. 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 28 LFA was conducted by the Washington State Conservation Commission (May 2002). Major impacts include fish habitat degradation from the upper Washougal River system reaches downstream to the mouth in Camas. The Yacolt Burn deforested large tracts of land in the upper reaches causing an increase in sediment transport, a reduction in hydrologic retention, and a general decline in habitat quality. Gravel extraction in the lower 20 miles of the river has caused a loss in suitable spawning substrate through this reach. Water quality remains a problem and the Washougal River is listed on the 303d list (WDOE) along with several of its' tributaries.

3.5 Ecological interactions.

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

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

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Multiple programs including fall Chinook, coho and steelhead programs are released from the Washougal Hatchery and limited natural production of Chinook, coho, chum and steelhead occurs in this system along with non-salmonid fishes (sculpins, lampreys and sucker etc.).

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

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

4 SECTION 4. WATER SOURCE

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

Table 4.1.1: Water sources for Washougal Hatchery.

Water Source	Water Right		Available Water Flow	Avg Water Temp. (ºF)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Washougal River (surface)	S2-*13405C WRIS/ 07058	10084	10.0 cfs	48.7	Rearing	Limited water during summer months due to low flows. Temps in lower river can reach the 70s in the summer.
	S2-25274C WRIS	----	12.0 cfs			
Boyle Cr. (spring water)	S2-CV2P694/ 07316	07327	5.5 cfs	49.3	Rearing	Limited water during summer months due to low flows.
Bob Creek (surface)	S2-*09760CWRIS/ 07314	07325	3.0 cfs	48.9	Rearing, incubation	None. Not used for incubation in the summer.

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

Water rights total 15,061 gpm from four sources.

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

Spring water from Boyle Creek, located approximately 68.6 m from the hatchery, supplies 2,300 gpm (5.1 cfs) non-turbid and minimal silt-laden water to the hatchery during high flow river events and is used for ponds 13 thru 24, as well as 27 for fall Chinook rearing. Since this is a short stream from a spring source, the agency has determined there are no fish populations within this stretch and does not need a screen intake. A gravity intake on Bob Creek is located 0.54 km from the grounds and supplies 2.5 cfs for incubation. Water temperature stays fairly constant year-round (see **Table 9.2.2**), and it is not used for incubation in the summer months. "C-Creek", another small spring source, is no longer used (Richard Johnson, pers. comm., 2004).

During summer, water from the river intake reflects elevated temperatures. Water temperature data collected at the Washougal Salmon Hatchery between 1987 and 1991 also documents high water temperatures in the upper Washougal basin. During this five-year recording period, water temperatures at the hatchery frequently exceeded 17.8°C during July, August and September; in some cases for as long as 17 days in a row (see also **Table 9.2.2**).

The water right permits for this facility was formalized through the Washington Department of Ecology (see **Table 4.1.1**), and were obtained by WDFW in 1950.

NPDES Permits:

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

Discharges from the cleaning treatment system are monitored as follows:

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

Table 4.2.1: Record of NPDES permit compliance.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Washougal Hatchery WAG13 1044	Y	Y	Y	07/25/2012	0	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 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.

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

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

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Beginning in 2011, broodstock will be collected at the mainstem resistance board weir (RBW) located at approximately at RKm 22.0 (RM 13.7). The trap consists a floating resistance board sections constructed primarily of PVC pipe in the center (**Figure 5.**) with 1½" spacing. An 8' x 10' aluminum live trap box is installed between the fixed panel and resistance board section on the river-right bank; an additional trap box was added in 2012 to provide greater carrying capacity. The resistance board sections are anchored with duckbill anchors and cables. The RBW generally operated from August 1 through October 31; coho and steelhead captured are passed above the trap.

If a high flow event prevents trapping at the lower weir, the Washougal Hatchery fishway will be used as a secondary collection site. The rack at the fishway is installed in August through February to capture coho broodstock. A bypass structure was installed at the base of the fish ladder in 2011 to allow fish to pass upstream without having to recruit to the adult holding pond. When the bypass is closed, any fish above the RBW site can recruit to the hatchery, especially in event of weir failure in the lower river.

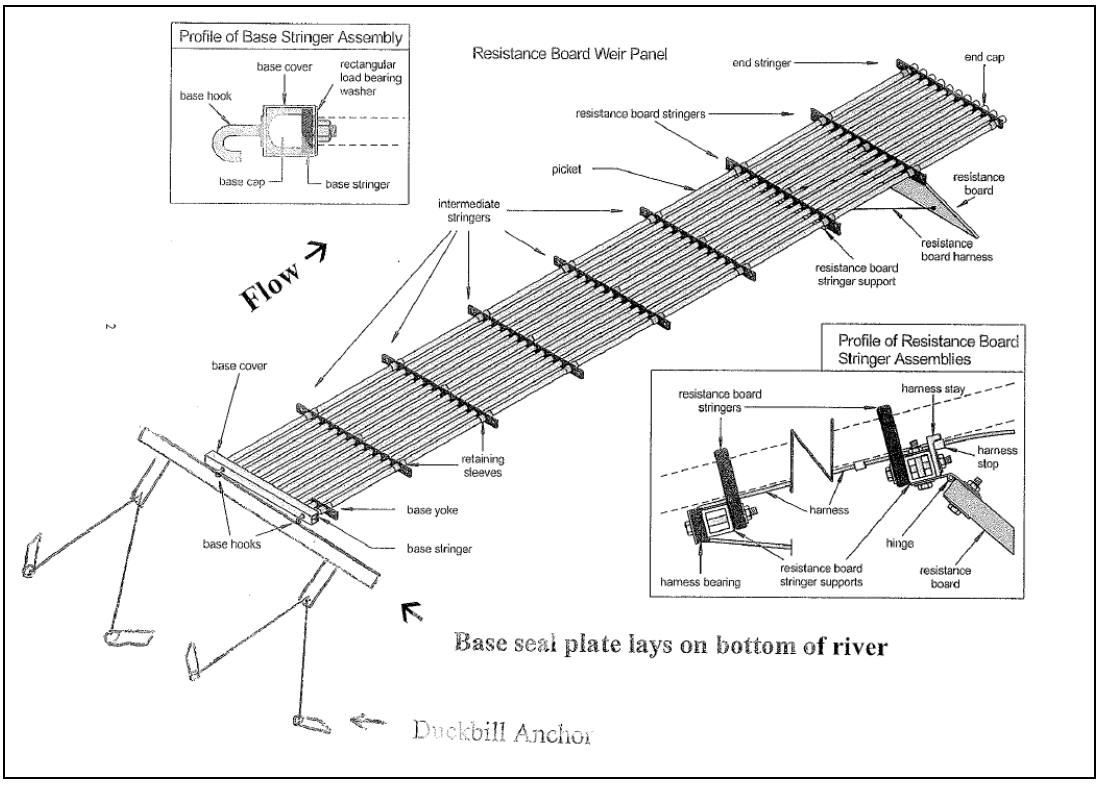

Figure 5.1: Schematic of resistance board weir.

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

Table 5.2.1: Transportation equipment available.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1,800	Y	N	25	Sodium Chloride (Salt)	5,000 ppm (~0.5%)
Tanker Truck	1,000	Y	N	25	Sodium Chloride (Salt)	5,000 ppm (~0.5%)

Adult fish will be removed from the trap live box via lift pump, to be trucked from the mainstem weir site to holding and sorting ponds via a tanker mounted on a flatbed truck. Normal transport time from weir is 25 minutes.

5.3 Broodstock holding and spawning facilities.

Table 5.3.1: Broodstock holding and spawning facilities available.

Type	Units (number)	Volume (cu.ft.)	Size (ft)			Flow (gpm)
			Length	Width	Depth	
Asphalt Adult holding pond	1	100,825	185	109	5	11,225

Integrated Hatchery Operations Team (IHOT) adult holding guidelines are followed for adult holding, density, water quality and alarm systems. Adults are seined, sorted, killed and spawned directly from the adult holding pond. Fish not ready to spawn are returned to the pond for further maturation. Spawning for this program takes place in a covered area.

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available.

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

Fertilized eggs are incubated in the deep troughs until eyed, then moved to vertical stack incubators for hatching. Water source is from Bob Creek (spring water).

5.5 Rearing facilities.

Table 5.5.1: Rearing facilities available.

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

Swim up fry are ponded into concrete raceways. After initial rearing in concrete raceways, sub-yearlings a mass-marked and moved to the large concrete rearing pond until release.

Earthen pond 27 was modified to a concrete rearing pond (475 ft x 40 ft x 4.5 ft) in 2010 to help reduce loading densities.

5.6 Acclimation/release facilities.

Fish are released on-site (see HGMP section 5.5) directly to the river.

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

Program has experienced operational difficulties during drought events, which caused problems in water availability and quality (temperature). Icing and slushing problems during the winter within the ponds can be a problem. Otherwise, the facility does not experience abnormal operational difficulties.

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.

- All pumps, broodstock holding, incubation and rearing receptacles have water loss alarms.
- One main river pump is kept specifically as a back-up in case of mechanical failure.
- Backup generator system is automatic in case of power loss.
- Multiple water sources (Boyles and Bob Creeks) are gravity-fed and can be used in case of total power and/or backup generator failure.
- Staff is available 24/7 to respond to pump failure, water loss, and flooding events.
- Aeration pumps are used to maximize the water conditions in the adult collection pond during periods of low water quality which benefits fish held until sorting can be accomplished.
- Fish health protocols through broodstock collection, incubation and rearing phases are followed and monitored monthly.

- Broodstock collection is checked daily for program and listed fish.
- Staff monitors the trap operation daily to keep the numbers of fish stacking in the trap area to manageable volumes. Heavy volumes can create density problems for listed fish if they are not removed expeditiously.

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 Source.

Broodstock has been collected at the mainstem resistance board weir (RBW) since 2011 (see HGMP section 5.1). Previously, program broodstock was derived from adults volitionally returning to the Washougal Hatchery. Program egg-take goals have been met, except in 1999, when the shortfall was filled with eggs from Elochoman Hatchery.

6.2 Supporting information.

6.2.1 History.

This is a mixed stock with composite production, and is similar in life history to other Tule fall Chinook stocks in the Lower Columbia. Broodstock are collected/ acquired randomly through the run timing to Washougal River according to protocols and guidelines that have been set forth by agency geneticists. The adult returns to the Washougal Hatchery have exceeded 3,000 fish from 1990 to present.

6.2.2 Annual size.

A total of 1,600 spawning pairs are collected from the annual adult return to Washougal Hatchery to meet egg-take goals for the segregated (1.3-million; see Deep River Net Pen Fall Chinook HGMP) and on-station integrated programs (3.5-million). Around 875 spawning pairs are needed for this program, based on an average fecundity of 4,400 eggs/female and pre-spawning mortality of 10%. To meet the needs of the integrated program, 30% of the broodstock will be of natural-origin.

6.2.3 Past and proposed level of natural fish in broodstock.

The level of natural origin fish in the returning broodstock is unknown prior to 100% mass-marked returns for all age classes beginning in 2011. Chinook abundance in the Washougal basin is estimated by mark-recapture carcass tagging experiments. In years when there is no carcass tagging, population estimates are based on the expansion factor that compares the total population estimate divided by the peak live and dead counts. With the operation of the adult weir in the lower Washougal River, broodstock composition can be controlled and managed for a minimum goal of 30% NOBs for the integrated program. Beginning in 2014 active integration of NOB's will occur.

6.2.4 Genetic or ecological differences.

Sixteen different stocks have been released from the hatchery since 1953. With the exception of a transfer of 1-2 million upriver bright fall-run Chinook from Priest Rapids Hatchery, these transfers have consisted of lower Columbia River fall-run Tule stocks (Myers et al.1995). Washougal River natural spawners are a mix of natural and hatchery origins but are comprised mostly of Washougal Hatchery strays. Strays from other hatcheries within this GDU are uncommon (Marshall et al. 1995). Broodstock collection has come from adults returning to the Washougal River since 1993, except in 1999, when Elochoman River fall Chinook were used to

make-up the shortfall. Genetic analysis of Washougal fall Chinook in 1995 and 1996 indicated that they were significantly different from other lower Columbia River Chinook stocks, except for Lewis River bright fall Chinook.

6.2.5 Reasons for choosing.

The stock has a run-entry pattern and timing that provides harvest opportunities for fisheries in the sub-basin, lower Columbia mainstem/tributaries, and the Washington/Oregon Coast, and represent the indigenous lower Columbia stock. The broodstock chosen has the desired life history traits to meet these harvest goals (e.g. run-timing) that provides significant harvest to the ocean and lower Columbia River fisheries (e.g., Buoy 10).

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.

- Natural spawners will be integrated into the broodstock to represent the natural fall Chinook run throughout the season.
- Hatchery program fish are mass-marked.
- There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the sub-basin.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish encountered during the broodstock collection process will be returned directly to the river or passed into the upper watershed, with minimal handling and holding time.
- Any observed mortalities will be reported in the WDFW Hatcheries Headquarters Database.
- Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW has established interim minimum escapement objectives. The minimum fall Chinook MSY escapement goal is 3,200 adult spawners from the mouth to the lower Washougal RBW.

7 SECTION 7. BROODSTOCK COLLECTION

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

Adults returning to the Washougal River.

7.2 Collection or sampling design.

Broodstock is collected at the mainstem resistance board weir (RBW) located at RKm 22.0 (RM 13.7) (see HGMP section 5.1).

A river-spanning weir provides the ability to capture returning adult salmonids at a high rate. A "fish tight" weir trap (all fish are captured), enables direct census counts of a population, and the ability to sample (if necessary) and selectively remove and/or pass 100% of fish captured. The trap structure is operated in the river from August 1 through October 31. The weir/trap is checked daily (multiple times daily, if necessary) by hatchery staff and four temporary technicians, stationed on-site on a rotating schedule to provide a near continuous presence at the weir, 24-hrs/day, 7-days/week, from installation through removal. Captured fish will be manually sampled to determine origin, and sorted for use as either broodstock, passage upstream, or surplus. All fall Chinook passed upstream at the weir will be double floy-tagged, opercula-punched, and biological data (fork length and sex) recorded; all other salmonid species will be enumerated and passed upstream untagged (see also HGMP section 11.1.1).

Because this is an integrated program, 30% of the fall Chinook broodstock should come from natural-origin spawners. However, due to the size of the program, it has been operating as a segregated program from 2011 through 2013. 2014 will be the first year of the stepping stone type program.

Natural-origin spawners in excess of weekly collection goals will be passed upstream. All others, including hatchery fish needed for broodstock, will removed from the trap into a tote custom-built to handle live fish or other fish lift methods, for transfer to the tanker truck, and transported to Washougal Hatchery holding ponds until spawning.

Lethal removal of known hatchery fish (identified by a fin-mark) will be utilized as a tool to promote recovery of natural-origin stocks and meet management guidelines and objectives. The proportion of hatchery fish removed will vary to meet management goals and objectives in the basin and, in some cases, may be used to evaluate hatchery reform actions.

Close attention will be paid to the recruitment of fish into the adult trap and the accumulation of fish below the trap. If fish are not adequately moving into the trap, a beach seine may be used to either capture fish or crowd them into the live box. If fish are stacking up below the weir and cannot be captured through trapping or seining, weir panels will be removed or submerged to allow fish passage upstream of the weir for short intervals.

If a high flow event prevents trapping at the lower weir, the Washougal Hatchery fishway will be used as a secondary collection site. The rack at the fishway is installed August through February. A bypass structure was installed at the base of the fish ladder in 2011 to allow fish to pass upstream without having to recruit to the adult holding pond. When the bypass is closed, any fish above the RBW site can recruit to the hatchery, especially in event of weir failure in the lower river.

7.3 Identity.

Washougal River fall Chinook spawn in the area from Salmon Falls at RKm 23.3 (RM 14.5), downstream approximately 6.4 km (4.0 miles). Natural spawning occurs in the Washougal River slightly later (October to November) than other lower Columbia River Tule fall Chinook stocks. Natural escapement is estimated using spawning ground counts within selected index areas. Straying of lower river hatchery (LRH) fall Chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production. The overall result of straying and transfers of fall Chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock. This is a mixed stock with composite production (SaSI 2002) and is similar to the life histories of other Tule fall Chinook stocks in the lower Columbia.

7.4 Proposed number to be collected:

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

See HGMP section 6.2.2.

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

Table 7.4.2.1: Composition of broodstock adults and jacks.

Brood Year	Marked			Unmarked		
	Females	Males	Jacks	Females	Males	Jacks
2002	962	962	1			
2003	905	900	7			
2004	986	1,090	9			
2005	1,224	1,214	11			
2006	1,017	1,016	3			

2007	1,057	1,059	11			
2008	715	703	5			
2009	997	988	5			
2010	1,005	1,005	2			
2011*	1,095	1,012	66	0	0	0
2012	1,160	1,195	41	0	0	0
2013	1,087	1,090	35	0	0	0

Source: WDFW Hatcheries Headquarters Database 2014.

Note: Fall Chinook releases from Washougal Hatchery have been 100% mass-marked since 2006, 2011 return year for all age classes.

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

Fish and Hatchery Program, staff develop weekly and cumulative broodstock collection goals and evaluate run size forecasts at the pre-season meeting. In years of high abundance where hatchery swim-ins exceed broodstock goals, fish may be donated to food banks or nutrient enhanced. Any nutrient enhancement occurring below the Washougal Salmon Hatchery must be approved by the Fish Program, and all carcasses released in this area shall have their tails cut to distinguish them from natural spawners.

Table 7.5.1: Disposition of fall Chinook returning to the Washougal River (RBW and Washougal Hatchery combined).

Brood Year	Mortality	Released Upstream	Shipped[a]	Surplus	Spawned
2007	360	0	0	2,158	2,127
2008	2,248	0	0	2,120	1,418
2009	1,623	0	0	4,254	1,985
2010	926	514	0	7,514	2,010
2011	1,755	180	2,307	2,827	2,107
2012	1,136	60	2,715	1,125	2,374

Source: WDFW Hatcheries Headquarters Database 2014; 2007-2008 data from Washougal Hatchery records.

[a] Transfer from RBW to Washougal Hatchery; these fish are already counted in the mortality, releases, surplus or spawned.

7.6 Fish transportation and holding methods.

A custom-built tote is used at the weir to transport fish from the trap to the tanker truck. Adult fish are trucked from the mainstem RBW site to Washougal Hatchery holding and sorting ponds via a tanker mounted on a flatbed truck (see HGMP section 5.2). I new transport system was purchased in 2014 and will be tested at the weir site. Normal transport time from the weir is 25 minutes.

7.7 Describe fish health maintenance and sanitation procedures applied.

WDFW facilities follow Integrated Hatchery Operations Team (IHOT), Pacific Northwest Fish Health Protection Committee (PNFHPC), WDFW's Fish Health Manual (November 1966, updated March 1998, revised March 2010) or tribal guidelines. Fish Health Specialists make monthly visits and consult with staff. The adult holding area is separated from all other hatchery operations. Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning: all equipment and personnel use disinfection procedures (chlorine or iodophor) upon entering or exiting the area. The spawning area and spawning implements are disinfected at the end the spawning day.

Fish treatments are rare and only for fungus control requiring formalin bath treatments.

7.8 Disposition of carcasses.

Fish can be donated to food banks or nutrient enhanced. The majority of carcasses in the recent past have been used by the Lower Columbia Fishery Enhancement Group (LCFEG) for nutrient enhancement.

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.

Weir trap:

1. **Trap box:**
   a. The highest potential for injury or mortality will likely be due to overloading of the trap box, which could be exacerbated by low flow/warm water conditions. To minimize this, the trap will be staffed nearly continuously while installed and the trap box will be checked multiple times/day, as necessary.
   b. Water temperature will be monitored.
   c. If abundance of salmonids exceeds the ability of staff to efficiently work through fish, modifications to the sampling schedule and/or trapping protocols will be made.
2. **High flow events**
   a. High flow events could prevent access to the trap box and limit WDFW staff's ability to handle fish, potentially trapping fish for the duration of the high flow event. WDFW staff monitor stream gauges to gather near real-time information on stream flows throughout the lower Columbia. Gauges are operated by Washington Department of Ecology (DOE) on the Washougal River (station ID: 28B080).
   b. Utilizing streamflow, weather forecast information, and direct observation, WDFW personnel will determine when flows begin to limit the ability to access the trap box and sample fish. The downstream end to the trap box will be closed to prevent fish from becoming entrapped while personnel cannot access the trap.
3. **Handling stress**
   a. Handling fish presents another potential injury/mortality risk. To minimize this, experienced, senior level staff will be overseeing tagging and handling operations and ensuring field technicians are well trained in proper fish handling techniques.
   b. In addition, anesthetic (MS-222) or electo-narcosis may be used to calm fish during intrusive procedures.

- Every effort shall be made to promote local adaptation of this fall Chinook salmon population and out of basin hatchery transfers will only be considered in extreme cases.
- Broodstock will be collected, throughout the entire run time, from adults arriving at the rack.
- Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered
- Limit out-of-basin transfers of eggs or fish, except in extreme cases.
- Fall Chinook have been mass-marked for Chinook programs since 2006.
- There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin.
- Holding pond procedures follow IHOT guidelines.
- Other listed fish will be released immediately, if encountered, during the broodstock collection process.

8 SECTION 8. MATING

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

8.1 Selection method.

Cohorts are utilized from the entire run cycle with males and females available on a given day mated randomly. Spawning is conducted weekly and occurs over a period of up to six weeks with the peak in October.

8.2 Males.

Adults are spawned at a 1:1 male:female ratio. Jacks are incorporated into the spawning at a minimum of 2.0% of the total spawning population.

8.3 Fertilization.

To maximize effective population size with-in the hatchery broodstock, fertilization occurs in 1:1 mating (females/males). Ovarian fluid is not drained prior to fertilization. Water hardening procedures with iodophor are followed after twenty minutes. Iodophor solution is used as rinse that is applied to hands and spawning implements per spawning. Iodophor foot baths are located at entrance to incubation room. Generally, sixty ovarian fluid and kidney/spleen samples are collected from female spawners to test for the presence of viral pathogens. Unmarked fish not used for integration needs are released upstream of the hatchery.

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

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

- Limit/eliminate out-of-basin transfers.
- Protocols for population size, fish health disinfection and genetic guidelines are followed.
- Spawn all collected mature broodstock if possible without regard to age, size, color or other physical characteristics. If not spawning all collected mature adults over the season, apply the same rationale to individual spawn days.
- Randomize mating and avoid selectivity beyond ripeness on a given spawn day.
- Use one male to one female as much as possible in order to ensure an equal genetic contribution.
- Do not mix milt from multiple males and add to eggs (pooling prior to mixing) in order to eliminate disproportionate genetic male contributions.
- Do not re-use males except as part of specific spawning protocols. A given male should be used as the first mate for only one female total.

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

9.1 Incubation:

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

Table 9.1.1: Survival rates (%) from egg-take to ponding, Washougal River fall Chinook.

Brood Year	Egg Take	% Survival Rate	
		Green-to-Eyed	Eyed-to-Ponding
2002	4,700,000	Na	Na
2003	4,700,000	Na	Na
2004	4,700,000	91.3	98.6
2005	4,700,000	89.2	97.4
2006	4,700,000	93.2	94.9
2007	4,783,300	88.3	97.9
2008	3,391,500	92.4	98.5
2009	4,705,110	84.1	97.1
2010	4,866,000	92.2	95.1
2011	4,798,882	94.3	98.1
2012	5,136,068	95.1	97.8
2013	4,822,551	94.8	98.3

Source: WDFW Headquarters Database 2014.
NA – Not available.

9.1.2 Cause for, and disposition of surplus egg takes.

The program broodstock collection goals set in the annual Future Brood Document. Egg-takes are managed according to data/information of historical egg-takes at the facility, and are maintained within the ±5% guidelines. Viral sampling (60 fish lots) are conducted over the course of the season.

In the event that egg survival is higher than expected, WDFW Regional Managers will be contacted for instructions for disposition of the surplus in accordance with Regional policy and guidelines set forth in management plans/agreements and ESA permits.

9.1.3 Loading densities applied during incubation.

Eggs are placed in deep troughs at 110,000 eggs/unit until eyed, then moved to stack incubators for hatching at 8,000 eggs/tray. Removal of dead eggs, accurate enumeration and loadings are adjusted during this time. Integrated Hatchery Operations Team (IHOT) species-specific incubation recommendations are followed for water quality, flows, temperature, substrate, and incubator capacities.

9.1.4 Incubation conditions.

IHOT species-specific incubation recommendations are followed for water quality, flows, temperature, substrate and incubator capacities. Incubation water temperature is monitored by thermograph and recorded (see **Table 9.2.2**), and temperature units (TUs) are tracked for embryonic development. Harmful silt and sediment is cleaned from incubation systems regularly while eggs are monitored to determine fertilization and mortality.

Eyed-eggs are treated with iodophor and formalin until eggs are ready to be shocked and picked. Eyed-eggs are loaded into the stack incubators, at 8,000 egg/tray, and incubated on surface water,

at a flow of 5 gpm. All eggs were treated with formalin dripped at 1:600 to control *Saprolegnia* until hatched. Dissolved oxygen (DO) content is monitored and have been at acceptable levels of saturation with a minimum criteria of 8 to 10 ppm. Siltation is controlled with rodding, as needed.

9.1.5 Ponding.

Fry are typically ponded to the raceways starting in late-January/February, when the yolk slit is closed to approximately 1-mm wide (approximately 1,600 TUs) or KD (95% yolk absorption).

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eye, fry fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW fish health specialist. In addition, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission. Disease treatment varies with the pathogen encountered, but is generally antibiotic in nature for bacterial infections and bath or drip treatments with chemotheraputants for external infections.

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

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

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

9.2 Rearing:

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

Table 9.2.1: Survival rates (%) from ponding to release.

BroodYear	Ponding-to-Release
2002	NA
2003	NA
2004	97.3
2005	96.2
2006	93.9
2007	96.4
2008	97.5
2009	95.8
2010	94.2
2011	96.6
2012	97.4
2013	97.2

Source: WDFW hatchery records.
NA – Not available

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

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

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).

9.2.3 Fish rearing conditions

Table 9.2.2: Monthly average surface water temperature (°F), Washougal Hatchery.

Month	Average Water Temperature (ºF)		
	Washougal R.	Bob Creek	Boyle Creek
January	39.3	43.2	42.2
February	42.1	44.5	44.3
March	43.4	45.0	46.0
April	45.6	47.1	47.2
May	50.6	49.1	50.8
June	54.1	50.5	51.2
July	61.4	56.9	59.1
August	60.8	58.2	58.7
September	56.8	56.0	56.1
October	47.5	48.0	48.5
November	44.1	45.0	45.2
December	38.7	43.2	42.3
Average	**48.7**	**48.9**	**49.3**

Source: WDFW Hatchery Records 2014.

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

Fish are reared in six raceways. Temperature, dissolved oxygen and pond turnover rate are monitored. IHOT standards are followed for: water quality, alarm systems, and predator control measures (netting) to provide the necessary security for the cultured stock. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers.

Fish are mass-marked when they are about 180 fpp, depending on growth rates and water temperature, starting in mid-April, and lasting for about six weeks; fish are coded-wire tagged in May. After marking, Chinook are transferred to the concrete rearing pond (Pond 27), where they remain until release in June.

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

Table 9.2.3: Monthly fish growth information by length (mm), weight (fpp), condition factor and growth rate.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
January	34.4	1,200	Na	Na
February	38.4	794	Na	0.338
March	42.7	579	Na	0.271
April	54.9	271	Na	0.532
May	68.1	142	Na	0.476
June	80.2	78	4.03	0.4507

Source: WDFW Hatchery Records.

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

See HGMP section 9.2.4. No energy reserve data available.

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

Fish are given variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contracts. Feeding frequencies varies depending on the fish size and water temperature, and usually begin at 8 feedings/7 days a week to 1-2 feedings/7 days; frequency of feeding decreases as fish grow from fry (hourly) to smolt (once or twice daily). Feed rates range from 1.0 to 3.0% B.W./day. The overall season feed conversion ratio has averaged approximately 0.74:1.0 (fry) to 0.82:1.0 (pre-smolts to release).

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. Kidney and spleen are checked for BKD. Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted (see **Attachment 1** for Virology Sampling reports, and **Attachment 2** - Fish Health Monitoring history).

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 (see also **Attachment 2**: Fish Health Monitoring summaries).

Sanitation. All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy). Every effort is made to prevent the horizontal spread of pathogens by splashing water. 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. Footbaths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens. Mortalities are collected and disposed of at a landfill.

Fish Health and/or treatment reports are kept on file (see **Attachment 1** for Fish Health monitoring history).

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

Gill ATPase activity is not measured. Fish size at release time is critical to the readiness for migration. The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, a leaner (0.80 – 0.90) condition factor (K), a silvery physical appearance and loose scales during feeding events are signs of smolt development.

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

Not applicable.

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

See HGMP sections 5.8, 6.3, 7.9 and 9.1.7.

10 SECTION 10. RELEASE

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

10.1 Proposed fish release levels.

Table 10.1.1: **Proposed release levels (maximum number).**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Sub-yearling	3,000,000	80.0	June	Washougal River

Source: WDFW Future Brood Document 2014.
Note: 80 fpp = 88 mm fork length (fl).

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

Stream, river, or watercourse: Washougal River (WRIA 28.0159)

Release point: RKm 32.2

Major watershed: Washougal Sub-Basin

Basin or Region: Lower Columbia River

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

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

Release Year	Number	Avg Size (fpp)	CV	Date
2002	4,144,650	67.0	7.09	June 13-30, July 3
2003	3,948,490	54.2	7.66	June 4-12, July 7-8
2004	3,684,580	50.9	6.01	June 10-15, July 7
2005	4,248,610	53.0	5.89	June 10-15, July 6
2006	4,109,300	53.2	10.16	June 16-25, July 12
2007	4,224,300	66.9	6.90	June 18-25
2008	4,169,737	65.0	9.03	July 1-5
2009	3,067,999	77.0	8.34	June 16-17
2010	3,032,420	98.0	8.44	May 28

2011	3,355,864	75.1	6.90	June 28-30
2012	3,141,458	79.2	8.60	June 27
2013	3,120,005	80.2	7.50	June 11

Source: WDFW Hatcheries Headquarters Database 2014.

Note: 50 fpp = 109 mm fork length (fl); 64 fpp = 95 mm fl; 74.0 fpp = 90 mm fork length (fl); 80.0 fpp = 88 mm fl.

Program was reduced from 4.0-million sub-yearlings in 2008.

10.4 Actual dates of release and description of release protocols.

Smolts are forced released at a size and time of release to the Washougal River in June; see **Table 10.3.1** for actual release dates. The release period of program fish is later, but lies within the natural out-migration time frame of naturally-produced Tule fall Chinook. River temperature and discharge can also be determinants of the date of release.

10.5 Fish transportation procedures, if applicable.

Program fish are released on-station and are not transported.

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

Fish are reared, acclimated, and released as sub-yearling smolts directly into the Washougal River from the rearing/acclimation ponds at the Washougal Hatchery. All production occurs with a mixture of Boyles Creek, Bob Creek, and Washougal River water, giving program fish a distinct location indicator.

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.

Brood Year	Age Class	Number	Mark-Type
2014	**Sub-yearlings**	900,000	AD+CWT
		2,100,000	AD-only

Fish have been 100% mass-marked (adipose fin-clipped) since the 2006. In addition, the integrated portion of the fall Chinook program will be 100% AD + coded-wire tag (AD+CWT). Fish are mass-marked when they are about 180 fpp, depending on growth rates and water temperature, starting in mid-April, and lasting for about six weeks; fish are coded-wire tagged in May.

Scale samples are read at WDFW Headquarters Olympia to verify age for run reconstruction. Snouts collected from the adipose fin-clipped adults are dissected, recovered and read at the WDFW CWT Lab in Olympia. CWT data is reported annual to RMIS.

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

The program guidelines for annual broodstock/egg-take collection are managed to prevent any surpluses, and maintained within the ±5% guideline. In the event of surplus >10%, WDFW Regional Managers will in accordance with regional policy and guidelines set forth in management plans/agreements and ESA permits, and after consultation with NMFS, instruct hatchery staff for disposition of the surplus.

10.9 Fish health certification procedures applied pre-release.

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

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

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

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

Emergency procedures and disposition of fish would adhere to the protocols and procedures set forth in the Section 7 Permit. If the program were threatened by ecological or mechanical events, the Complex Manager would contact and inform Regional management of the situation. Based on a determination of a partial or complete emergency release of program fish, authorized personnel would pull screens and sumps and fish would be early-released into the Washougal River. No release of fish will occur without a review by WDFW Fish Management and a risk assessment is performed.

In the event of a water system failure, screens would be pulled to allow fish to exit the ponds or in some cases they can be transferred into other rearing vessels to prevent an emergency release. WDFW also has emergency response procedures for providing back-up pumps, transport trucks, etc. in cases of emergency. In cases of severe flooding the screens are not pulled because flood waters rise to the point where they breach the ponds. Past experience has shown that the fish tend to lie on the bottom of the pond during flooding events and only those that are inadvertently swept out are able to leave. Every effort will be made to avoid pre-programmed releases including transfer to alternate facilities. Emergency releases, if necessary and authorized, would be managed by removal of outlet screens and pull sumps of the rearing units. If possible, staff would set up portable pumps to use river water to flush the fish.

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.

- All program fish are mass marked for easy identification. Returning hatchery fish are under heavy selective harvest and are identified by an adipose fin-clip.
- The production and release of only smolts through fish culture and release practices fosters rapid seaward migration with minimal delay in the rivers, limiting interactions with naturally-produced steelhead juveniles.
- Release is from a location downstream of much of the habitat of listed Chinook and steelhead.
- Releases from this program have been shown not to stray outside the lower Columbia (Marston and Iverson 2012).
- WDFW fish health and operational concerns are communicated to WDFW Region 5 staff for any risk management or needed treatment. See also HGMP section 9.7.
- 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.

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.

Resistance Board Weir. A river-spanning resistance board weir (RBW) and trap box will be installed in the lower Washougal River RKm 22.0 (RM 13.7) between August 1 and October 31 to facilitate collection/ management/monitoring of returning adult salmonids. Operations will primarily be focused on broodstock collection and pHOS control for fall Chinook programs, but will also be used to assess abundance monitoring and management. In addition, information gathered from other returning salmonids (chum, coho, and steelhead) will also be used to improve monitoring and management when possible. All fish (salmonids and other resident fish) will be released unharmed, except for a portion of hatchery-origin and natural-original fall Chinook needed for broodstock purposes, and surplus hatchery-origin fish beyond escapement needs.

The weir provides the ability to capture returning adult salmonids at a high rate. When the weir is "fish tight" (all fish are captured), direct census counts of a population are possible, all fish can be sampled (if necessary) and the ability to selectively remove and/or pass 100% of fish is provided. In instances when the weir is not fish tight, captured fish can be sampled, selectively sorted, and marked. All fall Chinook passed upstream at the weir will be given two uniquely-numbered Floy-tags (2-inch plastic tube tags with T-bar anchor, attached with a tagging gun/needle by inserting slightly behind the dorsal fin, anchored between internal dorsal rays), opercula-punched, and biological data (fork length and sex) recorded. Coho, steelhead, and any other salmonids will be enumerated by mark category and sex, and will not be tagged or marked at the weir prior to being released upstream.

The weir will also be used to meet guidelines/objectives for control of hatchery-origin fish allowed to spawn naturally. The congressionally-established Hatchery Scientific Review Group (HSRG) has reviewed Lower Columbia River (LCR) hatcheries and developed hatchery reform principles and standards that promote change towards conservation goals while still maintaining sustainable fisheries (HSRG 2009a, http://hatcheryreform.us). The HSRG developed standards for hatchery programs appropriate to the affected natural population's status as primary, contributing or stabilizing (HSRG 2009a). One of these standards pertains to the proportion of natural origin spawners composed of hatchery origin fish (pHOS). Weirs are one tool being used by WDFW to manage pHOS.

See also HGMP section sections 2.23, 5.1 and 7.2.

Mass-marking. Performance indicators for harvest will be accomplished by continuing mass marking (ad clip). CWT recoveries will help determine stray rate contributions on spawning grounds by watersheds close in proximity to this program's release vicinity. See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary.

Additional research, monitoring and evaluation in the Lower Columbia. WDFW is currently conducting the following Mitchell Act-funded research, monitoring and evaluation projects:

Table 11.1.1: Current WDFW Mitchell Act-funded research, monitoring and evaluation projects.

Project	Description
LCR Monitoring	WDFW has implemented an expanded monitoring program for Chinook, coho, chum and steelhead populations in the Lower Columbia River (LCR) region of Southwest Washington (WDFW's Region 5) and fishery monitoring in the lower mainstem of the Columbia River. The focus of this expanded monitoring is to 1)

	gather data on Viable Salmonid Population (VSP) parameters – spawner abundance, including proportion of hatchery-origin spawners (pHOS), spatial distribution, diversity, and productivity, 2) to increase the coded wire tag (CWT) recovery rate from spawning grounds to meet regional standards, and 3) to evaluate the use of PIT tags to develop harvest rates for salmon and steelhead populations. Additionally, key watersheds are monitored for juvenile salmonid out-migrant abundance. Coupled with adult abundance information, these data sets allow for evaluation of freshwater productivity and development of biological reference points, such as seeding capacity. Monitoring protocols and analysis methods utilized are intended to produce unbiased estimates with measurements of precision in an effort to meet NOAA monitoring guidelines (Crawford and Rumsey 2011).

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

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

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

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary, In addition, we will adaptively manage all aspects of the program to continue to minimize associated risks using the more recent available scientific research.

Trap box conditions. The highest potential for injury or mortality will likely be due to overloading of the trap box, which could be exacerbated by low flow/warm water conditions. To minimize this, the trap will be staffed nearly continuously while installed and the trap box will be checked multiple times/day, as necessary; temporary holding time will be <24 hours. In addition, water temperature will be monitored. If abundance of salmonids exceeds the ability of staff to efficiently work through fish, modifications to the sampling schedule and/or trapping protocols will be made to facilitate passage without handling. At all locations, this can be accomplished by opening the upstream gate on the trap box and allowing fish to pass through without handling, or by removing (or submerging) a panel section of the weir to allow fish passage around the trap box.

High flow events could prevent access to the trap box and limit WDFW staff's ability to handle fish, potentially trapping fish for the duration of the high flow event. WDFW project staff will monitor stream gauges to gather near real-time information on streamflows throughout the Lower Columbia. Gauges are operated by Washington Department of Ecology (DOE) on the Washougal River (station ID: 28B080). Utilizing streamflow, weather forecast information, and direct observation, WDFW personnel will determine when flows begin to limit the ability to access the trap box and sample fish. If these conditions are encountered the trap box will either be 1) opened on both the upstream and downstream end to allow direct passage through the trap, or 2) closed on both the upstream and downstream ends to prevent fish from becoming entrapped while personnel cannot access the trap. Which option is chosen will depend on the extent of the high

flow event, expected duration, and the trap counts (i.e. relative abundance of fish that may be impeded) in the weekly trapping period prior to the event.

Fish handling and tagging. Handling and tagging of fish presents another potential injury/mortality risk. To minimize this, experienced, senior level staff will be overseeing handling and operations and ensuring field technicians are well trained in proper fish handling techniques. In addition, anesthetic may be used to calm fish during intrusive tagging procedures.

Impeding fish movement. Close attention will be paid to the recruitment of fish into the adult trap and the accumulation of fish below the trap. If fish are not adequately moving into the trap, modifications will first be made to adjust flow and try to increase trapping efficiency. If this does not encourage fish to move into the live box, a beach seine will be used to either capture fish or crowd them into the live box. The final option if fish are stacking up below the weir and cannot be captured through trapping or seining will be to remove or submerge weir panels to allow fish passage upstream of the weir for short intervals.

Spawning ground surveys and biological sampling occurring during the recovery will employ measures to ensure that effects on the survival of the listed Chinook salmon population are insignificant. Salmon redds and live spawning fish will not be disturbed during surveys and sampling.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

No research is directly associated with the program.

12.2 Cooperating and funding agencies.

Any research is conducted by WDFW.

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

Beamesderfer, R., L. Berg, M. Chilcote, J. Firman, E. Gilbert, K. Goodson, D. Jepsen, T. Jones, S. Knapp, C. Knutsen, K. Kostow, B. McIntosh, J. Nicholas, J. Rodgers, T. Stahl, and B. Taylor. 2010. Lower Columbia River conservation and recovery plan for Oregon populations of salmon and steelhead. Oregon Department of Fish and Wildlife. 423 pp. Salem, Oregon. Available from: http://www.dfw.state.or.us/fish/CRP/docs/lower-columbia/OR_LCR_Plan%20-%20Aug_6_2010_Final.pdf.

Bilby R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 53:164–173.

Chen, M., E. Ray and S. Roberts. Operations report: Fish Health Summary; October 1, 2009 through March 31, 2010. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 8 pp.

Crawford, B.A. and S. Rumsey. 2011. Guidance for Monitoring Recovery of Pacific Northwest Salmon & Steelhead listed under the Federal Endangered Species Act (Idaho, Oregon, and Washington. NMFS NW Region. January 2011.

Fischer, M. and J. Hyde. 2011. Operations report: Washougal Hatchery; April 1, 2011 through September 30, 2011. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 26 pp.

Fischer, M. 2012. Operations report: Washougal Hatchery; October 1, 2011 through March 31, 2012. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 46 pp.

Fischer, M. and G. Haldy. 2012. Operations report: Washougal Hatchery; April 1, 2012 through September 30, 2012. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 28 pp.

Fischer, M. 2013. Operations report: Washougal Hatchery; October 1, 2012 through March 31, 2013. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 46 pp.

Fischer, M. 2013. Operations report: Washougal Hatchery; April 1, 2013 through September 30, 2013. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 34 pp.

Ford M.J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p.

Fuss, H, J.B. Byrne, and C.E. Ashbrook. 2000. Migratory behavior and incidence of post-release residualism of hatchery-reared coho and Chinook salmon released into the Elochoman River: completion report for FY 1996-1998. Washington Department of Fish and Wildlife, Fish Program, Science Division. FPA99-08. Olympia, Washington.

Good, T.P., R.S. Waples, and P. Adams, (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department Commerce. NOAA Tech. Memo. NMFS-NWFSC-66. 637 pp.

Gregory, S.V., G.A. Lamberti, D.C. Erman, K.V. Koski, M.L. Murphy, and J.R. Sedell. 1987. Influence of forest practices on aquatic production. *In* Salo, EO and Cundy TW. (editors), Streamside

management: forestry and fishery interactions. Institute of Forest Resources, University of Washington. Seattle, Washington.

Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-105, 360 p.

Hawkins, S. and J. Tipping. 1999. Predation by juvenile hatchery salmonids on wild fall Chinook salmon fry in the Lewis River, Washington. California Fish and Game. 85:124-129.

HSRG (Hatchery Scientific Review Group). 2004. Hatchery reform; principles and recommendations of the Hatchery Scientific Review Group. Long Live the Kings. Seattle, Washington. Available from: http://hatcheryreform.us/hrp_downloads/reports/hsrg_princ_recs_report_full_apr04.pdf

HSRG (Hatchery Scientific Review Group). 2009. Report to Congress on Columbia River Basin Hatchery Reform. Hatchery Scientific Review Group. Long Live the Kings. Seattle, Washington. http://hatcheryreform.us/hrp_downloads/reports/columbia_river/report_to_congress/hsrg_report_12.pdf.

HSRG (Hatchery Scientific Review Group). 2009. System-wide Report on Columbia River Basin Hatchery Reform. Hatchery Scientific Review Group. Long Live the Kings. Seattle, Washington. http://hatcheryreform.us/hrp/reports/system/welcome_showaction.

IHOT (Integrated Hatchery Operations Team). 1995. Operation plans for anadromous fish Production facilities in the Columbia River basin. Volume III - Washington. Annual Report 1995. Bonneville Power Administration, Portland, OR. Project Number 92-043. 536 pp.

IHOT (Integrated Hatchery Operations Team). 1998. Hatchery evaluation report summary for Beaver Creek Hatchery: a summarized compliation of independent audits based on IHOT performance measures. Northwest Power Planning Council, Portland, OR. BPA Project Number 95-2. 25 pp.

Johnson, M. 2007. Operations report: Washougal Hatchery; April 1, 2007 through September 30, 2007. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2008. Operations report: Washougal Hatchery; October 1, 2007 through November 31, 2007. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2008. Operations report: Washougal Hatchery; December 1, 2007 through March 31, 2008. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2008. Operations report: Washougal Hatchery; April 1, 2008 through September 30, 2008. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2009. Operations report: Washougal Hatchery; January 1, 2009 through March 31, 2009. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2009. Operations report: Washougal Hatchery; April 1, 2009 through September 30, 2009. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Johnson, M. 2010. Operations report: Washougal Hatchery; October 1, 2019 through March 31, 2010. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 20 pp.

Johnson, M. 2010. Operations report: Washougal Hatchery; April 1, 2010 through September 30, 2010. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 16 pp.

Johnson, M. 2011. Operations report: Washougal Hatchery; October 1, 2010 through March 31, 2011. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 28 pp.

Kline, T.C. Jr., J.J. Goring, Q.A. Mathisen, and P.H. Poe. 1997. Recycling of elements transported upstream by runs of Pacific salmon: I _^{15}N and _^{13}C evidence in Sashin Creek, southeastern Alaska. Canadian Journal of Fisheries and Aquatic Sciences 47(1): 136-144.

LCFRB (Lower Columbia Fish Recovery Board). 2010. Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan. June 6, 2010. http://www.lcfrb.gen.wa.us/Recovery%20Plans/March%202010%20review%20draft%20RP/RP%20Frontpage.htm.

Levy, S. 1997. Pacific salmon bring it all back home: Even in death these fish fuel life in their natal streams. Bio Science 47(10): 657-660.

Marston, G. and Iverson, C. 2012. Kalama River Out-of-Basin Stray Data. Technical Memorandum from Washington Department of Fish and Wildlife. June 26, 2012. Olympia, Washington. 2 pp.

Mathisen, O.A., P.L. Parker, J.J. Goering, T.C. Kline, P.H. Poe, and R.S. Scalan. 1988. Recycling of marine elements transported into freshwater systems by anadromous salmon. Verh. Int. Ver. Limnol. 23: 2249-2258.

McElhany, P., M.H. Ruckelhaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-42.

McElhany, P., C. Busack, M. Chilcote, S. Kolmes, B. McIntosh, J. Myers, D. Rawding, A. Steel, C. Steward, D. Ward, T. Whiesel, C. Willis. 2006. Revised viability criteria for salmon and steelhead populations in the Willamette and lower Columbia basins, review draft. Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) and Oregon Department of Fish and Wildlife (ODFW). Portland, Oregon.

McElhany, P., M. Chilcote, J. Myers, R. Beamesderfer. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and lower Columbia basins, review draft. NMFS-NWFSC. Seattle, Washington.

McElhany, P., T.Bachman, C. Busack, S. Heppell, S. Kolmes, A. Maule, J. Myers, D. Rawding, D. Shively, A. Steel, C. Steward, and T. Whitesel. 2003. Interim report on viability criteria for Willamette and Lower Columbia Basin Pacific salmonids. Unpublished report. NOAA Fisheries.

Myers, J., C. Busack, D. Rawding, A. Marshall, D. Teel, D.M. Van Doornik, and M.T. Maher. 2006. Historical population structure of Willamette and Lower Columbia River Basin Pacific salmonids. United States Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-73. Seattle, Washington.

NMFS (National Marine Fisheries Service). 1995. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/nmfscrit1.htm.

NMFS (National Marine Fisheries Service). 1996. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/pumpcrit1.htm.

NMFS (National Marine Fisheries Service). 1999. Endangered and threatened species: Threatened status for three Chinook salmon Evolutionarily Significant Units in Washington and Oregon, and Endangered status for one Chinook salmon ESU in Washington; final rule. Partial 6-month extension on final listing determinations for four Evolutionarily Significant Units of West Coast Chinook salmon; proposed rule. Federal Register 64:14308-14328.

NMFS (National Marine Fisheries Service). 2000a. A risk assessment procedure for evaluating harvest mortality of Pacific salmonids. National Marine Fisheries Service, Sustainable Fisheries Division, Northwest Region. May 30. 33pp.

NMFS (National Marine Fisheries Service). 2005. Endangered and threatened species: final listing determinations for 16 ESUs of west coast salmon, and final 4(d) protective regulations for threatened salmonid ESUs. Federal Register 70FR37160.

NMFS (National Marine Fisheries Service). 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register 71FR834.

NMFS (National Marine Fisheries Service). 2010. Endangered and threatened wildlife and plants: threatened status for Southern Distinct Population Segment of eulachon. Federal Register 75FR13012.

NMFS (National Marine Fisheries Service). 2011. Critical habitat for the southern distinct population segment of Eulachon: final biological report. U.S. Department of Commerce, NOAA. Northwest Region, Protected Resources Division. 59 pp.

NMFS (National Marine Fisheries Service). 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

NMFS (National Marine Fisheries Service). 2014. Endangered and threatened wildlife; final rule to revise the Code of Federal Regulations for species under the jurisdiction of the National Marine Fisheries Service. Federal Register 79FR20802.

NMFS SHIEER 2004, 70FR37160. June 28, 2005 - Final ESA listing determinations for 16 ESUs of West Coast salmon, and final 4(d) protective regulations for threatened salmonid ESUs; NMFS 2004. Salmonid Hatchery Inventory and Effects Evaluation Report (SHIEER). An evaluation of the effects of artificial propagation on the status and likelihood of extinction of west coast salmon and steelhead under the Federal Endangered Species Act. May 28, 2004. Technical Memorandum NMFS-NWR/SWR. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Portland, Oregon. 557p.

NPPC (Northwest Power Planning Council). 2001. Performance standards and indicators for the use of artificial production for anadromous and resident fish populations in the Pacific Northwest. Portland, Oregon. 19 pp.

Phinney, D. 2006. Compendium of Water Rights documents for Hatcheries and Wildlife areas. Washington Department of Fish and Wildlife Habitat Program. Olympia, Washington.

Piper, R., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, J.R. Leonard, A.J. Trandahl, and V. Adriance. 1982. Fish Hatchery Management. United States Dept of Interior, Fish and Wildlife Service. Washington, D.C.

Ray, E, L. Durham and S. Roberts. Operations report: Fish Health Summary; April 1, 2007 through September 30, 2007. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 9 pp.

Ray, E, L. Durham and S. Roberts. Operations report: Fish Health Summary; October 1, 2007 through March 31, 2008. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 6 pp

Ray, E, L. Durham and S. Roberts. Operations report: Fish Health Summary; April 1, 2008 through September 30, 2008. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Ray, E, and S. Roberts. Operations report: Fish Health Summary; October 1, 2008 through March 31, 2009. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 7 pp.

Ray, E, M. Chen and S. Roberts. Operations report: Fish Health Summary; April 1, 2009 through September 30, 2009. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 8 pp.

Ray, E, and S. Roberts. Operations report: Fish Health Summary; April 1, 2010 through September 30, 2010. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Ray, E, S. Bjork and S. Roberts. Operations report: Fish Health Summary; October 1, 2010 through March 31, 2011. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 10 pp.

Riley, S.C., H.J. Fuss, and L.L. LeClair. 2004. Ecological effects of hatchery-reared juvenile Chinook and coho Salmon on wild juvenile salmonids in Two Washington streams. North American Journal of Fisheries Management, 24(2): 506-517.

RMIS (Regional Mark Information System). 2012. Retrieved February 6th 2012. Available from: http://www.rmpc.org/.

Seidel, P. 1983. Spawning guidelines for Washington Department of Fish and Wildlife hatcheries. Washington Department of Fish and Wildlife. Olympia, Washington.

Sharpe, C., P. Topping, T. Pearsons, J. Dixon and H. Fuss. 2008. Predation of naturally-produced fall Chinook fry by hatchery steelhead juveniles in Western Washington Rivers. Fish Program, Science Division Washington Department of Fish and Wildlife. Olympia, Washington.

Steward, C. and T.C. Bjornn. 1990. Supplementation of salmon and steelhead stocks with hatchery fish; a synthesis of published literature. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho. Tech. Rpt. 90-1. Moscow, Idaho.

Thomas, J., E. Ray and S. Roberts. Operations report: Fish Health Summary; April 1, 2011 through September 30, 2011. Hatcheries Division, Washington Department of Fish and Wildlife. Olympia, Washington. 11 pp.

Thomas, J., E. Ray and S. Roberts. Operations report: Fish Health Summary; October 1, 2011through March 31, 2012. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 12 pp.

Thomas, J., E. Ray and S. Roberts. Operations report: Fish Health Summary; April 1, 2012 through September 30, 2012. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 11 pp.

Thomas, J., E. Ray and S. Roberts. Operations report: Fish Health Summary; October 1, 2012 through March 31, 2013. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 12 pp.

Thomas, J., E. Ray and S. Roberts. Operations report: Fish Health Summary; April 1, 2013 through September 30, 2013. Science Division, Washington Department of Fish and Wildlife. Olympia, Washington. 14 pp.

WDFW (Washington Department of Fish and Wildlife) and WWTIT (Western Washington Treaty Indian Tribes). 1998 (Updated 2006). Salmonid disease control policy of the fisheries Co-Managers of Washington State. Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes, Olympia Washington.

WDFW (Washington Department of Fish and Wildlife). 2010. Draft Conservation and Sustainable Fisheries Plan (C&SFP). Washington Department of Fish and Wildlife. Olympia, Washington. 208 pp.

WDFW (Washington Department of Fish and Wildlife). 2010. WDFW Fisheries Management and Evaluation Plan (FMEP). Lower Columbia River. Submitted to NMFS Portland, Oregon.

WDFW (Washington Department of Fish and Wildlife). 2013. 2013 Future brood document. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/publications/01356/.

WDFW (Washington Department of Fish and Wildlife). 2013. Hatcheries headquarters database. Hatcheries Data Unit, Washington Department of Fish and Wildlife. Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife). 2013. Salmonid stock inventory (SaSI). Fish Program, Science Division. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/conservation/fisheries/sasi/ .

WDFW (Washington Department of Fish and Wildlife). 2013. 2013/2014 Washington sport fishing rules. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/publications/01384/wdfw01384.pdf.

WDOE (Washington Department of Ecology). 2014. Water Resources Explorer. Retrieved July 8, 2014, from: https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx.

Wipfli, M.S., J. Hudson, and J. Caouette. 1998 Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Can J. Fish. Aquat. Sci. 55: 1503-1511.

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

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

Hatchery/ Collection site	Stock	Species	Date Sampled	Results	Comments	Life Stage	Sample number	NUMBER OF SAMPLES						CELL LINE	ID	INOC DATE
								OF	POOL	K/S	POOL	fry/visc /other	pools			
WASHOUGAL	WASHOUGAL R	FCHIN	10/10/06	**PARAMYXOVIRUS**	1+/12p OF & K/S	AD	1011-7/8	60	12	60	12			C	F&P	
WASHOUGAL	WASHOUGAL R	NCOHO	12/05/06	NEV		AD	1206-1/2	60	12	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/16/07	NEV		AD	1017-1/2	60	12	60	12					
WASHOUGAL	WASHOUGAL R	NCOHO	12/18/07	NEV	eggs to be shipped to Prosser H	AD	1219-4/5	84	20	60	13					
WASHOUGAL	WASHOUGAL R	FCHIN	10/07/08	NEV		AD	1008-5/6	60	12	60	12					
WASHOUGAL	WASHOUGAL R	NCOHO	12/16/08	NEV		AD	1217-7/8	60	12	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/13/09	NEV		AD	1014-1/2	30	6	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/13/09	NEV		AD	1014-1/2	30	6	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/27/09	NEV		AD	1028-8/9	30	6	30	6					
WASHOUGAL	WASHOUGAL R	FCHIN	10/27/09	NEV		AD	1028-8/9	30	6	30	6					
WASHOUGAL	WASHOUGAL R	NCOHO	12/15/09	NEV		AD	1215-19/20	60	12	60	12					
WASHOUGAL	WASHOUGAL R	NCOHO	12/15/09	NEV		AD	1215-19/20	60	12	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/19/10	NEV		AD	1020-6/7	60	12	60	12					
WASHOUGAL	WASHOUGAL R	NCOHO	12/07/10	NEV		AD	1207-3/4	60	12	60	12					
WASHOUGAL	WASHOUGAL R	FCHIN	10/18/11	NEV		AD	1019-3/4	60	12	60	12					
WASHOUGAL	DUNCAN CR	CHUM	11/16/11	NEV		AD	1117-5/6	5	2	13	11					
WASHOUGAL	DUNCAN AND IVE'S CR	CHUM	11/30/11	NEV	OF: #12-14, 15-17, 18, 20-22, 23-25, 26-28; K/S: F #12-15, 16-19, 20-23, 24-28 & M #13-17, 18-22, 23-26	AD	1201-3/4	16	6	31	7					
WASHOUGAL	COLUMBIA R/ VANCOUVER	CHUM	12/02/11	NEV	frozen; OF's:F11-13,F14-16,F17-19,F20-21 & K/S's: F/M 11-15,16-20, 21-22	AD	1208-6/7	11	4	24	6					
WASHOUGAL	IVE'S CR	CHUM	12/07/11	NEV	OF: #29-31, 32&34 K/S: F#29-33, M#27-32	AD	1208-8/9	5	2	11	2					
WASHOUGAL	COLUMBIA R/ VANCOUVER	CHUM	12/08/11	NEV	OF: F#23-28, 29-34; K/S: F#23-27, 28-32, 33-34, M#23-27, 28-32, SAMPLES CAME IN FROZEN	AD	1214-9/10	12	2	22	5					
WASHOUGAL	COLUMBIA R/ VANCOUVER	CHUM	12/13/11	NEV	OF: F#35-40, 41-46, 47-49; K/S: F#35-39, 40-44, 45-48, M#33-37, 38-42, 43-46	AD	1215-5/6	15	3	29	6					
WASHOUGAL	WASHOUGAL R	NCOHO	12/14/11	NEV		AD	1215-8/9	60	12	60	12					
WASHOUGAL	COLUMBIA R/ VANCOUVER	CHUM	12/16/11	NEV	I-205 collection site, OF and K/S came in frozen, OF:F#50-54, 55-57; K/S; F350-54, 55-57, M#47-51, 52-59	AD	1221-9/10	8	2	16	4					
WASHOUGAL	WASHOUGAL R	FCHIN	10/16/12	NEV		AD	1017-1/2	60	12	60	12					10/17
WASHOUGAL	DUNCAN CR	CHUM	11/14/12	NEV	Sent frozen	AD	1127-7/8	5	1	10	2					11/28
WASHOUGAL	DUNCAN CR	CHUM	11/07/12	NEV	Sent frozen	AD	1127-9/10	1	1	4	2					11/28
WASHOUGAL	COLUMBIA R/ VANCOUVER	CHUM	11/21/12	NEV	Sent frozen, I-205 collection site	AD	1127-11/12	10	2	20	4					11/28
WASHOUGAL	IVE'S CR	CHUM	11/7,11/14	NEV	Sent frozen	AD	1127-13/14	6	2	14	4					11/28
WASHOUGAL	DUNCAN CR	CHUM	11/28/12	NEV		AD	1129-4/5	11	2	22	4					11/30
WASHOUGAL	WASHOUGAL R	NCOHO	12/04/12	NEV		AD	1205-1/2	60	12	60	12					12/05
WASHOUGAL	I-205, WASHOUGAL R	CHUM	11/30/12	NEV	Samples previously frozen	AD	1212-5/6	14	3	28	6					12/12
WASHOUGAL	I-205, WASHOUGAL R	CHUM	12/07/12	NEV	Samples previously frozen	AD	1212-7/8	17	4	33	8					12/12
WASHOUGAL	I-205, WASHOUGAL R	CHUM	12/11/12	NEV		AD	1212-9/10	3	1	7	2					12/12

Hatchery/ Collection site	Stock	Species	Date Sampled	Results	Comments	Life Stage	Sample number	NUMBER OF SAMPLES						CELL LINE	ID	INOC DATE
								OF	**POOL**	**K/S**	**POOL**	**fry/visc /other**	**pools**			
WASHOUGAL	WASHOUGAL R	FCHIN	10/15/13	NEV		AD	1016-1/2	60	12	60	12					10/16/13
WASHOUGAL	DUNCAN CR	CHUM	11/15/13	NEV		AD	1121-1/2	3	1	6	2					11/21/13
WASHOUGAL	DUNCAN CR	CHUM	11/20/13	**Virus +**	1121-4; 1+/2PLS	AD	1121-3/4	5	1	10	2					11/21/13
WASHOUGAL	I-205	CHUM	11/22/13	NEV		AD	1206-7/8	8	2	16	4					12/06/13
WASHOUGAL	I-205	CHUM	11/27/13	NEV		AD	1206-1/2	6	2	12	4					12/06/13
WASHOUGAL	DUNCAN CR	CHUM	11/27/13	NEV		AD	1206-3/4	6	2	12	4					12/06/13
WASHOUGAL	WASHOUGAL R	NCOHO	12/03/13	NEV		AD	1204-4/5	60	12	60	12					12/04/13
WASHOUGAL	DUNCAN CR	CHUM	12/04/13	NEV		AD	1206-5/6	7	2	15	4					12/06/13
WASHOUGAL	I-205	CHUM	12/06/13	NEV		AD	1212-1/2	18	4	35	8					12/13/13
WASHOUGAL	DUNCAN CR	CHUM	12/11/13	NEV		AD	1212-3/4	2	1	4	2					12/13/13

Attachment 2: Fish Health Summaries - Washougal Hatchery, April 1, 2007 through September 30, 2007 to April 1, 2013 through Septmber 30, 2013.

Juveniles: Fall Chinook

2006 brood fall Chinook

They were healthy and vigorous.

2007 brood fall Chinook

Fry developed more deformities in the tail area than usual, although no pathogens were found. Loss was not significant but there are a lot of fry swimming sideways. By the end of the reporting period, the populations seem to be straightening out. No further health issues through their release in June 2008.

2008 brood fall Chinook

No health issues throughout rearing, until release in late-June 2009.

2009 brood fall Chinook

No health issues throughout rearing, until release in late-June 2010.

2010 brood fall Chinook

The general population remained healthy until release in June and July 2011. There were low levels of BGD and drop out, but nothing that required treatment

2011 brood fall Chinook

All eggs were treated with formalin dripped at 1:600 to control *Saprolegnia* until hatched. These fish underwent a loss due to gut fungus in early-March 2012, and then again in mid-March in fish that were ponded later. Loss was moderate in the first group reaching up to 0.2%/day in some ponds but loss was much lower in the later groups. The fish suffered a low level of loss in mid-April 2012, but no pathogens were detected and no cause was determined. A similar situation occurred at Beaver Creek Hatchery with this stock and in both cases the mortality subsided within a few days. Fairly substantial dropout was observed in May 2012. Fish were generally healthy just prior to release in late-June; gills were showing slight clubbing and there was some fraying of the dorsal fin.

2012 brood fall Chinook

No health issues throughout rearing, although one pond which had switched feed brands experienced a greater problem with dropouts. These fish did well, aside from some handling loss during marking. Fish were transferred Lewis River Hatchery in April 2013, and to Deep River Net Pens the mid-May; the remainder of the fish were released on schedule on June 11, 2013.

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 USFWS listed and candidate species are found in Cowlitz 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.

Listed or candidate species:
"No effect" for the following species:

Bull trout (*Salvelinus confluentus*) – Threatened (Critical Habitat Designated)
Nelson's checker-mallow (*Sidalcea nelsoniana*) –Threatened
Marbled murrelet (*Brachyramphus marmoratus*) –Threatened (Critical Habitat Designated)
Columbian White-Tailed deer (*Odocoileus virginianus leucurus*) – Endangered
Gray Wolf (*Canis lupus*) –Threatened
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened (Critical Habitat Designated)

Candidate Species
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS

15.3 Analyze effects.

Not applicable.

15.4 Actions taken to minimize potential effects.

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

15.5 References

Not applicable.

16 "TAKE" TABLES

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

Listed species affected: Fall Chinook (*Oncorhynchus tshawytscha*)	**ESU/Population:** Lower Columbia River Spring Chinook	**Activity:** Washougal Fall Chinook Program
Location of hatchery activity: Washougal Hatchery, Washougal River (WRIA 28.0159) at RKm 22.0	**Dates of activity:** September-November	**Hatchery program operator:** WDFW

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

Take Table to be submitted to NOAA-NMFS, in progress.

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

Instructions:

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

Table 2. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Winter Steelhead *(Oncorhynchus mykiss)*		**ESU/Population:** Lower Columbia River Steelhead		**Activity:** Washougal Fall Chinook Program
Location of hatchery activity: Washougal Hatchery, Washougal River (WRIA 28.0159) at RKm 22.0		**Dates of activity:** September-November		**Hatchery program operator:** WDFW
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass [a]			Unk	
Collect for transport [b]				
Capture, handle, and release [c]			TBD	
Capture, handle, tag/mark/tissue sample, and released [d]				
Removal (e.g. broodstock) [e]				
Intentional lethal take [f]				
Unintentional lethal take [g]		TBD		
Other Take (specify) [h]				

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

Table 3. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Coho (*Oncorhynchus kisutch*)		**ESU/Population:** Lower Columbia River Coho		**Activity:** Washougal Fall Chinook Program
Location of hatchery activity: Washougal Hatchery, Washougal River (WRIA 28.0159) at RKm 22.0		**Dates of activity:** September-November		**Hatchery program operator:** WDFW
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass [a]			TBD	
Collect for transport [b]				
Capture, handle, and release [c]			TBD	
Capture, handle, tag/mark/tissue sample, and released [d]				
Removal (e.g. broodstock) [e]				
Intentional lethal take [f]				
Unintentional lethal take [g]		TBD		
Other Take (specify) [h]				

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

Table 4. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chum (*Oncorhynchus keta*)		**ESU/Population:** Lower Columbia River Chum		**Activity:** Washougal Fall Chinook Program
Location of hatchery activity: Washougal Hatchery, Washougal River (WRIA 28.0159) at RKm 22.0		**Dates of activity:** September-November		**Hatchery program operator:** WDFW
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass [a]			TBD	
Collect for transport [b]				
Capture, handle, and release [c]			TBD	
Capture, handle, tag/mark/tissue sample, and released [d]				
Removal (e.g. broodstock) [e]				
Intentional lethal take [f]				
Unintentional lethal take [g]		TBD		
Other Take (specify) [h]				

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